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(54) **Interlock device for electrical apparatuses and group of parts including such device**

(57) Device (1) for interlocking at least a first (SW_{sx}) and at least a second (Sw_{dx}) electrical apparatus, including a first (L_{sx}) and second (L_{dx}) operating element, respectively, independently movable between a first and second operating position, the device (1) including inhibiting means (10, 11, 12, 13) which may be activated in order to alternatively lock the first (L_{sx}) or second (L_{dx}) operating element in a predetermined operating position,

characterized in that the inhibiting means (10, 11, 12, 13) comprise a first (10, 11) and second (12, 13) inhibiting element, respectively cooperating with the first (L_{sx}) and second (L_{dx}) operating element, wherein the device (1) comprises a locking element (9), which is slidable between a first (LP1) and second (LP2) locking position, in order to alternatively activate the first (10, 11) or second (12, 13) inhibiting element.

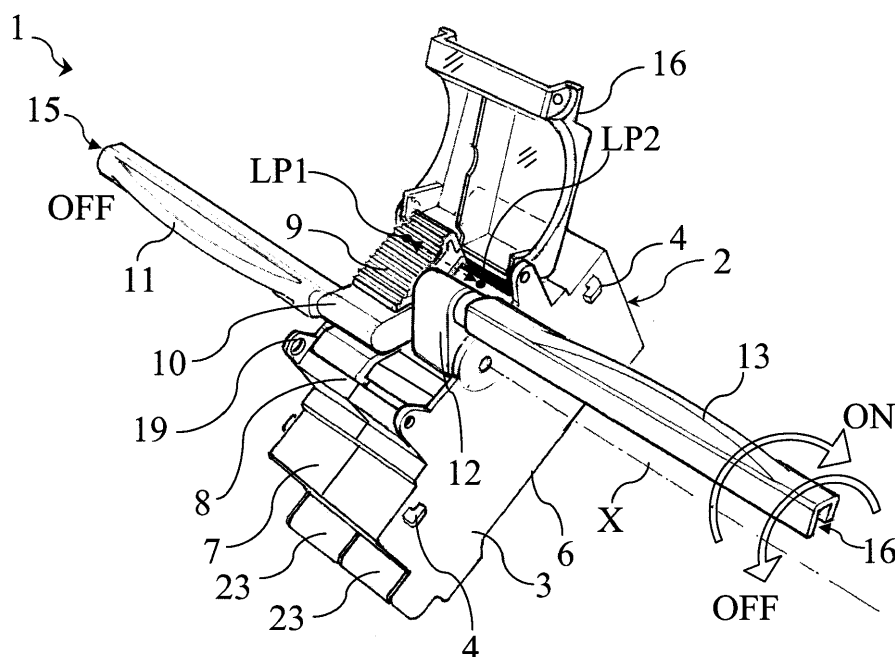


FIG. 3

Description

[0001] The present invention relates to the technical field of electrical apparatuses, and more in particular, to an interlocking device as defined in the preamble of first claim.

[0002] In the technical field of industrial electrical apparatuses, the use of mechanical interlocking devices is known, for example in order to prevent an undesired simultaneous activation of two energy sources to be operated in a mutually exclusive way (such as for example a primary and an auxiliary source). For example, mechanical devices for interlocking two electrical adjacent apparatuses in the same electrical panel are known, wherein said devices are provided with plates of various shapes/types, which slide on the front portions of the electrical apparatuses in order to interfere with respective operating elements, thus inhibiting their activation. In particular, such plates are positioned and shaped in a way to lock the operating element of one of the electrical apparatuses in a predetermined position, at the same time allowing a free actuation of the operating element of the other electrical apparatus.

[0003] Some examples of interlocking devices of the known art of the above said type are described in US patents: US 5,874,698, US 6,563,063, US 7,005,590, USD 331,390.

[0004] The object of the present invention is to provide an interlocking device, which, with respect to the known art, provides a simpler installation and higher flexibility in usage, at the same time ensuring the high reliability usually required of these devices.

[0005] The above said object is achieved by means of an interlocking device as generally defined in appended claim 1. Advantageous embodiments of the interlocking device according to the present invention are defined in the appended dependent claims.

[0006] A further object of the present invention is to provide an assembly of components as defined in appended claim 11.

[0007] Further characteristics and advantages of an interlocking device according to the present invention are provided by the following description of non limiting examples, in which:

- fig. 1 shows a perspective view of an assembly of components including a first and second electrical apparatus and an interlocking device according to a particularly preferred embodiment of the present invention, wherein the electrical apparatuses and the interlocking device are shown in an intermediate coupling arrangement;
- fig. 2 shows a perspective view of the assembly of fig. 1, wherein the electrical apparatuses and the interlocking device are shown in a mutually coupled state,
- fig. 3 shows a perspective view of the interlocking device of fig. 1 in a first operating arrangement,

- fig. 4 shows a perspective view of the interlocking device of fig. 1 in a second operating arrangement,
- fig. 5 shows the interlocking device of fig. 3 with some parts removed, and
- fig. 6 shows one of two inhibiting elements of the interlocking device of fig. 4.

[0008] In the drawing, like or similar elements have same numeral references.

[0009] With reference to fig. 1 and 2, an assembly of components is shown, comprising: an interlocking device 1 according to the present invention, a first Sw_{sx} and second Sw_{dx} electrical apparatus. For example, the electrical apparatuses Sw_{sx} and Sw_{dx} are modular circuit breakers (of the multipolar type in the particular example shown), which are to be mounted on the same fixing rail of an electrical panel, in order to be actuated in a mutually exclusive way. For example, the electrical apparatuses Sw_{sx} and Sw_{dx} functionally correspond to two different sources, which are connected in parallel to a load, wherein one is the primary source, and the other is an auxiliary source, which is provided in order to operate in case of failure or malfunctioning of the primary source.

[0010] The electrical apparatuses Sw_{sx} and Sw_{dx} are actuated by means of respective operating elements L_{sx} and L_{dx}, which are comprised of actuation levers, movable (for instance, rotatable) between a first operating position (switch off - OFF) and a second operating position (switch on - ON).

[0011] The interlocking device 1 comprises inhibiting means 11 and 13, which cooperate with respective operating elements L_{sx} and L_{dx} of electrical apparatuses L_{sx} and L_{dx}. These inhibiting means are part of an interlocking mechanism of device 1, which is not completely visible in fig. 1 and 2, since it is partially covered by a lid 16, which is preferably provided in the interlocking device 1.

[0012] As can be noted by joint observation of fig. 1 and 2, the interlocking device 1 comprises a primary body 2, which, in use, is to be interposed between the electrical apparatuses L_{sx} and L_{dx} to be interlocked. In particular, fig. 1 shows an intermediate coupling condition, in which the interlocking device 1 is partially coupled to the electrical apparatuses to be interlocked, and which is shown only in order to more clearly distinguish the interlocking device 1 from the electrical apparatuses L_{sx} and L_{dx}. In fig. 2, the interlocking device and the electrical apparatuses are shown in a typical coupled arrangement.

[0013] The interlocking device 1 is more clearly visible in fig. 3 and 4. The interlocking device 1 comprises a primary body 2, of generally box-like shape and formed by insulating material. Preferably, the primary body 2 is comprised of two half shells, which are coupled by means of special fixing means (not shown), for example, in order to have a length equivalent to two DIN modules.

[0014] In the example shown in the figures, two opposite faces of primary body 2 (only face 3 is shown) of

device 1 are provided with L-shaped hook means 4, for fixing the interlocking device 1 to the electrical apparatuses L_{sx} and L_{dx} to be interlocked. Such L-shaped hook elements 4 are already known to the skilled in the art (for example as described by European Patent EP 0872867, with particular reference to fig. 1 of this document) and therefore they will not be described further. As an alternative, or in addition to the L-shaped hooking means 4, fixing means (not shown) may be provided at the rear face 6 of primary body 2, in order to fix the interlocking device 1 to a fixing rail of an electrical panel, for instance to a so called DIN rail.

[0015] At the front face 7 of primary body 2 of interlocking device 1, and more in particular (according to a typical configuration of modular DIN devices) on a protruding portion 8 of said front face 7, an interlocking device 9, 10, 11, 12, 13 is provided, which comprises inhibiting means 10, 11, 12, 13 such as to alternatively lock the operating element L_{sx}, L_{dx} of first Sw_{sx} or second Sw_{dx} electrical apparatus in a predetermined operating position (in the example shown in the "OFF" position). In particular, the inhibiting means 10, 11, 12, 13 comprise a first 10, 11 and second 12, 13 inhibiting element, which cooperate with the operating element L_{sx} of first electrical apparatus Sw_{sx} and operating element L_{dx} of second electrical apparatus Sw_{dx}, respectively.

[0016] The interlocking mechanism 9, 10, 11, 12, 13 moreover comprises a sliding locking element 9, which slides between a first locking position LP1 and a second locking position LP2, in order to alternatively activate (i.e. in a mutually exclusive way) the first inhibiting element 10, 11 or the second inhibiting element 12, 13. As can be seen in fig. 3 and 4, the locking element 9 is slidably coupled to the protruding portion 8 of primary body 2 of interlocking device 1. From now on, in the present description, the sliding locking element 9 will be referred to as a "cursor", without any limitation to the scope of the invention.

[0017] In a particularly advantageous embodiment, the first inhibiting element 10, 11 and the second inhibiting element 12, 13, which are preferably made of insulating material, comprise a first 10 and second 12 arm, respectively, which are functionally connected to the primary body 2 of interlocking device 1 and carry a first 11 and second 12 rod, respectively, which protrude from the primary body 2, towards the first and second electrical apparatus, respectively, in order to engage the first and second operating element, respectively, of said apparatuses. Preferably, on the lower surface of rods 10, 11, a respective longitudinal coupling channel 15, 16 is provided, for receiving an end portion of respective operating element L_{sx}, L_{dx} (for example, the end of an actuation lever). It is to be noted that by providing continuous longitudinal channels 15, 16, it is advantageously possible, by suitably choosing the length of rods 11, 13, to operatively couple the interlocking device 1 to a first plurality and second plurality of electrical apparatuses, in order to interlock the electrical apparatuses of the first group

to the electrical apparatuses of the second group. In a particularly advantageous embodiment, in order to convey a higher mechanical strength to rods 11, 13, especially if these are of considerable length, it is envisaged to provide these rods with an inner reinforcing metal core.

[0018] In a particularly preferred embodiment, in which the operating elements L_{sx}, L_{dx} of electrical apparatuses Sw_{sx}, Sw_{dx} are rotatable levers, the inhibiting elements 10, 11, 12, 13 are independently rotatable about a rotation axis X. It is to be noted that if the operating elements of electrical apparatuses are sliding levers, as compared to rotating levers, the inhibiting elements 10, 11, 12, 13 may also be sliding elements (in a perpendicular direction with respect to the sliding direction of cursor 9).

[0019] In a particularly preferred embodiment the interlocking device 1 comprises a lid 16 which is rotatably hinged to primary body 2 so as to be moved between a closed and an open position, such as to avoid access to cursor 9 in the open position. In a particularly advantageous embodiment, the lid 16 comprises means for blocking the cursor 9 in any of its locking positions LP1 and LP2. For example, such means comprise a central septum 18 protruding from the internal surface of lid 16 towards the protruding portion 8 of primary body 2 of interlocking device 1. In the closed position of lid 16, the septum 18 is interposed between the first 10 and second 12 arm in order to inhibit the sliding of cursor 9. Preferably, for security reasons, the lid 16 in its closed position, may be secured to the primary body of interlocking device 1, by means of a pair of holes provided in the lid 16 and on the protruding portion 8 of the interlocking device 1, respectively (only the latter hole 19 is shown in fig. 3 and 4).

[0020] As may be noted by combining fig. 3 and 4, in use, the active position LP1 of cursor 9 interferes with arm 10 of inhibiting element 10, holding it in an OFF position. In this case, the inhibiting element 10, 11 may be considered "activated", since it inhibits any possible movement of the operating element L_{sx} of electrical apparatus Sw_{sx}. On the contrary, in operating position LP1, the inhibiting element 12, 13 may be freely moved (for instance manually) between ON and OFF positions (in this case, the inhibiting element may be considered "inactivated"). Moreover, when the inhibiting element 12, 13 is in an ON position, cursor 9 is locked in a position LP1, since if one tries to move the cursor to position LP2, this would abut against arm 12, inhibiting its displacement.

[0021] In operating position LP2, the cursor 9 interferes with arm 12 of inhibiting element 12, 13, holding it blocked in the OFF position. In this case, the inhibiting element 12, 13 may be considered "activated", since it inhibits any movement of operating element L_{dx} of electrical apparatus Sw_{dx}. In the operating position LP2, the inhibiting element 10, 11 may be freely displaced (for instance, manually) between ON and OFF positions. Moreover, when the inhibiting element 10, 11 is in ON position, the cursor 9 is blocked in position LP2, since if one tries

to move the cursor to the LP1 position, this would abut against arm 10, which inhibits its movement. As may be noted from fig. 4, the cursor 9 (in this particular example, when lid 16 is open) may be freely moved between the LP1 and LP2 positions, when both the inhibiting elements 10, 11, 12, 13 are in the OFF position.

[0022] In fig. 5, the interlocking device 1 of fig. 3 and 4 is shown with some of its parts removed. In particular the following were removed: one of the two half shells forming the primary body 2 of interlocking device 1, the lid 16 and the inhibiting element 12, 13. As can be seen in these figures, in a particularly preferred embodiment, the cursor 9 comprises a recess which surrounds at least a portion of arm 10 of inhibiting element 10, 11 (in the example shown, when the inhibiting element is in the OFF position shown). In this way, the cursor 9 in the LP1 position (fig. 3), by engaging arm 10, inhibits its rotation about a pin 20 (which extends in a direction corresponding to axis X in fig. 3 and 4) provided inside the protruding part 8 of interlocking device 1. Similarly, the same can be said for the other inhibiting element 12, 13, which is also rotatable about pin 20, when cursor 9 is in locking position LP2 (fig. 4).

[0023] Preferably, as shown in fig. 5, the cursor 9 is slidably guided by two pins s1, s2, provided inside the protruding part 8 of interlocking device 1.

[0024] In a particularly preferred embodiment, the interlocking device 1 comprises further signaling means for outputting an electrical signal which represents the position of the inhibiting elements 10, 11, 12, 13. In the example of fig. 5, such means comprise a microswitch 21 provided with a lever 22 operated by the inhibiting element 10, 11 when the latter is in the ON position in fig. 3. To this end, as shown in fig. 6, the arm 10 of inhibiting element 10, 11 is connected, on the opposite side with respect to rod 11, to a bar 24 for engaging lever 22 when the inhibiting element 10, 11 is in an ON position. Identical or similar signaling means (not shown in fig. 5) may be provided for signaling the position of the other inhibiting element 12, 13. The electrical signal output by microswitch 21 may be used for local or remote (for example optical) signaling. To this end, a terminal strip 23, electrically connected to the microswitch 21, may be provided in the interlocking device 1, in order to output the signal provided by the microswitch 21.

[0025] As may be appreciated by the preceding description, the interlocking device according to the invention evidently meets above said needs with respect to the devices of the known art.

[0026] In particular, it is to be noted that the interlocking device 1 advantageously provides excellent flexibility, since it may be comprised of a modular device to be used for interlocking electrical apparatuses without the need for special structural features or equipments as an interface to the same interlocking device. It is moreover to be noted that the mounting of such a device is extremely easy and timesaving.

[0027] Obviously, a skilled in the art, desirous to meet

particular contingent needs, may introduce various modifications and alterations to the above said interlocking device, which are all within the protection scope of the invention, as defined in the following claims.

Claims

1. Device (1) for interlocking at least a first (SW_{sx}) and at least a second (Sw_{dx}) electrical apparatus, including a first (L_{sx}) and second (L_{dx}) operating element, respectively, independently movable between a first and second operating position, the device (1) including inhibiting means (10, 11, 12, 13) which may be activated in order to alternatively lock the first (L_{sx}) or second (L_{dx}) operating element in a predetermined operating position,
characterized in that
the inhibiting means (10, 11, 12, 13) comprise a first (10, 11) and second (12, 13) inhibiting element, respectively cooperating with the first (L_{sx}) and second (L_{dx}) operating element, wherein the device (1) further comprises a locking element (9), which is slidable between a first (LP1) and second (LP2) locking position, in order to alternatively activate the first (10, 11) or second (12, 13) inhibiting element.
2. Device (1) according to claim 1, wherein the first (L_{sx}) and second (L_{dx}) electrical apparatuses are modular apparatuses, and wherein said device (1) is a modular device including a primary body (2) which is to be interposed between said electrical apparatuses.
3. Device (1) according to claim 2, wherein the first (10, 11) and second (12, 13) inhibiting element comprise a first (10) and second (12) arm, respectively, operatively connected to primary body (2) and having a first (11) and second (13) rod, protruding from the primary body (2), towards the first (Sw_{sx}) and second (Sw_{dx}) electrical apparatus, respectively, for engaging the first (L_{sx}) and second (L_{dx}) operating element.
4. Device (1) according to claim 3, wherein the first (11) and second (13) rod comprise a longitudinal channel (16) for receiving an end portion of first (L_{sx}) and second (L_{dx}) operating element.
5. Device (1) according to claim 3 or 4, wherein said at least one first (L_{sx}) and at least one second (L_{dx}) electrical apparatus comprise a first and second plurality of electrical apparatuses, respectively, and said rods (11, 13) are such as to engage respective operating elements of said first and second plurality of electrical apparatuses.
6. Device (1) according to any of preceding claims,

wherein the operating elements (L_{sx}, L_{dx}) are levers, which are independently rotatable about a rotation axis (X), between said first and second operating position, and wherein the first (10, 11) and second (12, 13) inhibiting elements are elements, which are independently rotatable about said rotation axis (X).

7. Device (1) according to any of claims 2 to 6, wherein the sliding locking element (9) is a cursor comprising a recess, which, in the first (LP1) and second (LP2) locking position, is such as to surround the arm (10, 12) of said first (10, 11) and said second (12, 13) inhibiting element.
8. Device (1) according to any of the preceding claims, further comprising a lid (16), which is hinged to said device (1) in order to deny, in the closed position, access to said sliding locking element (9), the lid (16) further comprising blocking means (18) such as to block, when the lid is closed, said locking element (9) in any of said locking positions (LP1, LP2).
9. Device (1) according to claim 8, wherein said blocking means comprise a septum (18) which protrudes from the internal part of said lid (16) towards said device (1), the septum (16) being such as to be positioned, when the lid is closed, between said first (10, 11) and second (12, 13) inhibiting element.
10. Device (1) according to any of the preceding claims, further comprising means (21, 22) for providing at least an electrical signal representing the activation status of said first (10, 11) and said second (12, 13) inhibiting element.
11. Assembly of components (1, Sw_{sx}, Sw_{dx}) comprising a first electrical apparatus (Sw_{sx}) and second electrical apparatus (Sw_{dx}) and a device (1) according to any of preceding claims, for interlocking said first and second electrical apparatus.

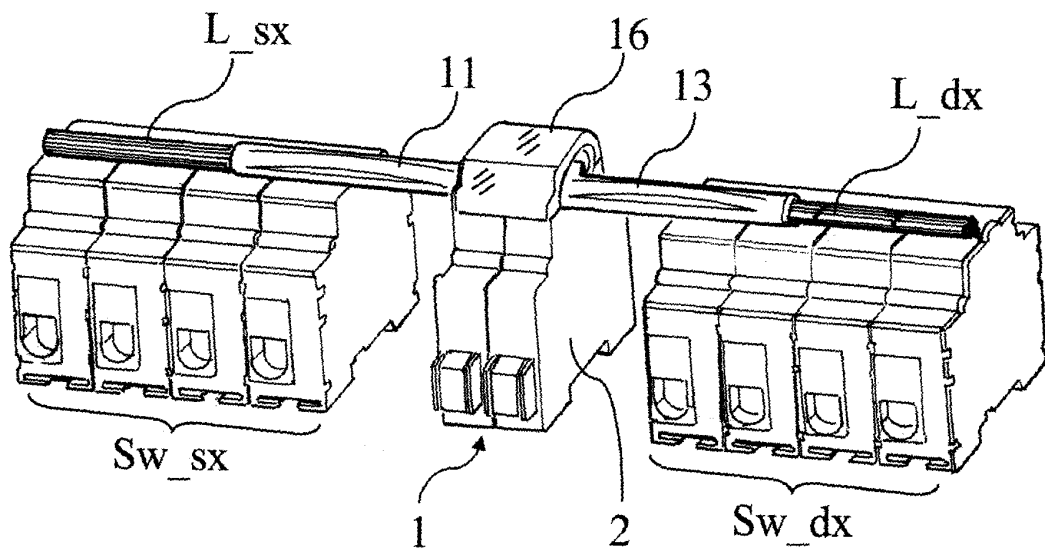


FIG. 1

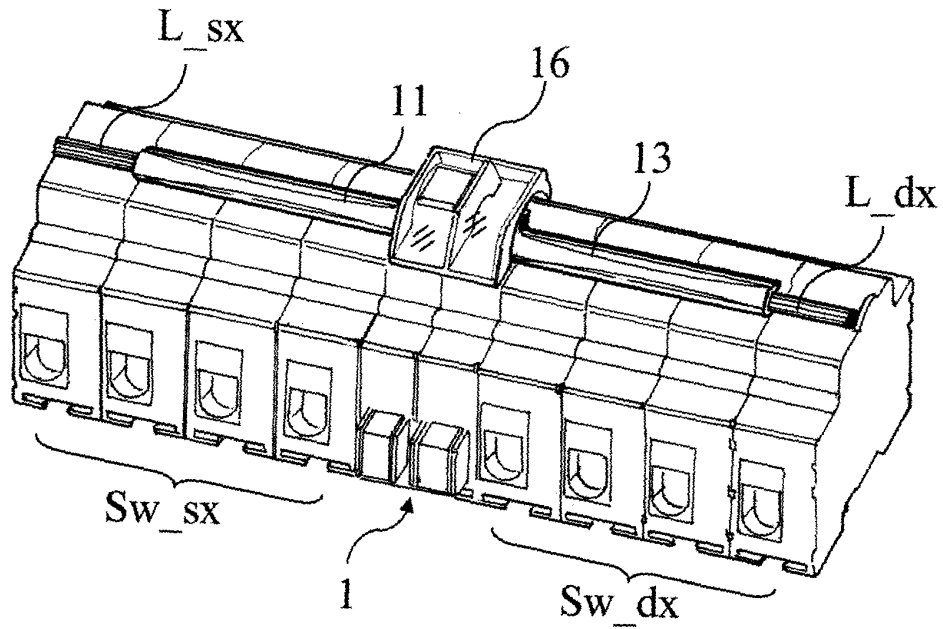


FIG. 2

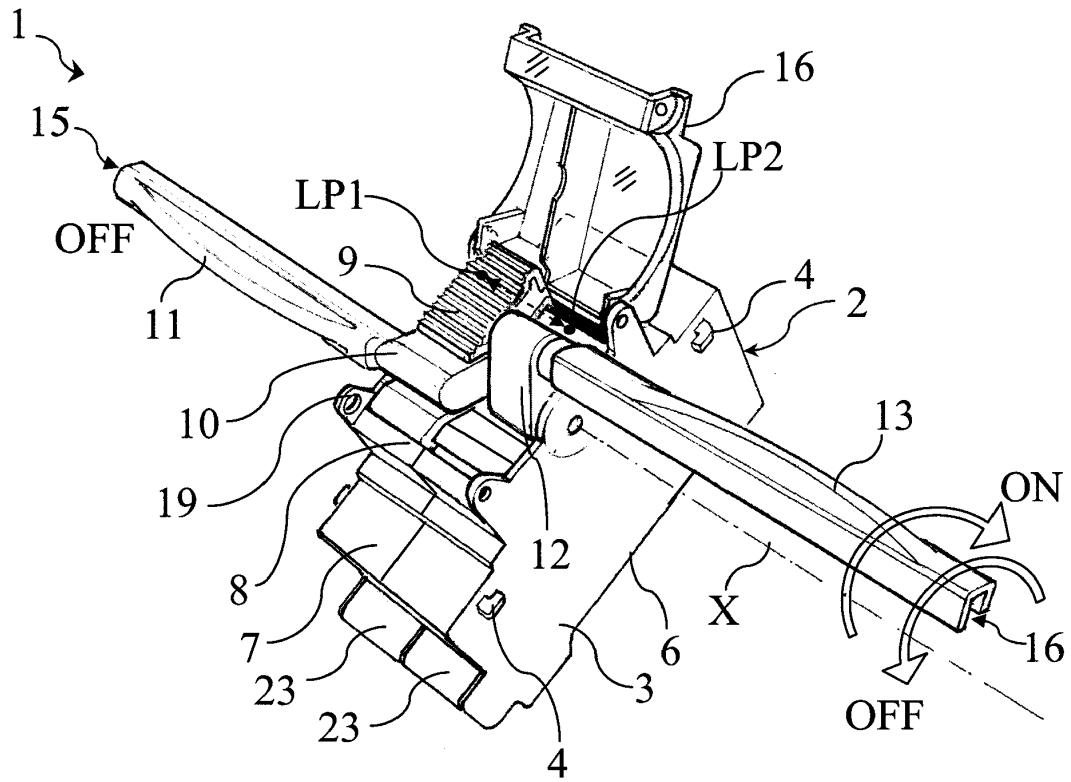


FIG. 3

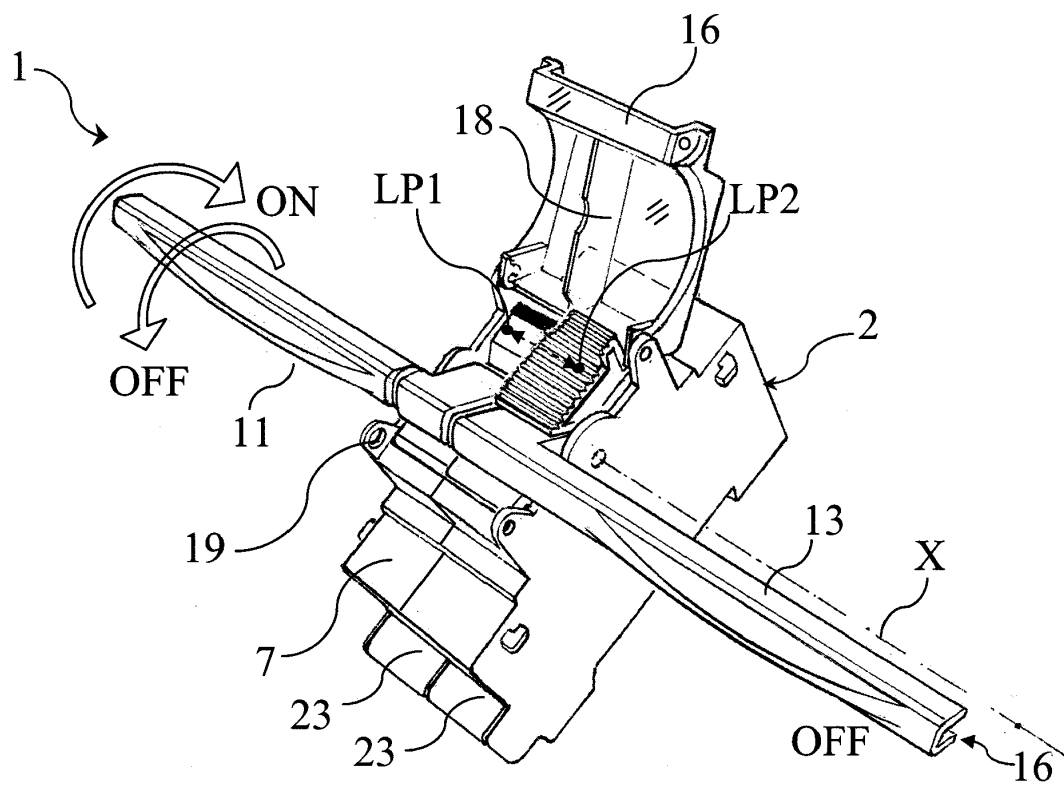


FIG. 4

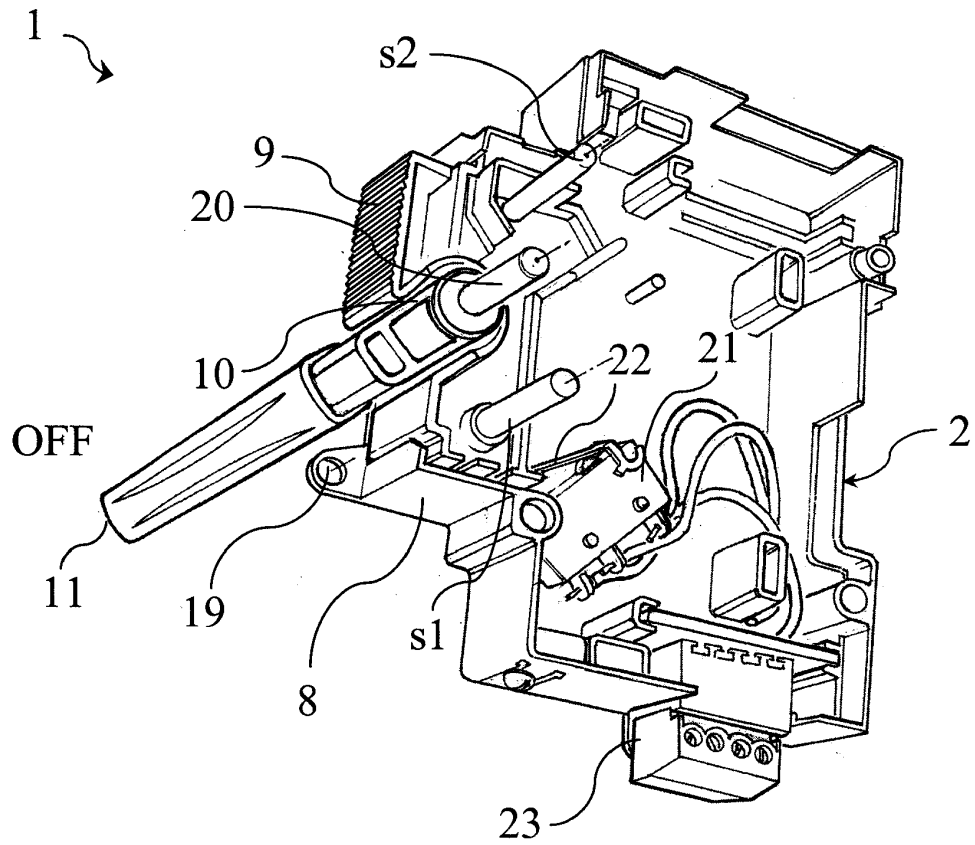


FIG. 5

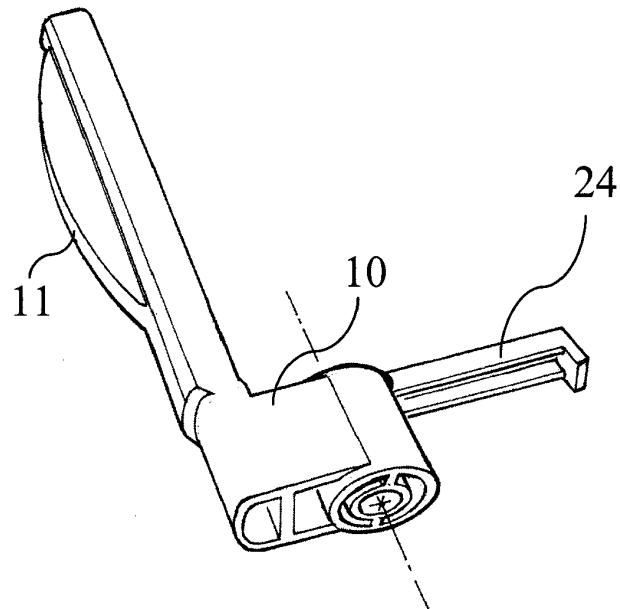


FIG. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 11 6810

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 02/50853 A (ABB SERVICE SRL [IT]; AZZOLA LUCIO [IT]; CARRARA OSVALDO [IT]) 27 June 2002 (2002-06-27) * abstract; figures 4,5 *	1,11	INV. H01H9/26
X	EP 1 643 519 A (EATON CORP [US]) 5 April 2006 (2006-04-05) * abstract; figure 2 *	1,11	
X	US 2003/155222 A1 (SCHNACKENBERG PAUL [US]) 21 August 2003 (2003-08-21) * abstract; figure 4 *	1,11	
X	US 6 563 063 B1 (MOORE MARSHALL R [US]) 13 May 2003 (2003-05-13) * abstract; figures 1,2 *	1,11	
X	US 5 790 369 A (SITLER DONALD D [US]) 4 August 1998 (1998-08-04) * abstract; figure 3 *	1-3,5,11	
Y		10	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 3 767 872 A (WHITCHURCH N) 23 October 1973 (1973-10-23) * column 8, line 52 - column 9, line 8 *	10	H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 January 2008	Examiner Simonini, Stefano
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 11 6810

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07-01-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0250853	A	27-06-2002	AT 358324 T	15-04-2007
			AU 4083302 A	01-07-2002
			CN 1481565 A	10-03-2004
			EP 1356484 A1	29-10-2003
			ES 2283450 T3	01-11-2007
			IT MI20002791 A1	21-06-2002
			US 2004045796 A1	11-03-2004

EP 1643519	A	05-04-2006	CA 2521680 A1	01-04-2006
			CN 1761009 A	19-04-2006

US 2003155222	A1	21-08-2003	US 2004118667 A1	24-06-2004

US 6563063	B1	13-05-2003	US 2003098222 A1	29-05-2003

US 5790369	A	04-08-1998	NONE	

US 3767872	A	23-10-1973	NONE	

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

- US 5874698 A [0003]
- US 6563063 B [0003]
- US 7005590 B [0003]
- US 331390 A [0003]
- EP 0872867 A [0014]