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(54) Connector having guide bush with internal mounting engagement

(57) An electrical connector (10) has at least one guide bush (28) mounted upon a front face of an electrical connector in an appropriately configured, internally threaded recess in the front face. The guide bush (28) is adapted for receiving therein a guide pin from a mating electronic component. The guide bush (28) comprises an integral, generally cylindrical body having a head portion (32) of a first diameter and an externally threaded tail portion (10) of a second diameter smaller than the first diameter. The generally cylindrical body has a coaxial bore (40) at least substantially therethrough and the bore has an engageable portion (42) for engaging a correspondingly shaped insertable jig, whereby the jig may be inserted into the bore for rotatingly engaging the engageable portion thereof and rotatingly mounting the guide bush (28) onto the connector by rotating the externally threaded tail portion (10) of the guide bush (28) into the internally threaded recess of the connector.

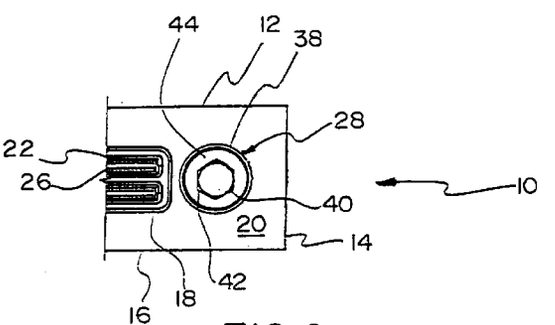

FIG.2

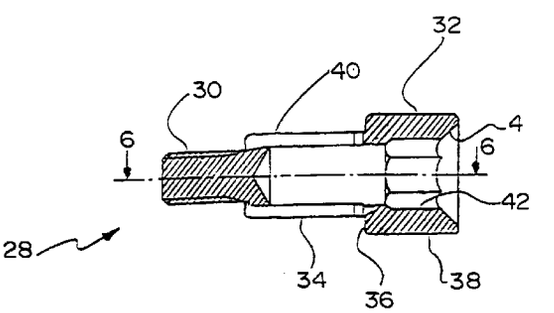

FIG.5

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Description

FIELD OF THE INVENTION

The present invention relates to electrical connectors and, more particularly, electrical connectors including mounting hardware or guide bushes.

BACKGROUND OF THE INVENTION

There are a large number and a considerable variety of input/output electrical connectors having guide bushes attached to the front faces thereof for facilitating mating with corresponding electronic devices, such as computers, computer peripherals, and other electrical connectors. Although the guide bushes are mounted to an electrical connector, a metal panel is typically sandwiched or secured between the head of the guide bush and the connector. The guide bushes facilitate mating of the connectors by providing, in conjunction with a corresponding guide pin, an alignment means for the mating portions of the connector and the mating component. Furthermore, the guides bushes may additionally provide supplemental grounding contact between the mated components as well as a metal panel such as of a computer or computer peripheral.

A typical electrical connector of the input/output type comprises an insulative housing having a front face and a mating portion projecting forwardly from the front face, a plurality of terminals mounted in the housing, the terminals generally having contact portions disposed along the mating portion, and a conductive shield on the front face of the housing, the shield generally including a shroud encircling the mating portion and a flange integrally formed with the shroud for overlying at least a portion of the front face of the connector. Typically, an internally threaded cylindrical recess extends through the flange and front face on either side of the shroud to provide a pair of recesses into which externally threaded guide bushes may be mounted. Generally, guide bushes have a relatively narrow externally threaded tail section for spirally engaging the internally threaded recesses, as well as a relatively wider polygonal head section for mounting adjacent the front face and projecting forwardly from the front face to provide a tapered guide pin-receiving aperture and axial cylindrical bore for enhancing mating capability with a corresponding electrical connector or electronic device.

Guide bushes typically include a hexagonal outside surface which is engaged by a rotating tool to mount the guide bush into internally threaded recesses of the electrical connector. The rotating tool typically includes some type of nut driving socket or other type of wrench-like device. In order to provide sufficient clearance for the rotating tool between the head of the guide bush and the projecting shroud, the recesses that receive the guide bushes must be disposed sufficiently far from the shroud.

The unfortunate result of disposing the guide bush recesses farther away from the shroud so that the circumscribing mounting tool may engage the head of the guide bush is that the connector becomes wider than would otherwise be necessary. Such additional width is undesirable since it results in a larger connector which is particularly undesirable in applications such as computer components.

Although some guide bushes have utilized both hexagonal shaped heads together with a screw slot across the front face thereof, this has proven to be unsatisfactory in some applications. In addition, U.S. Patent No. 5,340,329 discloses an electrical connector having latch hardware that includes a cylindrical body and a screw head shaped tip. This structure does not, however, function in the same manner as a guide bush of the present invention.

SUMMARY OF THE INVENTION

In order to address the above-described connector width problem, applicant discloses and claims herein an electrical connector having at least one guide bush for mounting upon a front face of the electrical connector into an appropriately configured, internally threaded recess in the front face, the guide bush for receiving therein a guide pin from a mating electronic component, the guide bush comprising an integral, generally cylindrical body having a head portion of a first width and an externally threaded tail portion of a second width smaller than the first width, the generally cylindrical body having a coaxial bore substantially therethrough, the bore having an engageable portion for engaging with a correspondingly shaped insertable jig, whereby the jig may be inserted into the bore for rotatingly engaging the engageable portion thereof and rotatingly mounting the guide bush onto the front face by rotating the externally threaded tail portion of the guide bush into the internally threaded recess in the front face.

Also disclosed and claimed herein are a guide bush for use with the described electrical connector and a connector having a structure appropriate for use with the new guide bush. The guide bush is for mounting upon a front face of the electrical connector into an appropriately configured, internally threaded recess in the front face, the guide bush for receiving therein a guide pin from a mating electronic component, the guide bush comprising an integral, generally cylindrical body having a head portion of a first width and an externally threaded tail portion of a second width smaller than the first width, the generally cylindrical body having a coaxial bore substantially therethrough, the bore having an engageable portion for engaging with a correspondingly shaped insertable jig, whereby the jig may be inserted into the bore for rotatingly engaging the engageable portion thereof and rotatingly mounting the guide bush onto the front face by rotating the externally threaded tail portion of the guide bush into the internally

threaded recess in the front face.

The connector has an insulative housing having a front face and a mating portion projecting forwardly from the front face, a plurality of terminals mounted in the housing, the terminals having contact portions disposed along the mating portion, and a conductive shield including a shroud generally encircling the mating portion of the housing and a flange integrally formed with the shroud, the flange overlying at least a portion of the front face, the shroud meeting the flange along the base of the shroud. A generally cylindrical recess extends through the flange of the shield and the front face at the portion where the flange overlies the front face, the recess configured for receiving therein a guide bush. The radius of the generally cylindrical recess at the front face is smaller than the minimum distance between the perimeter of the recess at the front face and the base of the shroud.

Thus, by providing a connector wherein the guide bushes are mounted by a tool which internally, rather than externally, engages the bushes, significantly less clearance between the exterior of the bushes and the shroud encircling the mating portion need be provided. The result is significant space savings and a more efficiently designed, miniaturized electrical input/output connector.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front elevational view of a broken away portion of a prior art connector.

FIGURE 2 is a front elevational view of a broken away portion of a connector in accordance with a preferred embodiment of the invention.

FIGURE 3 is a side elevational view of a guide bush in accordance with a preferred embodiment of the invention.

FIGURE 4 is a front elevational view of a guide bush in accordance with a preferred embodiment of the invention.

FIGURE 5 is a cross-sectional view of the guide bush of FIGURE 4 taken substantially along the line 5-5, as shown in FIGURE 4.

FIGURE 6 is a cross-sectional view of the guide bush of FIGURE 4 taken substantially along the line 6-6, as shown in FIGURE 5.

FIGURE 7 is a front elevational view of a broken away portion of a connector in accordance with a first alternative embodiment of the invention.

FIGURE 8 is a cross-sectional view of a guide bush in accordance with a first alternative embodiment of the invention.

FIGURE 9 is a front elevational view of a broken away portion of a connector in accordance with a second alternative embodiment of the invention.

FIGURE 10 is a side elevational view of a guide bush in accordance with a second alternative embodiment of the invention.

FIGURE 11 is a cross-sectional view of a guide bush in accordance with a second alternative embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 2 shows a broken away portion of an electrical input/output connector 10 in accordance with the present invention. The connector 10 has an insulative housing 12 having a front face 14 and a mating portion 22 projecting forwardly from the front face 14. A plurality of terminals are mounted in the housing 12, and the terminals have contact portions 26 disposed along the mating portion 22. A conductive shield 16 sits on the front face 14 of the housing 12, the shield 16 including a shroud 18 which generally encircles the mating portion 22 of the housing 12 and a flange 20 integrally formed with the shroud 18 for overlying at least a portion of the front face 14. The shield 16 is preferably one-piece, and the shroud 18 meets the flange 20 along the base of the shroud.

FIGS. 1 and 2 contrast a connector 10 in accordance with the invention (FIG. 2) with a typical prior art connector 60 (FIG. 1). One difference that can be readily seen is that the shroud 62 of the prior art connector is generally trapezoidal while the shroud 18 of the inventive connector 10 is substantially rectangular. While the generally rectangular shape is preferable for some applications, it is not a requirement of the invention described herein, and in fact, the invention contemplates a trapezoidal shroud in alternative embodiments thereof.

Other differences between the prior art connector 60 and the inventive connector 10 relate to the configuration of the guide bushes 28, 64 and the lateral spacing of the guide bush recesses from the shrouds.

Generally, the front face of a prior art input/output connector 60 has an internally-threaded guide bush recess on both sides of the shroud 62. The flange of the shield may also extend over the recesses, but the flange would then have an aperture matching the opening of the recess so as not to cover the recess and prevent mounting of a guide bush therein. A guide bush having an externally-threaded tail portion may then be mounted onto the front face of the connector by spirally threading the tail portion into the guide bush recess of the connector. The guide bush, in addition to having a relatively narrower tail portion for insertion into the recess, also has a relatively wider head portion for coming flush with a panel adjacent the flange portion of the shield overlying the front face of the connector when the guide bush is mounted into the recess. The head portion of the guide bush has traditionally had a hexagonal perimeter 68 (as shown in FIG. 1) and a cylindrical bore 66 axially therethrough or mostly therethrough. Such a guide bush is typically mounted to the front face of the connector 60 by using a circumscribing rotating tool, such as a nut

driving socket, a box-driver or a wrench.

By contrast, the inventive guide bush 28, as shown in FIGS. 2-6, has a relatively narrow, cylindrical, externally-threaded tail portion 30, a relatively wide head portion 32 of generally circular perimeter 38, and an intermediately-sized cylindrical intermediate portion 34 therebetween. The guide bush recesses of the inventive connector 10 are stepped so as to accommodate receiving therein cylindrical segments of distinct radii, i.e., both the tail portion 30 and the intermediate portion 34 of the guide bush 28. Importantly, the portion of the recess which accommodates the tail portion 30 is internally threaded so that the guide bush may be rotatably mounted therein. The guide bush 28 is fully mounted onto the flange 20 of the shield 16 and front face 14 of the connector 10 when the rear surface 36 of the head portion 32 of the guide bush 28 comes flush to a panel (not shown) against which the flange of the shield 16 is mounted.

As seen in FIGS. 2, 4, 5 and 6, the generally cylindrical bore 40 has a tapered aperture 44 and a hexagonal engagement portion 42 within the head portion of the guide bush 28. A correspondingly-shaped insertable jig or tool may be inserted into the bore 40 for rotatingly engaging the hexagonal engaging portion 42 and thereby rotatingly mounting the guide bush 28 onto the flange 20 of the shield 16 which is generally adjacent the front face 14 of the connector 10. In this manner, the guide bush 28 is rotatingly engaged from inside the axial bore 40 rather than being circumscribingly engaged at its perimeter as in the prior art. This manner of engagement removes the necessity for providing as much clearance between the most radially outward point of the head portion of the guide bush and the projecting shroud of the shield.

A first alternative embodiment of the invention is shown in FIGS. 7 and 8. The first alternative embodiment of the connector 110 is shown in Figure 7 to have a guide bush 112 in accordance with the invention. The guide bush includes a relatively narrow, externally threaded tail portion 114 and relatively wider generally cylindrical head portion 116. Unlike the previously described embodiment, the first alternative embodiment lacks an intermediate portion and a correspondingly stepped recess in the housing. Like the previously described embodiment, however, the first alternative embodiment of the guide bush 112 has a substantially circular perimeter 120 of the head portion 116. A coaxial bore 122 extends substantially through the length of the guide bush 112, and a tapered opening 126 to the bore facilitates its engagement with a guide pin from a mating electronic component. At the rear of the guide bush 112 inscribed into the axial bore 122 is a hexagonal engagement portion 124. Engagement portion 124 is engageable with a correspondingly shaped insertable jig or tool, whereby the jig may be inserted into the bore for rotatingly engaging the engageable portion 124 and rotatingly mounting the guide bush 112 onto the connector by rotating the externally threaded tail portion 114 of the guide bush 112 into the internally threaded recess of the connector 110.

A second alternative embodiment of the invention is shown in FIGS. 9-11. In the second alternative embodiment, the connector 210 has an inventive guide bush 212, as shown in FIG. 9. The guide bush 212 has a relatively narrow, externally threaded tail portion 214 and a relatively wider, generally cylindrical head portion 216. As with the first alternative embodiment, the second alternative embodiment does not have an intermediate portion or corresponding stepped recesses for retaining the guide bushes 212. Similar to the two previously described embodiments, the second alternative embodiment of the guide bush has a generally cylindrical head portion 216 having a rear surface 218 which comes flush with a panel against which the flange of the front face of the connector abuts when the guide bush 212 is fully mounted onto the connector 210. The guide bush 212 has a generally cylindrical bore 222 most of the way axially therethrough. At the end of the bore 222, in the tail portion 214 of the guide bush 212, is a cross-shaped or Phillips-tipped engagement portion 224. The Phillips-tipped engagement portion 224 maybe engaged by a correspondingly shaped insertable jig or tool whereby the jig rotatingly engages the engagement portion 224 to rotatingly mount the guide bush onto the connector by rotating the externally threaded tail portion 214 of the guide bush 212 into the internally threaded recess of the connector 210.

In still another alternate embodiment (not shown), the cross-shaped or Phillips-tipped engagement portion 224 of Figure 9-11 is replaced with a hexagonal shape such as that shown in Figures 7 and 8. Instead of having the through hole or bore of Figures 7 and 8, however, the end or bottom of the bore 222 is closed and has a hexagonal shape rather than the cross-shaped or Phillips-tipped engagement portion 224 of Figures 9-11.

The inventive connector and guide bush provide significant advantages over previous input/output connectors. In particular, the inventive connector and guide bush provide a smaller, space-efficient input/output interconnection between electrical components. In particular, the inventive connector requires less distance between the perimeter of the recess and the base of the shroud than the radius of the recess itself at the front face of the connector. This geometric spacing on the front face of the connector provides for an extremely compact and space-efficient connector. In a preferred embodiment, the minimum distance between the perimeter of the recess at the front face and the base of the shroud is no greater than one-sixteenth of an inch.

The invention contemplates a multitude of embodiments, such as ones wherein the guide bushes are mounted on the flange and front face of the connector by internally or inscribingly engaging the coaxial bore thereof rather than by externally or circumscribingly engaging the perimeter of the guide bush. Thus, a more

compact shape for the perimeter of the guide bush may be chosen and smaller clearance is required between the outermost point of the guide bush and the most proximate point of the shroud.

From the foregoing, it will be appreciated that the invention provides a novel electrical connector, and the invention is not limited to the embodiments described herein. Specific examples of alternative embodiments considered to be within the scope of the invention include embodiments where the internally engageable portion is proximate to the tapered aperture of the bore in the guide bush and where the engagement portion is disposed in the remote end of the bore from the aperture. Also, the invention contemplates the use of differently shaped engageable portions, such as polygonal shapes other than hexagons, or any other suitable shape for rotating engagement. Other modifications to the preferred embodiments may also be made within the scope of the invention. The invention is defined by the following claims.

Claims

1. A guide bush for mounting through a front face of an electrical connector into an appropriately configured, internally threaded recess through said front face, said guide bush being adapted for receiving therein a guide pin from a mating electronic component, said guide bush comprising:

   an integral, generally cylindrical body having a head portion of a first diameter and an externally threaded tail portion of a second diameter smaller than said first diameter;
   said generally cylindrical body having a coaxial bore at least substantially therethrough, said bore having an engageable portion for engaging with a correspondingly shaped insertable jig, whereby said jig may be inserted into said bore for rotatingly engaging said engageable portion thereof and rotatingly mounting said guide bush onto said connector by rotating said externally threaded tail portion of said guide bush into said internally threaded recess.

2. A guide bush in accordance with claim 1 wherein said engageable portion of said bore is disposed within said head portion of said cylindrical body.

3. A guide bush in accordance with claim 2 wherein said engageable portion of said bore is a generally polygonal inscribed segment of said bore.

4. A guide bush in accordance with claim 3 wherein said generally polygonal inscribed segment is generally hexagonal.

5. A guide bush in accordance with claim 1 wherein said engageable portion of said bore is disposed within said tail portion of said cylindrical body.

6. A guide bush in accordance with claim 5 wherein said engageable portion of said bore is a generally polygonal inscribed segment of said bore.

7. A guide bush in accordance with claim 6 wherein said generally polygonal inscribed segment is generally hexagonal.

8. A guide bush in accordance with claim 5 wherein said engageable portion of said bore is an appropriately shaped recess at the end of said bore remote from said front face of said connector, said appropriately shaped recess for accepting therein a tip of said insertable jig, whereby said tip of said jig may engage said appropriately shaped recess to rotate said guide bush.

9. A guide bush in accordance with claim 8 wherein said appropriately shaped recess is shaped for accepting therein and engaging with a Phillips-tipped jig.

10. An electrical connector having a pair of guide bushes mounted at opposite ends of a front face of said electrical connector in appropriately configured, internally threaded recesses, each said guide bush being adapted for receiving therein a guide pin from a mating electronic component, said guide bush comprising:

    an integral, generally cylindrical body having a head portion of a first diameter and an externally threaded tail portion of a second diameter smaller than said first diameter;
    said generally cylindrical body having a coaxial bore at least substantially therethrough, said bore having an engageable portion for engaging with a correspondingly shaped insertable jig, whereby said jig may be inserted into said bore for rotatingly engaging said engageable portion thereof and rotatingly mounting said guide bush onto said connector by rotating said externally threaded tail portion of said guide bush into said internally threaded recess.

11. An electrical connector in accordance with claim 10 wherein said engageable portion of said bore is disposed within said head portion of said cylindrical body.

12. An electrical connector in accordance with claim 11 wherein said engageable portion of said bore is a generally polygonal inscribed segment of said bore.

13. An electrical connector in accordance with claim 12

wherein said generally polygonal inscribed segment is generally hexagonal.

14. An electrical connector in accordance with claim 10 wherein said engageable portion of said bore is disposed within said tail portion of said cylindrical body.

15. An electrical connector in accordance with claim 14 wherein said engageable portion of said bore is a generally polygonal inscribed segment of said bore.

16. An electrical connector in accordance with claim 15 wherein said generally polygonal inscribed segment is generally hexagonal.

17. An electrical connector in accordance with claim 14 wherein said engageable portion of said bore is an appropriately shaped recess at the end of said bore remote from said front face of said connector, said appropriately shaped recess for accepting therein a tip of said insertable jig, whereby said tip of said jig may engage said appropriately shaped recess to rotate said guide bush.

18. An electrical connector in accordance with claim 17 wherein said appropriately shaped recess is shaped for accepting therein and engaging with a Phillips-tipped jig.

19. An electrical connector in accordance with claim 10 wherein said electrical connector further comprises a conductive shield on said front face, said shield including a substantially rectangular shroud generally encircling a mating portion of said connector.

20. An electrical connector comprising:

an insulative housing having a front face and a mating portion projecting forwardly from said front face;

a plurality of terminals mounted in said housing, said terminals having contact portions disposed along said mating portion; and

a conductive shield on said housing, said shield including a shroud generally encircling said mating portion of said housing and a flange integrally formed with said shroud, said flange overlying at least a portion of said front face, said shroud meeting said flange along the base of said shroud;

wherein a generally cylindrical recess extends through said flange of said shield and said front face at said portion where said flange overlies said front face, said recess configured for receiving therein a guide bush;

wherein the radius of said generally cylindrical recess at said front face is smaller than the minimum distance between the perimeter of said recess at said front face and said base of said shroud.

21. An electrical connector in accordance with claim 20 wherein said shroud is substantially rectangular.

22. An electrical connector in accordance with claim 20 wherein said cylindrical recess has at least one step therein such that said recess comprises a plurality of generally cylindrical segments of distinct radii.

23. An electrical connector in accordance with claim 20 wherein said minimum distance between the perimeter of said recess at said front face and said base of said shroud is no greater than one-sixteenth of an inch.

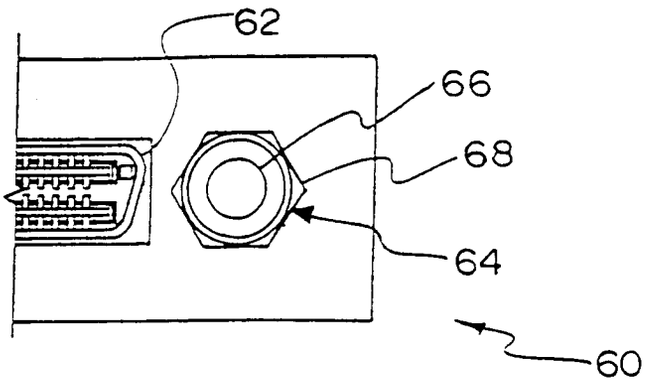

FIG.1

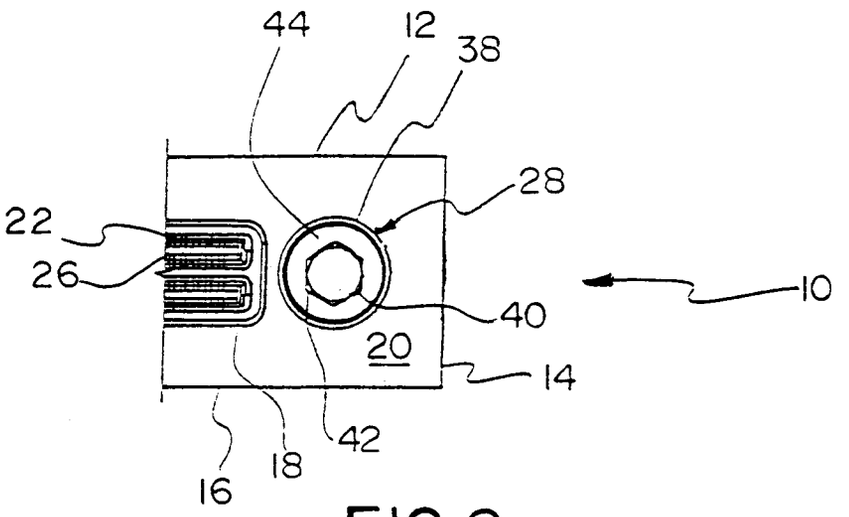

FIG.2

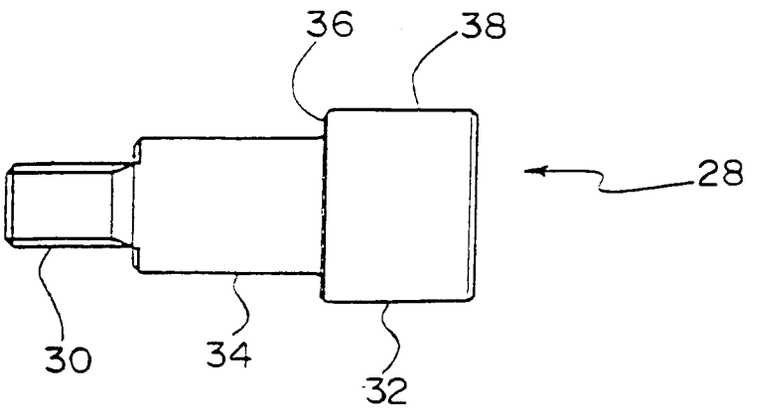

FIG.3

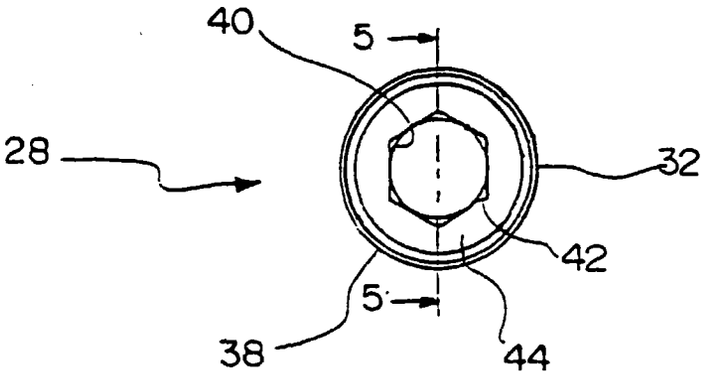

FIG.4

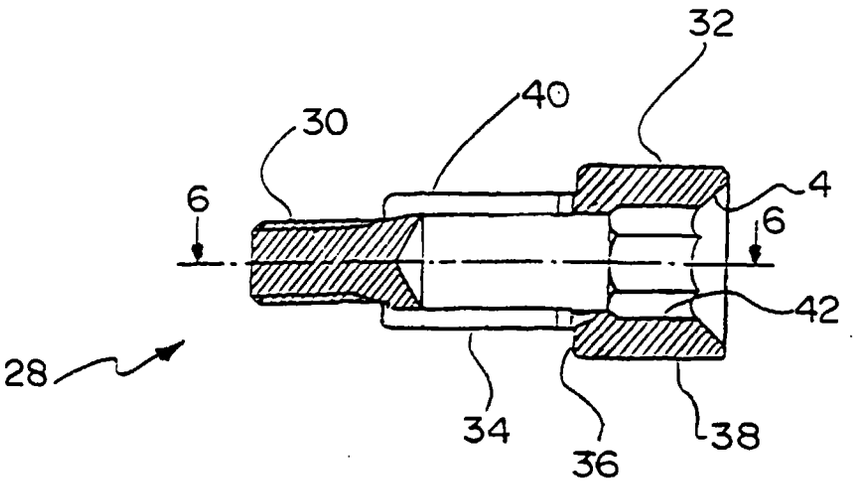

FIG.5

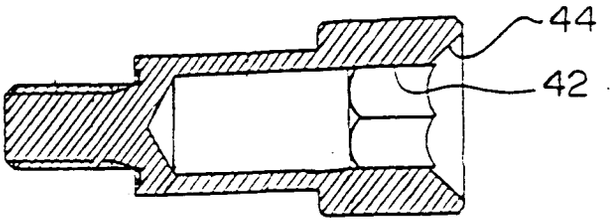

FIG.6

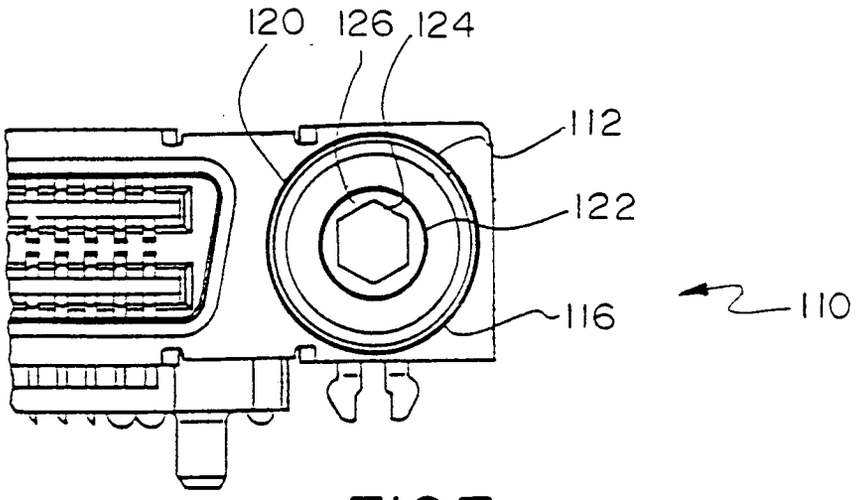

FIG.7

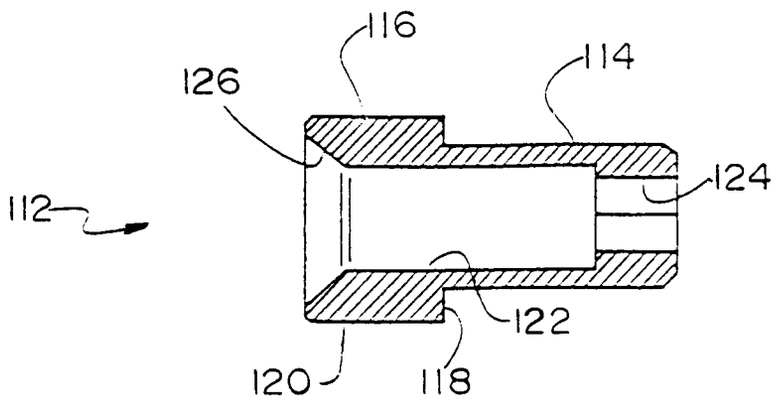

FIG.8

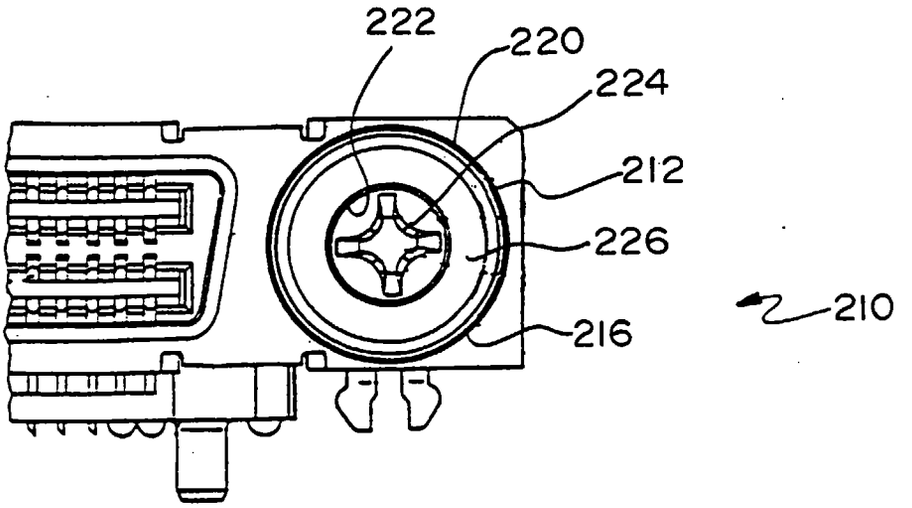

FIG.9

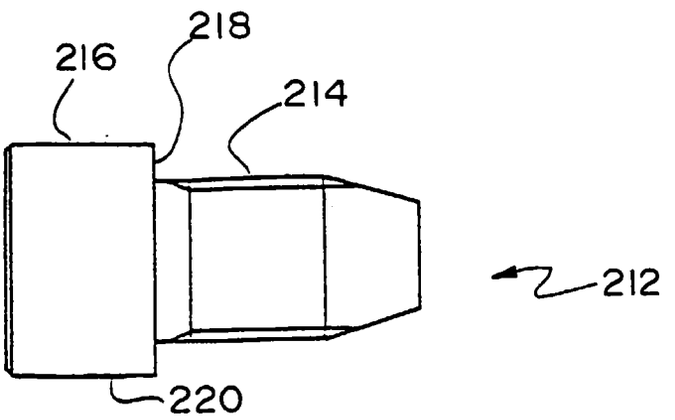

FIG.10

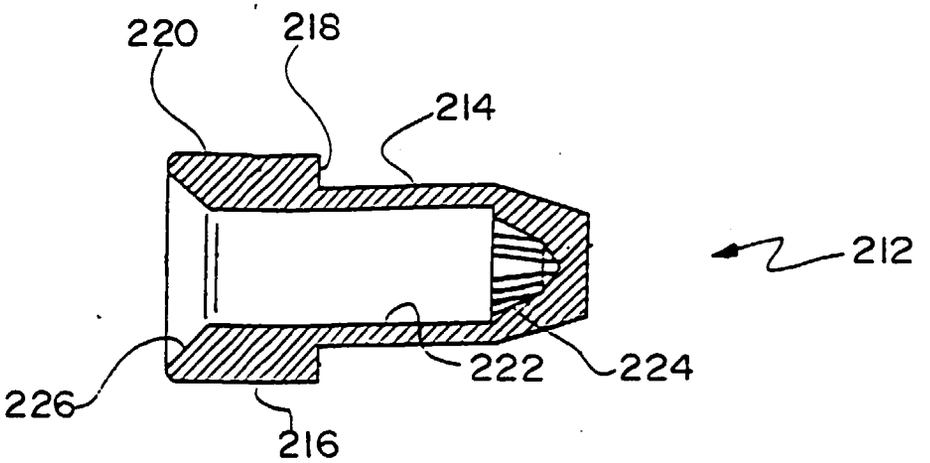

FIG.11