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(54) Latching system for electrical connectors

(57) A latching system is provided for electrical connectors having different latch mechanisms. A first connector includes a housing having a multi-function latching post thereon. The latching post has an internally threaded distal end for receiving a jack screw latch mechanism of a mating connector. The post also includes an external shoulder for receiving a spring arm latch mechanism of a different mating connector. The latching post further includes a reduced shank portion defining a second shoulder to facilitate mounting the first connector to a panel. A spring arm latch mechanism is located on one of the mating connectors via a mounting protrusion. The spring arm latch mechanism includes a mounting flange insertable beneath the mounting protrusion. The mounting flange has an upturned lip to prevent the flange from being inserted into the opening beneath the mounting protrusion.

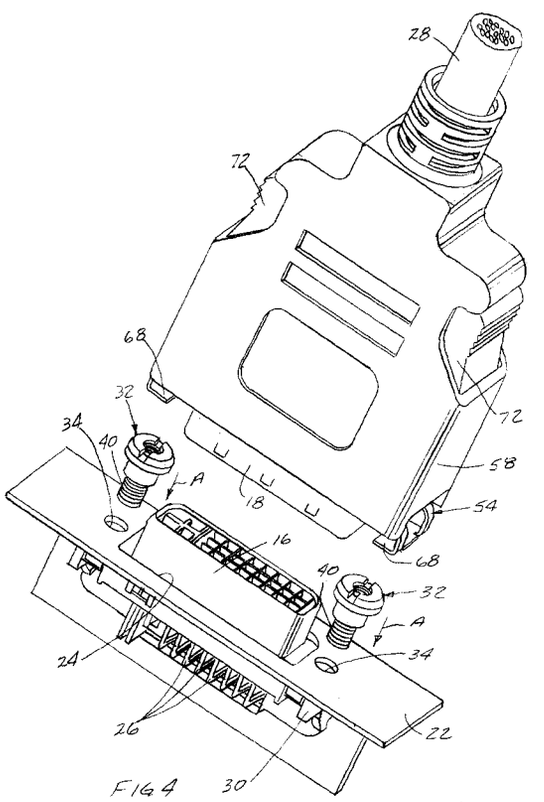

FIG 4

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Description

Field of the Invention

[0001] This invention generally relates to the art of electrical connectors and, particularly, to a connection system for electrical connectors having different latch mechanisms.

Background of the Invention

[0002] A typical electrical connector includes some form of dielectric housing for mating with a complementary connecting device, such as a mating connector. The housing mounts a plurality of terminals which make electrical contact with the terminals of the mating connector. The housing may be mounted on an extraneous support, such as a frame member, a panel or the like.

[0003] In many instances, it is highly desirable to provide some form of latching system between the mating connectors to hold the connectors in mated condition and prevent unintentional unmating. For example, resilient or spring-type latch arms have been used to hold a pair of connectors in mated condition. The resilient latch arms provide for ready unmating of the connectors when desired. A more secure latching system involves the use of jack screws extending from one connector and threaded into another connector of a mating pair thereof. The jack screws are not as easy to latch and unlatch as the resilient latch arms, but the jack screws provide a more rigid or secure connection. Unfortunately, differently configured connectors must be provided for each type of latching mechanism which often is not cost effective and creates compatibility and inventory problems. The present invention is directed to solving such problems by providing a common latching member which can be used with different latch mechanisms of various mating connectors.

[0004] In addition, as stated above, electrical connectors often are mounted to a frame member, panel or other chassis. This requires still further components in an electrical connection system which further increases the cost of the connector(s). The present invention is directed to solving these further problems by providing a latch member which not only accommodates different latch mechanisms but performs still a further function of mounting the respective connector to a panel or other chassis.

Summary of the Invention

[0005] An object, therefore, of the invention is to provide a new and improved latching system of the character described and, particularly, a latching system for electrical connectors having different latch mechanisms. In addition, the latching system is capable of providing a tight coupling between the mated electrical connectors that aids in minimizing, or even preventing, the EMI concerns associated with latching systems that do not provide a tight coupling between the mated connectors.

[0006] In the exemplary embodiment of the invention, the latching system includes a first connector having a housing with a latching member, also referred to as a latching post, thereon. The latching post includes an internally threaded distal end for receiving a jack screw latch mechanism of a mating connector. The latching post also has an external shoulder for receiving a spring arm latch mechanism of a different mating connector. Therefore, the latching post on the first connector does not have to be different for the different latch mechanisms of the mating connectors.

[0007] As disclosed herein, the external shoulder on the latching post is defined by an enlarged head at the distal end of the post. The housing of the first connector is elongated and includes a forwardly projecting mating portion. Preferably, a pair of the latching posts are spaced outwardly of opposite ends of the mating portion.

[0008] The latching post performs still a further function of mounting the first connector to a panel or other chassis. Specifically, the latching post includes an externally threaded shank portion for securing the post to the housing of the first connector. The externally threaded shank portion is of a reduced diameter to define a second shoulder to facilitate mounting the first connector to a panel by inserting the shank portion into a hole in the panel.

[0009] Another feature of the invention involves the spring arm latch mechanism on one of the mating connectors. The spring arm latch mechanism is mounted on a stamped and formed sheet metal component of the mating connector. The component includes a mounting protrusion formed out of an opening beneath the protrusion. The spring arm latch mechanism includes a mounting flange insertable beneath the mounting protrusion. The mounting flange has an upturned lip to prevent the flange from being inserted into or "stubbing" on the opening beneath the mounting protrusion.

[0010] Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

[0011] The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is perspective view of a pair of electrical

connectors in mated condition and embodying the concepts of the invention;
FIGURE 2 is a bottom plan view of the mated connectors of Figure 1;
FIGURE 3 is a perspective view of the connectors in unmated condition;
FIGURE 4 is a view similar to that of Figure 3, with the latching posts removed from the panel-mounted connector;
FIGURE 5 is a perspective view of one of the latching posts;
FIGURE 6 is an axial section taken generally along line 6-6 of Figure 5;
FIGURE 7 is a side elevational view of the mating connector, and including a section through the boot of the connector, to show the mounting of the spring arm latch mechanisms;
FIGURE 8 is a front perspective view of the mating connector, with the boot removed; and
FIGURE 9 is a perspective view of one of the spring arm latch mechanisms of the mating connector.

Detailed Description of the Preferred Embodiment

[0012] Referring to the drawings in greater detail, and first to Figures 1-3, the invention is embodied in an electrical connector assembly, generally designated 10, which includes a first or mounted connector, generally designated 12, and a second or mating connector, generally designated 14. Mounted connector 12 includes a forwardly projecting plug-type mating portion 16 for insertion into a forwardly projecting receptacle-type mating portion 18 of mating connector 14. Both mating portions as well as the connectors, themselves, have narrow elongated configurations. First connector 12 is mounted to a printed circuit board 20 and is mounted to and behind a panel 22, whereby mating portion 16 projects through an elongated opening 24 in the panel. The mounted connector includes a plurality of terminals 26 for insertion into appropriate holes 28 (Fig. 2) in circuit board 20 for connection, as by soldering, to appropriate circuit traces on the board and/or in the holes. Mating connector 14 includes a plurality of terminals (not visible in the drawings) terminated to a plurality of discrete electrical wires within an electrical cable 28. The respective terminals of the two connectors have contact portions exposed within mating portions 16 and 18 for engagement when the two connectors are mated as seen in Figures 1 and 2.

[0013] Mounted connector 12 includes a housing 30 which is substantially located behind panel 22. A pair of latching posts, generally designated 32, are spaced outwardly of the opposite ends of mating portion 16 to secure connector 12 to panel 22, with mating portion 16 extending through opening 24 in the panel. As shown in Figure 4, panel 22 includes a pair of mounting holes 34 spaced outwardly of opening 24 for receiving latching posts 32 therethrough.

[0014] Referring to Figures 5 and 6 in conjunction with Figures 1-4, each latching post 32 includes a body portion 36 (shown as cylindrical, but does not have to be cylindrical) which is disposed between an enlarged head portion 38 and a reduced shank portion 40. (Although the latching post 32 is shown as an integral piece, this invention is not limited to an integral latching post.) A first shoulder 42 is defined beneath head portion 38 between the head portion and body portion 36, and a second shoulder 44 is defined beneath cylindrical body portion 36 between the body portion and shank portion 40. The mounting post has an internally threaded bore 46 in its distal end, and shank portion 40 is externally threaded, as at 48. Finally, the end face of head portion 38 includes a cross slot 50 for accommodating a tool, such as a screwdriver, for rotating and mounting the latching post.

[0015] In operation, each latching post 32 is inserted into its respective mounting hole 34 in panel 22 in the direction of arrows "A" (Fig. 4). Externally threaded shank portions 40 of the latching posts are threaded into appropriate internally threaded bores (not visible in the drawings) in housing 30 of the mounted connector. The latching posts are rotatably tightened until second shoulders 44 of the latching posts abut against the front face of panel 22 to draw connector 12 tightly against the back side of the panel, with mating portion 16 of the connector projecting through opening 24 in the panel.

[0016] Mounting posts 32 in their mounted positions shown in Figures 1-3, now can interengage with different latch mechanisms of different mating connectors. Specifically, the internally threaded distal ends 46 of the latching posts can receive jack screw-type latch mechanisms of a mating connector. Such jack screw latch mechanisms are well known in the art and are not shown in the drawings. In addition, external shoulders 42 of latching posts 32 can receive the ends of spring arm latch mechanisms of a different mating connector. To that end, mating connector 14 is shown in Figures 1-4 with such spring arm type latch mechanisms, as described below.

[0017] More particularly, referring to Figures 7-9, a pair of spring arm latch mechanisms, generally designated 54, are mounted on opposite sides of mating connector 14. The mating connector includes a stamped and formed sheet metal shield 56 which surrounds a dielectric housing of the connector, the housing mounting the terminals of the connector which are terminated to the discrete electrical wires of electrical cable 28. An elastomeric strain relief boot 58 substantially surrounds mating connector 14 except for a pair of side openings 60 through which actuator portions of spring arm latch mechanisms 54 are exposed, as well as an end opening 62 through which mating portion 18 and latch portions of the spring arm mechanisms extend, as described hereinafter. A mounting protrusion 64, illustrated as being U-shaped in the described embodiment, is stamped and formed out of sheet metal shield 56 at each side

thereof. When the U-shaped mounting protrusions are stamped and formed, openings are created beneath the protrusions. The resulting openings are not visible in the drawings because they are blocked by the spring arm latch mechanisms.

[0018] Shell 56 also could be a plastic housing portion whereby U-shaped mounting protrusions 64 are molded integrally therewith. When the plastic component is molded, openings might be formed beneath the U-shaped mounting protrusions to accommodate molding core pins, for instance. These openings, just like the openings formed by stamping and forming the U-shaped mounting protrusions 64, would cause problems in inserting tongues 80 of the spring arm latch mechanisms through the U-shaped protrusions without outwardly bent lips 84 preventing the tongues from "stubbing" in the openings.

[0019] Each spring arm latch mechanism 54 is stamped and formed of sheet metal material and includes an elongated body or arm portion 66 having an inwardly formed latch portion 68 at one end and inwardly turned and folded back spring portion 70 at an opposite end. A plastic actuator button 72 (Figs. 7 and 8) is located about the end of arm portion 66 opposite latch portion 68, leaving spring portion 70 exposed. A retention tab 74 (Fig. 9) is formed out of an opening 76 to facilitate rigidly securing actuator button 72 to the respective spring arm latch mechanism. Inwardly formed latch portion 68 has a latch hook 78, illustrated as being a semispherical, or U-shaped, recess, which embraces a respective one of the latching posts 32. Specifically, recess 78 is sized and configured to embrace body portion 36 (Figs. 5 and 6) of one of the latching posts beneath circular shoulder 42 of the post.

[0020] Each spring arm latch mechanism 54 is mounted to its respective side of shield 56 of mating connector 14, by means of a mounting flange or tongue 80 stamped and inwardly formed out of an opening 82 in arm portion 66. The mounting tongue has an inclined latch boss 86 and an upwardly or outwardly bent lip 84 at the distal end thereof. When tongue 80 is inserted beneath U-shaped mounting protrusion 64 in the direction of arrow "B" (Fig. 8), outwardly bent lip 84 prevents the tongue from being inserted into the opening formed beneath the U-shaped protrusion. Without the outwardly bent lip, the tongue would have a tendency to "stub" against the edge of the opening and prevent the spring arm latch mechanism from being fully mounted to the connector.

[0021] When spring arm latch mechanisms 54 are mounted to the sides of shield 56 of mating connector 14, inclined bosses 86 snap behind U-shaped mounting protrusions 64 as shown clearly in Figures 7 and 8. Spring portions 70 abut against the sides of shield 56. Therefore, when it is desired to unmate connector 14 from mounted connector 12, actuator buttons 72 are squeezed inwardly in the direction of arrows "C" (Fig. 7) against the spring biasing of spring portions 70. This causes latch portions 68 at the opposite ends of the spring arm latch mechanisms to move outwardly in the direction of arrows "D", out of engagement behind shoulders 42 of latching posts 32, whereupon the connectors can be unmated. When pressure is released from actuator buttons 72, spring portions 70 bias the spring arm latch mechanisms back to their latching conditions.

[0022] It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

Claims

1. A latching system for electrical connectors having different latch mechanisms, comprising:

   a first connector including a housing having a latching post thereon, the latching post including
   an internally threaded distal end for receiving a jack screw latch mechanism of a mating connector, and
   an external shoulder for receiving a spring arm latch mechanism of a different mating connector.

2. The latching system of claim 1 wherein said external shoulder is defined by an enlarged head at said distal end of the latching post.

3. The latching system of claim 1 wherein said latching post includes an externally threaded shank portion for securing the post to the housing of the first connector.

4. The latching system of claim 3 wherein said externally threaded shank portion of the latching post is of a reduced diameter to define a second shoulder.

5. The latching system of claim 1 wherein said housing of the first connector is elongated, and including a pair of said latching posts near opposite ends of the elongated housing.

6. The latching system of claim 5 wherein said first connector includes a forwardly projecting mating portion, and the latching posts are spaced outwardly of opposite ends of the mating portion.

7. The latching system of claim 1 wherein said spring arm latch mechanism includes a latch hook for embracing the latching post behind said external

shoulder.

8. The latching system of claim 7 wherein said latch hook is U-shaped.

9. The latching system of claim 2 wherein said enlarged head includes a slot.

10. The latching system of claim 1 wherein said spring arm latch mechanism is mounted on a stamped and formed sheet metal component of said different mating connector, the component including a U-shaped mounting protrusion formed out of an opening beneath the protrusion, and the spring arm latch mechanism including a mounting flange insertable beneath the U-shaped mounting protrusion, the mounting flange having an out-turned lip to prevent the flange from being inserted into the opening beneath the U-shaped protrusion.

11. A latching system for electrical connectors having different latch mechanisms, comprising:

a first connector including a housing having a latching post thereon, the latching post including
an internally threaded distal end for receiving a jack screw latch mechanism of a mating connector,
an enlarged head at said distal end defining an external shoulder for receiving a spring arm latch mechanism of a different mating connector,
an externally threaded shank portion for securing the post to the housing of the first connector, and
said externally threaded shank portion being of a reduced diameter to define a second shoulder.

12. The latching system of claim 11 wherein said housing of the first connector is elongated, and including a pair of said latching posts near opposite ends of the elongated housing.

13. The latching system of claim 12 wherein said first connector includes a forwardly projecting mating portion, and the latching posts are spaced outwardly of opposite ends of the mating portion.

14. A latching post for an electrical connector to facilitate latching the connector to complementary mating connectors having different latch mechanisms, the latching post comprising:

an internally threaded distal end for receiving a jack screw latch mechanism of a mating connector; and
an external shoulder for receiving a spring arm latch mechanism of a different mating connector.

15. The latching post of claim 14 wherein said external shoulder is defined by an enlarged head at said distal end of the latching post.

16. The latching post of claim 14 wherein said latching post includes an externally threaded shank portion for securing the post to the housing of the electrical connector.

17. The latching post of claim 16 wherein said externally threaded shank portion of the latching post is of a reduced diameter to define a second shoulder.

18. The latching post of claim 15 wherein said enlarged head includes a slot.

19. An electrical connector, comprising:

a shell including a mounting protrusion formed out of an opening beneath the protrusion; and
a spring latch arm for latching the connector to a complementary connecting device, the latch arm including a mounting flange insertable beneath said mounting protrusion, and the mounting flange having an upturned lip to prevent the flange from being inserted into the opening beneath the mounting protrusion.

20. The electrical connector of claim 19 wherein said shell is stamped and formed of sheet metal material.

21. The electrical connector of claim 19 wherein said mounting protrusion is U-shaped.

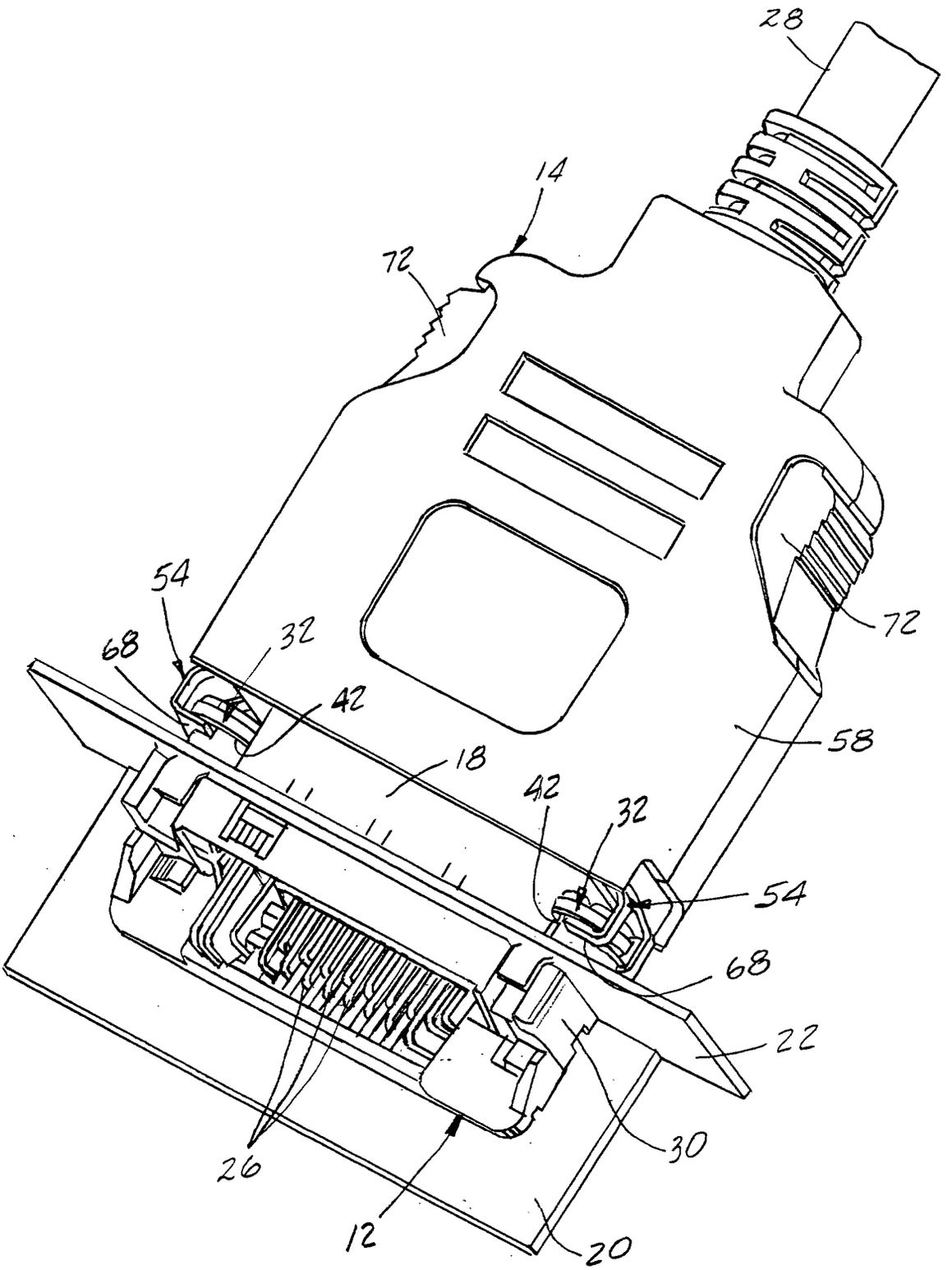

FIG. 1

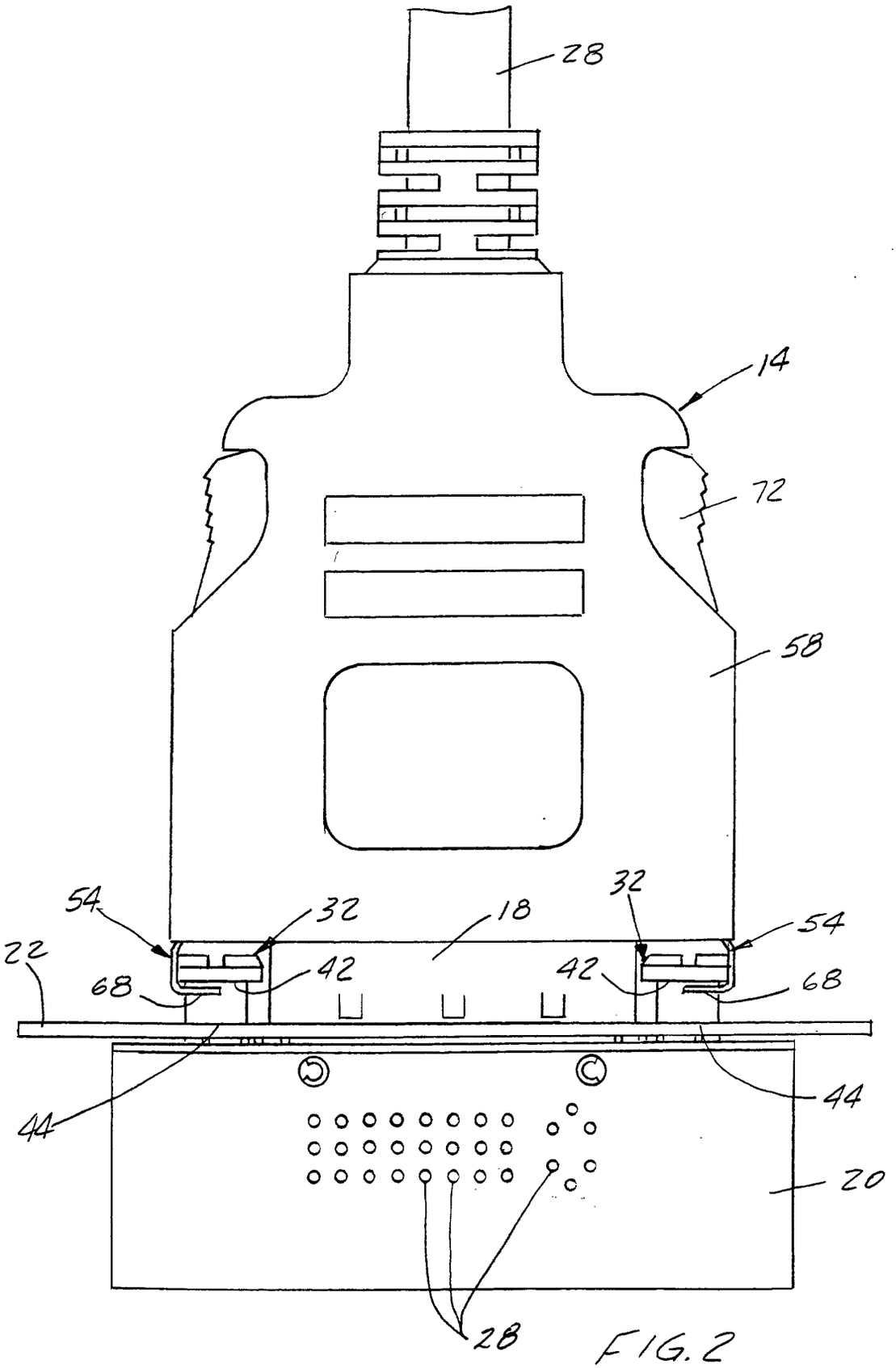

FIG. 2

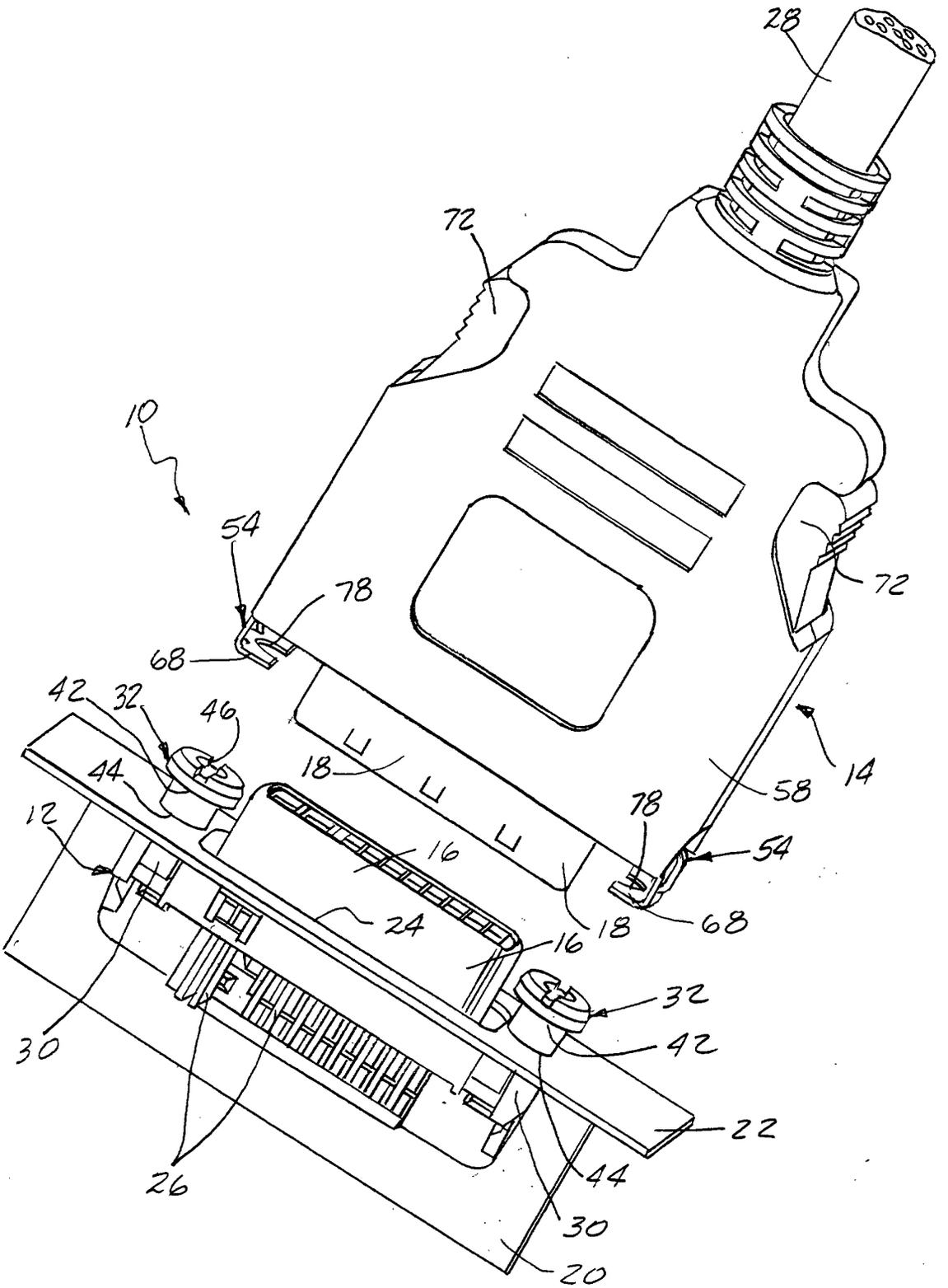
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FIG. 3

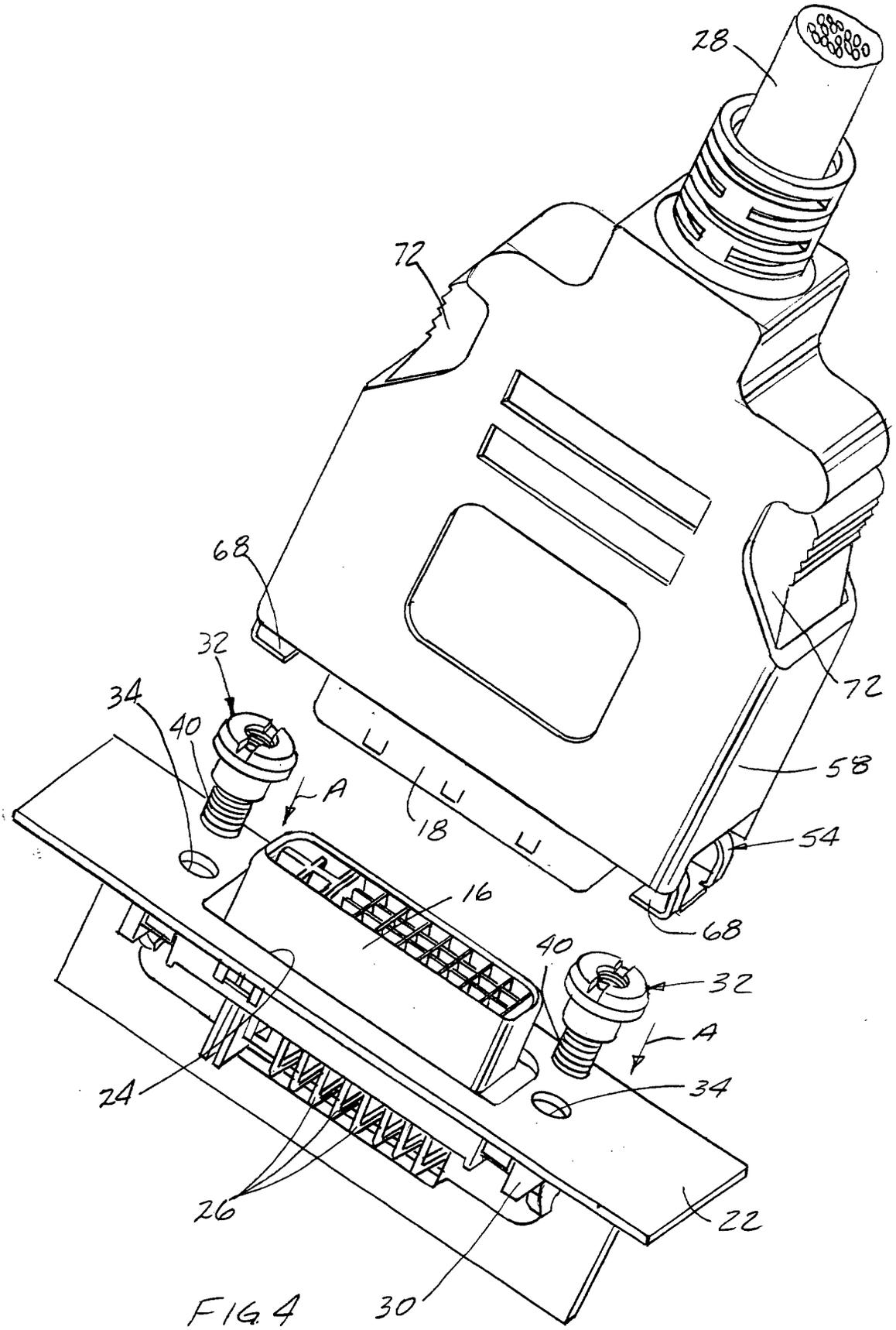

FIG. 4

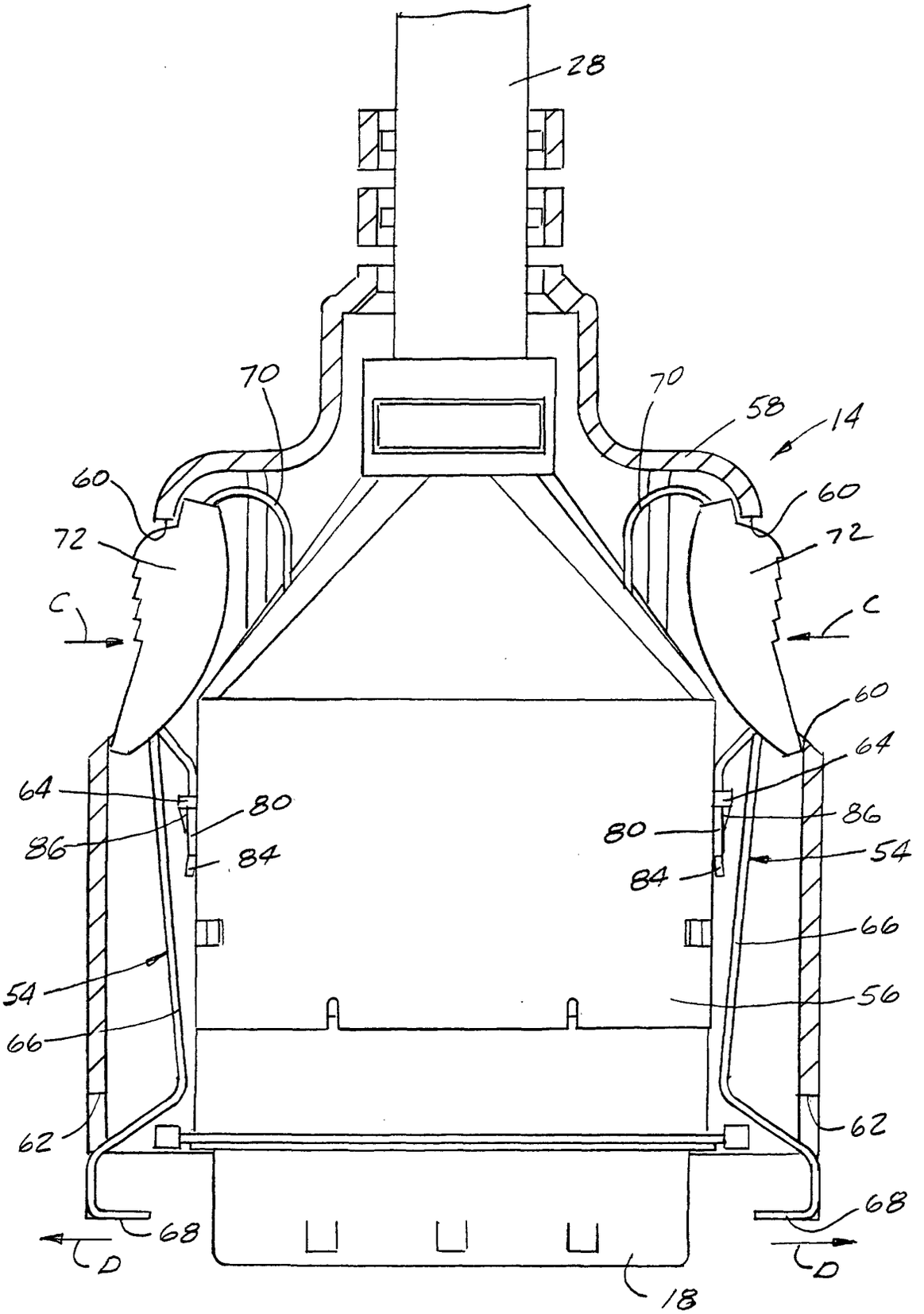
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FIG. 7

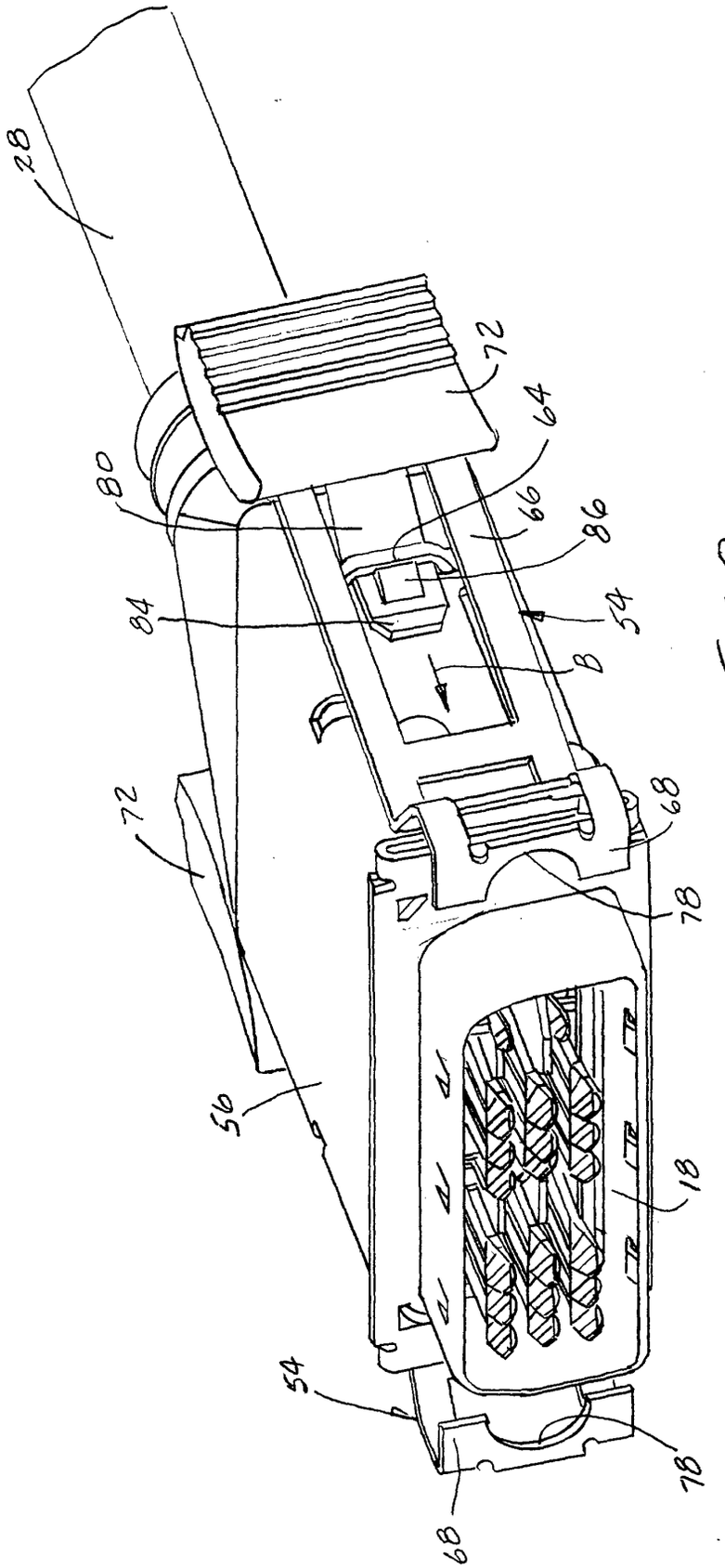

FIG. 8

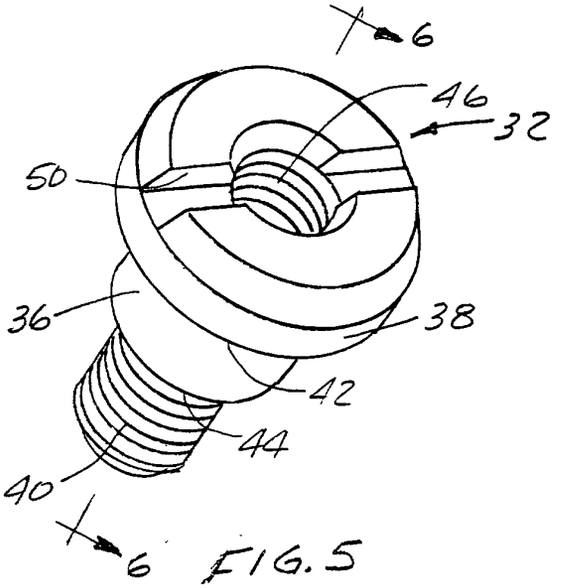

FIG. 5

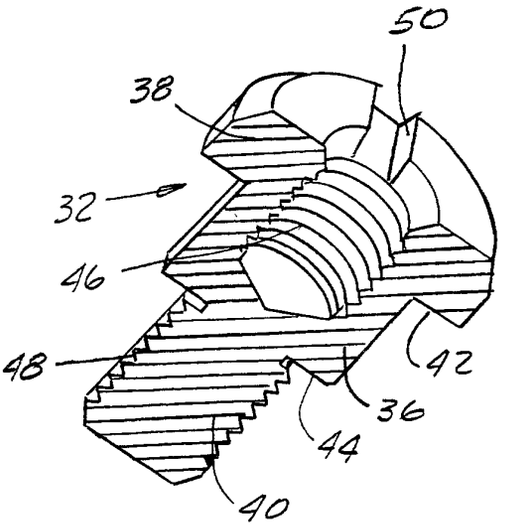

FIG. 6

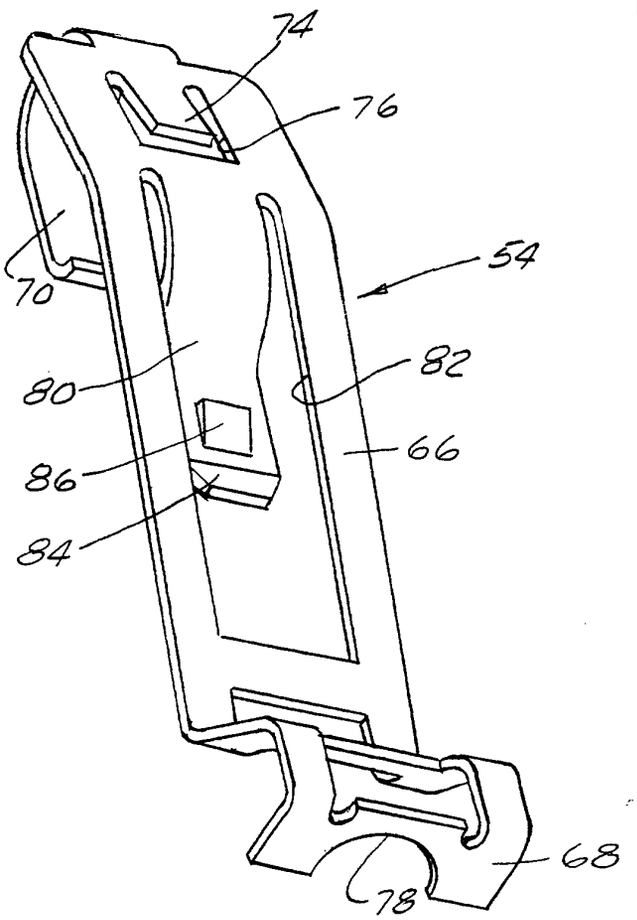

FIG. 9