

Description

Field of the invention

[0001] The present invention generally finds application in the field of electric devices and particularly relates to a modular switch having a multipole connector or the like.

[0002] The invention further relates to a kit for modular assembly of a switch having a multipole connector.

Background art

[0003] Prewired switches are known, consisting of a box-like case that houses one or more pairs of electric contacts having electric cables connected therewith for connection of the switch to a power consuming unit.

[0004] EP1304710 also discloses such a modular prewired switch, consisting of a case that houses the electric contacts and with a prewired connection module removably connected thereto.

[0005] The latter is equipped with a plurality of first metal connection elements, which are adapted to engage corresponding second metal elements to establish an electric connection between the cables and the contacts held in the case.

[0006] Thus, whenever a switch replacement is needed, the only part to be replaced will be the case, with no disconnection of the power-consuming units.

[0007] Switches are also known which have an AMP or multipole threaded output connector, either of male or female type, which is adapted to be connected to a power-consuming unit having a similar input multipole connector, of female or male type respectively.

[0008] One of the main drawbacks of this particular type of switches is that the connector is stationary relative to the case.

[0009] As a result, for each application, the whole switch has to be placed with its connector appropriately oriented according to the position of the connector of the power consuming unit to be connected.

[0010] In an attempt to at least partially obviate the above drawbacks, switches with multipole connectors have been provided, in which the connector is mounted in such a manner as to be able to rotate relative to the box-like case, but be still integral therewith.

[0011] Nevertheless, these switches provide a connector that can be still oriented less than needed.

[0012] Furthermore, in case of failure of any component, the entire switch must be replaced.

Disclosure of the invention

[0013] The object of the present invention is to overcome the above drawbacks, by providing a modular switch of simple and inexpensive construction.

[0014] A particular object is to provide a modular switch that can be simply and conveniently adapted to particular

applications.

[0015] A particular object is to provide a modular switch with a connector that can be easily assembled and configured according to the position of the input of the electric circuit to be served.

[0016] Another object of the present invention is to provide a modular switch whose components may be replaced without disconnecting the power consuming unit being served.

[0017] Yet another object is to provide a kit for modular assembly of a switch that affords simple and fast customized configuration of the switch, while reducing manufacturing and storage costs, as well as purchase costs for the final user.

[0018] These and other objects, as more clearly explained below, are fulfilled by a modular switch as defined in claim 1, which comprises a control unit having a box-like case that houses at least two mutually movable electric contacts designed for connection to an external electric circuit, an actuator adapted associated with said case and adapted to be actuated from the outside to interact with said movable contacts and promote the opening/closing of the circuit, a first connecting device having a first connector adapted for connection to the external circuit; means for electric connection of said first connector with said contacts.

[0019] The switch is **characterized in that** the electric connection means include a first interface member of predetermined shape, which is associated with the control unit and a second interface member, which is associated with the first connecting device.

[0020] The second interface member has a shape that mates the shape of the first interface member for removable and modular coupling thereto irrespective of the shape and/or direction of the first connector.

[0021] Due to this feature of the invention, the switch may be simply and quickly assembled and configured by the final user him/herself as needed.

[0022] Particularly, the user may replace the first connecting device with another device having its connector with an orientation other than that of the connector of the device that has been replaced, or a connector of different type or having a different number of connecting pins, to adapt it to the position and/or type of the power consuming unit that is served by the electric circuit to be controlled.

[0023] Alternatively, the control unit may be also advantageously replaced with another identical control unit, in case of failure, or with a different control unit if the electric circuit/s of the power consuming unit being served is required to be controlled in a different manner.

[0024] In a further aspect, the invention relates to a kit for modular assembly of a switch as defined in claim 9.

[0025] This aspect of the invention will allow a final user to assemble different types of switches according to the particular needs, or to replace one of its components without having to purchase an entire switch every time.

[0026] Likewise, in the manufacturing process, a smaller number of control units may be provided, as compared to the overall number of connecting devices, which will provide considerable savings and a considerably simplified management of manufacturing and inventory.

[0027] Advantageous embodiments of the assembly are defined by the dependent claims.

Brief description of the drawings

[0028] Further features and advantages of the invention will become more apparent upon reading the following detailed description of a few preferred non exclusive embodiments of a modular switch and a kit for assembly thereof according to the present invention, which are described by way of a non limiting example with the help of the accompanying drawings in which:

FIG. 1 is a perspective view of a switch of the invention according to a preferred, non exclusive embodiment;

FIG. 2 is a first perspective and partially exploded view of the switch of FIG. 1;

FIG. 3 is a second perspective and partially exploded view of the switch of FIG. 1;

FIG. 4 is an exploded perspective view of a detail of the switch of Fig. 1;

FIG. 5 is a top view of the detail of Fig. 4;

FIG. 6 is a front view of the detail of Fig. 4;

FIG. 7 is a side view of the detail of Fig. 4;

FIG. 8 is a perspective view of a kit of the invention;

Detailed description of a preferred embodiment

[0029] Referring to the accompanying figures, a modular switch of the invention, generally designated by numeral 1, may be used with one or more electric circuits for control and management of power consuming units of any kind.

[0030] By way of example and without limitation, the switch 1, as shown in assembled configuration in Fig. 1, may be a position switch, possibly prewired.

[0031] As more clearly shown in Figs. 2 and 3, a switch 1 of the invention comprises a control unit 2 having a box-like case 3 with two or more mutually movable electric contacts held therein, for connection to one or more electric circuits to be served.

[0032] In the present figures, the electric contacts and their mutual connections are not shown, and will not be further described hereinafter, as their number and interconnections may be selected from the variety of known solutions generally available for each particular type of switch, according to the number of power consuming units to be managed and the ways they are controlled.

[0033] The control unit 2 further houses an actuator 4 that can be actuated from the outside to interact, through any known type of control mechanism, not shown, with one or more of the electric contacts.

[0034] Thus, the mutual motion of two or more electric contacts will promote the opening and/or closing of one or more electric circuits connected to the switch 1.

[0035] The modular switch 1 also comprises a first connecting device 5 having a containing shell 6 that is adapted to be secured to the case 3 of the control unit 2.

[0036] The first connecting device 5 is equipped with a first outer multipole connector 7 that extends out of the shell 6 in a first predetermined direction X

[0037] The first multipole connector 7 is further connected to the electric contacts through appropriate electric connection means.

[0038] The first connector 7 may be a common multipole connector of the externally threaded type, having any number of connection pins 8, as shown in Fig. 1, or may be selected from the various types of commonly available multipole connectors, e.g. of the AMP type or the like.

[0039] The first connector 7 may also be of the female type, if the circuit to be served has an input with a male connector.

[0040] The electric connection means comprise a first interface member 9 stably associated with the electric contacts and electrically connected therewith, and a second interface member 10 associated with the first connector 7 and electrically connected with the connection pins 8 thereof.

[0041] The second interface member 10 may be held in the shell 6 for removable engagement of the first interface member 9, which may in turn be entirely contained in the case 3.

[0042] According to a peculiar feature of the invention, the first and second interface members 9, 10 have predetermined relative shapes, for removable and modular coupling irrespective of the shape and/or the direction of extension X of the first connector 7.

[0043] According to yet another peculiar aspect of the invention, means are provided for removable attachment of the shell 6 to the case 3, which are adapted to allow removal of the first connecting device 5 from the control unit 2 and modular replacement thereof with a second connecting device 5'.

[0044] The shell 6 also allows simple and safe grip of the relevant connecting device 5 by the user for simpler removal and replacement.

[0045] The second device 5' may be similar to the first device 5, i.e. equipped with a second outer connector 7' extending in a second predetermined direction X', which may be the same as or different from the first direction X.

[0046] According to yet another alternative configuration, the second connecting device 5', irrespective of the direction of extension X' of its outer connector 7', may have a third interface member 11, possibly but not necessarily different from the second interface member 10, whose shape mates the shape of the first interface member 9 of the control unit 2 for removable and selective engagement thereof.

[0047] The modularity of the switch 1 is further in-

creased by the possibility of connecting any one of the connecting devices 5, 5' with an additional control unit, not shown, which differs from the first control unit 2 in terms of type and/or number of electric contacts, i.e. with an identical control unit when the first one needs replacement due to a failure.

[0048] Particularly, the additional control unit has a first interface member susceptible of interacting with both the second 10 and the third 11 interface members, but also with the interface members of further connecting devices, to ensure electric connection between the contacts and the outer multipole connectors 7, 7',

[0049] In a particular preferred, non limiting configuration of the invention, the first 9 and second interface members 10 comprise third 12 and fourth 13 multipole connectors respectively.

[0050] As shown in Fig. 4, the fourth multipole connector 13 is of the male type, with a plurality of connection pins 14 adapted to be fitted into corresponding seats 15 of the third connector 12, which will accordingly be of the female type.

[0051] The number of seats 15 of the third connector 12 is advantageously greater than the number of pins 14 of the fourth connector 13, so that the third connector 12 may be used with different connecting devices 5, 5', ... having a different number of pins 14, 14', for different interface members.

[0052] It shall be also understood that the interface members 9, 10 may also have a reversed configuration with respect to the figures, with the third connector 12 of male type and the fourth connector 13 of female type.

[0053] Electric continuity between the pins 14 of the fourth connector 13 and those of the first or second connectors 7, 7' is ensured by additional conductor elements, not shown, such as cables or the like, held in the shell 6, 6'.

[0054] Removable attachment of the connecting device 5 to the control unit 2 may be ensured by a specially shaped spigot 16 integral with one of the case 3 and the shell 6 and designed to be stably inserted and held in a matingly shaped cavity 17 formed in the other of the shell 6 and the case 3.

[0055] For instance, as more clearly shown in Figs. 5 to 7, the shell 6 may have a side wall 18 open at its top and having a specially shaped upper portion 19, slightly recessed with respect to the rest of the side wall 18 to define the spigot 16.

[0056] The case 3 may in turn include an outer box-like body 20 open at its bottom and an entirely closed inner box-like body 21 holding both the electric contacts and the mechanisms for controlling them, with the actuator 4 sliding therein.

[0057] The inner body 21 may have such a size as to define a peripheral groove between its outer side wall 22 and the inner side wall 23 of the outer body 20, which groove represents the cavity 17 for holding the spigot 16.

[0058] Thus, the switch 1 may be assembled by simply inserting the spigot 16 into the groove 17.

[0059] The control unit 2 and the connecting device 5 may be joined together by simple interference of the spigot portion 16 with the groove 17 as well as their respective interface members 9, 10.

5 **[0060]** Nevertheless, for an even more stable attachment, preventing any accidental separation, the removable anchor means may comprise one or more screws, preferably a pair of screws 24, 24' adapted to be introduced into corresponding pairs of aligned cylindrical holes 25, 26; 25', 26' formed in the shell 6 and the case 3.

10 **[0061]** In a preferred aspect of the invention, the cylindrical holes 25, 25' that are formed on the shell 6 are symmetrical with respect to a center plane π of the connecting device 5, which does not necessarily pass through the direction of extension X of the first connector 7.

15 **[0062]** Likewise, the cylindrical holes 26, 26' that are formed on the case 6 are symmetrical with respect to a center plane of the control unit 2, coinciding, in the illustrated configurations, with the center plane π of the connecting device 5.

20 **[0063]** Therefore, with the switch assembled, the screws 24, 24' will be located symmetrically with respect to the center plane π of the connecting device 5 and/or the control unit 2.

25 **[0064]** In an alternative configuration, not shown, this is the only type of screw anchor means or the like whereas no spigot 16 will not be provided.

30 **[0065]** Fig. 8 finally shows a particular configuration of a kit for modular assembly of a switch 1 as described hereinbefore.

35 **[0066]** The kit comprises at least one control unit 2 with a box-like case 3 that houses at least two mutually movable electric contacts, adapted for connection to one or more electric circuits and a plurality of connecting devices 5, 5', 5" as described above which are mutually interchangeable.

40 **[0067]** Each of the connecting devices 5, 5', 5" has a containing shell 6, 6', 6" adapted to be attached to the case 3 of the control unit 2 and is equipped with its multipole connector 7, 7', 7" that extends from the corresponding shell 6, 6', 6" in its respective predetermined direction X, X', X".

45 **[0068]** Conveniently the connecting devices 5, 5', 5" have respective portions of the anchor means, e.g. the spigots 16, 16', 16", that are substantially similar, for removable and modular attachment of one of these connecting devices 5, 5', 5" at a time to the control unit 2.

50 **[0069]** The multipole connectors 7, 7', 7" may be selected from the group comprising threaded multipole connectors, AMP connectors or the like.

55 **[0070]** Advantageously, at least two of the connecting devices 5, 5', 5" of the plurality have respective outer connectors 7, 7', 7" extending in different directions X, X', X" for highly flexible use of the kit.

[0071] The kit may be also integrated with an additional connecting device 5" having an output cable 27 instead of a multipole connector and having, like the others, a

shell 6" with an anchor spigot 16".

[0072] The kit may also comprise two or more control units having different numbers of pairs of electric contacts and/or types of interconnections between such respective electric contacts.

[0073] The above disclosure clearly shows that the modular switch and the kit for modular assembly of a switch of the invention fulfill the intended objects, and particularly of allowing very simple and quick customized and flexible configuration of a switch.

[0074] The switch and kit of this invention are susceptible to a number of changes or variants, within the inventive concept disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

[0075] While the switch and the kit have been described with particular reference to the accompanying figures, the numerals are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

Claims

1. A modular switch, for the opening/closing of at least one electric circuit, comprising:

- a control unit (2) with a box-like case (3) housing at least two reciprocally movable electric contacts connectable to an external electric circuit;
- an actuator (4) movably housed into said case (3) and actuatable from the outside for interacting with said contacts and promoting the opening/closing of the circuit;
- a first connecting device (5) having a first multipolar connector (7) connectable with the external circuit;
- means (9, 10) for the electric connection of said first connector (7) with said electric contacts;

characterized in that said electric connection means (9, 10) comprise a first interface member (9) of a predetermined shape associated to said electric contacts and a second interface member (10) associated to said first connecting device (5), said second interface member (10) being of complementary shaped relative to said first interface member (9) for removably coupling therewith in a modular fashion irrespective from the shape and/or the extension of said first connector (9).

2. Modular switch as claimed in claim 1, **characterized in that** said first and said second interface member (9, 10) comprise internal connectors (12, 13), respectively of male and female type, reciprocally con-

nectable.

3. Modular switch as claimed in claim 2, **characterized in that** said female connector (12) comprises a plurality of seats (15) and said male connector (13) comprises a plurality of pins (14) insertable into corresponding seats (15).
4. Modular switch as claimed in claim 2 or 3, **characterized in that** said first connecting device (5) comprises a shell (6) designed for firmly housing one between said male connector (13) or said female connector (12) and to allow the grapping of said first connecting device (5) for its connection with said control unit (2).
5. Modular switch as claimed in claim 4, **characterized by** comprising means for removably anchoring said shell (6) to said case (3), said anchoring means comprising a shaped clutch (16) solidal with one of said case (3) and said shell (6), the other of said shell (6) and said case (3) being provided with a counter-shaped cavity (17) for housing and holding said clutch (16).
6. Modular switch as claimed in claim 5, **characterized in that** said shell (6) has an upperly opened side wall (18) having a shaped upper portion (19) defining said clutch (16), said case (3) having a downwardly opened external body (20) and a box-like internal body (21) housing said electric contacts and dimensioned to delimit a peripheral groove into said case (3) for defining said cavity (17) for said clutch (16).
7. Modular switch as claimed in claim 5 or 6, **characterized in that** said removably anchoring means comprise at least one screw (24), preferably a couple of screws (24, 24') insertable into corresponding couples of aligned cylindrical holes (25, 26; 25', 26') realized into said shell (6) and into said case (3).
8. Modular switch as claimed in claim 7, **characterized in that** said holes (25, 25') of said shell (6), respectively said holes (26, 26') of said jacket (3), are symmetrical with respect of a middle plane ($\square$) of said first connecting device (5), respectively of said control unit (2).
9. A kit for the modularly assembling of a switch according one or more of the preceding claims, comprising:
 - at least one control unit (2) with a box-like case (3) designed for housing at least two reciprocally movable electric contacts therein, said contacts being connectable to the electric circuit;
 - at least two connecting devices (5, 5') interchangeably connectable to said control unit (2)

and provided respectively with a first and a second external multipolar connector (7, 7') extending along a corresponding first and second predetermined direction (X, X');

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wherein said control unit (2) has a first interface member (9) associable to said electric contacts and having a predetermined shape;

wherein said connecting devices (5, 5') have respectively a second and a third interface member (10, 11)

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associated, respectively, to said first and to said second multipolar connectors (7, 7'), said second and third interface member (10, 11) being of a complementary shape relative to said first interface member

(9) for their modular coupling with this latter in a removably and selectively way;

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10. Kit as claimed in claim 9, **characterized by** comprising at least two control units (2) having differentiated number of couples of electric contacts and/or type of interconnections between said electric contacts.

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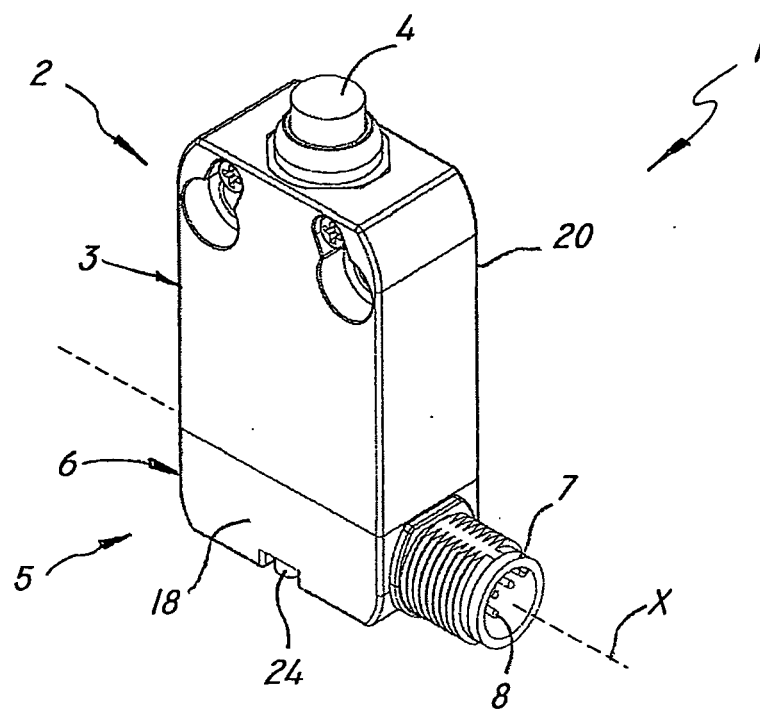


FIG. 1

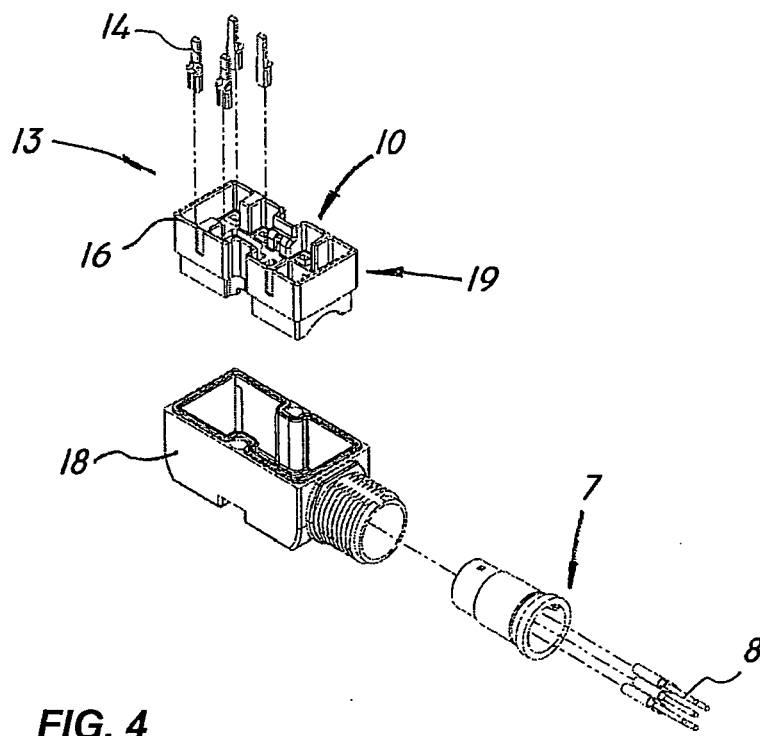


FIG. 4

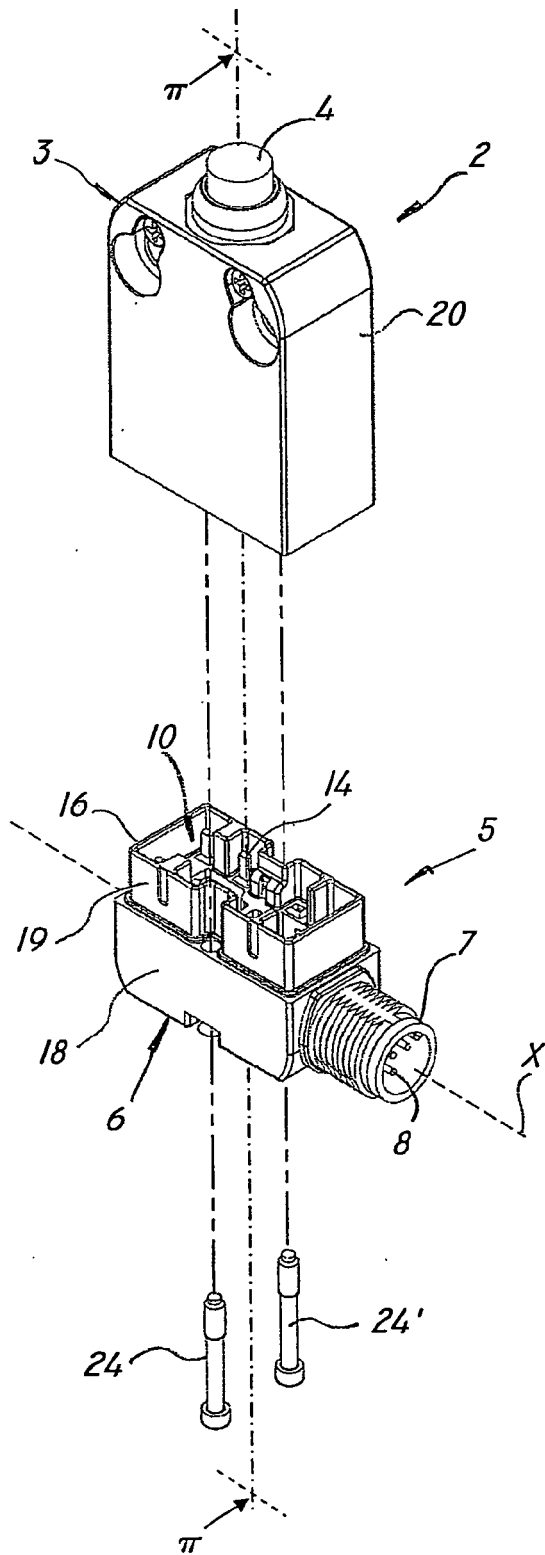


FIG. 2

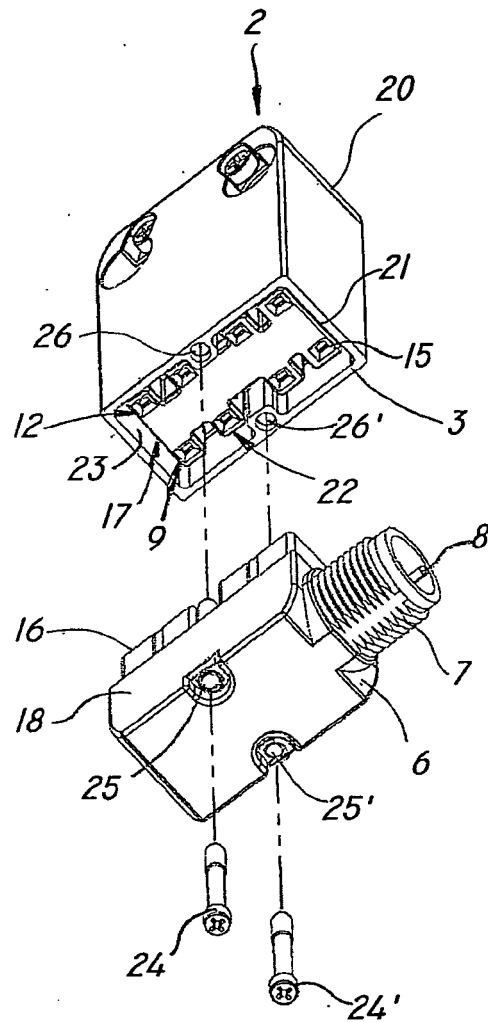


FIG. 3

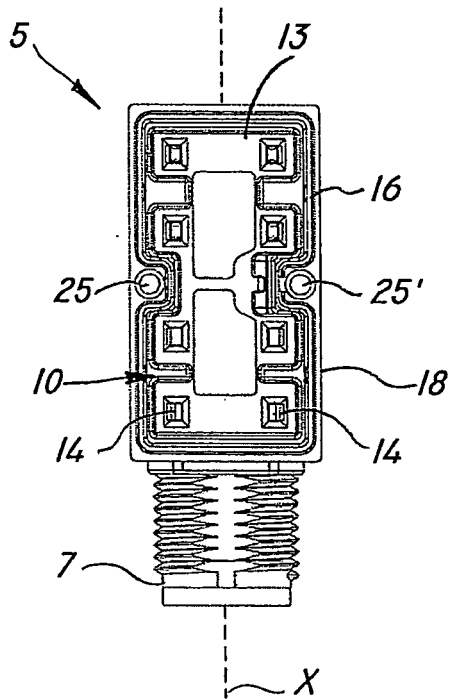


FIG. 5

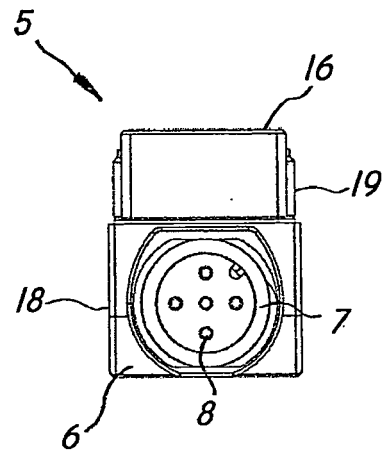


FIG. 6

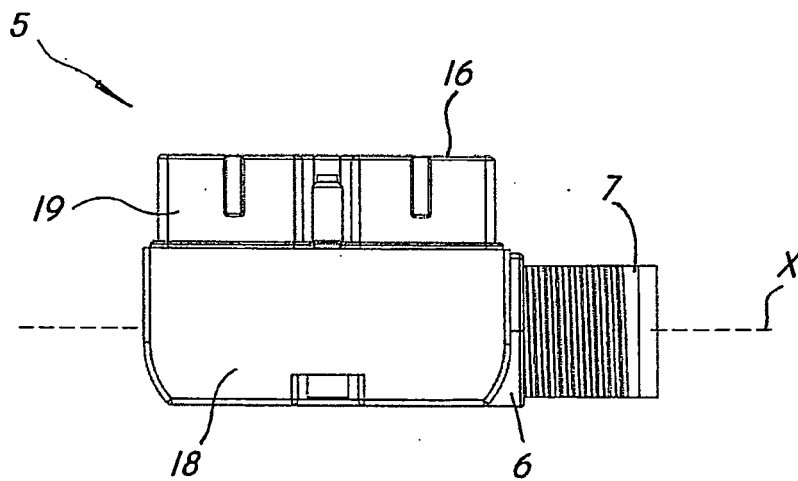


FIG. 7

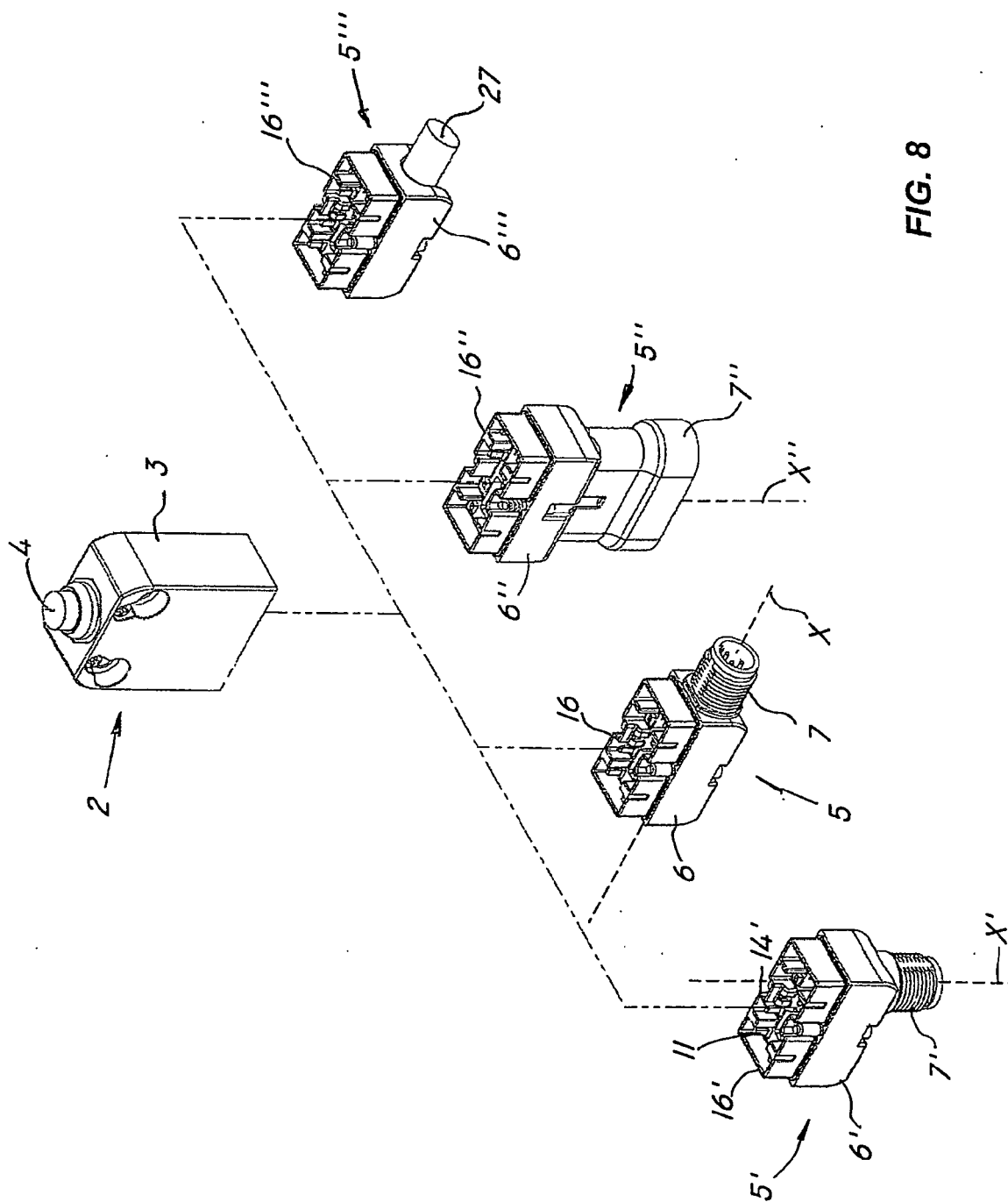


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 10 00 9489

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 304 710 A1 (SCHNEIDER ELECTRIC IND SAS [FR]) 23 April 2003 (2003-04-23)	1-8	INV. H01H1/58
A	* figure 2 *	9,10	ADD. H01H13/50

Y	EP 1 912 231 A2 (SUZO INTERNAT NL B V [NL]) 16 April 2008 (2008-04-16)	1-8	
	* abstract; figure 1 *		

			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 December 2010	Examiner Simonini, Stefano
CATEGORY OF CITED DOCUMENTS		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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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 00 9489

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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15-12-2010

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			DE	60223642 T2		30-10-2008
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REFERENCES CITED IN THE DESCRIPTION

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