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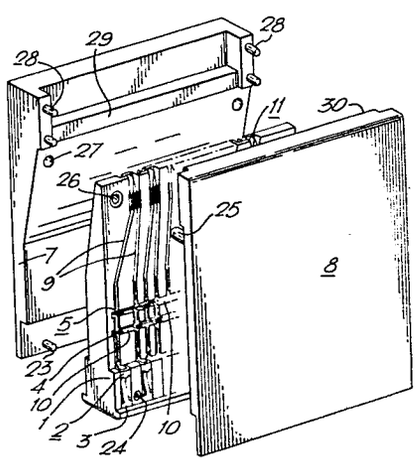
(54) Electrical connector for terminating flat, multi-conductor electrical cable.

(57) An electrical connector for terminating a flat multi-conductor electrical cable (100), comprises a body member (1) carrying on each of two opposite surfaces a row of terminals (2) and a bus member (5), and two cover members (7, 8) covering the two surfaces respectively. The surfaces of the body member (1) are formed with grooves (9) which receive conductors (101) of the cable (100) and guide them from mouths (11) of the grooves (9) at an edge of the body member (1), to the terminals (2) and bus member (5). The mouths (11) are formed to guide the conductors (101) over the two surfaces of the body member (1) as required.



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Electrical connector for terminating flat, multi-conductor electrical cable.

This invention relates to an electrical connector for terminating a flat multi-conductor electrical cable.

In United States Patent Specification No. 4,094,566 there is described such an electrical connector comprising a body member of electrically insulating material carrying on a surface thereof a row of electrical terminals each having a mating portion adjacent one edge of the body member surface and a conductor-connection portion in the form of a slotted plate adapted to establish an electrical connection to a conductor of a flat multi-conductor electrical cable by movement of the conductor transversely of its axis into the slot in the plate, in known manner.

This known connector also includes a bus member arranged on the body member surface and providing a plurality of integrally formed slotted plate portions in a row parallel to the row of slotted plate conductor-connection portions of the terminals.

For use of this known connector, an end portion of a cable to be terminated is prepared by exposing the conductors thereof, and the conductors are then moved transversely of their axes into appropriate ones of the slotted plate portions of the terminals in the case of

signal conductors and the bus member in the case of ground conductors.

Thus, the signal conductors are terminated to individual terminals of the connector while the ground conductors are commoned by the bus member.

The bus member initially has a slotted plate portion aligned with the slotted plate portion of each terminal, and also a slotted plate portion positioned between each adjacent pair of terminal slotted plate portions. Prior to conductor connection, those portions of the bus member aligned with terminals to be connected to signal conductors are bent to an inoperative position so that a signal conductor can pass over each such portion without connection thereto.

The known connector also includes a cover member adapted to be positioned over the body member surface and the terminals and bus member thereon, the inner surface of the cover member being formed with grooves to receive the conductors of the cable, and with transverse slots to receive the slotted plate portions of the terminals and bus member, whereby the conductors can be located in the grooves and the cover member then applied to the body member to urge the conductors into the slots in the associated slotted plate portions of the terminals and bus member.

The connector specifically described in the above noted United States specification has a row of terminals on each of two opposite surfaces of the body member and a bus member which extends across both surfaces, the conductors of a cable to be terminated being separated into two groups

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for termination on the two surfaces of the body member respectively, each surface then being covered by an individual cover member.

According to this invention a known connector as discussed above is characterised in that the terminal carrying surfaces of the body member are formed with grooves to receive the conductors of a cable and direct the conductors to the conductor-connection portions of the terminals and bus member, an edge of the body member being formed to guide the conductors to overlie the two surfaces of the body member as required.

The connector of this invention has the advantage that the body member serves both to carry the terminals and bus member, and also to locate the conductors of a cable in the connector as required, whereby it is ensured that the conductors are accurately aligned with the conductor-connection portions of the terminals and bus member. Further, only the body member is a relatively complex structure, it being possible for the cover members to be smooth surfaces and thus easy to manufacture.

This invention will now be described by way of example with reference to the drawings, in which:-

Figure 1 is a perspective view of an assembled connector according to the invention with a cable connected thereto and positioned over a contact-post-carrying substrate with which the connector is to be mated;

Figure 2 is an exploded perspective view of the connector of Figure 1;

Figures 3 and 4 illustrate the manner in which the terminals are retained on the body member of the connector of Figures 1 and 2;

Figure 5 is a side view of the body member

of the connector of Figures 1 and 2;

Figure 6 is a sectional perspective view of part of the conductor guiding edge of the body member of Figure 5;

Figure 7 is an exploded perspective view of a terminal and the associated part of the body member of the connector of Figures 1 and 2;

Figure 8 is a sectional side view of the connector of Figures 1 and 2 with the conductors of a cable positioned for receipt in the grooves in the body member of the connector;

Figure 9 is a view similar to Figure 8 but showing the conductors received in the grooves in the body member;

Figure 10 is a view similar to Figures 8 and 9 but showing the conductors connected and the cover members of the connector in position;

Figure 11 is a view on the lines XI - XI in Figure 8;

Figure 12 is a view on the line XII - XII in Figure 9;

Figure 13 is a view similar to Figure 1 but showing another connector according to the invention;

Figure 14 is a view similar to Figure 2 but of the other connector of Figure 13;

Figure 15 is a sectional side view of the connector of Figures 13 and 14 in a partly assembled state;

Figure 16 is a view similar to Figure 15 but with the connector fully assembled;

Figure 17 is a transverse sectional view through the strain relief part of the connector of Figures 13 to 16;

Figure 18 is an exploded perspective view of a different strain relief feature for the connector

of Figures 13 to 17; and

Figure 19 is a view similar to Figure 17 but through the feature of Figure 18.

Referring to Figures 1 to 12, the connector comprises a body member 1 moulded from electrically insulating plastics material and carrying on each of its two opposite major surfaces, a row of electrical terminals 2 each stamped and formed from sheet metal, and having, as shown in Figure 7, a socket portion 3 adjacent one edge of the body member surface, and a conductor-connection portion 4 in the form of a slotted plate adapted to establish an electrical connection to a conductor of a cable by movement of the conductor transversely of its axis into the slot in the plate, in known manner.

The body member 1 also carries a bus member 5 stamped and formed from sheet metal and extending across both the major surfaces of the body member 1, the bus member 5 providing a plurality of integrally formed slotted plate portions 6 in two rows parallel to the two rows of slotted plate conductor-connection portions 4 of the two rows of terminals 2 respectively.

The connector also comprises two cover members 7 and 8 each moulded from electrically insulating material and adapted to be latched in position over a respective major surface of the body member 1.

As best seen in Figures 2 and 5, both the major surfaces of the body member 1 are formed with grooves 9 to receive the conductors of a cable, and with transverse slots 10 to receive the slotted plate portions 4 and 6 of the terminals 2 and bus member 5, respectively.

As shown in Figure 6, each groove 9 opens

to an edge of the body member 1 by way of a funnel entry mouth 11 defined by three converging walls, namely two side walls 12 and a base wall 13. The base walls 13 are arranged with some on each side of the central longitudinal plane of the body member 1 such that conductors inserted into the mouths 11 will be guided to one or the other surface of the body member 1. Adjacent the position where it opens into the mouth 11 each groove 9 is formed at each edge with an upstanding ridge 14 which is used to secure a conductor in the groove 9 as will be explained below.

As shown in Figure 7, each terminal 2 is received in a cavity 15 in the body member 1, with an intermediate portion 16 of the terminal 2 joining the receptacle portion 3 and the slotted plate portion 4 being received in a slot 17 joining the cavity 15 to the slot 10 which receives the slotted plate portion 4. The terminal intermediate portion 16 is formed with a recess 18 which receives a projection 19 in the slot 17 to locate the termina 2 correctly. Referring now to Figures 3 and 4 also, each longitudinal edge of the cavity 15 is formed with an upstanding ridge 20 which after insertion of a terminal 2 is turned over the cavity 15, as shown in Figure 4, in order to retain the terminal 2 in the cavity 15. The free end wall 21 of the cavity 15 is formed with an aperture 22 by way of which a male terminal post (Figure 1) can be inserted into the receptacle portion 3 of a terminal 2 in the cavity 15.

Referring now to Figures 8, 9 and 10, in order to terminate a flat multi-conductor cable, 100 in Figure 1, with the connector, the insulation is stripped from an end portion of the cable to

expose the conductors 101, some of which in use constitute signal conductors and are to be connected to respective terminals 2, and the others of which in use constitute ground conductors and are to be connected to the bus member 5.

The cable 100 is then advanced axially towards the mouths 11 of the grooves 9 in the body member 1, with the open sides of the mouths 11 closed by wiping members 200 of a tool not shown in detail. The mouths 11 guide the conductors 101 to overlie the two major surfaces of the body member 1, as shown in Figure 8.

The wiping members 200 are then moved over the surfaces of the body member 1 (downwards as seen in the drawings) to the position shown in Figure 9, during which movement they urge the conductors 101 into respective grooves 9 in the body member 1. As shown in Figures 11 and 12, the wiping members 200 also deform the ridges 14 to overlie the conductors 101 after insertion into the grooves 9 whereby the conductors 101 are retained in the grooves 9.

A further tool 300 (Figure 9) is then used to urge the conductors 101 into the slotted plate portions 4 and 6 of the terminals 2 and bus member 5 as appropriate, this in known manner.

The cover members 7 and 8 are then applied to the body member 1, as shown in Figure 10, and are secured to the body member 1 by pegs 23 (see Figure 2) on both cover members 7 and 8 which engage in holes 24 in the body member 1, pegs 25 on the cover member 8, which extend through holes 26 in the body member 1 and engage in holes 27 in the cover member 7, and pegs 28 on the cover member

7, which engage in holes 29 (Figure 10) in the cover member 8.

As shown in Figures 2 and 10, the cover members 7 and 8 are formed, at the cable exit end of the connector, with longitudinally offset transverse bars 29 and 30 respectively, whereby the cable 100 is formed into a sinuous path, shown in Figure 10, to provide strain relief against axial forces on the cable 100, for the connections between the conductors 101 and the terminals 2 and bus member 5.

The assembled connector is then as shown in Figure 1, and can be mated with an appropriate array of male terminal posts 400 carried by a substrate 401 to provide required connections between the conductors 101 of the cable 100 and the posts 400.

Referring now to Figures 13 to 17, the connector here shown is similar in design in function to the connector of Figures 1 to 12, and corresponding parts have the same references.

The essential differences are in the general shape of the connector, the manner in which the cover members 7 and 8 are secured to the body member 1, and the manner in which strain relief is provided by the cover members 7 and 8.

As shown in Figures 14 and 15, the cover members 7 and 8 are formed at the mating end (lower end in the drawings) of the connector with a row of projecting teeth 30 arranged and adapted to engage in the male-contact-receiving apertures 22, as shown in Figures 15 and 16, to secure the cover members 7 and 8 to the body member 1 at that end.

Thus, after connection of the conductors 101 to the terminals 2 and bus member 5, as described with reference to Figures 1 to 12, the teeth 30 are

engaged in the apertures 22, as shown in Figure 15, and the cover members 7 and 8 then closed onto the body member 1, as shown in Figure 16. Each cover member 7 or 8 is formed at one side with a latch arm 31 having at its free end an inwardly directed projection 32 arranged and adapted to engage in a recess 33 in the other cover member 8 or 7 thereby to latch the cover members 7 and 8 together and thus to the body member 1, as shown in Figure 16.

Each cover member 7 or 8 also carries on its inner surface a row of stop members 34 which after latching of the cover members 7 and 8 to the body member 1, are located behind the receptacle portions 3 of the terminals 2, and serve to prevent over insertion of a male contact (400 in Figure 13) into the receptacle, thus preventing damage to the connection between the terminal 2 and a conductor 101.

As its latching end (upper end in the drawings) each cover member 7 or 8 is formed at one side with a tapered V-shaped projection 35, and at the other side with a correspondingly shaped recess 36 arranged and adapted to receive the projection 35 of the other cover member 8 or 7, with the cable 100 located between the projections 35 and recesses 36. Thus, on latching of the cover members 7 and 8 together, the cable 100 is distorted in two directions, as shown in Figures 16 and 17, and very effective strain relief is provided for the connections between the conductors 101 and the terminals 2 and bus member 5.

In the modified connector shown in Figures 18 and 19, the ridges 35 and recesses 36 in the cover members 7 and 8 are simply block-shaped with sloping ends instead of having the shapes shown in Figures 13 to 16.

Claims:

1. An electrical connector for terminating a flat multi-conductor electrical cable, comprising a body member of electrically insulating material carrying on each of two opposite surfaces a row of electrical terminals each having a mating portion adjacent one edge of the body member surface and a conductor-connection portion in the form of a slotted plate adapted to establish an electrical connection to a conductor of a flat multi-conductor electrical cable by movement of the conductor transversely of its axis into the slot in the plate, and a bus member which extends across both surfaces of the body member and provides a plurality of slotted plate portions in a row on each surface parallel to the row of slotted plate conductor-connection portions of the terminals on that surface, and two cover members adapted to be positioned over the body member surfaces, and the terminals and bus member thereon, respectively, characterised in that the terminal carrying surfaces of the body member (1) are formed with grooves (9) to receive the conductors (101) of a cable (110) and direct the conductors (101) to the conductor-connection portions (4 and 6) of the terminals (2) and bus member (5), an edge of the body member (1) being formed to guide the conductors (101) to overlie the two surfaces of the body member (1) as required.

2. A connector as claimed in Claim 1, characterised in that each conductor-receiving groove (9) opens to an edge of the body member (1) by way of a funnel entry mouth (11) defined by three converging walls (12, 13), the base walls (13) of the mouths (11) being arranged with some on each side of the central longitudinal plane of the body

member (1) such that conductors (101) inserted into the mouths (11) will be guided to one or the other surface of the body member (1).

3. A connector as claimed in Claim 2, characterised in that adjacent the position where it opens into the mouth (11) each groove (9) is formed at each edge with an upstanding ridge (14) which, after insertion of a conductor (101) into the groove (9), is turned in over the conductor (101) to retain the conductor (101) in the groove (9).

4. A connector as claimed in Claim 1, Claim 2 or Claim 3, characterised in that the cover members (7, 8) are secured to the body member (1) by means of pegs (23, 25, 28) on a cover member (7 or 8) which engage in holes (24) in the body member (1) or holes (27, 29) in the other cover member (8 or 7).

5. A connector as claimed in any preceding claim, characterised in that at the cable exit end of the connector the cover members (7, 8) are formed with longitudinally offset transverse bars (29, 30) whereby a cable (100) is formed into a sinuous path on mounting of the cover members (7, 8) on the body member (1).

6. A connector as claimed in Claim 1, Claim 2 or Claim 3, characterised in that the cover members (7, 8) are each formed at the mating end of the connector with a row of projecting teeth (30) arranged and adapted to engage in apertures (22) in the body member (1), to secure the cover members (7, 8) to the body member (1) at that end.

7. A connector as claimed in Claim 6, characterised in that at the cable exit end of the connector each cover member (7, 8) is formed at one side with a latch arm (31) having at its free end

an inwardly directed projection (32) arranged and adapted to engage in a recess (33) in the other cover member (8, 7) thereby to latch the cover members (7, 8) together over the body member (1).

8. A connector as claimed in Claim 6 or Claim 7, characterised in that each cover member (7, 8) carries on its inner surface a row of stop members (34) which after latching of the cover members (7, 8) to the body member (1) are located behind the mating portions (3) of the terminals (2).

9. A connector as claimed in any one of Claims 1 to 4 or Claims 6 to 8, characterised in that at the cable exit end of the connector each cover member (7, 8) is formed at one side with a projection (35) and at the other side with a correspondingly shaped recess (36) arranged and adapted to receive the projection (35) of the other cover member (8, 7) with a cable (100) located between the projections (35) and recesses (36) whereby on latching of the cover members (7, 8) to the body member (1) the cable (100) is distorted in two directions (Figures 16 and 17).

10. A connector as claimed in Claim 9, characterised in that the projections (35) are of tapered V-shape (Figures 13 to 17).

FIG.1.

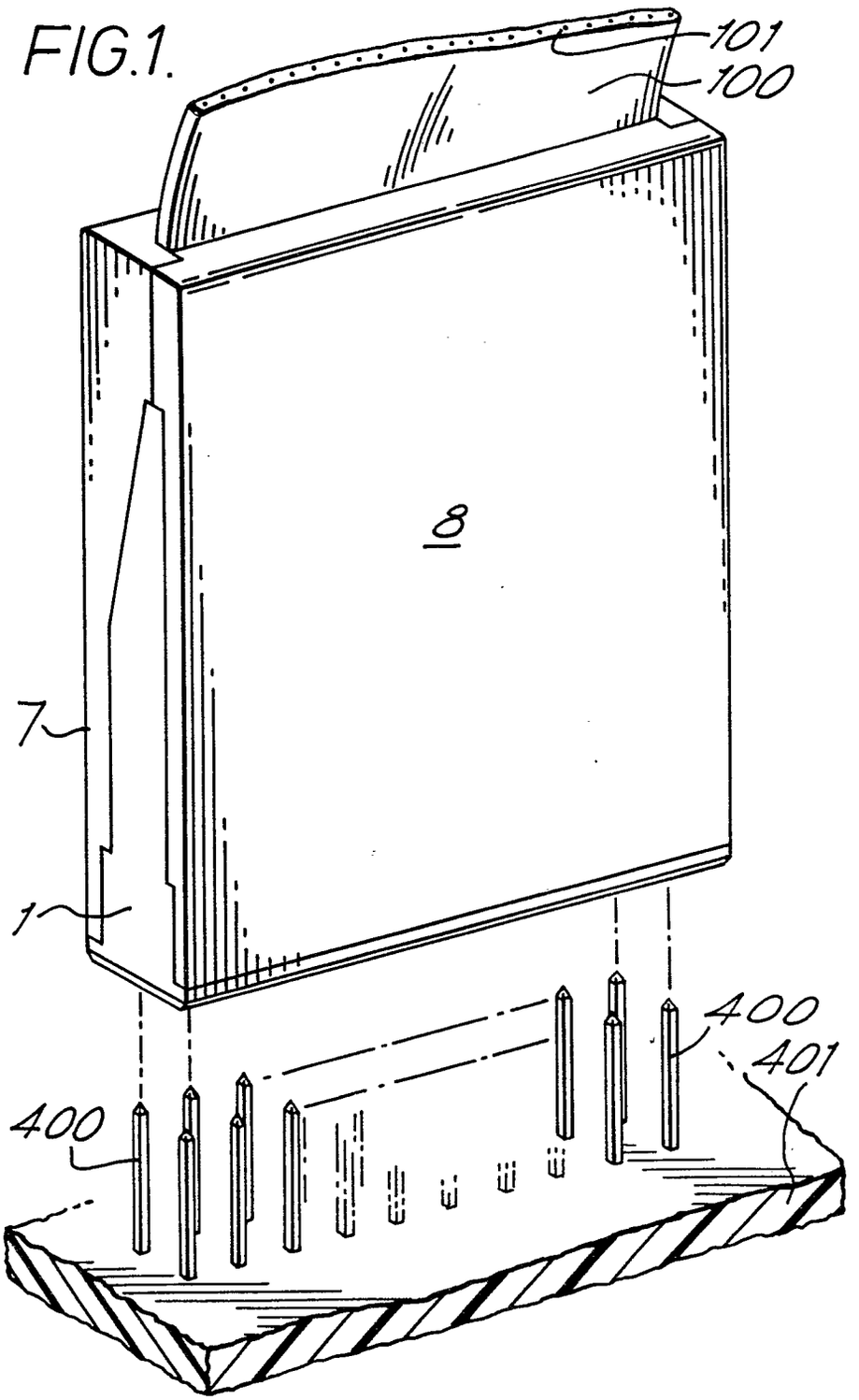


FIG.2.

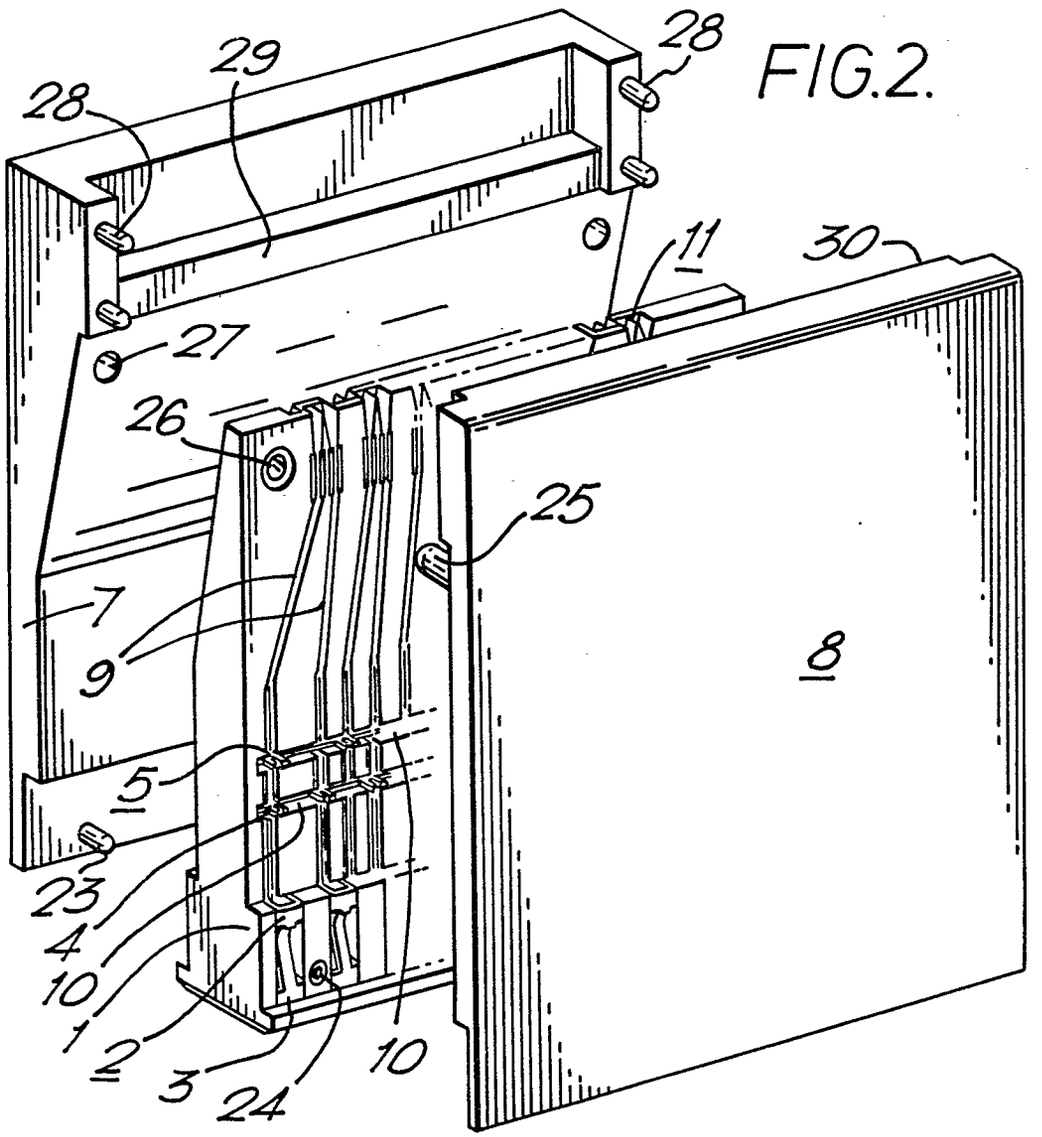


FIG.3.

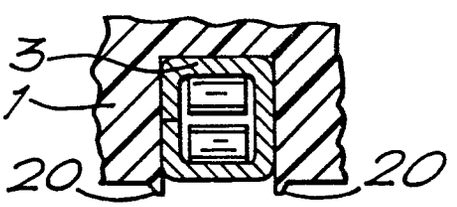
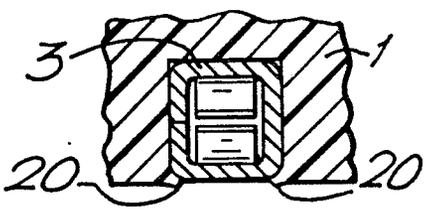


FIG.4.



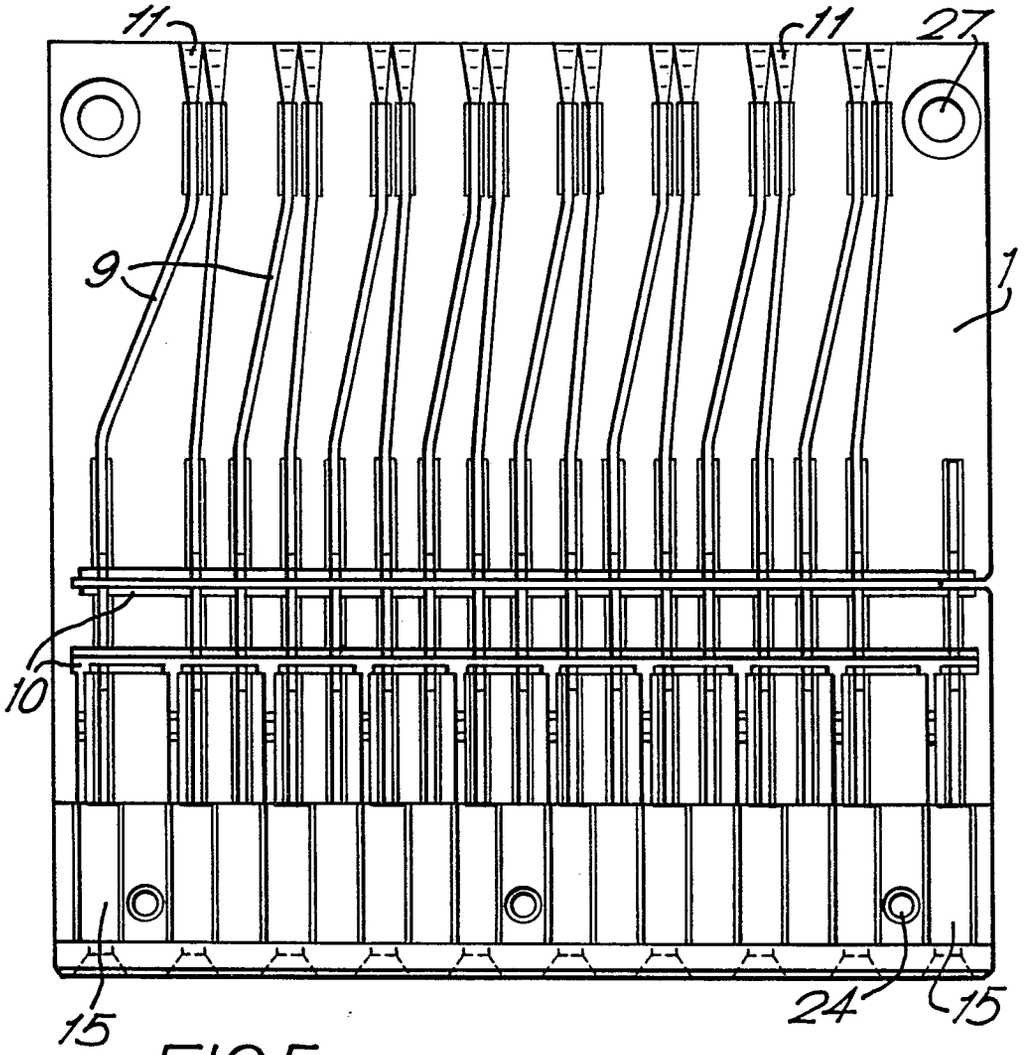


FIG.5.

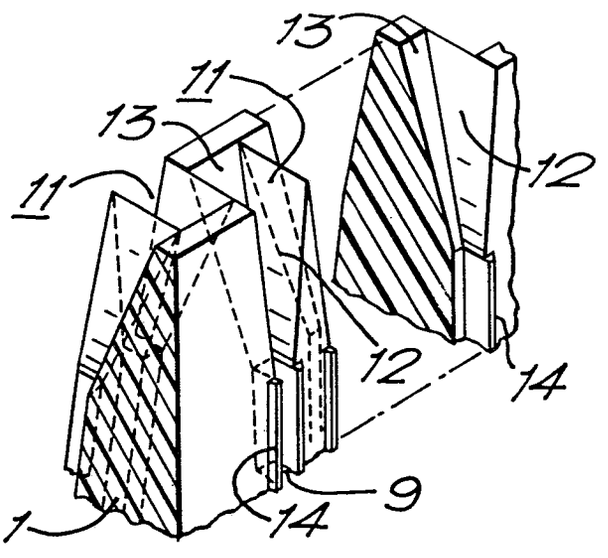


FIG.6.

FIG.7.

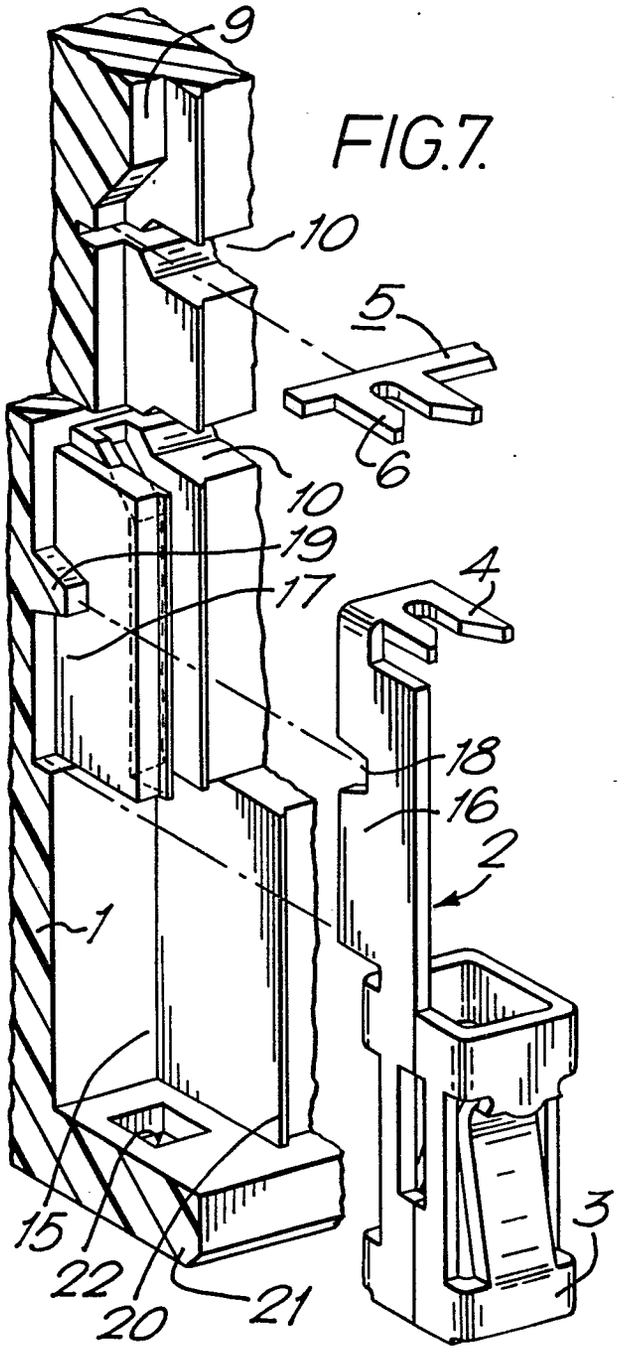

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FIG.8.

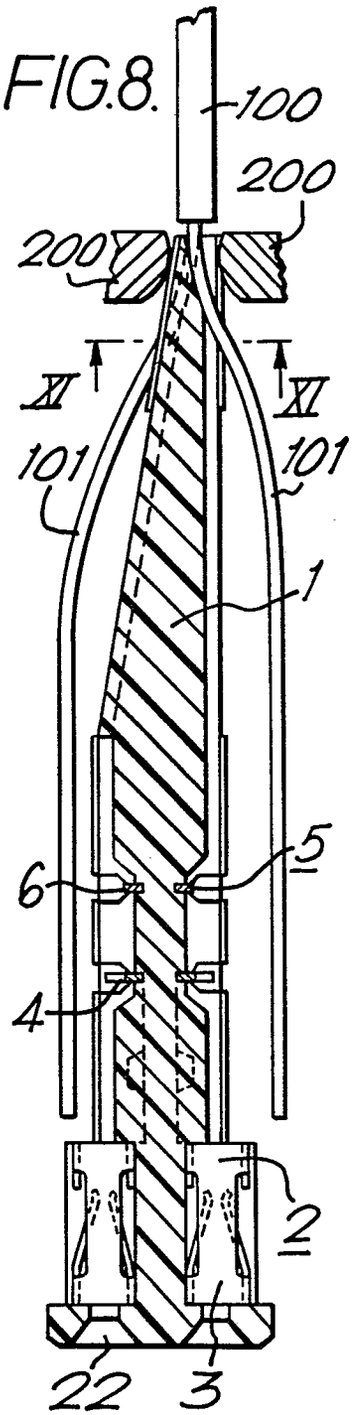
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FIG.9.

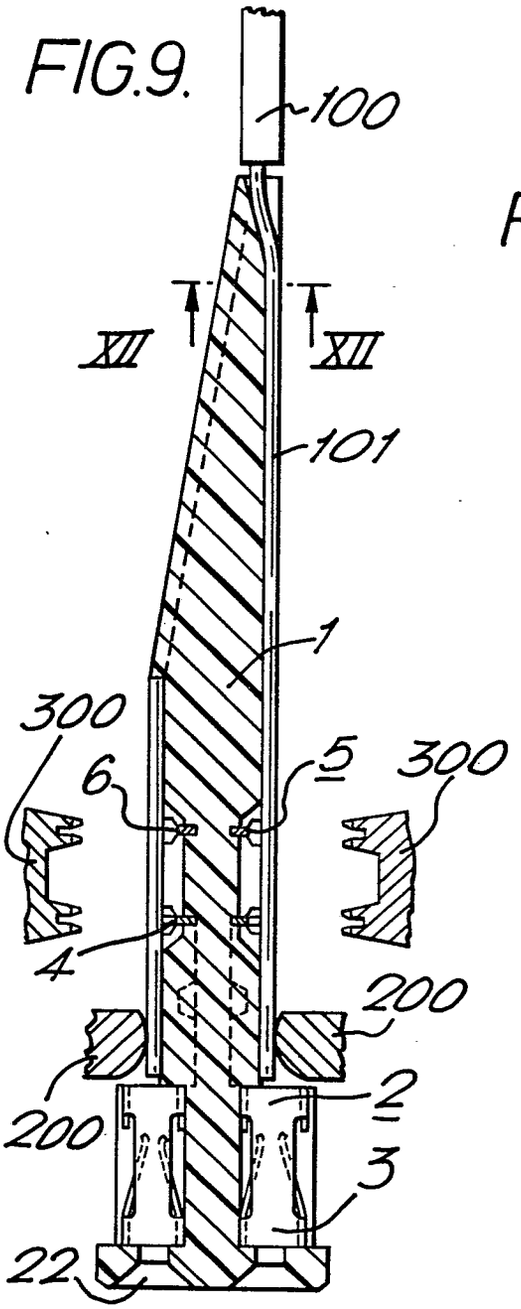


FIG.10.

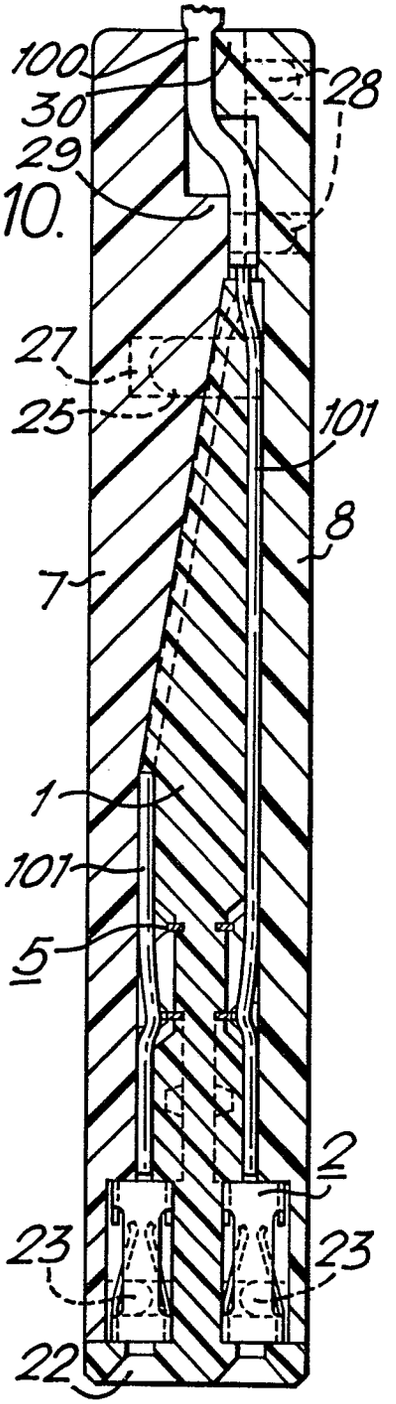


FIG.11.

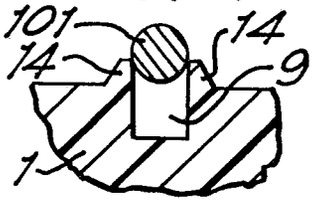


FIG.12.

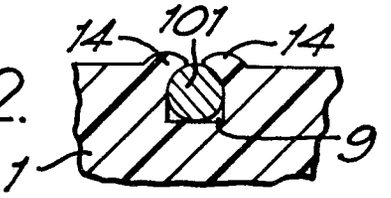


FIG.13.

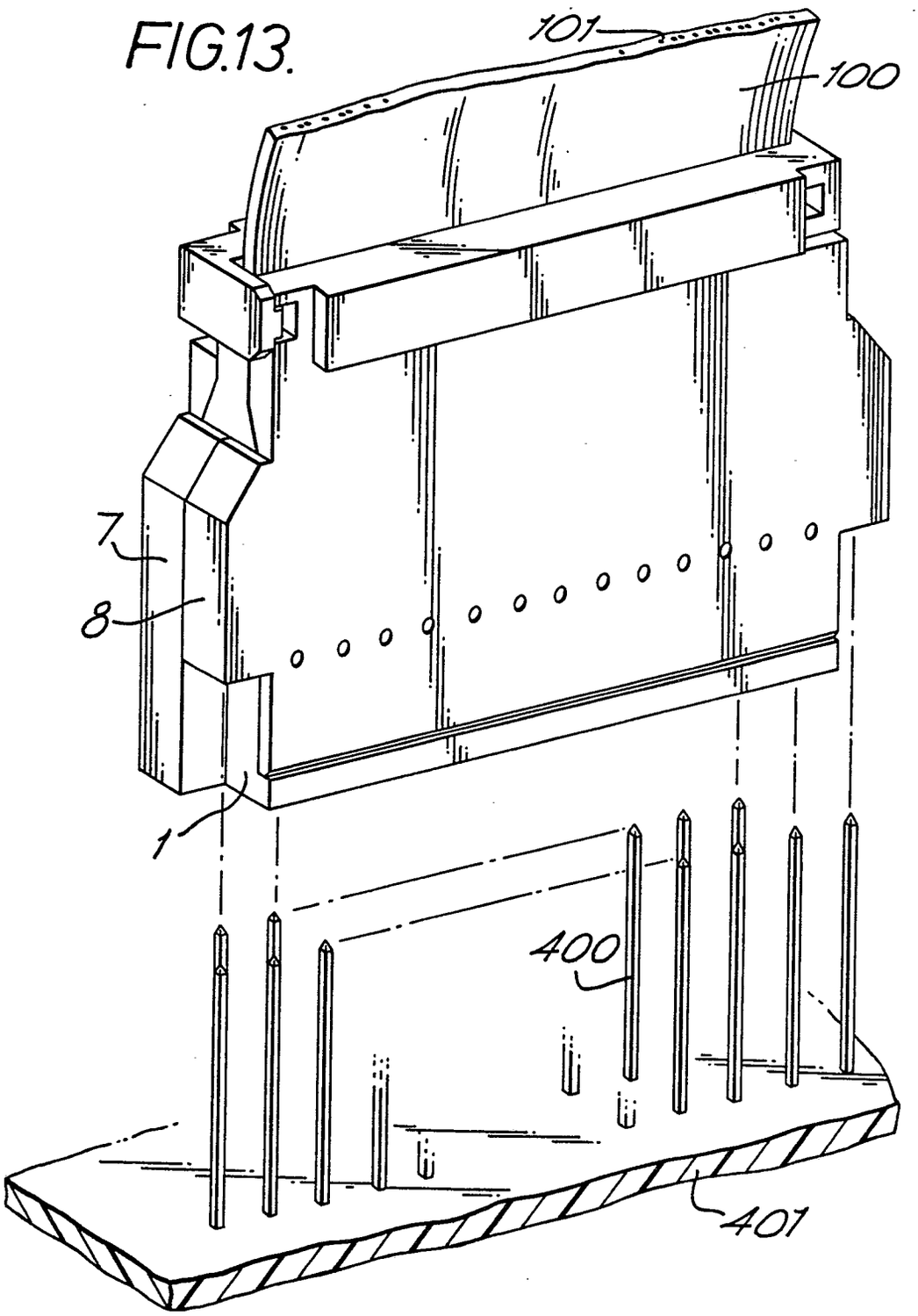


FIG.14.

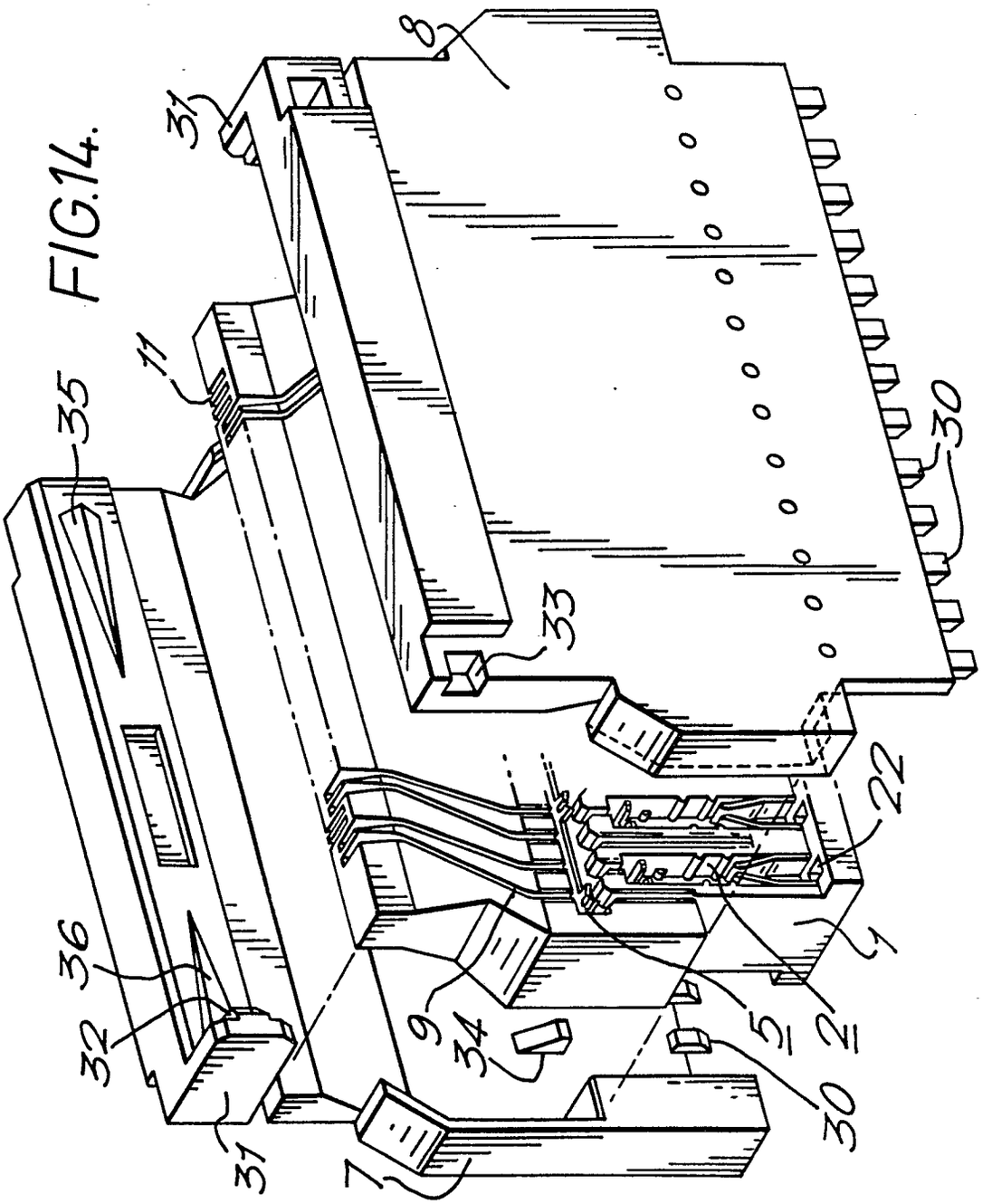
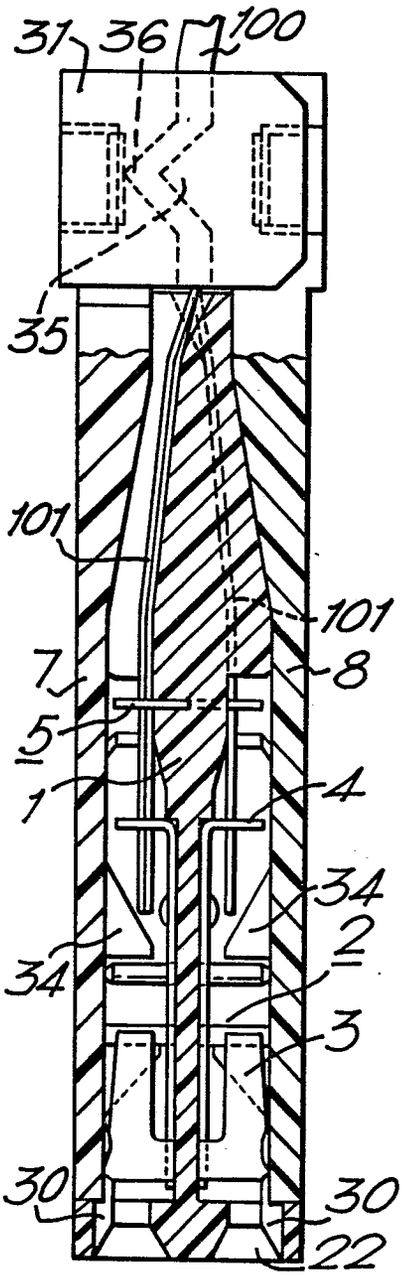


FIG.16.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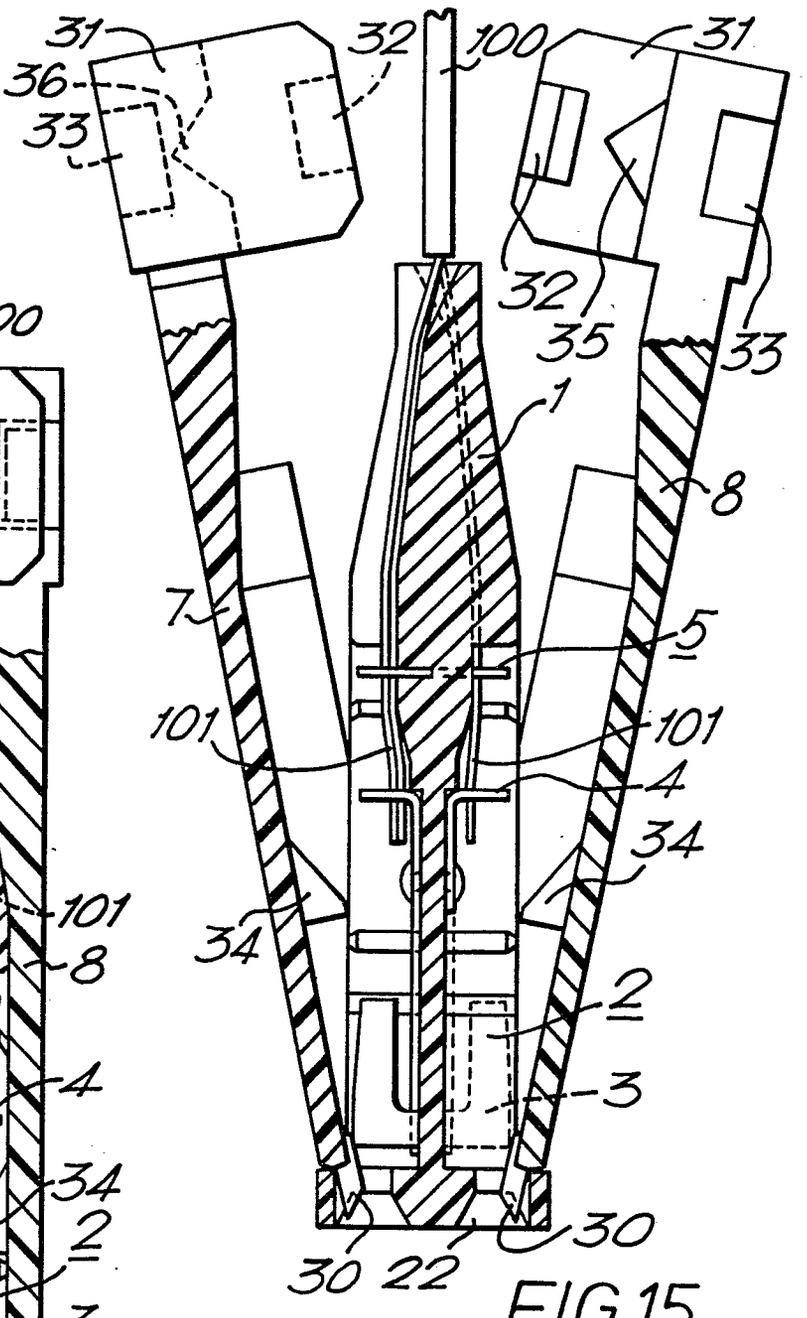
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FIG.15.

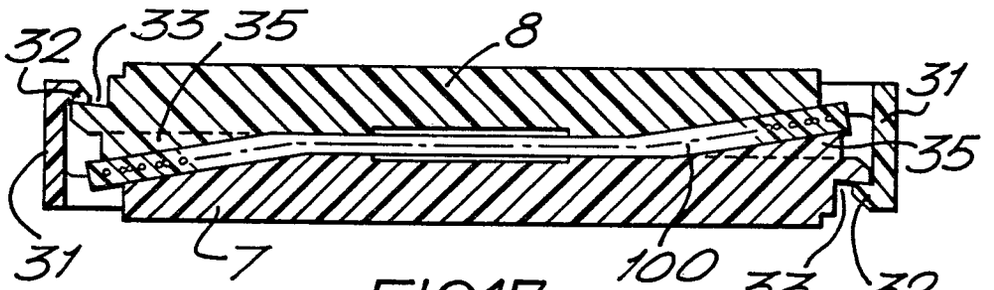

FIG.17.

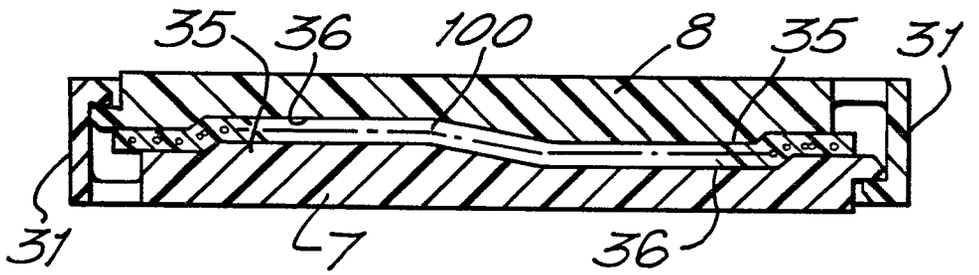

FIG.19.

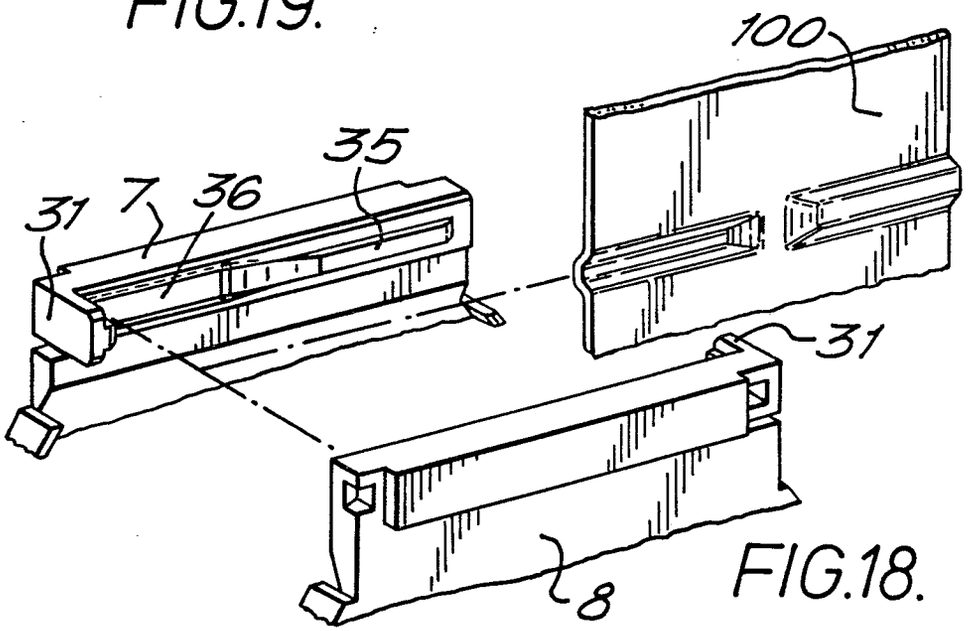

FIG.18.

European Patent Office

EUROPEAN SEARCH REPORT

Application number
0018160
EP 80 30 1128

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US - A - 4 076 365 (AMP) * Abstract; figures *	1
A	US - A - 3 731 251 (THOMAS & BETTS) * Column 4, line 47 - column 5, line 28; figures *	1
A,D	US - A - 4 094 566 (AMP) * Figure 10 *	10
A	FR - A - 2 361 759 (AMP) * Figures *	1,7
A	FR - A - 2 310 060 (MOLEX) * Figures 3,7 *	2
A	FR - A - 2 066 671 (THOMAS & BETTS) * Page 3, lines 1-31; figures *	1
A	US - A - 3 873 172 (AMP) * Abstract; figures *	6
A	DE - A - 1 947 355 (AMP) * Pages 8,9; figures 12,13 *	1,2,5,9

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CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

H 01 R 23/66

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

H 01 R 23/66
23/72
13/58

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	07-07-1980	RAMBOER

EPO Form 1503.1 06.78

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	betrifft Anspruch
A	FR - A - 1 361 157 (BURNDY) * Page 3, right-hand column, paragraph 2; figures * --	5
A	US - A - 4 139 727 (SIEMENS) * Figures * ----	9

KLASSIFIKATION DER ANMELDUNG (Int.Cl. 3)

RECHERCHIERTE SACHGEBIETE (Int. Cl. 3)