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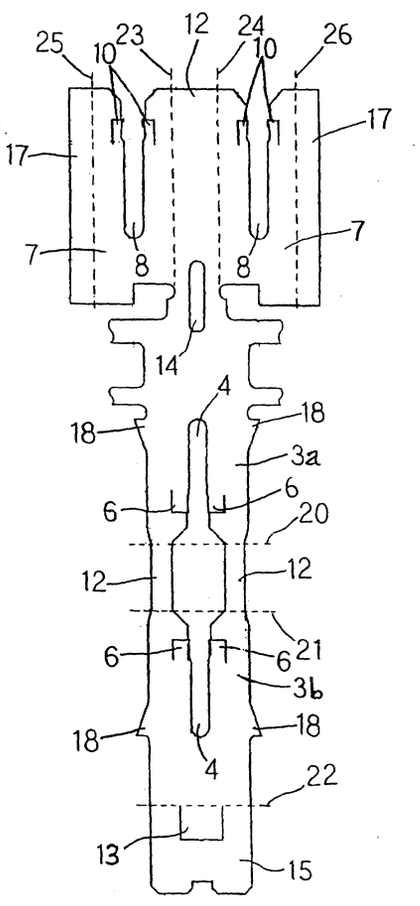
(54) Electrical terminal

(57) An electrical terminal 1 is provided that is formed by being stamped and bent from a metal plate. This terminal is equipped with a pair of opposing first electrical wire accommodating slots 4 that are respectively formed in a pair of opposing first plate parts 3, and a pair of opposing second electrical wire accommodating slots 8 that are respectively formed in opposing second plate parts 7. The pair of second plate parts 7 are formed by a pair of plate parts that are bent from both side edges of a flat plate part 12 that extends from one of the first plate parts 3, with these plate parts being bent substantially at right angles relative to the flat plate part 12, so that the pair of second electrical wire accommodating slots 8 formed in the second plate parts 7 and the pair of first electrical wire accommodating slots 4 formed in the first plate parts 3 are arranged substantially at right angles.

Figure 4



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Description

[0001] The present invention relates to an electrical terminal which is equipped with first electrical wire accommodating slots that accommodate a first electrical wire extending from an electrical device such as a motor, etc., and second electrical wire accommodating slots that accommodate a second electrical wire that is separate from the first electrical wire, and in which the first electrical wire and second electrical wire are electrically connected.

[0002] The electrical terminal shown in Figure 5 is a conventional electrical terminal as disclosed in U.S. Patent No. 4,118,103.

[0003] This electrical terminal 100 is formed by stamping and bending a metal plate, and has a pair of opposing plate parts 102 that are connected via a bent part 101. A pair of opposing first electrical wire accommodating slots 103 which are formed in the bottom portions of the plate parts 102 and which accommodate a first electrical wire (not shown in the figures), and a pair of opposing second electrical wire accommodating slots 106 which are formed in the upper portions of the plate parts 102 and which accommodate a second electrical wire (not shown in the figures), are respectively formed in the opposing plate parts 102. First electrical wire accommodating openings 104 which are wider than the first electrical wire accommodating slots 103 are formed so that these openings extend from the bottom ends of the pair of plate parts 102 to the first electrical wire accommodating slots 103, and a pair of protruding edge parts 105 which remove the insulating covering of the first electrical wire are formed on both sides of each first electrical wire accommodating slot 103. Furthermore, folded-back portions 107 which are folded back to the inside toward each other from the respective upper ends of the pair of plate parts 102 are formed, and protruding parts 108 that protrude inward are formed in the respective folded-back portions 107. As a result of the presence of the foldedback portions 107, the thickness of the plate parts 102 which have the second electrical wire accommodating slots 103 is doubled, so that the strength of the plate parts 102 is sufficient when a relatively thick second electrical wire is inserted into these accommodating slots.

[0004] The first electrical wire (not shown) is a slender electromagnetic coil conductor which is insulated by varnish, while the second electrical wire (not shown) is a conductor whose core is covered by an insulating outer covering consisting of a synthetic plastic material that is thicker than a varnish covering.

[0005] In the case of the electrical terminal 100 shown in Figure 5, the first electrical wire accommodating slots 103 and second electrical wire accommodating slots 106 formed in the plate parts 102 are respectively formed as pairs of slots. As a result, the first electrical wire accommodated in the first electrical wire accommodating slots 103 and the second electrical wire accommodated in the second electrical wire accommodating slots can be securely connected to the electrical terminal 100, so that the mutual connection of the first and second electrical wires can be securely accomplished.

[0006] However, since the first electrical wire accommodating slots 103 and second electrical wire accommodating slots 106 are formed in the same flat plates, the slots are parallel to each other. As a result, the first electrical wire accommodated in the first electrical wire accommodating slots 103 and the second electrical wire accommodated in the second electrical wire accommodating slots 106 are effectively parallel to each other, so that cases in which it is desired to cross the first electrical wire and second electrical wire when the wires are connected to the electrical terminal 100 cannot be handled.

[0007] Accordingly, an object of the present invention is to provide an electrical terminal which makes it possible to achieve a secure mutual connection between a first electrical wire and a second electrical wire, and which makes it possible to connect the first electrical wire and second electrical wire by crossing the wires.

[0008] The electrical terminal of the present invention is formed by being stamped and bent from a metal plate, and is equipped with a pair of opposing first electrical wire accommodating slots which are respectively formed in a pair of opposing first plate parts, and a pair of second electrical wire accommodating slots which are respectively formed in a pair of opposing second plate parts, such that a first electrical wire may be accommodated in the first electrical wire accommodating slots and a second electrical wire may be accommodated in the second electrical wire accommodating slots. The first electrical wire and the second electrical wire are electrically connected. The pair of second plate parts are formed by a pair of plate parts which are bent from both side edges of a flat plate part extending from one of the first plate parts, with these plate parts being bent substantially at right angles with respect to the flat plate part, and the pair of second electrical wire accommodating slots formed in the second plate parts and the pair of first electrical wire accommodating slots formed in the first plate parts cross each other substantially at right angles.

[0009] Furthermore, it is effective if a stopper part, which restricts the movement of the second plate parts to the outside when the second electrical wire is accommodated in the second electrical wire accommodating slots, is formed on the first plate part that is opposite the first plate part from which the flat plate part extends.

[0010] Furthermore, it is effective if a reinforcing bead part which reinforces the flat plate part is formed on the flat plate part.

[0011] Figure 1 is a plan view of the electrical terminal of the present invention.

[0012] Figure 2 is a front view of the electrical terminal shown in Figure 1.

[0013] Figure 3 is a side view of the electrical terminal

shown in Figure 1.

[0014] Figure 4 is a plan view of the metal plate stamping blank used to form the electrical terminal shown in Figure 1.

[0015] Figure 5 is a perspective view of a conventional example of an electrical terminal.

[0016] As shown in Figures 1 through 3, the electrical terminal 1 is formed by stamping and bending a metal plate, and has a pair of opposing first plate parts 3 that are connected via a connecting part 2. A pair of opposing first electrical wire accommodating slots 4 which accommodate a first electrical wire (not shown in the figures) are respectively formed in the pair of first plate parts 3. The first electrical wire may be, for example a relatively slender electrical magnetic coil conductor insulated by means of a varnish, which extends from an electrical device such as a motor, etc. First electrical wire accommodating openings 5 which are wider than the first electrical wire accommodating slots 4 are formed so that these openings 5 extend from the lower ends of the pair of first plate parts 3 to the first electrical wire accommodating slots 4, and a pair of protruding edge parts 6 which remove the insulating covering of the first electrical wire when the first electrical wire is accommodated are formed on both sides of each first wire accommodating slot 4. The protruding edge parts 6 are formed by cutting along L-shape cutting lines 6a on both sides of each first electrical wire accommodating slot 4, and pressing the cut portions from both sides so that the edge parts are caused to protrude slightly into the first electrical wire accommodating slots 4. A pair of engaging projections 18 which engage with an insulating housing (not shown in the figures) are formed on the respective side edges of the pair of first plate parts 3.

[0017] The electrical terminal 1 has a pair of opposing second plate parts 7 that are distanced from the first plate parts 3. The pair of second plate parts 7 are formed by a pair of plate parts that are bent from both side edges of a flat plate part 12 that extends upward from one of the first plate parts 3 (the first plate part 3 on the right side in Figure 3), with these plate parts being bent substantially at right angles relative to the flat plate part 12. A pair of opposing second electrical wire accommodating slots 8 that accommodate a second electrical wire (not shown in the figures) from above are respectively formed in the second plate parts 7. The second electrical wire accommodating slots 8 and first electrical wire accommodating slots 4 are oriented substantially at right angles to one another. The second electrical wire may be a conductor in which the circumference of the core is covered with a relatively hard Teflon as an insulating covering. Second electrical wire accommodating openings 9 are formed so that these openings 9 extend from the upper ends of the pair of second plate parts 7 to the second electrical wire accommodating slots 8. Knife edges 11 are used for efficient cutting of the Teflon covering of the second electrical wire and are formed on the edge parts of the second wire accommodating openings 9. A pair of protruding edge parts 10 which remove the insulating covering of the second electrical wire when the second electrical wire is inserted into the second electrical wire accommodating slots 8 are formed on both sides of each of the second electrical wire accommodating slots 8. Moreover, the tip end portions 17 of the pair of second plate parts 7 are bent inward toward each other and joined by a seam 16, so that a box-form shape is constructed. As a result, the pair of second plate parts 7 in which the second electrical wire accommodating slots 8 are formed are structurally strengthened.

[0018] The upper end portion 15 of the other first plate part 3 that is opposite the first plate part 3 from which the flat plate part 12 extends is bent substantially at right angles toward the first plate part 3 from which the flat plate part 12 extends, and the tip end of this other first plate part 3 is caused to contact the first plate part 3 from which the flat plate part 12 extends. As a result, the pair of first plate parts 3 in which the first electrical wire accommodating slots 4 are formed are structurally strengthened. Furthermore, a stopper part 13 which restricts the movement of the second plate parts 7 to the outside when the second electrical wire is accommodated in the second electrical wire accommodating slots 8 is formed as a protruding part on the aforementioned other first plate part 3. The stopper part 13 contacts the bent tip end portions 17 of the second plate parts 7 before the second electrical wire is accommodated in the second electrical wire accommodating slots 8. Meanwhile, a reinforcing bead part 14 which reinforces the flat plate part 12 extending from the opposite first plate part 3 is formed on the flat plate part 12.

[0019] The electrical terminal 1 is stamped from a metal plate in the shape shown in Figure 4, and is formed by bending the pair of first plate parts 3 along the bending lines 20 and 21, bending the upper end portion 15 of one of the first plate parts 3 along the bending line 22, bending the pair of second plate parts 7 along the bending lines 23 and 24, and bending the tip end portions of the second plate parts 7 along the bending lines 25 and 26.

[0020] The electrical terminal 1 constructed as described above is attached to a motor-side insulating housing (not shown in the figures) by press-fitting the engaging projections 18 with the first electrical wire accommodating openings 5 facing downward. The first electrical wire extending from the motor is disposed in the insulating housing beforehand, and when the electrical terminal 1 is attached to the insulating housing, the first electrical wire is accommodated in the first electrical wire accommodating slots 4 from the first electrical wire accommodating openings 5, so that this first electrical wire is electrically connected to the electrical terminal 1. In this case since the upper end portion 15 of the aforementioned other first plate part 3 is bent substantially at right angles toward the opposite first plate part 3 and the

tip end of this other first plate part 3 is caused to contact the aforementioned opposite first plate part 3 so that the pair of first plate parts 3 in which the first electrical wire accommodating slots 4 are formed are structurally strengthened, the first plate parts 3 are not deformed by press-fitting in the insulating housing.

[0021] After the electrical terminal 1 has been fastened to the insulating housing, the second electrical wire which is fastened in place, for example, by means of an insulating cover, is inserted into the second electrical wire accommodating slots 8 from the second electrical wire accommodating openings 9, so that the second electrical wire is electrically connected to the electrical terminal 1. As a result, the first electrical wire and second electrical wire are electrically connected to each other by the electrical terminal 1. Since the pair of second electrical wire accommodating slots 8 formed in the second plate parts 7 and the pair of first electrical wire accommodating slots 4 formed in the first plate parts 3 are arranged substantially at right angles, the first and second electrical wires accommodated in these slots are disposed so that they are oriented at right angles. Furthermore, since the first electrical wire accommodating slots 4 and second electrical wire accommodating slots 8 are respectively formed as pairs of slots rather than as single slots, the first and second electrical wires are securely connected to the electrical terminal. Moreover, since a reinforcing bead part 14 which reinforces the flat plate part 12 that connects the first plate parts 3 and second plate parts 7 is formed on the flat plate part 12, there is little danger that the flat plate part 12 will bend when the second electrical wire is inserted in the second electrical wire accommodating slots 8. Furthermore, since a stopper part 13 which restricts the movement of the second plate parts 7 to the outside when the second electrical wire is accommodated in the second electrical wire accommodating slots 8 is formed on the other first plate part 3 that is opposite the first plate part 3 from which the flat plate part 12 extends, the movement of the second plate parts 7 is restricted even if the second plate parts 7 should tend to bend to the outside about the flat plate part 12. Accordingly, the connection of the second electrical wire to the electrical terminal 1 is securely accomplished.

[0022] An advantage of the present invention is that a pair of second plate parts are formed by a pair of plate parts which are bent from both side edges of a flat plate part extending from one first plate part, with these plate parts being bent substantially at right angles relative to the flat plate part, so that a pair of second electrical wire accommodating slots formed in the second plate parts and a pair of first electrical wire accommodating slots formed in the first plate parts are oriented substantially at right angles. Accordingly, the first electrical wire and second electrical wire can be connected by being arranged at right angles. Furthermore, since the first electrical wire accommodating slots and second electrical wire accommodating slots are respectively formed as pairs of slots, the mutual connection of the first electrical wire and second electrical wire via the electrical terminal can be securely accomplished.

[0023] A further advantage of the present invention is that a stopper which restricts the movement of the second plate parts to the outside when the second electrical wire is accommodated in the second electrical wire accommodating slots is formed on the other first plate part that is opposite the first plate part from which the flat plate part extends. Accordingly, even if the second plate parts should tend to bend to the outside about the flat plate part when the second electrical wire is accommodated, the movement of the second plate parts is restricted by the stopper part, so that the connection of the second electrical wire to the electrical terminal can be securely accomplished.

[0024] A further advantage of the present invention is that a reinforcing bead part which reinforces the flat plate part is formed on the flat plate part. Accordingly, there is little danger that the flat plate part will bend when the second electrical wire is inserted into the second electrical wire accommodating slots.

Claims

1. An electrical terminal which is **characterized by** the fact that in an electrical terminal [a] which is formed by being stamped and bent from a metal plate, [b] which is equipped with [i] a pair of opposing first electrical wire accommodating slots which are respectively formed in a pair of opposing first plate parts, and [ii] a pair of second electrical wire accommodating slots which are respectively formed in a pair of opposing second plate parts, and [c] a first electrical wire which is accommodated in the aforementioned first electrical wire accommodating slots and a second electrical wire which is accommodated in the aforementioned second electrical wire accommodating slots are electrically connected,

   the aforementioned pair of second plate parts are formed by a pair of plate parts which are bent from both side edges of a flat plate part extending from one of the aforementioned first plate parts, with these plate parts being bent substantially at right angles with respect to the aforementioned flat plate part, and
   the aforementioned pair of second electrical wire accommodating slots formed in the aforementioned second plate parts and the aforementioned pair of first electrical wire accommodating slots formed in the aforementioned first plate parts cross each other substantially at right angles.

2. The electrical terminal claimed in Claim 1, which is **characterized by** the fact that a stopper part which

restricts the movement of the aforementioned second plate parts to the outside when the aforementioned second electrical wire is accommodated in the aforementioned second electrical wire accommodating slots is formed on the aforementioned first plate part that is opposite the first plate part from which the aforementioned flat plate part extends.

3. The electrical terminal claimed in Claim 1 or 2, which is **characterized by** the fact that a reinforcing bead part which reinforces the aforementioned flat plate part is formed on said flat plate part.

Figure 1

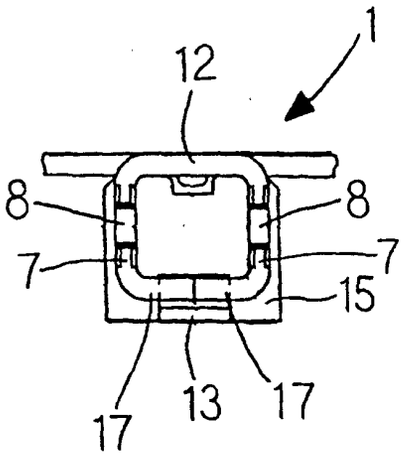


Figure 2

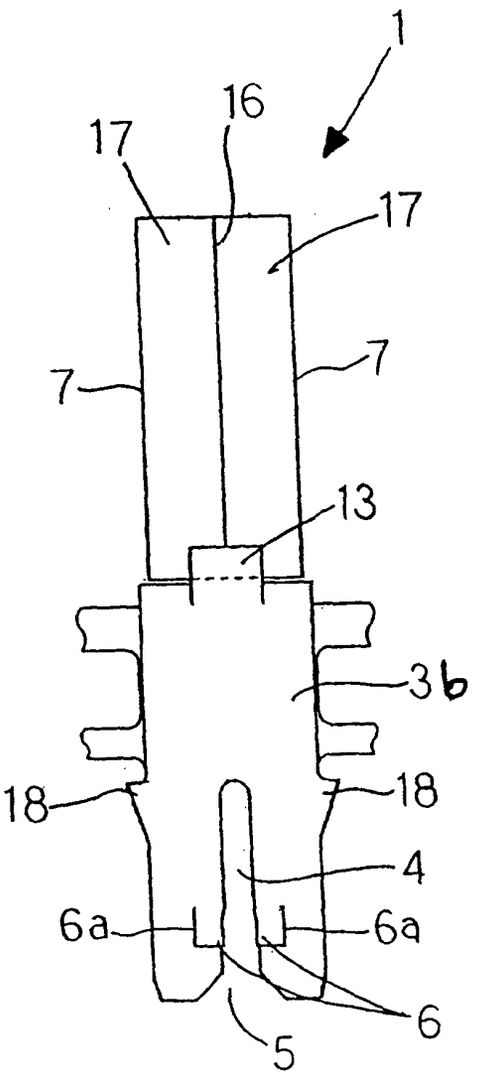


Figure 3

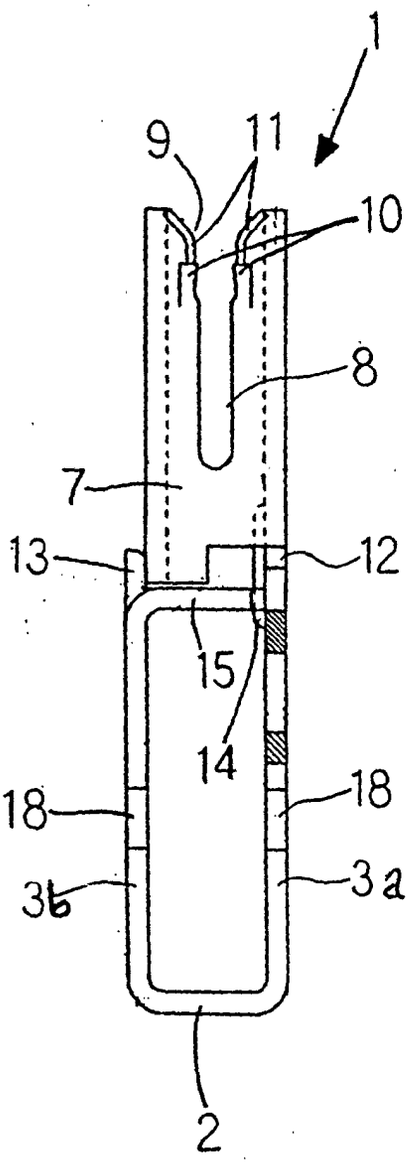
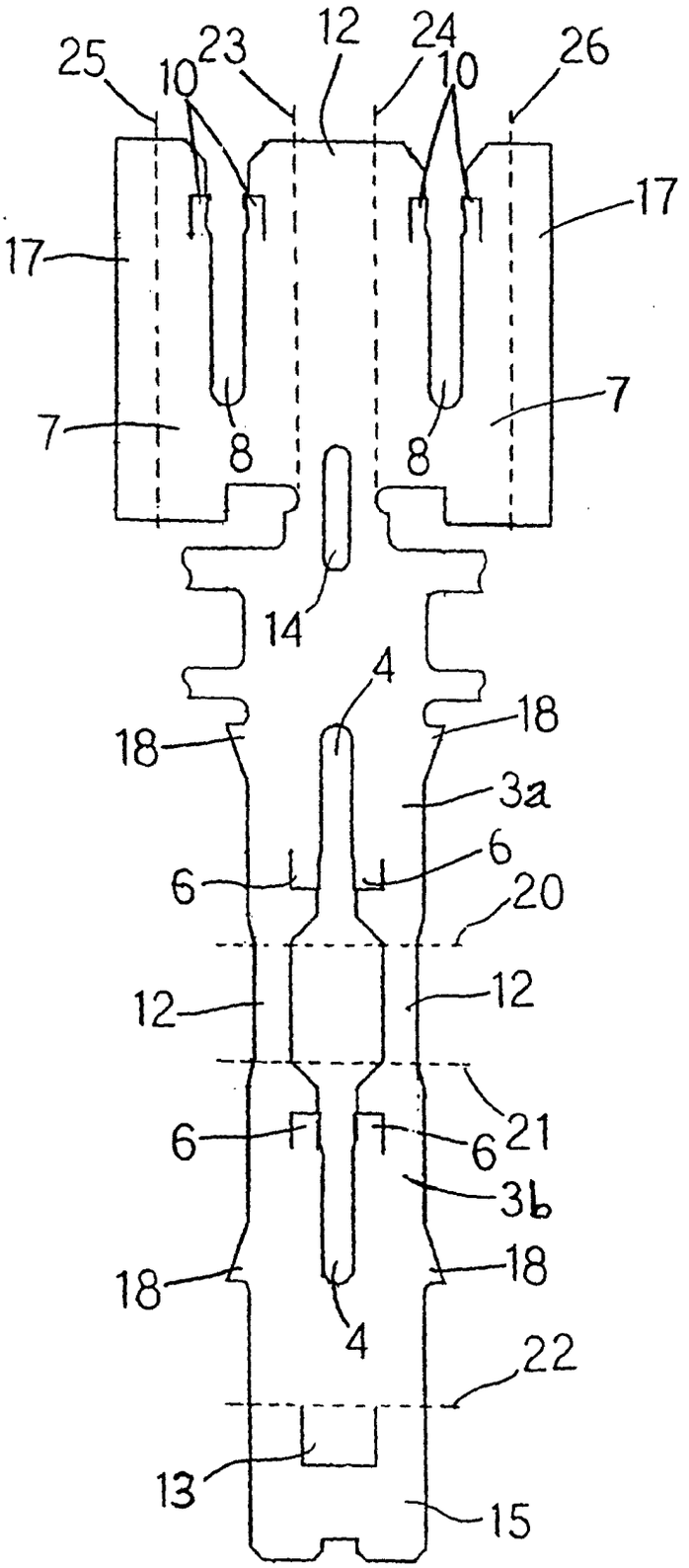


Figure 4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3b
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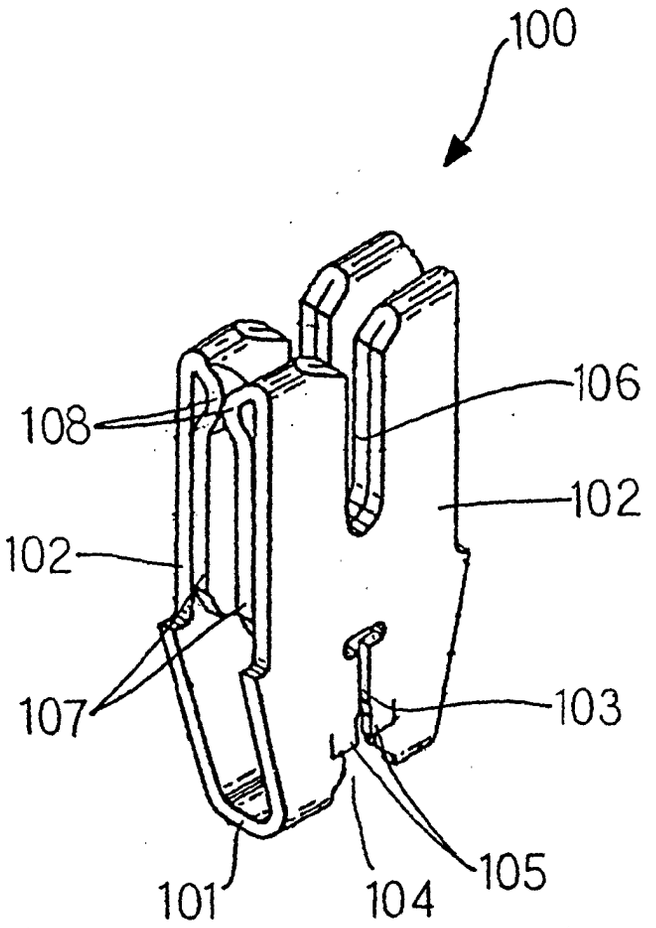
Figure 5



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 4499

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.7)
Y	WO 98 47201 A (BENOIT DOMINIQUE ;PICAUD JEAN PIERRE (FR); WHITAKER CORP (US)) 22 October 1998 (1998-10-22) * abstract; figure 3 *	1-3	H01R4/24
Y	EP 0 571 156 A (WHITAKER CORP) 24 November 1993 (1993-11-24) * page 3, column 2, line 47 - page 4, column 3, line 14; figures 7,8 *	1-3	
Y	FR 2 581 259 A (AMP FRANCE) 31 October 1986 (1986-10-31) * page 2, line 26 - page 3, line 13; figures 1-3 *	1,2	
Y	EP 0 435 292 A (ZIERICK MFG CORP) 3 July 1991 (1991-07-03) * page 5, column 7, line 24 - line 41; figures 3,4 *	3	
A	US 5 044 978 A (GELIN CLAUDE) 3 September 1991 (1991-09-03) * column 3, line 25 - line 44; figure 4 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 September 2000	Criqui, J-J

CATEGORY OF CITED DOCUMENTS

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19-09-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9847201 A	22-10-1998	AU 6513098 A	11-11-1998
EP 0571156 A	24-11-1993	US 5338220 A	16-08-1994
		JP 6089749 A	29-03-1994
FR 2581259 A	31-10-1986	DE 3682566 A	02-01-1992
		DE 3682566 D	02-01-1992
		EP 0221137 A	13-05-1987
		WO 8606552 A	06-11-1986
EP 0435292 A	03-07-1991	US 5022868 A	11-06-1991
		AT 127622 T	15-09-1995
		DE 69022199 D	12-10-1995
		DE 69022199 T	04-04-1996
US 5044978 A	03-09-1991	FR 2647970 A	07-12-1990
		AT 108953 T	15-08-1994
		DE 69010774 D	25-08-1994
		DE 69010774 T	27-10-1994
		DK 400521 T	03-10-1994
		EP 0400521 A	05-12-1990
		ES 2059881 T	16-11-1994
		IE 63810 B	14-06-1995
		JP 3014719 B	28-02-2000
		JP 3067474 A	22-03-1991
		PT 8461 U	30-10-1992
		PT 94197 A	28-02-1992

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