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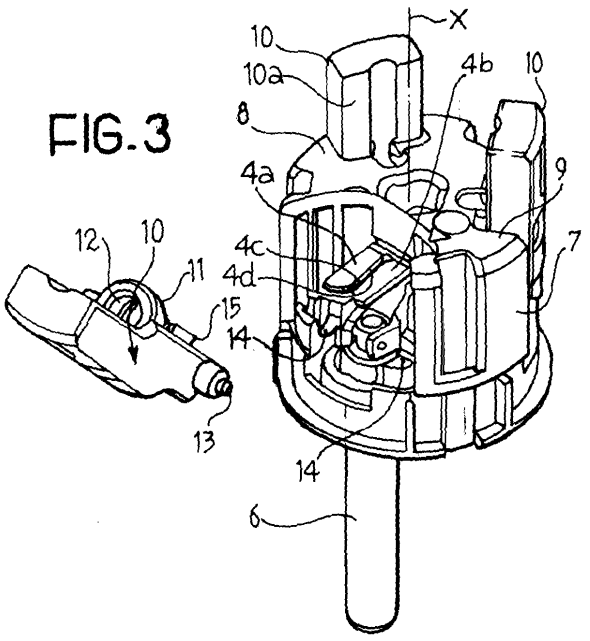
This application was filed on 22 - 03 - 2007 as a divisional application to the application mentioned under INID code 62.

(54) A conductor restraining lever for a contact-holder unit of an electrical connection socket/plug

(57) The lever (10) is for guiding and restraining an electrical conductor (c1 or c2 or c3) to be inserted between the facing edges of a pair of contact blades (4a, 4b) mounted in the body (7) of a contact-holder unit for an electrical connection socket/plug. The lever has a side (10a) with an annular portion (11, 12) for restraining a respective conductor (c1-c3). An end of the lever has pins (13) for pivotably mounting the lever on the body (7) in order to selectively adopt a first, open or released position (10') in which the conductor is released from the pair of blades, and a second, closed or locked position on the body (7) in which the conductor is inserted between the facing edges of the pair of blades in order to ensure electrical contact. On the face (10a) the lever has a radially projecting portion (15) which can urge the conductor (c1-c3) towards and between the contact blades (4a, 4b), forcing the conductor to adopt a bent shape.

FIG.3



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Description

[0001] The present invention relates to a conductor restraining lever for a contact-holder unit of an electrical connection socket/plug having the characteristics mentioned in the preamble of Claim 1. The invention is applicable both to fixed electrical connection sockets/plugs and to movable or "in line" sockets/plugs which are normally used in the industrial field. A socket/plug of the above-mentioned type is known from patent publication EP-1 178 574 A1.

[0002] The sockets/plugs are connected to the ends of electrical cables and generally comprise a containing housing defining in its interior a generally cylindrical seat for housing a contact-holder unit which carries a plurality of electrical contacts constituted by pairs of blades. Each pair of blades can receive one of the conductors of an electrical cable to be connected. A lever for guiding and clamping a conductor of the cable is mounted on the body of the contact holder in the vicinity of each pair of blades. Each lever generally has an engagement means (such as an annular portion) for favouring the correct positioning of the conductor and is articulated to the body of the contact-holder so as to be able to adopt an open or released position, for example, during an operation to connect/disconnect or replace conductors, in which the conductor held by the lever is removed and disengaged from the pair of blades. To ensure electrical contact between the conductor and the pair of blades, the lever is pivoted to a closure position, forcing the conductor held by the lever to slip between the pair of blades in order to be clamped in a position in which it is inserted between them.

[0003] The object of the present invention is to provide a contact-holder unit in which the operations to clamp and release the levers of the type discussed above can be performed conveniently and easily by hand.

[0004] Another object of the invention is to perform more effective clamping and electrical connection of the conductors, both when they are protected by an insulating sheath and when they are bare.

[0005] These and other objects and advantages which will be understood better from the following description are achieved according to the invention by a conductor restraining lever having the characteristics defined in the appended claims.

[0006] The structural and functional characteristics of a preferred but non-limiting embodiment of a lever according to the invention will now be described; reference is made to the appended drawings, in which:

Figure 1 is an exploded axial section through a movable socket/plug with conductor restraining levers according to the invention,

Figure 2 is a perspective view of the contact-holder unit of Figure 1,

Figure 3 is an exploded perspective view of the contact-holder unit of Figure 1,

Figure 4 is a view from above or behind, taken on the arrow IV of Figure 2,

Figure 5 is a schematic view of the contact-holder unit of Figure 1 in partial axial section, and

Figure 6 is a perspective view similar to Figure 2 of a variant of the invention.

[0007] With reference initially to Figure 1, a movable electrical connection socket/plug comprises a containing housing 1 in the form of a sleeve defining in its interior a substantially cylindrical seat 2 for housing a contact-holder unit, generally indicated 3. The socket/plug shown in the drawings is of the movable or "in-line" type; reference to this possible area of application should not be interpreted as in any way limiting of the scope of the patent which is also applicable to fixed sockets/plugs.

[0008] In the embodiment illustrated, the contact-holder unit 3 comprises three pairs of facing blades 4a, 4b constituting electrical contacts to which the conductors c1, c2, c3 of a cable A are connected; the cable A is introduced through an opening 5 formed in the rear portion of the containing sleeve 1. The blades 4a, 4b lie in a plane substantially perpendicular to the axis (indicated x) along which the plug is coupled with a corresponding socket. It should be noted that, in the embodiment of Figure 1, a plug with axial pins 6 is shown but the following discussion also applies to a socket.

[0009] Throughout this description and in the appended claims, terms and expressions indicating positions and orientations such as "axial", "longitudinal", "transverse" and "radial" are intended to relate to the central geometrical axis x of the socket/plug which coincides with the axis along which the socket and the plug are coupled with one another; similarly "rear" and "front" should be understood with reference to the direction of coupling of the socket/plug with a complementary plug/socket element.

[0010] The blades 4a, 4b of each pair have facing contact edges 4c, 4d which are oriented in a substantially radial direction in order to house between them a respective electrical conductor c1, c2, or c3.

[0011] The contact-holder unit has a substantially cylindrical body 7 which is inserted and clamped in the seat 2 of the containing sleeve 1 in a manner known *per se.* The body 7 of the contact-holder unit forms a transverse end wall 8 at the rear and has three peripheral recesses 9 which extend axially and each of which houses a respective lever 10 for guiding and clamping a conductor c. Each lever 10 is articulated to the body 7 of the contact-holder and has an annular portion 11 defining a hole 12 through which the end portion of the conductor c is passed.

[0012] An important characteristic of the solution according to the present invention is that each lever 10 is articulated to the contact-holder body 7 so as to be pivotable in a plane which is defined herein as "axial", between a released position (as shown by the levers indicated 10' in Figures 2 and 4) and a contact position in which the lever occupies the recess 9 and is oriented in

a substantially axial direction. In this position, the levers 10 are included within the circular shape of the contact-holder unit 3 which can thus be inserted in the outer containing casing or sleeve 1.

[0013] For articulation to the body 7, each of the levers 10 forms, at its end which is defined herein as the "front" end, a pair of opposed pins 13 (only one of which is visible in Figure 3) which are inserted in corresponding articulation seats 14 formed in the front portion of the contact-holder body 7.

[0014] In order to connect a conductor c1 (or c2 or c3) electrically to the socket/plug, a lever 10 must first of all be moved to the open or outwardly inclined position 10'. The conductor is then inserted in the hole 12 in the lever; the conductor remains lying along the side 10a of the lever which, in the condition of normal use, faces towards the centre of the contact-holder unit. On this side 10a, each lever 10 preferably has a fork-shaped portion 15 which projects radially towards the central axis x and which serves as a support to stabilize the conductor and hold it in an engaged position which forces it to be inserted between the blade contacts as shown in Figure 5.

[0015] The lever 10 is pushed manually from the open or outwardly-pivoted position 10', causing it to enter the recess 9 and thus forcing the conductor c to be inserted between the edges 4c, 4d of the blades 4a and 4b which cut the insulating sheath of the conductor, thus making the electrical contact.

[0016] In this embodiment, resilient locking teeth 16 (Figure 2) are provided in pairs in each recess 9 of the contact-holder body 7 to snap-lock the lever 10 in the closed position. The locking teeth 16 are preferably disposed at the level of the rear wall 8 of the body 7 and engage corresponding recesses 17 constituting locking seats formed in the lever 10.

[0017] In the embodiment of Figure 6, the resilient locking teeth 16' are arranged in pairs for engagement in corresponding recesses 17' formed on two opposite sides of the lever 10.

[0018] Again according to the invention, in the closure or normal operation position of the contacts, that is, with the conductor c engaged between the blade contacts 4a and 4b and with the lever 10 locked parallel to the axis x of the socket/plug, an appreciable portion of the lever 10 (as indicated 10b) projects rearwardly beyond the transverse rear wall 8 of the contact-holder body 7. This enables an operator to release each lever easily by exerting a thrust with his fingers.

[0019] Once the contacts of the various conductors are secured by the respective blade contacts, the levers are oriented parallel to the longitudinal axis of the socket/plug and the contact-holder unit can be inserted in the containing sleeve and locked therein.

[0020] The cable A projects from the rear opening 5 of the sleeve 1 and is clamped with the use of a rear threaded ring nut 18 which engages on a thread 19 formed at the rear end of the sleeve 1. The screwing-on of the ring-nut 18 brings about axial sliding of a cable-clamping element 20 with resilient teeth 21 which engages on the frustoconical wall 22 of the rear opening 5 with the interposition of a frustoconical sealing element 23 and is tightened radially onto the cable, preventing movements thereof in an axial direction.

[0021] The present invention affords the following advantages.

[0022] The levers 10 can be locked in and released from the contact-closure position manually, requiring a minimal effort. The invention utilizes the geometry of the lever to obtain a convenient and advantageous grip in order to exert with the fingers the effort which is necessary to open and close the electrical contact.

[0023] The arrangement of the resilient locking means for the levers enables the operator to be confident that locking has taken place since he can easily check, by pulling the lever in the opening direction, to ascertain whether locking has taken place correctly or not.

[0024] The support portion 15 forces the conductor to adopt a bent shape inside the contact-holder unit (as shown schematically in Figure 5) which ensures contact with the fork-shaped contact elements even if the conductor has no insulating sheath on its end portion. The fork-shaped contacts are effective in cutting the insulating sheath if it also covers the end portion of the conductor.

[0025] Finally, when a lever 10 is moved to the open position 10', the space between the contact blades and the articulation region of the lever enables any resides of insulating sheath left by previous connections to be removed from the recess 9 easily and quickly.

Claims

1. A lever (10) for guiding and restraining an electrical conductor (c1 or c2 or c3) to be inserted between the facing edges of a pair of contact blades (4a, 4b) mounted in the body (7) of a contact-holder unit for an electrical connection socket/plug which can be coupled with a corresponding plug/socket along a given coupling direction (x), the lever having:

   a side (10a) with an engagement means (11, 12) for restraining a respective conductor (c1-c3), and
   an end with articulation means (13) for pivotably mounting the lever on the body (7) in order to selectively adopt a first, open or released position (10') in which the conductor is released from the pair of blades, and a second, closed or locked position on the body (7) in which the conductor is inserted between the facing edges of the pair of blades in order to ensure electrical contact,

   characterized in that on the face (10a) the lever has a radially projecting portion (15) which can urge

the conductor (c1-c3) towards and between the contact blades (4a, 4b), forcing the conductor to adopt a bent shape.

2. A lever according to Claim 1, **characterized in that** the radially projecting portion (15) is spaced axially from the engagement means (11,12) so that, in the second position of the lever (10), the blades (4a, 4b) are in an axially intermediate position between the projecting portion (15) and the engagement means (11,12).

3. A lever according to Claim 1, **characterized in that** the radially projecting portion (15) is fork-shaped.

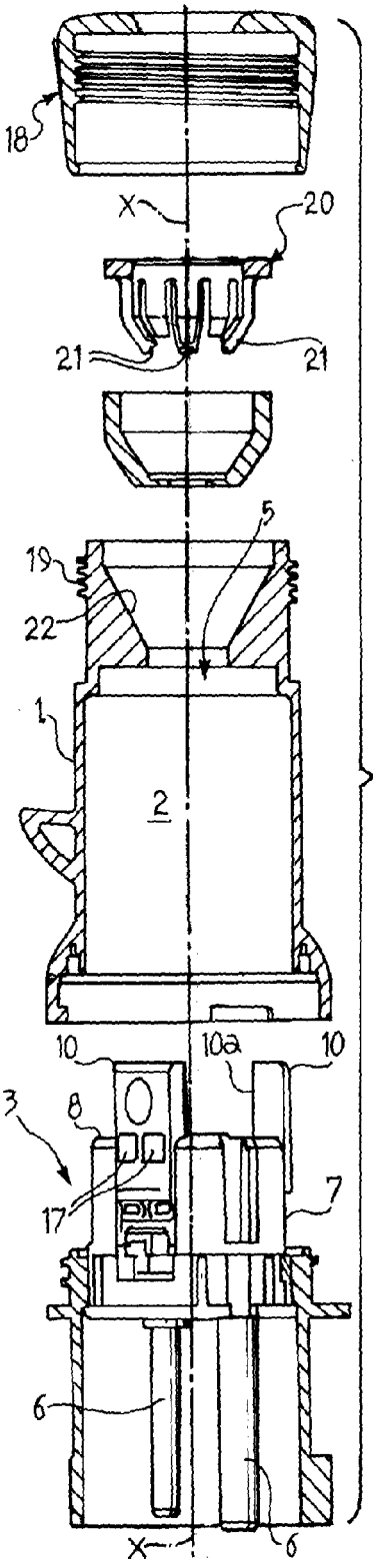


FIG. 1

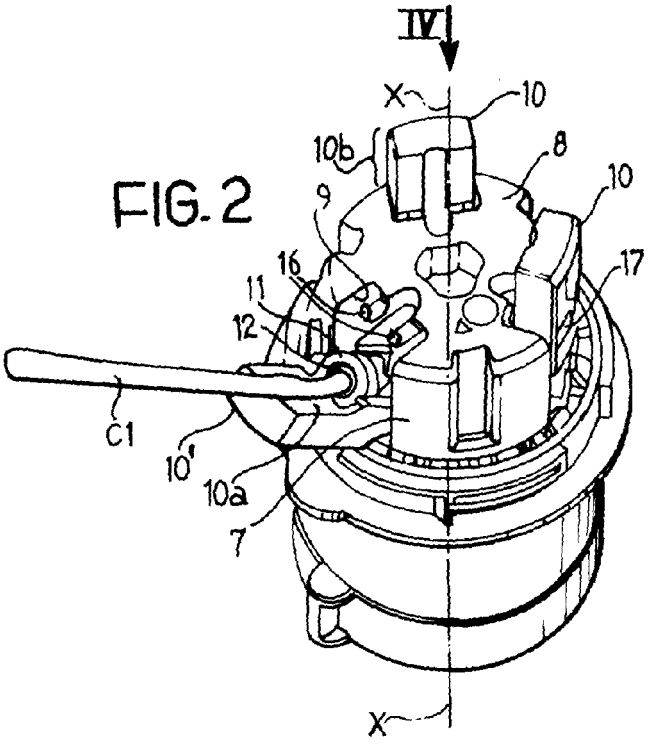


FIG. 2

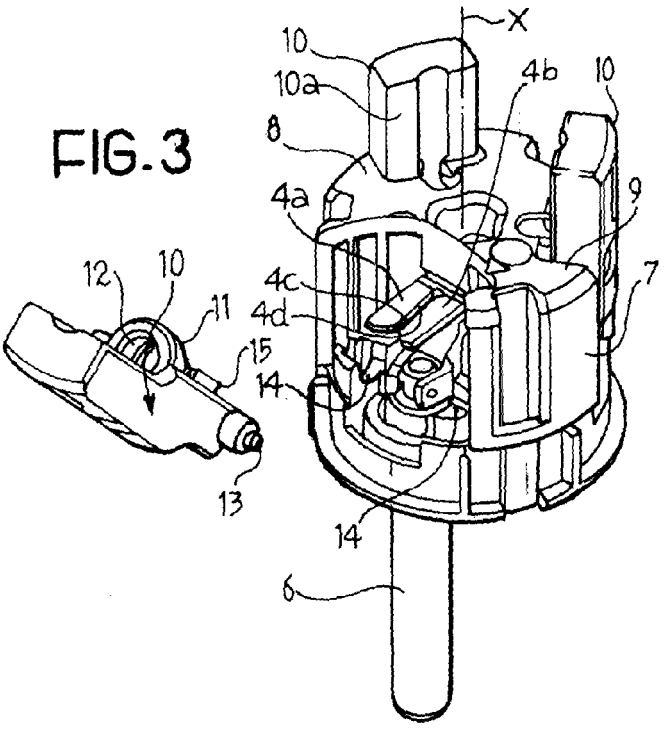


FIG. 3

FIG. 4

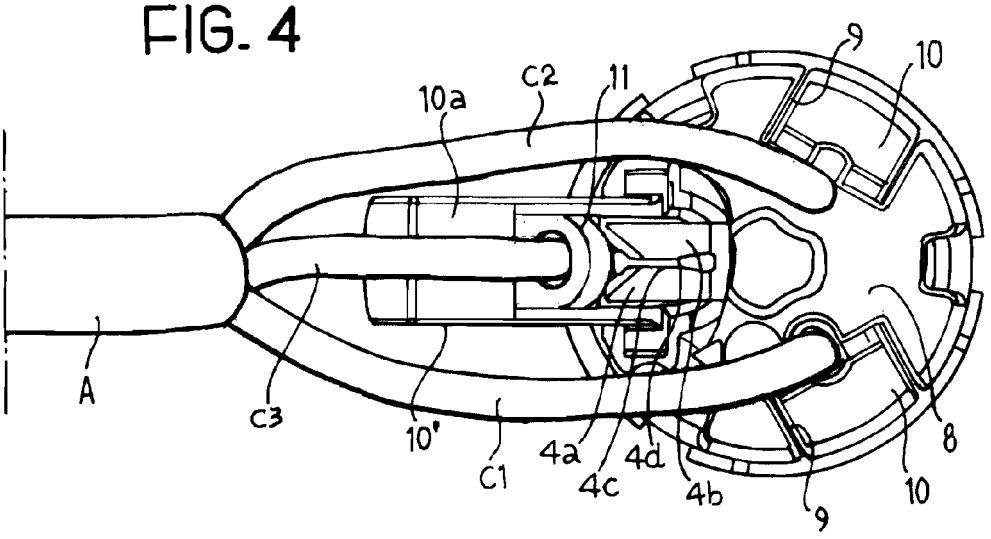


FIG. 5

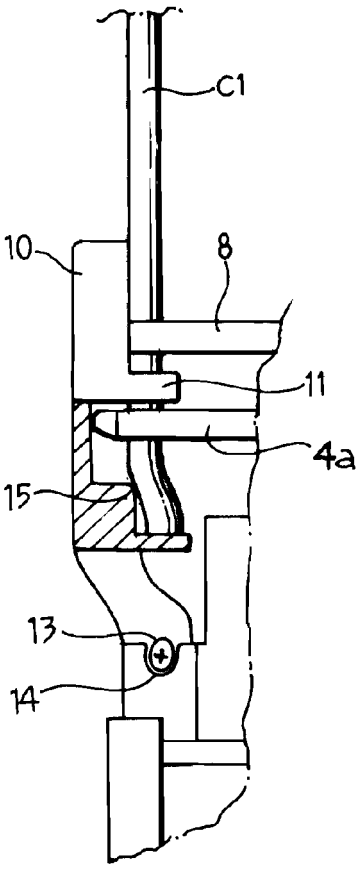
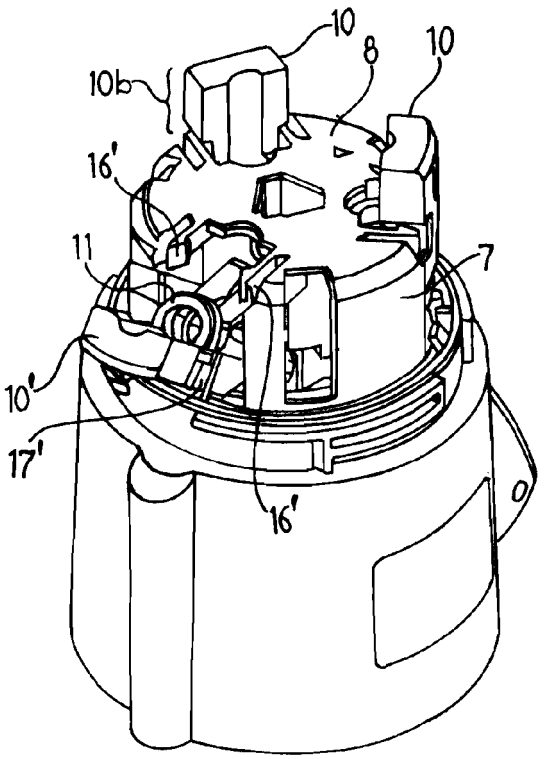


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 07 10 4713

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 96/33523 A (WHITAKER CORP [US]) 24 October 1996 (1996-10-24) * the whole document * -----	1,2	INV. H01R4/24 H01R13/506
X	FR 2 414 261 A (HUBBELL INC HARVEY [US]) 3 August 1979 (1979-08-03) * the whole document * -----	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 May 2007	Salojärvi, Kristiina

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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22-05-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9633523 A	24-10-1996	NONE	
FR 2414261 A	03-08-1979	AU 521978 B2	13-05-1982
		AU 4280678 A	19-07-1979
		CA 1103771 A1	23-06-1981
		DE 2855685 A1	19-07-1979
		GB 2019667 A	31-10-1979
		GB 2076598 A	02-12-1981
		JP 54095394 A	27-07-1979
		SE 423292 B	26-04-1982
		SE 7900159 A	10-07-1979
		ZA 7806796 A	31-10-1979

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1178574 A1 **[0001]**