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(54) Electrical connector assembly for mounting on a printed circuit board and method for mounting it

(57) An electrical connector assembly for facilitating mounting an electrical connector on a top surface of a printed circuit board. A connector housing is adapted for mounting at the edge of the circuit board. A plurality of terminals are mounted on the housing, with tail portions of the terminals projecting from the housing for solder termination to the top surface of the circuit board. A removable cover is mounted on the housing and includes a support arm portion projecting from the housing and adapted for engagement with a bottom surface of the printed circuit board. With the circuit board so positioned, the board is sandwiched between the tail portions of the terminals and the support arm portion of the cover at the edge of the board. A method of fabricating an electrical connector and circuit board assembly is also disclosed.

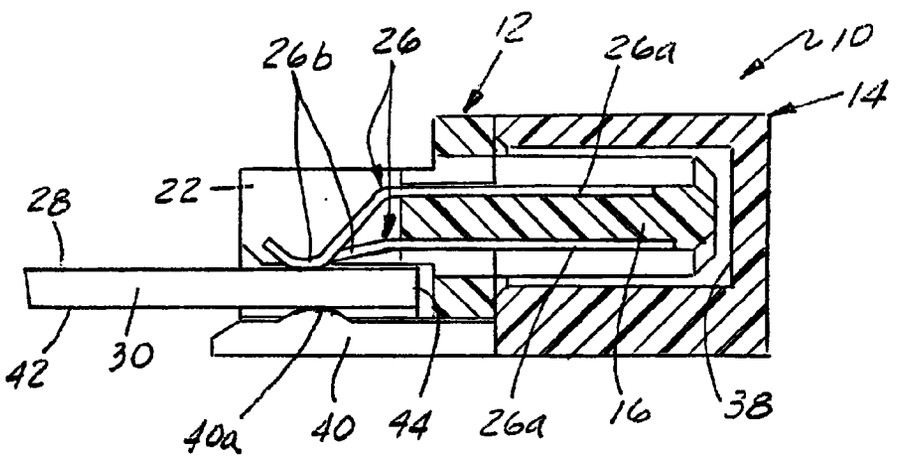

FIG. 4

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Description

Field of the Invention

[0001] This invention generally relates to the art of electrical connectors and, particularly, to a circuit board mounted electrical connector assembly including a cover, the cover performing a plurality of distinct functions.

Background of the Invention

[0002] A wide variety of electrical connectors are used for mounting on printed circuit boards to connect terminals of the connectors to circuit traces on the boards. One type of such electrical connector includes an elongate dielectric housing mounting a plurality of conductive terminals, with the terminals having solder tails projecting from the housing for soldering to circuit traces on the printed circuit board. The connector may be adapted for mounting on a top surface, for instance, of the printed circuit board at an edge of the board.

[0003] Typically, connectors of the character described have some form of means for holding the connector housing to the printed circuit board during the soldering process. For instance, the elongated housing may be provided with a forwardly extending mating end and one or more rearwardly extending mounting flanges or bosses having depending mounting pegs for insertion into appropriate mounting holes in the printed circuit board. In many applications, however, it is desireable to minimize the number of holes in a circuit board because such holes can complicate the design of the circuit boards as well as the assembly of the various components including the connectors.

[0004] Another problem involves transporting the connector assembly during processing. For instance, it is known to secure an electrical connector by a vacuum-suction nozzle, whereby the connector is brought to a selected position relative to a printed circuit board by the vacuum-suction nozzle. The electrical connector simply is released from the nozzle by stopping application of the negative pressure thereto. However, the connector housing often must be unduly enlarged to provide a flat surface against which the vacuum-suction nozzle can operate.

[0005] Still further, during fabrication of electrical connector assemblies, such as during soldering processes, or during storage or shipment of such assemblies, it is desirable to protect the connector assemblies, particularly the thin, fragile terminals at the mating end of the connector. The terminals need to be protected from being bent or broken by inadvertent contact with foreign objects, as well as simply covering and protecting the terminals from the accumulation of dust or other foreign debris.

[0006] The present invention is directed to solving the above myriad of problems by providing a cover for an electrical connector, with the cover performing multiple functions of protecting portions of the connector, providing a pick-up surface for a vacuum-suction nozzle and also providing support for the connector on a printed circuit board, such as at an edge of the board.

Summary of the Invention

[0007] An object, therefore, of the invention is to provide a new and improved electrical connector assembly, including a cover, for facilitating mounting an electrical connector on a top surface of a printed circuit board, such as at an edge of the board.

[0008] In the exemplary embodiment of the invention, the connector assembly includes a dielectric connector housing adapted for mounting at the edge of the printed circuit board. A mating end of the housing projects away from the edge. A plurality of conductive terminals are mounted on the housing and tail portions of the terminals project from the housing for solder termination to the top surface of the printed circuit board. A cover is mounted on the housing about at least a portion of the mating end thereof. The cover includes a support arm portion projecting from the bottom of the housing and adopted for engagement with a bottom surface of the printed circuit board. With a circuit board so positioned, the board is sandwiched between the tail portions of the terminals and the support arm portion of the cover at the edge of the board.

[0009] As disclosed herein, the cover includes a plurality of the support arm portions for engagement with the bottom surface of the circuit board. In addition, a plurality of support flange portions are spaced along the housing for positioning over the top surface of the printed circuit board. The tail portions of the terminals are disposed between the spaced support flange portions. The support arm portions of the cover include rounded surfaces for engaging the bottom surface of the printed circuit board on tangents of the rounded surfaces.

[0010] The terminals include contact portions exposed on the mating end of the connector housing. The cover substantially surrounds the mating end and protects the contact portions of the terminals. The cover has a top planar surface for engagement by a vacuum-suction pick-up nozzle. The cover includes an outwardly projecting tongue at each opposite side thereof for press-fitting within opposing grooves in the housing.

[0011] The invention also contemplates a method of fabricating an electrical connector and circuit board assembly. The dielectric connector housing, the terminals and the cover are provided as described above. The edge of the printed circuit board is inserted into a mouth between the support arm portions of the cover and the tail portions of the terminals. The tail portions then are soldered to circuit traces on the top surface of the printed circuit board. The cover can remain in position for protecting the connector during shipping and

handling, and the cover thereafter can be removed when the connector assembly is finally assembled in an electronic apparatus.

[0012] 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

[0013] 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 a perspective view of the electrical connector assembly incorporating the concepts of the invention, with the cover removed from the housing;

FIGURE 2 is a perspective view of the assembly with the cover mounted on the housing;

FIGURE 3 is a perspective view of the assembly mounted at an edge of a printed circuit board;

FIGURE 4 is a vertical section, on an enlarged scale, taken generally along 4-4 of Figure 3;

FIGURE 5 is a perspective view of the connector assembly mounted on the printed circuit board, with the cover removed, such as after the terminals are soldered to the circuit board; and

FIGURE 6 shows the connector and printed circuit board being mounted on a casing of a computer disk drive.

Detailed Description of the Preferred Embodiment

[0014] Referring to the drawings in greater detail, and first to Figures 1 and 2, the invention is embodied in an electrical connector assembly, generally designated 10, which includes a dielectric or insulataive connector housing, generally designated 12, and a cover, generally designated 14. Figure 1 shows the cover about to be assembled to the housing in the direction of arrow "A." Figure 2 shows the cover fully assembled to the housing.

[0015] Dielectric connector housing 12 of connector assembly 10 includes a forwardly projecting mating end formed by a pair of forwardly projecting mating portions 16. The entire housing, including mating portions 16, is a one-piece structure molded of dielectric material such as plastic or the like. Forwardly projecting mating portions 16 are disposed between opposite side portions 18 of the housing. The side portions are generally channel-shaped to define inwardly opening grooves 20 for receiving opposite sides of a mating connector (not shown). Housing 12 includes a plurality of rearwardly projecting support flanges or bosses 22 which are configured for positioning over and engaging a top surface of a printed circuit board, as described hereinafter.

[0016] At this point, it should be noted that rearwardly projecting flanges or bosses 22 of connector housing 12 often are provided in prior art electrical connectors to provide a support means for downwardly projecting mounting pegs which are effective for mounting the connector assembly on a printed circuit board. However, in the present invention, the outer support flanges 22 are provided with holes 24. As shown in Figure 6, these holes are used to mount the connector and circuit board on an electronic apparatus and, therefore, neither the support flanges nor the rest of the connector are used to provide mounting pegs for the connector.

[0017] Referring to Figure 4 in conjunction with Figures 1 and 2, connector housing 12 mounts a plurality of terminals, generally designated 26. The terminals includes contact portions 26a disposed on opposite sides of forwardly projecting mating portions 16 of the housing. The terminals also include tail portions 26b projecting rearwardly of the housing for solder termination to appropriate circuit traces on a top surface 28 of a printed circuit board 30 (Fig. 4). The terminals are stamped and formed from conductive sheet metal material.

[0018] Referring back to Figure 1, cover 14 of connector assembly 10 includes an elongate, central body portion 32 having tongues or wings 34 projecting from opposite sides thereof. Tongues 34 are sized for press-fitting into grooves 20 of housing 12 to establish a frictional engagement between the cover and the housing. Central body portion 32 has a top planar surface 36 of a significant size for engagement by an appropriate vacuum-suction nozzle. As seen in Figure 4, central body portion 32 of the cover is generally hollow to define an interior cavity 30 for receiving forwardly projecting mating portions 16 of the connector housing. The cover thereby substantially surrounds the mating portions 16 and protects contact portions 26a of terminals 26 from damage by engaging extraneous foreign objects as well as providing a dust cover about the mating portions and the contacts.

[0019] Referring specifically to Figures 1 and 4, cover 14 includes three support arm portions 40 projecting from the bottom of the cover into engagement with a bottom surface 42 of printed circuit board 30. Therefore, as clearly seen in Figure 4, the printed circuit board is sandwiched between tail portions 26b of terminals 26 and flanges 22 locate at the top surface 28 of circuit board 30 and support arm portions 40 of cover 14 located at the bottom surface 42 of circuit board 30. Support arm portions 40 have rounded top surfaces 40a which engage the bottom surface 42 of the circuit board inwardly of an edge thereof and along the top of the rounded surfaces. This provides single point (or line) contact between the rounded surfaces and the bottom

surface of the circuit board to ensure full contact of the top surface of the board with tail portions 26b of terminals 26.

[0020] Figures 3 and 4 show the entire electrical connector assembly 10, including housing 12 and cover 14, mounted at edge 44 of printed circuit board 30. Support arm portions 40 (Fig. 4) support the printed circuit board so that tail portions 26b of the terminals can be soldered to top surface 28 of the circuit board, as the support arm portions engage bottom surface 42 of the circuit board in a supporting manner. After the tail portions of the terminals are soldered to the top surface of the printed circuit board, cover 14 then can be removed in the direction of arrow "B" as shown in Figure 5 with the connector 12 supported on the board solely by the strength of the solder joints at the tail portions 26b of the terminals. The subassembly of housing 12, terminals 26 and circuit board 30 then can be mounted in an appropriate electronic apparatus as shown in Figure 6.

[0021] More particularly, Figure 6 shows a casing, generally designated 43, such as a disk drive casing of a computer. The casing has an interior cavity 44 and a pair of upstanding solid bosses 46 having axial threaded bores 48. The subassembly of connector housing 12 and printed circuit board 30 are mounted on casing 43 by a pair of mounting screws 50 inserted through holes 24 in support flanges 22 of the housing. Of course, the circuit board is also provided with appropriate mounting holes in alignment with holes 24 of the housing and bores 48 of the casing. Through such a configuration, only two holes are required in the circuit board yet the connector is securely fastened to the subassembly shown in Figure 6 once the screws 50 are in place.

[0022] The use of such terms as "top", "bottom", "above", "below" and the like herein and in the claims hereof is not intended to be limiting in any way. These terms are used solely for purposes of providing a clear and concise understanding of the disclosed and claimed invention. It is fully understandable that the electrical connector assembly disclosed and claimed herein is omnidirectional both in fabrication and use.

[0023] 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. An electrical connector assembly (10) for facilitating the mounting of an electrical connector on a top surface (28) of a printed circuit board (30), adjacent an edge (44) of the board, comprising:

   a dielectric connector housing (12) adapted for mounting on said top surface (28) of the circuit board (30) adjacent the edge (44) of the printed circuit board (30), with a mating end (162) of the housing projecting away from the edge, said housing (12) including at least one support flange portion (22) projecting in a direction opposite said mating end and over said top surface (28) of the circuit board;

   a plurality of conductive terminals (26) mounted on the housing (12), each said terminal having a tail portion (26b) projecting from the housing for solder termination to the top surface (28) of the printed circuit board (30); and

   a removable cover (14) mounted on the housing (12) about at least a portion of the mating end (16) thereof, the cover (14) including a support arm portion (40)projecting from the bottom of the housing and adapted for engagement with a bottom surface (42) of the printed circuit board (30), whereby upon mounting the assembly (10) on the board (30), the board is sandwiched between the tail portions (26b) of the terminals (26) and the support arm portion (40) of the cover (14) at the edge (44) of the board.

2. The electrical connector assembly of claim 1, including a plurality of support flange portions (40) projecting in a direction opposite said mating end (16) and spaced along the housing (12) with the tail portions (26b) of the terminals (26) being disposed therebetween.

3. The electrical connector assembly of claim 1 wherein said cover (14) substantially surrounds the mating end (16) of the connector housing (12).

4. The electrical connector assembly of claim 1 wherein said terminals (26) include contact portions (26a) exposed on the mating end (16) of the connector housing (12).

5. The electrical connector assembly of claim 4 wherein said cover (14) substantially surrounds the mating end (16) of the connector housing.

6. The electrical connector assembly of claim 1 wherein said connector housing (12) and said cover (14) include complementary interengaging tongue-and-groove members for mounting the cover to the housing.

7. The electrical connector assembly of claim 6 wherein said cover (14) includes an outwardly projecting tongue (34) at each opposite side thereof press-fit within opposing grooves (20) in the housing.

8. The electrical connector assembly of claim 1, including a plurality of said support arm portions (40) spaced along the housing (12).

9. The electrical connector assembly of claim 1 wherein said support arm portion (40) includes a rounded surface (40a) for engaging the bottom surface (42) of the printed circuit board (30) on a tangent of the rounded surface.

10. The electrical connector assembly of claim 1 wherein said cover (14) has a planar surface (36) of a size sufficient for engagement by an appropriate vacuum-suction nozzle.

11. The electrical connector assembly of claim 2 wherein said mating portion (16) and said support flange portions (22) extend in opposite directions, and said opposite directions are generally parallel to the top surface (28) of the circuit board (30) to which the connector assembly (10) is adapted to be mounted.

12. A method of fabricating an electrical connector and circuit board assembly, comprising the steps of:

providing a printed circuit board (30) having oppositely facing top and bottom surfaces (28,42) and a plurality of surface mount pads located adjacent an edge (44) of said top surface (28);
providing a connector assembly (10) adapted for mounting at the edge (44) of the printed circuit board (30), said assembly (10)including an insulative housing (12) having a mating portion (16) and a plurality of conductive terminals (26) mounted on said housing, each terminal including a mating section (26a) located in said mating portion (16) of said housing (12) and a tail section (26b) projecting rearwardly from the housing (12) and adapted for solder termination to respective ones of the surface mount pads on the top surface (28) of the printed circuit board (30), and a removable cover (14) secured to the housing (12) with a support portion (44) of the cover projecting from the housing and spaced from the tail sections (26b) of the terminals (26) to define a mouth therebetween;
inserting the edge (44)of the printed circuit board (30) into said mouth and aligning said tail sections (26b) with respective ones of said surface mount pads; and
soldering the tail portions (26b) of the terminals to the surface mount pads of the printed circuit board (30) as said support portion (40) of the cover (14) engages a bottom surface (42) f the circuit board (30) to support the board during the soldering process.

13. The method of claim 12 further including removing the cover (14) after the soldering process.

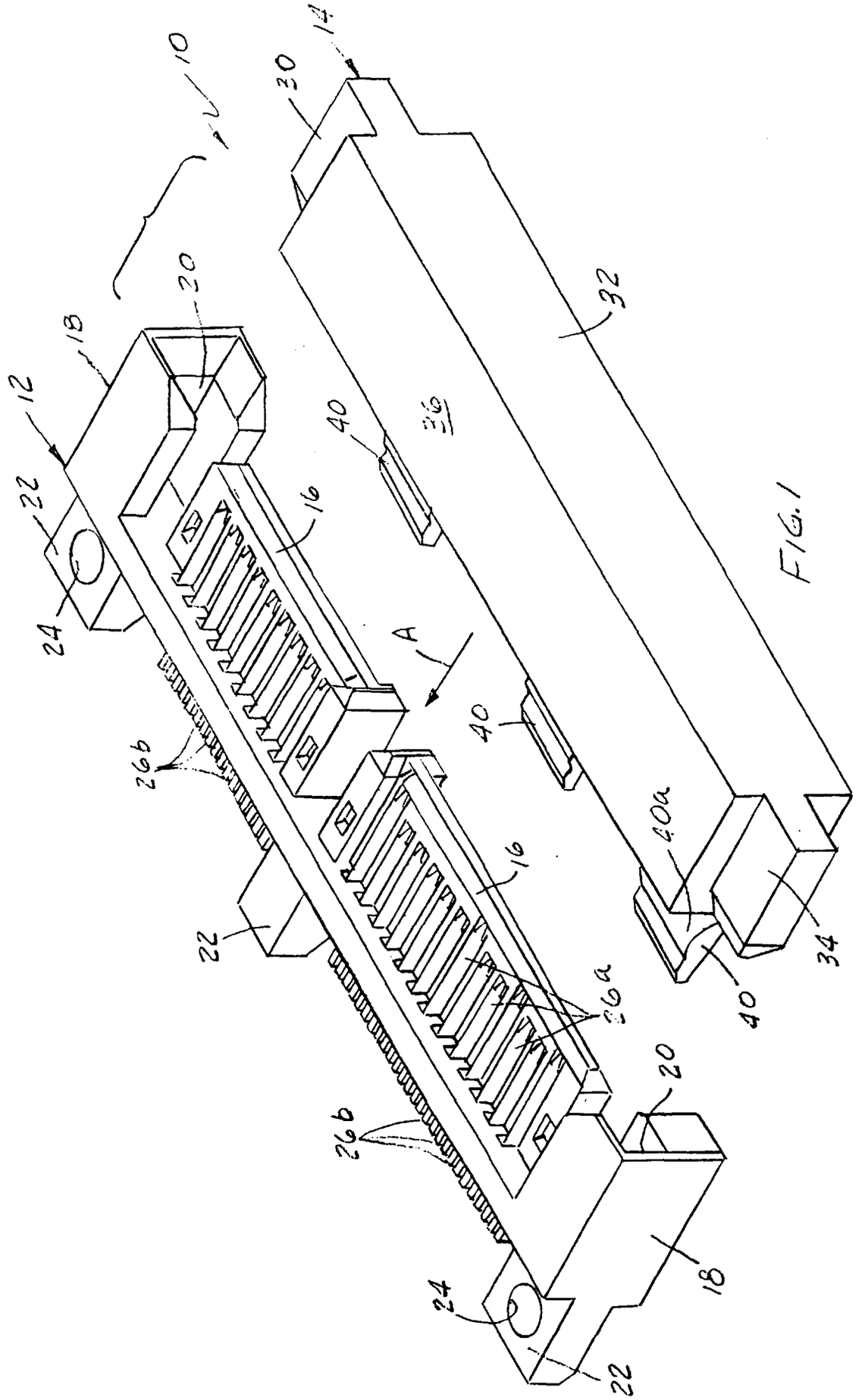

FIG. 1

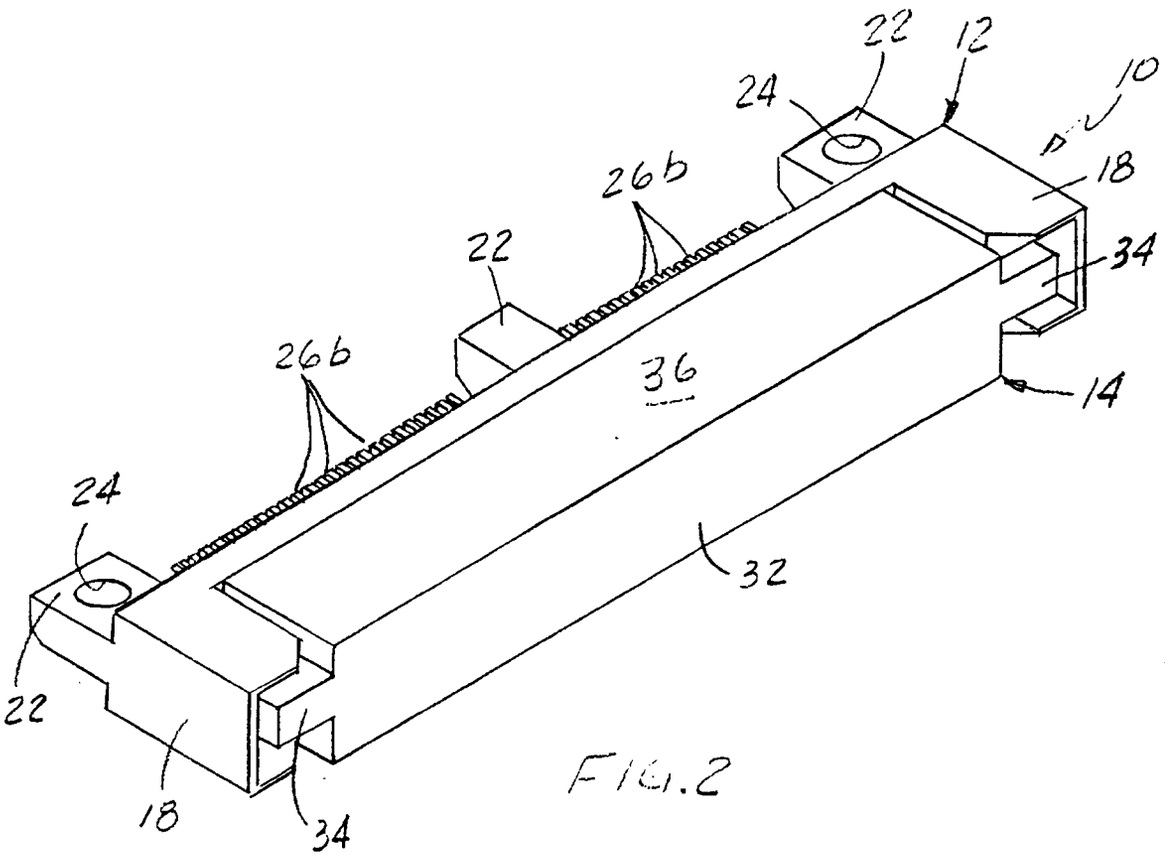
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FIG. 2

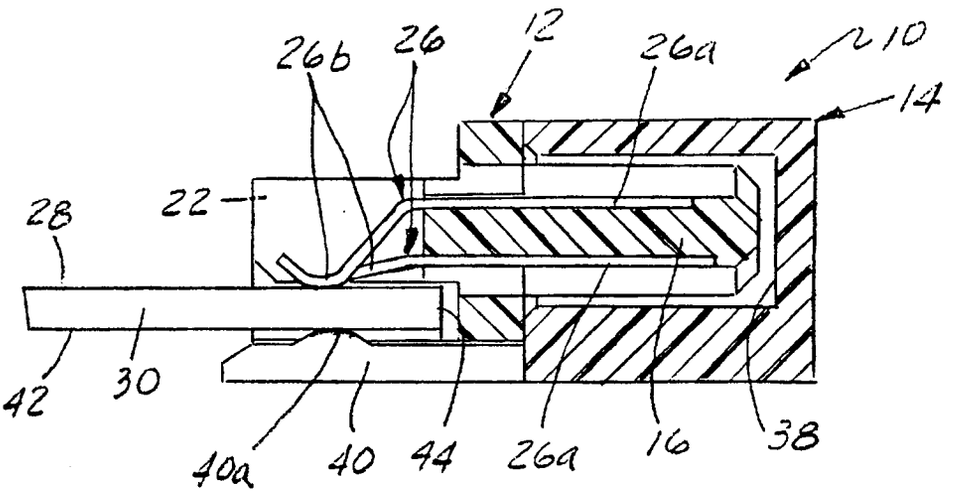
26b
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FIG. 4

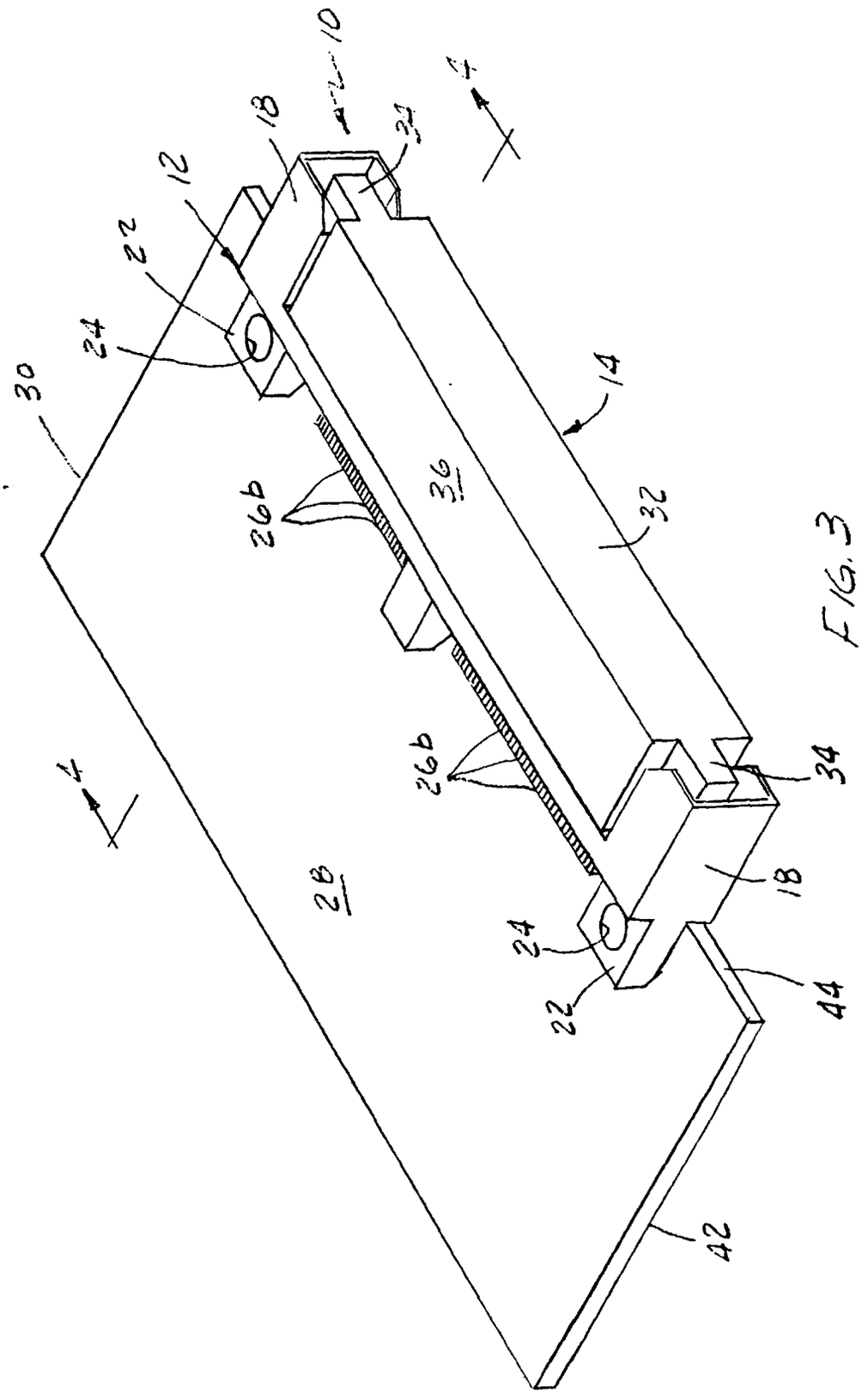

FIG. 3

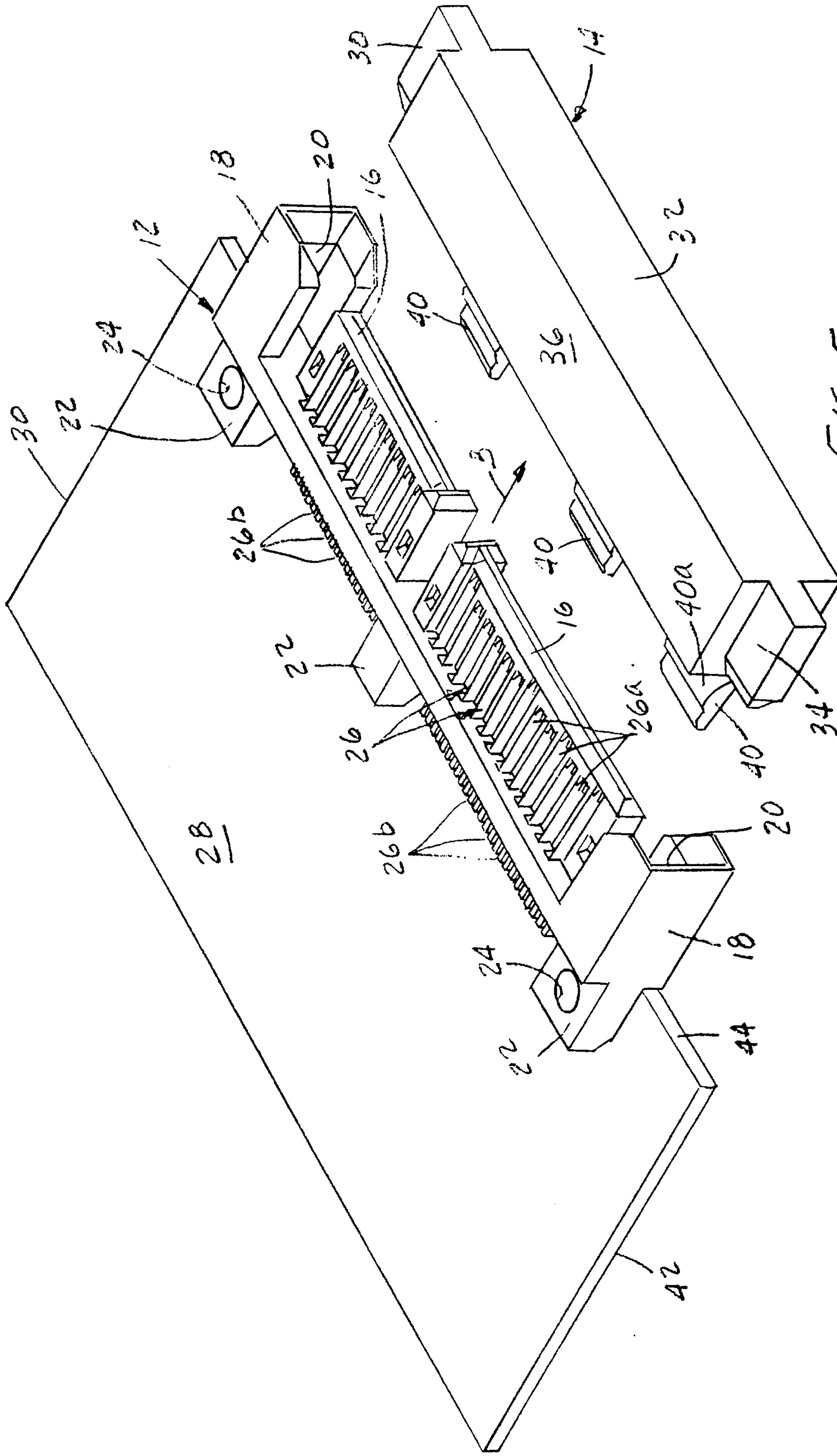

FIG. 5

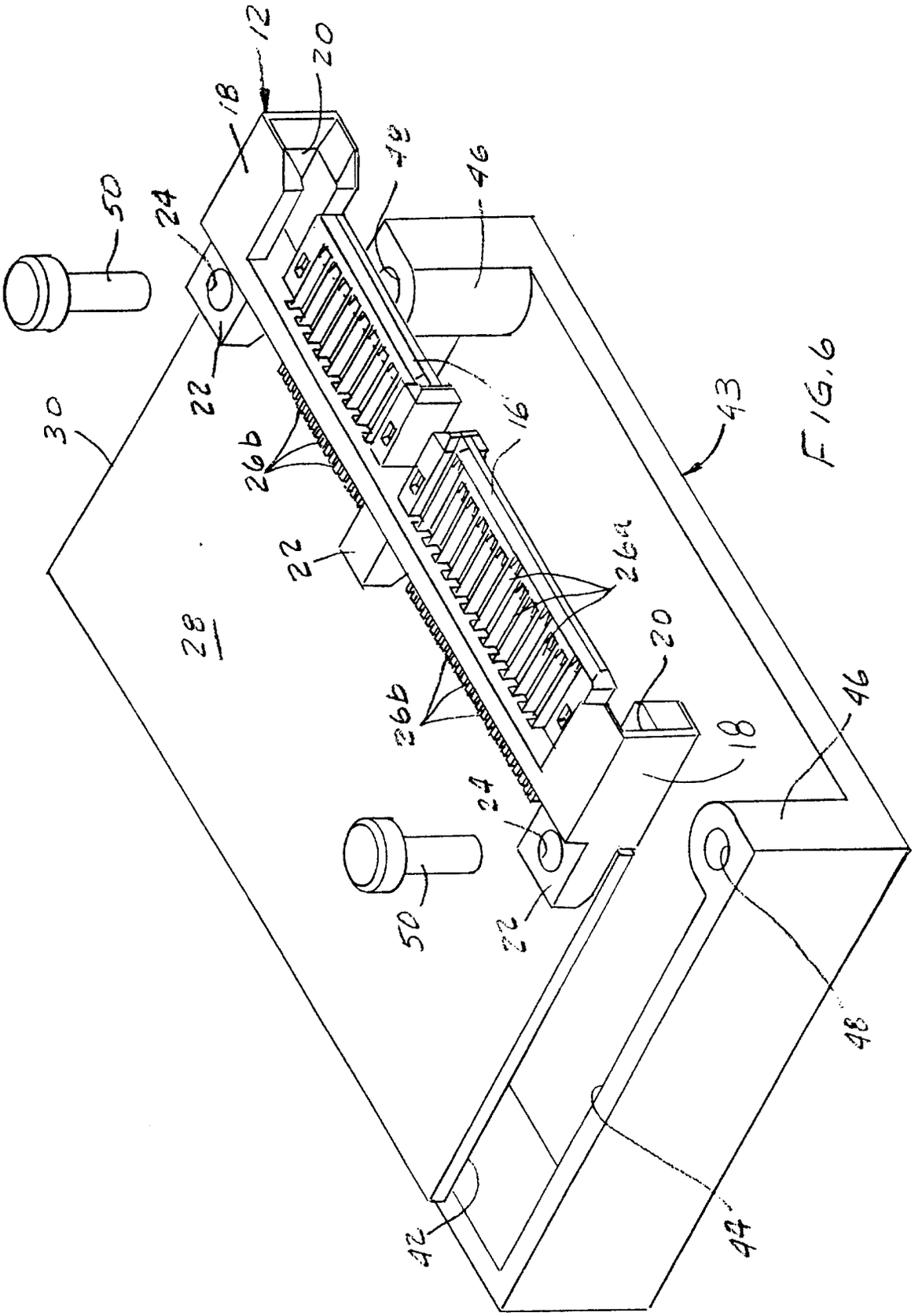
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FIG. 6