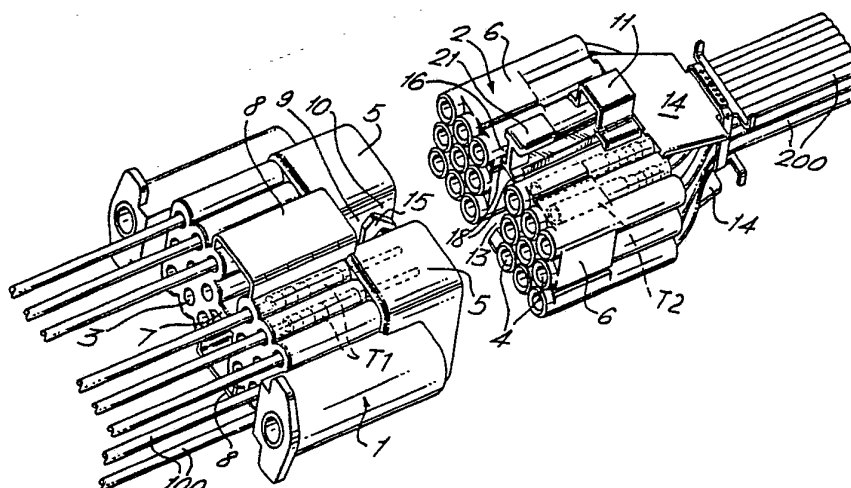




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(54) Title: BIPARTITE ELECTRICAL CONNECTOR HOUSING



(57) Abstract

One of housing parts (1 and 2) has ramps (15), which are engaged by projections (18) on latch arms (16) on the other housing part (2) to secure the housing parts (1 and 2) in mating relationship and thereby providing a force which assists the mating of the housing parts (1 and 2). In order to allow the arms (16) to be released from the ramps (15) by displacing only one of the arms (16), the arms (16) are ganged through a torsion spring (12) so that by depressing one arm (16) towards the mated housing parts (1 and 2), or by pulling the other arm (16) away from the mated housing parts (1 and 2), both of the arms (16) can be released from engagement with their associated ramps (15) simultaneously.

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-1-

BIPARTITE ELECTRICAL CONNECTOR HOUSING

5 This invention relates to a bipartite electrical connector housing comprising first and second housing parts each for containing at least one electrical terminal, the housing parts being capable of being mated to mate the terminals when these are contained therein, the housing parts having interengaging latching members which provide a force which assists in the mating of the two housing parts and which serve to secure them together in their mated condition, the latching members comprising a ramp on each of two opposite sides of the first housing part, and a resilient cantilever arm on each of two opposite sides of the second housing part, each arm carrying a projection adapted and arranged to ride over a ramp on the first housing part as the housing parts are mated.

10 Such a bipartite housing is disclosed in US-A-4026624, in which the problem of unmating the first and second housing parts has been approached by splitting each arm on the second housing part into two parts and giving the projections on the arms and the ramps, camming surfaces which engage when the housing parts are being unmated to separate the two parts of each arm such that they pass on opposite sides of the associated ramp rather than having to pass back over the ramp.

20 However, the engagement between the camming surfaces offers a resistance to unmating, albeit that this resistance can be less than that which would occur if the projections on the arms had to pass back over the ramps.

25 In US-A-3933406 there is disclosed a similar bipartite housing save that the ramps on the first housing part and the projections on the arms of the second housing part have cooperating surfaces which engage when the housing parts are fully mated, to prevent unmating of the housing parts. The arm parts have extensions directed away from the ramps and being adapted and arranged such that by squeezing the free ends of the arm part extensions together, the cooperating surfaces on the ramps and on the projections on the arms can be disengaged



-2-

to permit the projections to pass back on opposite sides of the associated ramp to permit unmating.

However, here again the latching arrangement offers some resistance to unmating, and has the further disadvantage that the provision of the arm extensions takes up additional space. Unmating is also difficult since two hands are required to operate the unlatching arrangement, it thus being necessary for the first housing part to be supported in some way while the second housing part is pulled away therefrom.

10 In EP-A-0039548 there is disclosed a bipartite housing as discussed above in which the ramps are supported on the first housing part such that deflection of the arms of the second housing part towards the first housing part when the housing parts are mated disengages the cooperating surfaces of the ramps and projections and enables the housing parts to be unmated with the projections on the arms of the second housing part passing under the ramps on the first housing part.

20 This known bipartite housing has the advantage that the two housing parts are positively secured in the mated condition, so that unmating is impossible until the latching members are appropriately manipulated, when the two housing parts can be easily unmated.

However, access is needed to both sides of the mated housings to manipulate the latching members to effect unlatching, and in certain circumstances such access may not be available, especially where the connector is located in a part of an automobile where the space available is very limited.

Latching at two sides of an assembly is preferable to ensure reliability, and thus this disadvantage cannot be overcome simply by providing a latching arrangement on only one side of an assembly.

According to this invention a bipartite electrical connector housing comprising first and second housing parts each containing at least one electrical terminal, the housing parts being capable of being mated to mate the terminals when these



-3-

are contained therein, the housing parts having interengaging latching members which provide a force which assists the mating of the two housing parts and which serve to secure them together in their mated condition, the latching members comprising a ramp on each of two opposite sides of the first housing part, and a resilient cantilever arm on each of two opposite sides of the second housing part, each arm carrying a projection adapted and arranged to ride over a corresponding ramp on the first housing part as the two housing parts are mated, the ramps on the first housing part and the projections on the arms of the second housing part having cooperating surfaces which engage when the housing parts are fully mated, to prevent unmating of the housing parts, is characterized in that the arms on the second housing part are ganged through a common torsion spring member, the ramp on one side of the first housing part being such that deflection of the associated arm of the second housing part towards the first housing part when the housing parts have been mated, which deflection causes twisting of the torsion spring member, disengages the cooperating surfaces of the ramp and the associated projection at said one side of the first housing part, and is accompanied by deflection of the arm on the other side of the second housing part away from the first housing part to disengage the cooperating surfaces of the ramp and associated projection at said other side of the second housing part, to permit the housing parts to be unmated, with the projection at said one side passing under its associated ramp, and the projection on said other side passing over its associated ramp.

Twisting of the torsion member can be effected either by urging the arm at said one side towards the first housing part, or by urging the arm at said other side away from the first housing part.

The bipartite housing of this invention has the advantages that positive mating of the housing parts is ensured; positive latching together of the housing parts in the mated condition at



-4-

5 two opposed sides is ensured; unlatching of the housing parts can be effected easily when required; and unlatching of the housing parts requires access to only one side of the mated parts.

10 An electrical connector assembly comprising embodiments of a bipartite connector housing according to this invention will now be described by way of example with reference to the drawings in which:

Figure 1 is a perspective view of the assembly showing the housing parts in the unmated condition;

15 Figure 2 is a longitudinal sectional view through one housing part of the assembly;

Figure 3 is a longitudinal sectional view through the other housing part of the assembly;

Figure 4 is a diagrammatic view of the latching arrangement of the assembly during mating of the housing parts;

20 Figure 5 is a diagrammatic view of the latching arrangement of the assembly in the latched condition;

Figure 6 is a diagrammatic view of the latching arrangement of the assembly at unmating of the housing parts;

25 Figure 7 is a diagrammatic view of the latching arrangement of the assembly during unmating of the housing parts; and

Figure 8 is a diagrammatic view similar to Figure 6 but showing a modified form of the latching arrangement of the assembly.

30 The connector assembly shown in Figure 1 comprises a bipartite insulating connector housing consisting of housing parts 1 and 2 each containing electrical terminals T1 or T2 terminating individual electrical conductors 100 or 200, the housing parts 1 and 2 being capable of being mated to mate the terminals T1 and T2 when these are contained in the housing parts.

35 The housing parts 1 and 2 are each molded from electrically insulating plastic material, and each has two spaced groups of nine tubes defining through cavities 3 or 4 containing the terminals T1 or T2 (only a few of which are shown), the leading



-5-

ends of the tubes defining the cavities 3 in the housing part 1 opening into shroud portions 5 which receive leading end portions 6 of the tubes defining the cavities 4 in the housing part 2, when the housing parts are mated.

5 The two groups of tubes defining the cavities 3, and the associated shroud portions 5 of the housing part 1, are connected by a central web portion 7 (Figure 1) and opposed U-section outer web portions 8, so that a space 9 is provided between the opposed inner surfaces 10 of the shroud portions 5.

10 The two groups of tubes defining the cavities 4 of the housing part 2 are connected by outer web portions 11 and by a torsion spring member 12 so that a space 13 is provided between the two groups of cavities 4.

 The housing part 2 is also formed with a strain relief
15 arrangement comprising a pair of hingedly connected flaps 14 which can be closed and secured together about the conductors 200.

 The housing parts 1 and 2 have interengaging latching members which provide a force which assists the mating of the
20 housing parts and which serve to secure the housing parts together in their mated condition.

 The latching members comprise on the housing part 1, a pair of ramps 15 formed on the opposed inner surfaces 10 of each of the shroud portions 5, and on the housing part 2, a
25 pair of resilient cantilever arms 16 connected by bight portions 17 to the rearward edge of the torsion spring member 12 and extending forwardly in the space 13 between the two groups of tubes defining the cavities 4. At its free end, each arm 16 carries two cam projections 18 each adapted and arranged to ride
30 over one of the ramps 15 on the housing part 1, the ramps 15 and the projections 18 having cooperating surfaces 19 and 20 respectively which engage when the housing parts 1 and 2 are fully mated, to prevent unmating of the housing parts, as will all be described below.

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-6-

One of the arms 16 is also formed at its free end with a pushbutton 21 by which the arm can be depressed to unlatch the housing parts 1 and 2, as will also be described below.

5 Mating of the housing parts 1 and 2 will now be described with reference to Figures 4 and 5.

As shown in Figure 4, as the housing parts are mated in the direction of the arrow M, the projections 18 on the arms 16 ride up forwardly facing surfaces of the associated ramps 15, thus causing resilient outward deflection of the arms 16. If the
10 mating force is removed before the projections 18 reach the peaks of the ramps 15 the housing parts will be urged apart again by the forces induced in the arms 16 by their deflection.

When the projections 18 pass over the peaks of the associated ramps 15 and engage rearwardly facing surfaces
15 thereof, the forces induced in the arms 16 by their deflection serve to urge the housing parts towards each other and thus assist in ensuring that the housing parts become positively mated.

As shown in Figure 5, when the housing parts are fully
20 mated the projections 18 are engaged behind the associated ramps 15 with their surfaces 20 and 19 in engagement, thereby preventing unmating of the housing parts.

When, as shown in Figures 6 and 7, it is desired to unmate the housing parts, the pushbutton 21 is depressed, as indicated
25 by the arrow P in Figure 6, thereby to disengage the surfaces 19 and 20 of the ramps 15 and projections 18. The arm 16 which carries the pushbutton 21 (the upper arm in Figure 6) is deflected directly by the applied force, this deflection causing twisting of the torsion spring member 12 which carries the arms
30 16 and through which they are ganged. This twisting of the torsion spring member 12 causes the other arm 16 (the lower arm 16 in Figure 6) to be deflected so that the surfaces 20 of the projections 18 thereon are moved out of engagement with the surfaces 19 of the associated ramps 15. The housing parts can
35 then be pulled apart in the direction of the arrow A in Figures 6



-7-

and 7, the projections 18 on the arm 16 carrying the pushbutton 21 passing under the associated ramps 15, and the projections 18 on the other arm 16 passing back over the associated ramps 15.

When the projections 18 are finally clear of the associated ramps 15 the torsion spring member 12 untwists and returns to its rest condition, so that the arms 16 are returned to their initial position.

Figure 8 shows a modification of the latching arrangement shown in Figures 1 to 7. As shown in Figure 8, a finger grip 22 is provided on the other arm 16, that is the lower arm 16 in the drawings. With this modified arrangement, the mating of the housing parts 1 and 2 and their latching in the mated condition is as above described with reference to Figures 4 and 5. However, unmating is effected by pulling the finger grip 22, and thus the arm 16 on which it is provided, away from the housing parts, as indicated by the arrow P in Figure 8, so that the projections 18 on the other, lower arm 16 pass back over the associated ramps 15 while the induced twisting of the torsion member 12 disengages the projections 18 on the upper arm 16 from the associated ramps 15 so that they can pass under the ramps 15 as the housing parts are unmated, as shown in Figure 7.

Both the above described embodiments have the particular advantage that, while secure latching together of the housing parts 1 and 2 in the mated condition is provided on two sides of the assembly, unlatching of the parts 1 and 2 can readily be effected, even when there is access to only one side of the assembly as may be the case, for example, where the assembly is located amongst crowded other parts, for example, in the electrical system of an automobile.

-8-

CLAIMS:

1. A bipartite electrical connector housing comprising first and second housing parts (1 and 2) each for containing at least one electrical terminal (T1 or T2), the housing parts being
5 capable of being mated to mate the terminals (T1 and T2) when these are contained therein, the housing parts (1 and 2) having interengaging latching members (5 and 16) which provide a force which assists the mating of the housing parts (1 and 2) and which serve to secure them together in their mated condition,
10 the latching members comprising a ramp (15) on each of two opposite sides of the first housing part (1), and a resilient cantilever arm (16) on each of two opposite sides of the second housing part (2), each arm (16) carrying a projection (18) adapted and arranged to ride over a corresponding ramp (15) on
15 the first housing part (1) as the housing parts (1 and 2) are mated, the ramps (15) on the first housing part (1) and the projections (18) on the arms (16) of the second housing part (2) having cooperating surfaces (19 and 20) which engage when the housing parts (1 and 2) are fully mated, to prevent unmating of
20 the housing parts (1 and 2), characterized in that the arms (16) on the second housing part (2) are ganged through a common torsion spring member (12), the ramp (15) on one side of the first housing part (1) being such that deflection of the associated arm (16) of the second housing part (2) towards the
25 first housing part (1) when the housing parts have been mated, which deflection causes twisting of the torsion spring member (12) disengages the cooperating surfaces (19 and 20) of the ramp (15) and the associated projection (18) at said one side of the first housing part (1) and is accompanied by deflection of
30 the arm (16) on the other side of the second housing part (2) away from the first housing part (1) to disengage the cooperating surfaces (19 and 20) of the ramp (15) and the associated projection (18) at said other side of the second housing part (2), to permit the housing parts (1 and 2) to be
35 unmated, with the projection (18) at said one side passing under



-9-

its associated ramp (15), and the projection (18) at said other side passing over its associated ramp (15).

2. A bipartite electrical connector housing according to claim 1, characterized in that the arm (16) on the one side of the second housing part (2) is provided with a pushbutton (21) which can be depressed to deflect said arm (16) towards the first housing part (1), in the mated condition of the housing parts (1 and 2).

3. A bipartite electrical connector housing according to claim 1, characterized in that the arm (16) on the other side of the second housing part (2) is provided with a finger grip (22) which can be pulled to move said arm (16) away from the first housing part (1), in the mated condition of the housing parts (1 and 2), thereby to deflect the arm (16) on the one side of the second housing part (2) towards the first housing part (1).

4. A bipartite electrical connector housing according to claim 1, in which the torsion spring member (12) connects two spaced portions of the second housing (2).



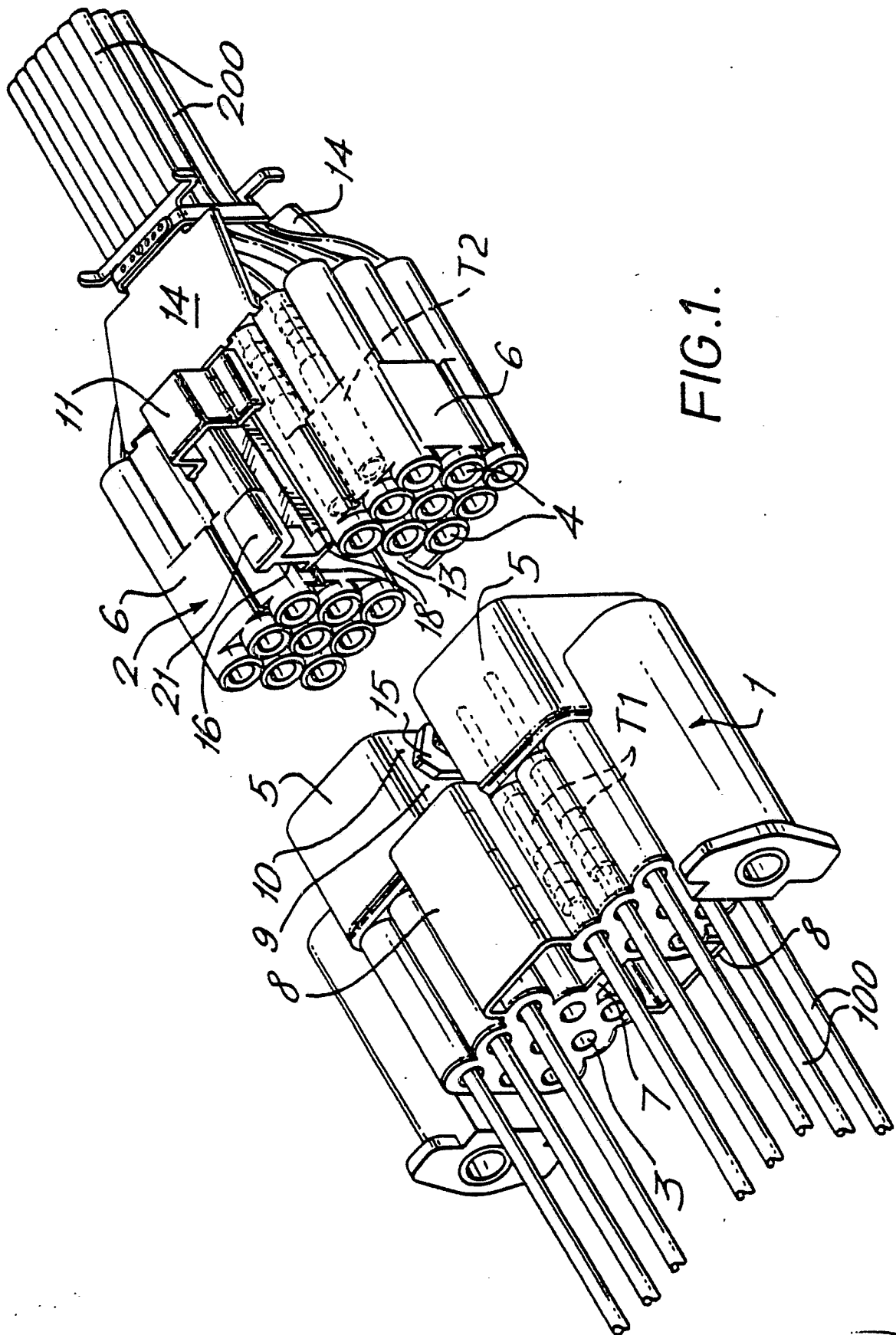


FIG.2.

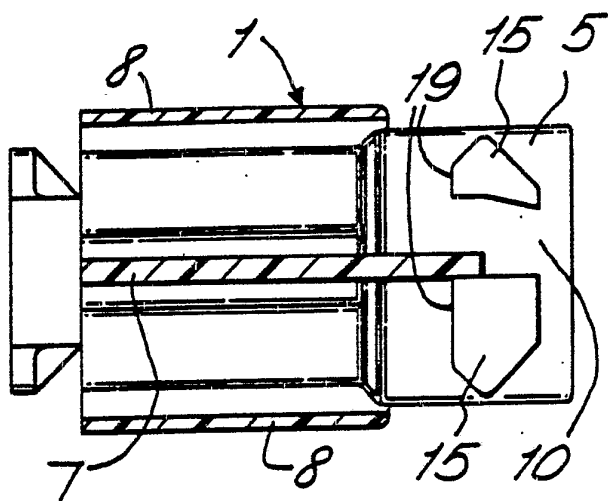


FIG.3.

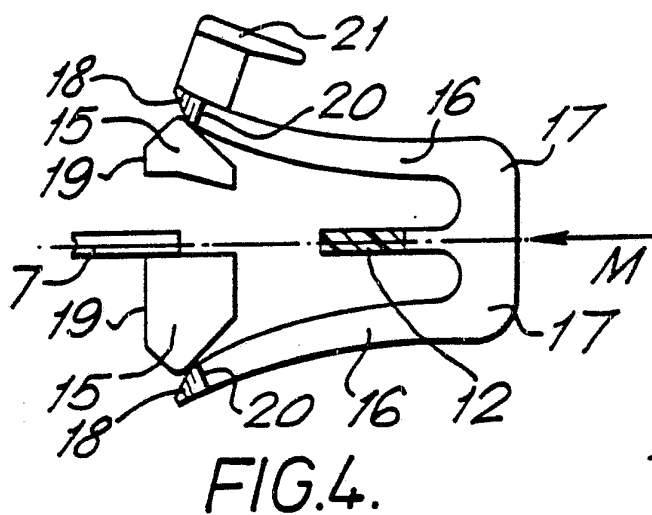
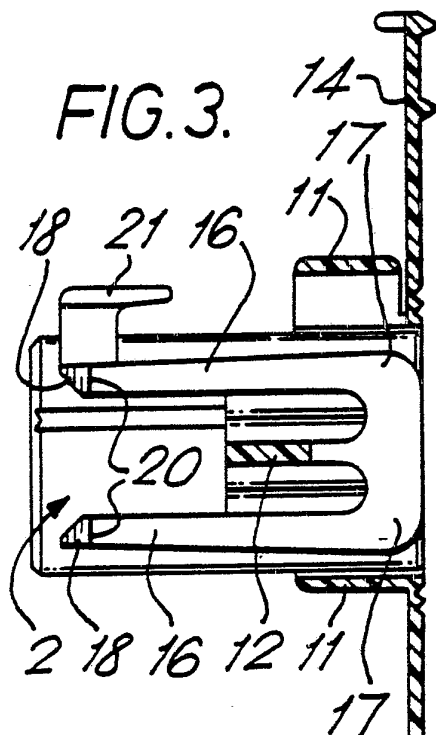
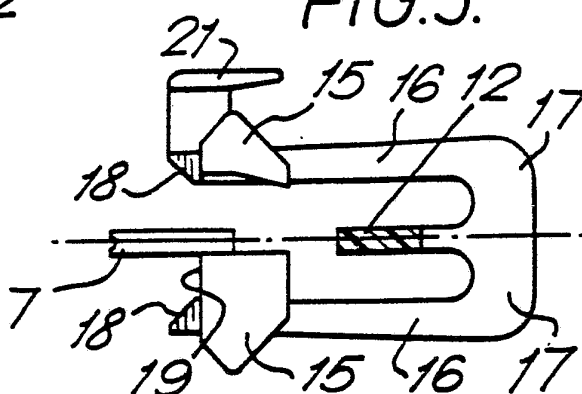


FIG.4.

FIG.5.



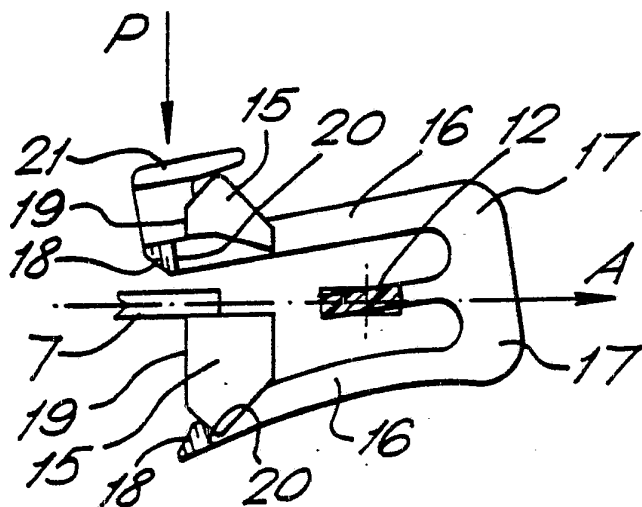


FIG. 6.

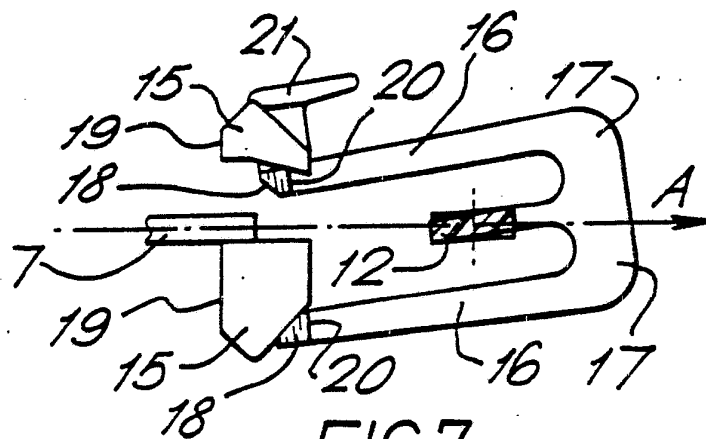


FIG. 7.

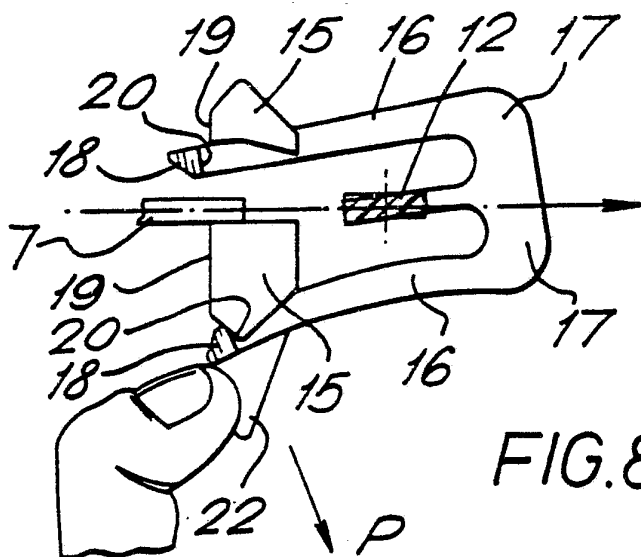
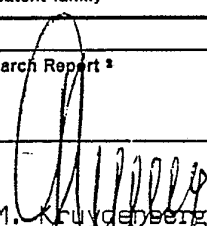


FIG. 8.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 84/00443

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC IPC ³ : H 01 R 13/627						
II. FIELDS SEARCHED Minimum Documentation Searched ⁴ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="border: 1px solid black; padding: 10px; vertical-align: top;">IPC³</td> <td style="border: 1px solid black; padding: 10px; vertical-align: top;">H 01 R 13/00</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵			Classification System	Classification Symbols	IPC ³	H 01 R 13/00
Classification System	Classification Symbols					
IPC ³	H 01 R 13/00					
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴						
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸				
A	DE, A, 2801427 (BUNKER RAMO) 20 July 1978 see page 6, line 1 - page 9, line 13 --	1				
A	US, A, 3933406 (CAMERON) 20 January 1976 (cited in the application) --					
A	US, A, 4026624 (BOAG) 21 May 1977 (cited in the application) -----					
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IV. CERTIFICATION						
Date of the Actual Completion of the International Search ¹ 29th June 1984		Date of Mailing of this International Search Report ² 20 JUL. 1984				
International Searching Authority ¹ EUROPEAN PATENT OFFICE		Signature of Authorized Officer ¹⁰  G.L.M. KRUEGER				

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 84/00443 (SA 6898)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 13/07/84

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 2801427	20/07/78	JP-A- 53088186	03/08/78
US-A- 3933406	20/01/76	None	
US-A- 4026624	31/05/77	DE-A, B, C 2730980	09/03/78
		AU-A- 2727877	01/02/79
		JP-A- 53040893	13/04/78
		CA-A- 1071730	12/02/80
		AU-B- 505786	29/11/79
		GB-A- 1586517	18/03/81

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