

Description

[0001] The present invention relates to an industrial inline electrical socket/plug.

[0002] The industrial sector in general, and the hand-icraft and service sectors, use so-called industrial plugs and sockets of the inline type, i.e., not fixed to the wall, for electrical connections.

[0003] Inline plugs and sockets can be connected to the end of an electrical cable and are usually constituted by two parts: a plug-in component and a grip. The cable is inserted in the grip and the terminals of the conductors are fixed to the electrical terminals of the plug-in component.

[0004] Specific standards (for example IEC 309) regulate the manufacture of these inline plugs and sockets, regarding their dimensions, the number and the type of connectors, etc. Regarding safety, these standards also prescribe that sockets/plugs must ensure imperviousness to external agents, especially water and dust, and that it must be possible to remove the grip from the plug-in component only by means of a tool so as to avoid the risk of accidental opening.

[0005] In some conventional inline plugs/sockets, the grip and the plug-in component are simply connected by means of screws.

[0006] In other sockets/plugs, the assembling operation is facilitated by providing a bayonet coupling between the grip and the plug-in component.

[0007] In accordance with impermeability standards, in these sockets/plugs there is a gasket interposed between the grip and the plug-in component, or the profiles, that come into contact when coupling the plug-in component to the grip, are contoured in order to avoid infiltrations.

[0008] WO-97/36347 discloses a connector plug for the electrical connection between a touring vehicle and a trail, comprising a casing accommodating a contact carrier and closed by a protective cap substantially external to the casing.

[0009] DE-4429780 discloses a two piece casing having a contact carrier.

[0010] The aim of the present invention is to provide an industrial inline electrical socket/plug which is improved with respect to the cited prior art.

[0011] An important object of the present invention is to provide an industrial inline electrical socket/plug which effectively and simply insulates the region of the electrical connections from the outside.

[0012] Another object of the present invention is to provide an industrial inline electrical socket/plug which is constructively simple and reliable in use and can be manufactured at competitive costs.

[0013] This aim, these objects and others which will become better apparent hereinafter, are achieved by an industrial inline electrical socket/plug as claimed in the appended claims.

[0014] Further characteristics and advantages of the

present invention will become better apparent from the following detailed description of preferred but not exclusive embodiments thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a partially sectional view of an electrical socket and plug assembly according to the invention;

Figure 2 is a front view of a plug-in component for the connection of an electrical socket according to the invention;

Figure 3 is a rear view of the plug-in component of Figure 2;

Figure 4 is a side perspective view of the electrical socket of the preceding figures, showing the plug-in component outside of the casing;

Figure 5 is a partially sectional and exploded side elevation view of the electrical socket of the preceding figures;

Figure 6 is a partially sectional side elevation view of the socket of the preceding figures, showing a step of the insertion of the plug-in component and the system for locking the cable in the inactive condition;

Figure 7 is a partially sectional side elevation view of the socket of the preceding figures, illustrating the plug-in component in position and the cable locking system in the activated condition.

[0015] With reference to the above-cited figures, the industrial inline electrical socket and the corresponding plug, according to the invention, respectively designated by the reference numerals 1 and 101, comprise a casing 30, 130 which includes a grip 2, 102 and a neck 3, 103, at the front. The neck 3, 103 surrounds a removable plug-in component 4, 104. According to the invention, the grip portion 2, 102 and the protective neck 3, 103 are formed monolithically and constitute the casings 30 and 130 respectively.

[0016] The casings 30 and 130 differ in the dimensions of the respective necks 3 and 103. The neck 103 of the plug must in fact be inserted, sliding along the neck 3 of the socket, upon connection. The standards prescribe that the neck 3 must form a slot 5 adapted to receive a corresponding ridge 105 provided on the neck 103. The socket includes a hinged cover 6 which is kept in the closed position by a spring when the socket is not engaged by a plug. The plug-in components 4 and 104 differ only in the presence of bushes in one and of pins in the other. Hereinafter, the description will focus on the socket, bearing in mind that apart from the above-cited differences everything that will be described also applies to the corresponding plug.

[0017] To the rear, in the grip portion 2, the casing 30 has a threaded region 7 which is adapted to receive, and nondetachably retain, a ring 8 which actuates the cable locking system, which is described hereinafter.

The internal surface of the grip body 2 has guiding protrusions 9 which allow insertion and locking in the active position of the plug-in component 4, as described in greater detail hereinafter. The plug-in component 4 is constituted by a cylindrical body in which there are channels for accommodating bushes suitable to receive pins. The bushes end with blades 10, between which the electrical cables are inserted while they are still sheathed in their insulation, passing through slots 11 provided in a rear wall 12 of the plug-in component 4. Proximate to the blades 10 there are fixing levers 13 which are pivoted, by means of pivot-like protrusions 14, in cavities 15 formed in the rear wall 12 and in the plug-in component 4. The levers 13 have a recess 16 in which the end of the electrical cable, that passes through the slot 11, is arranged. When the levers 13 for fixing on the plug-in component are closed, the electrical cables are forced to slide between the blades 10, which penetrate the insulating sheath and ensure electrical connection. A protruding profile 35, formed on the lever 13, ensures mechanical locking with the body of the plug-in component when the levers are closed, engaging elastically against the rear wall 12 of the plug-in component 4. The levers 13 can be opened by acting with a tool in a hole 36 which is provided laterally with respect to the lever so as to turn outward the lever 13 until the protruding profile 35 disengages from the rear wall 12. When the fixing levers 13 are closed and retained in position by the action of the protruding profile 55, the plug-in component 4 can be inserted in the casing 30. Once the electrical connections have been provided, the plug-in component 4 is placed inside the casing 30, making it slide axially until orientated radial fins 17 fit between the guiding protrusions 9, which form a single access channel, and rest on them, as shown more clearly in Figures 6 and 7.

[0018] A seat 18 is formed in the front wall of the plug-in component 4, between the bushes or the pins, and a tool, for example a conventional screwdriver, can engage therein. By means of the tool, it is possible to turn the plug-in component, in the proposed example through ninety degrees and clockwise, so that the radial fins 17, by sliding along the guiding protrusions 9, are offset with respect to the access channel, so as to retain the plug-in component 4 in its seat. The radial fins 17 further form a flexible retention tooth 37 which at the end of the rotation engages the guiding protrusions 9, locking the plug-in component 4 and thus providing a bayonet coupling. In order to disengage the parts, it is sufficient to insert a tool along a cavity formed between the internal surface of the casing 30 and a slot 38 provided in the plug-in component 4 along the directrix of the tooth 37, so as to apply a pressure to the retention tooth, disengaging it from the guiding protrusions 9. To release the parts, it is then sufficient to turn the plug-in component 4 in the opposite direction. Once the plug-in component 4 has been engaged in the casing 30, the cable is locked by screwing on the ring 8. The ring 8 has a thread 19 by way of which it couples to the thread 7 pro-

vided in the rear part of the grip body 2. The ring 8 is of the nondetachable type and is adapted to lock, by means of an annular surface 20, a gasket member 21 which has an annular slot 22 adapted to engage the outer annular edge of a locking member 23 provided with flexible teeth 24. The gasket member 21 has a cylindrical wall 39 which is arranged between the locking member 23 and the cable 40, so that the teeth 24 close onto the cable 40, guided by an annular protrusion 25 which is perpendicular to the internal surface of the casing 30 and forms a narrow opening. This fixing system prevents relative movements between the cable and the casing 30, and the gasket member 21, which is made of flexible material, ensures the seal between the cable 40 and the edge 26 of the central opening of the gasket member. The cable locking system is reversible by simply unscrewing the ring 8.

[0019] In practice it has been observed that the invention achieves the intended aim and objects, providing an industrial inline electrical socket/plug which is perfectly insulated and constructively simple.

[0020] An advantage of the electrical socket/plug according to the present invention is the fact that wiring is extremely quick and easy.

[0021] A further advantage of the electrical socket/plug according to the present invention is that a cable fixing system is provided which prevents relative movements between the cable and the grip, preventing the accidental disengagement of the plug-in component while ensuring insulation of the plug-in component.

[0022] A further advantage of the electrical socket/plug according to the present invention is that it has a particularly simple final assembly.

[0023] The electrical socket/plug according to the invention is susceptible of numerous modifications and variations, within the scope of the appended claims. All the details may be replaced with technically equivalent elements.

[0024] The materials used, as well as the dimensions, may of course be any according to requirements and to the state of the art.

Claims

1. An industrial inline electrical socket/plug, comprising a casing and a plug-in component which has electrical connectors for a cable to be connected and members for mutual electrical connection between a plug and a socket, said casing being monolithic and comprising a grip portion and a protective neck for said electrical connection members, **characterized in that** said plug-in component is engaged in said casing by means of a bayonet coupling.
2. The electrical socket/plug according to claim 1, **characterized in that** said bayonet coupling com-

prises guiding protrusions which are formed in an internal surface of said grip portion and provide an access channel which can be engaged by said plug-in component.

3. The electrical socket/plug according to claim 1 or 2, **characterized in that** said plug-in component is constituted by a substantially cylindrical body which is inserted fully in said casing, said electrical connectors comprising pairs of blades, each one of said pairs of blades receiving an end of an electrical cable which is still sheathed, said end of said cable passing through a slot which is provided in an end wall of said plug-in component.
4. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** it comprises fastening levers proximate to said blades, said fastening levers being pivoted, by means of pivot-like protrusions, in cavities formed in said end wall and in said plug-in component, each fastening lever having a recess for accommodating the end of said electrical cable that passes through said slot.
5. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said fastening levers are closed onto said plug-in component, forcing said electrical cables, by means of said recess, to slide between said blades, which penetrate the insulating sheath and ensure electrical contact.
6. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said levers comprise a protruding profile which engages elastically against said rear wall of said plug-in component, ensuring the mechanical locking of said levers in said plug-in component.
7. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** the opening of said levers is achieved by acting with a tool in a hole provided laterally to said lever, so as to make said lever rotate outward until said protruding profile disengages from said rear wall.
8. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said plug-in component comprises radial fins cooperating with said guiding protrusions, allowing insertion in said access channel of said casing.
9. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said plug-in component comprises a tool seat which is formed in the front wall of the plug-in component in order to rotate said plug-in component by means of

said tool for closing and opening.

10. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said plug-in component comprises a flexible retention tooth which at the end of the rotation engages said guiding protrusions, locking the plug-in component in its active position.
11. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said plug-in component can be released by inserting a tool along an access cavity formed between the internal surface of said casing and a slot formed in said plug-in component along the directrix of said retention tooth, so as to apply pressure to said retention tooth, disengaging it from said guiding protrusions.
12. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** it comprises a cable clamping device which comprises a thread formed in said casing, proximate to the cable insertion region, and suitable to engage a fastening ring.
13. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** said ring is suitable to lock a gasket member, by means of an annular surface, said gasket member having an annular slot engaging the outer annular edge of a locking member provided with flexible teeth.
14. The electrical socket/plug according to one or more of the preceding claims, **characterized in that** the gasket member has a cylindrical wall which is arranged between the locking member and the cable, so that the teeth of said locking member close onto the cable, being guided by an annular protrusion which is perpendicular to the internal surface of the casing and forms an opening having a small diameter.

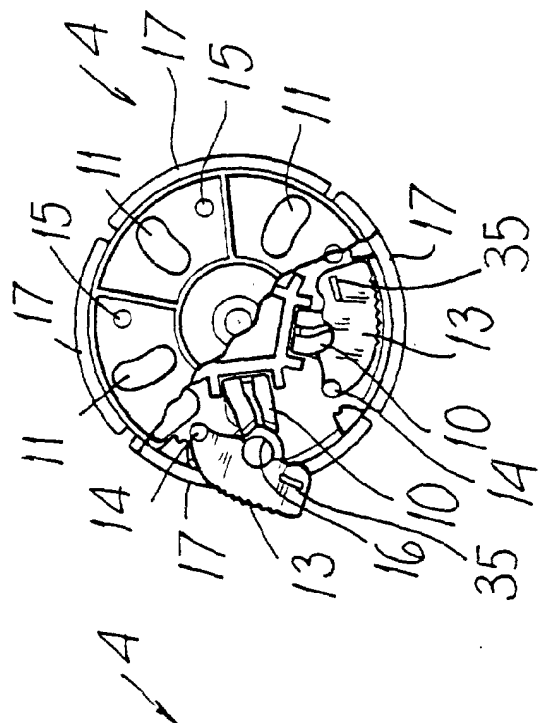
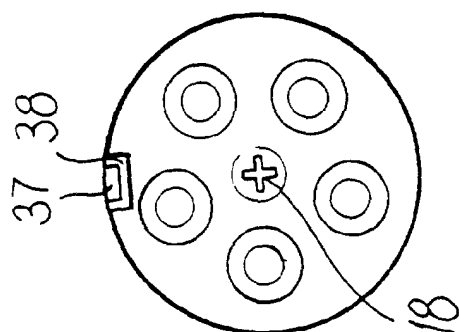


Fig. 2

Fig. 3

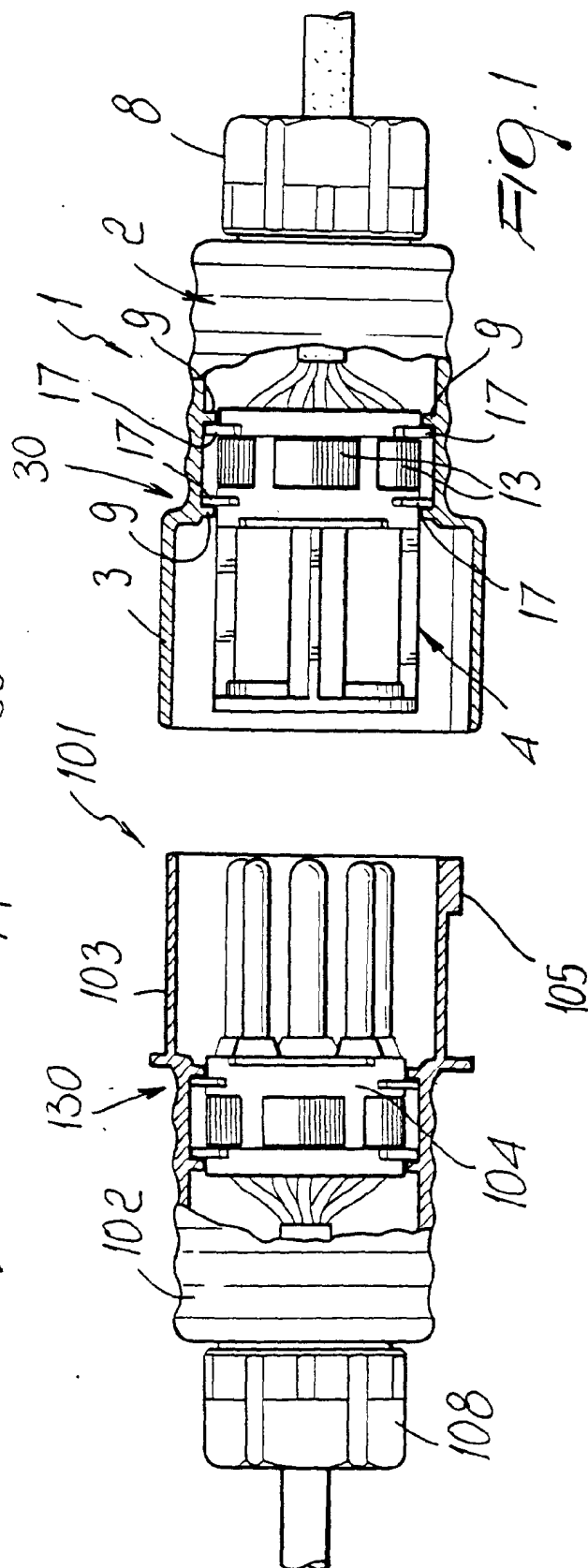
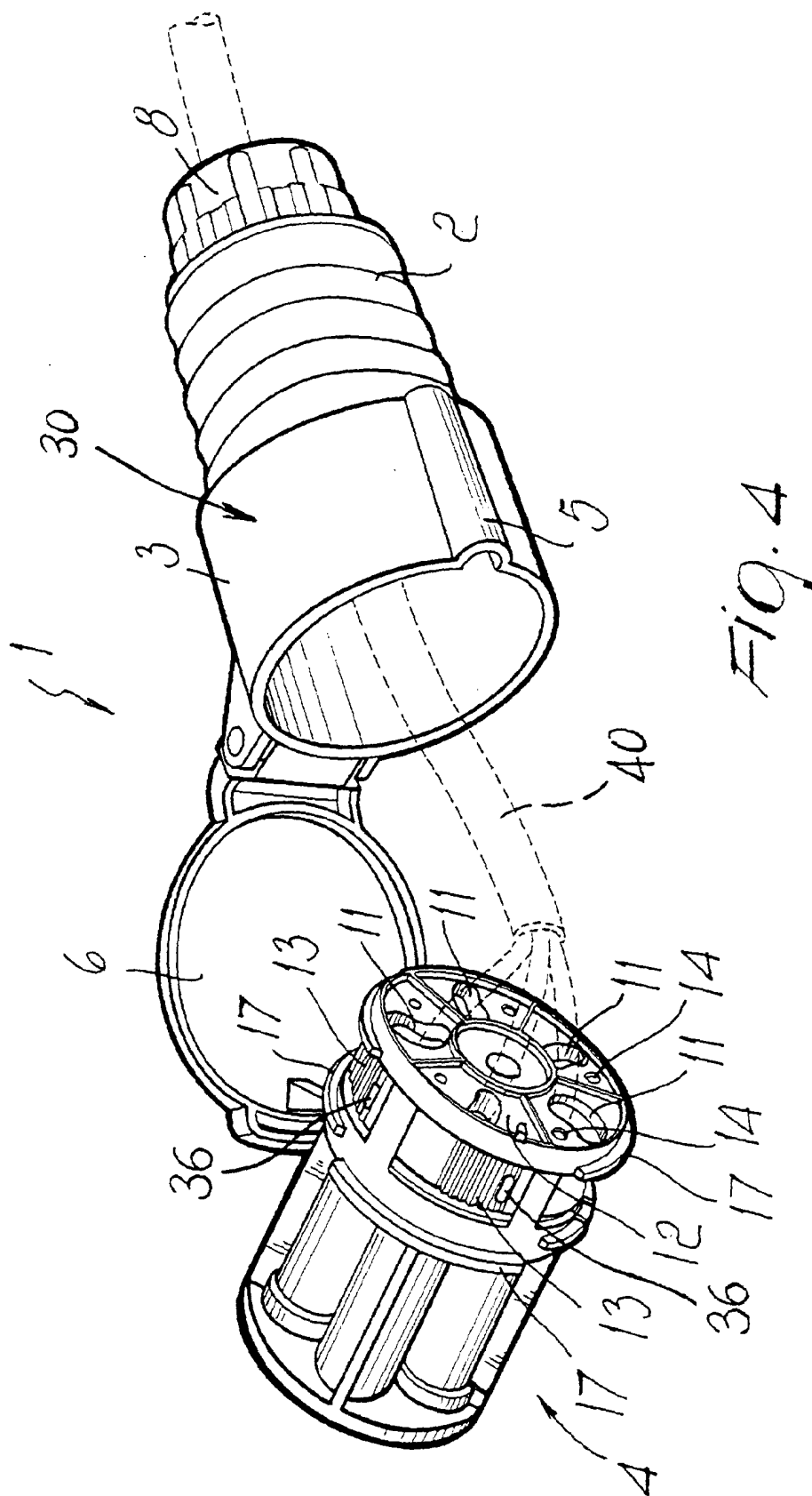
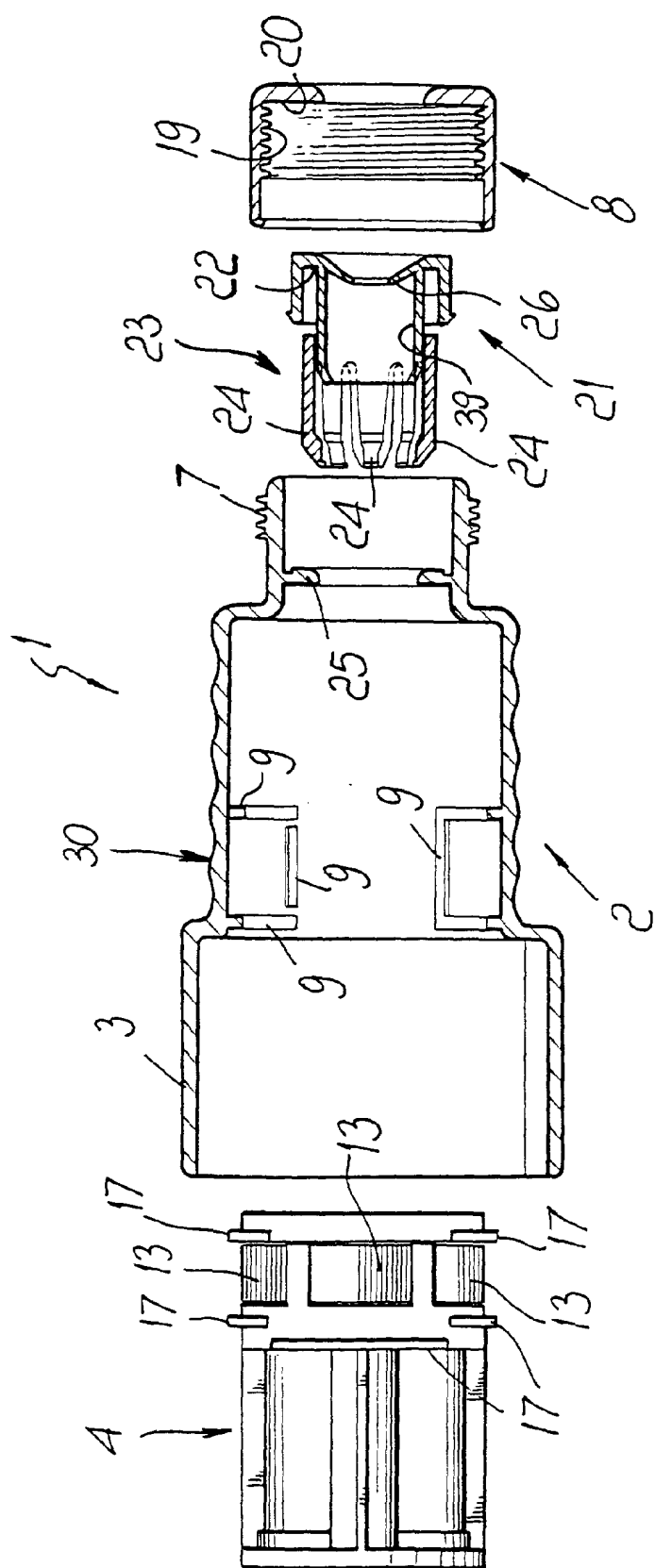
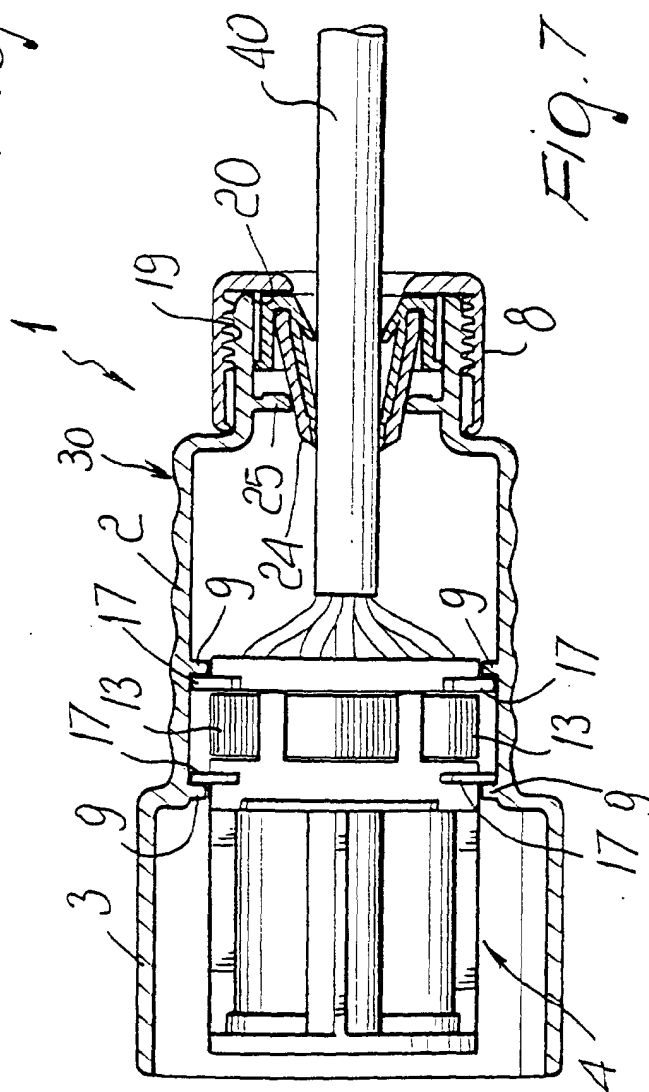
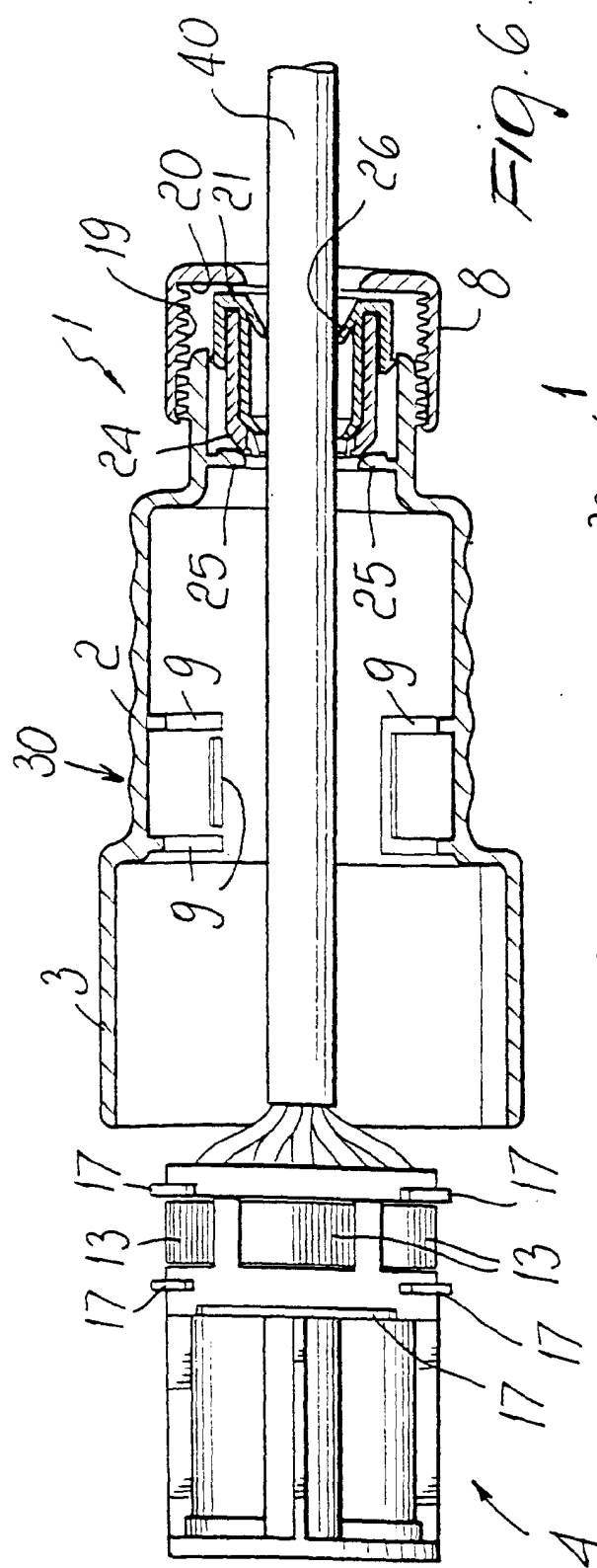


Fig. 1









European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 5897

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X,D	WO 97 36347 A (MEMBER S SPA ;PASOTTO GIORGIO (IT)) 2 October 1997 (1997-10-02)	1,2,8	H01R13/502
Y	* abstract; figure 2 *	3-6, 12-14	
Y,D	DE 44 29 780 C (BINDER FRANZ ELEKTR) 14 March 1996 (1996-03-14) * column 1, line 33 - line 66; figures 1-4,12 *	3,12-14	
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A	FR 2 702 092 A (SALIGNY YVES) 2 September 1994 (1994-09-02) * page 7, line 27 - line 29; figure 1 *	9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 October 2001	Examiner Criqui, J-J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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