CLASS 417, PUMPS

SECTION I - CLASS DEFINITION

This is the general class for the pumping of fluids, and includes the pumping of slurries, fluent material and the like if handled in a manner not inconsistent with the handling of fluids. With the exception of "gettering pumps" as discussed in Lines With Other Classes and Within This Class, below, a pump is defined as means to move a fluid by taking it from one place or location and moving it to another place or location different from whence it came, the pump, therefore having an inlet and an outlet for the pumped fluid which are separate and distinct.

The pumping of the fluid is generally accomplished by action thereon of a mechanical member (e.g., piston) or by contact or entrainment with another fluid (e.g. jet pumps). Also, the pumping may be accomplished by the direct action on the pumped fluid of an electric or magnetic force (e.g., electromagnetic pumps). However, for the line with respect to "ion pumps", see Lines With Ohter Classes and Within This Class and Subclass References to the Current Class, below.

VACUUM FORMATION BY GETTERING

This class is the residual home for the formation of a vacuum in an enclosed space by a gettering action; a getter being a material which when placed in an enclosed space reduces the gas or vapor content of the space either by a chemical or physical action. Also, included are those devices and processes in which the fluid is ionized to permit or enhance the gettering action. These devices are often termed "getter-ion pumps". See the notes and search notes in subclasses 48 and 49 for a statement of the lines.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

LINE WITH CLASS 313 AND CLASS 315

For the line with Classes 313, Electric Lamp and Discharge Devices and 315, Electric Lamp and Discharge Devices: Systems, with respect to "ion pumps", see Subclass References to the Current Class, below.

RELATIONSHIP TO CLASS 91, MOTORS: EXPANSIBLE CHAMBER TYPE

Refer to Lines With Other Classes and Within This Class in the class definition of Class 91 for a statement of the line between Classes 91 and 417.

RELATIONSHIP TO CLASS 92, EXPANSIBLE CHAMBER DEVICES

Class 92 is directed to expansible chamber devices, per se, and with respect to nonrotary expansible chamber pumps is related to Class 417 as a subcombination thereof. Class 92 is limited to expansible chamber devices in which the working member has an oscillating or reciprocating motion to expand and contract the chamber. Thus, Class 92 cannot take the subcombination of any rotary expansible chamber pump. See the note below regarding the relationship of this class (417) and Class 418, Rotary Expansible Chamber Devices, for the disposition of this art.

Set forth below are the lines between Class 92 and Class 417 as they relate to nonrotary expansible chamber pumps:

A. With Drive Means

1. Motor Driven

Class 92 excludes motor driven expansible chamber devices when the motor is significantly claimed. See (2) Note in Class 417 subclass 321 for a statement of what constitutes a significantly claimed motor.

2. Operated By Art Device

Class 92 excludes an expansible chamber pump mounted upon or adjacent to an art device to be operated thereby. See Class 417 subclasses 229+ for this subject matter and for a definition of an art device.

3. Other Drive Mechanism

Other specific means to drive an expansible chamber pump such as gearing, linkage, etc., including disconnectable drives are not excluded from Class 92.

B. Valving

1. Pump Fluid

Class 92 excludes any expansible chamber pump which includes control of the pump fluid by a valving action. Thus, any claimed valving of pump fluid of an expansible chamber pump is sufficient to preclude classification in Class 92 even though the valving claimed may not be

all of the valving necessary to cause the pump to operate in the intended manner.

2. Nonpump Fluid

Class 92 does not exclude valving of nonpump fluid as, for example, valving for lubricant, coolant, sealant, etc.

C. With Diverse Pump

An expansible chamber pump in combination with another pump of a different type (i.e., which, per se, would not be classified in Class 92) is excluded from Class 92 unless the pump of a different type is a mere auxiliary of the expansible chamber pump (i.e., lubricant or coolant pump, etc.).

Relationship to Class 137, Fluid Handling. The line between Classes 137 and 417 is generally that of combination and subcombination. Class 137 generally provides for fluid handling systems and Class 417 generally provides for motor driven pumps and pumps, per se. There are certain areas of subject matter which are considered to be peculiar to pumps and their operation and are considered as exceptions to the general rule stated above. These exceptions and other detailed lines will be set out below.

D. Pump-Tank Relationship

The combination of a pump and a tank generally will be classified in Class 137. However, a single nominally recited tank, reservoir, chamber, pump or other similar fluid holding means will be considered as merely a flow line or conduit and will be classified in Class 417. See (9) Note in the Class Definition of Class 222, Dispensing, regarding other pump-tank relationships.

E. Pump-Accumulator Relationship

An accumulator or surge dampening device is usually a device having a single fluid opening and is connected to a pump inlet or outlet for the purpose of maintaining a smooth flow to or from the pump. Such devices when disclosed for the purpose of surge dampening or insuring smooth flow and claimed in combination with a pump are classified in Class 417.

F. Pump-Liquid Accumulation Control Relationship

1. A pump claimed in combination with a liquid accumulation controlled valve is classified in Class 137 with the following exceptions which are classifiable in Class 417:

a. When the liquid accumulation responsive valve controls a liquid flow to the pump or a gas relief from the pump is for the specifically disclosed purpose of priming the pump, see Class 417, subclasses 200 and 435.

b. When the liquid accumulation responsive valve functions as a pump valve in a fluid displacement-type pump, see Class 417, subclass 65 in general and subclasses 126+ and 138 in particular.

c. When the liquid accumulation responsive valve is the distributor of an expansible chamber-type pump, see Class 417, subclass 297.5.

2. A Jet pump claimed in combination with liquid level responsive regulating means therefor is classified in Class 417, subclass 182.5.

3. A pump claimed in combination with liquid accumulation-controlled drive transmission therefor is classified in Class 417, subclass 211.5.

4. A pump claimed in combination with a liquid accumulation controlled-drive motor therefor is classified in Class 417, subclasses 36+.

G. Pump-Plural Serial Valve Relationship

A pump claimed in combination with plural serial valves in either or both an inlet or an outlet flow path and without any branched flow paths is classifiable in Class 417. The rule for serial valves applies even though one or more of the valves is manually operated or condition responsive, see Class 417 for serial pump distributors, for a manually operated valve in serial relationship with a pump distributor, and for a condition responsive valve in combination with a pump. (See Subclass References to the Current Class, below.)

H. Pump-Main Flow Path and Branched Flow Path Relationship

Generally a branched flow system having a main flow path and a branched flow path, whether including a pump or not, is classifiable in Class 137. However, there are a number of exceptions which usually depend upon the disclosure in the particular patent as set forth below.

1. A pump having plural branched flow paths, whether valved or not, communicating with a single source or receiver is classifiable in Class 417. Where there is no specific disclosure of the source or receiver for the flow

paths, the disclosure will be considered as if there were a single source or receiver and will be classified in Class 417.

2. A pump having a main flow path and a branched flow path, each communicating with separate sources or receivers is classifiable in Class 417 if:

a. the source or receiver for the main flow path is unclaimed or nominally claimed and

b. the branched flow path is specifically disclosed as a relief inlet or outlet for the pump, a priming inlet to the pump, a bypass around the pump, or a vent, waste or drain outlet from the pump, and either(1) the main flow path is uncontrolled or (2) the main flow path is controlled and the branched flow line is (a) uncontrolled, (b) manually controlled or (c) controlled by a condition responsive valve responding to a condition in the main flow path which is sensed between the pump and the main flow path controller.

I. Condition Responsive Control of Pump Drive Motor

A motor driven pump having a condition responsive control for controlling the operation of the motor is classifiable in Class 417. The combination of a pump and a disconnectable drive, clutch or variable transmission having a condition responsive control is classifiable in Class 417. (See Subclass References to the Current Class, below.)

J. Direct Response Valve-Pump Cylinder Relationship

The combination of one or more direct response valves of the type classifiable in Class 137, subclasses 511+ and a nominally recited cylinder is classifiable in Class 137. The specific recitation of a cylinder head is not considered to be a specific recitation of the cylinder.

RELATIONSHIP TO CLASS 415, ROTARY KINETIC FLUID MOTORS OR PUMPS

Class 415 takes rotary, nonexpansible chamber-type pumps. However, Class 417 provides for rotary, nonexpansible chamber-type pumps in certain combinations as enumerated below. Unless specifically excluded below, a patent to a rotary nonexpansible chamber-type pump, as defined in the class definition of Class 415, will be classified as an original in Class 415 as opposed to Class 417.

1. With Drive Means

a. Motor Driven

Class 415 excludes motor driven rotary nonexpansible chamber-type pumps when the motor-pump combination is significantly claimed. For a detailed explanation of what constitutes a significantly claimed motor-pump combination see Subclass References to the Current Class in this class and Lines With Other Classes and Within This Class, General Relationship With Other Classes, paragraph A in the Class 415 definition.

b. Operated By Art Device

A rotary, nonexpansible chamber- type pump operated by an art device is excluded from Class 415. See Class 417 for this subject matter and the definition of an art device. (See Subclass References to the Current Class, below.)

c. Other Drive Mechanism

Other specific means to drive a rotary, nonexpansible chamber pump such as gearing, linkage, etc., including disconnectable drives (e.g., clutch) are not excluded from Class 415.

2. With Diverse Pump

The combination of a rotary, nonexpansible chamber-type pump with another pump of a different type (e.g., recipro- cating, rotary expansible chamber, etc.), is excluded from Class 415 and is classified in Class 417 unless the different type pump is a mere auxiliary of the rotary, nonexpansible chamber-type pump (e.g., lubricating or coolant pump). In the latter case, classification in Class 415 is proper.

Relationship to Class 418, Rotary Expansible Chamber Devices

Class 418 takes rotary expansible chamber pumps even though the disclosure and claims may be restricted to pump use. In some ways Class 418 may be considered to be less comprehensive than Class 417 and rotary expansible chamber-type pumps in certain combinations enumerated below will be classified in Class 417 rather than Class 418. Unless specifically excluded below a patent to a rotary expansible chamber type as defined in the Class Definition of Class 418 will be classified as an original in Class 418 as opposed to Class 417:

3. With Drive Means

a. With Motor

Class 418 excludes motor driven rotary expansible chamber devices when the motor is significantly claimed even if the motor is of the rotary expansible chamber type. For a detailed explanation of what constitutes a significantly claimed motor; see Subclass References to the Current Class, below.

b. Operated By Art Device

A rotary expansible chamber pump mounted upon or adjacent an art device to be operated thereby is excluded from Class 418. See this class (417) for this subject matter and the definition of an art device. (See Subclass References to the Current, Class, below.)

c. Other Drive Mechanism

Other specific means to drive the pump such as gearing, linkage, etc., including disconnectible drives (e.g., clutch) are not excluded from Class 418 even if the drive is not reversible.

4. Valving

a. Cyclic or Position Responsive

Class 418 will take rotary expansible chamber pumps combined with valves for the pumped fluid which have a repetitive pattern or cycle of operation which is related to the rotation of the pump. These may be termed cyclic or position responsive valving and include the opening and closing of inlet or exhaust ports by the movement of the rotor past same. The adjustment of this type valving so as to provide, for example, early cutoff of supply is also included in Class 418. The inclusion, however, of means to cutoff operation of the pump after a predetermined number of revolutions is excluded from Class 418, this being considered to be a dispensing feature for Class 222, Dispensing.

b. In-Line

An in-line valve is defined as one situated in the normal line of pumped fluid flow which acts in some way to control the flow in that line, but not by diverting the fluid to a second or subsidiary flow line (e.g., bypass). Class 418 will take all in-line valves combined with a rotary expansible chamber pump which are controlled by some means other than a condition of the pumped fluid (e.g., manual throttle) and will also take those which are actuated directly by the application of the pumped fluid thereto (i.e., direct response valves). Those devices including in-line valves which are controlled by a pumped fluid condition (e.g., pressure, flow) and in which said valves are not of the direct response type are excluded from Class 418 and will be classified in Class 417 if otherwise appropriate.

c. Branched Flow or By-pass

i. Separate Valve Means

Those rotary expansible chamber devices which include a separate valve means (as opposed to a movable chamber part as discussed in paragraph (2) immediately below) to divert or bypass all or a portion of the pumped fluid from its normal or first course of flow to a second or waste path are excluded from Class 418 regardless of whether the valve is manually or otherwise controlled unless the diverted fluid is used merely for a pump perfecting function such as lubricating, cooling, vane bias, etc.

ii. Movable Chamber Part

Many rotary expansible chamber pumps have expansible chamber parts which are in running contact with other chamber parts and which move from a “normal” or contacting position to a noncontacting position and in so moving allow passage or bypass of pumped fluid thereby. Exemplary of such parts are vanes, abutments, end plates, etc., and such parts are usually biased into contacting position by means such as a spring, pressure fluid conducted from the expansible chamber or the like. Such devices are not excluded from Class 418 even though the yielding of the part may be considered to be performing a bypassing function. However, if pumped fluid is conducted to the part for such a biasing function (e.g., behind end plate) and there is a controlled application of fluid to or release of the fluid from the bias area for the disclosed purpose of bypassing said fluid or conducting it to another point of use such devices are excluded from Class 418 and are classified in Class 417 if otherwise appropriate. Also Class 418 excludes a pump having a movable chamber part whose movement is controlled in response to the pressure or flow of the pumped fluid of a second rotary expansible chamber device.

d. Reversible or Unidirectional Flow

Some rotary expansible pumps are provided with adjustable or self-acting means by which for a given direction of rotation of the pump the flow may be reversed in the line in which the fluid is being pumped, or upon reversal

of the direction of rotation of the pump the flow will continue in the same direction in the pumped fluid flow line. This, per se, will not serve to preclude classification in Class 418.

5. With Diverse Pump

The combination of a rotary expansible chamber pump with another pump of a different type (centrifugal, reciprocation, etc.), is excluded from Class 418 and is classified in Class 417 unless the different type pump is a mere auxiliary of the rotary expansible chamber pump as, for example, a lubricating or cooling fluid pump, etc. In the latter case classification in Class 418 is proper.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for a motor driven pump having a condition responsive control for controlling the operation of the motor.

48, and 49, for a statement of the lines see the notes and search notes in these subclasses.

49, for ion pumps.

50, in which pumping may be accomplished by the direct action on the pumped fluid of an electric or magnetic force (e.g., electromagnetic pumps).

212+, for the combination of a pump and a disconnectable drive, clutch or variable transmission having a condition responsive control.

229+, for a rotary, nonexpansible chamber-type pump operated by an art device.

229+, for a rotary expansible chamber pump mounted upon or adjacent an art device to be operated thereby.

279+, for a condition responsive valve in combination with a pump, subclass 441 for a manually operated valve in serial relationship with a pump distributor, and subclass 456 for serial pump distributors.

321, for a detailed explanation of what constitutes a significantly claimed motor-pump combination see the (2) Note in this subclass.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

62, Refrigeration, subclass 55.5 for cold traps including those in which the sole disclosure is to act as a “pump” and for cold traps combined with a nominally claimed mechanical or roughing pump. Class 417, however, takes the combination of a cold trap and a significantly claimed device of this class (pump).

73, Measuring and Testing, subclass 168 for means to test blowers and pumps.

119, Animal Husbandry, subclasses 72+ for animal watering devices including animal operated pumps combined with a trough for receiving the pumped water.

166, Wells, appropriate subclasses for pumps combined with well processes or features especially, subclasses 369+ for well production processes including pumping steps, subclasses 53+ for automatic wells including control of a pump in response to a well condition, subclass 54.1 for wells with means for separately pumping from plural sources in a well, subclasses 61 and 62 for heating, refrigerating or insulating means with an eduction pump or plunger in the well, subclasses 68+ for above and below ground structure including an eduction pump or plunger in the well, subclasses 105+ for a well with an eduction pump or plunger in the well, subclass 176 well brushing, scraping, cutting or punching-type cleaners on a pump sucker rod, subclasses 316+ for valves including well pump or tubing drain valves.

406, Conveyors: Fluid Current, appropriate subclasses for systems which transport solids by means of a fluid current, and which include a pump for generating the fluid current. See particularly subclasses 10+ for control circuits for pump drives, which are responsive to a sensed condition, and subclasses 45 and 46+ for subject matter relating to the pumping and transportation of slurries.

415, Rotary Kinetic Fluid Motors or Pumps, for rotary fluid kinetic energy devices disclosed as a pump or a motor. Class 415 will also take a plurality of such devices in which each is a pump or each is a motor. Class 417 will take a rotary fluid kinetic energy motor driving a rotary fluid kinetic energy pump if a claim sets out that one is a motor and one is a pump. However, Class 415 will take this disclosed motor driven pump relation if a claim does not reflect that one is a motor and the other a pump.

416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses for motor driven fluid reaction surfaces (i.e., impellers) in which there is no claimed fluid confining or deflect-

ing means, upstream or downstream of or encompassing the impeller.

418, Rotary Expansible Chamber Devices, for rotary expansible chamber devices disclosed as a pump or a motor. Class 418 will also take a plurality of such devices in which each is a pump or each is a motor. Class 418 will not take a rotary expansible chamber-type motor driving a rotary expansible chamber-type pump if a claim recites one as a motor and one as a pump. However, Class 418 will take this disclosed motor driven pump relationship if a claim does not reflect that one is a motor and the other a pump.

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_C 30 K) superconducting devices, and particularly subclass 165 for pumps utilizing a suspension of superconducting particulate material, and cross-reference art collection 910 for pumps utilizing superconducting materials.

623, Prosthesis (i.e., Artificial Body Members), Parts Thereof, or Aids and Accessories Therefor, subclass 3 for pumps solely disclosed as artificial hearts.

SUBCLASSES

1 This subclass is indented under the class definition. Subject matter in which the pump is provided with (1) a motor to drive the fluid moving element thereof, (2) control means to control the motor in some manner and (3) a separate sensing means which is responsive to the occurrence of a condition or a change in condition of either the pump or the fluid being pumped and which causes operation of the control means to alter the operation of the motor.

(1) Note. Sensing of the speed of a motor which is mechanically connected to the pump for driving same is considered as sensing a condition of the pump and is included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

187+, for regulation of a jet pump by motive fluid control, jet pumps not being considered as motor driven.

196+, for diverse pumps having condition responsive control of a drive motor for one pump which is a mere priming pump for another.

212+, for condition responsive control of a pump drive transmission.

321+, for pumps which are cyclically driven by a cyclically operable motor and in which the control of the motor is caused to operate cyclically by a cyclically changing condition of the pump or pump fluid such that this change of condition and its control of the motor are the normal manner of operation.

2 This subclass is indented under subclass 1. Subject matter comprising at least two pumps which are either (1) independently driven by separate drive motors, (2) adapted to be supplied from separate sources, or (3) adapted to deliver to separate destinations.

(1) Note. For purposes of this definition, a single cylinder having a pumping member (e.g., piston) which serves to divide the cylinder into two pumping chambers is considered to comprise plural pumps if the pump chambers are adapted to deliver fluid to separate destinations or receive fluid from separate sources.

(2) Note. To be included under this definition, the plural pumps must supply fluid for external use (i.e., one may not be a mere auxiliary of another such as a lubricant, coolant, or priming pump).

(3) Note. An entrainment-type pump (e.g., jet pump) has not been construed as motor driven and consequently the combination of a condition responsive motor driven pump and jet pump is not included under part (1) of the above definition and such combination would be classified here only if the motor driven pump and jet pump respectively deliver to separate destinations or receive fluid from separate sources.

3 This subclass is indented under subclass 2. Subject matter in which each of said plural pumps has its respective inlet or outlet connected to a single flow line so that fluid will

flow either to or from said pumps through said flow line.

(1) Note. For purposes of this definition, a common inflow or outflow line is defined as a conduit or tank in that portion of the system which handles fluid flow to or from two or more pumps. Patents disclosing parallel flow paths in which a pressure condition is sensed in one path only, but for the disclosed purpose of indicating the common flow line pressure condition, have been placed in subclass 2, above, and appropriately cross-referenced into this subclass or those indented hereunder.

4 This subclass is indented under subclass 3. Subject matter in which sensing means is operative to sense a condition or change of condition occurring in the fluid in the common flow line joining either the pump inlets or pump outlets.

5 This subclass is indented under subclass 4. Subject matter in which each of said plural pumps is driven by separate drive motor and the control means is operative to simultaneously or relatively control the operation of each of said plural drive motors.

6 This subclass is indented under subclass 5. Subject matter in which there is an additional sensing means to sense a condition or change in condition in either (1) a fluid flow line which is peculiar to a single pump, or (2) a pump which is peculiar to a single flow line, said additional sensing means serving to effect operation of the same or different control means.

7 This subclass is indented under subclass 5. Subject matter in which the control means for the pumps comprise a start and stop device for the motor of each pump and which are related to one another in such a manner that the pumps will either be started or stopped in a certain order in response to changes in conditions sensed by the sensing means.

8 This subclass is indented under subclass 7. Subject matter having means related to the control means for cyclically changing the order of starting or stopping the pump drive motors.

9 This subclass is indented under subclass 1. Subject matter in which there is means provided for accumulating or detecting leakage of pump fluid from the pump or system or leakage of an extraneous fluid into the pump or system and the control means acts in response to such leakage to stop operation of the pump motor.

(1) Note. There must be a specific disclosure that the fluid which causes operation of the control means has leaked from the device. The mere possibility of detecting leakage by some conventional means, such as a pressure responsive device, is not sufficient for classification in this subclass.

10 This subclass is indented under subclass 1. Subject matter in which the drive motor comprises an engine in which fuel is burned in a chamber from which power is directly derived and the control means is operative to either (1) control actuation of a secondary motor which is utilized for initiating operation of the fuel burning engine or (2) control operation of the pump to cause same to be operated as a motor for initiating operation of the fuel burning engine.

11 This subclass is indented under subclass 1. Subject matter in which the drive motor is of the reciprocating expansible chamber type and derives its power by the burning of fuel in the chamber and in which the piston or working member of the motor is free of any mechanical linkage or gearing which limits its movement to a fixed stroke during its cycle of operation.

12 This subclass is indented under subclass 1. Subject matter having means related to the sensing means for either (1) causing the state of operation of the drive motor to be maintained for a specified period of time after a condition or change in condition is detected by the sensing means before allowing the state of operation to be changed in accordance with the sensed condition, (2) allowing the state of operation of the drive motor to be changed in response to a sensed condition and then causing said changed state of operation to be maintained for a specified period of time regardless of further condition changes, (3) causing the control means or sensing means to be ineffective for a specified period of time during motor

start up, or (4) altering the effectiveness of the control means for a specified period of time after the sensing means has detected a change in condition.

(1) Note. A fluid dashpot or damper utilizing fluid independent of the pump fluid and which serves only to attenuate the effect of periodic condition fluctuations of short duration is not considered to be a delay or timing means under this definition.

13 This subclass is indented under subclass 1. Subject matter including a means to supply lubricating, sealing, or cooling fluid to the pump and the sensing means senses a condition or change of condition of said lubricating, sealing, or cooling means and operates the motor control means in response thereto.

14 This subclass is indented under subclass 1. Subject matter including an additional sensing means operatively connected to the control means, said additional sensing means being responsive to a condition or change of condition (e.g., ambient condition) of the surrounding environment.

15 This subclass is indented under subclass 1. Subject matter in which there is additionally provided means for transmitting motion from the motor to the pump and control means for either (1) interrupting motion of the pump (e.g., clutch, lock, etc.), (2) varying the rate of motion of the pump (e.g., brake, adjustable gearing, etc.) or (3) changing the swept volume of pumping member or motor working member displacement of an expansible chamber-type pump or motor (e.g., stroke control).

16 This subclass is indented under subclass 1. Subject matter in which the pump is driven by two or more individual motors, each of said motors having a motor working member for driving the same fluid moving element of the pump and in which at least one of the motors is controlled by the controlling means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for condition responsive control of a starter motor for an internal combustion engine. The starter motor, even though it may incidentally drive the pump while cranking the combustion engine, is not considered to be a separate pump drive motor for this subclass.

17 This subclass is indented under subclass 1. Subject matter in which the control means comprises two or more controlling elements which are capable of being separately actuated in response to the same or different conditions to separately control the drive motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for condition responsive control of a starter motor for an internal combustion engine, such apparatus usually incorporating a separate control means for terminating operation of the internal combustion engine.

18 This subclass is indented under subclass 1. Subject matter comprising a single drive motor controlling element which is caused to be operated in response to means sensing plural conditions which are (1) different in kind, e.g., pressure and flow rate, or (2) if of the same kind, different by the part of the system characterized by the condition, e.g., inlet and discharge pressures of the pump.

(1) Note. The diverse condition may be a condition external of the pump or pump fluid system, e.g., a drive motor condition.

19 This subclass is indented under subclass 18. Subject matter in which the sensing means responds to a condition or change of condition on the fluid inlet or intake side of the pump and a condition or change of condition on the fluid outlet or discharge side of the pump.

20 This subclass is indented under subclass 18. Subject matter in which one of the plural conditions to which the sensing means responds is a change in rate of pump fluid flow to, or from the pump.

21 This subclass is indented under subclass 18. Subject matter in which the drive motor is of the type which is motivated by a fluid and one of the plural conditions to which the sensing

means responds is a condition or change in condition of the motor driving fluid.

22 This subclass is indented under subclass 18. Subject matter in which one of the plural conditions to which the sensing means responds for causing operations of the single drive motor control element is the rate of speed at which the pump is driven.

23 This subclass is indented under subclass 22. Subject matter having valve means for varying the flow of fluid being pumped, there being additionally provided a sensing means having a single sensing part for detecting a condition other than the rate of speed at which the pump is driven, the single sensing means causing operation of both the pump fluid valve means and the single drive motor control element.

24 This subclass is indented under subclass 22. Subject matter in which the means sensing the rate of speed at which the pump is driven comprises either a secondary pump or an electric generator which is mechanically driven by the pump drive motor for producing a fluid or electric signal, respectively, indicative of the rate of speed at which the pump is driven.

25 This subclass is indented under subclass 1. Subject matter comprising two or more pressure responsive sensing elements which either simultaneously, successively, or selectively respond to a change in pressure occurring in the same part of the system (e.g., both respond to pump discharge pressure) for effecting operation of a single motor control element.

26 This subclass is indented under subclass 1. Subject matter including valve means for varying the flow of fluid being pumped, which valve means is operated by sensing the occurrence of a condition or change of condition in the fluid being pumped.

(1) Note. This definition is not intended to include those devices in which there is a single sensing means operating a valve whose sole function is to divert a portion of the pumped fluid to cause operation of the drive motor control means, such devices have been considered to be merely pilot valves for the drive control means.

(2) Note. A direct acting valve, e.g., a check valve which is responsive only to the direction of flow in a line is not included. However, a valve which diverts flow from one line to another, in a branched system, even though dependent only on the direction of flow in the lines is included.

(3) Note. For purposes of this definition, pump fluid includes any fluid which is caused to be moved by the pump. Therefore, a gas vent valve for spoiling a liquid pump by allowing gas to enter the pump is included under this definition. Also, a discriminating valve for allowing gas, but not liquid, to be vented from a liquid pumping system is included.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for condition responsive control of pump fluid which is utilized as motive fluid for starting an internal combustion engine drive motor.

27 This subclass is indented under subclass 26. Subject matter in which means are provided for retarding or delaying actuation of the valve means for the purpose of preventing increase of pressure in the pump until a period of time after the drive motor control means has been adjusted to cause such increase, said valve actuation delaying or retarding means being separate and isolated from the motor control means and having no retarding or delaying effect thereon.

(1) Note. Devices in which the pump fluid valve is caused to be operated in response to the motor control element having been adjusted to a predetermined motor controlling position are not included under this definition in the absence of a separate retarding or delaying means for the valve control means.

28 This subclass is indented under subclass 26. Subject matter in which the valve means and the control means for the drive motor are both caused to be actuated by a sensing means having a single sensing part for detecting the

occurrence of a condition or change of condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, for a common condition sensing element which causes operation of both a pump drive motor control element and a pump fluid control valve.

29 This subclass is indented under subclass 26. Subject matter in which the valve means is controlled in response to one condition of the system and the control means for the motor is responsive to a second condition which (1) differs in kind from the first, e.g., pressure and flow rate, or (2) if of the same kind, differs by the part of the system characterized by the condition, e.g., inlet and discharge pressures of the pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, for a sensing means responsive to pump speed for causing operation of a pump drive motor control element and a sensing means responsive to a condition other than pump speed for causing operation of a pump fluid control valve.

30 This subclass is indented under subclass 29. Subject matter in which the fluid control means comprises a valve in the discharge of the pump which is farther from the pump, on the discharge side, than the sensing means for the drive controlling means, said valve being controlled in response to the collection of liquid in a receiver or receptacle located in the pump discharge line.

31 This subclass is indented under subclass 30. Subject matter in which the drive control means is responsive to the liquid pressure in the pump discharge line.

32 This subclass is indented under subclass 1. Subject matter in which the condition sensed is a change in the temperature of either the pump or the fluid being moved by the pump.

33 This subclass is indented under subclass 1. Subject matter in which the control means acts to stop operation of the pump by stopping the drive motor in response to a change of condition but will not again start the pump when the condition returns to normal; the control means requiring the intervention of a human operator to restore the pump to a running condition.

34 This subclass is indented under subclass 1. Subject matter in which the drive motor comprises an engine in which fuel is burned in a chamber from which the power is directly derived and the control means includes means which acts on the engine to change some operating characteristic thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for system condition responsive control of a starter motor for an internal combustion engine driving a pump.

11, for system condition responsive control of a free piston-type internal combustion drive engine.

35 This subclass is indented under subclass 1. Subject matter in which the drive motor is of the type which is driven directly by wind, (e.g., a windmill), and a receptacle is provided for receiving liquid which is to be pumped or which has been pumped by the pump and the sensing means is responsive to the quantity of liquid collected in the receptacle.

36 This subclass is indented under subclass 1. Subject matter in which there is provided a receptacle for receiving liquid which is to be pumped or which has been pumped by the pump and the sensing means is responsive to the quantity of liquid in the receptacle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

35, for control of a wind motor in response to liquid accumulation.

182.5, for means for controlling an entrainment-type pump (e.g., jet pump) in response to the level of pumped liquid, subclass 211.5 for means controlling a pump drive transmission (e.g., clutch, cam, etc.) in response to the level of pumped liquid and subclass 297.5 for liquid level control which modifies the operation of an expansible chamber pump distributor.

37 This subclass is indented under subclass 36. Subject matter in which the sensing means is responsive to movement of the liquid receptacle or an auxiliary liquid receptacle in communication therewith, said movement being caused by the weight of the liquid collected therein.

38 This subclass is indented under subclass 36. Subject matter in which the sensing means comprises a device which responds to liquid pressure changes and is either in fluid communication with or mounted within the receptacle in a manner such that the liquid must either reach a predetermined level before it may pass to the pressure sensing device or exert sufficient pressure on the sensing device to cause actuation thereof.

(1) Note. A movable receptacle is not considered a pressure sensor under this definition, such devices being classified in subclass 37 above.

(2) Note. The liquid pressure may be transmitted to the sensing means via another liquid (e.g., mercury column).

39 This subclass is indented under subclass 36. Subject matter in which the pump is driven by a fluid motor and the supply of motive fluid for the fluid motor is in fluid communication with the liquid collecting receptacle.

40 This subclass is indented under subclass 36. Subject matter in which the sensing means comprises a buoyant element which floats on the surface of the liquid collected in the receptacle.

41 This subclass is indented under subclass 40. Subject matter in which the pump is driven by a fluid motor and the control means acts to control the flow of fluid to said motor.

42 This subclass is indented under subclass 1. Subject matter in which the sensing means senses the rate of speed at which the pump is driven.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22+, for a single motor control element which is operated in response to means sensing diverse conditions, one of said diverse conditions being the speed of the pump.

43 This subclass is indented under subclass 1. Subject matter in which the sensing means is responsive to variations in the rate of flow of the fluid flowing to or from the pump.

44.1 By control of electric or magnetic drive motor:

This subclass is indented under subclass 1. Subject matter in which the motor is of the type having a working member (e.g., armature) which is motivated by electricity or a magnetic field.

(1) Note. Collected in this subclass are patents directed to system condition responsive control of drive motors of the type commonly referred to as magnetic or electromagnetic clutches.

44.11 Responsive to change in electrical operating characteristic:

This subclass is indented under subclass 44.1. Apparatus wherein the electric drive motor comprises a sensing means where an operating characteristic changes in response to a change in an electrical current drawn by the motor or a change in a voltage across the motor or a change in a phase shift of the motor.

44.2 Responsive to pump fluid pressure:

This subclass is indented under subclass 44.1. Apparatus having a sensing means responsive to variation in pressure present in the fluid flowing to or out from the pump and which causes operation of the control means to alter the operation of the motor.

(1) Note. The fluid pressure may be transmitted to the sensing means via another liquid (e.g., mercury column).

44.3 Inlet pressure:

This subclass is indented under subclass 44.2. Apparatus wherein the sensing means is located at an inlet side of the pump.

44.4 Low pressure stops motor from turning on pump:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical contact having an opened position and a closed position and the contact remains in the opened position as long as the sensed pressure of the fluid remains below a predetermined value.

44.5 Mercury switch:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical circuit and the sensing means includes a device which contains mercury which is motivated by the variations in the fluid pressure; the said motivation triggers the electrical circuit of the motor to close or open.

44.6 Dial-type sensor:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical circuit and the sensing means includes a dial indicator which has a rotary movement responsive to the fluid pressure and a manually adjustable set point which causes the electrical circuit to open or close when the positions of the indicator and manual set point are properly aligned.

44.7 Bellow-type sensor:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical circuit and the sensing means includes a flexible structure which is capable of expanding to increase the volumetric capacity thereof, said structure comprising (a) a tube of flexible material having a circumferentially corrugated or pleated wall, (b) at least four plates, each plate having a central opening therein defining an edge inwardly of the outer peripheral edge thereof, said plates being arranged in superposed relation with adjacent plates secured along their inner and outer edges alternately, or (c) a pair of rigid platelike members pivoted together along a portion of their peripheral edges, the remaining peripheral edge portion of said plates being joined together by a flexible member which is pleated in some position of relative pivotal movement of the platelike members.

44.8 Piston-type sensor:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical circuit and the sensing means includes a plunger or a solid disk which fits snugly into a cylinder and wherein the plunger or the disk moves when subjected to the fluid pressure variation in the cylinder causing the electrical circuit of the motor to close or open.

44.9 Diaphragm:
This subclass is indented under subclass 44.2. Apparatus wherein the motor comprises an electrical circuit and the sensing means includes a relatively thin membranelike member having a peripheral edge portion, said member being adapted to be associated with a surrounding or encompassing tubular rigid structure to extend transversely thereof to form a closing wall for said tubular structure, the outer peripheral edge of said membrane being in sealing relationship with the encompassing wall of said tubular structure; said member moves in response to the fluid pressure variation causing the electrical circuit of the motor to close or open.

(1) Note. The membranelike member need not span the entire space within the encompassing wall of the tubular member, but may be in the form of a ring or frustum having the inner peripheral edge thereof in sealing engagement with a rigid element movable relative to and coaxial with the encompassing tubular member.

45 Subject matter under subclasses 44.1+ in which the motor is electrically operated and the motor or electric supply circuit therefor includes an electrical component (e.g., resistance element, starting winding, etc.) which is either (1) adjustable to change its electrical value or characteristic or (2) capable of being included in or shunted out of the main motor circuit; and in which the control means acts to control the adjustment or shunting of the component in response to the sensed condition.

46 This subclass is indented under subclass 1. Subject matter in which the motor drive means for the pump is of the type which includes a movable working member which is motivated

by a fluid and the control means comprises means for controlling the flow of motive fluid to or from the motor in response to the sensing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21, for a single fluid motor control element which is operated in response to means sensing diverse conditions, one of said diverse conditions being a motive fluid condition.

34, for means for system condition responsive control of an internal combustion-type drive engine.

41, for means for controlling motive fluid to drive motor in response to float means which senses accumulation of pumped liquid in a receiver.

47 This subclass is indented under subclass 46. Subject matter in which the motor is of the type in which the drive element rotates about an axis and derives its power by the fluid impacting against the drive element.

48 This subclass is indented under the class definition. Subject matter in which (1) the fluid is pumped by or the pumping effect relies upon the direct action thereon of electrical means or a magnetic field, or (2) the fluid is "pumped" or trapped by means of a getter.

(1) Note. This is the residual home for the creation of a vacuum in an enclosed space by means of a gettering action as defined in (2) Note below. This and indented subclasses include the combination of the chamber to be evacuated and the gettering means. It also includes significant claimed containers holding getter material for disposition in a chamber to be evacuated.

(2) Note. A getter is a material which, when placed in an enclosed space, reduces the gas or vapor content of the space either by a chemical or physical action.

SEE OR SEARCH THIS CLASS, SUBCLASS:

322, for pumps having a chamber which is expanded and contracted by an electrical or magnetostrictive action on the walls thereof.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures subclasses 255+ for a loose metal particle composition.

96, Gas Separation: Apparatus, subclasses 108+ for solid sorbent apparatus for separating vaporous or gaseous constituents. The subject matter classified in Class 96 may be intended to create a vacuum in an enclosed space, but must selectively separate one constituent from another. Thus, Class 96 does not take solid sorbent apparatus or any other means intended to sorb all of the gas or vapor constituents in a chamber.

204, Chemistry: Electrical and Wave Energy, subclasses 192.1+ for processes for coating or forming an article by cathode sputtering and subclass 298.01 for cathode sputtering apparatus to coat or form an article.

252, Compositions, subclasses 181.1+ for getters and gas or vapor generating materials, per se, and also for such materials claimed as being in a container, but where no structure of the container is claimed.

313, Electric Lamp and Discharge Devices, subclasses 545 through 566 for electric lamps and space discharge devices which include a getter or gas or vapor generating material as a part thereof.

406, Conveyors: Fluid Current, appropriate subclasses for systems which transport solids by means of a fluid current, and which include a pump for generating the fluid current. See particularly subclasses 10+ for control circuits for pump drives, which are responsive to a sensed condition, and subclasses 45 and 46+ for subject matter relating to the pumping and transportation of slurries.

445, Electric Lamp or Space Discharge Component or Device Manufacturing, subclasses 38+, 53+ and 73 for methods and apparatus for evacuating electric lamp and space discharge devices and including some step or means limited to the manufacture or repair of electric lamp or space discharge device.

49 This subclass is indented under subclass 48. Subject matter in which the pumping action is effected by or relies upon the ionization of the pumped fluid by the action of electrical means and including a getter material for the ionized fluid or an additional pump of a different type (e.g., mechanical, diffusion, etc.).

(1) Note. The line between this Class 417 and Classes 313, Electric Lamp and Discharge Devices and 315, Electric Lamp and Discharge Devices: Systems, in the field of ionic pumps generally falls into two categories as follows: (a) SPACE DISCHARGE AND GETTERING - The distinction between Class 417 and Classes 313 and 315 in the field of creation of a high vacuum involving electrical space discharge with gettering is one of art. Thus, a patent to a space discharge device combined with gettering means (the getter may be an electrode of the space discharge device) in which the sole disclosure is to act as a vacuum pump (i.e., the only disclosed use of the space discharge device is to ionize fluid to be trapped by the getter); or one in which all of the claims are limited to a pumping or vacuum creating function will be classified as an original in Class 417. Conversely, those in which the disclosure is not limited to a vacuum pump function and having a claim not limited to pumping will be classified in Class 313 or Class 315 if otherwise appropriate; (b) SPACE DISCHARGE WITHOUT GETTERING - Those devices in which a fluid or fluid stream is ionized by a space discharge device and do not include gettering of the ionized fluid will generally be classified in Class 313 or 315 even though the sole disclosure relates to pumping or vacuum formation. However, if in addition to the ionization means an additional pump of the nonionization type is claimed the patent will be classified in Class 417.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, appropriate subclasses and see particularly subclasses 231.01+, 359.1+ and 545 to 566. See (1) Note above.

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses and see particularly subclasses 111.01+ See (1) Note above.

50 This subclass is indented under subclass 48. Subject matter in which the pumped fluid is electrically conductive, a current being caused to flow in the fluid while being subjected to a magnetic field, the result being a pumping action on the fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49, for the “pumping” of fluid or formation of a vacuum by ionizing the fluid to be pumped and subjecting the ionized fluid to a magnetic field and see the notes thereto for similar art classified elsewhere.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclass 11 for dynamoelectric apparatus utilizing a conducting fluid.

51 This subclass is indented under subclass 48. Subject matter provided with getter means and in which means are provided to elevate the temperature of the getter, to change the state of the getter from a solid to a vapor or to renew the getter to perform its gettering function after having already operated as a getter.

52 This subclass is indented under the class definition. Subject matter in which the fluid to be pumped is isolated in a chamber, heated to expel a portion thereof from the chamber, this expelled portion constituting the pumped fluid, and the fluid remaining in the chamber then cooled so as to contract and establish a reduced pressure in the chamber to draw in a new charge of fluid.

53 This subclass is indented under the class definition. Processes of pumping .

SEE OR SEARCH CLASS:
166, Wells, subclasses 369+ for a process of producing a well including a significant manipulative step in addition to pumping.

54 This subclass is indented under subclass 53. Processes in which one fluid is pumped or motivated by direct contact or entrainment with another fluid, the motive fluid before contact or entrainment being separate from the pump fluid.

55 This subclass is indented under subclass 54. Processes in which the composition of the motive fluid is specified in a claim.

(1) Note. The following are excluded under this definition as specific motive fluid: water, air, steam, mercury. Oil is also excluded under this definition unless the composition is more specifically recited than mere “oil”.

56 This subclass is indented under the class definition. Apparatus in which the pump has a piston which reciprocates within an elongated cylinder of uniform cross-sectional dimensions which is adapted to be positioned within a drilled well, said piston serving to separate the cylinder into respective motor and pump chambers, means providing either a restricted or a controlled flow path which provides communication between the pump and motor chambers (i.e., between opposite sides of the piston), the induction of at least a portion of the fluid to be pumped flowing serially through the motor chamber, said restricted or controlled flow path, and thence into said pump chamber; motive fluid being subsequently applied to said motor chamber to drive said piston on an eduction stroke.

(1) Note. The motive fluid under this definition may be derived either from the well itself or from an external source.

(2) Note. This subclass and those indented hereunder are intended to include the subcombination of a valved or radially expansible piston for performing a valving function which is disclosed as having utility in the apparatus defined herein.

57 This subclass is indented under subclass 56. Apparatus in which there is provided means for controlling the flow of liquid from the pump chamber, said flow controlling means being operated in response to either (1) the sensing of a condition or change in condition or (2) the arrival of the piston at a predetermined position in the cylinder.

(1) Note. For purposes of this definition, a mere check valve in the eduction flow conduit which opens in the direction of pump fluid eduction is not considered to be condition responsive control. Also, the mere passing of the eduction port by the free piston is not considered to be position responsive control of the type herein provided for.

58 This subclass is indented under subclass 56. Apparatus in which there is provided valve means for controlling the inlet of motive fluid to the motor chamber, said valve means comprising mechanical elements which are relatively moved in response to either (1) the sensing of a condition or change in condition or (2) the arrival of the piston at a predetermined position in the cylinder.

(1) Note. For purposes of this definition, a mere check valve positioned within the motive fluid supply line which opens in the direction of motive fluid supply to the motor chamber is not considered to be condition responsive control.

(2) Note. Supply of motive fluid which is controlled by well liquid level in which the well liquid serves to directly cover or uncover motor chamber supply ports is excluded under this definition. However, a piston controlled cylinder port which is subsequently opened to allow the supply additional motive fluid is included hereunder.

59 This subclass is indented under subclass 56. Apparatus in which at least a portion of the piston is capable of expansion and contraction in a direction perpendicular to its axis of reciproca-

tion to thereby provide a valving action with the chamber in which it reciprocates to allow or interrupt fluid communication between the pump and motor chambers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
555.1+, and see the search notes therein, for other fields of search for radially expansible and contractible pistons.

60 This subclass is indented under subclass 56. Apparatus in which the piston has a fluid flow passage formed therein which extends to opposite ends of said piston and valve means carried by the piston for controlling said passage, said valve means being positively mechanically moved by engagement of said valve (or an element associated therewith) with a stationary chamber portion.

61 This subclass is indented under the class definition. Apparatus in which the pump unit or the intake or discharge line thereof is buoyant or buoyantly supported so as to be capable of floating on a body of liquid, the pump not being operated by the rise and fall or flow of the liquid on which it or its intake or discharge line floats.

SEE OR SEARCH CLASS:
415, Rotary Kinetic Fluid Motors or Pumps, subclass 7, for a float supported or buoyant runner.

62 This subclass is indented under the class definition. Apparatus comprising two pumping members or units, and means being provided by which the pumped fluid is successively acted upon by said members or units, and alternatively the members or units are arranged in separate or branched flow lines so as to take from a common or separate sources and deliver to a common or separate outlets.

63 This subclass is indented under the class definition. Apparatus having (1) signals, indicators, registers, recorders, or gauges for indicating a condition of the pump or pumped fluid or the position of a pump part such as a piston, control member, valve, etc., such devices comprising relatively movable, changeable or audible information giving parts, or (2) transparent viewing means whereby the pump operation or the condition of some part thereof may be observed.

(1) Note. For classification under part (1) of this definition there must be either an indicia or an audible or visual signal or a means whose sole purpose is to indicate a condition of the device. Relative to indicia there must be graduations or markings disclosed. Where it is indicated that the mere position of a pump part is indicative of a condition of the pump (e.g., valve handle position indicated direction of fluid flow) classification under the definition does not result unless some cooperating indicia are included.

64 This subclass is indented under the class definition. Apparatus having a cellular member rotatable about an axis with means to isolate therein and from its source a volume of gas to be pumped, transfer said volume to a position where a gaseous motive fluid may be admitted into said cellular member for the purpose of increasing the pressure of said volume while an interface is maintained between the two gases, and then permit the pumped gas and the motive gas to be exited from said cellular member each into a separate flow path.

65 This subclass is indented under the class definition. Apparatus in which one fluid is pumped or motivated by direct contact or entrainment with another fluid, the motive fluid before contact or entrainment being separate from the pump fluid.

(1) Note. This definition does not include mere pulsation dampeners or accumulators, i.e., a trapped, confined compressible fluid which directly receives energy from another fluid and returns the energy to the other fluid from which it was received.

SEE OR SEARCH THIS CLASS, SUBCLASS:
64, for gas pressure exchange devices using a rotary cellular member to transfer a gas to be pumped to a position where its pressure may be increased by being contacted directly by a gaseous motive fluid.

66 This subclass is indented under subclass 65. Apparatus in which a driven element is provided to continuously and unidirectionally move the motive fluid either as slugs or a complete ring about an axis at a relatively high rate of speed, said motive fluid directly contacting and imparting energy to the fluid being pumped while in said movement about an axis.

67 This subclass is indented under subclass 66. Apparatus in which the driven element is provided with a passage passing through the axis of rotation of the element at the point where it is supported for rotation and said passage is described as conveying motive fluid or fluid being pumped.

68 This subclass is indented under subclass 66. Apparatus in which the motive fluid is rotated by the driven member at such a speed and in such a manner as to form a peripheral ring around the driven member within a surrounding casing.

69 This subclass is indented under subclass 68. Apparatus including a second pump which is of a different basic type from the liquid ring pump.

(1) Note. The liquid ring pump may be merely a priming pump for the second pump.

70 This subclass is indented under subclass 66. Apparatus in which a passage to supply motive fluid to be rotated by the driven element is provided, said passage being closely related to the axially remote portion of the rotary element.

71 This subclass is indented under subclass 66. Apparatus in which a passage is provided to bring fluid to be pumped into contact with motive fluid being moved about an axis, said passage being closely related to axis of the driven element.

72 This subclass is indented under subclass 71. Apparatus in which an outlet passage for pumped fluid is provided, said passage being closely related to the axially remote portion of the rotary element.

73 This subclass is indented under subclass 65. Apparatus comprising a pumping chamber into which pump fluid is alternately introduced and expelled, the pumping being effected by burning of motive fluid and application of the products of combustion to the chamber.

74 This subclass is indented under subclass 73. Apparatus having a separate ignition means to ignite the motive fluid, said ignition means being responsive to a condition of the pump fluid.

75 This subclass is indented under subclass 73. Apparatus including means to return a portion of the pump fluid to the pump chamber and utilize the momentum thereof to effect expulsion of a previously burned charge of motive fluid, and compress the next incoming charge of motive fluid.

76 This subclass is indented under subclass 65. Apparatus including a jet pump and an additional pump which includes a mechanical impelling member (e.g., piston, rotor, etc.) to generate the motive fluid supplied to the jet pump.

(1) Note. For the definition of a jet pump see this class subclass 151.

(2) Note. The jet pump may have the sole disclosed use of priming the motive fluid generating pump.

77 This subclass is indented under subclass 76. Apparatus in which the motive fluid and the pumped fluid are of different states (i.e., liquid and gas) and after entrainment the two are separated and the motive fluid fed back to the entrainment area as recirculated motive fluid.

(1) Note. This definition excludes a jet pump which primes the other pump of air but then acts to pump liquid when the other pump is primed.

78 This subclass is indented under subclass 76. Apparatus provided with a rotary impeller which acts to project motive fluid therefrom, the exit of the impeller acting as the motive fluid nozzle and being disposed in the area of entrainment.

(1) Note. This definition excludes an impeller whose discharge is confined by a passage which acts as the motive fluid nozzle. See subclass 84.

SEE OR SEARCH THIS CLASS, SUBCLASS:

66+, for pumping one fluid by contact or entrainment with another wherein the contact or entrainment occurs within a rotary impeller.

79 This subclass is indented under subclass 76. Apparatus in which at least a portion of the output of the jet pump is supplied back to the intake of the motive fluid generating pump.

80 This subclass is indented under subclass 79. Apparatus in which the motive fluid generating pump comprises a pumping member which has unidirectional rotary motion about a fixed axis and acts to pump fluid by a centrifugal, centripetal or screw effect.

81 This subclass is indented under subclass 80. Apparatus in which the rotary nonexpansible chamber-type pump includes a plurality of rotary pumping members at least a portion of the pumped fluid passing successively from one pumping member to the next.

82 This subclass is indented under subclass 80. Apparatus in which the jet pump may be selectively placed in different positions with respect to the rotary pump, usually for adapting the apparatus to operate with a shallow well with the jet proximate the rotary pumping member or with a deep well with the jet positioned in the well remote from the rotary pumping member.

83 This subclass is indented under subclass 80. Apparatus in which the jet pump is located in close physical proximity to the rotary pumping member of the diverse pump and is contained within the housing structure (including inlet and outlet connections) thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

82, for combined jet and rotary nonexpansible chamber-type pumps in which the jet may be selectively located in the rotary pump casing or remote therefrom.

84 This subclass is indented under subclass 76. Apparatus in which the motive fluid generating pump comprises a pumping member which has unidirectional rotary motion about a fixed axis and acts to pump fluid by a centrifugal, centripetal or screw effect.

85 This subclass is indented under subclass 65. Apparatus comprising a plurality of discrete pumps of different basic types.

(1) Note. This definition does not include a plurality of pumps of different basic types if one is a mere auxiliary or ancillary of the other (e.g., lubricant or cooling pump for main pump). However, a pump whose sole disclosed function may be to prime the other pump is not considered a mere auxiliary and this combination is included in this definition.

(2) Note. This definition includes as different basic-type pumps which may both be of the fluid contact or entrainment types such as, for example, jet pump and aerated column, pneumatic displacement and jet, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

69, for diverse pumps one of which is the liquid ring type.

86 This subclass is indented under subclass 85. Apparatus in which one of the pumps is of the type having a chamber or container in which liquid to be pumped is collected and means to apply gas pressure from an external source to the surface of the liquid in said chamber or container to expel the liquid therefrom.

(1) Note. The gas pressure may be merely atmospheric air admitted to the chamber which has been filled by applying vacuum thereto.

87 This subclass is indented under subclass 85. Apparatus in which one of the pumps comprises a jet pump.

(1) Note. For the definition of a jet pump see this class subclass 151.

SEE OR SEARCH THIS CLASS, SUBCLASS:

76, for a jet pump with a motive fluid generating pump.

88 This subclass is indented under subclass 87. Apparatus in which the diverse pump is driven by an internal combustion engine or fluid motor and the exhaust motive fluid or combustion products from the motor are directed to the fluid jet producing means of the jet pump to act as the motive fluid therefor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

91, for an aerated column pump and a diverse pump which is driven by an internal combustion engine or fluid motor the exhaust of which provides the aeration fluid.

89 This subclass is indented under subclass 87. Apparatus in which another of the pumps comprises a pumping member which has unidirectional rotary motion about a fixed axis and acts to pump fluid by centrifugal, centripetal or screw effect.

SEE OR SEARCH THIS CLASS, SUBCLASS:

80, for a jet pump with a rotary nonexpansible chamber-type pump which generates the motive fluid for the jet.

90 This subclass is indented under subclass 85. Apparatus in which one of the pumps is of the aerated column type.

(1) Note. For the definition of an aerated column pump see this class subclass 108.

91 This subclass is indented under subclass 90. Apparatus in which the diverse pump is driven by an internal combustion engine or fluid motor, the exhaust motive fluid or combustion products from the motor constituting the gas which is injected into the liquid column.

SEE OR SEARCH THIS CLASS, SUBCLASS:

88, for a jet pump in which the jet motive fluid is the exhaust from an internal combustion engine or fluid motor which drives a pump different from the jet pump.

92 This subclass is indented under subclass 65. Apparatus in which a fluid may be pumped by the direct action thereon of a compressing chamber or container and a liquid forming part of said compressing chamber or container, the body of liquid in effect constituting a piston in said container whereby relative movement between said liquid and said container varies the volume of a space in said chamber or container to pump the fluid.

93 This subclass is indented under subclass 92. Apparatus in which at least one wall of said chamber means is moved relative to a surface of said body of liquid to change the volume of said chamber and thus pressurize the fluid confined therein.

94 This subclass is indented under subclass 93. Apparatus in which said chamber has a wall means having a spiral configuration which extends along an axis, and upon rotation about said axis said wall means is caused to move relative to said liquid surface, move said fluid axially and change the pressure of said fluid to be pumped which is confined in said chamber.

95 This subclass is indented under subclass 93. Apparatus in which the movement of the chamber operates a cyclically operated valve or other cyclic control means for flow of the body of liquid to or from the chamber.

96 This subclass is indented under subclass 93. Apparatus in which the body of liquid is completely supported by the structure which forms the chamber, said structure being moved to cause said fluid to be pumped.

97 This subclass is indented under subclass 93. Apparatus in which a plurality of chamber means are provided, said chambers being moved relative to one another.

98 This subclass is indented under subclass 93. Apparatus in which the chamber means is moved to-and-fro.

99 This subclass is indented under subclass 92. Apparatus in which the liquid body comprises the element mercury.

100 This subclass is indented under subclass 92. Apparatus in which the body of liquid is moved by the natural tide or wave action of a large body of water in its natural situation.

101 This subclass is indented under subclass 92. Apparatus in which relative height of the surface of the body of liquid in said chamber cyclically operates a valve or other control means to effect cyclic pumping.

102 This subclass is indented under subclass 101. Apparatus in which a plurality of interrelated variable volume compressing chambers are provided.

103 This subclass is indented under subclass 92. Apparatus in which a plurality of contracting chambers are provided.

104 This subclass is indented under subclass 92. Apparatus in which the body of liquid is set in motion and the inertia of the body of liquid (i.e., the tendency to remain in motion or at rest) being effective to produce the pumping action.

105 This subclass is indented under subclass 65. Apparatus in which gaseous pumping fluid is reduced to the liquid state with a resultant pressure change, which change causes the pumped fluid to be motivated.

106 This subclass is indented under subclass 105. Apparatus comprising plural pumping chambers which are so interrelated as to produce alternate or successive pumping from the chambers.

107 This subclass is indented under subclass 105. Apparatus with means responsive to a condition of the pumping or pumped fluid, said means controlling the flow of the pumping or pumped fluid.

108 This subclass is indented under subclass 65. Apparatus comprising a vertical column into which the liquid to be pumped enters, with means to inject a gaseous motive fluid below the level of the liquid accumulated therein which effects a mixed mass of reduced specific gravity to elevate said liquid with said gas.

SEE OR SEARCH THIS CLASS, SUBCLASS:

85+, for means for pumping a fluid which employs a means to aerate the fluid to reduce its specific gravity in combination with another kind of pump means (e.g., jet, etc.).

151+, for jet pumps which employ a motive fluid moving at a greater velocity than the fluid to be pumped thereby creating a vacuum or reduced pressure area to motivate the pumped fluid and wherein the motive fluid may subsequently become entrained with the pumped fluid.

109 This subclass is indented under subclass 108. Apparatus wherein said injection means comprises valve means which opens and closes to control the gaseous motive fluid injected.

110 This subclass is indented under subclass 109. Apparatus having (1) fluid impinging means in the flow path of the liquid to be pumped, to be acted upon thereby, or (2), means responsive to the velocity of the moving liquid being pumped comprising a restricted passageway.

111 This subclass is indented under subclass 109. Apparatus wherein said valve means comprises plural valves mounted at vertically spaced levels along said vertical column, and having common mechanical or electrical actuating means to actuate or permit the actuation of the valves in a particular sequence.

112 This subclass is indented under subclass 109. Apparatus wherein said valve means is actuated by an associated flexible diaphragm or bellows-type sensing element which is responsive to the pressure of either the liquid to be pumped, or the gaseous pumping fluid.

113 This subclass is indented under subclass 112. Apparatus wherein said valve means comprises a pilot valve and a main valve, said pilot valve controlling actuating fluid to the main valve to control actuation thereof, and said sensing element controlling the actuation of said pilot valve.

114 This subclass is indented under subclass 109. Apparatus wherein said valve means comprises a pilot valve and a main valve, said main valve controlling the gaseous motive fluid injection and said pilot valve controlling actuating fluid to the main valve to control actuation thereof.

115 This subclass is indented under subclass 109. Apparatus wherein said valve means is actuated in response to the attainment of an absolute rate of flow, pressure or other absolute condition of the motive fluid to control the flow of motive fluid injected into the pumped fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

109, for devices having unbiased check valves in the gaseous motive fluid line which merely acts to prevent the flow of the liquid to be pumped back into the motive fluid line and which, by their nature, permit flow of motive fluid to flow therethrough whenever the pressure of the motive fluid exceeds that of the pumped fluid.

110, for those devices having motive fluid injection control valves which are controlled in response to the flow of the pumped fluid and which may also be influenced by a motive fluid condition.

117, for those devices having motive fluid injection control valves which are actuated to permit the flow of motive fluid into the pumped fluid in response to a static head build up of pumped fluid.

116 This subclass is indented under subclass 109. Apparatus comprising float means or other nonpressure sensitive means responsive to the level of liquid accumulated, which float means controls actuation of said valve means.

117 This subclass is indented under subclass 109. Apparatus wherein said valve means comprises a valve member, said valve member being biased closed by weight, spring, or other means, and having means exposed to the accumulation of liquid within said vertical column, which means, in response to the pressure of the accumulated liquid, opens or tends to open said valve member.

118 This subclass is indented under subclass 65. Apparatus in which the fluid which is to be pumped is a liquid, and the motive fluid is a gas, comprising a pumping chamber, a liquid inlet and a liquid outlet through which the liquid is pumped into and out of said chamber, means for supplying and exhausting the gas to effect the pumping of said liquid, and further having (1) pump means to supply or exhaust the gas or (2), liquid level float means to effect control of the gas or liquid entering or leaving said chamber or (3) means to effect repetitive or cyclic pumping into and from said chamber upon initiation of the pumping action.

(1) Note. The pumps disclosed in the patents contained herein operate on a differential pressure principle, i.e., by withdrawing the gaseous motive fluid which is in contact with a portion of a confined liquid to be pumped, a higher pressure, e.g., atmospheric, acting upon another portion of said confined liquid effects movement and thus pumping thereof.

(2) Note. Devices are included under this definition wherein the pumping chamber is provided with a single means by which both the liquid and the gas are exhausted.

(3) Note. Devices are classified under this definition which have pumping chambers which are submerged in the liquid to be pumped whereby the liquid is introduced into the chamber by gravity.

119 This subclass is indented under subclass 118. Apparatus having a pump means to supply or exhaust the gas, said pump means comprising means to utilize a body of liquid, which body

of liquid is in contact with the gas, to compress or expand said gas.

120 This subclass is indented under subclass 118. Apparatus having pump means for said motive fluid, and including condition responsive control means to directly control said pump means.

121 This subclass is indented under subclass 118. Apparatus comprising plural pumping chambers where the liquid output of one chamber is the liquid input for another.

122 This subclass is indented under subclass 118. Apparatus comprising plural pumping chambers interrelated by means to effect alternate pumping from said chambers.

123 This subclass is indented under subclass 122. Apparatus wherein said interrelated means is responsive to a condition of the motive fluid or the fluid which is pumped in a first chamber, to control the supplying or exhausting of motive fluid to a second chamber.

124 This subclass is indented under subclass 123. Apparatus wherein the condition is the weight of the fluid which is pumped which has accumulated in the first chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

140, for devices having a movably mounted means adapted to receive the fluid which is pumped and adapted to be moved in response to a quantity of fluid received to control the pumping operation.

125 This subclass is indented under subclass 123. Apparatus wherein the condition is the liquid level of the fluid which is pumped in the first chamber.

126 This subclass is indented under subclass 118. Apparatus having means buoyed by the fluid which is pumped and responsive to change in level thereof to control flow of the fluid which is pumped or of the motive fluid into or from the pumping chamber.

127 This subclass is indented under subclass 126. Apparatus having more than one buoyant means in a single pumping chamber.

128 This subclass is indented under subclass 126. Apparatus wherein the flow of the fluid which is pumped or the flow of the motive fluid is controlled by a valve means which is controlled by the buoyed means through a pilot valve means.

129 This subclass is indented under subclass 126. Apparatus wherein the flow to or from the pumping chamber of the motive fluid or of the fluid which is pumped is controlled by said buoyed means through an electrical actuating means.

130 This subclass is indented under subclass 126. Apparatus wherein the admission of the motive fluid to the pumping chamber is controlled by the buoyed means.

(1) Note. Apparatus having means to control the admission of atmospheric air to a pumping chamber adapted to be placed under a vacuum are classified in this and indented subclasses.

131 This subclass is indented under subclass 130. Apparatus wherein said buoyed means also controls the exhausting of the motive fluid from the pumping chamber.

(1) Note. Apparatus having means to control the flow of working fluid from the pumping chamber to a vacuum source are classified in this and indented subclasses.

132 This subclass is indented under subclass 131. Apparatus wherein said buoyed means also controls the pumped fluid ejected from the pumping chamber.

133 This subclass is indented under subclass 131. Apparatus wherein the float means initiates the operation of an over center (e.g., spring, weight, etc.) valve actuator to control the flow of motive fluid to and from the pumping chamber.

134 This subclass is indented under subclass 126. Apparatus wherein the flow of motive fluid from the pumping chamber is controlled by the buoyant means.

(1) Note. Devices having means to control the flow of motive fluid from the pumping chamber to the vacuum source are classified in this and indented subclasses.

135 This subclass is indented under subclass 134. Apparatus wherein said buoyant means further controls the flow of fluid which is pumped from the pumping chamber.

136 This subclass is indented under subclass 134. Apparatus wherein said buoyant means further controls the flow of fluid which is pumped into the pumping chamber.

137 This subclass is indented under subclass 118. Apparatus wherein the pumping chamber alternately admits and ejects a fluid which is pumped by controlling flow of the pumped fluid or motive fluid by a mechanism motivated (1) in response to an ambient or external pumped fluid or motive fluid condition or (2) by the pumped fluid, motive fluid or other means.

138 This subclass is indented under subclass 137. Apparatus wherein said means for admitting or ejecting the fluid which is pumped to and from the pumping chamber comprises liquid level sensing means at predetermined liquid level(s).

139 This subclass is indented under subclass 137. Apparatus wherein the mechanism, by which the fluid which is pumped is admitted to or ejected from the pump chamber, is motivated in response to a condition of the pumped fluid.

140 This subclass is indented under subclass 139. Apparatus having a movably mounted means adapted to receive the fluid which is pumped and adapted to move in response to a quantity of fluid received to control the mechanism by which the fluid which is pumped is admitted to or ejected from the pump chamber.

(1) Note. The pump chamber may be the movably mounted means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

124, for devices having plural interrelated pumping chambers which include a means to sense the weight received of fluid which is pumped to control the pumping operation of the chambers.

141 This subclass is indented under subclass 139. Apparatus wherein the mechanism, by which the fluid which is pumped is admitted to or ejected from the pumping chamber, is controlled in response to the rate of flow of the fluid which is pumped.

142 This subclass is indented under subclass 139. Apparatus wherein the mechanism, by which the fluid which is pumped is admitted to or ejected from the pumping chamber, is controlled in response to the pressure of the fluid which is pumped.

(1) Note. This subclass includes those devices which have means which are described as sensing the “weight” of the pumped fluid but which, in fact, sense pumped fluid pressure at a given point in the pump chamber. However, a device which includes a container into which pumped fluid is placed and which measures a predetermined weight of fluid therein to control the pumping operation is classified in subclass 139.

SEE OR SEARCH THIS CLASS, SUBCLASS:

143, for devices wherein repetitive pumping is effected in response to a sensed motive fluid pressure or pressure differential.

143 This subclass is indented under subclass 137. Apparatus wherein the alternate admission and ejection of the fluid which is pumped into and from the pump chamber results from the alternate admission and withdrawal of the motive fluid to or from the pump chamber said motive fluid being controlled by valve means responsive to the motive fluid pressure.

(1) Note. The pressure responsive means does not include a mere pressure responsive check valve in the motive fluid inlet or outlet of the pumping chamber.

144 This subclass is indented under subclass 137. Apparatus in which said means for effecting the admission and ejection of the pumped fluid

from the pump chamber is a valve means for supplying or exhausting the gaseous pumping fluid to said chamber and having additional means correlating control of said valve means with the operation of a means generating said motive fluid.

145 This subclass is indented under subclass 137. Apparatus wherein said means for effecting the admission and ejection of the pumped fluid from the pump chamber comprises valve means which correlates the supplying and exhausting of motive fluid to and from the pumping chamber.

146 This subclass is indented under subclass 145. Apparatus which includes a pilot valve for controlling said valve means.

147 This subclass is indented under subclass 145. Apparatus wherein said valve means comprises a single valve member to control both supply and exhaust.

148 This subclass is indented under subclass 118. Apparatus having the pump means, (i.e., vacuum generator), to withdraw the gaseous motive fluid from the pumping chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

119, for a device having a vacuum generator comprising a liquid the surface of which communicates with the motive fluid.

149 This subclass is indented under subclass 148. Apparatus including a pump means (i.e., pressure generator), to supply pumping fluid to said pumping chamber.

150 This subclass is indented under subclass 65. Apparatus comprising a vertically disposed tube through which motive fluid drops freely under the influence of gravity, contact with or entrainment of the pumped fluid being made in the tube.

151 This subclass is indented under subclass 65. Apparatus in which motive and pumped fluids are brought into intimate contact in an enclosed flow path, the motive fluid having a higher velocity than the pumped fluid and imparting energy to the pumped fluid by the action of entrainment and frictional contact.

SEE OR SEARCH THIS CLASS, SUBCLASS:

76+, for jet pumps having a motive fluid generating pump.

87+, for diverse pumps one of which is a jet pump.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 888+ for systems having multiple inlets and a single outlet with means to promote mixing or combining of plural diverse fluids and subclass 842, for a “turbulence amplifier” having similar structure. If the system is disclosed as one of the fluids acting to pump the other classification is in this class (417).

261, Gas and Liquid Contact Apparatus, subclasses 76+ for injector-type gas and liquid contact apparatus where there is a mutual exchange of properties between the fluids.

152 This subclass is indented under subclass 151. Apparatus in which the pump is adapted to be connected to or enclosed within a space which is to be evacuated to a high vacuum, the motive fluid being in the form of a vapor which acts to remove fluid diffusing out of said space, the motive fluid acting to remove the fluid by entrainment and condensation.

(1) Note. The vapor is generally oil or mercury which is generated in a boiler.

153 This subclass is indented under subclass 152. Apparatus in which means are provided to cool the pump, usually the outer walls or nozzle thereof or heat insulation means are provided to prevent heat transfer from the motive fluid to the zone being evacuated.

154 This subclass is indented under subclass 152. Apparatus in which there is a vertically disposed conduit which the motive fluid vapor flows upwardly from a vapor generator (i.e., boiler) the motive fluid being reversed and directed transversely and downwardly from the conduit into the entrainment area, the motive fluid upon condensation flowing back to the generator.

155 This subclass is indented under subclass 151. Apparatus in which the combining tube of the jet pump is a flue or stack of a furnace and the jet acts to increase the draft effect of the flue or stack.

(1) Note. Where the operation of the device necessarily involves a treatment of the flue gases, such as the entrainment of air or air and steam to effect combustion of unconsumed particles of fuel, or where any treatment of the fuel gases not merely a pumping effect is involved, or where the combination embraces elements of a furnace mechanism of greater scope than herein defined, the device is classified in appropriate subclasses of Class 110, Furnaces; see especially subclasses 150, 160, and indented subclass. Compare Class 261, Gas and Liquid Contact Apparatus, subclass 24, and indented subclasses.

156 This subclass is indented under subclass 155. Apparatus in which the pumped fluid contains sparks or cinders and means are provided to separate out or reduce the size of the sparks or cinders prior to discharge from the pump.

SEE OR SEARCH CLASS:

96, Gas Separation: Apparatus, appropriate subclasses, for spark arresters, per se. When a spark arrester is combined with a jet pump it is considered to be a perfecting feature of the pump and is classified in Class 417.

157 This subclass is indented under subclass 155. Apparatus including means for controlling the operation of the jet pump or the flow of motive or pumped fluid to or from the jet pump by means of a valve or throttling action.

158 This subclass is indented under subclass 151. Apparatus including means to energize or motivate the motive fluid of the jet pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

76+, for a jet pump with a motive fluid generating pump.

152+, for vapor condensation vacuum diffusion-type pumps with motive fluid generating means.

159 This subclass is indented under subclass 158. Apparatus in which the means to energize or motivate the motive fluid is an internal combustion engine.

(1) Note. The motive fluid may be fluid exhausted by the engine or drawn into the intake manifold or otherwise energized by the engine.

160 This subclass is indented under subclass 151. Apparatus provided with means to remove accumulated foreign material from the jet pump or its connected flow lines by means of applying motive fluid to the pump by a route other than its normal flow path to the entrainment area or by means of a fluid other than the motive or pumped fluid which is applied to the pump.

161 This subclass is indented under subclass 151. Apparatus in which the pumped fluid flows toward the entrainment area along a given path and motive fluid is projected radially of the given path in the form of a disc-like sheet, the pumped fluid being entrained by the disc-like sheet and during entrainment flowing outwardly from the given path.

SEE OR SEARCH THIS CLASS, SUBCLASS:

78, for radial disc-type jet pumps in which the entrainment is at the exit of a centrifugal impeller.

162 This subclass is indented under subclass 151. Apparatus having a valved waste passage to conduct pumped fluid which has been entrained away from the device and is also provided with a valve to control flow of motive fluid to the jet, there being means provided which upon actuation of one of the valves causes or prevents actuation of the other.

163 This subclass is indented under subclass 151. Apparatus in which a first stream of motive fluid acts to entrain pumped fluid and then a second stream of motive fluid from the same or different sources as the first acts to entrain the

combined motive and pumped fluid from the first entrainment.

164 This subclass is indented under subclass 163. Apparatus in which heat exchange apparatus is provided to remove heat from the combined motive and pumped fluid from the first entrainment before said fluid is acted upon by the second motive fluid stream.

165 This subclass is indented under subclass 163. Apparatus in which both the first and second streams of motive fluid are provided with separate and distinct valves to individually control the flow thereof.

(1) Note. The separate and distinct valves may be unitary with one another so long as there are distinct valve portions which control each of the motive fluid flow paths.

166 This subclass is indented under subclass 165. Apparatus in which the separate and distinct valves are so related that upon actuation first one valve controls its motive fluid flow path and then the other controls its motive fluid flow path in sequence.

167 This subclass is indented under subclass 163. Apparatus in which one of the motive fluid streams is projected centrally so as to entrain an annular stream of pumped fluid outwardly thereof and another motive fluid stream is in the form of an annulus so as to entrain a stream of pumped fluid in the center of the annulus.

168 This subclass is indented under subclass 163. Apparatus in which one of the motive fluid streams is confined to a conduit terminating in a nozzle and the other motive fluid stream is directed around the circumference of the conduit at the point at which it entrains pumped fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

154, for vapor condensation vacuum diffusion-type pumps with reverse flow jets from a vertical stack rising from a motive fluid generator.

169 This subclass is indented under subclass 163. Apparatus in which the motive fluid streams in their flow to the entrainment nozzle are parallel and spaced laterally from one another.

170 This subclass is indented under subclass 163. Apparatus in which the first and second motive fluid flows at the points of entrainment are substantially in line with one another.

(1) Note. The motive fluid streams may be of annular form with the annuli having a common central axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

154, for vapor condensation vacuum diffusion-type pumps with plural reverse flow jets from a vertical stack rising from a motive fluid generator.

171 This subclass is indented under subclass 151. Apparatus in which the motive fluid is introduced in a plane at right angles to and tangentially of the inflow of pumped fluid establishing a vortex-type entrainment within or without the rotating motive fluid.

172 This subclass is indented under subclass 151. Apparatus provided with a conduit for supplying motive fluid to the entrainment area and a conduit for conducting motive and pumped fluid from the entrainment area, one conduit being concentrically disposed within the other. The direction of flow of the motive fluid being opposite to the direction of flow of the combined motive and pumped fluid.

173 This subclass is indented under subclass 151. Apparatus combined with heat exchange means to reduce the temperature of the motive fluid or the pumped fluid or both other than by a mere direct interchange of heat between the motive and pumped fluids.

(1) Note. This definition excludes the injection of one fluid into another fluid even though for the sole disclosed purpose of cooling if the injected fluid has a pumping effect on the other fluid by a jet or entrainment action (i.e., transfer or velocity energy).

SEE OR SEARCH THIS CLASS, SUBCLASS:

153, for vapor condensation vacuum diffusion-type pumps with cooling means.

164, for successive introduction of motive fluid into the pumped fluid with cooling means between the stages of pumping.

174 This subclass is indented under subclass 151. Apparatus in which motive fluid acts to entrain pumped fluid and then the combined motive and pumped fluid stream acts to further entrain additional fluid to be pumped at a point downstream of the first entrainment.

175 This subclass is indented under subclass 151. Apparatus in which an additional jet device is provided with discharges to waste and is so connected as to draw the pumped fluid into the first jet pump to prime same or to remove pumped fluid from an overflow or waste chamber of the first jet.

176 This subclass is indented under subclass 151. Apparatus having a plurality of motive fluid nozzles, the motive fluid from each acting to entrain pumped fluid, the combined motive and pumped fluid from each entrainment traveling in a separate downstream conduit or combining tube, the entrainments being in parallel with one another; i.e., each motive fluid stream is separate from the others and acts to entrain separate flows of pump fluid.

(1) Note. The pumped fluid may originate in a common pipe or conduit and the outputs from the downstream conduits may combine into a single flow.

SEE OR SEARCH THIS CLASS, SUBCLASS:

163, for the successive introduction of motive fluid to a single pumped fluid stream.

174, for a single motive fluid stream which successively entrains pumped fluid.

179, for plural motive fluid jets for a single entrainment, i.e., with a single combining tube.

177 This subclass is indented under subclass 151. Apparatus in which the motive fluid is projected into the entrainment area in the form of a continuous annulus and pumped fluid is entrained both outwardly and inwardly of the motive fluid annulus.

178 This subclass is indented under subclass 151. Apparatus in which there is provided within the apparatus a plurality of alternate flow confining segments (e.g., nozzles, combining tubes, etc.) and means to permit one of the segments to be adjusted into use position to the exclusion of another from use position.

179 This subclass is indented under subclass 151. Apparatus in which in a single zone of entrainment of pumped fluid (i.e., single inflow of pumped fluid and single outflow of combined pumped and motive fluid) there is provided means to project a plurality of separate motive fluid streams or different sources of motive fluid are provided for delivery through the same motive fluid projecting means.

(1) Note. The separate motive fluid streams or sources may be used simultaneously or alternately.

SEE OR SEARCH THIS CLASS, SUBCLASS:

163, for successive introduction of motive fluid into the pumped fluid along the path of flow of the pumped fluid.

174, for successive entrainment of pumped fluid by a single motive fluid flow.

176, for plural motive fluid jets having separate combining tubes from the jets.

180 This subclass is indented under subclass 179. Apparatus in which means are provided by which at least one of the motive fluid jets or sources may be individually controlled.

181 This subclass is indented under subclass 151. Apparatus in which the jet pump unit is adapted to be connected by a readily detachable means to a spigot or a flexible tube from which motive fluid for the jet is supplied.

182 This subclass is indented under subclass 151. Apparatus including means for controlling the operation of the jet pump or the flow of motive

or pumped fluid to or from the jet pump by means of a valve or throttling action.

SEE OR SEARCH THIS CLASS, SUBCLASS:

118+, for successive introduction of motive fluid into the pumped fluid with individually controlled motive fluid flows.

157, for jet pumps with regulation in which the combining tube is the flue or stack of a furnace for interrelated overflow and motive fluid valves.

162, for interrelated overflow and motive fluid valves.

179, for plural motive fluid jets or sources for a single entrainment with individual or relative control of the jets or sources.

182.5 This subclass is indented under subclass 182. Apparatus in which the controlling means acts in response to the level of pump fluid.

183 This subclass is indented under subclass 182. Apparatus in which the control is effected by a change in the relative axial positions of the motive fluid nozzle and the conduit which receives the combined motive and pumped fluid from the entrainment area.

184 This subclass is indented under subclass 183. Apparatus in which the change in the relative axial positions of the nozzle and conduit is in response to variation in fluid pressure caused by the operation of the jet pump.

185 This subclass is indented under subclass 182. Apparatus in which the controlling means is located in the output flow line downstream from the entrainment area.

(1) Note. The controlling means is in the main outflow line from the pumps and does not merely control a passage to waste.

SEE OR SEARCH THIS CLASS, SUBCLASS:

192, for a pressure controlled overflow line downstream of the entrainment area.

186 This subclass is indented under subclass 182. Apparatus in which the motive fluid is directed into the entrainment area by a nozzle and valve means are provided which when actuated cause all or a portion of the motive fluid to be diverted from the nozzle.

(1) Note. The diversion of the motive fluid may be merely around the nozzle to reenter the pump downstream of the normal entrainment area or the diversion may be away from the pump as, for example, into the normal pumped fluid inlet line.

SEE OR SEARCH THIS CLASS, SUBCLASS:

185, for main line control downstream of the entrainment area which may cause an increase in motive fluid pressure so as to by-pass.

187 This subclass is indented under subclass 182. Apparatus in which the controlling means is positioned in the motive fluid inlet line upstream of the entrainment area or at the point of discharge into the entrainment area.

SEE OR SEARCH THIS CLASS, SUBCLASS:

162, for interrelated motive fluid and overflow valves.

165+, for successive introduction of motive fluid into the pumped fluid with individually controlled motive fluid flows.

179, for plural motive fluid jets or sources for a single entrainment with individual or relative control of the jets or sources.

186, for controlling means to by-pass motive fluid from the entrainment nozzle.

188 This subclass is indented under subclass 187. Apparatus including controlling means in the pumped fluid inlet line upstream of the entrainment area, means being provided which interrelates the motive fluid and pumped fluid controlling means such that when one is actuated the other is necessarily controlled.

189 This subclass is indented under subclass 187. Apparatus in which the motive fluid controlling means acts in response to variation of fluid pressure which is incident to the operation of the jet pump.

190 This subclass is indented under subclass 182. Apparatus in which the controlling means is positioned in the pumped fluid inlet line upstream of the entrainment area.

SEE OR SEARCH THIS CLASS, SUBCLASS:

188, for interrelated motive fluid and pumped fluid controls.

191 This subclass is indented under subclass 190. Apparatus in which the pumped fluid controlling means acts in response to variation of fluid pressure which is caused by the operation of the jet pump.

192 This subclass is indented under subclass 182. Apparatus in which the controlling means controls the flow to waste of the combined motive and pumped fluid downstream of the entrainment area, said controlling means acting in response to variation of fluid pressure caused by the operation of the jet pump.

193 This subclass is indented under subclass 192. Apparatus in which the controlling means comprises an axially movable section of the flow conduit or a movable wall portion of the conduit downstream of the entrainment area.

SEE OR SEARCH THIS CLASS, SUBCLASS:

184, for a movable combining tube which shifts in response to fluid flow and in shifting varies the axial relationship between the motive fluid nozzle and the entrance to the combining tube.

194 This subclass is indented under subclass 151. Apparatus having means to impart to the pumped fluid a whirling or helical motion prior to its being entrained by the motive fluid.

195 This subclass is indented under subclass 151. Apparatus in which a claim includes a recitation of the material of which the jet pump or a part thereof is made.

SEE OR SEARCH THIS CLASS, SUBCLASS:

55, for processes of pumping by contact or entrainment utilizing a specific motive fluid.

196 This subclass is indented under subclass 151. Apparatus in which some portion of the flow confining means of the jet pump is represented in a claim by a mathematical formula or equation or some specific proportions or dimensions of the parts are set forth.

197 This subclass is indented under subclass 151. Apparatus in which the motive fluid is supplied as an annular stream which entrains the pumped fluid centrally thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

167, for successive introduction of motive fluid to act on the pumped fluid, one of the motive fluid streams being peripherally supplied.

177, for an annular motive fluid stream which entrains pumped fluid both exterior and interior of the annulus.

198 This subclass is indented under subclass 151. Apparatus in which a claim includes details of the construction or shape of the nozzle from which motive fluid is projected into the entrainment area.

(1) Note. This subclass includes specific nozzle shapes to provide a particular shape or pattern of motive fluid projection.

SEE OR SEARCH THIS CLASS, SUBCLASS:

179+, for plural motive fluid jets into a single entrainment area including a nozzle which is subdivided to provide a plurality of distinct flow paths.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for nozzle, per se.

199.1 DIVERSE PUMPS:
This subclass is indented under the class definition. Apparatus comprising a plurality of discrete pumps of different basic types.

(1) Note. This definition does not include a plurality of pumps of different basic types if one is a mere auxiliary or ancillary of the other (e.g., lubricant or cooling water or condensate removal pump for main pump).

(2) Note. This definition includes diverse pumps wherein one of the pumps is disclosed merely as priming another, the priming pump in this instance not being considered merely ancillary to the other pump.

(3) Note. Mere difference in size or shape, etc., of the same basic type of pump is not included under this definition.

(4) Note. The following are exemplary of different basic types of pumps: (a) Rotary expansible chamber; (b) Rotary nonexpansible chamber; (c) Reciprocating working member (piston or cylinder); (d) Collapsible chamber (e.g., diaphragm, bellows); and (e) Hydraulic ram.

(5) Note. A patent will be classified as an original in this or indented subclasses if the pumps are disclosed as diverse, but a claim recites only one of the pumps specifically. On the other hand a plurality of pumps which are disclosed as diverse but are claimed broadly will not be classified as an original under the definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
69, for diverse pumps one of which is of the liquid ring type.
76+, for jet pumps with motive fluid generating pumps.
85+, for diverse pumps at least one of which is of the type in which fluid is pumped by contact or entrainment with another.

SEE OR SEARCH CLASS:
418, Rotary Expansible Chamber Devices, subclass 3 for diverse rotary expansible chamber-type pumps.

199.2 Priming and venting:
This subclass is indented under subclass 199.1. Apparatus wherein one of the pumps supplies fluid to the pumping chamber of the main pump which is supplied with a valve to exhaust the fluid from the pumping chamber.

200 This subclass is indented under subclass 199.1. Apparatus in which one of the pumps is priming or maintaining the other pump primed and including means responsive to the level of pump fluid in some part of the system to control the pump fluid or modify the operation of at least one of the pumps.

(1) Note. The operation of the pump is considered to be modified, for example, if the drive means is controlled, the capacity is varied, or a valve is operated to bypass the discharge, to draw from a different source, to deliver to a different place or vary the inlet or outlet.

201 This subclass is indented under subclass 199.1. Apparatus in which one of the diverse pumps comprises a pumping member which has unidirectional rotary motion about a fixed axis and acts to pump fluid by a centrifugal, centripetal or screw effect.

SEE OR SEARCH THIS CLASS, SUBCLASS:
200, for the combination of a centrifugal pump and a diverse pump for priming the centrifugal pump with liquid level responsive control of one of the pumps or the pump fluid.

202 This subclass is indented under subclass 201. Apparatus having means to modify the operation of another of the pumps in response to a condition of the rotary nonexpansible chamber-type pump.

(1) Note. The operation of the pump is considered to be modified, for example, if the drive means is controlled, the capacity is varied, or a valve is operated to

bypass the discharge, to draw from a different source, to deliver to a different place or vary the inlet or outlet.

(2) Note. The condition of the pump to which the control responds may be, for example, pressure, flow, loss of prime, etc.

203 This subclass is indented under subclass 201. Apparatus in which the diverse pumps are arranged such that the entire or a substantial portion of the output of one is directed to the second so as to be serially acted upon thereby, the rotary nonexpansible chamber-type pump being upstream of the diverse pump so as to feed fluid thereto with the diverse pump acting as a second stage.

204 This subclass is indented under subclass 199.1. Apparatus in which one of the pumps is of the rotary expansible chamber type having a partition (i.e., vane or abutment) or cylinder which moves incident to rotation of the pump, the partition or cylinder constituting or being directly connected to a piston which reciprocates upon movement of the partition or cylinder, the piston operating within a chamber and forming therewith a reciprocating expansible chamber pump.

205 This subclass is indented under subclass 199.1. Apparatus in which the diverse pumps are arranged such that the output of one is directed to the inlet of the second so as to be serially acted upon thereby.

SEE OR SEARCH THIS CLASS, SUBCLASS:

203, for a centrifugal pump delivering fluid to a diverse pump in series therewith.

206 This subclass is indented under subclass 205. Apparatus in which the fluid is acted upon by a rotary expansible chamber- type pump and then by an expansible chamber- type pump having a pumping member which performs its pumping function by a reciprocating (including oscillating) motion.

(1) Note. A rotary expansible chamber-type pump under this definition is as defined in Class 418.

(2) Note. Flexible wall pumping members (e.g., diaphragm, bellows) are not considered to have reciprocating motion under this definition.

207 This subclass is indented under the class definition. Apparatus in which a pumping action is obtained by the direct application of heat to the fluid to be pumped.

208 This subclass is indented under subclass 207. Apparatus in which the fluid to be pumped is a liquid, the application of heat to the liquid causing at least a portion thereof to vaporize, the vapor pressure then impelling the liquid through an outlet.

209 This subclass is indented under subclass 208. Apparatus which includes valve means which controls flow of the fluid which is pumped into a chamber means in which said fluid is vaporized, said valve means being closed by a buildup in pressure during vaporization of said fluid and opened by a decrease in pressure after the vapor or fluid has been expelled from said chamber.

210 This subclass is indented under the class definition. Apparatus in which there is provided biasing means movable relative to a reciprocating-type pumping member, said biasing means receiving energy from the pump fluid and serving to bias the pumping member in opposite directions over different portions of pumping member movement in one reciprocatory stroke direction.

211 This subclass is indented under the class definition. Apparatus in which the pump is adapted to be mounted upon or attached to a device which is subject to or adapted to produce motion or vibration, the pump having a relatively movable pumping member, the relative movement of which is caused by the inertia thereof and the motion or vibration of the device or by the inertia of a separate member which is connected to or operatively associated with the pumping member.

(1) Note. The device is usually a vehicle.

211.5 This subclass is indented under the class definition. Apparatus in which the pump or means for transmitting motion to the pump from a source of power is provided with control means for either (1) interrupting motion of the pump (e.g., clutch, lock, etc.), (2) varying the rate of motion of the pump (e.g., brake, dashpot, adjustable gearing, etc.), (3) changing the swept volume of displacement of an expansible chamber-type pump, or (4) changing the volumetric capacity of an expansible chamber- type pump (e.g., clearance control); said control means being operable in response to the level of pump fluid.

212 This subclass is indented under the class definition. Apparatus in which the pump or means for transmitting motion to the pump from a source of power is provided with control means for either (1) interrupting motion of the pump (e.g., clutch, lock, etc.), (2) varying the rate of motion of the pump (e.g., brake, dashpot, adjustable gearing, etc.), or (3) changing the swept volume of the pumping member of an expansible chamber-type pump (e.g., stroke control); said control means being operable in response to a sensed condition of the pump or pumped fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

211.5, for liquid level responsive control of pump displacement, volumetric capacity or drive transmission.

274, for means for varying the volumetric capacity of an expansible chamber-type pump in response to a sensed condition, the capacity varying means not affecting pumping member displacement (e.g., clearance control).

213 This subclass is indented under subclass 212. Apparatus combined with fluid flow control means for varying the flow of pumped fluid to or from the pump or pump chamber, or controlling a relief or bypass which means is also operated by sensing the occurrence of a condition or a change in condition.

(1) Note. See the definition and notes under subclass 279, which notes are also applicable to this subclass.

214 This subclass is indented under subclass 212. Apparatus in which the control means comprises a positive lock, friction brake, fluid retarder or similar device which will act to prevent or restrict movement of the pumping member by acting directly thereon or on a part directly connected thereto.

215 This subclass is indented under subclass 212. Apparatus in which the pump comprises an expansible chamber-type pump having a plurality of relatively movable pumping elements working in a single pump chamber and relatively movable driving elements are connected to the pumping elements so that they may be driven into the pumping chamber together, e.g., in phase, or at different times, e.g., out of phase, to vary the volume of fluid pumped; the control means acting to change the relationship, e.g., phasing, between the driving elements to vary the output of the pump.

216 This subclass is indented under subclass 212. Apparatus comprising a plurality of pumping units wherein the control means effects a change in the operating characteristics of one unit relative to another.

217 This subclass is indented under subclass 212. Apparatus in which the pump has a mechanical pumping member (e.g., rotor or piston) driven from a rotary driving element and an inlet and an outlet; means being provided to change the flow of the pumped fluid without altering the direction of rotation of the driving element, i.e., the inlet under one condition of operation becomes the outlet under the other condition of operation and vice versa; the control means acting on the reversing means to cause its operation.

218 This subclass is indented under subclass 212. Apparatus in which the pump is of the expansible chamber-type, i.e., having a relatively movable pumping member and chamber, and including a mechanical movement having relatively movable parts in which the driving relationship is varied by an adjustable element (e.g., cam, eccentric, link, etc.,) which is moved relative to another part.

219 This subclass is indented under subclass 218. Apparatus wherein the relatively movable pumping member and chamber comprise a rotor and an encompassing movable stator in which movement of the stator causes the pumping member to move radially of the axis of rotation of the rotor resulting in a change in the stroke of the pumping member or a change in displacement of the pump.

220 This subclass is indented under subclass 219. Apparatus in which the pump is a rotary pump of the expansible chamber type.

SEE OR SEARCH CLASS:

418, Rotary Expansible Chamber Devices, subclasses 24+, for rotary expansible chamber motors or pumps in which the capacity is varied by a movable member (e.g., stator, etc.), the member being moved by the direct application of working fluid thereto, there being no condition responsive valving controlling the application or release of fluid to or from the member.

221 This subclass is indented under subclass 218. Apparatus wherein the cam or eccentric forms a part of a rotary drive in which a cooperating cam follower or eccentric strap moves radially of the shaft on which the cam or eccentric is mounted or carried.

(1) Note. A crankshaft having an adjustable throw on which a working member, a pitman, or member connected to the working member is mounted is included under this definition as the equivalent of an eccentric and strap.

222.1 This subclass is indented under subclass 218. Apparatus in which the adjustable element is a cam which forms part of a rotary drive means and the camming face of the cam extends transversely of the axis of rotation of the rotary drive means so that the cam follower moves parallel to such axis.

222.2 This subclass is indented under subclass 222.1. Apparatus in which the adjustable element is operated in response to pressure introduced into the sump.

223 This subclass is indented under subclass 212. Apparatus including a mechanical movement having relatively movable parts comprising elements of the drive which can be engaged and separated to start and stop the pump while permitting the power source to operate continuously.

225 This subclass is indented under the class definition. Apparatus in which there is a source of fluid having an initial pressure or velocity head, and means are provided which utilize the energy of said source fluid to boost the head of a first portion thereof to a higher value, by reducing the head of a second portion of said source fluid.

(1) Note. This definition does not include motor driven pumps which pump from an unconfined body of fluid in which the motor is driven by energy derived from the unconfined body of fluid (e.g., fluid current, tide and wave motor, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

330+, for tide and wave motor driven pumps.

334+, for fluid current motor drive pumps.

226 This subclass is indented under subclass 225. Apparatus in which the source fluid has an initial velocity head, said means including plural fluid outlets, one of said outlets being a valve controlled waste outlet, whereupon the sudden closing of said valve effects discharge or a first portion of said source liquid through the other of said outlets at a higher head, while a second portion has passed to waste at a lower head.

227 This subclass is indented under subclass 226. Apparatus including two or more valve controlled waste outlets, the source fluid flowing to each waste outlet through a separate conduit.

228 This subclass is indented under the class definition. Apparatus in which the pump or some part thereof (e.g., cylinder, bearing, drive motor) is cooled or lubricated by the feed or circulation of a separate fluid (i.e., not the pumped fluid), and means to control the flow of or modify a condition of said separate fluid (e.g., temperature), said means being operated

by a separate sensing means which is responsive to a condition or a change of condition other than a manual control.

229 This subclass is indented under the class definition. Apparatus in which the pump is mounted on or proximate to an object and is powered by the relative motion of movable parts of the object or by motion of the object as a whole, the object being of special construction or adaptation to perform a particular function other than (1) a supporting function, or (2) the pumping which forms the basic subject matter of this class.

(1) Note. This definition includes a pump operator in the form of a treadle, rail section, etc., which is actuated by the passing of a vehicle thereover.

230 This subclass is indented under subclass 229. Apparatus in which the object is a device for supporting the weight of a person in a seated position, wherein the pumped fluid is directed to elsewhere other than toward a body part of a seated occupant.

SEE OR SEARCH CLASS:

297, Chairs and Seats, subclass 180.16 for chairs combined with pumps in which the pumped fluid is directed toward a body part of the occupant of the chair.

231 This subclass is indented under subclass 229. Apparatus in which the pump is mounted on or attached to a vehicle and is driven incident to movement of the vehicle or the relative motion of vehicle parts.

(1) Note. The pump may be attached to the vehicle only when it is desired to operate the pump. For example, this definition includes those devices in which a vehicle drive wheel is elevated and a pump attached thereto.

(2) Note. The pump is considered to be combined with vehicle under this definition if it is driven by some part of the vehicle other than directly by the vehicle motor. For example, this definition includes those devices in which the pump is driven by a vehicle wheel or axle, transmission, fly-wheel or tractor power take-off shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

211, for vehicle mounted pumps in which the pump has an inertia-type pumping member operated by the vibration or relative movement of parts of the vehicle.

234, for pumps supported on wheels or a wheeled frame for portability.

364, for pumps which are driven by internal combustion engines.

232 This subclass is indented under subclass 231. Apparatus in which the vehicle has attached thereto a scoop adapted to be immersed in a body of liquid located outside the vehicle, liquid being induced to flow through the scoop due to motion of the vehicle and the inertia of the body of liquid.

233 This subclass is indented under subclass 231. Apparatus in which the pump is driven by the rotating motion of a wheel or axle of the vehicle.

(1) Note. This definition does not include those devices in which a ground engaging wheel is provided solely to drive the pump and has no support function for the vehicle.

234 This subclass is indented under the class definition. Apparatus having (1) wheels, skids or other special means to facilitate moving the pump over the surface on which it rests, (2) means which specifically adapts the pump to be supported on some part of a human body or animal, or (3) a handle by which the pump may be carried.

(1) Note. To fall within part (1) of this definition the wheels, skids or the bike must be merely to make the pump ambulant or portable and may not be a vehicle or the like intended primarily for some other function with a pump incidentally mounted thereon (e.g., bicycle and tire pump thereon).

SEE OR SEARCH THIS CLASS, SUBCLASS:

231+, for a vehicle mounted or attached pump in which the pump is operated by some part of the vehicle (e.g., wheel or axle) and in which the vehicle serves some function other than mounting and driving the pump (e.g., automobile).

235 This subclass is indented under subclass 234. Apparatus in which the pump is driven to perform its pumping function as a result of being moved over the surface on which it is supported on the wheels, skids or the like.

SEE OR SEARCH THIS CLASS, SUBCLASS:

231+, for a vehicle mounted or attached pump in which the pump is operated by some part of the vehicle (e.g., wheel or axle) and in which the vehicle serves some function other than mounting and driving the pump (e.g., automobile).

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 155+ for sprayers with mobile tank-type supply means in which the sprayer operating means is interconnected with the ground traverse means.

236 This subclass is indented under the class definition. Apparatus which by adjustment or relative rearrangement of its parts or by the addition or omission of a part is so changed as to become basic subject matter of another class.

237 This subclass is indented under subclass 236. Apparatus in which a device is operable under one condition as a pump and as a result of the adjustment, rearrangement of parts or addition or omission of a part is operable as a motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

364, for a pump mechanically driven by an internal combustion engine including a pump mounted on an engine cylinder or head and mechanically driven by the piston of the engine.

380, for a pump having a motor driven by the products of combustion (or a component thereof) of an internal combustion engine including a pump mounted on an engine cylinder and operated by the pressure fluctuations in the cylinder.

SEE OR SEARCH CLASS:

60, Power Plants, subclass 408 and 629, for a convertible motor and pump with means for storing the fluid energized by the pump mechanism and utilizing such fluid as the motive fluid for the converted motor.

123, Internal-Combustion Engines, subclasses 319+ for internal combustion engines whose cycles are modified to produce a braking action by displacement of fluid and not being disclosed as capable of delivering fluid for a useful external purpose.

238 This subclass is indented under the class definition. Apparatus which by relative rearrangement of its parts or by the addition or omission of a part is so changed as to operate in a different way or change its function or enhance its operation in some way.

SEE OR SEARCH THIS CLASS, SUBCLASS:

82, for the combination of a rotary nonexpansible chamber-type pump and a jet pump in which the location of the jet pump is changeable by assembly or disassembly.

236, for pumps convertible to basic subject matter of another class.

239 This subclass is indented under subclass 238. Apparatus in which the rearrangement of parts or addition or omission of a part is accomplished in order to permit or accommodate the operation of the pump in a reverse direction of rotation or a reverse direction of flow of pump fluid through the pump.

240 This subclass is indented under the class definition. Apparatus in which the pumping is effected by a body of liquid which is at least partially confined and forms a liquid piston to act as a pumping member, either the liquid piston or the means confining the liquid or both

being set into motion, the inertia of the liquid piston (i.e., the tendency to remain in motion or at rest) or the momentum thereof being effective to produce the pumping action.

(1) Note. For a patent to be classified under this definition the pump must rely upon the inertia or momentum of the liquid for its operation. In many pumps such as a reciprocating piston, expansible chamber type the momentum of liquid being expelled from a chamber might incidentally also produce additional pumping action over that produced by the expansible chamber effect. However, such pumps are not included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

104, for a momentum liquid piston used as a pumping means to pump a different fluid.

241 This subclass is indented under subclass 240. Apparatus in which the liquid is set in motion by the absolute movement of the means confining the liquid.

242 This subclass is indented under the class definition. Apparatus comprising two or more pump chambers there being provided means for separately controlling the inlet of fluid to each chamber and each chamber being provided with a relatively movable wall portion (e.g., piston) for changing the chamber volume; there being additionally provided a flow path for establishing intercommunication between said chambers which is distinct from the normal pump fluid inlet flow paths, said flow path being controlled as a result of the wall portion reaching a predetermined position in one of said pumping chambers.

(1) Note. For purposes of this definition, the plural pumping chambers may be formed by a single cylinder having a single piston therein providing oppositely facing pumping faces for dividing the cylinder into plural chambers.

243 This subclass is indented under the class definition. Apparatus in which the pumped fluid is first acted upon by one pump or pumping member and subsequently acted upon by a second pump or pumping member and provided with heat exchange apparatus interposed between the pumps or pumping members to dissipate heat from the pump fluid generated by the pumping operation.

(1) Note. To be classified under this definition there must be claimed some structure peculiarly adapted to cooling or heat exchange such as fins, cooling fan, etc., or a specific structural relationship of the intercooler to the pump. A mere conduit between stages in which cooling might incidentally occur would be excluded. The mere claiming of an “intercooler” or “cooler” is not sufficient to cause classification under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

164, for successive stage pumps of the jet type with cooling means between the jet stages.

SEE OR SEARCH CLASS:

165, Heat Exchange, for heat exchange, per se, and see particularly subclasses 120+ for heat exchangers with a pump or impeller for moving the exchanger material.

244 This subclass is indented under the class definition. Apparatus in which the pumped fluid is serially acted upon by a plurality of pumping units.

(1) Note. This definition includes those expansible chamber pumps in which the fluid is pumped by being successively acted upon by opposed faces of a unitary pumping member provided valving is present in all three of the following locations; inlet valve means to the first chamber, valve means to control the flow from one face to the other (e.g., valved piston) and outlet valve means from the second chamber. It is not necessary that all of such valving be claimed, but all must be disclosed. In the absence of the disclosure of any of said valving in combination with the unitary pumping member the patent is excluded from this definition. See subclasses 437+. How-

ever, this definition does include those pumps in which the fluid is successively acted upon by different faces of a unitary pumping member if the faces move in the same direction to effect the pumping action. In this case the valving for the three locations above noted is not required.

(2) Note. This definition excludes those pumps having a unitary pumping member which includes a plurality of spaced serially arranged self-acting valves which simultaneously control the pumped fluid to or from a common expansible chamber; this not being considered to be a plurality of pumping units. See subclass 459.

(3) Note. Multi-stage rotary pumps of the expansible or nonexpansible chamber type are generally classified in Classes 415 and 418. However, said pumps are included in this class in certain combinations such as when driven by a significantly claimed motor. Such rotary pumps will be included under this definition only if they include a plurality of rotors or runners which have or are capable of relative movement during operation.

(4) Note. Apparatus in which the pump fluid successively flows from a pump chamber and then through a motor working chamber to be expelled therefrom with exhausted motive fluid is excluded under this definition as constituting successive stages. See subclasses 377+.

(5) Note. Relatively movable pumping members which successively act upon the pumped fluid are included under this definition and do not require the disclosure of valves in the three locations as set forth in (1) Note above.

245 This subclass is indented under subclass 244. Apparatus in which one of the pumping units is driven by a fluid motor, the motive fluid for operating the fluid motor being provided from another of the pumping units in the series.

246 This subclass is indented under subclass 244. Apparatus in which the serial pumping units are provided with pumping members which are capable of or constrained to move relative to each other, said pumping members being driven by two or more working members which are capable of or constrained to move relative to each other.

247 This subclass is indented under subclass 246. Apparatus in which the pumping members and motor working members partake of a continuous, unidirectional, rotary movement about an axis.

248 This subclass is indented under subclass 244. Apparatus including a plurality of individual pumping members or units each of which handles a portion only of the total fluid pumped (i.e., operate in parallel flow paths) and a further single pumping unit or member which acts upon the total fluid handled by said plurality of pumping members or units, the single pumping unit or member acting upon the fluid either prior or subsequent to its being acted upon by said plurality of pumping members or units.

(1) Note. A plurality of pumping members acting in a single expansible chamber are not considered to be parallel stages under this definition. However, a double acting pumping member is considered to be parallel stages under this definition.

249 This subclass is indented under subclass 244. Apparatus in which there is a chamber or reservoir intermediate said stages which is continually open to atmosphere, the prior stage delivering the pumped fluid to said chamber or reservoir and the subsequent stage removing the pumped fluid therefrom.

250 This subclass is indented under subclass 244. Apparatus in which in addition to the pump fluid intake to the prior stage and discharge from the subsequent stage there is provided (1) means in the fluid flow path intermediate the stages whereby fluid may be introduced to be acted upon by the subsequent stage which was not acted upon by the prior stage or (2) means to take additional pump fluid directly into the subsequent stage which was not acted upon by the prior stage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

242, for a controlled bypass between plural pump chambers which is in addition to the normal inlet flow paths to the chambers.

251 This subclass is indented under subclass 244. Apparatus in which in addition to the pump fluid intake to the prior stage and discharge from the subsequent stage there is provided (1) means in the fluid flow path intermediate the stages whereby pump fluid which was acted upon by the prior stage may be discharged without being acted upon by the subsequent stage or (2) means to permit discharge of pump fluid directly from the prior stage without being acted upon by the subsequent stage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

242, for a controlled bypass between plural pump chambers which is in addition to the normal inlet flow paths to the chambers.

252 This subclass is indented under subclass 251. Apparatus in which the discharge is between the stages and operates to discharge some or all of the fluid from the prior stage in response to the pressure of the pumped fluid at some point in the system.

(1) Note. The discharge is considered to be between the stages if it is intermediate the discharge control means for the prior stage and the intake control means for the subsequent stage (e.g., check valves, etc.).

253 This subclass is indented under subclass 244. Apparatus in which the pumped fluid is controlled prior to, during or after being acted upon by the pumping units, the control operating in response to the occurrence of a condition or a change in condition.

(1) Note. The fluid may be controlled by controlling an inlet or discharge valve (e.g., by holding an inlet or discharge valve open), a bypass valve or a clearance space.

(2) Note. This definition includes direct acting relief valves and the like, but excludes a mere cyclic distributor valve (e.g., inlet or discharge check valve) of an expansible chamber pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

252, for multistage pumps with an interstage pressure responsive discharge for pumped fluid.

254 This subclass is indented under subclass 244. Apparatus in which the successive pumping units each include a rigid pumping member which partakes of a to-and- fro movement to perform the pumping function.

(1) Note. The stages may be formed by the opposite faces of a unitary pumping member.

(2) Note. This definition excludes pumping members of the flexible wall type.

255 This subclass is indented under subclass 254. Apparatus in which the successive reciprocating pumping members are driven by a rotary shaft having crank means or the like thereon connected to the pumping members, a housing (i.e., crankcase) in which the shaft operates and (1) the housing together with a pumping member constituting one of the pumping units or (2) at least a portion of the fluid acted upon by a prior stage passing into the housing before being acted upon by a subsequent stage.

256 This subclass is indented under subclass 254. Apparatus in which the pumping members are constrained to move in opposite directions, the pumping members containing valves and the pump fluid passing successively through the members.

257 This subclass is indented under subclass 256. Apparatus in which the axes of the oppositely moving pumping members form a common straight line.

258 This subclass is indented under subclass 254. Apparatus in which one of the pumping members comprises a piston which reciprocates in a fixed cylinder and another pumping member

comprises a cylinder which moves with respect to a fixed piston encompassed thereby.

259 This subclass is indented under subclass 254. Apparatus in which at least one of the pumping units comprises a valved piston.

(1) Note. For the definition of valved piston see subclass 545 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

256, for pumps including oppositely movable valved pumping members (usually pistons) which successively act on the pump fluid.

260 This subclass is indented under subclass 259. Apparatus in which the valved piston has (1) relatively movable valve members which form, respectively, the inlet and outlet valves for one of the pumping units or (2) has a movable valve member which forms the inlet or outlet valve for one of the pumping units and the piston itself acts as the outlet or inlet valve, respectively, for said unit (e.g., piston controlled port, etc.).

261 This subclass is indented under subclass 259. Apparatus in which the piston is provided with a plurality or relatively movable valves through which the pump fluid must flow serially enroute from one stage of pumping to the next stage of pumping.

262 This subclass is indented under subclass 259. Apparatus in which the valve in the piston is the intake valve to the first pumping unit of the series of pumping units which act on the pump fluid.

263 This subclass is indented under subclass 259. Apparatus in which in addition to the successive pumping units including the valved piston another pumping member is provided which pumps fluid in parallel with said units; i.e., the fluid pumped by the pumping member does not pass through the pumping units.

(1) Note. The additional pumping member maybe an element of a second multistage pump unit.

264 This subclass is indented under subclass 259. Apparatus in which the pumping units are driven by a motor of the type which includes a movable working member which is motivated by a fluid.

265 This subclass is indented under subclass 254. Apparatus in which the successive pumping members are capable of or constrained to move relative to one another incident to the pumping operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

256+, for oppositely moving valved pumping members which successively act on the pump fluid.

266 This subclass is indented under subclass 254. Apparatus in which the pumped fluid is successively acted upon by three or more reciprocating pumping members.

267 This subclass is indented under subclass 254. Apparatus in which the pumping members which successively act upon the pump fluid are each of the type which act to pump separate streams of fluid in both directions of reciprocation, i.e., each pumping member of the series is of the double acting type.

268 This subclass is indented under subclass 254. Apparatus in which the successive pumping members are unitary with one another, and are operative in the same direction of motion for the pumping (i.e., discharging) stroke.

269 This subclass is indented under the class definition. Apparatus in which the pump comprises three or more cylinders, each cylinder being provided with a relatively reciprocating piston (include diaphragm) to thereby form a plurality of pumping chambers, the cylinders or a transmission element in common operative engagement with said cylinders or pistons being adapted to rotate about a fixed axis; said cylinders being physically arranged in a manner such that their longitudinal axes either (1) intersect at a common point or (2) extend parallel to said axis of rotation.

(1) Note. Devices having three or more cylinders arranged in the above defined

relationship are intended to be included hereunder only in those instances where the disclosed structure limits the device to a pumping function (e.g., check valve control of admission or discharge of pump fluid to or from the cylinders) or has structure claimed which has utility only in a pumping operation. Therefore, plural cylinder devices of this arrangement which are in fact capable of operation as a motor and which have no features claimed of sole pump utility are classified in Class 91, Motors: Expansible Chamber Type, regardless of whether they are disclosed and claimed generically or solely as pump or motor. However, intended to be classified in this class are plural cylinder devices of the above defined type which are disclosed solely or claimed solely as a pump and which in addition claim means separate from the pump for sensing a condition (excludes direct response via pumping member) to effect control of either (1) the pumped fluid (see subclass 270, indented hereunder) or (2) the pump drive transmission (see subclasses 212+). Also, plural cylinder devices of this type having a significantly claimed motor drive therefor are intended to be classified in this class (see subclass 271, indented hereunder) provided the claims do not reflect control of the drive in response to a sensed pump condition which would cause classification in subclasses 1+.

(2) Note. To fall within the scope of this definition the motor must be of the type which includes at least three cylinders and none of said three may be formed integral with the relatively reciprocating piston of another.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, appropriate subclasses, for mechanical motion converting apparatus having no pump fluid valving or porting claimed and see especially subclass 22 for apparatus for converting rotary motion to reciprocating and rotary motion and subclass 55 for apparatus employing a cam and slide for converting rotary motion to or from reciprocating or oscillating motion.

91, Motors: Expansible Chamber Type, subclasses 472+, for three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and which are generic to operation as either a pump or a motor. See note above for the distinction between this subclass and subclasses 472+ in Class 91.

92, Expansible Chamber Devices, appropriate subclasses, for expansible chamber devices having plural parallel, radial, or conical arranged cylinders in which there is no valving of the pumped fluid claimed and see especially subclasses 12.1+ for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis, 56+ for plural rotating cylinders, 68+ for relatively movable working members interconnected with a common rotatable shaft, and 146+ for plural unitarily mounted cylinders.

270 This subclass is indented under subclass 269. Apparatus including fluid flow control means for varying the flow of the fluid being pumped, said means being operated by sensing the occurrence of a condition or change in condition.

(1) Note. For a further definition of what constitutes the occurrence of a condition or a change in condition see the definition and notes of subclass 279 of this class.

(2) Note. This definition does not include a distributor for the pump formed by relatively rotating parts (e.g., disc valve) in which the relatively rotating parts are biased into sealing engagement by springs or the like which could yield to allow separation of the valve ports and permit escape or by-pass of pump fluid.

271 This subclass is indented under subclass 269. Apparatus in which the pump is driven by a motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

321+, for pumps other than the above defined type which are motor driven.

272 This subclass is indented under subclass 269. Apparatus in which there is provided fluid pressure responsive means located externally of the pumping chambers and associated with at least one of said plural cylinders or relatively reciprocating piston for exerting thereon a continuous force in one reciprocatory stroke direction to promote expansion or contraction of the pumping chamber associated with said one cylinder or piston.

273 This subclass is indented under subclass 269. Apparatus in which the longitudinal axes of said plural cylinders intersect at a common point from which they radiate and are contained within a common plane perpendicular to said axis of rotation.

(1) Note. In some instances, the longitudinal axes of the cylinders move relative to the axis of rotation and devices of this type are intended to be included hereunder if the individual cylinder axes pass through the common point in at least one position of their movement.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, appropriate subclasses for mechanical motion converting apparatus having no pump fluid valving or parting claimed and see especially subclass 55 for apparatus employing a cam and slide for converting rotary motion to or from reciprocating or oscillating motion.

91, Motors: Expansible Chamber Type, subclasses 491+, for three or more cylinders arranged in radial relationship with a rotary transmission axis which are generic to operation as either a pump or motor.

92, Expansible Chamber Devices, appropriate subclasses, for expansible chamber devices having plural radial cylinders in which there is no valving of pump fluid claimed and see especially subclass 58 for plural rotating cylinders in which the axis of the cylinders intersect the rotation axis at a common point, subclasses 72+ for relatively movable working members interconnected with a common rotatable shaft and in which the shaft axis is intersected by the axis of the working members and subclass 148 for three or more unitarily mounted, radially arranged cylinders.

274 This subclass is indented under the class definition. Apparatus comprising condition responsive means to vary the clearance volume of the expansible chamber of an expansible chamber pump by sensing the occurrence of a condition or change in condition.

(1) Note. Those expansible chamber devices which have a movable wall which is movable solely by the pressure of the fluid in the chamber acting directly on the wall or a separate fluid reaction surface connected to the movable wall are excluded from this subclass, see Class 92, subclass 60. The terms “acting directly” as used above mean that the fluid acts on the separate fluid section surface without being valved. When there is disclosure of a valve between the chamber and the fluid reaction surface the patent is classifiable in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

212+, for variable displacement expansible chamber pumps provided with condition responsive drive control means.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 60 for a flexible or resiliently biased nonworking member movable wall which is in constant communication with the working chamber of a nonrotary expansible chamber device.

418, Rotary Expansible Chamber Devices, subclasses 16+ for a variable volume working chamber rotary expansible chamber device and subclasses 24+, in particular, for such devices having

a spring or fluid biased movable member.

275 This subclass is indented under subclass 274. Apparatus in which the means to vary the clearance volume comprises a separate chamber for varying the capacity of the expansible chamber, and a valve means for isolating said separate chamber from the expansible chamber.

(1) Note. For the definition of an expansible chamber-type pump, see definition of subclass 437 below.

276 This subclass is indented under subclass 275. Apparatus in which the pump is of the double acting type having two pumping chambers, each of said pumping chambers being connected to a separate clearance chamber, and at least two of the separate clearance chambers being interconnected by valve means.

277 This subclass is indented under subclass 275. Apparatus wherein a single expansible chamber has two or more clearance chambers connected thereto.

278 This subclass is indented under the class definition. Apparatus comprising fluid flow control means for varying the flow of pumped fluid, and including means operated in response to a condition or change in condition occurring externally of the system other than a manually induced condition or change.

(1) Note. Additional structure or modification of the pump structure to respond to or compensate for the external condition must be included and hence mere exposure of the pump or pump part to an external condition is excluded from this definition.

(2) Note. Fluid flow control varying means under this definition is intended to include means for varying the volume or pressure of pumped fluid delivered by the pump.

279 This subclass is indented under the class definition. Apparatus comprising fluid flow control means for varying the flow of pumped fluid, and including means sensing the occurrence of a condition or change in condition of either the pump or the fluid being pumped to actuate the control means.

(1) Note. The terms “bypass” and “relief” as used in subclasses indented hereunder are defined as follows: bypass, a flow line which connects the pump discharge passage directly to the pump intake passage, and relief, a flow line which connects the pump discharge directly to exhaust (e.g., a sump, atmosphere or the like).

(2) Note. Valves which may ordinarily be considered to be fluid flow or condition responsive (e.g., check valves, etc.) are excluded from this and the indented subclasses if they normally are operated through a cycle every time the pump or pumping member with which they are associated is operated through its normal pumping cycle. However, (1) spring biased valves which are solely disclosed as being bypass or relief valves even though they may operate cyclically and (2) normally cyclically operable valves which have their cycle or operation altered or modified by a change of condition have been included in this and indented subclass. See subclasses 297+ for the latter type. See subclasses 502 and 503 for multiple cyclic outlet and inlet paths, respectively, and subclass 504 for plural outlet paths to a single discharge line acting under different conditions.

(3) Note. The control of an atmospheric air inlet to the pulsation dampening chamber of a pump is not included in this subclass. See subclasses 540+ and the notes thereto for the classification of such devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:

270, for pumps having three or more radial, parallel, or coaxially arranged cylinders having condition responsive control of the pump fluid.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 115.01+ for a self-proportioning system having a by-pass or relief controlled by a main line condition.

280 This subclass is indented under subclass 279. Apparatus in which the pump is provided with a driving motor and the sensing means responds to a condition of the motor or the operating medium of the motor which is generated by a condition or change of condition of the pump.

(1) Note. The condition sensed must be more than the manual operation for starting or stopping the drive means. See subclasses 316+ for correlated pump fluid and motor or clutch control.

SEE OR SEARCH THIS CLASS, SUBCLASS:

293+, for pumped fluid control responsive to the speed of a driven pump part.

281 This subclass is indented under subclass 279. Apparatus comprising a pumping unit having means for lubricating a part of the unit which is so related to the flow control means that such means is controlled in response to a condition or change in condition of the means lubricating the pumping unit.

282 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means comprises a single flow controlling element for a single fluid passage controlled by a plurality of separate sensing elements or signals, each responsive to a different condition or change in such condition.

(1) Note. A bypass valve provided with means responsive to discharge pressure will not be classified in this subclass merely because the valve or controller is exposed to the fluid entering the pump. Such a bypass valve is classified below on other features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

300, for a flow generated pressure differential which is sensed and the high and low pressures determining such differential applied to opposite faces of an actuator controlling the fluid flow control means.

283 This subclass is indented under subclass 279. Apparatus comprising a pump which includes a movable part or portion other than the pumping member but which is normally in contact with the pumping member, the part or portion normally being biased against the pumping member by pumped fluid pressure acting thereon, and in which there is a bypass or relief valve for pumped fluid, the operation of the bypass or relief valve relieving the pressure bias on the part or portion such that it moves out of contact with the pumping member to permit fluid to pass around the pumping member from the pump discharge to the inlet.

284 This subclass is indented under subclass 279. Apparatus in which a movable pumping member is provided with a bypass or relief passage and the fluid flow control means controlling such passages is carried by the pumping member.

285 This subclass is indented under subclass 279. Apparatus comprising a pump of the nonrotary expansible chamber type having plural pumping chambers, one of which is caused to expand simultaneously with the contraction of another, and the fluid flow control means comprises valve means which controls the flow of fluid directly from the contracting chamber to the expanding chamber.

(1) Note. The passage connecting the chambers may do so by branching from another flow line, but if it does so, the branching must be between the chamber and any pump distributor valve located in the other flow line.

286 This subclass is indented under subclass 279. Apparatus in which a plurality of pumping units are provided and wherein the fluid flow control means operated in response to a condition or change in condition individually controls the operating characteristics of one unit relative to another and comprises (1) means other than the valving required for the pumping function of such unit or (2) means to operate the necessary valving of a pumping unit in a

manner inconsistent with the pumping function of such unit.

(1) Note. To be considered plural pumping units under this definition each unit must operate in or comprise a pumping chamber separate and distinct from the pumping chamber of another unit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for multistage pumps having condition responsive control of at least one of the stages.

270, for three or more cylinders arranged in parallel, radial or conical relationship with rotary transmission axis having condition responsive pumped fluid control.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 111+ for self-proportioning systems having plural inflows including a flow line from plural pumps.

287 This subclass is indented under subclass 286. Apparatus in which the pumping units have different volumetric displacements to provide different rates of flow or different pressure heads.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for diverse capacity pumps of the multistage type having condition responsive control of at least one of the stages.

288 This subclass is indented under subclass 286. Apparatus in which the plurality of pumping units are each provided with a relief or bypass passage and the fluid flow control means comprises valve means which, in response to a condition, operates to serially open or close the passages.

289 This subclass is indented under subclass 279. Apparatus in which the pump includes an expansible chamber-type pump having a supply or discharge port controlled by the position of the pumping member and the position at which the pumping member covers or uncovers the port is varied in response to the sensed condition.

(1) Note. For the purpose of this definition a pumping member controlled port includes the types set forth below in subclass 490.

290 This subclass is indented under subclass 279. Apparatus including means to cause or permit the fluid flow control means to operate or not to operate for a period of time after a change of condition has been sensed and then act to start, stop or change the mode of operation of the means.

(1) Note. Excluded from this definition is a dashpot or damper whose control fluid is independent of the pumped fluid and which dashpot or damper is in combination with valve means which controls the pumped fluid flow. Such combination is classified below on other features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

27, for condition responsive control of both the pump fluid and the pump drive motor with means for delaying operation of the pump fluid controlling valve.

291 This subclass is indented under subclass 279. Apparatus in which the pump is of the type in which the flow of fluid through the pump is caused to change direction and flow in the opposite direction when the direction of rotation of the pump element or the drive means is reversed and in which the fluid flow control means controls a bypass line or lines, the means being operable to direct fluid from the discharge to the inlet of the pump irrespective of the direction of the fluid flow through the pump.

292 This subclass is indented under subclass 279. Apparatus where the condition or change in condition is the temperature of the pump or pumped fluid.

293 This subclass is indented under subclass 279. Apparatus in which there is provided a sensing means responding to the speed of a driven portion of the pump means or the drive means for

such means and which is related to the fluid flow control means to operate the latter when the pump portion or drive means attains a predetermined speed or changes speed.

294 This subclass is indented under subclass 293. Apparatus wherein the sensing means comprises centrifugally actuated means effecting operation of the fluid control means either (1) directly or (2) through a fluid control circuit.

295 This subclass is indented under subclass 279. Apparatus in which the fluid control means comprises valve means other than a distributor which valve means varies the flow of fluid entering the pumping means by restricting the size of, or closing the inlet passage of the pumping means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

298, for an inlet distributor having means to modify its operation.

296 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means comprises a bypass or relief valve which has at least one part thereof carried by a distributor of the pump which carries at least one part of a distributor of the pump.

(1) Note. For the definition of the term "distributor," see the notes under subclass 437.

297 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means includes a cyclically operable pump valve and means for modifying the normal operation of said valve.

297.5 This subclass is indented under subclass 297. Apparatus in which the means for modifying the normal operation of said valve acts in response to the level of pump fluid.

298 This subclass is indented under subclass 297. Apparatus in which the cyclically operable pump valve is the inlet or intake valve of the pump.

299 This subclass is indented under subclass 279. Apparatus in which there is a bypass or relief line controlled by the fluid flow control means, the bypass or relief line being normally open to permit flow therethrough and the control means operating to close the line when the flow rate through the pump or the pressure generated by the pump increases above a minimum value.

300 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means is operated in response to the volume of fluid flowing through the pump or changes in the volume of fluid flowing through the pump.

301 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means comprises a valve in a bypass passage around the pump, which valve is responsive to an increase in the inlet passage to permit fluid to flow from the inlet to the discharge side of the pump.

302 This subclass is indented under subclass 279. Apparatus in which the flow control means control flow in two or more pumped fluid flow paths.

303 This subclass is indented under subclass 302. Apparatus wherein one of the condition responsive fluid flow paths comprises a normally closed main line path in the pump inlet or outlet, and another comprises a normally closed path in a relief or bypass passage, said paths provided with valve means operated by the condition responsive means to open the main line path before the opening of the other.

304 This subclass is indented under subclass 302. Apparatus in which the condition responsive fluid control means comprises means located in a plurality of separate bypass or relief passages.

SEE OR SEARCH THIS CLASS, SUBCLASS:

287, for plural diverse capacity pumps or chambers having sequentially controlled passages controlled by a single valve element.

288, for plural pumps or chambers having sequentially operated bypass or relief passages.

308, for plural relief or bypass valves having at least one responsive to pressure.

305 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means is provided with a separate means under the control of a human operator for operating the flow control means independently of the condition sensed.

(1) Note. The manual actuating means must be specifically disclosed as operating the fluid flow control means by an independent or overriding action of the condition sensing means. The disclosure of a manual adjusting means, which might incidentally cause operation of the flow control, is not included.

306 This subclass is indented under subclass 279. Apparatus in which the flow control means controls a passage communicating with the atmosphere and the inlet of a pump or pumping chamber of a pump and is operative in response to a condition of such pump to admit atmospheric air to the pump inlet or pumping chamber to reduce or destroy the normal vacuum which exists in the inlet or in the pumping chamber during the intake stroke of the pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

307+, for a pressure responsive bypass or relief valve which permits the discharge of pumped fluid to the inlet of the pump or to ambient in response to a pressure rise in the pumping chamber.

307 This subclass is indented under subclass 279. Apparatus in which the fluid flow control means controls a bypass or relief line.

308 This subclass is indented under subclass 307. Apparatus in which there is an additional relief or bypass path having an independent control means to control the flow of fluid in the path.

309 This subclass is indented under subclass 307. Apparatus in which the fluid flow control means is operated in response to a condition of the fluid in the intake or low pressure inlet of the pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

301, for an inlet pressure responsive bypass from the pump inlet to the pump discharge.

310 This subclass is indented under subclass 307. Apparatus wherein the pump is of the rotary expansible chamber type.

311 This subclass is indented under subclass 307. Apparatus in which the fluid control means comprises a valve which is biased to a closed position by means of a spring and means are provided for varying the bias of the spring.

312 This subclass is indented under the class definition. Apparatus including means to attenuate sound created by operation of the pump, said means acting upon the pump fluid to accomplish the attenuation.

SEE OR SEARCH CLASS:

181, Acoustics, subclass 403 for refrigerator compressor mufflers.

313 This subclass is indented under the class definition. Apparatus claimed in combination with features other than the fluid impelling means or valving, the drive means or casing or support structure for the pump and not provided for in preceding subclasses.

(1) Note. In view of the intimate relationship between Class 92, Expansible Chamber Devices, and this class with respect to nonrotary expansible chamber-type pumps some subjects matter which ordinarily would be considered to be combined when claimed in combination with nonrotary expansible chamber pumps of this class (417) are not considered to be combined herein and are excluded under this definition. The following basis has been used to determine whether certain subject matter is to be considered as combined under this definition. If Class 92 specifically provides a basis of classification for the subject matter of Class 92, then said subject matter combined with a nonrotary expansible chamber pump will be excluded from this definition. The miscellaneous com-

bined subclass of Class 92 (subclass 145) is not considered to specifically provide a basis of classification for any combined device. For example, a nonrotary expansible chamber pump combined with fluid purifying means as provided for in Class 92 subclasses 78+ or with nonsealing cleaning means as provided for in Class 92 subclass 87 are excluded from this definition.

(2) Note. Note the following subclasses providing for subject matter not considered to be combined under this definition; 496+, 432+, 434, 435, 438, and 493+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

372, for motor driven pumps having common or interrelated cooling means for the pump and motor.

314 This subclass is indented under the class definition. Apparatus comprising a reciprocating pumping member (e.g., piston) having opposed working faces disposed in a pair of pumping chambers, both of said chambers being effective to pump fluid under one condition of operation and means to alter the operation thereof so as to cause only one of the pumping chambers to be active during continued reciprocation of the pumping member.

315 This subclass is indented under the class definition. Apparatus in which the pump has a mechanical pumping member (e.g., rotor or piston) and an inlet flow line and means being provided to (1) change the flow of the pumped fluid without altering the movement of or direction of rotation of the pumping member, i.e., the inlet flow line under one condition of operation becomes the outlet flow line under the other condition of operation and vice versa or (2) change the direction of rotation of the pumping member or a driving element therefor without reversing the direction of flow of the pump fluid in the flow lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

239, for similar devices in which the reverse flow with unidirectional drive or the unidirectional flow with reverse drive is effected by a rearrangement of parts or the addition or omission of a part.

291, for a reversibly driven pump with a pressure responsive bypass operable in either flow direction.

316 This subclass is indented under the class definition. Apparatus in which the pump is driven by a motor or a selectively disengageable drive means (i.e., clutch), the motor or clutch having means (e.g., valve, switch, brake, starter-circuit, lever, etc.) for controlling its operation and the pump having control means associated therewith (i.e., pump fluid valve or displacement varying means), there being provided positive actuation means for both the motor or clutch control means and the pump control means, said motor or clutch control means and said pump control means being interrelated in a manner which causes or requires positive actuation of the pump control means upon actuation of the motor or clutch control means to at least one of its operative controlling positions, or vice versa.

317 This subclass is indented under subclass 316. Apparatus in which the valve means associated with the pump comprises a pump fluid distributor for cyclically controlling the flow of pump fluid to or from the pump.

(1) Note. See (1) Note of subclass 437 for definition of distributor.

318 This subclass is indented under subclass 317. Apparatus comprising a motor of the type which is motivated by fluid (includes internal combustion engine type) and has valve means movable relative to the motor working member for cyclically controlling inlet or exhaust of motive fluid to and from the motor (i.e., motive fluid distributor); said motor valve means and said pump fluid distributor being interconnected by a mechanical element (includes abutment or lost motion-type interconnection) such that movement of the motor valve means causes movement of the pump fluid distributor, or vice versa.

319 This subclass is indented under the class definition. Apparatus in which the pump has a driven pumping member, the driving means including (1) a friction or interlocking means to

secure drive continuity between two rotating members of the driving means, but being releasable to interrupt the drive, or (2) a member or part so designed as to break or rupture on overload so as to discontinue the drive.

320 This subclass is indented under the class definition. Apparatus in which one or more pumping members act to form a progression of completely isolated variable volume pumping chambers by a unidirectional movement.

(1) Note. Pumps comprising a series of pumping members or a single pumping member travelling unidirectionally through a fluid confining chamber are found here.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 151, for motors having serially formed expanding working chambers.

418, Rotary Expansible Chamber Devices, subclass 4, for a plurality of chamber partitions moving along a curved path, the distance between said partition members varying during their course of travel.

321 This subclass is indented under the class definition. Apparatus in which the pump is driven by a significantly claimed motor.

(1) Note. This definition excludes motor driven pumps in which the pump is a mere accessory of or ancillary to the operation of the motor and such ancillary function is reflected in the claims. For example, an engine driving a cooling water pump with no claimed connection of the pump to the engine would be included under this definition, but if a claim recites the connection of the cooling water pump to the engine this would be excluded. Such a combination would be classifiable in the appropriate motor class.

(2) Note. In order for a patent to be classified under this definition there must be a significant recitation of both the motor and the pump. A specifically claimed pump driven by a nominally claimed motor is classified in appropriate other subclasses of this class or other appropriate classes which include pumps (e.g., Class 415, Rotary Kinetic Fluid Motors or Pumps; Class 418, Rotary Expansible Chamber Devices, etc.). Likewise, a specifically claimed motor driving a nominally claimed pump is classified in the appropriate class providing for such motor (e.g., Class 91, Class 415, Class 418, etc.). Enumerated below are a number of examples for both pump and motor as to what is considered significant recitation and that which is not significant recitation.

A. Motor Recitation

(1) Significant motor inclusion: (a) A motor having any structural detail thereof recited, e.g., piston, rotor, runner, armature, etc., or designation of a turbine as to type, e.g., axial flow, two-stage, etc.; (b) Recital of details of motor crankcase structure, housing, base, or support for the motor. (c) Recital of structure ancillary to the motor, e.g., fluid or electrical control circuit or power generating apparatus, cooling or lubricating structure, etc.

(2)Insignificant motor inclusion: (a) Means for driving or drive means. (b) A motor specified as to some extremely common type, e.g., rotary, reciprocating, electric, fluid, expansible chamber, turbine, internal combustion engine, etc., or any combination of said types.

B. Pump Recitation

(1)Significant pump inclusion: (a) A pump having any structural detail thereof recited, e.g., piston, gear, screw, rotor or impeller within a recited casing, etc., or designation of rotary nonexpansible chamber as to type, e.g., axial flow, centrifugal, two-stage, etc.; (b) Recital of structure ancillary to the pump, e.g., cooling or lubricating structure for the pump. (c) Recital of details of pump crankcase, structure, housing, base or support for the pump.

(2)Insignificant pump inclusion: (a) A pump specified by name or extremely common type, e.g., pump or pump means, blower, fan, compressor, rotary, reciprocating, expansible chamber, liquid, etc., or any combination of said types.

C. Pump and Motor Support or Spatial Relationship: (1) The following motor-pump relationships are considered significant for purposes of classification herein, even though neither pump nor motor is specifically recited. (a) The claiming of a spatial relationship between the pump and motor or common support therefor, e.g., motor mounted on the pump, pump mounted on the motor, a common base, support, or housing for the pump and motor. (b) The claiming of means for permitting or preventing heat transfer between the pump and motor or pump and motive fluids. (c) The claiming of means common to the pump and motor for cooling or lubricating same.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for motor driven pumps with condition responsive control of the pump drive motor.

91, for diverse pumps in which one is fluid motor driven and the other is of the aerated column type, the motor exhaust comprising the aeration fluid.

245, for successive stage pumps in which one stage has a motor driven by fluid supplied from another stage.

271, for motor driven pumps in which the pump has three or more cylinders arranged in parallel, radial or conical relationships with a rotary transmission axis.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 533+ for a motor driven expansible chamber device disclosed solely as the master in a pulsator system,

92, Expansible Chamber Devices, for non-rotary expansible chamber devices disclosed as being of the pump or motor type. Class 417 will take a motor-type expansible chamber device driving a pump-type expansible chamber device if a claim recites one as a motor and one as a pump. Class 92 takes plural expansible chamber devices including those in which one is of the motor type driving another of the pump type if no claim recites that one is a motor and the other a pump.

322 This subclass is indented under subclass 321. Apparatus in which the pump has an expansible chamber, at least some of the walls of which are of such a nature as to change dimension when subjected to a magnetic or electric force to change the volume of the chamber and means to subject the walls to such a force.

SEE OR SEARCH THIS CLASS, SUBCLASS:

413.2, for piezoelectric member attached to diaphragm.

323 This subclass is indented under subclass 321. Apparatus in which the pump has an inlet and outlet for fluid pumped for external use, at least a portion of the fluid either (1) prior to entry to the pump or (2) discharge from said pump outlet, being utilized either immediately or stored for later use, and without further addition of energy, under at least one phase or condition of operation, as a source of motive fluid for a fluid motor which is used to either drive the pump or provide motive power for starting a motor (usually combustion engine) which drives the pump.

(1) Note. In part (2) of the above definition, the pumped fluid must have been discharged from the pump prior to its being used as motive fluid. Therefore, reciprocating expansible chamber pumps which utilized the pressure energy of the fluid existing within the pumping chamber or a chamber in nonvalved continuous communication therewith for reacting on the pumping member itself or a member connected thereto are excluded under this definition even though such an arrangement may be said to assist in driving the pump. Also those devices

which permit the pump fluid to continuously apply a force to a reciprocatory-type pumping member are excluded under this definition.

(2) Note. The fluid motor of this definition, due to its particular relationship of receiving motive fluid from the pump which it is driving, will be a mere auxiliary of some other source of pump motivating power (e.g., primary motor, primary motive fluid source, or manual actuator) which may or may not be claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

225, for intensifiers of the type which utilize a portion of the pump fluid upstream of the pump for driving the pump motor to raise the remainder of said pump fluid to a higher head.

324 This subclass is indented under subclass 321. Apparatus in which the pump is driven by a prime mover, there being provided either (1) adjusting or converting means for conditioning the pump for operation as a motor or (2) a source of motive fluid selectively communicable with the pump for causing the pump to be operated as a motor; operation of the pump as a motor serving to start or aid in starting the prime mover drive.

325 This subclass is indented under subclass 321. Apparatus in which the motor is of the type which unidirectionally rotates to cause the pump to operate and upon starting the motor operates for a limited time in a direction of rotation opposite to the normal pump driving direction of rotation (usually to unload the pump) and having means which then reverses the direction of rotation so as to operate the pump in the normal manner.

326 This subclass is indented under subclass 321. Apparatus in which there is provided motor control means which is operable at the will of a human operator, said control means being effective upon operation thereof to either (1) change the rate of movement of a motor working member or (2) change the direction of working member rotation in a motor of the type having a rotating working member.

(1) Note. The motor control means of this definition may be a reversible flow motive fluid generating pump, flow reversal of said motive fluid generating pump causing reversal or rotation of a rotary motor.

327 This subclass is indented under subclass 321. Apparatus in which the motor has a movable working member which receives its motive power as a consequence of the reactive force created by the discharge of motive fluid therefrom to the surrounding medium.

328 This subclass is indented under subclass 321. Apparatus in which the motor is of the type which includes a movable member which is motivated by either (1) the force of gravity or (2) a spring.

(1) Note. To fall within the scope of this definition the motivating force produced by the spring or gravitational force must be controllable or variable in intensity or direction to cause operation of the movable member, i.e., a weight or spring for exerting a continuous unidirectional biasing force is excluded.

329 This subclass is indented under subclass 328. Apparatus in which a fluid material is utilized for causing motion of the movable member, the principle force applied to movable member being derived from gravitational force exerted thereon by the fluent material (i.e., weight).

(1) Note. Exemplary of apparatus classified under this definition are devices comprising either a movable container or piston within an open ended cylinder which is alternately filled and emptied with liquid, the weight of the liquid causing movement of the container on the piston within the cylinder.

330 This subclass is indented under subclass 321. Apparatus in which the motor has at least one movable working member positioned and adapted to receive energy from the alternating, cyclic, surface movement of a fluid body which movement is the result of either tidal or wave action.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 495+ for motors having buoyant working members motivated by the vertical rise and fall of a surface of a body of fluid.

331 This subclass is indented under subclass 330. Apparatus in which the motor working member is buoyant so as to float in the water which is actuating it.

332 This subclass is indented under subclass 331. Apparatus in which the buoyant motor working member moves about a pivot point or fixed axis.

333 This subclass is indented under subclass 331. Apparatus in which the movement of the buoyant motor working member is restricted to a fixed path by a guiding and confining means, such as a slide or a track.

334 This subclass is indented under subclass 321. Apparatus in which the motor has a movable working member adapted to receive energy from an unconfined body of fluid, such as the wind or a river current.

(1) Note. Apparatus under this definition is limited to those devices in which motive fluid for the working member is completely nonconfined. Apparatus having stationary means for directing the flow of motive to the motor working member (e.g., trough, baffles, etc.) is thereby excluded under this definition.

335 This subclass is indented under subclass 334. Apparatus in which, in addition to the fluid current motor, there is provided additional means to impart driving energy to the pump.

(1) Note. The additional means is usually one for manually operating the pump (e.g., handle).

(2) Note. Patents have been classified in this subclass on a disclosure basis with many of the patents not claiming the fluid current motor or pump, but merely the mechanism for alternative drive.

336 This subclass is indented under subclass 334. Apparatus in which the motor working member moves unidirectionally about a fixed axis, said axis being substantially horizontal and oriented in a direction parallel to the flow of the moving fluid.

337 This subclass is indented under subclass 321. Apparatus in which the motor has a buoyant movable working member which member is positioned in a container for liquid, said container being alternately filled and emptied so as to move the buoyant member up and down or said buoyant member being alternately filled and emptied so as to move up and down.

SEE OR SEARCH THIS CLASS, SUBCLASS:

331+, for tide or wave actuated float which drives the pump.

338 This subclass is indented under subclass 321. Apparatus in which two or more pumping members which are capable of or constrained to move relative to each other are driven by two or more motor working members which are capable of or constrained to move relative to each other.

(1) Note. The plural pumping members under this definition must each provide an output of fluid for external use. Therefore, a motor driven pump which is a mere auxiliary or ancillary of another motor driven pump (e.g., supplies motive fluid or cooling fluid for another motor driven pump) is not included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

246+, for plural relatively movable pumping members driven by plural relatively movable working members wherein the pumping members serially act upon the pumped fluid.

339 This subclass is indented under subclass 338. Apparatus in which the motor working members are motivated by fluid (includes internal combustion engines) and in which said pumping and motor working members partake of alternate to-and-fro motion.

(1) Note. The plural pumping members under this definition must each provide an output of fluid for external use. Therefore, a motor driven pump which is a mere auxiliary or ancillary of another motor driven pump (e.g., supplies motive fluid or cooling fluid for another motor driven pump) is not included under this definition.

(2) Note. Pumping members or working members of the flexible wall type or which partake of an oscillatory motion are included under this definition.

(3) Note. Plural relatively movable common piston or common flexible wall type pump-motors fall within the scope of this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

246, for plural relatively movable pumping members driven by plural relatively movable working members wherein the pumping members serially act upon the pumped fluid.

340 This subclass is indented under subclass 339. Apparatus in which the relatively movable working members form opposite walls of a common expansible working chamber adapted to receive pressure or combustion working fluid, said working members moving toward and away from each other during expansion and contraction of the expansible working chamber.

341 This subclass is indented under subclass 340. Apparatus in which there is provided mechanical motion constraining means (e.g., linkage, gearing, etc.) for interconnecting the working members of said common expansible chamber in a manner which necessitates motion of one working member relative to another.

342 This subclass is indented under subclass 339. Apparatus in which the working members are interconnected by a body of fluid which is totally confined during at least a portion of working member movement, the confining means for said body of fluid being formed in part by said working members or portions connected thereto so that movement of one working member necessitates movement of the other.

(1) Note. The fluid interconnection under this definition must be between faces or portions of the working members other than their fluid working faces or portions.

(2) Note. Plural working members which are interconnected solely by a confined body of fluid are intended to fall within the scope of this definition, even though the disclosed normal mode of operation may not provide for relative working member motion.

343 This subclass is indented under subclass 339. Apparatus in which there is provided mechanical motion constraining means (e.g., linkage, gearing, etc.) for interconnecting the pumping or working members in a manner which necessitates motion of one working member relative to another or one pumping member relative to another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

341, for mechanically interconnected, relatively movable working members which form opposite walls of a common expansible chamber.

344 This subclass is indented under subclass 339. Apparatus in which there is provided valve means for controlling motive fluid for one of said working members, said valve means being controlled in response to another working member attaining a predetermined position.

(1) Note. The valve means under this definition which controls motive fluid for one working member may comprise a cylinder port controlled by the working member of another.

345 This subclass is indented under subclass 344. Apparatus in which the control valve means comprises either (1) a multiway valve or (2) plural valve means and a single element for actuating each of the valve means said control valve means controlling motive fluid for the plural working members or actuating fluid for

fluid operated valves which control motive fluid for the plural working members, each of said working members, either jointly or successively, operating said single element or said multiway valve.

346 This subclass is indented under subclass 344. Apparatus having a separate motive fluid control valve for each working member and separate actuating means for each valve, and wherein each working member separately controls an actuating means for a valve controlling motive fluid for another of said working members.

(1) Note. The motive fluid control valve for one working member and the actuating means therefor may comprise a cylinder port controlled by the working member of another.

347 This subclass is indented under subclass 339. Apparatus having control valve means comprising either (1) a multiway valve or (2) plural valve means and a single element for actuating each of the valve means, said control valve means controlling motive fluid for the plural working members or actuating fluid for fluid operated valves which control motive fluid for the plural working members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

345, for relatively movable nonrotary working members driving relatively movable nonrotary pumping members having motive fluid control by a single member responsive to the position of each of the working members.

348 This subclass is indented under subclass 321. Apparatus in which there is provided a member which rotates more than 3605 about a fixed axis, at least one portion of said member, during different segments of each revolution thereof, serving alternately as both a pumping member and a fluid motor working member.

(1) Note. The motor and pump under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

349 This subclass is indented under subclass 321. Apparatus in which there is provided means forming an expansible and contractible chamber, said chamber serving both as an expansible motor chamber and an expansible pumping chamber.

(1) Note. The pump fluid under this definition may comprise a portion or component of the combustible charge of an internal combustion engine, provided said charge is discharged from the chamber prior to combustion thereof.

(2) Note. This definition excludes those pumps in which the fluid is pumped in a separate chamber and then discharged through the motor chamber even though the energy of the fluid may be increased in the motor chamber. See subclasses 377+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

105+, for apparatus in which one fluid is caused to be pumped by the condensation of a motivating fluid.

348, for rotary expansible chamber devices having a common pump and motor working member in which the common member defines a common rotating pump and motor chamber.

377+, see (2) Note above.

350 This subclass is indented under subclass 321. Apparatus in which the motor has a working member which is drivingly connected to and located between opposite plural pumping members, said motor working member and said plural pumping members having a rotary motion of more than 360° in a single direction about a single common axis.

(1) Note. A rotary fluid motor under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

351 This subclass is indented under subclass 321. Apparatus in which the pump has a pumping member which is drivingly connected to and located between opposite plural motor working members, said pumping member and said plural motor working members having a rotary motion of more than 360° in a single direction about a single common axis.

(1) Note. A rotary fluid motor under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

352 This subclass is indented under subclass 321. Apparatus in which the pump has a rotating pumping member and at least a portion of the motor or motor part (e.g., armature, runner, stator) is situated interiorly of the axial and radial limits of said pumping member.

(1) Note. For purposes of this definition a mere drive shaft which connects the motor working member to the pumping member is not considered to be a portion of the motor.

(2) Note. The motor or motor part situated within the pumping member is, in many instances, an integral or monolithic portion of the pumping member.

(3) Note. The fluid motor under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

353 This subclass is indented under subclass 352. Apparatus in which the portion of the motor situated within the pumping member is the rotor of an electric motor.

(1) Note. Included under this definition are those devices in which the pumping member has an outer working face or pumping portion and is made of some specific material (e.g., magnetizable) so as to also function as the motor working member.

354 This subclass is indented under subclass 353. Apparatus in which the electric motor has a stator which is positioned radially interiorly of the rotor of the electric motor.

355 This subclass is indented under subclass 321. Apparatus in which the motor has a rotating working member and at least a portion of the pump or pump part (e.g., stator, runner, etc.) is situated interiorly of the axial and radial limits of said working member.

(1) Note. For purposes of the definition, a mere drive shaft which connects the motor working member to the pumping member is not considered to be a portion of the motor.

(2) Note. The pump or pump part situated within the motor working member is, in many instances, an integral or monolithic portion of the motor working member.

(3) Note. A rotary fluid motor under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

356 This subclass is indented under subclass 355. Apparatus in which the rotating working member is the rotor of an electric motor.

357 This subclass is indented under subclass 321. Apparatus in which the pump is driven by an electric motor comprising rotatable armature and stator portions, said armature rotating in a chamber which is fluidly isolated from said stator, and in which the pumped fluid communicates with said armature containing chamber.

(1) Note. Included under this definition are devices in which the armature containing chamber is either in open communication with the pumped fluid or in restricted communication with the pump fluid through a leakage path.

358 This subclass is indented under subclass 321. Apparatus in which the pump and motor are carried in or from unitary structure which is movable through a vertically disposed fluid conduit by fluid under pressure applied beneath the structure to elevate the pump and motor from a working position at the lower end of the conduit to an inoperative position at the upper end.

359 This subclass is indented under subclass 321. Apparatus in which (1) both the motor and pump are of the rotary type, the rotors of the motor and pump being connected to operate as a unit, there being means provided to adjust the running position of the rotor unit with respect to the pump casing or (2) the driving connection between the motor and pump includes generally aligned rotary pump and motor shafts, there being means provided to adjust the running position of one of the shafts relative to the other (e.g., radially, axially, etc.).

(1) Note. Under section (1) of this definition the adjustment may include the entire motor (e.g., rotor and casing) or merely the rotor of the motor which is connected to the pump rotor.

360 This subclass is indented under subclass 321. Apparatus in which there is provided means designed to aid in securing or detaching the pump and motor to or from each other or to or from a supporting structure.

(1) Note. This definition is not intended to include those devices in which a mere securing means is made easily accessible, for example, bolts for securing the pump to the motor which bolts are located so as to be readily removed with the proper tool. Devices included under this definition are, for example, a motor driven pump combined with a tool or jig for assembling or disassembling one relative to the other, or cooperating means between a pump and motor for permitting ready assembly or disassembly without the use of a tool. Despite the above limitations, however, if a claim emphasizes the feature of assembly or disassembly it is classifiable under this definition.

361 This subclass is indented under subclass 321. Apparatus in which the pump and motor are rigidly secured to each other to form an integral pump motor unit, the unit being adjustably secured to a stationary frame or base so as to be selectively movable relative thereto.

SEE OR SEARCH THIS CLASS, SUBCLASS:

359, for a motor and pump rotor which are adjusted as a unit relative to the pump casing.

362 This subclass is indented under subclass 321. Apparatus in which the power transmitting connection between the motor and the pump includes a continuous flexible member, e.g., belt, chain, etc., which moves in an endless path to transmit the driving power.

363 This subclass is indented under subclass 321. Apparatus in which the means for mounting the motor in driving relation to the pump includes vibration dampening means (e.g., spring, rubber block, etc.) for either (1) resiliently supporting the pump or motor to a mounting (e.g., base, casing, etc.) on which they are commonly supported, or (2) resiliently attaching the motor to the pump or vice versa.

364 This subclass is indented under subclass 321. Apparatus in which the motor comprises a chamber having a movable wall portion (i.e., working member) cooperating therewith to form an alternately expansible and contractable chamber, expansion of said chamber being caused by the burning of a combustible fluid within the chamber, said chamber expansion causing movement of said movable wall portion, the movable wall portion being connected to the pump.

(1) Note. The distinction between this subclass and subclasses 375+ is one of disclosure. Thus, any patent which has at least one embodiment of the invention which is disclosed as an internal combustion engine, and which has a claim specific to such embodiment, is classified in this subclass even though the claimed apparatus is not limited to internal combustion engine operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

34, for internal combustion engine driven pump having means for controlling the engine in response to a pump or pump fluid condition.

237, for internal combustion engines in which at least one cylinder is convertible to operation as a pump.

324, for internal combustion engine driven pumps wherein the pump is operated as a motor to start the internal combustion engine.

365 This subclass is indented under subclass 321. Apparatus in which the pump has a pumping member and the motor has a working member, each of said members rotating about a common axis, there being provided means for applying an axial force (i.e., in the longitudinal direction of said axis of rotation) to said pumping and working members in opposition to the combined net axial force produced by said pumping and working members.

(1) Note. This definition does not include a mere design of the pump and motor rotors so as to provide zero axial thrust. There must be provided some special means such as a separate fluid reaction surface or spring, etc., to be included under this definition.

366 This subclass is indented under subclass 321. Apparatus in which there is provided means for allowing at least a portion of the fluid which flows through the pump to either (1) contact a motor or motor part, (2) induce flow of or pressurize a secondary fluid which contacts a motor or motor part, or (3) transfer heat to a secondary fluid or element which contacts a motor or motor part; said means having as its disclosed function the augmentation of cooling, lubricating, sealing, or cleansing of the motor or motor part.

(1) Note. This definition is limited to apparatus in which the fluid which cooperates with the means in the manner set forth in (1), (2), (3) of the above definition is that which flows through the pump. Therefore, apparatus utilizing fluid for cooling or lubricating a motor is included under this definition only in those instances in which the cooling or lubricating fluid itself flows through the pump or is motivated to flow or in heat exchange relationship with fluid which flows through the pump.

(2) Note. Apparatus comprising a pump which has as its sole function supplying cooling or lubricating fluid to its driving motor is considered to be an auxiliary of the motor and does not form subject matter for this class and will be found in the appropriate motor class. To come within the scope of this definition, the pump must supply fluid to a point of external use as well as supplying fluid for cooling or lubricating its driving motor. Also, apparatus in which the mere positional relationship between the pump and motor causes the entire volume of pumped fluid to flow over or around the motor to thereby necessitate cooling or lubrication of the motor by reason of the positional relationship are not intended to be included under this definition, particularly those devices in which the entire motor unit is positioned within a conduit or tank for supplying pump fluid to or from the pump without design or modification of the conduit, tank, or motor for enhancing a cooling or lubricating function. For example, in the above arrangement, the claiming of structure peculiar to cooling (e.g., heat conducting fins) or structure peculiar to lubricating (e.g., lubricant passages within a motor bearing) would cause classification under this definition. Other examples of structure peculiar to cooling would be the recital of flow passages for directing all or a portion of the pumped fluid to or through the motor or motor part, or means for interconnecting the pumping and working members via a material having high thermal conductivity characteristics.

(3) Note. For purposes of this definition, a bearing which aids in supporting a motor working member is considered to be a “motor part” as set forth in the above definition. Therefore, apparatus utilizing pumped fluid for cooling or lubricat-

ing a motor bearing forms subject matter within the scope of this definition.

(4) Note. A secondary fluid utilized for cooling, lubricating, sealing, or cleaning a motor or motor part forms subject matter to be included under this definition when the fluid is in heat exchange relationship with or caused to flow through the motor by the pumped fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

357, for rotary electric motor driven pumps having pumped fluid circulation within an isolated motor armature containing chamber.

SEE OR SEARCH CLASS:

62, Refrigeration, subclass 505 for a compressor-condenser-evaporator circuit in which there is provided means for cooling the compressor motor by the refrigerant.

367 This subclass is indented under subclass 366. Apparatus in which an intermediate fluid is utilized for cooling, lubricating or sealing the motor, said intermediate fluid being separate from and in heat exchange relationship with the pumped fluid.

(1) Note. Included under this definition are motors of the type having a sealed casing for enclosing a secondary fluid therein and means for augmenting heat transfer between the secondary fluid and the pump fluid by way of the motor casing.

368 This subclass is indented under subclass 366. Apparatus in which there is provided means (e.g., auxiliary pump) in addition to the pump driven by the motor, said additional means either (1) serving to cause or aid in causing flow, agitation, or pressurization of pump fluid which contacts the motor or (2) receiving energy from the pump fluid to cause or impart flow, agitation or pressurization of a secondary fluid which contacts the motor.

369 This subclass is indented under subclass 366. Apparatus in which there is provided a divided flow path or pump fluid which has been acted upon by the pumping member of said pump, one branch of said divided flow path serving to direct pump fluid to the motor or part thereof.

(1) Note. To fall within the scope of this definition, flow passage means must be present for the express purpose of providing a divided flow path. Mere accidental divided flow paths through or around a motor of conventional design, in the absence of passage means provided for such purpose, is excluded, e.g., one flow path between electric motor field coil and casing and another between the field coil and armature is not considered classifiable under this definition.

370 This subclass is indented under subclass 369. Apparatus in which the pump fluid which is directed to the motor or motor part by way of said downstream divided flow path is returned to the pump to be recirculated therethrough.

371 This subclass is indented under subclass 366. Apparatus in which the pump fluid is directed to the motor or part thereof upstream of and prior to engagement with the pumping member of the pump.

372 This subclass is indented under subclass 321. Apparatus in which both the pump and motor are cooled or lubricated by a common or interrelated cooling or lubrication means.

(1) Note. The interrelated cooling means may include (1) a fan, or equivalent devices, which force cooling fluid over the pump and motor or (2) a cooling fluid which enters into heat exchange relation with separate fluid cooling circuits passing through the pump and motor.

373 This subclass is indented under subclass 321. Apparatus in which there is provided means which has as its particular function the prevention of heat transfer between the motor or part thereof and the pump or part thereof, or between motive fluid and pumped fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

366+, for means providing for the cooling of the motor by the pumped fluid which

serve the purpose of preventing transfer of heat between the pump and motor.

372, for motor driven pumps having interrelated cooling means which may serve the purpose of preventing the transfer of heat between the pump and motor.

374 This subclass is indented under subclass 321. Apparatus in which, in addition to the pump motor, there is provided secondary means adapted to impart driving energy to the pump, said secondary means comprising either (1) an element (e.g., handle, tool) which is adapted for selective manual operation at the will of a human operator, (2) a secondary motor for driving the pump which is of a basically different type, or (3) a mechanically driven element connected in driving relationship with the pump and receiving its driving energy from a source other than the working member of the pump motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

323, for an auxiliary motor for driving the pump, said motor receiving its driving energy from the pump fluid.

335, for a fluid current motor driven pump with alternative drive means.

375 This subclass is indented under subclass 321. Apparatus in which the motor is of the type which includes a movable working member (e.g., piston, turbine runner, diaphragm, etc.) which is motivated by a fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

329, for motors of the type which are motivated by the simple force of weight of a fluent material.

364, for fluid motors of the type which are motivated by the burning of a combustible mixture within an expansible chamber of the motor (i.e., internal combustion engine).

376 This subclass is indented under subclass 375. Apparatus in which the fluid utilized for motivation of the fluid motor working member is steam, the steam, after having acted upon the motor working member, being directed into the pump or pump fluid flow line so as to commingle with the pump fluid.

377 This subclass is indented under subclass 375. Apparatus in which the fluid motor is of the expansible chamber or pulsator or fluid link type, the motor working member thereof driving a pumping member which cooperates with a pumping chamber to cause alternate expansion and contraction thereof to pump fluid therefrom, the fluid expelled from said pumping chamber flowing serially therefrom through the expansible motor working chamber or the pulsator or fluid link chamber.

(1) Note. For the definition of pulsator or fluid link see this class, subclass 383.

378 This subclass is indented under subclass 377. Apparatus in which the fluid motor is of the pulsator or fluid link type.

(1) Note. For the definition of a pulsator or fluid link see this class, subclass 383.

379 This subclass is indented under subclass 375. Apparatus in which there is provided significantly claimed motive fluid generating apparatus (e.g., pump boiler, etc.) for either (1) increasing the pressure or velocity of a fluid which is used to motivate the fluid motor or (2) decreasing the pressure of a fluid which is withdrawn from the fluid motor to allow atmospheric or ambient pressure fluid to cause motivation of the fluid motor.

380 This subclass is indented under subclass 379. Apparatus in which the motive fluid generating apparatus comprises an internal combustion engine which is motivated by a combustible mixture, the combustible mixture or a component thereof being additionally used, either prior to, during, or after combustion, as the source of motivating fluid for the fluid motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

364, for an internal combustion engine which mechanically drives a pump.

381, for a pump motor driven by combustion products in which the combustion products generator is other than an internal combustion engine.

381 This subclass is indented under subclass 379. Apparatus in which the fluid which drives the fluid motor is the product of a combustion process and the means to form the combustion products is claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

380, for a pump motor driven by combustion products in which the combustion products generator is an internal combustion engine.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 39.01+ for the combination of a pump feeding to a combustion products generator, the combustion products driving a motor to drive the pump, the pump providing only the fluid utilized in the combustion products generator; and subclasses 226.1+ for reaction motors in which a pump is provided to supply air to a combustion products generator and additionally supply air for use in an air jet.

382 This subclass is indented under subclass 379. Apparatus including a plurality of pumping members which pump fluid for external use, one of said pumping members also additionally supplying motive fluid for a fluid motor which drives another pumping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

245, for serially arranged pump units in which the fluid output of one of the units provides motive fluid for a fluid motor driving another of the units.

383 This subclass is indented under subclass 379. Apparatus in which the means for increasing the pressure of the motive fluid comprises an enclosed chamber containing the motive fluid (i.e., pulsator fluid) the boundaries of said chamber being formed in part by a movable driving member (e.g., pulse pump piston) and the fluid motor working member (e.g., piston), said fluid being in a state of total confinement within the boundaries of said chamber during at least a portion of driving member movement, whereby movement of the driving member in one direction causes displacement of said fluid so as to transmit energy from the driving member through the medium of said fluid to said fluid motor working member, and at least a portion of said fluid returning from whence it came upon movement of the driven member in the opposite direction.

(1) Note. A manually operated driving member is included under this definition.

384 This subclass is indented under subclass 383. Apparatus in which at least a portion of the confined fluid is compressible (e.g., air).

(1) Note. Those devices in which only a portion of the confined fluid is compressible and the other portion is incompressible are included under this definition.

385 This subclass is indented under subclass 383. Apparatus in which means is provided to supply additional fluid to or exhaust fluid from the fluid confining chamber.

(1) Note. Means for merely prefilling the chamber with fluid prior to operation of the device or means for emptying the chamber during inactivity are not included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

378, for pulsator devices in which the pumped fluid flows serially through the pulsator fluid containing chamber. Such devices necessarily include means for allowing fluid flow to and from the pulsator chamber and have not been cross-referenced into this subclass or those indented hereunder.

SEE OR SEARCH CLASS:

60, Power Plants, subclass 543 for a self-cycling pulsator, per se, or driving a merely nominal load that has self-operated pulse fluid purge and quantity adjusting structure.

386 This subclass is indented under subclass 385. Apparatus in which the means for supplying or exhausting fluid is made effective in response

to the attainment of a predetermined position by the fluid motor working member.

387 This subclass is indented under subclass 385. Apparatus in which the means for supplying or exhausting fluid is made effective in response to the attainment of a predetermined position by the driving member.

388 This subclass is indented under subclass 385. Apparatus in which the means for supplying or venting fluid is made effective in response to the existing pressure of the confined fluid.

389 This subclass is indented under subclass 383. Apparatus in which both the movable driving member and the fluid motor working member are fabricated of either (1) flexible material or (2) rigid members hinged or interfitted together so that the members are movable relative to each other; the flexing of the material or relative movement of the rigid members of the driven member serving to cause flexing of the material or relative movement of the rigid members of the fluid motor working members.

390 This subclass is indented under subclass 379. Apparatus in which the motive fluid generating apparatus comprises a fluid pump (e.g., centrifugal, expansible chamber, axial flow, etc.).

391 This subclass is indented under subclass 375. Apparatus in which the pump is of the type having an expansible pumping chamber, the exhaust motive fluid from the fluid motor being directed into the pumping chamber or into the pump fluid before the pump fluid enters the expansible pumping chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

377, for a fluid motor driven pump in which the fluid discharged by the pump flows through the motor working chamber.

392 This subclass is indented under subclass 375. Apparatus in which there is provided a movable wall member which forms both the motor working member and the pumping member, said member comprising either (1) a piston which reciprocates within a single continuous working chamber of uniform internal cross-sectional dimensions to divide same into motor and pump chamber portions or, (2) a deformable or collapsible member (e.g., diaphragm, bellows, etc.) which has a portion thereof secured to a single continuous working chamber to divide same into motor and pump chamber portions; whereby, application of motive fluid to said motor chamber portion causes movement of said member for expanding said motor chamber portion and simultaneously contracting said pump chamber portion.

(1) Note. Plural members with substantially identical external cross-sectional dimensions and which are in face-to-face contact or spaced with an interposed rigid element to form in effect a single unitary motor working and pumping member are included under this definition. However, plural members which are spaced solely by a body of fluid enclosed therebetween which serves to transmit movement of one of the members to another form pulsator or fluid link devices and are excluded under this definition, such devices being classified in subclasses 383+, above.

SEE OR SEARCH THIS CLASS, SUBCLASS:

56+, for drilled well-type pumps having a free piston common to both a pump and motor chamber.

383+, for pulsator apparatus comprising a movable wall separating a pump chamber from a motive fluid (i.e., pulsator fluid) chamber.

393 This subclass is indented under subclass 392. Apparatus in which the movable chamber dividing member is rigidly secured to a second movable chamber dividing member which separates a second single continuous chamber into a single motor and pump chamber portions.

394 This subclass is indented under subclass 392. Apparatus in which the movable member is deformable and comprises either a wall portion formed of flexible material or rigid members hinged or interfitted together so that the members are movable relative to each other; the flexing of the material or the relative movement of the members constituting the movement which effects the work function of the expansible pump and motor chambers.

395 This subclass is indented under subclass 394. Apparatus in which the deformable member comprises a relatively thin membrane like element having a peripheral edge portion, said member being adapted to be associated with a surrounding or encompassing tubular rigid chamber forming means and extending transversely thereof to form a separating wall for dividing said chamber into respective motor and pump chambers, the outer peripheral edge of said membrane being in sealing relationship with the encompassing wall of said tubular structure.

(1) Note. The membrane like member need not span the entire space within the encompassing wall of the tubular member, but may be in the form of a ring or frustum having the inner peripheral edge thereon in sealing engagement with a rigid element movable relative to and coaxial with the encompassing tubular member.

396 This subclass is indented under subclass 375. Apparatus in which the pump has a movable pumping member which is driven by plural fluid motor working members, said working and pumping members having an alternate to-and-fro motion along a common longitudinal axis of reciprocation, the pumping member being located between said motor working members and connected thereto in a manner such that all of said members move in unison during the normal mode of operation (includes flexible wall type motors and pumps).

(1) Note. Apparatus in which the fluid motor working members comprise movable pistons and the pumping member comprises a moving cylinder, or vice versa, is excluded under this definition; see subclass 400, below, for subject matter of this type.

SEE OR SEARCH THIS CLASS, SUBCLASS:

393, for plural unitarily movable common pump and motor working members of the type in which the pumping faces of the device are positioned intermediate the motor working faces.

397 This subclass is indented under subclass 375. Apparatus in which the fluid motor has a movable working member for driving plural pumping members, said working and pumping members having an alternate to-and-fro motion along a common longitudinal axis of reciprocation, the motor working member being located between said pumping members and drivingly connected thereto in a manner such that all of said members move in unison during the normal mode of operation; (includes flexible wall type motors and pumps).

(1) Note. Apparatus in which the fluid motor working member comprises a movable piston and the pumping members comprise movable cylinders, or vice versa, is excluded under this definition; see subclass 400, below, for subject matter of this type.

SEE OR SEARCH THIS CLASS, SUBCLASS:

393, for plural unitarily movable common pump and motor working members of the type in which the motor working faces of the device are positioned intermediate the pumping faces.

398 This subclass is indented under subclass 375. Apparatus in which the fluid motor is of the type comprising a cylinder and a piston, one of which is the movable motor working member and cooperates with the other to form an expansible motive fluid working chamber, said working member partaking of an alternate to-and-fro motion in a straight line.

399 This subclass is indented under subclass 398. Apparatus in which the fluid motor drives a pump of the type comprising a cylinder and a piston, one of which is a movable pumping member and cooperates with the other to form an expansible pumping chamber, said pumping member partaking of an alternate to-and-fro motion in a straight line.

400 This subclass is indented under subclass 399. Apparatus in which (1) the motor piston is the movable motor working member and is drivingly connected to the pump cylinder which is the movable pumping member, or (2) the motor cylinder is the movable motor working mem-

ber and is drivingly connected to the pump piston which is the movable pumping member.

401 This subclass is indented under subclass 399. Apparatus in which the motor piston is the movable motor working member and the pump piston is the movable pumping member, said motor piston being drivingly connected to the pump piston in a manner such that both of said pistons move together in unison during the normal mode of operation.

(1) Note. Included under this definition are those devices in which there is provided a valved pump piston and the motor working member is connected to the pump piston valve to actuate same and to drive the pump piston through a lost motion connection.

402 This subclass is indented under subclass 401. Apparatus in which there is provided means (e.g., spring) for continuously applying a force to the pump piston or part connected thereto for continuously urging the pump piston in a direction to contract the pumping chamber.

(1) Note. The means for applying the continuous force may be a double acting differential area fluid motor in which fluid pressure is constantly applied to one piston working face.

(2) Note. To be included under this definition the bias means must be other than a mere weight.

403 This subclass is indented under subclass 401. Apparatus in which the motor piston cooperates with a single continuous motor cylinder to divide same into a pair of opposed expansible working chambers, there being means provided for controlling the supply or exhaust of motive fluid to or from each of said opposed working chambers to drive the motor piston in opposite directions.

404 This subclass is indented under subclass 403. Apparatus in which the pump piston cooperates with a single continuous pump cylinder to divide same into a pair of opposed expansible pumping chambers, movement of said pump piston in opposite directions serving to alternately expand and contract said opposed pumping chambers, there being provided means for controlling the inlet or discharge of pumped fluid to each of said chambers which is not of the type which controls serial flow of pumped fluid from one chamber to the other.

405 This subclass is indented under subclass 375. Apparatus in which the movable working member partakes of a unidirectional rotary motion about a fixed axis.

(1) Note. The fluid motor under this definition may be of the rotary expansible chamber type as provided for in Class 418, Rotary Expansible Chamber Devices, or of the kinetic type as provided for in Class 415, Rotary Kinetic Fluid Motors or Pumps.

406 This subclass is indented under subclass 405. Apparatus in which the rotary motor working member is directly connected to or integral with a rotary pumping member such that the working member rotates the pumping member in unison therewith.

SEE OR SEARCH THIS CLASS, SUBCLASS:

348, for a fluid motor driven pump having a rotor, at least one portion of the rotor during different segments of a revolution thereof serving alternately as both a pumping member and a fluid motor working member.

407 This subclass is indented under subclass 406. Apparatus in which the pump and motor rotors are connected together by a shaft there being provided a central bearing means intermediate the rotors for supporting the shaft, there being no support means for the shaft outboard of either of the rotors; i.e., the shaft is cantilevered or overhung from both ends of the central bearing to carry the pump and motor rotors.

408 This subclass is indented under subclass 406. Apparatus in which the direction of flow of motive fluid through the motor rotor is substantially parallel to the axis of rotation while the fluid is acting on the rotor to produce work and the direction of flow of pump fluid through the rotary pumping member is also substantially parallel to the axis of rotation while being acted upon by the pumping member.

409 This subclass is indented under subclass 406. Apparatus in which the direction of flow of motive fluid through the motor rotor is substantially parallel to the axis of rotation while the fluid is acting on the rotor to produce work; the rotary pumping member producing a rotary movement of the pump fluid to utilize the centrifugal force developed thereby to effect the pumping action.

410.1 Electric or magnetic motor:
This subclass is indented under subclass 321. Apparatus in which the motor is of the type which includes a movable working member (e.g., armature) which is motivated by electricity or a magnetic field.

SEE OR SEARCH THIS CLASS, SUBCLASS:
322, for a pump having a chamber which is expanded or contracted by a magnetostrictive action.
353+, for electric motor driven pumps in which the armature of the motor is within a rotary pumping member.

410.2 Having piezoelectric driven blade:
This subclass is indented under subclass 410.1. Apparatus wherein a pumping member includes a flat and thin, flexible member which is motivated to provide the pumping action by attaching to the flexible member a crystalline substance, and a mechanical stress is produced by subjecting the crystalline substance to an electrical voltage.

(1) Note. The blade for this subclass is cantilevered.

SEE OR SEARCH THIS CLASS, SUBCLASS:
413.2, for piezoelectric driven diaphragm.

410.3 Rotary expansible chamber pump:
This subclass is indented under subclass 410.1. Apparatus wherein a pumping member is turning in a single direction about a fixed or movable axis thereby increasing and decreasing volume of an enclosed space which is adapted to receive and discharge a fluid.

410.4 Interengaging rotary pumping members:
This subclass is indented under subclass 410.3. Apparatus wherein a plurality of pumping members rotating about fixed axes have surface portions disposed to maintain a line contact therebetween against which pressure fluid reacts to thereby form a boundary of the enclosed space.

(1) Note. Interengaging rotary members include gears, helical screws, gerotors, etc.

410.5 Helical pumping member having planetary movement (e.g., scroll):
This subclass is indented under subclass 410.3. Apparatus wherein the pumping member includes continuous working portions in the form of a spiral lying in the same plane and having increasing radius, and has circular translatory or oscillatory movement without rotation about its axis while the axis moves in an orbit.

411 Apparatus under subclasses 410.1+ having means for storing electrical energy (e.g., battery, etc.), or for generating electrical power for use by the electric motor which drives the pump.

412 Apparatus under subclasses 410.1+ in which the electric motor drives a pump of the type having an expansible and contractible pumping chamber, at least a portion of said pumping chamber being defined by a deformable wall which is formed either of flexible material or rigid members hinged or interfitted together so that the members are movable relative to each other; the flexing of the material or the relative movement of the members constituting the movement which effects the pumping function of the expansible and contractible chamber.

413.1 Diaphragm type:
This subclass is indented under subclass 412. Apparatus in which the deformable wall comprises a relatively thin membranelike member having a peripheral edge portion, said member being adapted to be associated with a surrounding or encompassing tubular rigid structure to extend transversely thereof to form a closing wall for said tubular structure, the outer peripheral edge of said membrane being in sealing

relationship with the encompassing wall of said tubular structure.

(1) Note. The membranelike member need not span the entire space within the encompassing wall of the tubular member, but may be in the form of a ring or frustum having the inner peripheral edge thereof in sealing engagement with a rigid element movable relative to and coaxial with the encompassing tubular member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

381, for a fluid motor driven pump in which a common diaphragm forms both the pumping member and motor working member.

413.2 Piezoelectric driven:

This subclass is indented under subclass 413.1. Apparatus wherein the membranelike member is motivated to provide a pumping action by attaching to the membrane a crystalline substance, and a mechanical stress is produced by subjecting the crystalline substance to an electrical voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

322, for working chamber of the pump made directly from a material that expands and contracts when subjected to an electric or a magnetic force.

410.2, for piezoelectric driven blade.

413.3 Of semiconductor material (e.g., silicon, germanium, etc.):

This subclass is indented under subclass 413.1. Apparatus wherein the membranelike member is made of a solid crystalline substance (e.g., silicon or germanium) that has an electrical conductivity greater than an insulator but less than a good conductor.

(1) Note. The membrane is constructed from the material used in an electric printed circuit and produced by using the same technique (e.g., etching, etc.) as used to produce the printed circuit.

414 Apparatus under subclasses 410.1+ in which the motor has a sealed housing, means being provided to cause the internal pressure in said housing or some part thereof to be the same as or bear some selected relationship to the ambient pressure on the exterior of the housing.

(1) Note. The “ambient” pressure on the exterior of the housing may be pump intake or discharge pressure.

415 Apparatus under subclasses 410.1+ in which the pump is of the type comprising a rigid pumping member which alternately moves to-and-fro (includes oscillatory movement).

416 This subclass is indented under subclass 415. Apparatus wherein the working member of the electric motor alternately moves to-and-fro (includes oscillatory movement).

(1) Note. Apparatus in which the electric motor armature or core is merely claimed by name as a pump plunger or piston is not sufficient to cause classification in this or indented subclasses. However, the recital of a separate piston connected to the armature or any additional pump structure such as inlet or outlet ports will cause classification herein.

417 This subclass is indented under subclass 416. Apparatus wherein the working member of the pump and the working member of the motor are either formed as a single element or rigidly interconnected for unitary movement.

418 This subclass is indented under subclass 417. Apparatus in which the rigid pumping member is provided with a pair of oppositely directed pumping faces, said pumping member cooperating with a single pump cylinder to divide same into a pair of opposed expansible pumping chambers or with plural pump cylinders to form plural plural expansible pumping chamber; reciprocation of said pumping member in one stroke direction serving to expand one pump chamber and simultaneously contract another

419 This subclass is indented under subclass 415. Apparatus in which the pump comprises a plurality of rigid pumping members which move or are capable of moving relative to one another incident to the operation of the pump.

420 Apparatus under subclasses 410.1+ in which there is provided a rotary magnetic driving element and a rotary magnetic driven element formed by or connected to the pumping member, the power being transmitted from the driving to the driven element by the magnetic attraction therebetween.

421 Apparatus under subclasses 410.1+ in which the electric driving motor is sealed from the pump fluid by means of air trapped inside the motor casing, such as in a diving bell.

422 Apparatus under subclasses 410.1+ in which a sealed, tubular means is connected to or formed integrally in a cover or casing enclosing the electric motor; the said means forming or containing a service conductor (e.g., electric conduit, lubricant conductor, etc.).

423.1 Apparatus under subclasses 410.1+ in which the working members of both the pump and the motor perform their work by means of a unidirectional rotary motion; the pump working member acting to pump fluid by a centrifugal, centripetal or screw effect, i.e., not by positive displacement of the fluid by an expansible chamber effect.

423.11 This subclass is indented under subclass 423.1. Apparatus wherein there is provided a sealing means to prevent pumped fluid from leaving the pumping chamber and entering the motor chamber.

SEE OR SEARCH CLASS:

277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 358+ for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.), subclasses 409+ for a dynamic close proximity seal (e.g., contactless, fluent, etc.) or subclasses 500+ for a dynamic circumferential contact seal for other than a piston.

423.12 This subclass is indented under subclass 423.1. Apparatus wherein there are provided a bearing to support the shaft of the motor or pump.

SEE OR SEARCH CLASS:

384, Bearings, for specific structure of bearings which can be of general use.

423.13 This subclass is indented under subclass 423.12. Apparatus wherein there is provided means to provide a fluid which is not the pumped fluid to reduce the friction in the bearing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

366, for a means which provides pumped fluid to lubricate the bearing.

423.14 This subclass is indented under subclass 423.1. Apparatus wherein there is provided specific structure of the housing for the pump or motor.

423.15 This subclass is indented under subclass 423.1. Apparatus wherein there is provided a means to position and hold the pump and motor combination in its working environment.

423.2 This subclass is indented under subclass 423.1. Apparatus wherein the pump is specifically adapted to create a suction to clean a surface.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclasses 300.1+ for a suction cleaner having means to contact the surface to be cleaned.

423.3 This subclass is indented under subclass 423.1. Apparatus wherein the pump and motor are constructed to operate when completely surrounded by the fluid to be pumped.

423.4 This subclass is indented under subclass 423.1. Apparatus wherein the pump has rapidly rotating fins to impart a high momentum to gas molecules to achieve a high vacuum.

423.5 This subclass is indented under subclass 423.1. Apparatus wherein there is more than one pump and motor combination used together.

423.6 This subclass is indented under subclass 423.1. Apparatus wherein the motor shaft and pump shaft are not directly connected and there is a means to transmit the power from the motor

shaft to the pump shaft which is not an elastomeric endless belt.

SEE OR SEARCH THIS CLASS, SUBCLASS:
362, for a pump and motor interconnected by and endless flexible transmission element.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, for gearing and transmissions, per se.
416, Fluid Reaction Surfaces (i.e., Impellers), subclass 170 for an impeller with specific drive or transmission means.

423.7 This subclass is indented under subclass 423.1. Apparatus wherein there is provided specific details to the motor such as the armature, rotor windings, circuits, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
353+, for an electric motor armature within a rotary nonexpansible chamber-type pumping member.
356, for a rotary nonexpansible chamber-type pumping member within an electric motor armature.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, for electric motors with no significantly claimed pump. See 417/321 for example of significantly claimed pump structure.

423.8 This subclass is indented under subclass 423.1. Apparatus wherein there is provided cooling means using fluid other than the pumped fluid in cool the pump or motor, or for materials surrounding the pump or motor to conduct the heat away from the pump or motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
366, for a means to cool the motor using the fluid being pumped.

423.9 This subclass is indented under subclass 423.1. Apparatus wherein means are provided to block the entrance of foreign matter to the pump chamber or means to separate foreign material from the pumped fluid.

424.1 This subclass is indented under subclass 423.1. Apparatus in which the pump and motor unit is provided with support means such that when the unit is supported in operational position to perform the pumping function the rotation axis of the pump and motor is disposed vertically.

SEE OR SEARCH THIS CLASS, SUBCLASS:
421, for a vertically disposed rotary motor pump unit in which the motor is sealed from a pumped fluid by means of a body or air trapped in the motor housing.

424.2 This subclass is indented under subclass 424.1. Apparatus wherein the pump is disposed above the motor.

425 This subclass is indented under the class definition. Apparatus comprising a plurality of separate pumping units each having a pumping member or a plurality of pumping members operable in a single pumping chamber one of said pumping members being operated by power means such as a motor or driven shaft and another of the pumping members being designed to be operated manually by an operator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
374, for a pump which is alternatively motor or manually actuated.

426 This subclass is indented under the class definition. Apparatus comprising a plurality of pumping units and control means to change the operating characteristics of one relative to another.

(1) Note. To be considered plural pumping units under this definition each unit must operate in or comprise a pumping chamber separate and distinct from the pumping chamber of another unit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
5+, for plural pumps with a common inflow or outflow path and means to

control the drive means for said pumps individually in response to a sensed condition in the common inflow or outflow line.

62, for a plurality of pumps which may act alternatively in series flow or parallel flow relationship.

250, and 251+, for multistage pumps with an interstage intake or discharge, respectively.

286+, for plural pumps with individual condition responsive control of at least one.

427 This subclass is indented under subclass 426. Apparatus in which at least one of the pumping units has a cycle of operation and a valve (distributor) which operates in a given manner or pattern in accordance with the cycle of operation and the control means is effective to modify or disable the pattern of operation of the valve.

428 This subclass is indented under subclass 426. Apparatus in which at least one of the pumps has means to bypass fluid from or around the pump to waste or back to supply and the control means is effective to control said bypass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

288, for plural pumps or chambers with condition responsive control of sequential operation of separate bypass or relief passages for the pumps or chambers.

429 This subclass is indented under subclass 426. Apparatus in which the pumping units are driven by a single common drive member (e.g., shaft) and the control means is effective to change the relationship of at least one of the pumps with respect to the drive member.

(1) Note. The change in relationship of the pump to the drive member may be disconnection therefrom.

430 This subclass is indented under the class definition. Apparatus including means for contact with or by the pump fluid effective to impart a continual motion to the pump fluid in a manner or direction other than that which is necessary to effect pumping of said fluid to cause solid material to remain suspended in, or become entrained with said pump fluid.

(1) Note. For classification in this subclass the means must be clearly disclosed as having an agitating or whirling function. A mere projection on or configuration of a piston or a cylinder which would incidentally agitate or whirl the pump fluid is not classified in this subclass unless such projection or configuration is specifically disclosed to perform such function.

(2) Note. Included under this definition are devices of the type having an expansible and contractible chamber other than that necessary to effect pumping into which pump fluid is drawn and subsequently expelled for the disclosed purpose of agitating the pump fluid.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 173 for a piston having a rotation imparting fluid impinging surface thereon.

431 This subclass is indented under subclass 430. Apparatus in which said means comprises a fluid other than the pump fluid which is applied to or injected into the pump fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

432+, for means to apply a separate fluid to a pump valve.

432 This subclass is indented under the class definition. Apparatus in which the pump is provided with a valve to control the pump fluid and including means to apply or direct a fluid other than the pump fluid to some portion of the valve.

(1) Note. The fluid may be applied to the valve for various purposes such as lubricating, sealing, cooling, flushing, etc. However, a separate fluid applied to a pump valve portion for the sole purpose of actuating the valve is excluded under this definition. See subclass 507, below, for such subject matter.

(2) Note. The pre-filling of a chamber containing a valve to form a liquid seal for the valve is considered to be means to apply a fluid to the valve under this definition.

(3) Note. A separate fluid which is injected in or entrained by the pump fluid upstream of the valve so as to intermingle with the pump fluid before contact with the valve is excluded from this definition.

433 This subclass is indented under subclass 432. Apparatus in which the fluid pumped is a gas and a body of liquid is provided which contacts the valve and through which the pumped gas passes, the liquid acting to prevent gas leakage through the valve when closed.

434 This subclass is indented under the class definition. Apparatus in which the pump fluid is liquid, the pump including a port or valve other than the ports or valves necessary to the normal operation of the pump, said port or valve being positioned in the pump chamber or pump fluid conduit to allow pump fluid therein to flow through said port or upon actuation of said valve to drain said pumping chamber or conduits.

(1) Note. When the drain means comprises a valve, the valve may not be of the type which cyclically controls the discharge of pump fluid as a consequence of operation of the pump and must be disclosed as for the purpose of draining the pump after termination of the use thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

435, for a separate port or noncyclic valve for venting or filling a pump portion.

440+, for a separate selectively controlled noncyclic valve for a purpose other than draining a pump portion.

443+, for a pressure responsive distributor opened in response to pumping member position.

446, for means for selectively holding a pressure responsive distributor open.

447, for a pressure responsive distributor which is constantly biased open.

493+, for a pumping member controlled inlet or outlet port including plural cyclically controlled inlet or outlet flow paths.

503, for multiple cyclic outlet paths.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclass 565.36 for a valve means for draining a pump tube. Class 417 takes a valve designed to drain a pump tube or chamber where the pump is claimed or when some structure peculiar to a pump is claimed. The mere claiming of a pump barrel or cylinder does not preclude classification in Class 137.

166, Wells, subclasses 316+ for well structure having a valve means associated therewith and operable to drain a portion of the well structure.

251, Valves and Valve Actuation, subclasses 142+ for a fluid flow path combined with a means to control the flow of fluid through said flow path, particularly subclasses 149.1+ for a valve operated by joining the flow path sections together and subclasses 145+ for a valve for controlling a port in a pipe side where the flow path sections or the pipe constitute an inlet or discharge pipe of a pump.

435 This subclass is indented under the class definition. Apparatus in which the pump fluid is liquid, the pump including port or valve other than the ports or valves necessary to the normal operation of pump, said port or valve being positioned in the pump chamber or pump fluid conduit to permit the escape of gases from the pump or conduit or to permit the filling of the pump or conduit with liquid for priming purposes.

(1) Note. When the venting or filling means comprises a valve, the valve may not be of the type which cyclically controls the supply or discharge of pump fluid as a consequence of operation of the pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

199.1+, for diverse pumps one of which may be a priming pump for another.

425, for plural pumping members one of which is power driven and one manually operated.
434, for a separate port or noncyclic valve for draining a pump chamber or conduit.
440+, for a separate selectively controlled noncyclic valve for a purpose other than venting or filling a pump portion.
443+, for a pressure responsive distributor opened in response to pumping member position.
446, for means for selectively holding a pressure responsive distributor open.
447, for a pressure responsive distributor which is continuously biased open.
493+, for a pumping member controlled inlet or outlet port including plural cyclically controlled inlet or outlet flow paths.
502, for multiple cyclic inlet paths.
503, for multiple cyclic outlet paths.

436 This subclass is indented under the class definition. Apparatus in which there is provided a fluid conduit and a separate impelling member for propelling fluid through the conduit, the impelling member having motion or a component of motion which is transverse to the direction of fluid flow in the conduit said transverse motion or component of motion being effective to propel or aid in the propulsion of the fluid through the conduit.

437 This subclass is indented under the class definition. Apparatus comprising a chamber having a wall portion or pumping member movable to effect a change in volume of said chamber and means to control the flow of pump fluid into or out of said chamber.

(1) Note. The term distributor as used in the titles and definitions under this subclass is defined as a means which comprises or includes a part which is movable relative to the pumping member of an expansible chamber-type pump to control a pump fluid port or passage in such a manner as to cyclically control supply or discharge of pump fluid to or from the pump.

(2) Note. Collected in this subclass are original copies of patents directed to expansible chamber-type pumps in which the means for controlling flow of pump fluid into or out of the pump chamber is selectively controlled by a human operator (e.g., manually operated valve, finger obturated port), it being necessary for the operator to operate said fluid control means during each complete cycle of expansion and contraction of the pump chamber to enable the pump to perform its pumping function.

438 This subclass is indented under subclass 437. Apparatus in which the fluid pumped is a gas and means are provided to introduce a liquid into the gas while it is in the pump chamber or prior to its introduction into the chamber for the purpose of cooling the gas.

SEE OR SEARCH THIS CLASS, SUBCLASS:
432+, for the application of a separate fluid to a pump valve for lubricating, cooling, etc.

439 This subclass is indented under subclass 437. Apparatus in which the expansible chamber in addition to the normal inlet for pump fluid is provided with a connection to a space in the pump which does not form a part of the expansible chamber or the flow path of pump fluid to or from the chamber so as to draw fluid from said space.

(1) Note. The space may be one which expands and contracts incident to the operation of the pump (e.g., crankcase on the nonpumping side of a piston) or a leakage collection area, etc. The connection may be directly into the expansible chamber or may be to the pump fluid intake line upstream of the intake valve.

440 This subclass is indented under subclass 437. Apparatus provided with valve means other than that necessary for controlling inlet and discharge of pumped fluid to the pump chamber during normal operation of the pump, said valve means being operable to control the flow of pumped fluid to or from the pump chamber or conduit therefor.

(1) Note. A valve positioned to permit the independent flow of fluid around the

pump from the inlet of the pump to the pump discharge is included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

279+, for a pump fluid control valve which is responsive to a pump condition.

434, for a separate port or valve for filling or draining a pump portion.

441 This subclass is indented under subclass 440. Apparatus in which said valve means is effective to control the pump fluid in the line of normal flow to or from the pump chamber, i.e., a throttle or stop valve in the flow line, not a valve which diverts the pump fluid flow from the normal course.

442 This subclass is indented under subclass 437. Apparatus in which a plurality of inlet or a plurality of outlet distributors are provided in a single chamber and means are provided for selectively disabling at least one of the plural distributors such that fluid may be supplied to or discharged from the chamber through different distributors at different times.

(1) Note. The use of all the distributors in one mode of operation and less than all the distributors in another mode of operation is included in this subclass.

443 This subclass is indented under subclass 437. Apparatus in which the means for controlling pump fluid to or from the pump chamber includes valve means of the type which normally opens or closes responsive to a pressure differential between the pump chamber and an inlet or discharge conduit for cyclically controlling pump fluid for the pumping operation and including means operable as a result of the pumping member being moved to a given position in the pump chamber for moving said valve to open position irrespective of said pressure differential.

(1) Note. A pressure responsive distributor which can be selectively opened only when the pumping member is at a given position in the pump chamber is included under this definition, e.g., a pressure responsive foot valve which is capable of being opened by relative rotation of a reciprocating pumping member when same is at the end of its reciprocatory stroke.

444 This subclass is indented under subclass 443. Apparatus in which the pressure responsive distributor which is moved to open position is located on or carried by a piston-type pumping member (includes diaphragm-type pumping member).

445 This subclass is indented under subclass 444. Apparatus in which the expansible chamber pump is additionally provided with valve means located within a fixed wall portion of the pump chamber forming means (e.g., cylinder), said valve means being of the type which normally opens or closes responsive to a pressure differential between the pump chamber and an inlet or discharge conduit for cyclically controlling pump fluid for the pumping operation and including means operable as a result of the pumping member being moved to a given position in the pump chamber for moving said valve to open position irrespective of said pressure differential.

446 This subclass is indented under subclass 437. Apparatus in which the means for controlling pump fluid to or from the pump chamber includes valve means of the type which normally opens or closes responsive to a pressure differential between the pump chamber and an inlet or discharge conduit for cyclically controlling pump fluid for the pumping operation and includes means for moving and holding said valve in open position irrespective of said pressure differential.

SEE OR SEARCH THIS CLASS, SUBCLASS:

297+, for an expansible chamber pump having a cyclically operated valve in which the operation of said valve is modified responsive to a pump condition.

443+, for a pressure responsive distributor which is moved to open position responsive to pumping member position.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 522+ for a direct response line condition respon-

sive valve having external means for biasing valve open.

447 This subclass is indented under subclass 437. Apparatus in which the means for controlling pump fluid to or from the pump chamber includes valve means of the type which normally opens or closes responsive to a pressure differential between the pump chamber and an inlet or discharge conduit for cyclically controlling pump fluid for the pumping operation and including means other than the pump fluid (e.g., spring, weight, float, etc.), for continuously exerting a force on said valve in the valve opening direction.

448 This subclass is indented under subclass 437. Apparatus in which the pumping member is provided with an operating rod and the pump as a whole is mounted in a vertically disposed pipe or tube for conducting fluid and the pump and its mounting in the tube are so related that the whole pump is removable from the tube solely by manipulation of the operating rod.

449 This subclass is indented under subclass 448. Apparatus in which the pump is provided with a piston which is fixed with respect to the pipe or tube and is stationary during operation of the pump, but is so mounted as to be removed with the pump unit.

450 This subclass is indented under subclass 448. Apparatus in which the means for mounting the pump in the tube includes relatively movable parts for positively holding the pump against movement in the tube; the release of the pump being effected by the movement of one of the parts by the operating rod for the pumping member.

451 This subclass is indented under subclass 437. Apparatus in which there is a valve structure located in a stationary wall of the expansible chamber and there are means carried by the valve structure which cooperates with the pumping member, to permit the removal of the valve structure along with the pumping member from the expansible chamber.

452 This subclass is indented under subclass 451. Apparatus in which the means on the valve structure which cooperates with the pumping member comprises portions on both the valve structure and the pumping member that are normally unconnected and are movable into engagement with each other to effect the removal of the valve structure.

453 This subclass is indented under subclass 452. Apparatus in which the engageable portions are formed by interengaging helical screw threads.

454 This subclass is indented under subclass 437. Apparatus comprising means designed to facilitate the removal or replacement of a valve of the pump or to facilitate access to a valve of the pump for inspection or repair, etc.

(1) Note. Excluded from this definition are mere securing means for parts which would permit the removal or replacement of a valve or access thereto unless said securing means is disclosed as being specifically designed for said purpose.

SEE OR SEARCH THIS CLASS, SUBCLASS:

448+, for a pump mounted in a vertical tubular flow conduit removable as a unit by driving rod manipulation.

451+, for a valve element mounted in a fixed chamber wall and selectively removable with the pumping member.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 128 for expansible chamber devices having assembly or disassembly facilitating means.

137, Fluid Handling, subclass 454.4 for removable, pump-type valve head and seat unit in which no pumping member is claimed.

455 This subclass is indented under subclass 437. Apparatus in which the means to control the pump fluid is a valve means, said valve means having parts which in addition to their relative movement for the valving function are relatively movable for a nonfluid flow controlling function.

(1) Note. The valve parts are usually to reduce static friction or cause uniform wear of a valve element and its seat.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 330+ and the search there noted, for valves, per se, having a similar function.

456 This subclass is indented under subclass 437. Apparatus including two or more distributors through which the pumped fluid must pass serially in the course of flowing to the pump chamber or from the pump chamber to the point of use, each distributor having a cyclically moved flow controlling element which is capable of or constrained to move relative to the flow controlling element of another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

502, for multiple cyclic outlet paths from a single pump chamber including a cyclically controlled bypass valve downstream of the discharge distributor from the chamber.

457 This subclass is indented under subclass 456. Apparatus in which a part of the pump chamber wall which is traversed by the pumping member (i.e., cylinder or liner) has an absolute motion and forms or carries a part forming the movable element of at least one of said serially arranged distributors.

458 This subclass is indented under subclass 456. Apparatus in which said two or more serially arranged distributors are of the type which move to an open or closed position in response to a pressure differential in the pumping chamber and the inlet or discharge conduit.

459 This subclass is indented under subclass 458. Apparatus in which said two or more serially arranged pressure responsive distributors are both located within or carried by a piston type pumping member and serves to control fluid flow through a passage formed in the piston.

(1) Note. For definition of structure necessary to form a valved piston, see subclass 545 definition and (1) Note thereunder.

SEE OR SEARCH THIS CLASS, SUBCLASS:

261, for a piston having relatively movable serial distributors between stages of successive stage pumping units.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 512+ for plural direct responsive type valves.

460 This subclass is indented under subclass 437. Apparatus in which the expansible chamber pump comprises a cylinder having a piston (includes diaphragm) movable therein and in which incident to the operation of the pump, the cylinder has an absolute movement.

(1) Note. Those pumps in which it involves an obvious matter of choice or reversal of parts whether the piston is stationary and the cylinder movable or vice versa will not be classified under this definition even if the claims identify the cylinder as the movable element. However, where the claims set forth a specific power transmission element (e.g., crank) for moving the cylinder, classification under this definition results.

(2) Note. An open ended cylindrical member or sleeve in which the piston reciprocates and which has an absolute sliding, rotary, or oscillating motion on its longitudinal axis is not considered to be a moving cylinder under this definition and is classified in subclass 509, below. However, if the cylindrical member carries or has formed as a part thereof the end wall of the expansible chamber (i.e., abutment) it is considered to be a cylinder and is included under this definition even if the sole disclosed purpose of the sliding, rotating, or oscillatory movement is for valving pumped fluid.

(3) Note. A cylinder which has an absolute reciprocating, rotary or oscillatory motion on an axis other than the longitudinal axis thereof is included under this definition even if the sole disclosed purpose of such motion is for the valving of pumped fluid and regardless of whether the cylinder forms a portion of the cham-

ber end wall (e.g., the entire abutment surface for the pumped fluid may be provided by a stationary valve element).

SEE OR SEARCH THIS CLASS, SUBCLASS:

269, for pumps having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis which cylinders may move incident to the operation of the pump.

449, for a pump mounted in a vertical tubular flow conduit removable as a unit by driving rod manipulation and having a fixed piston and moving cylinder.

457, for an expansible chamber-type pump having serially arranged distributors for controlling inlet or discharge of pump fluid wherein one of the distributors is formed in part by a moving cylinder having a port cooperating with a stationary ported member.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 472+ for motors or pumps having three or more parallel or radially arranged cylinders which may move incident to operation of the motor or pump and subclasses 196+ for an expansible chamber-type motor or a device disclosed and claimed generically as a pump or motor which has a moving cylinder.

92, Expansible Chamber Devices, subclasses 117+ for cylinders mounted for movement incident to expansion or contraction of the expansible chamber.

461 This subclass is indented under subclass 460. Apparatus in which the cylinder has an absolute rotational or oscillatory motion about the longitudinal axis thereof (i.e., the axis of reciprocation of a piston therein) during operation of the pump.

462 This subclass is indented under subclass 460. Apparatus in which the cylinder is mounted on a fixed supporting structure for movement relative thereto, during operation of the pump, in a circular path of more than 360° in a single direction about an axis other than the longitudinal axis of the cylinder (i.e., other than the axis of reciprocation of a piston therein), said cylinder and the piston therein being mechanically interconnected in a manner which causes reciprocation of the piston relative to said cylinder upon rotation thereof.

463 This subclass is indented under subclass 462. Apparatus in which the relatively reciprocating piston has a second pumping chamber formed integral therewith, said second pumping chamber being provided with a relatively reciprocating piston.

464 This subclass is indented under subclass 460. Apparatus in which either the cylinder or piston therein is pivotally mounted relative to a fixed support and the other is driven by a mechanism (e.g., crank or lever) in a manner which necessitates alternate to-and-fro motion of less than 360° of the cylinder about an axis formed by said pivotal mounting, said axis being obliquely disposed (i.e., not parallel or coincident) relative to the longitudinal axis of the cylinder (i.e., the axis of working member reciprocation).

465 This subclass is indented under subclass 464. Apparatus in which either (1) the cylinder or (2) the piston or member rigid therewith (e.g., piston rod) is provided with a pump chamber communicating passage which terminates exteriorly thereof, the terminal portion of said passage (i.e., port) being in sliding engagement with and movable relative to a stationary element having at least one port, said relative sliding movement serving to change the relative alignment of said passage terminal portion and said stationary port for controlling the flow of pumped fluid to or from the pump chamber.

466 This subclass is indented under subclass 460. Apparatus in which the cylinder has an absolute to-and-fro motion along a fixed axis and is provided with an external portion forming a chamber communicating port, said port forming portion being in sliding engagement with and movable relative to a stationary element having at least one port, movement of said cylinder relative to said stationary element serving to change the relative alignment of said ports for controlling the flow of pumped fluid to or from the pump chamber.

467 This subclass is indented under subclass 460. Apparatus comprising two or more cylinders, each of said cylinders having an absolute movement and capable of or constrained to move relative to each other.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 66 for relatively movable working members comprising or disposed within movably mounted cylinders.

468 This subclass is indented under subclass 460. Apparatus in which the movable cylinder has either (1) an external surface or (2) a member rigidly secured externally thereof; said surface or member forming a piston type pumping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

258, for successive stage pumps having a reciprocating cylinder with an integral piston or external pumping face.

469 This subclass is indented under subclass 460. Apparatus in which both the cylinder and the piston have an absolute rectilinear to-and-fro motion along the same fixed axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

466, for a cylinder and piston which reciprocate on a common axis with the inlet or discharge of pump fluid being controlled by cooperating ports in the cylinder and a fixed member.

470 This subclass is indented under subclass 437. Apparatus in which the expansible chamber pump is disclosed as being utilized for the purpose of producing pressure below that of the surrounding medium (i.e., vacuum pump), the pumping member of which is driven in a chamber collapsing direction by means of an element (e.g., cam) which is unsecured to, and adapted for abutment with the pumping member or portion rigid therewith to drive same, there being provided separate means, other than the pumped fluid, (e.g., spring) associated with the pumping member for continuously urging said pumping member in a chamber expanding direction.

(1) Note. For classification under this definition, the pump must be positively disclosed as being utilized for the purpose of producing a vacuum. Expansible chamber type pumps having the above defined relationship between the pumping member, abutment drive, and biasing means, but which are not disclosed for use in vacuum production are classified below on other features.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 129 for an expansible chamber device having an abutment connection between the working member thereof and a power transmission element.

471 This subclass is indented under subclass 437. Apparatus in which the expansible chamber-type pump is disclosed as being utilized for the purpose of producing pressure greater than atmospheric the pumping member of which is driven in a chamber expanding direction by means of an element (e.g., cam) which is unsecured to, and adapted for abutment with the pumping member or portion rigid therewith to drive same, there being provided separate means, other than the pumped fluid, (e.g., spring) associated with the pumping member for continuously urging said pumping member in a chamber collapsing direction.

(1) Note. Expansible chamber-type pumps having the above defined relationship between the pumping member, abutment drive, and biasing means are excluded under this definition if disclosed as being utilized for the purpose of producing a vacuum, such pumps being classified below on other features.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 129 for an expansible chamber device having an abutment connection between the working member thereof and a power transmission element.

472 This subclass is indented under subclass 437. Apparatus in which the expansible pump chamber comprises a flexible structure which is capable of expanding to increase the volu-

metric capacity thereof, said structure comprising (1) a tube of flexible material having a circumferentially corrugated or pleated wall, (2) at least four plates, each plate having a central opening therein defining an edge inwardly of the outer peripheral edge thereof, said plates being arranged in superposed relation with adjacent plates secured along their inner and outer edges alternately or (3) a pair of rigid plate like members pivoted together along a portion of their peripheral edges, the remaining peripheral edge portion of said plates being joined together by a flexible member which is pleated in some position of relative pivotal movement of the plate like members.

SEE OR SEARCH CLASS:
92, Expansible Chamber Devices, subclasses 34+, for bellows-type expansible chamber devices, per se.

473 This subclass is indented under subclass 472. Apparatus comprising a plurality of separate pump chambers each including a separate bellows.

(1) Note. The separate bellows may have a common wall.

SEE OR SEARCH CLASS:
92, Expansible Chamber Devices, subclass 37 for plural bellows-type expansible chamber devices, per se.

474 This subclass is indented under subclass 437. Apparatus comprising a relatively long pumping chamber, said chamber having one of its walls formed of flexible material and means for collapsing said flexible wall either progressively or sequentially in a direction along the length of the chamber, the collapsing of said chamber wall serving to control the inlet of pump fluid to or the discharge of pump fluid from said chamber.

(1) Note. A flexible chamber wall pump which is directly deformed by a rigid element having a planetating or nutating motion is excluded under this definition, such subject matter being classified in Class 418. For the definition of planetary or nutating motion, see Class 418, subclasses 49 and 54, respectively. A roller mounted on a rotating arm is not considered to comprise planetary movement.

SEE OR SEARCH CLASS:
418, Rotary Expansible Chamber Devices, subclass 56 for a nonmetallic working member having planetary movement, and subclasses 153+ for a rotary expansible chamber pump or motor having a resilient, nonmetallic working member.

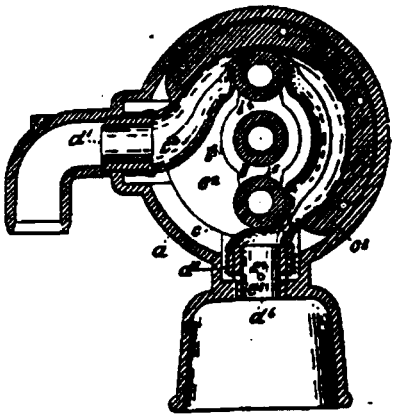
475 This subclass is indented under subclass 474. Apparatus comprising two or more distinct isolated relatively long pumping chambers, each of said pump chambers having one of its walls formed of flexible material, and means for progressively or sequentially collapsing each of said flexible walls.

(1) Note. A single elongated flexible wall member which is collapsed by plural engagement elements at spaced locations along its length to divide the chamber formed by said flexible wall into progressively formed chamber portions is not considered to constitute plural chambers under this definition. Also, excluded under this definition, are devices in which a secondary pump chamber is provided which has the sole function of enhancing the operation of another collapsible wall chamber (e.g., vacuum producing pump for restoring the shape of a flexible wall pump after deformation thereof).

476 This subclass is indented under subclass 474. Apparatus in which the means for collapsing the flexible chamber wall comprises an element which either directly contacts said wall or an additional flexible material member interposed between the wall and said element, the collapsing element having a rolling or sliding engagement with the flexible wall or interposed flexible material member in performing the wall collapsing function.

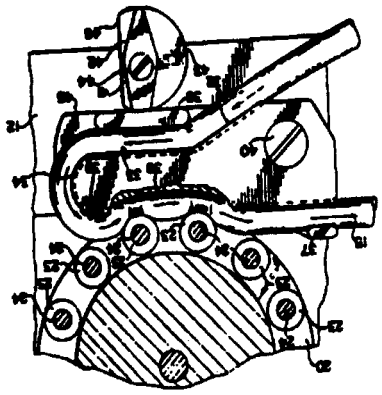
477.1 Plural spaced engagement member or member portions:
This subclass is indented under subclass 476. Apparatus in which there is provided two or more elements or two or more portions of a common element which directly contact the

flexible wall or interposed flexible member for rolling or sliding engagement therewith at spaced locations thereon, each of said elements or element portions serving to collapse the flexible wall.



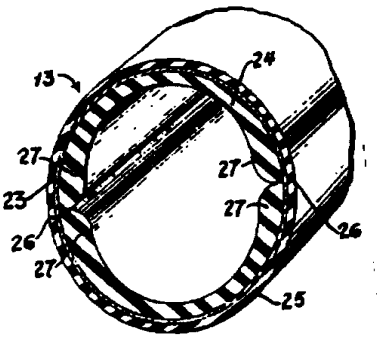
477.11 Adjustable backing:
This subclass is indented under subclass 477.9. Apparatus wherein the position of the backing member of the flexible wall is changeable.

(1) Note. The change of position of the backing member accommodates different sizes of the flexible wall, or controls the degree of closure of the flexible wall, or eases the insertion or removal of the flexible wall or interposed flexible member.

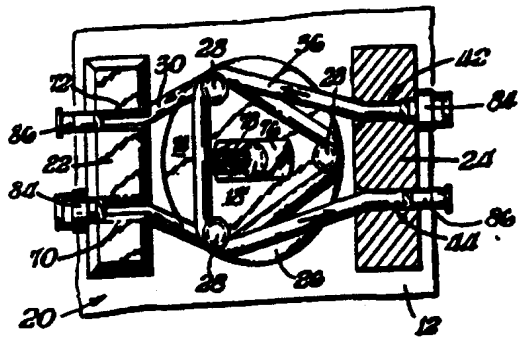


477.12 Specific flexible wall or interposed flexible member:
This subclass is indented under subclass 477.1. Apparatus wherein significance is attributed to a shape or material of the flexible wall or interposed flexible member.

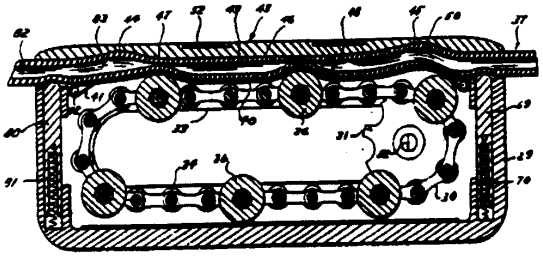
(1) Note. The interposed flexible member may include a particular means associated with the flexible wall to reduce wear on the flexible wall by the rolling or sliding elements.



477.13 Flexible tube without backing member:
This subclass is indented under subclass 477.1. Apparatus wherein the flexible member is a tube, and a portion of the tube which comes in contact with the rolling or sliding members does not have a backing member.

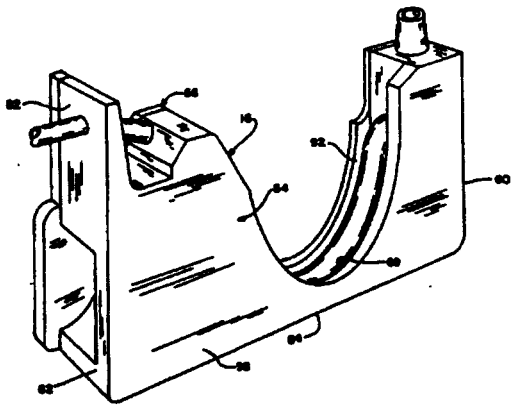


477.14 Endless chain or belt:
This subclass is indented under subclass 477.1. Apparatus wherein the rolling or sliding members are secured to an endless chain or a belt and driven thereby.

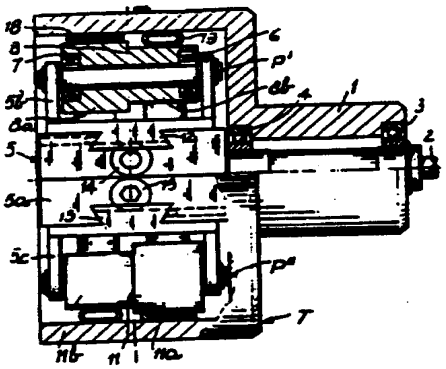


477.2 Cassette:
This subclass is indented under subclass 477.1. Apparatus wherein the flexible wall or interposed flexible member is contained in a housing; said housing is interchangeable with similar housings.

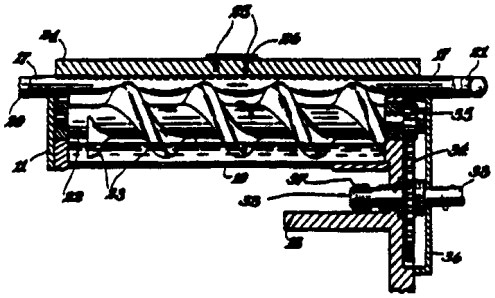
(1) Note. At least one housing is placed in a base unit in order to be activated by a drive.



477.3 Specific rollers or slides structure:
This subclass is indented under subclass 477.1. Apparatus wherein a significance is attributed to the rolling or sliding elements (e.g., a specified shape, a specified positional relation, or a specified material constituents).



477.4 Helical slide:
This subclass is indented under subclass 477.3. Apparatus wherein the sliding element is in the shape of a helix.



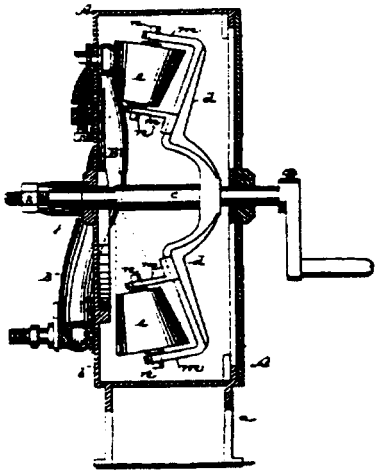
477.5 Roller axes or slide contact surfaces at significant angle with drive axis:
This subclass is indented under subclass 477.3. Apparatus wherein axes of rotation of the rolling elements or contact surfaces of the slide elements are positioned at an angle to the axis of a shaft or rotor which moves the rolling or sliding elements.

(1) Note. The angle is between 30 degrees and 90 degrees.

(2) Note. The rollers or the slides which merely return the flexible wall or interposed flexible member to undeformed shape are also included in this subclass.

(1) Note. The biasing can be caused by means such as a spring or weight or fluid pressure.

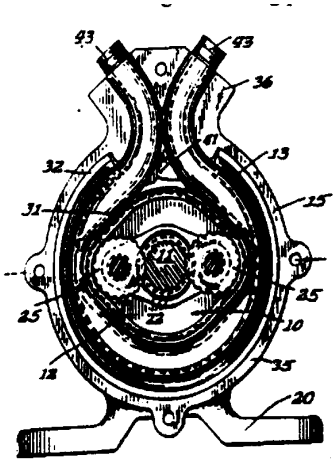
(2) Note. The axes of the rolling elements or the contact surfaces of the slide elements which have adjustable angles with respect to the axis of the shaft or rotor are included in this subclass.



477.6 Positively driven rollers:
This subclass is indented under subclass 477.3. Apparatus wherein the rolling members are directly driven by a rotating drive means, such as shaft or gear for rotation.

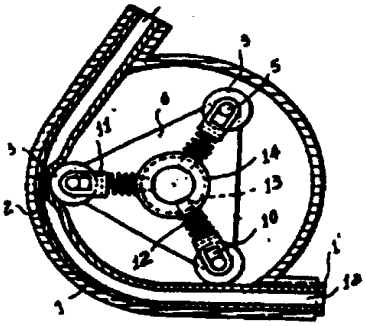
(1) Note. The drive means causes the rolling numbers to rotate even if the flexible members were removed.

(2) Note. The arrangement can be similar to a sun gear driving planetary gears.



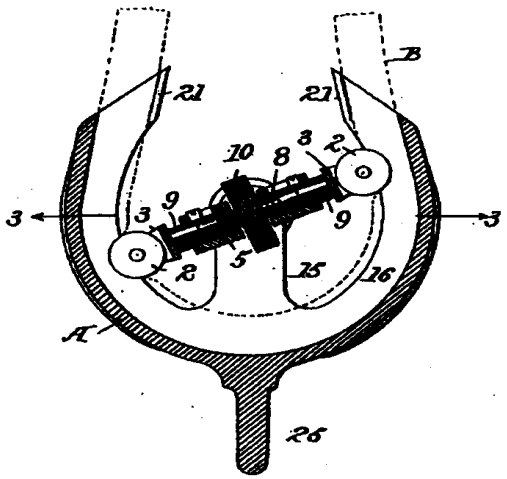
477.7 Biased rollers or slides:
This subclass is indented under subclass 477.3. Apparatus wherein the rolling or sliding elements are biased to engage or to disengage the flexible wall or interposed flexible member.

(1) Note. The biasing can be caused by means such as a spring or weight or fluid pressure.

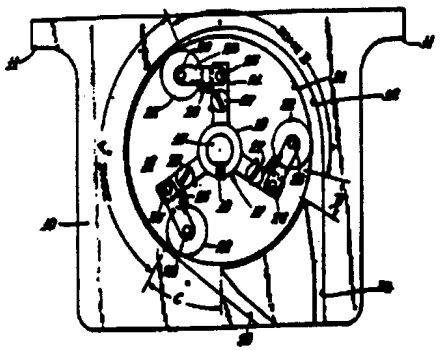


477.8 Adjustable rollers or slides:
This subclass is indented under subclass 477.3. Apparatus wherein the position of the rolling or sliding elements are changeable.

(1) Note. The change of position of the rolling or sliding elements accommodate different sizes of the flexible wall or interposed flexible member, or vary wear on the elements, or vary an output of the pump, or ease insertion or removal of the flexible member.



477.9 Specific backing member for flexible wall: This subclass is indented under subclass 477.1. Apparatus wherein the significance is attributed to a particular shape or position or material of the backing member for the flexible wall.



478 This subclass is indented under subclass 437. Apparatus comprising an elongated hollow member having walls thereof formed of flexible material, said member having an inlet valve at one end thereof for controlling flow of fluid into said member and an outlet valve at the opposite end thereof for controlling the flow of fluid out of the member.

479 This subclass is indented under subclass 437. Apparatus in which the movable wall portion of said chamber is formed of flexible material and in which the means for controlling pumped fluid into or out of said chamber is formed in part (e.g., movable distributor portion or seat therefor) by an integral portion of said flexible material.

480 This subclass is indented under subclass 437. Apparatus in which a wall portion of the expansible chamber is fabricated of flexible material or rigid members hinged or interfitted together so that the members are movable relative to each other, the flexing of the material or the relative movement of the members constituting the movement which expands and contracts the chamber and the means for controlling flow into or out of said chamber being located on or supported by said wall portion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

472+, for bellows-type pumping members which may have valve means supported on a movable portion thereof.

481 This subclass is indented under subclass 437. Apparatus in which the wall portion is a rigid member and moves to-and-fro in an arcuate path of less than 360°.

482 This subclass is indented under subclass 481. Apparatus in which the means for controlling the inlet of fluid into the chamber comprises a distributor positioned in a stationary wall of the chamber which lies in the path of travel of the pumping member at the end of the stroke thereof.

483 This subclass is indented under subclass 482. Apparatus including means for controlling the discharge of fluid from the chamber, said means comprising a distributor positioned in the pumping member.

484 This subclass is indented under subclass 481. Apparatus in which the means for controlling the inlet of fluid into the chamber or exhaust of fluid from the chamber comprises a distributor positioned in the pumping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

483, for a discharge distributor in an oscillating pumping member combined

with an inlet distributor in an abutment wall for the pumping member.

485 This subclass is indented under subclass 437. Apparatus comprising a single pump chamber having a reciprocating pumping member therein and a plurality discharge outlets communicating therewith, and control means for successively establishing communication with said plural outlets upon successive discharge strokes of said pumping member.

486 This subclass is indented under subclass 437. Apparatus in which a single pump chamber includes two or more pumping members.

(1) Note. The plural pumping members may act upon the pump fluid within the single chamber either simultaneously, successively, or selectively.

(2) Note. For purposes of this definition, the pump chamber is construed as including only that chamber volume formed downstream of valve means controlling inlet of pump fluid to the chamber and upstream of valve means controlling discharge pump fluid from the chamber.

(3) Note. The plural pumping members under this definition may be laterally spaced, coaxial, or concentric and each must be disclosed as positively driven to act upon fluid within the pump chamber. However, in the case of concentric pumping members, the pumping faces thereof must be either axially spaced or relatively movable, e.g., a pumping member having a sealing ring or separable drive rod portion forming a portion of the pumping face is considered to be a single pumping member and is excluded under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

215+, for plural pumping members in a single chamber with condition responsive control of a drive transmission to change the phase relationship of the pumping members.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 6 for a working member having a selectively variable end face area, and subclasses 60+ for a resiliently biased nonworking member movable wall in constant communication with a working chamber.

487 This subclass is indented under subclass 486. Apparatus having at least two pumping members within said single chamber which are adapted for to-and-fro movement upon a common longitudinal axis.

488 This subclass is indented under subclass 487. Apparatus in which the pumping members form opposing walls of said chamber.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 501 for three or more cylinders arranged in parallel, radial or conical relationship with a rotary transmission axis with oppositely moving pistons in each cylinder.

92, Expansible Chamber Devices, subclasses 69+ for an expansible chamber device having relatively movable working members interconnected with a common rotatable shaft and forming oppositely movable walls of a common chamber, and subclass 75, for working members forming oppositely movable walls of a common chamber.

489 This subclass is indented under subclass 437. Apparatus in which the expansible chamber pump comprises a cylinder having a relatively movable piston therein, admission or discharge of pumped fluid to or from the expansible chamber occurring as the result of the piston being either (1) tipped or canted relative to the cylinder to provide a fluid flow passage between adjacent cylinder and piston sidewall portions or (2) withdrawn or extracted from the cylinder so as to provide open communication between the cylinder interior and the surrounding medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:

320, for apparatus having a pumping member which moves unidirectionally into and out of a chamber to form serial pumping chambers.

490 This subclass is indented under subclass 437. Apparatus in which the supply or discharge of pump fluid to or from the pump chamber is by way of a port which is controlled by opening or closing same upon movement (reciprocatory or rotary) of the pumping member relative to the pump chamber; said port being either (1) formed in a pump chamber wall (e.g., cylinder) and opened or closed directly by the pumping member (e.g., piston) or element integral with or movably carried thereby or, (2) formed in the pumping member and opened or closed directly by a pump chamber wall or element integral with or movably carried thereby.

(1) Note. For purposes of this definition, an element which is movably carried by the pumping member for controlling a chamber wall port may be movable relative to the pumping member but must move with the pumping member over at least a portion of the stroke thereof, the element itself serving to directly control a chamber wall port. However, a valve element which is mounted in a chamber wall portion and which is shifted by abutment or frictional engagement with pumping member is not considered to be movably carried by the pumping member and is excluded under this definition. See subclass 520.

SEE OR SEARCH THIS CLASS, SUBCLASS:

489, for a pump having an inlet or discharge path controlled by withdrawal or tilting of the pump piston relative to the cylinder therefor.

520, see (1) Note above.

491 This subclass is indented under subclass 490. Apparatus comprising two or more pumping chambers and in which a single unitary element forms the pumping members for said chambers, said element being effective to control the inlet of fluid into or the discharge of fluid from the several chambers by either (1) alternately covering and uncovering a port in a wall of each of said chambers, or (2) alternately covering and uncovering a single port which is common to and placed in communication with each of said chambers at different positions of the pumping member stroke.

(1) Note. For a definition of plural chambers see the definition and notes of subclass 521.

492 This subclass is indented under subclass 491. Apparatus in which the pumping member rotates about its longitudinal axis to effect the covering and uncovering of said port.

493 This subclass is indented under subclass 490. Apparatus comprising a single pump chamber having either (1) an inlet flow path for pump fluid and at least two outlet flow path which are different from each other and from said inlet flow path or (2) an outlet flow path for pump fluid and at least two inlet flow paths which are different from each other and from said outlet flow path; each of said two flow paths being cyclically controlled (i.e., controlled each time during a single pumping member movement cycle) at different times in the pump cycle and at least one of said two paths being controlled by a pumping member controlled part.

(1) Note. The plural inlet or outlet flow paths may be supplied from the same or different sources or deliver to the same or separate destinations. Therefore, a bypass of pump fluid to waste or back to supply or a vent to atmosphere is considered to be a flow path under this definition.

(2) Note. A passage to which pumped fluid is delivered or from which fluid is drawn into the pump is not considered to be an inlet or outlet under this definition if the fluid is delivered to or drawn from a portion of the pump assembly and is utilized for an ancillary purpose of the pump such as cooling or lubricating a pump part.

(3) Note. The flow paths are considered to be different under this definition if the

pump fluid flows through one path at one time and flows through the same path and additionally through another path at another time.

SEE OR SEARCH THIS CLASS, SUBCLASS:

485, for a plurality of pumping member controlled outlet ports which sequentially discharge fluid on successive strokes of the pumping member.

494 This subclass is indented under subclass 493. Apparatus including means which may be selectively moved and held in different positions to effect control of said pumping member controlled port at different times in the pumping member stroke.

495 This subclass is indented under subclass 493. Apparatus including a piston type pumping member provided with a fluid passage extending from the end face thereof through the opposite end of the piston or through a side wall portion thereof, said passage being provided with a relatively movable valve means to control the flow of fluid through said passage.

496 This subclass is indented under subclass 490. Apparatus in which in addition to the control of pump fluid by a pumping member controlled port there is a separate means to control the pump fluid in either the inlet or outlet flow path for the pump; i.e., the pump fluid is serially controlled by both means either going to or coming from the pump chamber.

(1) Note. The separate means may be a second pumping member controlled port. The disclosed use of many of the devices in this subclass is that the pumping member closes and seals an inlet or discharge port when idle to prevent leakage.

497 This subclass is indented under subclass 490. Apparatus in which the port through which pump fluid flows to or from the pump chamber is formed in an end wall of the pump chamber (i.e., that portion of the pump chamber not traversed by the pumping member), the pumping member or element carried thereby being effective to intermittently obstruct fluid flow through said port by alternately entering into and exiting from or abuttingly seating on same.

498 This subclass is indented under subclass 490. Apparatus comprising one port for providing inlet of pump fluid to the pump chamber and another port for providing discharge of pump fluid therefrom, each of said ports being formed in a pump chamber sidewall portion and longitudinally spaced from each other, said ports individually providing the sole path for inlet and discharge of pump fluid and being controlled by the covering or uncovering thereof by the pumping member or element carried thereby.

499 This subclass is indented under subclass 490. Apparatus including means which may be selectively moved and held in different positions to effect opening or closing of such port at different positions of pumping member stroke.

SEE OR SEARCH THIS CLASS, SUBCLASS:

494, for a pump chamber having plural controlled inlet or outlet flow paths, control of one of said paths being effected by a pumping member controlled port which has means associated therewith for effecting the control thereof at different positions of pumping member stroke.

500 This subclass is indented under subclass 490. Apparatus in which the working member rotates about its longitudinal axis during reciprocation thereof to effect the covering and uncovering of said port.

SEE OR SEARCH THIS CLASS, SUBCLASS:

492, for an inlet or exhaust control for plural chambers comprising a common working member movable about an axis.

501 This subclass is indented under subclass 490. Apparatus including a distributor positioned in facing relationship with the pumping member end face, the area of the movable portion of the distributor or the movable portion of the valve which seats on the nonmovable portion of the valve being substantially the same as the area of the pumping member end face.

502 This subclass is indented under subclass 437. Apparatus comprising a single pump chamber having a plurality of outlet passages for pumped fluid, each of said outlet passages being individually, cyclically controlled and either (1) delivering to separate destinations, or (2) if delivering to a common destination, the control means having different modes of operation or operating at different times in the pump cycle.

(1) Note. For purposes of this definition, cyclic control of the outlet passages is not limited to control which is effected during each stroke of a reciprocating pumping member and includes control which is effected after a predetermined number of strokes of the pumping member.

(2) Note. A bypass of pumped fluid back to supply or to waste is considered to be an outlet under this definition including those in which the bypass is downstream of the cyclic outlet from the pump chamber. However, a passage through which pumped fluid is delivered to a portion of the pump assembly (e.g., bearing) and is utilized for an ancillary purpose of the pump such as cooling or lubricating of a pump such as cooling or lubricating of a pump part is not considered to be an outlet under this definition.

(3) Note. A pump chamber having one outlet through a valve in a piston operating therein and another outlet through a valve not in the piston is intended to form subject matter under this definition, said valves being considered as having different modes of operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

251+, for successive stage pumps having a pump fluid discharge path intermediate of the pumping stages.

493+, for plural controlled inlet or outlet flow paths, the control of at least one of said paths being effected by a pumping member controlled port.

503 This subclass is indented under subclass 437. Apparatus comprising a single pump chamber having a plurality of inlet passages for pump fluid, each of said inlet passages being individually, cyclically controlled and either (1) supplied from different sources or (2) if supplied from a common source, the control means having different modes of operation or operating at different times in the pump cycle.

(1) Note. For purposes of this definition, cyclic control of the inlet passages is not limited to control which is effected during each stroke of a reciprocating pumping member and includes control which is effected after a predetermined number of strokes of the pumping member.

(2) Note. A passage from which fluid is drawn from a portion of the pump assembly (e.g., bearing) for enhancing the function of said assembly portion (e.g., cooling, sealing) is not considered to be an inlet under this definition, this subject matter forming the basis of subclass 439.

(3) Note. A pump chamber having one inlet through a valve in a piston operating therein and another inlet through a valve not in the piston is intended to form subject matter under this definition, said valve being considered as having different modes of operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

242, for a cyclically controlled bypass between plural pump chambers which is in addition to the normal inlet flow paths to the chamber.

250+, for successive stage pumps having a pump fluid inlet intermediate of the pumping stages.

493+, for plural controlled inlet or outlet flow paths, the control of at least one of said flow paths being effected by a pumping member controlled port.

504 This subclass is indented under subclass 437. Apparatus including a plurality of outlet valves or a plurality of different outlet flow paths controlled by a single valve element for a single

expansible chamber, said outlet valves or flow paths discharging to a common outlet line and being designed to open in response to different conditions in the expansible chamber.

(1) Note. Ordinarily one of the valves is a distributor and another is one which opens only in response to excess pressure, e.g., when a slug of water accumulates in an air compressor. The distributor may be pressure responsive or mechanically actuated. In a mechanically actuated distributor the condition is the position of the pumping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

307+, for a pressure operated relief or bypass which vents fluid to waste or back to supply.

502, for an expansible chamber having multiple outlets which are each cyclically operated and operate under different conditions or discharge to different lines.

505 This subclass is indented under subclass 437. Apparatus in which the means for controlling the flow of fluid into or out of the chamber comprises valve means which is actuated by an electric current or a magnetic field.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 275 for a cyclically operable expansible chamber-type motor having an electrically or magnetically actuated distributor.

506 This subclass is indented under subclass 437. Apparatus in which the control means comprises a distributor, and in which the extent or movement of said distributor toward open or closed position or the relation of the movement of the valve with respect to the pumping member may be varied by means which may be selectively moved and held in different positions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

297+, for condition responsive means to vary the operation of a distributor for an expansible chamber pump.

427, for a plurality of pumps including means to adjust the distributor movement of one or more of the pumps.

524+, for separate means to bias a pressure responsive distributor to open position.

507 This subclass is indented under subclass 437. Apparatus in which the means to control the flow of fluid into or out of the chamber comprises a distributor, said distributor being at least partially moved cyclically by a fluid reactive surface formed on the distributor, or formed on an element adapted to contact the distributor means.

(1) Note. The reactive surface excludes the areas of the distributor means which are subjected to pump pressures as the working fluid is moved to and from the working chamber.

508 This subclass is indented under subclass 507. Apparatus in which in addition to the fluid reactive surface for moving the distributor there is also provided means to move said distributor which is interconnected with or abutted by the pumping member or a drive transmission element associated therewith in a manner which causes the distributor to be mechanically shifted upon movement of the pumping member or transmission element through a pumping operation cycle.

509 This subclass is indented under subclass 437. Apparatus in which a part of the pump chamber wall which is traversed by the pumping member is movable and forms or carries a part forming a portion of a distributor which controls inlet or discharge of pump fluid to or from the pump chamber.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 276, and see the search notes therein, for cyclically operable expansible chamber motors in which the valve means is formed by a movable portion of the working chamber wall traversed by the working member.

510 This subclass is indented under subclass 437. Apparatus in which the means for controlling flow of pump fluid into or out of the pump

chamber comprises a distributor which is interconnected with or adapted to be abutted by the pumping member or a drive transmission element associated therewith in a manner which causes said distributor to be mechanically shifted upon movement of the pumping member or transmission element through a pumping operation cycle.

(1) Note. A moving cylinder having a port which cooperates with a stationary member for controlling the flow of pump fluid to or from the pump chamber is not considered to be a mechanically actuated distributor under this definition, such subject matter being classified in subclasses 460+, above.

SEE OR SEARCH THIS CLASS, SUBCLASS:

443+, for means for actuating a pressure responsive distributor to an open position responsive to pumping member position.

456, for an expansible chamber pump having relatively movable serial distributors in which one of said distributors is of the mechanically actuated type.

460+, for a moving cylinder which cooperates with a stationary member for controlling inlet and discharge of pump fluid to or from the pump chamber, and see (1) Note, above.

490+, for an inlet or discharge port formed in a pumping member or chamber wall which is controlled by an element carried by the other.

508, for a distributor which is moved by a separate fluid reactive surface as well as a mechanical means.

509, for a distributor which is formed in part by a traversed chamber wall portion, the wall portion usually being moved by interconnection or frictional engagement with the pumping member.

511 This subclass is indented under subclass 510. Apparatus in which the valve element is carried on or within the piston for axial movement relative thereto and either (1) the piston is in frictional contact with a pump chamber wall portion and is driven by a power transmission element which is rigidly connected to the valve element or (2) the valve element is in frictional contact with a pump chamber wall portion and the piston is driven by a transmission element rigidly connected thereto.

512 This subclass is indented under subclass 511. Apparatus in which the valve element comprises a single unitarily movable member which controls either the inlet to or discharge from two or more pump chambers.

513 This subclass is indented under subclass 511. Apparatus in which the valve element and piston have conical or frustoconical seating engagement to perform the valving function.

514 This subclass is indented under subclass 510. Apparatus in which the pumping member comprises a piston, said piston or an element rigid therewith (e.g., piston rod) having a pump fluid connecting passage formed therein, the mechanically actuated valve element being located within or carried by the piston and positioned in flow controlling relationship with said piston passage for performing the valving function.

SEE OR SEARCH THIS CLASS, SUBCLASS:

511, for a distributor carried by a piston in which either the distributor or piston frictionally engages a chamber wall and the pump drive rod is rigid with the other.

515 This subclass is indented under subclass 510. Apparatus comprising two or more pumping chambers.

(1) Note. A device in which fluid is moved from one side of a pumping member to the opposite side thereof during movement of the pumping member in one direction of its stroke and then lifted out of the chamber during movement of the pumping member in the second direction of its stroke is not considered plural chambers and is excluded from this subclass.

(2) Note. A pump including a plurality of pumping members acting upon a body of fluid, and in which the fluid acted upon by a first pumping member is in commu-

nication with the fluid acted upon by a second pumping member in all operative conditions of the pump, is not considered as constituting plural chambers and is excluded from this subclass. Such subject matter is classified below on other features.

516 This subclass is indented under subclass 515. Apparatus in which the valve element comprises a single unitarily movable member which controls either (1) the inlet of pump fluid to two or more pump chambers or (2) the discharge or pump fluid from two or more pump chambers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

512, for a single mechanically actuated distributor element which is located within or carried by a pump piston which controls pump fluid inlet to or discharge from plural pump chambers.

517 This subclass is indented under subclass 516. Apparatus in which the unitarily movable valve element controls both the inlet and discharge of pump fluid to and from two or more pump chambers.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 472+ for pumps or motors comprising three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which motive or pump fluid flow is usually controlled by a single, unitary, mechanically actuated valve element. For the line between Class 91 and Class 417 concerning this type of pump, see the note in Class 417 subclass 269.

518 This subclass is indented under subclass 510. Apparatus in which the inlet and discharge valves comprise a single unitary element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

517+, for a unitary inlet and discharge distributor for plural pumping chambers.

519 This subclass is indented under subclass 518. Apparatus in which the element partakes of a movement about an axis to effect control of the pump fluid.

520 This subclass is indented under subclass 510. Apparatus in which a portion of the valve element or a member connected thereto is either (1) frictionally connected with the pumping member or (2) is located in the path of pumping member movement and adapted to be moved by contact therewith at some portion of the pumping member stroke.

SEE OR SEARCH THIS CLASS, SUBCLASS:

443+, for means for actuating a pressure responsive distributor to an open position responsive to pumping member position.

490+, for an inlet or discharge port formed in a pumping member or chamber wall which is controlled by an element carried by the other.

521 This subclass is indented under subclass 437. Apparatus comprising two or more pumping chambers.

(1) Note. A device in which fluid is moved from one side of a pumping member to the opposite side thereof during movement of the pumping member in one direction of its stroke and then lifted out of the chamber during movement of the pumping member in the second direction of its stroke is not considered plural chambers and is excluded from this subclass.

(2) Note. A pump including a plurality of pumping members acting upon a body of fluid, and in which the fluid acted upon by a first pumping member is in communication with the fluid acted upon by a second pumping member in all operative conditions of the pump, is not considered as constituting plural chambers and is excluded from this subclass. Such subject matter is classified below on other features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

244+, for a successive stage pump.

473, for plural bellows-type pumping chambers.

480, for a pump in which the fluid is moved from one side of a flexible wall pumping member to the other through a valved port in said flexible wall pumping member.

486+, for plural pumping members in one chamber having a single inlet or discharge distributor.

491, for plural pumping chambers in which the inlet or exhaust to each chamber is controlled by a pumping member which is common to all pumping chambers.

515, for plural pumping chambers in which the inlet or discharge valve for the chambers is mechanically actuated.

545+, for a pump in which fluid is moved from one side of a pumping member to the other through a valved port in the pumping member.

555.1, for fluid serially moved to opposite sides of a common pumping member.

522 This subclass is indented under subclass 521. Apparatus in which a conduit for the discharge of fluid from a first chamber is in direct communication with a nonpumping chamber containing a portion of the second pumping member other than the pumping face of said pumping member, said nonpumping chamber not constituting the inlet or outlet flow path for pump fluid to or from the pumping chamber containing the second pumping member so that the fluid discharged from said first chamber contacts such pumping member portion.

523 This subclass is indented under subclass 521. Apparatus in which at least one of the chambers is defined in part by a piston, said piston or element rigid therewith (e.g., piston rod) having a pump fluid conducting passage formed therein and the means for controlling fluid flow into or out of the chamber including a movable valve member in flow controlling relationship with said passage, said valve member being located within or carried by said piston or element rigid therewith.

(1) Note. For classification under this definition, the expansible chamber pump must be provided with a pump fluid conducting passage which is physically located within the piston or element rigid therewith. A pump having relatively movable piston portions for controlling flow from one side of the piston to the other via a flow path formed between the piston and a cylinder sidewall (i.e., pump fluid flows around the piston) is excluded under this definition; see subclasses 555.1+, below, and the search note therein to Class 92 for such subject matter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

545, for valved piston-type pumps not involving plural pumping chambers and see the search notes thereto for valved pistons elsewhere classified.

524 This subclass is indented under subclass 523. Apparatus in which said valve means in the pumping members comprises either (1) a single rigid unitarily movable valve member which moves from one position to another to alternately control the inlet to or discharge from said two or more chambers or (2) relatively movable inlet or discharge valve members which are mechanically interrelated in a manner such that movement of an inlet or discharge valve member for one pump chamber necessitates movement of an inlet or discharge valve member, respectively, for another pump chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

512, for a single mechanically actuated distributor element located within or carried by a pump piston which controls pump fluid inlet to or discharge from plural pump chambers.

525 This subclass is indented under subclass 523. Apparatus in which a first pumping chamber extends in a direction axially of a second pumping chamber, the piston for said first and second pumping chambers comprising a rigid unitary element, said element having valves

thereon for controlling fluid to or from each of said chambers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

524, for unitary or interconnected inlet or discharge distributors in a common piston for plural pumping chambers.

526 This subclass is indented under subclass 525. Apparatus in which there is a single inlet or discharge conduit common to the plural chambers said conduit being mounted on and movable with the piston.

527 This subclass is indented under subclass 525. Apparatus in which the inlet or discharge conduit for the first pumping chamber extends axially through a portion of the second pumping chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

526, for a common pumping member having valves for aligned pumping chambers and a conduit which forms a common inlet or discharge for the chambers mounted on the pumping member and extending through at least one of the chambers.

528 This subclass is indented under subclass 523. Apparatus in which the chambers are positioned in axial alignment and a conduit for conducting fluid to or from a first pumping chamber extends axially through a portion of a second pumping chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

526, and 527, for axially aligned pumping chambers and a common pumping member having valves for both chambers and a pump fluid conduit extending through one of the chambers.

529 This subclass is indented under subclass 523. Apparatus comprising two or more pistons which are capable of or constrained to move relative to each other, the longitudinal axis of one of said pistons being spaced from and parallel to the longitudinal axis of another of said pistons, said pistons being positioned in separate pumping chambers.

530 This subclass is indented under subclass 523. Apparatus in which the piston of at least one of the chambers is imperforate.

531 This subclass is indented under subclass 521. Apparatus in which the means for controlling pump fluid flow into or out of two or more chambers comprises either (1) a single rigid unitarily movable valve member which moves from one position to another to alternately control the inlet to or discharge from said two or more chambers or (2) relatively movable inlet or discharge valve members which are mechanically interrelated in a manner such that movement of an inlet or discharge valve member for one pump chamber necessitates movement of an inlet or discharge valve member, respectively, for another pump chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

491+, for plural pumping chambers having a common pumping member, said pumping member controlling the inlet or discharge port of two or more of said chambers.

512, for a single mechanically-actuated distributor element located within or carried by a pump piston which controls pump fluid inlet to or discharge from plural pump chambers.

516, for a single mechanically-actuated distributor element which controls pump fluid inlet to or discharge from plural pump chambers.

524, for plural pumping chambers including a valved piston and in which a common element forms an inlet or discharge valve for two or more chambers.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 178+ for an expansible chamber-type motor having a single valve unit controlling plural working chambers.

532 This subclass is indented under subclass 531. Apparatus in which the means for controlling pump fluid flow into or out of said two or more chambers comprises a single valve member which moves as a unit about an axis.

533 This subclass is indented under subclass 521. Apparatus in which two or more pumping chambers are positioned in spaced parallel relationship including a conduit positioned between said pumping chambers and at least partially lying within the axial limits of the pumping chambers, said conduit being in communication with the controlled discharge of each of said pumping chambers, so that each of said pumping chambers discharge into and through said conduit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

539, for other pumps having laterally spaced parallel pumping chambers.

534 This subclass is indented under subclass 521. Apparatus in which the plural pumping chambers are formed at opposite ends of a common pumping member which moves to-and-fro along a straight line (includes diaphragm), movement of said pumping member effecting expansion of one of said pumping chambers and simultaneous contraction of the other.

(1) Note. Plural pumping chambers formed in separate cylinders are included under this definition if the cylinders are coaxial and contain pumping members which are rigidly interconnected.

SEE OR SEARCH THIS CLASS, SUBCLASS:

404+, for a double acting pump piston driven by a rigidly attached double acting reciprocating fluid motor.

418, for a double acting pump piston driven by a rigidly attached reciprocating electric motor.

491+, for a common pumping member for plural pumping chambers in which the pumping member controls an inlet or discharge port for the chamber.

525+, for a common pumping member for plural aligned chambers wherein the pumping member includes valves for controlling pump fluid to or from the chambers.

528+, for plural pumping chambers wherein a fluid conduit for one of the chambers extends through a portion of another.

535 This subclass is indented under subclass 534. Apparatus in which there is provided inlet discharge valve means for controlling flow of pump fluid to and from the chambers, the discharge valves for the several chambers being located at a position radially spaced from the path of movement of the pumping member.

536 This subclass is indented under subclass 535. Apparatus in which the inlet and discharge valves for the several chambers are located at a position radially spaced from the path of movement of the pumping member.

537 This subclass is indented under subclass 536. Apparatus in which all the valves are positioned on one side of a plane parallel to and extending through the axis of the working member.

538 This subclass is indented under subclass 521. Apparatus in which said pumping chambers are coaxial with each other with one end of one chamber secured to the end of a second chamber, and in which the valve means for controlling the inlet and discharge of said chambers is positioned adjacent the secured ends of said pumping chambers.

539 This subclass is indented under subclass 521. Apparatus comprising two or more pumping members which are capable of or constrained to move relative to each other, the longitudinal axis of one of said pumping members being spaced from and parallel to the longitudinal axis of another of said pumping members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

269, for three or more pump cylinders arranged in parallel relationship with a rotary transmission axis.

529, for parallel laterally spaced valved pumping members.

533, for spaced parallel pumping chambers having a common discharge conduit or chamber spaced therebetween in which the pumping members may have relative motion.

540 This subclass is indented under subclass 437. Apparatus comprising a fluid receiving or confining means positioned in open communica-

tion with the pump fluid either upstream of the means to control the flow of fluid into the chamber or downstream of the means to control the flow of fluid from the chamber to absorb pulsations initiated in said fluid incident to an operation of the pump.

SEE OR SEARCH CLASS:
138, Pipes and Tubular Conduits, subclasses 26+ for pressure compensators, per se.

541 This subclass is indented under subclass 540. Apparatus in which the fluid confining means is fixed to the pumping member for movement therewith.

542 This subclass is indented under subclass 540. Apparatus in which a fluid receiving or confining means is provided both upstream of the means to control the flow of fluid into the chamber and downstream of the means to control the flow of fluid from the chamber.

543 This subclass is indented under subclass 540. Apparatus in which said means comprises an enclosed space having a compressible fluid confined therein, said compressible fluid being in direct contact with the portion of the pump fluid entering said space.

SEE OR SEARCH THIS CLASS, SUBCLASS:
541, for a confined compressible fluid dampening chamber carried by the pumping member.
542, for combined inlet and discharge pulsation dampening chambers of the confined compressible fluid type.

SEE OR SEARCH CLASS:
137, Fluid Handling, subclass 207 for a surge suppressor of the type comprising a gas stored over a body of liquid.

544 This subclass is indented under subclass 543. Apparatus in which the space having confined compressible fluid is associated with a pump of the type which is manually operated, e.g., by a handle or treadle.

545 This subclass is indented under subclass 437. Apparatus in which the pumping chamber is defined in part by a piston, said piston or element rigid therewith (e.g., piston rod) having a pump fluid conducting passage formed therein and the means for controlling fluid flow into or out of the chamber includes a movable valve member in flow controlling relationship with said passage, said valve member being located within or carried by said piston or element rigid therewith.

(1) Note. For classification under this definition, the expansible chamber pump must be provided with a pump fluid conducting passage which is physically located within the piston or element rigid therewith. A pump having relatively movable piston portions for controlling flow from one side of the piston to the other via a flow path formed between the piston and a cylinder sidewall (i.e., pump fluid flows around the piston) is excluded under this definition; see subclasses 555.1+, below, and the search note therein to Class 92 for such subject matter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
244+, for successive stage pumps and particularly subclasses 259+ for those including a valved piston and see the notes in subclass 244 for the distinction between these subclasses.
467, for a valved piston in which the valve is mechanically actuated.
484, for a valved oscillating-type pumping member.
495, for a valved piston combined with pumping member controlled inlet or discharge ports.
511, for a piston carried distributor in which either the piston or distributor frictionally engages the pumping chamber wall and the distributor or piston, respectively, is integral with the drive rod of the pump.
523+, for a plural chamber pump having a valved pumping member.

546 This subclass is indented under subclass 545. Apparatus in which the piston is provided with relatively movable valve members which control flow of fluid into and out of the expansible chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

260, for successive stage pumps having a valved piston which contains both the inlet and the outlet valve for one of the stages.

486, for a pumping chamber having two or more relatively fixed pumping members and in which the inlet valve is positioned in one working member and the discharge valve is positioned in a second pumping member.

525, for a common valved pumping member for plural pumping chambers in which both the inlet and discharge valves for the chambers are disposed in the pumping member.

547 This subclass is indented under subclass 545. Apparatus in which a conduit for the pump fluid is rigidly fixed to the valved piston.

(1) Note. A device of the type disclosed as a hollow piston or plunger through which the pump fluid flows and in which such fluid is discharged from said piston or plunger through openings therein into a casing or space which slidably receives such piston or plunger, and in which an end face of said piston or plunger further acts upon said fluid to move the same from said casing or space, is excluded from this subclass. Such device is classified below on other features. However, when the piston is also provided with a fluid conduit fixed thereto and the fluid is discharged by the said end face into the conduit for ultimate discharge, said device is included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

528, for a plural chamber pump provided with a valved pumping member having a fluid conduit secured thereto, said conduit extending through a portion of one chamber and conducting fluid to or from a second chamber.

548 This subclass is indented under subclass 545. Apparatus in which the valved piston is slidable within a tube (e.g., cylinder) and has rigidly attached thereto a wall member which is in sealing engagement with said tube or another tube aligned and in open communication therewith, said wall member having a face portion in contact with the pumped fluid downstream of the valved piston and said first tube being provided with a discharge for pumped fluid positioned between said valved piston and wall member.

(1) Note. The discharge may be an annular passage surrounding the first or second tube.

549 This subclass is indented under subclass 545. Apparatus including means separate from the valve element and engageable therewith to continuously exert a force thereon in a direction toward its seat.

SEE OR SEARCH THIS CLASS, SUBCLASS:

507+, for a distributor which is moved by a separate fluid responsive element.

550 This subclass is indented under subclass 545. Apparatus in which the valve or part thereof (e.g., hinge) is formed of flexible material and in which opening and closing of said valve is effected by the flexing of said material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

479, for a flexible wall-type pumping member in which a portion of said flexible wall forms a pump fluid valve.

551 This subclass is indented under subclass 545. Apparatus in which the valve comprises a rigid member which is mechanically interconnected with the piston in a manner which constrains said member for movement about an axis.

(1) Note. A movable rigid valve member which is connected to the piston by means of a flexible element (e.g., resilient material hinge) which flexes upon movement of the valve to constrain movement of the valve member about an axis is not classified under this definition, such subject matter being provided for in subclass 550, above.

552 This subclass is indented under subclass 545. Apparatus in which the valve comprises a member movable in a to-and-fro motion toward and away from its seat.

SEE OR SEARCH CLASS:
137, Fluid Handling, subclasses 528+ for a reciprocating direct responsive valve.

553 This subclass is indented under subclass 552. Apparatus in which the valve comprises a ring like member.

554 This subclass is indented under subclass 552. Apparatus in which the valve comprises a member in the shape of a ball or sphere.

SEE OR SEARCH CLASS:
137, Fluid Handling, subclasses 533.11+ for a ball-type reciprocating direct responsive valve.

555.1 Fluid serially moved to opposite side of pumping member:
This subclass is indented under subclass 437. Apparatus having a reciprocating pumping member and in which fluid is moved from one side of the pumping member to the opposite side thereof during one reciprocatory stroke direction and then moved in the direction of movement of the pumping member during the other reciprocatory stroke direction.

(1) Note. A piston having a cup shaped axially extending peripheral lip portion fabricated of flexible material and in direct contact with pump fluid which is radially movable relative to a cylinder sidewall responsive to pump chamber pressure to control fluid flow around the piston is not considered in itself to be a valve and, per se, does not form subject matter under this definition. However, such devices when claimed in combination with a valve for controlling fluid flow into or out of the pump chamber form subject matter under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
254+, for a successive stage pump comprising pumping chambers on opposite sides of a pumping member in which the fluid is serially pumped from one pumping chamber to the next.
545+, for a pump in which fluid is serially moved to opposite sides of a valved piston.

SEE OR SEARCH CLASS:
92, Expansible Chamber Devices, subclasses 240+ for a piston having a sidewall portion including a peripheral axially extending flexible lip which may be disclosed as performing a valving function and see the search notes therein.

555.2 Well swabs:
This subclass is indented under subclass 555.1. Apparatus wherein the reciprocating pumping member is located in a well and used to force fluid from the pumping chamber.

556 This subclass is indented under subclass 555.1. Apparatus in which the pumping member comprises a piston formed of plural relatively movable rigid side wall forming segments, said segments being movable to a first relative position during movement of the piston in one reciprocatory stroke direction to prevent fluid flow from one end of the piston to the other and movable to a second relative position during movement of the piston in the other reciprocatory stroke direction to permit such flow.

(1) Note. For classification under this definition, the relatively movable piston side wall segments must be fabricated of rigid material and be relatively movable in a manner to control fluid flow either between the segments and a cylinder side wall or between relatively engageable segment portions. The rigid segments may include resilient portions for sealing engagement with the cylinder side wall and such will not serve to exclude the device from classification under this definition provided that the relative movement of the segments themselves serve to control fluid flow rather than the mere flexing of a resilient piston portion responsive to relative movement of the segment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

59, for a radially expansible piston for controlling fluid flow in a drilled well free piston-type pump.

489, for a single unitary piston forming element which is tilted relative to a cylinder in which it reciprocates for the purpose of controlling inlet or discharge of pump fluid.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 247 for a pair of axially spaced relatively movable rigid piston forming members having a radially movable element interposed therebetween wherein said radially movable element is either (1) flexible, or (2) has no disclosed valving function.

557 This subclass is indented under subclass 437. Apparatus in which the pumping chamber is always in communication with the inlet or the discharge to or from said chamber during all phases of operation of the pump.

(1) Note. For classification under this definition the pump must be disclosed as of the type in which the inlet or exhaust are never completely closed under any condition of operation of the pump. However, the constantly open line may be throttled so long as it is not completely closed.

(2) Note. The subject matter in this subclass usually involves a restricted flow path either in the inlet or exhaust conduit which permits unimpeded flow in one direction, but restricts flow in a reverse direction.

558 This subclass is indented under subclass 437. Apparatus having both a distributor to control inflow and a distributor to control outflow of pumped fluid for said chamber, the movable valving part of one of said distributors forming the flow passage and seat for and carrying the movable valving part of the other distributor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

504, for plural outlet valves for a single chamber in which one of the valves controls a passage through the other.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclass 512.2 for plural check valves in which one valve carries the head and seat for another.

559 This subclass is indented under subclass 437. Apparatus in which the means for controlling the flow of fluid into or the discharge of fluid from the chamber comprises valve means, said valve means being of the type which moves to open or close position responsive to a pressure differential in the pumping chamber and the inlet or discharge conduits.

SEE OR SEARCH THIS CLASS, SUBCLASS:

297+, for condition responsive means for modifying the operation of a cyclically operated valve (e.g., check valve).

427, for plural pumps having distributors which are individually adjusted.

447, for pumping chamber pressure responsive distributors with separate means to bias same open.

458+, for relatively movable serial pressure responsive distributors.

479, for a distributor formed from an integral portion of a flexible wall pumping member.

480, for a distributor in a flexible wall pumping member.

482+, for an oscillating pumping member with an inlet distributor in an abutment wall for the pumping member.

483, and 484, for an oscillating pumping member having a distributor positioned therein.

486+, for a single inlet or discharge distributor for a chamber having plural pumping members.

496, for a chamber pressure responsive distributor in serial relationship with a pumping member controlled port.

523+, for plural pumping chambers including a valved pumping member.

531+, for plural pumping chambers with a common element which forms an inlet or discharge distributor.

536+, for plural pumping chambers at opposite ends of a reciprocating pumping member with inlet and discharge distributors positioned laterally of the pumping member path.

538, for aligned pumping chambers with inlet and discharge distributors at adjacent ends of the aligned chambers.

545+, for valved pistons and see the search notes thereto for other valved pistons.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 511+ for direct response valves, per se, and see subclasses 512+ for plural direct response valves. The claiming of a direct response valve mounted in a cylinder or cylinder head or the like does not preclude classification in Class 137. Also the claiming of both an inlet and outlet valve does not preclude classification in Class 137 if no pumping member is claimed.

560 This subclass is indented under subclass 559. Apparatus in which a single unitary movable valve member is so positioned relative to the conduits communicating with the chamber inlet and discharge as to form the sole means for controlling both the inlet of pump fluid into the chamber and the discharge of pump fluid from the chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

531, for a single element controlling both inlet and discharge of pump fluid to and from plural pump chambers.

561 This subclass is indented under subclass 559. Apparatus in which means are provided to prevent movement of said valve means, said means being effective in response to the pumping member attaining a given position in the chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

446, for selectively operable means for holding pressure responsive distributor open.

562 This subclass is indented under subclass 559. Apparatus in which a portion of the valve means or valve supporting means extends into the pumping chamber from a fixed wall thereof and in which a wall of the pumping member is provided with a groove, recess or indentation for receiving said valve means or valve supporting means during movement of the pumping member in the normal operation thereof in the pumping chamber.

563 This subclass is indented under subclass 559. Apparatus comprising an inlet valve and a discharge valve of substantially the same shape and having substantially the same mode of operation, a first said valve being either greater in some dimension than said second valve or being made of a different material than said second valve.

564 This subclass is indented under subclass 563. Apparatus in which said valves consist of ring-shaped members.

565 This subclass is indented under subclass 559. Apparatus having a fluid inlet conduit and a fluid discharge conduit, said conduits being linearly aligned and a pivoted inlet and discharge distributor being disposed in the aligned inlet and discharge distributors, respectively.

(1) Note. The pivoting of the distributors may be accomplished by a flexing of the material thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

567+, for nonpivoted inlet and discharge distributors seating in coaxial ports.

566 This subclass is indented under subclass 559. Apparatus in which the valve means is fabricated of nonmetallic material.

(1) Note. A mere sealing portion of a metallic valve (e.g., o-ring) which is fabricated of nonmetallic material is not

intended to be included under this definition. Generally, for classification under this definition, the entire pump fluid contacting portion of the movable valving member or seat therefor must be formed of nonmetallic material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

479, for a valve formed from an integral portion of a flexible wall pumping member.

550, for a valve piston having a valve formed of flexible material.

567 This subclass is indented under subclass 559. Apparatus comprising an inlet and discharge valve positioned in an inlet and discharge port, respectively, which form seats for said valves, the central axis of the inlet seat port coinciding with the central axis of the discharge seat port.

(1) Note. Either or both of the ports may be annular so long as the axes of the ports coincide.

SEE OR SEARCH THIS CLASS, SUBCLASS:

558, for inlet and discharge distributors in coaxial ports in which the port (seat) for one is formed in the other; i.e., the one distributor is carried by and controls a passage in the other.

568 This subclass is indented under subclass 567. Apparatus in which said axis is perpendicular to the direction of movement of the pumping member.

569 This subclass is indented under subclass 559. Apparatus in which the inlet or discharge valve is positioned in a fixed wall of the working chamber which is opposite the end face of the pumping member when in operative position in the pumping chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

482+, for an oscillating pumping member with a distributor in an abutment wall for the pumping member.

570 This subclass is indented under subclass 569. Apparatus in which the movable portion of the valve or the movable portion of the valve which seats upon the nonmovable portion of the valve is substantially the same area as the end face of the pumping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

501, for a coextensive distributor opposite a pumping member end face combined with a pumping member controlled inlet or discharge port.

571 This subclass is indented under subclass 569. Apparatus in which an inlet valve and a discharge valve are positioned in a wall opposite the end face of said pumping member.

572 This subclass is indented under the class definition. Apparatus not otherwise provided for.

CROSS-REFERENCE ART COLLECTIONS

900 Pumps which are disclosed as pumping slurries; i.e., fluids which contain suspended solids, such as concrete.

901 Pumps which are disclosed as pumping gases in the liquified state at very low temperatures, e.g., liquid oxygen. This collection is not intended to include refrigerant compressors in which the refrigerant liquifies at a relatively high temperature when placed under compression.

SEE OR SEARCH CLASS:

62, Refrigeration, subclasses 45.1+ for stored solidified or liquified gas handling.

902 Pumps comprising a motor driving the pump, the motor and pump being disposed within a sealed casing such that no part of the motor-pump unit projects through the casing so as to require a running seal.

903 Pumps which are operated by a treadle adapted to be operated by the foot or feet of a human or animal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

229, for pumps operated by a passing vehicle.

SEE OR SEARCH CLASS:

119, Animal Husbandry, subclass 76 for animal operated watering pumps delivering to a watering trough.

904 WELL PUMP DRIVEN BY FLUID MOTOR MOUNTED ABOVE GROUND:

A collection of patents disclosing a pump installed below ground to obtain subterranean fluids, and wherein the pump member is operated by a motor located above the ground surface, and the said motor has a reciprocating working member which is motivated by a fluid.

END