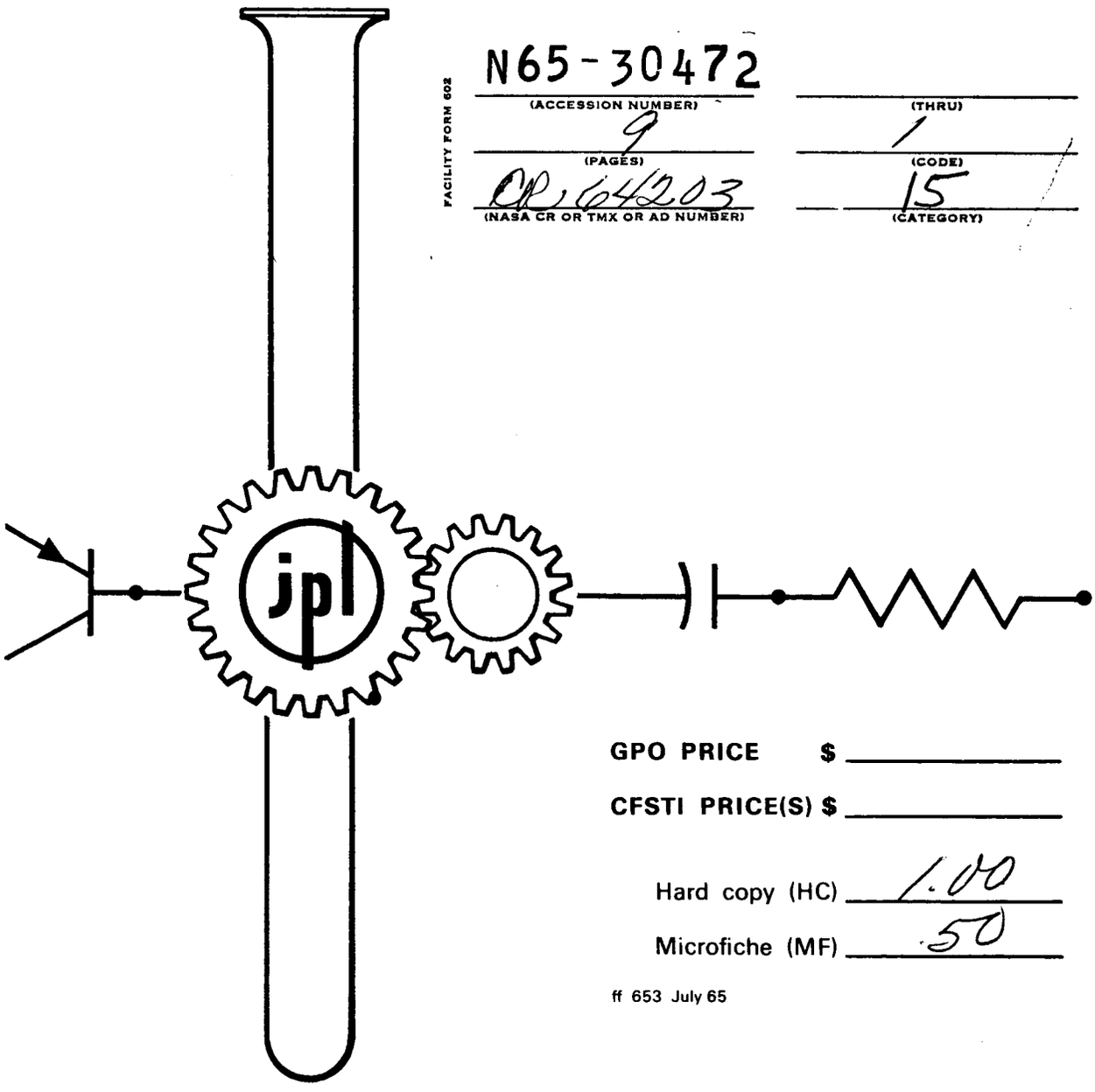
INDUSTRIAL TECHNIQUES

BULLETIN October, 1962



JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY

INDUSTRIAL BY-PRODUCTS OF SPACE RESEARCH AT JET PROPULSION LABORATORY

This is a report of some of the products and methods developed at the Jet Propulsion Laboratory in the course of its space program, and which may have industrial use. The new problems which must be overcome in the development and fabrication of space vehicles and related ground support equipment have led to new products and techniques, many of which can be applied in industry. In addition, the activity created in support of research has resulted in the invention of many improved versions of everyday items.

Some of the less complicated devices are presented in some detail in this report. Though none of them has been patented by JPL thus far, no guarantee can be given that the items are not covered by patents or will not be patented. Additional details on how to produce or utilize the inventions described can be obtained from the Jet Propulsion Laboratory, a nonprofit research laboratory of the California Institute of Technology. It is suggested that inquiries be directed to the Patent Office of Jet Propulsion Laboratory, Pasadena, California.

QUICK DISCONNECT COUPLING Designer: A. K. Forsythe

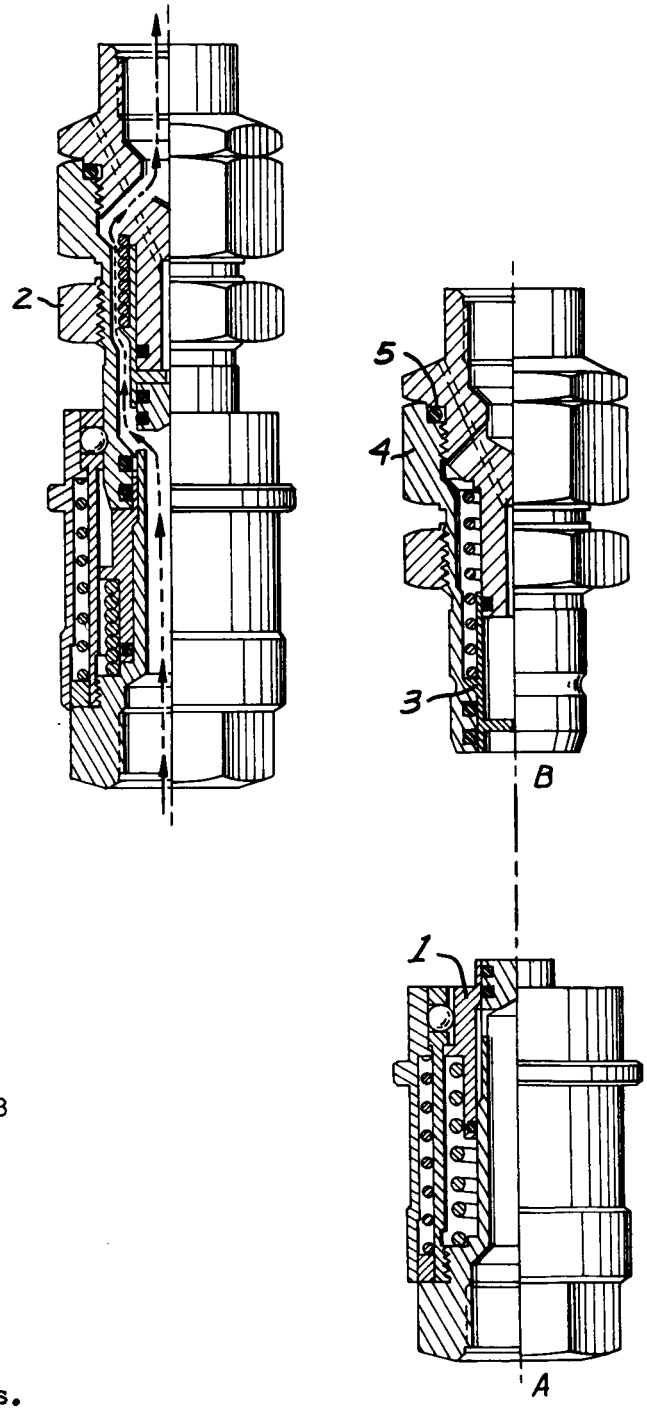
IT1006

This invention relates to an improved quick-disconnect coupling which has, in combination, the features of self-sealing, no spill, and balanced reaction in addition to lighter weight and smaller size.

The connector features tight sealing, in combination, by metal O-ring seals and quick separation and sealing of both lines at disconnection.

In reference to the figure, the outer sleeve of connector A is pulled back to allow the ball bearing to rise when inserting connector B. Connector B is pushed in until the ball slips into the ball detent groove and the outer sleeve is allowed to return to position due to spring tension. When connector B is inserted, a spring loaded member 1 which butts up against the end of connector B is pushed back maintaining a reaction against connector B. The fluid passage is thereby opened. The sealing joint is tightened by turning the sealing nut 2 on the tapered sleeve of connector B. In joining the two connectors, the spring loaded member 3 of connector B is pushed back opening the fluid passage to complete the fluid coupling. Sealing nut 4 is turned to tighten the body of connector B against the O-ring seal 5. This completes the physical connection.

Upon disconnection, the sealing nuts are loosened and the connectors separated. In separating, the reacting spring-loaded members return to their original positions sealing-off both lines.



LIQUID NITROGEN-GASEOUS NITROGEN SEPARATOR Designer: J. B. Stephens

IT1008

This innovation relates to a simple means for separating liquid and gaseous Nitrogen. It was designed specifically for the purpose of making the filling of small containers from storage tanks a simpler and less cumbersome matter.

Reference is directed to Figure 2. A length of aluminum tubing 1 is provided with small holes 2 along one of it's sides leaving a substantial length of tubing at the upstream end 3 and the downstream end 4 which are not drilled.

The tubing is then bent into a helix of not less than three turns in a manner so as to have the holes 2 directed inward. The upstream end 3 is provided with a standard fitting 5 adaptable to the outlet of your storage tank and the downstream end is bent downward and provided with a filter (made of steel wool) 6 lodged in the lower end. A short piece of aluminum tubing 7 having an O.D. suitable to be fit into the tubing 1 is placed in the upstream end. The downstream end 8 of the tube 7 is flattened and formed in a crescent shape. The crescent shape is mounted near the outer wall of the tube in a manner so as to cause the liquid to adhere to the outer wall. The gaseous and liquid nitrogen is separated by centrifugal force and the gas escapes through the inwardly directed holes 2.

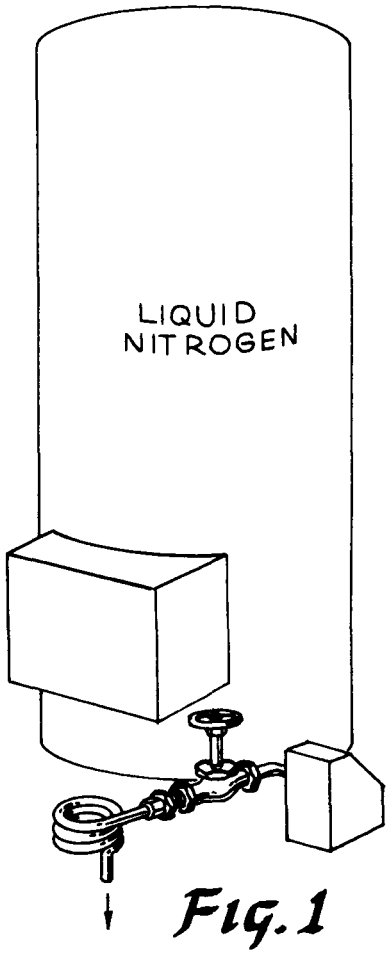


Fig. 1

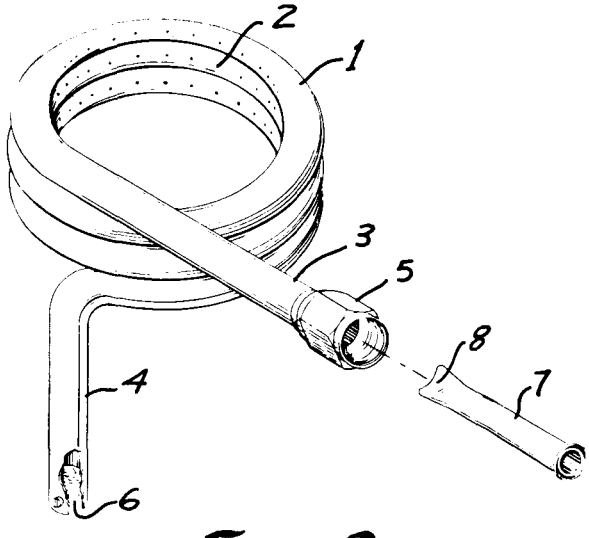


Fig. 2

KEENSERT INSTALLATION TOOL

Designer: James R. Cameron

IT1009

This innovation relates to a driving tool for driving the keys of a Keensert type metal reinforcement fitting used to provide a hard screw-threaded member in soft metal such as aluminium etc.

In reference to Figure 1, a sleeve member 1 is slideably mounted on a rod-like anvil 2. The driving end of the anvil 3 is provided with a centering pin 4 and two pair of notches. A pair of deep rectangular notches 5 are disposed on opposite sides of the anvil and a second pair of shallow rectangular notches 6 positioned 90° from the first pair on opposite sides of the anvil.

In reference to Figure 2, a keyway 7 in the side of the anvil is positioned to receive a set screw 8 to lock the sleeve and anvil together.

In reference to Figure 3, step 1 shows an insert 9 provided with a pair of detachable locking keys 10 and 11 fitted into the deep rectangular notches 5. The set screw is tightened into the keyway to lock the sleeve on the rod providing a holding device for screwing the insert into the pre-tapped soft metal 12. The figure shows the insert in the position in which it is to be locked in by the pin 10 and 11. Step 2 shows the anvil repositioned so that keys 10 and 11 fit into the shallow rectangular notches 6 and is now freed from the outer sleeve so that a blow from a hammer may break away the keys 10 and 11 at the point 13, driving them down along side the insert as shown. Step 3 shows the insert driven in flush with the outer surface of the metal by slightly rotating the anvil so that the second blow drives them in flush with the metals as shown in step 4.

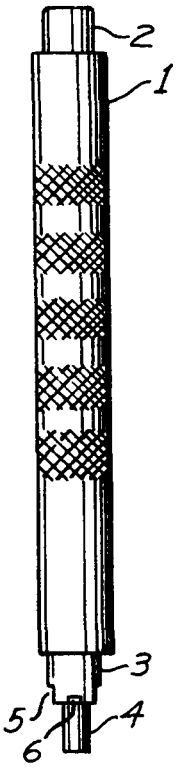


FIG. 1

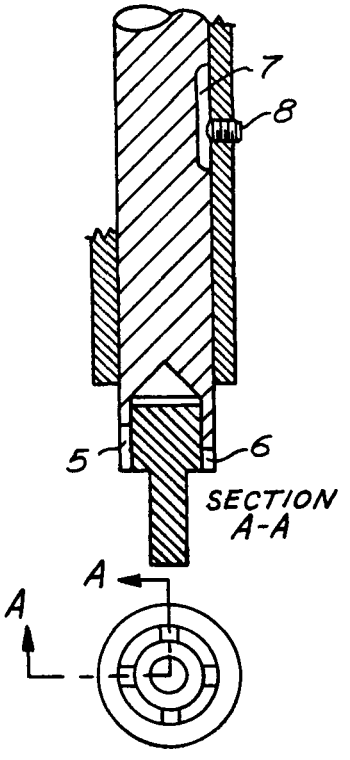


FIG. 2

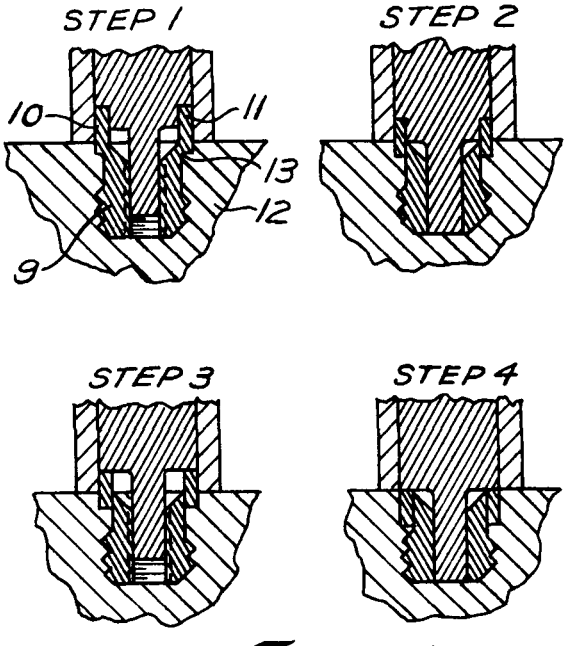


FIG. 3

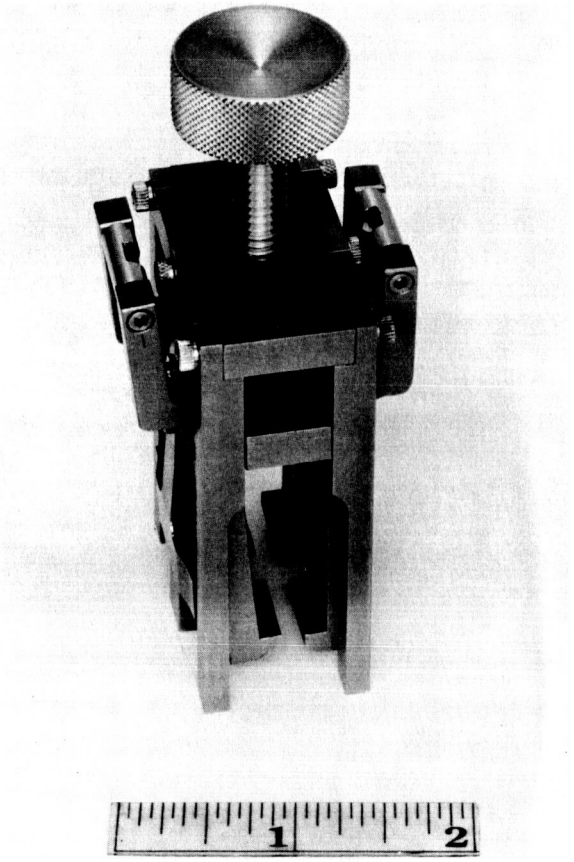
PLUG PULLER

Designer: Robert Garwood

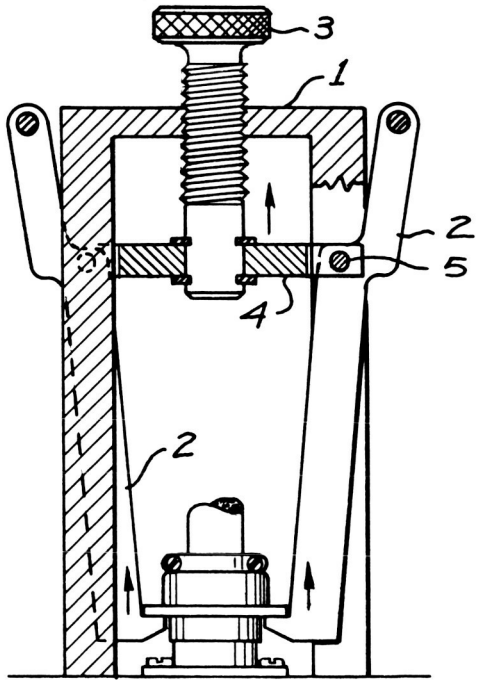
IT1010

This device provides for disconnecting large ordnance cable plugs from panel-mounted receptacles without cocking or otherwise injuring the connectors.

The plug-puller consists of a frame 1, having a threaded top plate and six legs, two hook members 2 for grasping the flange of the plug to be removed, two spring members for holding the hooks against the plug body and a knurled hand screw 3, secured to a plate 4, for pulling the connectors apart. The plate 4 is held in position on the screw by retaining rings that fit into grooves in the screw on both sides of the plate.



In operation, the plug-puller is centered over the plug to be pulled, the screw is turned clockwise until the hooks move down, engaging the flange on the plug and position themselves as shown. The hooks are held against the plug body by springs (see photograph), which are mounted on the frame and cause the hook members to pivot about the pivot rods 5 which engage the hook members 2 and the plate 4. The hand screw is then turned out, counterclockwise, elevating plate 4 and hook members 2, thus separating the plug from the receptacle.



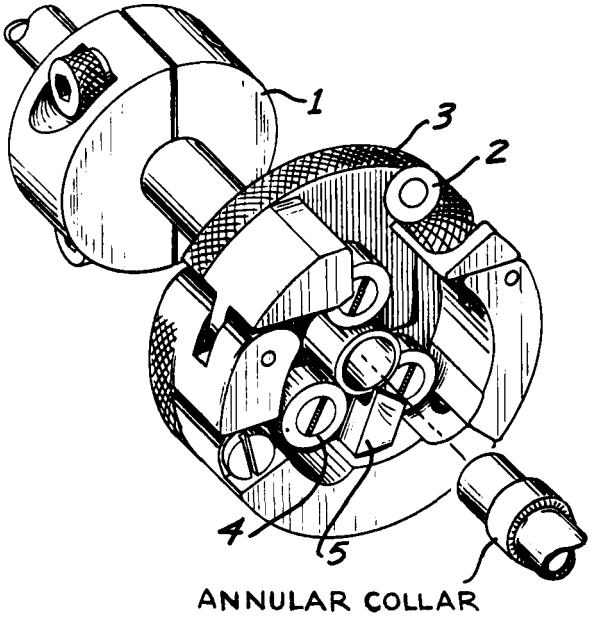
TUBE JOINT AND CUTTING TOOL

Designer: Gerald S. Perkins

IT1011

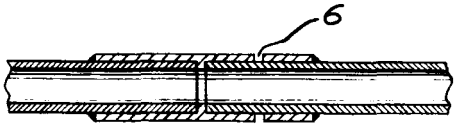
This innovation relates to a means for coupling tube joints by welding. Such a coupling can be separated by a special cutting tool in a manner so that the joint can be remade and welded.

It has been found that in outer-space conditions most all conventional type joints such as AN fittings, etc., cannot be fully dependable. In other words, under these environmental conditions, the only trustworthy joints that can be made are welded joints. This may well be true in jet aircraft.

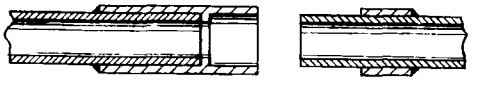


ANNULAR COLLAR

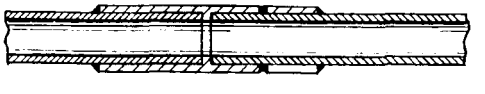
In reference to the figure, a back-up block 1 is placed on the line adjacent to the sleeve. The swing-in latch stud 2 closes the hinged sleeve cutter on the line against the back-up block so that the cutter body rotates on the three bearing races 4 spaced 120° apart on the body of the cutter. The cutter blade 5 mounted in a pad which is in turn adjustably mounted to the cutter body contacts the sleeve and, when the cutter is rotated manually, cuts the sleeve. The cutter blade position and depth are adjustable by means of set screws in the pad. Figure (a) shows a sleeve having an internally disposed annular ring matching the thickness and internal diameter of the tube to be joined. The groove 6 represents the cut-away portion of the sleeve. The separation of the tube is shown in (b) and the joint as it is remade is shown in (c).



a



b



c

SNAP-IN CONNECTORS FOR MINIATURIZED CIRCUITS Designer: R. A. Morrison

IT1012

The innovation described and illustrated here is a unique application of snap fasteners 1, (of the type used on clothing), used to connect electronic components 2 to their respective sub-assemblies or chassis 3. Components are packaged as illustrated in Figures 1 and 2, using the snap fasteners as effective connectors.

There are several advantages to be gained by this method of installation:

1. Effects compactness not afforded when using standard soldered terminals.
2. Retention of snaps does not require any protective varnish.
3. Makes both the electrical connection as well as rigidizing the component.
4. Easily removed for replacement.

It might be noted that the construction of these snaps can be redesigned especially for electronic application. For instance, a large area of the flange could be eliminated, thus making the connector even smaller.

Tests were made in vibration environments of from 3 to 30 g's rms sinewave sweeps from 20 to 1500 cycles per seconds, with no malfunction. Also, a two channel oscillograph was used to monitor continuity in circuits which were charged with 22 volts dc. No discontinuity was found.

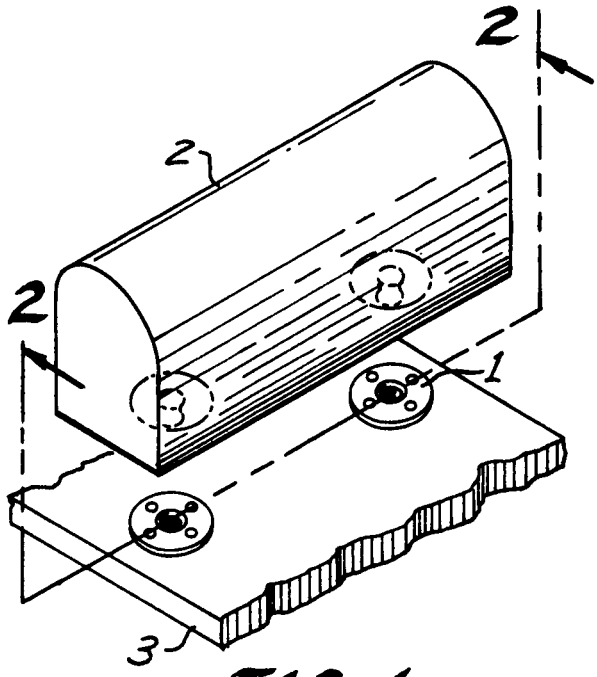


FIG. 1

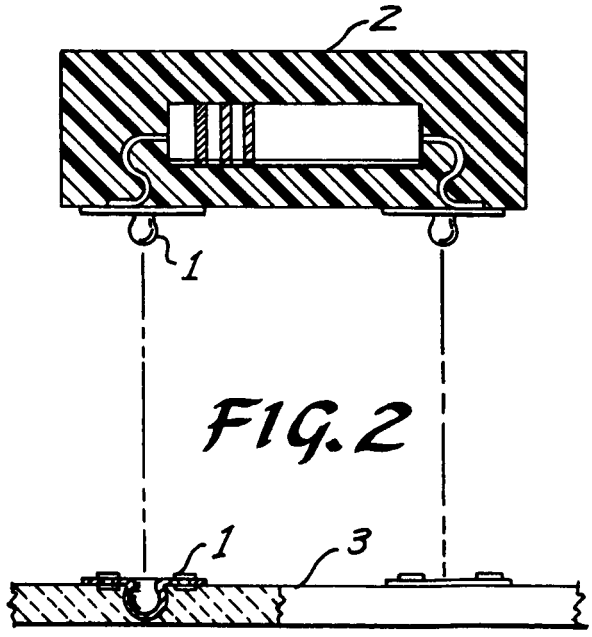


FIG. 2

HEATSINK

Designer: Unknown

IT1013

This innovation relates to a simple means for providing first, a heatsink to be used when soldering or welding electrical connections. It is especially useful when one is working with components which can easily be damaged by momentary overheating. Secondly, by providing them in colors, they can be used as markers useful in disassembly and re-assembly.

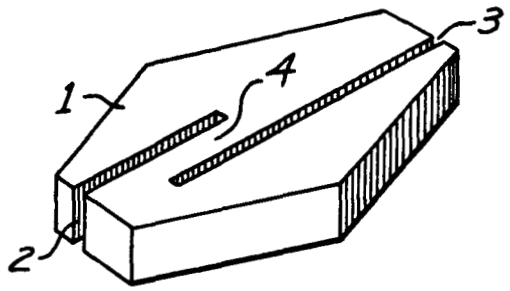


FIG. 1

Figure 1 shows a six sided block 1 of a metal such as aluminum. A first saw cut 2 is made about 1/3 of the way through the length of the block and a second cut 3 started from the opposite end and slightly offset from the first in a manner to form a flexible member 4 holding the two halves together. Reference is directed to Figure 2, where it is shown how pressure exerted on the ends 5 and 6 will open the distance between the ends 7 and 8 in a manner analogous to a clamp thus providing means for clamping the block to a wire which is shown in Figure 3.

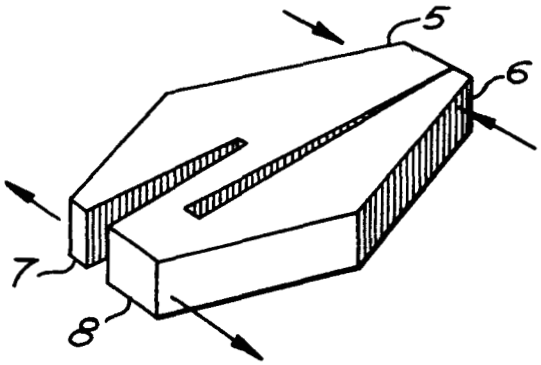


FIG. 2

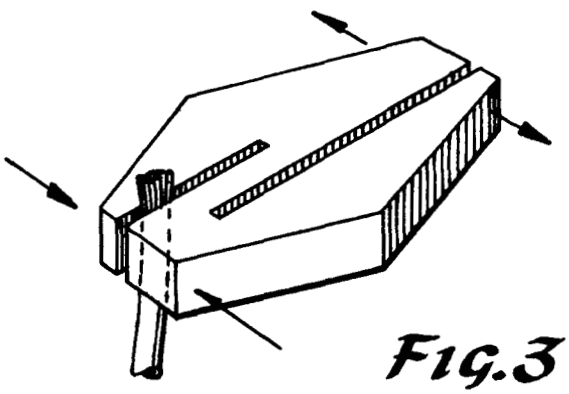


FIG. 3