

[54] **FASTENING SYSTEM**

[72] Inventor: **James Iantorno**, Mamaroneck, N.Y.

[73] Assignee: **Sealectro Corporation**,
Mamaroneck, N.Y.

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[58] Field of Search **339/126, 127, 147, 221, 17 D, 339/17 CF, 60; 248/27; 287/DIG. 8; 24/73 RM, 221 R; 151/41.73, 68; 85/7**

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Primary Examiner—Richard E. Moore

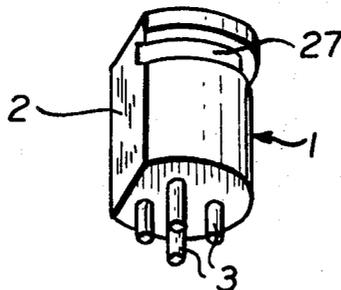
Attorney—James M. Heilman and Heilman and Heilman

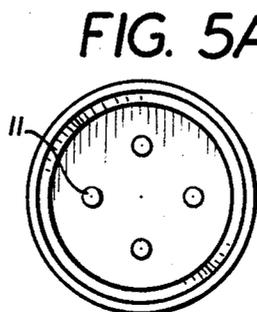
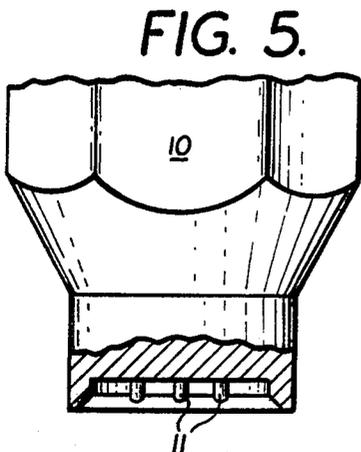
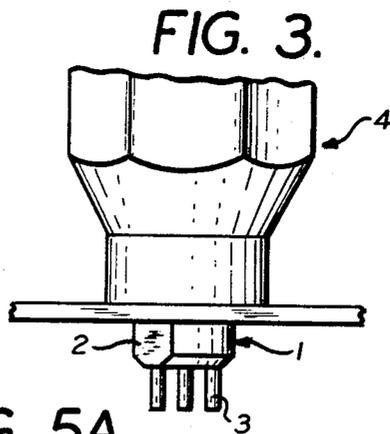
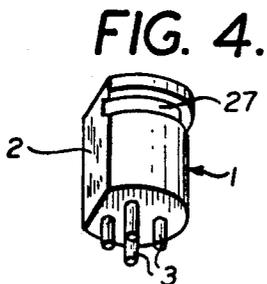
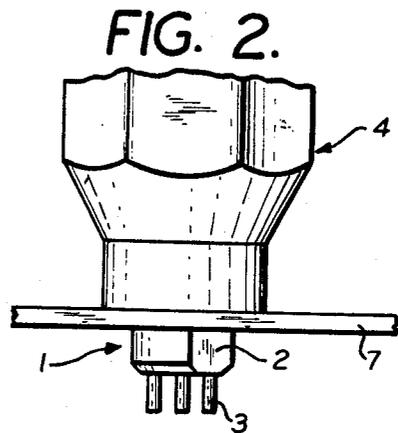
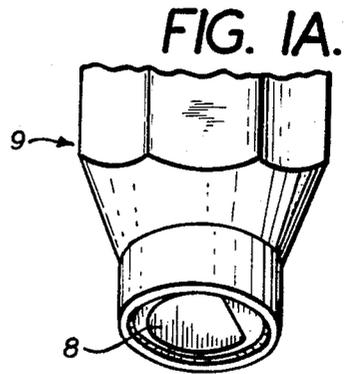
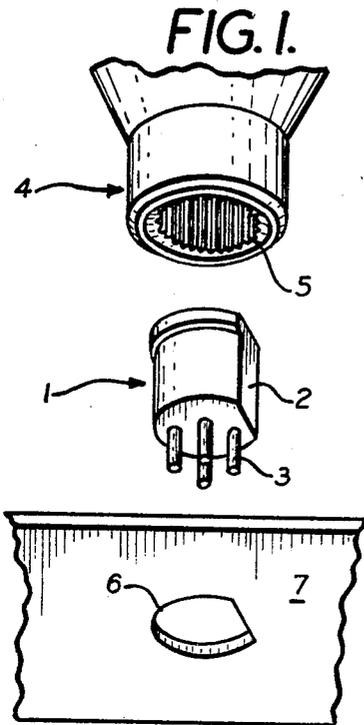
[57] **ABSTRACT**

A fastening system or device for general use in a variety of applications such as panels, doors, and general cover fastenings, but with special advantages in transistor sockets, bushings, terminals and spacer mountings.

This invention is also suitable for use in ¼ turn fasteners. Specifically, the invention comprises an irregularly shaped opening in a base or mounting plate and a corresponding irregular shape in a complementary piece permitting the piece to pass through the opening securely locking the two elements together when relative motion occurs.

3 Claims, 12 Drawing Figures





INVENTOR
JAMES IANTORNO
BY *James M. Heilman*
ATTORNEY.

FIG. 6.

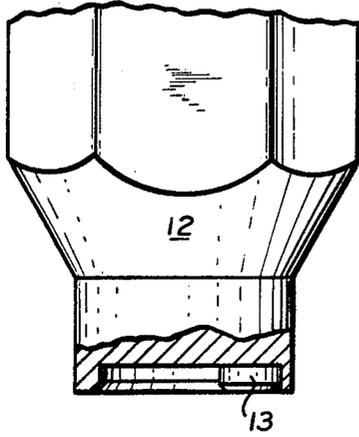


FIG. 6A.

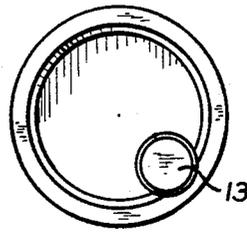


FIG. 7.

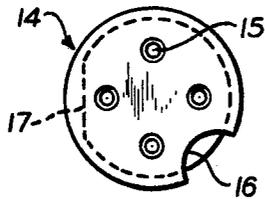


FIG. 8.

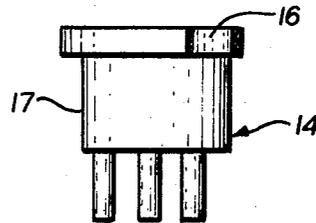
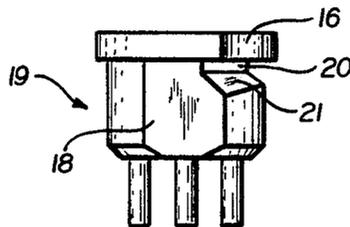


FIG. 9.



INVENTOR
JAMES IANTORNO
BY *James M. Heilmann*
ATTORNEY

FASTENING SYSTEM

This invention relates to a fastening system or device for general use in a variety of applications such as panels, doors, and general cover fastenings, but with special advantages in transistor sockets, bushings, terminals and spacer mountings.

This invention is also suitable for use in $\frac{1}{4}$ turn fasteners. Specifically, the invention comprises an irregularly shaped opening in a base or mounting plate and a corresponding irregular shape in a complementary piece permitting the piece to pass through the opening securely locking the two elements together when relative motion occurs between them.

Presently, difficulties arise during the manufacture and installation of similar hardware due to the number of parts required, their complexity, and problems in handling. This reflects an increase in cost of the basic assembly. Some parts require threaded mating sections or threaded mounting holes to complete the fastening operation, while others, such as compression mounted transistor sockets, require countersunk holes.

In mounting hole preparation, operations such as threading, and the labor required to install various parts also adds to the total cost of these assemblies. For specific examples: tip jacks may be made up of (1) insulator (2) contact (3) threaded sleeve (4) terminal (5) nut and (6) lockwasher. This unit requires wrenching from both sides, or the nut is eliminated and the mount material threaded. Or, $\frac{1}{4}$ turn fasteners, sometimes supplied as two sub assemblies, are made of at least two pieces each and both usually require riveting at two or more points and possibly eyeletting. Size and weight are also objectionable in both the above examples.

One common type of transistor socket or bushing marketed is made up of contacts mounted in a molded insulated body held in place by pressing a plated stamped metal retaining ring onto the minor diameter after the socket has passed through the mounting hole.

A second type of socket contains a threaded aluminum shell in addition to the contacts and insulation, and is fastened through the use of a threaded retainer nut.

A third type is a compression mounted socket which calls for countersunk holes in the chassis to avoid shaving, deforming or damaging the component.

An attempt to eliminate the countersink on the mount hole for compression types has been made through the use of a stamped, flanged or coined washer that has been pressed onto a reduced or stepped portion of the minor diameter of an insulator prior to mounting permitting the stepped portion to pass through the chassis mounting hole freely while the washer with its countersunk lead permits the insulator minor diameter to extrude through the chassis mount hole without scraping or damage. The cold flow properties of the insulator locks the socket into place against the bottom of the chassis surrounding the mount hole.

In automatic feeding for assembly of the components during manufacture and installation into a chassis prior to wiring, problems are compounded when applied to some of the existing designs and assembly systems.

The object of this invention is to provide a simple, low cost, light weight universal fastening device for

mounting primarily into a "flattened round" hole such as D shape, but is not limited to this configuration. Other shapes, such as square and triangular, etc., can be used, where rotating either the male or female member will permit an interference and engagement such that they will resist parting when an axial force is applied. The device, which can be made of plastic or metal, is self locking and in the case of those containing the cam device, i.e., a cam surface, are self seating.

With the foregoing and other objects in view, as will appear from a reading of the following specification and claims, the invention resides in the novel arrangement and combination of parts and in the details of construction and process of manufacture hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention. It will be further understood that the invention is susceptible of embodiment in many and various forms, some of which are illustrated in the accompanying drawing, and that the structural details or particular steps of the method herein set forth may be varied to suit particular purposes and still remain within the inventive concept.

Referring briefly to the drawings:

FIG. 1 is an exploded view showing a transistor socket being inserted into a mounting plate by a friction inserting tool.

FIG. 1A illustrates a modified mounting tool for use with "flattened round" or D sockets.

FIG. 2 shows the assembly prior to being rotated.

FIG. 3 illustrates the socket after being rotated and in completely secured position.

FIG. 4 is a view of the socket after being removed and illustrating, in exaggerated form, the integral securing channel or groove formed by the configuration mounting plate aperture.

FIG. 5 is a partial cross-sectional view of a socket multiple pin driving tool, while FIG. 5A is a bottom view thereof.

FIG. 6 is a partial sectional view of a single pin driving tool, while FIG. 6A is a bottom view thereof.

FIG. 7 is a socket upon which the tools illustrated in either FIG. 5 or FIG. 6 may be used.

FIG. 8 is a side view of the socket shown in FIG. 7.

FIG. 9 is a socket provided additionally with a positioning and tightening cam surface.

Referring in detail to FIG. 1, numeral 1 illustrates a socket or bushing body having a section 2 cut away to form a geometrical shape, such as a D shape, and having contacts 3 thereon. Element 1 may be a socket as illustrated, or any other transistor holding form or general bushing form.

Socket 1 is forced by tool 4 having a serrated interior surface formed by inwardly extending teeth 5 which abut against and may slightly cold form and flow against the outside circumference of the shoulder on socket 1. Hence, when the socket is inserted into aperture 6 in mounting plate 7, the socket can be driven and will have a groove 27 formed therein (See FIG. 4) after $\frac{1}{4}$ turning. This groove will securely, but removably, lock the socket in the mounting plate. Reversing the direction of rotation will permit removal of the socket without unnecessary deformation so that it can be reinstalled.

A modified tool, i.e., a matching D tool 9 is illustrated in FIG. 1A having a D head 8 therein.

A further modified form of driving tool 10 having pin driving elements 11 therein is seen in FIG. 5.

Element 12 illustrates a still further modified form of driving tool having a side pin or abutment 13 around the circumference thereof. Obviously, either tool 10 or 12 could be equipped with the combination elements 11 and 13 to more effectively perform their driving functions. Either one or the other of the tools illustrated in FIGS. 5 and 6 could be used to drive the socket 14 having contacts 15 and cooperating notch 16 therein. Notch 16 may also serve as an orienting element in order that the socket is correctly positioned. The operation of the socket in FIG. 8 is the same as in FIG. 4, wherein a securing channel is turned beneath the head of the socket since the body of the socket has a D-shaped configuration 17.

The modified socket shown in FIG. 9, in addition to having the D flat 18 in body 19, has a cam surface comprising a vertical section 20 and an inclined plane surface 21. The inclined surface 21 will not only serve to position the socket, but will also serve to draw down and tighten the socket.

Parts may be made and, for example, mounted as follows:

- a. An insulator is machined or molded
- b. A conductor is either press-fit into the axial bore or molded in.
- c. Punch a flattened round hole 6 into the mounting plate.
- d. Place terminal 1 into hole 6 and rotate 1/4 turn to secure.

The assembling system, being made up of fewer and simpler, more stable parts, automatic component assembly can be accomplished with a minimum of difficulty. The completed component also has a desirable center of gravity that aids in feeding it into the chassis.

The best driving geometry can be selected for specific applications and include internal and external hex, single or double d, straight or angular screw driver slot, etc., in addition to pin driving tools that mate with the socket holes. Automation tooling design might also dictate other driving geometry.

The design lends itself readily to a variety of fabricating methods thereby making it practical to manufacture smaller as well as larger quantities.

Obviously, applicant's tools could be used by hand, but normally only the head portions combining drivers, such as 8, 13, etc. would be mounted on automatic machinery for rapid assembly procedures and the sockets turned through the predetermined angle such as 90° or 180°. The sockets may be made of insulating materials such as polytetrafluoroethylene, acetal, nylon, rubber, etc., or of metals such as aluminum and steel.

An important feature is that the sockets, or other elements can be disassembled, removed, reassembled and installed, retaining sufficient holding power to meet performance requirements.

Some of the advantages of this invention are:

- 1. A fastener design that is low in cost and lightweight.
- 2. A removable and reusable device with self-locking tendencies that will resist loosening.
- 3. A fastening device requiring only simple, non-critical hole preparation for mounting. (Operations such as staking and riveting not required).

Other advantages are clearly apparent.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

- 1. A device comprising a fastening element having a D-shaped section; a base plate having at least one hole therein in which said fastening element is positioned, said hole formed with a D-shape to match the shape of the fastening element; said fastening element having an enlarged head portion to position and limit axial movement of the fastening element in one direction; the flat portion of the D-shaped hole having a limited thickness for erosion of the fastening element when it is turned relative to the base; said fastening element also formed with a cam surface which engages one side of the base for securely seating the head against the base; said cam surface including a vertical surface adjoining the head and a downwardly inclined bearing ledge terminating in the flattened portion of the base.

2. A device as claimed in claim 1 wherein the fastening element is a transistor socket formed of polytetrafluoroethylene.

3. A device as claimed in claim 1 wherein said fastening element is a socket for supporting circuit components and includes conductive contacts for connection to an external circuit.

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