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(12) # EUROPEAN PATENT APPLICATION

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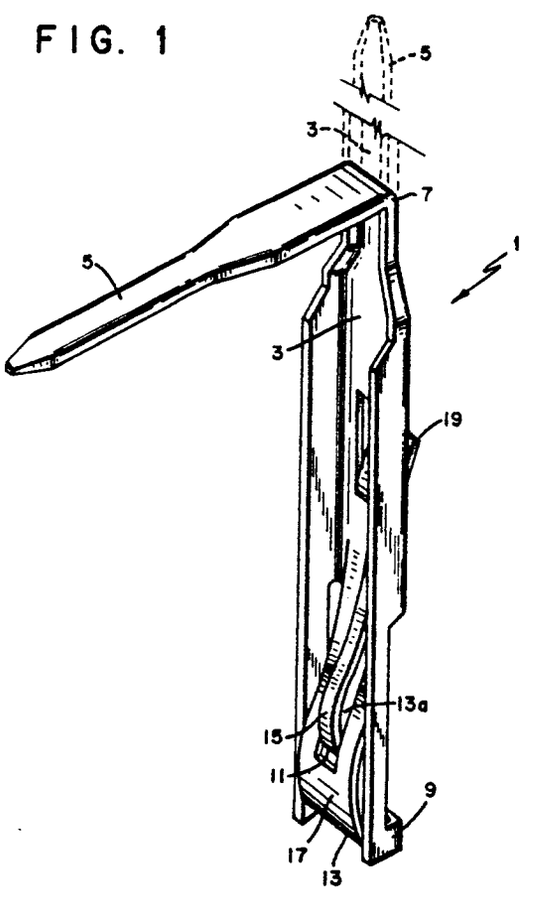
(54) **Low insertion force contact.**

(57) A contact is provided comprised of a channel type body construction for insertion into a connector block from the rear. The contact consists of a flexible in line dual beam structure which compresses to physically and electrically engage a pin contact inserted into a pocket from the front of the connector block. A molded in rib at the front end of the pocket located the contact in its optimum mating position. The in-line dual beam feature provides for low insertion force and at the same time provides two points of contact. A compressible punched-out tab prevents the contact from being pulled out of its respective pocket in the connector block.

FIG. 1



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LOW INSERTION FORCE CONTACT

BACKGROUND OF THE INVENTION

This invention relates to a low insertion force contact, used in a low engaging force interconnection system consisting of a daughter board and a mother board. The electrical connection is established by means of mating pins of the connector on the mother board connecting to the low insertion force contacts of the connector block on the daughter board. The electrical connection between mother board and daughter board is achieved by engaging the pin contacts of the mother board connector with the low insertion force contacts of the daughter board connector block. Such mother/daughter board type connectors and contacts are generally discussed in U.S. Patent 4,439,000 and in the references cited on the face thereof.

In the past the interconnection between mother and daughter boards was achieved with card edge connectors (for example, a single row with a maximum of about 50 contacts). In order to stay abreast of advancing technology, and keeping in mind the size limitations of the boards, high density interconnecting connectors, i.e., those with up to about 800 contacts, were developed, and which required a low insertion force contact.

In the prior art such contacts are generally of complicated construction to ensure retention within a daughter board connecting block. Typically, such contacts are inserted into the daughter board connector block from the front thereof. Contact is then established by insertion of a pin contact extending from the mother board into receiving pockets, i.e., passages extending throughout the connector block, holding respective low insertion force contacts. The contacts are dimensioned so that they cannot be passed out from the pocket through the other or near side of the block.

Since these contacts are inserted from the front of the block, the blocks holding them are difficult to mold since tolerances must be maintained very precisely to ensure that there is no electrical contact between respective outwardly projecting metal portions. Further, the portion of each contact retained within the block is typically of complicated construction to ensure maintaining of contact with pins extending from the mother board.

SUMMARY OF THE INVENTION

It is thus an object of the present invention to provide a insertion force contact which can be easily assembled into a connector block for a daughter board in a high density interconnection system.

It is another object of the present invention to provide such a contact which can be easily assembled by automation into a daughter board connector block.

Still another object is to provide such a contact which allows molding of the connector block with which it is employed to be conducted in a simple manner without requiring maintenance of precise tolerances.

Yet still another object of the present invention is to provide such a contact which ensures good electrical connection with connecting pin contacts extending from a mother board to which it is connected, and which is structured for being reliably retained within the connector block with which it is employed.

These and other objects of the invention will become more readily apparent from the following discussion of the invention.

In accordance with the invention there is provided a contact comprising a substantially channel type longitudinally projecting body construction. The body includes a termination end at one end thereof which is constructed for being bent over at an angle approximately perpendicular to the body for insertion and connection by soldering to a daughter board. Spring contact engagement means is located at the other end of the body for engaging a pin contact from a mother board with a predetermined force when the contact is received in a connector block of the daughter board. Also located on the body is retaining means for engaging a wall of pockets of the daughter board connector block, after the contact has been inserted therein, for resisting removal therefrom when the contact is received in a passage of the connector block prior to fixed attachment of the connector block to the daughter board along with soldering of the termination end of the contact to the daughter board.

In a more specific aspect the spring contact engagment means comprises dual in-line tines or beams which have been punched out from the body and bent or constructed in a manner such that they are spaced from the walls of a pocket in the connector block by a predetermined distance less than the size of a pin contact with which it is to establish electrical connection in the pocket of the connector block with a predetermined force

when received therein. In this specific construction when a pin contact, for example, from a mother board is inserted into the connector block pocket, from the front of the connector block, it is held with a predetermined force by the dual in-line beams, between the dual in-line beams and a wall of the pocket. The retaining means preferably comprises a punched out flexible tab which bends when the contact is inserted into a receiving passage from the top of the connector block, and once received therein, resists removal prior to soldering to the daughter board, in the same direction of insertion by engaging the walls of the passage with the end of the tab.

These and other features of the invention will become better understood from a reading of the detailed discussion made with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure I is a perspective view of a contact in accordance with the invention;

Figure 2 is a side cross-sectional view of a contact in accordance with the invention, shown inserted in a pocket of a daughter board soldered to a daughter board, and establishing electrical contact with a pin contact of a mother board;

Figure 3 is a front view of the contact in accordance with the invention showing the pocket wall engaging the projecting therefrom;

Figure 4 is a cross-sectional side view along lines BB of the contact of Figure 3;

Figure 5 is a cross-sectional view of the contact of Figure 4 along lines AA thereof;

Figure 6 is a rear view of the contact of Figure 3.

Figure 7 is a side view of a plurality of contacts according to the invention shown in position for being inserted into a daughter board connector block and illustrating how they are bent once inserted in the connector block; and

Figure 8 is a side cross-sectional view showing a pluality of contacts according to the invention shown assembled in a daughter board connector block.

DETAILED DISCUSSION OF THE INVENTION

In the drawings, throughout the several views, like numbers designate like elements. Referring now to Figures I, 3, 4 and 5 there are shown several views of a low insertion force contact I in accordance with the invention.

The contact I is generally elongated in shape and of typically a U-shaped construction having a channel 3 extending the length thereof. A first terminating end 5 is provided for being inserted into a through hole of a daughter board for soldering therein to establish electrical connection therewith. The remaining portion of the contact is constructed for being received within a daughter board connector block which is typically firmly attached to a daughter board, i.e. a printed circuit board constructed for being connected a mother board, i.e. another printed circuit board of the type which includes various daughter boards connected thereto. The construction of the contact I is such as to be readily inserted into pockets of a connector block 25 in a manner such that the termination end 5 can be bent at a point 7 at an angle of appoximately 90° with respect to the remainder of the body of the contact I.

For insertion into the connector block, the contact I includes a compressible punched out tab I9 which permits entry into pockets in a connector block from the rear thereof whereby the tab I9 is compressed and prior to soldering of the end 5 to a daughter board and secure attachment of the connector block thereto, serves to restrain the contact I from being withdrawn from the connector block by engaging the walls of the pocket wherein it is received. The contact I also includes dual in-line beams or tines II and I3 which serve to compressively engage a pin contact 23 of the mother board as will be discussed in greater detail hereinafter.

As shown in Figure 2, the contact I in accordance with the invention is received within a pocket 29 of a daughter board 27 connector block 25. Once received in the pocket 29, the end 5 is bent over at point 7 and inserted within a through hole of a daughter board 27. It is held therein by soldering as shown at soldered region 3I. Prior to soldering, the tab I9 serves to prevent the contact I from being withdrawn from the rear portion of the pocket 29 after insertion. A projection 9 at the other end of the contact cooperates with a positioning ridge 2I within the pocket 29 to more accurately position the contact I within the pocket 29. Dual in-line beams or tines II and I3 include respective engaging surfaces I5 and I7 (Figure I) which in relaxed position are spaced by a predetermined distance smaller than the dimension of a pin contact 23 from the opposite wall of the pocket 29.

For connection to a mother board, the connector block 25 is brought down at the respective pocket 29 thereof to receive pin contacts 23 from a mother board which in turn compress the tines II and I3 inwardly to establish electrical contact therewith. It is noted that tine II cooperates with tine I3 by having a portion passing through an opening

13A of tine 13. Once connection is established and the connector block 25 is secured to the daughter board 27 and soldering at solder point 31 is established, the function of the tab 19 is no longer required inasmuch as the entire assembly is held securely.

As more clearly shown in figure 5, the connector 1 includes a generally U-shaped channel 3 which aids in establishing the soldered connection to the daughter board 27. The assembly is generally inserted into a connector block 25 in the direction C as generally shown in Figure 7 with all contacts 1 being inserted at the same time and then the bending from the dotted line position of portion or end 5 at point 7 is then effected to permit insertion of the respective ends 5 into the respective through-holes of a daughter board. The entire assembly is more clearly shown received in the cross-sectional view of the daughter board connector block 25 shown in Figure 8.

With respect to the connector block 25 itself, it is noted, as previously discussed, that it includes a molded-in ridge or rib 21 which is for the purpose of more precisely positioning the contact within the pocket 29 of the connector block 25. Typically, the connector block 25 will be manufactured of conventional plastics molding materials. As to the contact 1 itself, it must be made of a material which is sufficiently electrically conductive but wear resistant and resilient enough to establish electrical connection with a pin contact 23 of a mother board.

The preferred materials are of a variety of copper alloys including phosphor bronze, tin brass and brass alloys of the type which are well known to those of ordinary skill in the art.

With respect to the connector block 25, although it was noted that plastics materials are preferred, any insulative type material will suffice. The connector block itself must be molded within precise tolerances so as to permit ease of entry of the contact of the invention and the matting pin in a cooperative manner. In this regard, the channel or pocket must be sufficiently large from the rear portion so as to permit entry of the contact but sufficiently small at the front or bottom opening thereof to prevent passage of the contact therethrough while at the same time permitting passage of a pin contact from the mother board thereinto. It is also noted that the contact of the invention lends itself readily to automated assembly since insertion into the connector block 25 is from the rear. Accordingly, both insertion as well as bending and then soldering can be conducted in a simply sequential step operation by automated machinery as will be readily apparent to those of ordinary skill in the art.

Claims

1. A contact comprising a channel type longitudinally projecting body including a termination end portion at one end thereof constructed for being bent over at an angle approximately perpendicular to the body for insertion and connection by soldering to a daughter board, spring contact engagement means at the other end for engaging a pin contact from a mother board with a predetermined force when said contact is received in a connector block of the daughter board, and retaining means for engaging the walls of pockets of the connector block to resist removal therefrom when said contact is received in a pocket of a connector block prior to soldering and attachment to a daughter board.

2. A contact as in claim 1 wherein said spring contact engagement means comprises dual in-line beams punched out from said body and bent in a manner such that they are spaced from the walls of a connector block pocket by a predetermined distance less than the diameter of a pin contact from a mother board, whereby when a pin contact is inserted into said recess it is held with a predetermined force in contact with the wall of the recess and said dual in-line beams.

3. A contact as in claim 1 wherein said retaining means comprised a punched out tab which is flexible with respect to said body such as to permit insertion of said contact into a pocket in a connector block with a substantially low amount of force, and having an end for engaging the walls of said pocket when said contact is inserted to resist said contact being pulled out of said connector block prior to soldering of the contact to a daughter board.

4. A contact as in claim 2 wherein said retaining means comprised a punched out tab which is flexible with respect to said body such as to permit insertion of said contact into a pocket in a connector block with a substantially low amount of force, and having an end for engaging the walls of said pocket when said contact is inserted to resist said contact being pulled out of said connector block prior to soldering of the contact to a daughter board.

5. A contact as in claim 1 further comprising a stop projection located at the end of said contact closest to said spring contact engagement means, and of a size for engaging a molded in rib in a pocket of a connector block to ensure precise positioning of said contact in said pocket.

6. A contact as in claim 2 further comprising a stop projection located at the end of said contact closest to said spring contact engagement means, and of a size for engaging a molded in rib in a pocket of a connector block to ensure precise positioning of said contact in said pocket.

7. A contact as in claim I made of copper alloy.

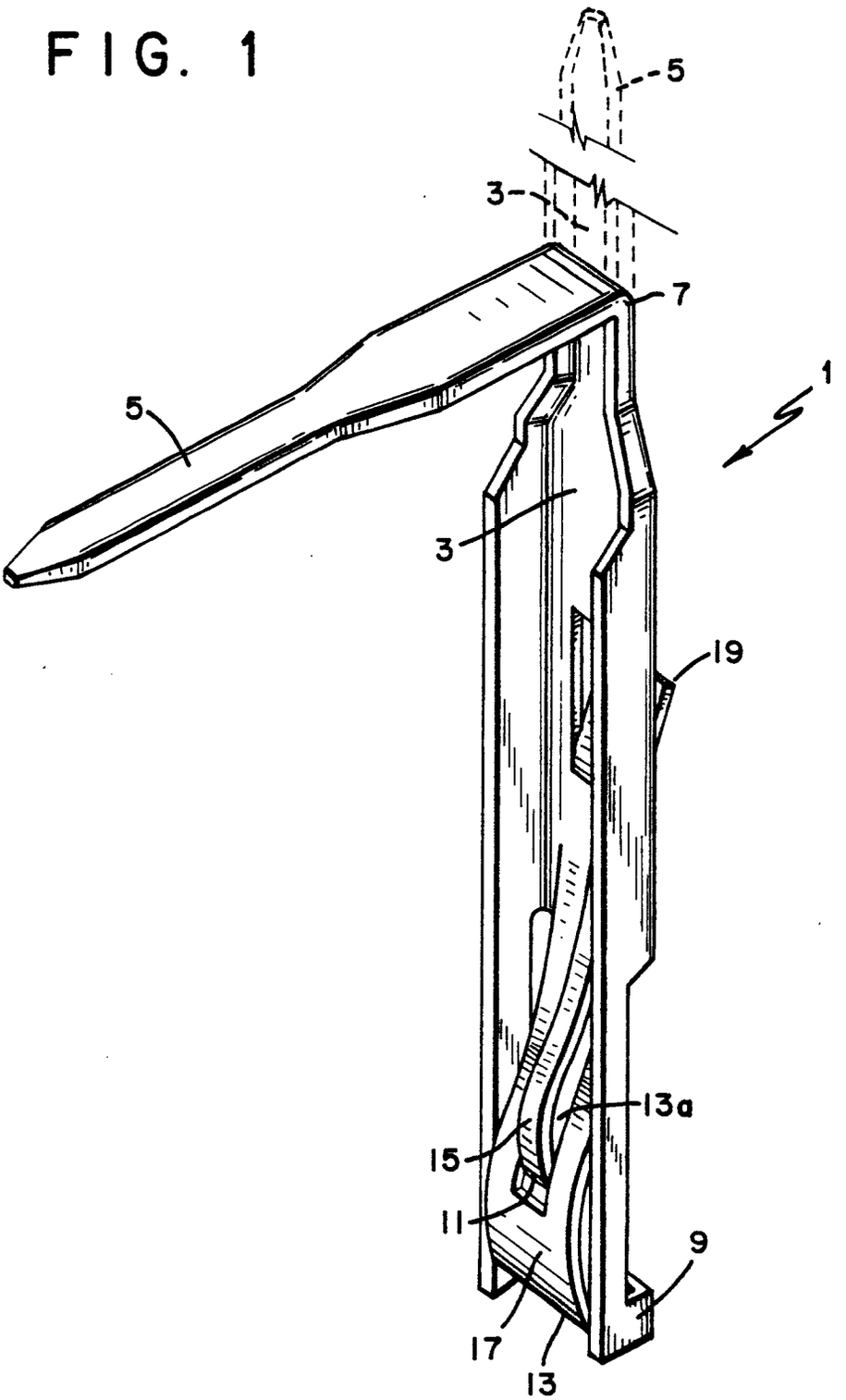
8. A contact as in claim 2 made of copper alloy.

9. A contact as in claim 3 made of copper alloy.

I0. A contact as in claim 4 made of copper alloy.

II. A contact as in claim 5 made of copper alloy.

FIG. 1



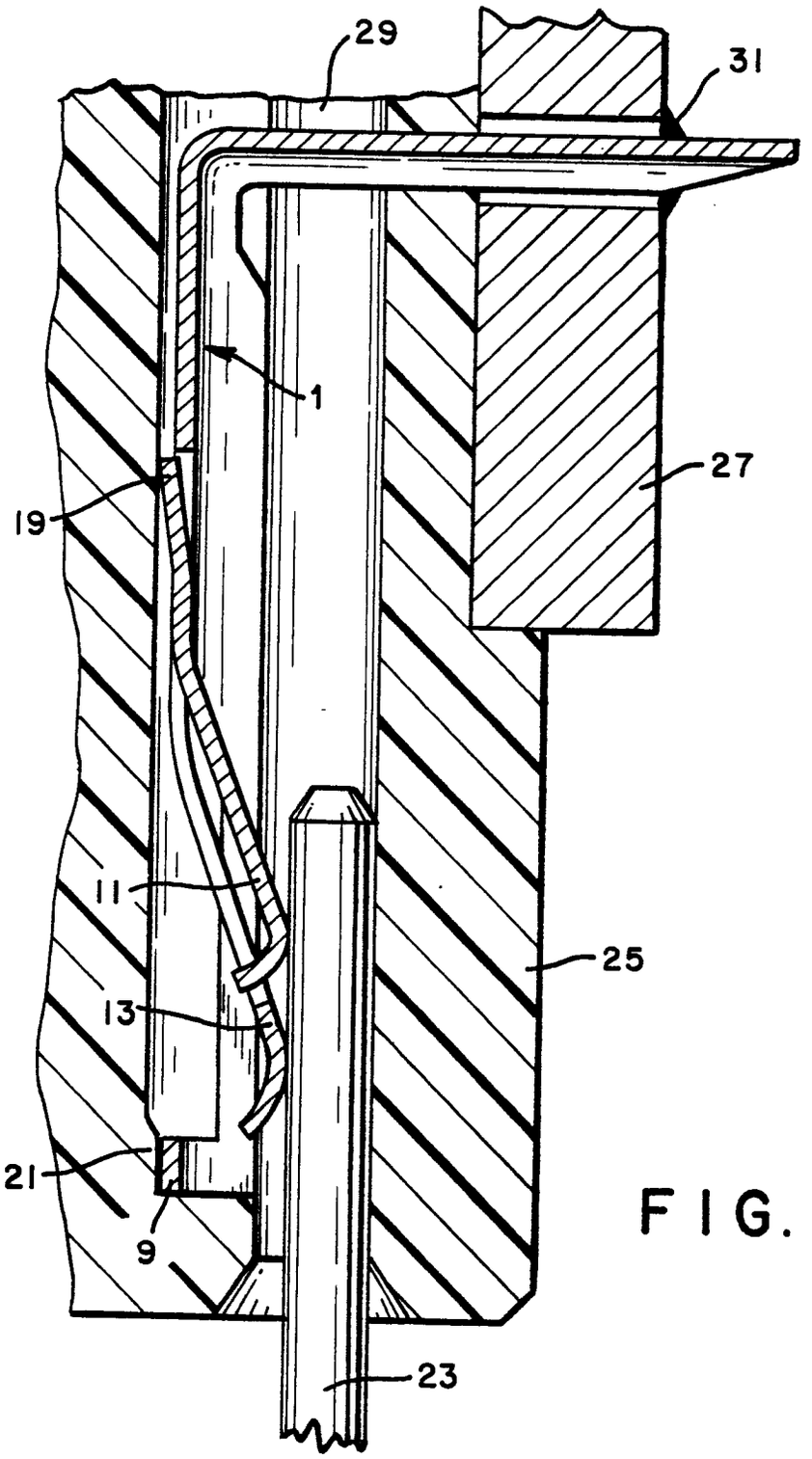


FIG. 2

FIG. 3

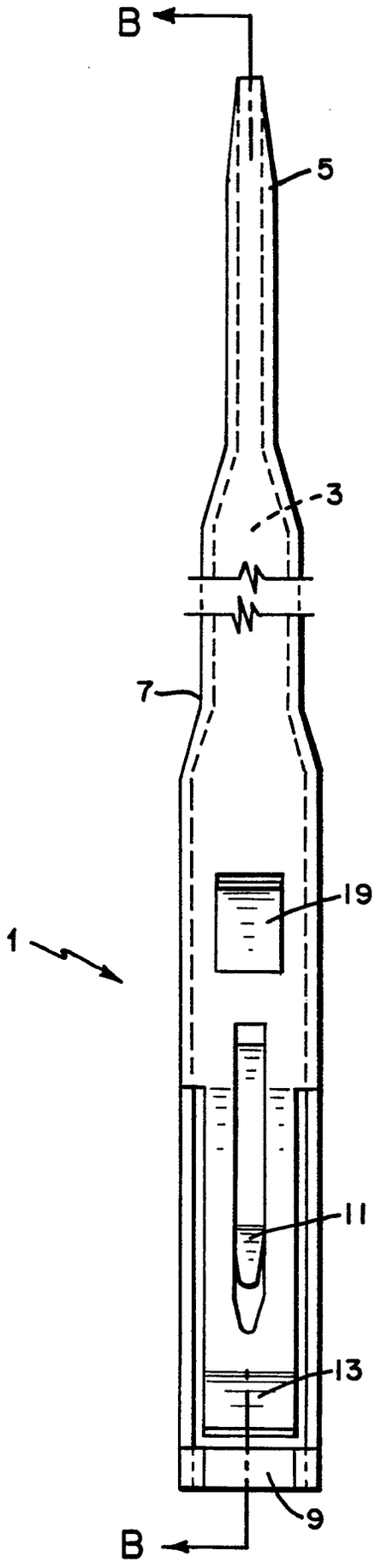
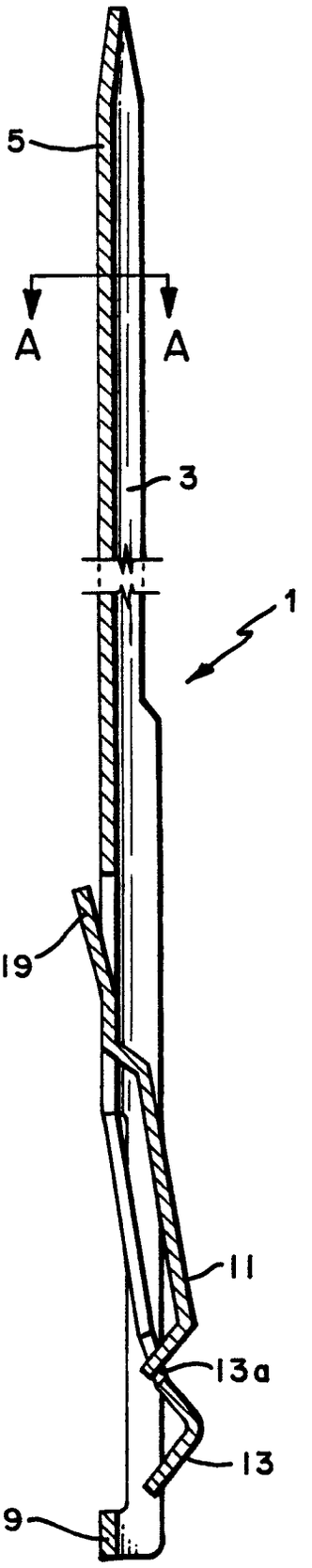


FIG. 4



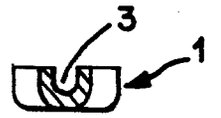


FIG. 5

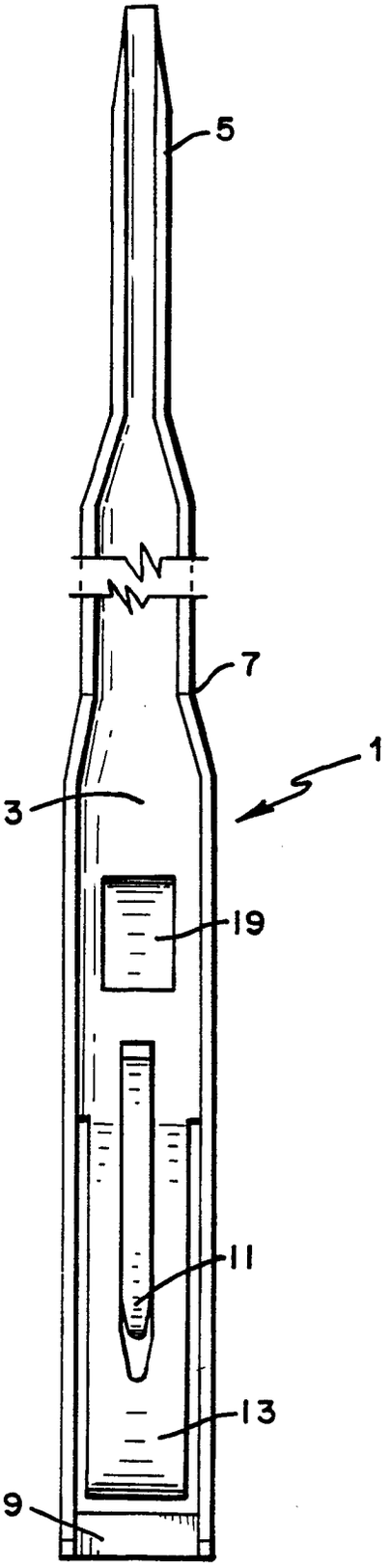


FIG. 6

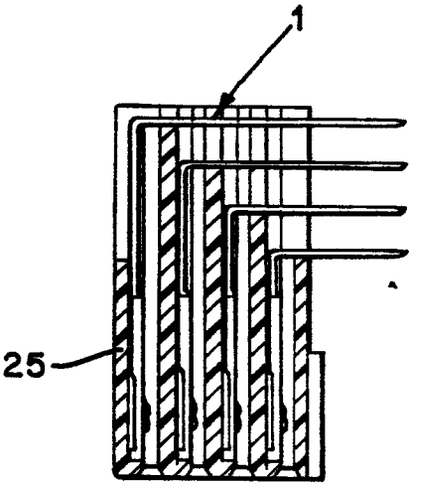


FIG. 8

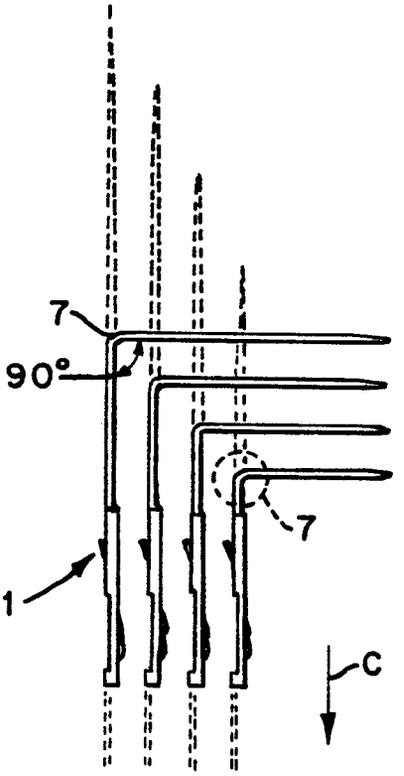


FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 11 3319

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	FR-A-1 308 204 (AMP) * Column 2, lines 7-23; column 4, line 56 - column 5, line 35; figure 5 *	1	H 01 R 13/115
X		3,4-11	

Y	EP-A-0 015 696 (AMP) * Page 10, lines 1-29; figures 1,2 *	1	
X		2	

A	EP-A-0 147 039 (AMP) * Page 2, lines 3-14; page 4, lines 21-24; figures 2,3 *	1	
	-----		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 01 R 13/00 H 01 R 23/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-02-1987	CRIQUI J.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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