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3,100,931

REMOVAL TOOL-PIN AND SOCKET ELECTRICAL CONNECTORS

Filed June 27, 1961

2 Sheets-Sheet 1

Fig-1

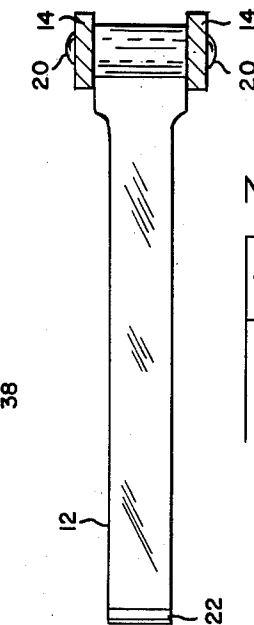
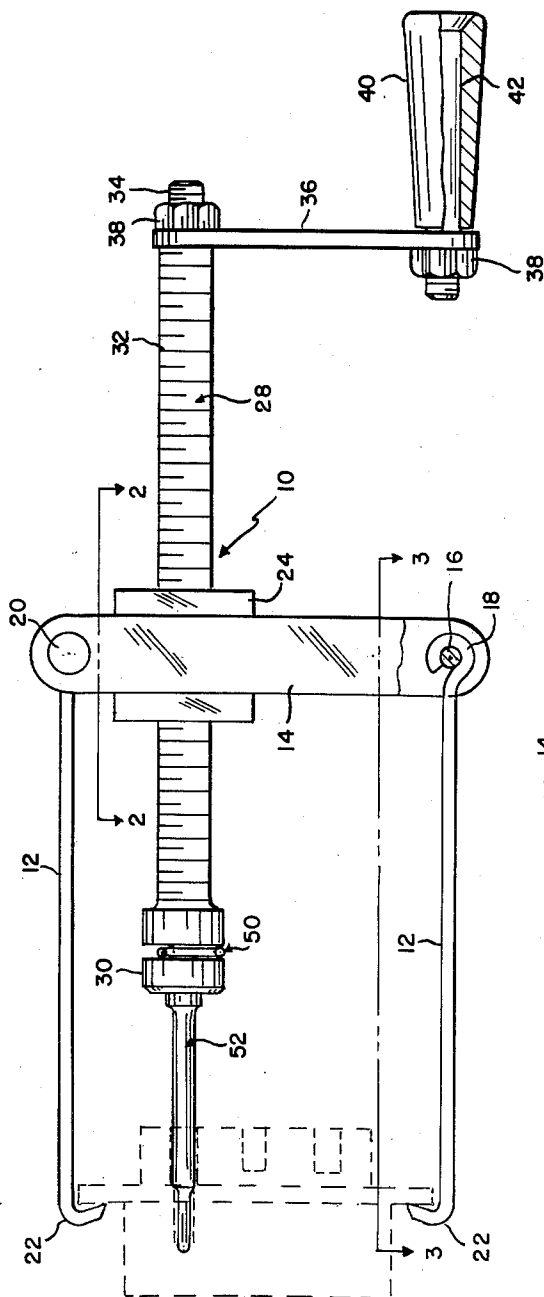


Fig-3

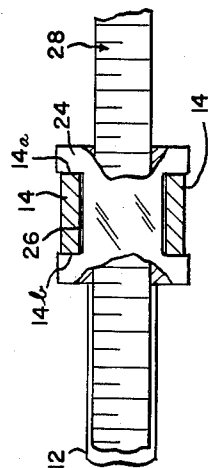


Fig-4

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2 Sheets-Sheet 2

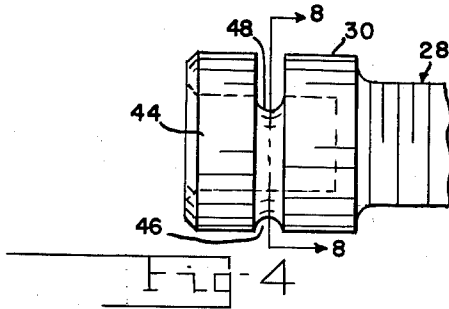


Fig. 5

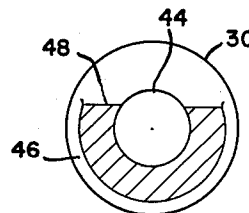
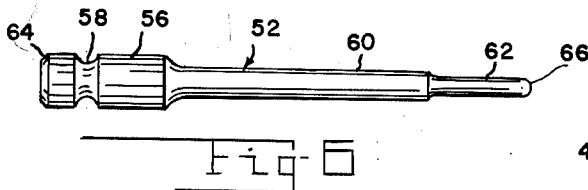
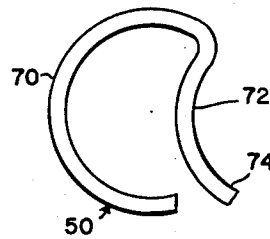
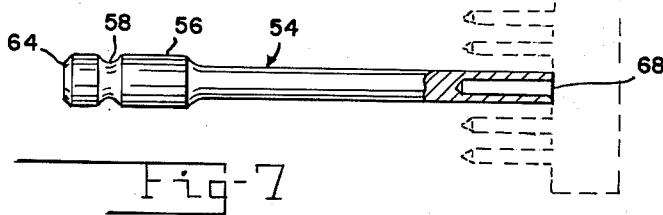


Fig. 8



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REMOVAL TOOL-PIN AND SOCKET ELECTRICAL CONNECTORS

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1 Claim. (Cl. 29—203)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to tools for the removal of potted pins and sockets from electrical connector plugs and the like.

Many electrical systems such as used on aircraft for example, include a multiplicity of small diameter insulated wires formed into cables which are used for connecting various electrical apparatus. For convenience, or to provide a method for quick disconnect, it is customary to join two cable-halves together by means of connector plugs which are connected to each other by means of extruding pins on one plug which enter and make mechanical and electrical connection with suitable sockets carried in the companion plug. The pin or male plug has one wire soldered or otherwise joined to the end of each pin, a group of which are then dielectrically potted in the plug in such spaced relationship as to engage the sockets potted in the female plug, which sockets are joined in like manner to the wires in the other cable-half.

Either in normal usage or by accident, one or more of the wires in the cable often become severed and require replacement before the electrical apparatus will again function.

Heretofore, when it became necessary to replace a broken wire, the end of the broken wire with its attached pin or socket had to be cut out of the plug with a knife and the potting compound picked out with needle nose pliers or tweezers. This method was not only time consuming and tedious but often resulted in a poorly repaired plug. After a replacement wire was soldered to the pin or socket, the pin or socket with new attached wire had to be reset in fresh potting compound in its originally spaced relationship. This was not only difficult to do, but also time consuming in waiting for a quantity of fresh potting compound to become firmly set before again connecting the plugs.

The object of this invention is to provide a means for pushing a pin or a socket with attached wire from a connector plug or the like without digging out potting compound.

Another object is to push out the original pin or socket without breaking out surrounding potting compound, so that a replacement pin or socket will be in properly spaced relationship when placed in the hole vacated by the original pin or socket where it is easily held in place with a small amount of fresh potting compound.

Still another object of this invention is to make a replacement in a minimum length of time by quick removal of the pin or socket with the defective wire, and its subsequent replacement without the time consuming requirements of determining its proper location and waiting for a fresh batch of potting compound to harden.

A further object of this invention is to provide a low cost and rapid means for repairing defective plugs which otherwise would be discarded.

Further objects and advantages will be apparent from the specification and drawings wherein like elements are indicated by like numerals and where:

FIG. 1 is an elevation of the tool with attached socket punch and showing its use in pushing a socket from a female plug;

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FIG. 2 is a sectional side elevation along line 2—2 of FIG. 1 and showing the slide block nesting in the link rails;

FIG. 3 is a sectional elevation along line 3—3 of FIG. 1 and showing a jaw mounted between the link rails;

FIG. 4 is a partial side view of the actuating screw showing the collet end with arcuate groove for retaining lock spring;

FIG. 5 shows the lock spring used for holding the punches in the collet of the actuating screw;

FIG. 6 is a side view of the punch used for pushing sockets from the connector plug;

FIG. 7 is a side view of the punch used for pushing pins from the connector plug; and

FIG. 8 is an axial view along line 8—8 of FIG. 4 showing the bore for receiving the head of the punches and arcuate lock spring retaining groove.

Referring to FIG. 1, removal tool 10 has two holding jaws 12 for grasping the connector plug, pivotally mounted between support structures or link rails 14 by means of rivets 16 which pass through holes in the ends of the link rails and through looped ends 18 on jaws 12. Rivets 16 have heads 20 on each end and are of such length as will produce a snug assembly while still permitting the jaws 12 to swing on the rivets. Jaws 12 may be made of material such as steel and of any convenient width as will be suitable for the application. The jaws 12 terminate in looped ends 18 on one end and in hooks 22 on the other end. The hooks 22 may be of any convenient form suitable for holding the particular plug while the tool is in operation.

Slide block 24 may be made rectangular in shape and having recesses 26 formed in two opposing sides. The recesses are of such depth that the portion of the slide block remaining between the recesses will not exceed and will preferably be slightly less than that portion of jaws 12 which is mounted between link rails 14. Furthermore, recesses 26 in slide block 24 are of such width as will produce a sliding fit on edges 14a and 14b of link rails 14. It is thus seen that slide block 24 may be longitudinally moved on the link rails within the confines of the looped ends 18 of jaws 12.

Actuating screw 28 which terminates in a chuck or collet 30 on one end is of some convenient diameter less than the metal thickness between recesses 26 of slide block 24 and carries thread 32 which engages a like thread through slide block 24 as shown on FIG. 2. The end of actuating screw 28 opposite from collet 30 terminates in a threaded diameter 34 which is of less diameter than thread 32. Crank 36 may be made of flat strap iron and is drilled and tapped at each end to a diameter and pitch as thread 34 on actuating screw 28. One end of the crank 36 is screwed onto threaded diameter 34 of actuating screw 28 and locked in place with nut 38. Handle 40 may be of any convenient shape and rotatably attached to crank 36 by means of flat-head screw 42, the threaded end of which is screwed through the remaining tapped hole in crank 36 and locked in place with nut 38. It will be noted that advancing the actuating screw exerts pressure to force the pins and sockets from the connector plug.

Referring to FIG. 4 and FIG. 8, collet 30 contains flat bottom bore 44 on the longitudinal axis of actuating screw 28. An arcuate groove 46 with flat side 48 accommodates lock spring 50 in a manner and for a purpose hereinafter described. The flat side 48 is cut deep enough to penetrate into the side of bore 44 as shown on FIG. 4 and FIG. 8.

The socket punch 52 as shown on FIG. 6 and the pin punch 54 as shown on FIG. 7 are interchangeable in collet 30 where they are locked in place with lock spring 50 as shown on FIG. 1. Referring to FIG. 6 socket punch 52 has a head 56 of such diameter as will slideably enter bore 44 of collet 30 and an arcuate groove 58 of the same

radius as the arcuate groove 46 on collet 30 and so located longitudinally that the arcuate groove 58 on the punch will coincide with the flat side 48 of collet 30 when the punch bottoms out in bore 44. Punch 52 is held in place by lock spring 50. Punch 52 has a shank 60 of a diameter slightly smaller than the outside diameter of the socket to be pushed from the connector plug and a nose 62 slightly smaller than the inside diameter of the same socket. Punch 52 has a chamfer 64 on the end of head 56 for easy entry into bore 44 of collet 30 and to spread the deformed portion 72 of lock spring 50 when the punch is inserted. Nose 62 has a rounded point 66 for easy entry into the socket to be pushed from the connector plug. Punches with various diameter shanks 60 and noses 62 are provided for use on various size sockets.

The pin punch 54 as shown on FIG. 7 is similar to the socket punch 52 except for bore 68 which is substituted for nose 62. Bore 68 on the longitudinal axis is of such depth that the end of the pin in the connector plug will engage the bottom of the bore 68. Punches with various diameter shanks and bores are provided for use on various designs and sizes of pins.

Referring to FIG. 5 lock spring 50 is formed from spring wire to substantially the shape shown. The wire diameter is such as will fit the arcuate groove 46 of collet 30 and the arcuate groove 58 of punches 52 and 54. The large semicircular portion 70 of the spring fits arcuate groove 46 of collet 30 and the deformed portion 72 fits in the flat side 48 of the collet and engages arcuate groove 58 of the punch and holds it in place. A punch may be released from the collet with an outward motion on tail 74 of lock spring 50 thereby disengaging the deformed portion 72 from the arcuate groove 58 of the punch.

In operation the removal tool is properly rotated on the plug and the slide block placed in such position as will permit the punch to make engagement with the pin or socket which is pushed from the connector plug by rotation of the actuating screw.

While a preferred form of the invention has been shown and described, various modifications and substitutions of equivalents will occur to those skilled in the art after a study of the foregoing disclosure; hence, the disclosure should be taken in an illustrative rather than in a limiting sense; and it is the desire and intent to reserve all modifications within the scope of the claim.

I claim:

A tool for removing pins and sockets from electrical connector plugs and the like comprising; a pair of holding jaws pivotally mounted between link rails, threaded sliding means guided between and supported by said link rails, threaded actuating screw engaging said threaded sliding means and terminating in turning means on one end and a collet at the other end, said collet being bored to receive the heads of interchangeable punches fitting various size pins and sockets, said punches being retained in said collet by locking means.

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