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(54) **Interlock device for electrical circuit breakers, kit of parts including such device**

Sperrvorrichtung für elektrische Schutzschalter, Kit mit Teilen mit einer derartigen Vorrichtung

Dispositif de verrouillage pour disjoncteurs électriques, kits de pièces comportant ce dispositif

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Description

[0001] The present invention relates to the technical field of the electrical apparatuses and, particularly, it relates to an interlock device as defined in the preamble of the first claim. Document EP0383700 discloses a device according to the preamble of claim 1.

[0002] In the technical field of the industrial electrical apparatuses, it is known to use mechanical interlock devices that are associated with electrical circuit breakers, for example, in order to prevent an undesired simultaneous activation of two energy sources intended to operate in a mutually excluding manner (such as, for example, a primary source and an auxiliary source).

[0003] Particularly, "front" interlock devices are known which are suitable to frontally act by mechanical interference with the front control levers of the electrical circuit breakers to be interlocked. However, such devices compromise the possibility to frontally apply front implements such as, for example, a motorization device to the circuit breakers.

[0004] "Rear" interlock devices are further known which are intended to be mounted inside an electric panel or box at the back of the circuit breakers to be interlocked. However, such devices, while allowing the application of front implements to the circuit breakers, have other types of drawbacks. In fact, since they are located in the rear part of the electric panel, in which conductive electrical parts under tension are present, they have the main drawback to necessitate cutting out the voltage to the electric panel during the maintenance operations for the interlock devices. Furthermore, the "rear" interlock devices generally have a complex structure which is characterized by a high number of pieces, they occupy much room in the thickness of the electric panel, and require periodic adjustment operations.

[0005] The object of the present invention is to provide an interlock device which is able to obviate the above-discussed drawbacks relative to the prior art.

[0006] Such object is achieved by an interlock device as generally defined in the annexed claim 1.

[0007] Advantageous embodiments of an interlock device according to the present invention are as defined in the annexed dependant claims.

[0008] Further objects of the present invention are to provide a kit of parts as defined in the claims 16 to 18.

[0009] Further characteristics and the advantages of the invention will be clear from the following detailed description, given only by way of non-limiting example, with reference to the annexed drawings, in which:

- Fig. 1 is a front perspective view of a kit of parts including a first and a second electrical circuit breakers, and an interlock device according to a currently preferred embodiment of the present invention, where the kit of parts is shown in a first operative configuration;
- Fig. 2 is a front perspective view of the kit of parts of

Fig. 1 in a second operative configuration;

- Fig. 3 is a perspective view of an electrical circuit breaker of the kit of parts of Fig. 1, and of a component of the interlock device of Fig. 1;
- Fig. 4 is a perspective view of an inner member of the electrical circuit breakers of Fig. 1 which is coupled to the interlock device component represented in Fig. 3;
- Fig. 5 is a perspective view of the kit of parts of Fig. 1, in which one of the circuit breakers has been removed, and in which the interlock device is represented in a third configuration;
- Fig. 6 is a perspective view of the kit of parts of Fig. 5, in which a first lid of the interlock device can be seen;
- Fig. 7 is a front perspective view of the interlock device of Fig. 1, in which an additional component of such device is shown;
- Fig. 8 is a perspective view of the kit of parts of Fig. 1, in which a second lid of the interlock device can be seen;
- Fig. 9 is a rear perspective view of the kit of parts of Fig. 1.

[0010] In the following description, the terms "high", "low", "right", "left", "upper", "lower", "horizontal", "vertical", "clockwise", "counter clockwise" are referred to an observer of Fig. 1 as presented and not being rotated in any manner.

[0011] With reference to the Fig. 1, a kit of parts is illustrated, which comprises: an interlock device 1 according to the present invention, a first Sw-sx and a second Sw-dx electrical circuit breakers. The circuit breakers, in the exemplary case, are molded case multipole electrical circuit breakers which are intended to be installed on a support member, such as, for example, a respective insertion strip, or a support plate which is fixed or securable inside an electric panel, in order to be actuated in a mutually excluding manner. For example, the Sw-sx and Sw-dx electrical apparatuses functionally correspond to two separate sources, which are connected in parallel to a load, one of which is the primary source, and the other one is the auxiliary source which is provided so as to operate in the event of a failure or malfunction of the primary source.

[0012] The Sw-sx circuit breaker comprises an outer shell 2 including a front wall 2a, on which a control lever L-sx for the circuit breaker operation is provided, a pair of opposite side walls 2b, 2c, an upper side 2d, a lower side 2e, and a rear wall 2f (Fig. 9) which is intended, in use, to be connected for example to a support plate (not shown).

[0013] Similarly, the Sw-dx circuit breaker comprises an outer shell 3 including a front wall 3a, on which a L-dx control lever analogue to L-sx is arranged, a pair of opposite side walls 3b, 3c, an upper side 3d, a lower side 3e, and a rear wall 3f (Fig. 9) which is intended to be connected for example to a support plate (not shown).

[0014] Particularly, the control levers L-sx, L-dx of the circuit breakers Sw-sx, Sw-dx are independently movable between a first activation position ON, corresponding to a closed state of the circuit breaker, and a second deactivation position OFF, corresponding to an open state of the circuit breaker.

[0015] With reference to the Fig. 6, the interlock device 1 includes a box-shaped main shell 4 intended to be sandwiched between the side walls 2c and 3b of the outer shells 2, 3, which are mutually facing in the operative conditions of the device. Thereby, the interlock device 1 is arranged between the two circuit breakers Sw-sx, Sw-dx.

[0016] The main shell 4 of the device 1 includes two opposite side faces (of which, only one, indicated with 5, is visible in Fig. 6) which operatively face the side walls 2c and 3b, respectively, of the circuit breakers Sw-sx, Sw-dx.

[0017] The main shell 4 includes, particularly, a box-like portion 6 (Fig. 5), and a front lid 7 (Fig. 6) which is removably secured to the box-like portion, for example, by means of screws. In this case, the side face 5 is preferably defined by both the box-like portion 6 and the front lid 7 (Fig. 6).

[0018] The main shell 4 further has two communication openings 8, 9, each of which extends partially frontally on the front lid 7 and partially on a respective side face of the main shell 4.

[0019] Particularly, each of the portions of the two communication openings 8, 9 which frontally extend on the front lid 7, extends horizontally from the edge of the lid 7 towards a central vertical axis of the same lid 7.

[0020] The portions of the two communication openings 8, 9 which extend on the side faces of the main shell 4 have, in the exemplary case, a generally enlarged shape which extends on the respective wall and, particularly, operatively face respectively two openings, preferably manufactured under the shape of two bent slots 10, 11 (Figs. 1 and 3) which are provided on the side walls 2c and 3b, respectively, of the outer shells 2, 3 of the circuit breakers Sw-sx, Sw-dx. Optionally, other two slots which are identical to the slots 10, 11 are further provided on the side walls 2b and 3c, respectively, of the shells 2, 3, that is on the side walls which, in the illustrated embodiment, do not face the interlock device 1.

[0021] With reference to the Fig. 1, the device 1 comprises locking means which consist of, in the exemplary case, a rocker 12 which is rotatable around a horizontal support pivot between a first (left) and a second (right) angular positions, which are distinct and predetermined. Particularly, the rocker includes two teeth 13a, 13b angularly spaced apart from each other around the support pivot, which comprise a first 14a and a second 14b engagement surfaces (Fig. 7), respectively, the function of which will be explained herein below.

[0022] The device 1 further comprises secondary control members consisting of a first 15 and a second 16 control pins in the currently preferred embodiment. Each

of the control pins 15, 16 is movable between a lower operative position and an upper operative position associated to the ON, OFF positions of the respective control lever L-sx, L-dx, and is suitable to cooperate with the rocker 12 in order to prevent to the circuit breakers Sw-sx, Sw-dx to be both in a closed state.

[0023] Particularly, the control pins 15, 16 are such as to cooperate with the rocker 12, so that, when the first pin 15 is in the upper operative position (Fig. 2), the rocker and, consequently, the second pin 16, are in the second angular position and in the lower operative position, respectively.

[0024] On the other hand, when the second pin 16 is in the upper operative position (Fig. 1), the rocker and, consequently, the first pin 15, are in the first angular position and in the lower operative position, respectively.

[0025] Particularly, each of the first 15 and the second 16 control pins is intended to be rotationally integral to a respective rotatable activation member or contact carrier shaft 17a, 17b (Figs. 3 and 4) located inside the shell of the first Sw-sx and the second Sw-dx circuit breakers. The rotatable activation members carry the movable electrical contacts for the switching of the circuit breakers between the closed state and the open state, and are actionable through the control levers L-sx, L-dx, respectively.

[0026] In the particular example considered herein, respective holes 17c, 17d are provided on the rotatable activation members 17a, 17b, which respectively face the bent slots 10, 11, inside which the pins 15, 16 are suitable to be fitted. Optionally, each of the rotatable activation members can comprise a further hole intended to face a respective slot of the two slots optionally obtained on the side walls 2b, 3c of the outer shells 2, 3.

[0027] Furthermore, it is appropriate to notice that, by means of the rotatable activation members 17a, 17b, the lower and upper operative positions of the first 15 and second 16 control pins correspond to the OFF and ON positions, respectively, of the control levers L-sx, L-dx.

[0028] In accordance with an embodiment, the device 1 can comprise positioning means of the rocker 12. In the exemplary embodiment, such rocker positioning means comprise, particularly, a spring 18 (Fig. 7) which is suitable to cooperate with the teeth 13a, 13b in order to bring the rocker to a preset intermediate angular position when the control levers L-sx, L-dx are both in the OFF position. Such intermediate position of the rocker is preferably centred relative to the first and second angular positions.

[0029] In accordance with an embodiment, the spring 18 has also the function of reducing the clearances which could be present between the tooth 13b and the second 16 control pin, when such pin 16 is in the upper operative position, and between the tooth 13a and the first 15 control pin when such pin is in the upper operative position, respectively.

[0030] In the exemplary embodiment, the spring 18 has, particularly, two elastic arms 19, 20 which are re-

spectively supported by two spring positioning and support members 21, 22 which are provided in the main shell 4.

[0031] Particularly, the arms 19, 20 are suitable to be subjected to an upwardly flexure, under the action of the two teeth 13a, 13b, respectively, so that when the rocker 12 is in the first angular position (Fig. 1), the arm 20 has stored the maximum elastic energy while the arm 19 is unloaded, and when the rocker 12 is in the second angular position (Fig. 2), the conditions of the two arms are inverted relative to those previously described.

[0032] With reference to Fig. 8, the device 1 comprises a secondary front lid 23, intended to be connected in an overlapped manner to the front lid 7 (Fig. 6) of the main shell 4, so as to cover the front portions, if present, of the communication openings 8, 9 (Fig. 6) and to prevent the access to the screws for the connection of the front lid 7 to the box-like portion 6. Furthermore, each of the front lid 7 and the secondary front lid 23 has two opposite eyelets (particularly, only the eyelets 24 of the front lid 7 in Fig. 6 are visible), the eyelets being two by two aligned when the two lids are overlapped. This allows the insertion of a protective closing means, such as a wire with lead seal, through each pair of aligned eyelets.

[0033] Finally, in order to accurately position the interlock device 1 relative to the circuit breakers Sw-sx, Sw-dx on the main shell 4 of the device 1, centring means are provided which, in the exemplary case, are obtained by means of two tongues 25a, 25b which are projecting from the main shell 4 of the device 1. Such centring means are, particularly, suitable to engage in respective conjugated centring means respectively provided on the outer shells 2, 3 of the circuit breakers Sw-sx, Sw-dx.

[0034] In the exemplary embodiment, such conjugated centring means are, particularly, two centring recesses 25c, 25d visible in Fig. 9 or, with reference to the recess 25c, in Fig. 3. Optionally, two other centring recesses can respectively be obtained on the outer shells 2, 3 of the circuit breakers Sw-sx, Sw-dx, on the side opposite that in which they are illustrated in the annexed Figures.

[0035] The installation of the kit of parts Sw-sx, Sw-dx, 1, will be described herein below, with particular reference to the case in which such kit of parts is intended to be secured inside an electric panel by means of a support plate. Such support plate can be, for example, an inner panel provided in the electric panel, or a support plate which can be secured inside an electric panel, for example including coupling means to a DIN rail.

[0036] Initially, the main shell 4 of the device 1 is secured on the support plate (not shown).

[0037] Once the main shell 4 has been secured, the first pin 15 is connected to the first circuit breaker Sw-sx by being inserted through the bent slot 10 in order to partially fit it inside the hole 17c (Fig. 3) provided on the rotatable activation member 17a.

[0038] The assembly consisting of the circuit breaker Sw-sx and the pin 15, after that the control lever L-sx has been brought in the OFF position so that the pin 15 results

to be in the lower operative position, is made to slide laterally relative to the device 1 (the direction of the arrow S in Fig. 6) so that the side wall 2c of the circuit breaker Sw-sx slides along the side face of the interlock device main shell 4 and, concomitantly, the pin 15 inserts through the front portion of the communication opening 8.

[0039] In this regard, it should be noticed that the control pins 15, 16, when are in the lower operative position, turn out to face respectively the front portions of the communication openings 8, 9. In fact, in such manner one can be sure that the circuit breakers installation and removal is always accomplished when these are in an open state (OFF).

[0040] Furthermore, it should be noticed that when the control pins 15, 16 are in the lower operative position, the spring 18, when present, is suitable to cooperate with the rocker 12 so as to bring it to and maintain it in an intermediate angular position between the first and second angular positions. Particularly, the intermediate angular position is such as to prevent that, in the absence of the control pins 15, 16, rocker portions can assume positions corresponding to the communication openings 8, 9 front portions. In such manner, the spring 18 promotes the coupling of the circuit breakers Sw-sx, Sw-dx to the interlock device 1, thus allowing having the front portions of the communication openings 8, 9 free from obstacles when the control pins 15, 16 are being inserted within the main shell 4.

[0041] Once the coupling of the circuit breaker Sw-sx to the device 1 has been accomplished, the circuit breaker will be accurately positioned relative to the device 1, by causing the centring tongue 25a (Fig. 9) outwardly projecting from the main shell 4 to be engaged in the corresponding conjugated centring recess 25c (Fig. 3) which is provided on the outer shell 2 of the circuit breaker Sw-sx.

[0042] Finally, the circuit breaker Sw-sx is secured to the support plate, for example, by means of screws.

[0043] The installation of the circuit breaker Sw-dx is carried out in a similar manner as described for the circuit breaker Sw-sx, on the opposite side of the main shell 4 of device 1 relative to that of the circuit breaker Sw-sx. Particularly, in this case, the coupling between the circuit breaker Sw-dx and the interlock device is carried out by inserting first the second control pin 16 through the bent slot 11 and the hole 17d provided on the rotatable activation member 17b (Fig. 4) of the circuit breaker Sw-dx, then by inserting the pin 16 coupled to the circuit breaker Sw-dx, through the communication opening 9 front portion. The relative positioning between the circuit breaker Sw-dx and the device 1 is then accomplished by engaging the projecting centring tongue 25b (Fig. 9) in the corresponding conjugated centring recess 25d which is provided on the outer shell 3 of the circuit breaker Sw-dx.

[0044] In the end, the secondary front lid 23 is connected to the front lid 7 of the main shell 4.

[0045] The operation of the device 1 is as follows.

[0046] Let's assume that the device 1 is initially in the

configuration in Fig. 1, in which the control members L-sx, L-dx are respectively in the OFF and ON positions, considering the front lid 7 as being connected to the box-like portion 6.

[0047] In such configuration, the rotatable activation member 17b of the circuit breaker Sw-dx results to be locked, in a manner known *per se*, so that the second control pin 16 also results to be locked in the upper operative position.

[0048] When the control lever Sw-sx is moved from the OFF position to the ON position, the first control pin 15 acts in a supporting relationship against the engagement surface 14a (Fig. 7) of the tooth 13a of the rocker 12, in order to impart a clockwise rotation to the latter.

[0049] However, such clockwise rotation is prevented by the second control pin 16, which acts as an abutting member against the second engagement surface 14b belonging to the rocker tooth 13b, so that the first control pin 15 is locked in the lower operative position and, consequently, the control lever L-sx remains locked in the OFF position.

[0050] In order to unlock the rotatable activation member 17b of the circuit breaker Sw-dx, it is necessary to act upon the control lever L-dx, for example, manually, by bringing it from the ON position to the OFF position.

[0051] This movement of the control lever L-dx results, by means of the rotatable activation member 17b, in the second control pin 16 being moved from the upper operative position to the lower operative position.

[0052] Particularly, the pin 16 moves through the bent slot 11 and the side portion of the communication opening 9 covering, in the exemplary case, a curvilinear path, for example corresponding to a circumference arc.

[0053] On the basis of what has been described above, it should be understood that, once the control lever L-dx, has been moved to the OFF position, the clockwise rotation of the rocker 12 is no more opposed by the control pin 16.

[0054] Thus, the control lever L-sx can be moved from the OFF position to the ON position by actuating the rotatable activation member 17a of the circuit breaker Sw-sx and, consequently, the control pin 15.

[0055] Particularly, the latter, upon moving through the bent slot 10 and the communication opening 8 side portion, passes from the lower operative position to the upper operative position, thus giving the rocker a clockwise rotation until it reaches to the second angular position (Fig. 2).

[0056] Starting from the latter configuration, in order to bring the control lever L-dx from the OFF position to the ON position, it is necessary to proceed in the reverse manner as that described above.

[0057] Particularly, in this case, in order to allow for the counter-clockwise rotation of the rocker 12, it is necessary to act upon the control lever L-sx of the circuit breaker Sw-sx by bringing it from the ON position to the OFF position. In such manner, in fact, the rotatable activation member 17a is unlocked and, consequently, the

first control pin 15, which passes from the upper operative position to the lower operative position.

[0058] Once such configuration has been achieved, where the control levers L-sx, L-dx of the circuit breakers are both in the OFF position, it is therefore possible to bring the control lever L-dx to the ON position. During such movement, the second control pin 16 moves, particularly, from the lower operative position to the upper operative position while acting in a supporting relationship against the engagement surface 14b of the tooth 13b, so as to give the rocker a counter-clockwise rotation, until it achieves the first angular position (Fig. 1).

[0059] It should be understood that variations and/or additions are contemplated to what has been described and illustrated above.

[0060] According to another embodiment of the invention, the openings 10, 11 which are provided on the side walls 2c, 3b of the outer shells 2, 3 of the circuit breakers Sw-sx, Sw-dx may not be bent slots, but, for example, rectilinear slits.

[0061] According to a further embodiment of the invention, each of the communication openings 8, 9 of the main shell 4 of device 1 may be such as to be extended only on a respective side face of the main shell 4.

[0062] Finally, a molded case multipole electrical circuit breaker Sw-sx is disclosed, including:

- an outer shell 2 comprising a front wall 2a on which a primary control member L-sx is provided which is movable between an activation position ON and a deactivation position OFF of the circuit breaker, a pair of opposite side walls 2b, 2c, an upper side 2d, a lower side 2e, and a rear wall 2f intended to be connected to a support member;
- an opening 10 on at least one of the opposite side walls 2b, 2c of the outer shell 2; and
- a rotatable activation member 17a arranged internally relative to the outer shell 2 and carrying the electrical contacts for the switching of the circuit breaker between a closed state and an open state, where such rotatable activation member includes at least one hole 17c facing the opening 10 provided on at least one of the opposite side walls 2b, 2c of the outer shell 2.

[0063] Particularly, according to an embodiment of the molded case multipole electrical circuit breaker, the opening 10 which is provided on at least one of the opposite side walls 2b, 2c of the outer shell 2 of the circuit breaker can be manufactured under the shape of a bent slot.

[0064] According to a further embodiment of the molded case multipole electrical circuit breaker, this can include at least one centring recess 25c on the respective outer shell 2.

[0065] Finally, according to a further embodiment of the molded case multipole electrical circuit breaker, this can be suitable to be coupled to a device which is different

from the interlock device according to the present invention, such as, for example, an outer residual current protection unit. Such residual current protection unit is put beside a side wall 2b, 2c of the molded case circuit breaker. Particularly, the coupling of the outer residual current protection unit can be accomplished through coupling means that are intended to pass through the opening 10 which is provided on the outer shell 2 of the circuit breaker Sw-sx, so as to cooperate with the hole 17c which is provided on the rotatable activation member 17a. It should be noticed that such coupling means between the circuit breaker and the residual current protection unit can be implemented through a pin completely similar to the control pins 15, 16. In such manner, the residual current protection unit can operate an automatic opening of the multipole circuit breaker by means of such pin, following an intervention of the residual current protection, by directly acting on the rotatable activation member 17a through the pin 15, 16.

[0066] In view of what has been described above, it is therefore possible to understand how an interlock device according to the present invention is such as to solve the above-mentioned drawbacks with reference to the prior art.

[0067] Particularly, the side arrangement of the interlock device and the ability thereof to laterally act with the respective circuit breakers allows avoiding the drawbacks of the "front" and "rear" interlock devices, thus allowing obtaining a kit of parts which is suitable to receive any utility, also a front utility, which is suitable to reduce the thickness dimension inside the electric panel, and which is relatively easy, both from the point of view of the components which are employed and the operation thereof.

[0068] The principle of the invention being understood, the embodiments and implementation details may be widely varied relative to what has been described and illustrated herein by way of non-limiting example only, without thereby departing from the scope of the invention as defined in the annexed claims.

Claims

1. An interlock device (1) to prevent that a first (Sw-sx) and a second (Sw-dx) electrical circuit breakers may be both in a closed state, each of the circuit breakers comprising:

- an outer shell (2, 3); and
 - a primary control member (L-sx, L-dx) being located on a front wall (2a, 3a) of said shell and movable between a deactivation position (OFF) and an activation position (ON) of the circuit breaker;
- the interlock device (1) being intended to be sandwiched between facing side walls (2c, 3b) respectively belonging to the shell of the first

(Sw-sx) and the second (Sw-dx) circuit breakers, and comprising:

- a first (15) and a second (16) secondary control member which are movable between a first and a second operative position, the secondary control members being adapted to be operatively associated respectively to the first (L-sx) and the second (L-dx) primary control member, so that the first and second operative position correspond to said deactivation and activation position of the primary control members, respectively; and

- locking means (12) capable of selectively locking the first and second secondary control member in the first operative position, when the interlock device is sandwiched between the two circuit breakers; whereby

the secondary control members (15, 16) are adapted to be operatively movable through respective openings (10, 11) of said facing side walls (2c, 3b) of the first (Sw-sx) and second (Sw-dx) circuit breakers;

the interlock device (1) being **characterized in that** said locking means comprise a rocker (12) that can rotate about a preset axis between a first and a second angular position which are distinct and predetermined.

2. The interlock device (1) according to claim 1, wherein the rocker (12) includes a first (14a) and a second (14b) engagement surface such that when the rocker (12) is in the first angular position, the first (15) secondary control member and the second (14b) engagement surface are suitable to be in abutment with the first engagement surface (14a) and the second (16) secondary control member, respectively, and when the rocker (12) is in the second angular position, the second (16) secondary control member and the first (14a) engagement surface are suitable to be in abutment with the second (14b) engagement surface and the first (15) secondary control member, respectively.

3. The interlock device (1) according to claim 1 or 2, wherein when the rocker (12) is in the first angular position, the first (15) secondary control member is in the first operative position, while the second (16) secondary control member is movable between the first and second operative positions, and when the rocker (12) is in the second angular position, the second (16) secondary control member is in the first operative position, while the first (15) secondary control member is movable between the first and second operative positions.

4. The interlock device (1) according to claim 2, wherein

- the rocker comprises a first (13a) and a second (13b) tooth which are angularly spaced apart from each other around said preset rotation axis, the first (14a) and the second (14b) engagement surface belonging respectively to said first (13a) and second (13b) tooth of the rocker (12).
- 5 5. The interlock device (1) according to one of claims 1 to 4, wherein said rocker (12) preset rotation axis is horizontal.
 - 10 6. The interlock device (1) according to one of the preceding claims, comprising a main shell (4) including two communication openings (8, 9) through which said first (15) and second (16) secondary control member are respectively operatively movable.
 - 15 7. The interlock device according to the claim 6, wherein the main shell (4) comprises a box-like portion (6) and a front lid (7) which is removably connected to the box-like portion (6), and wherein each of said communication openings (8, 9) extends partially frontally on the front lid (7) and partially on a respective side wall of the main shell (4); the side and front portions of the communication openings (8, 9) being intended respectively to the operative movement and to the connection/disconnection of the secondary control members (15, 16) from the main shell (4).
 - 20 8. The interlock device (1) according to claim 7, wherein the first (15) and the second (16) secondary control members, when are in the first operative position, result to face the front portions of the communication openings (8, 9).
 - 25 9. The interlock device (1) according to any claim 1 to 8, wherein the rocker is adapted to assume an intermediate angular position between the first and second angular positions and wherein the interlock device comprises rocker (12) positioning means (18) which are suitable to cooperate with said rocker in order to bring the rocker to and to maintain the rocker in the intermediate angular position when said secondary control members (15, 16) are in the first operative position.
 - 30 10. The interlock device (1) according to claim 9, wherein said rocker (12) intermediate angular position is centred between the first and second angular positions.
 - 35 11. The interlock device (1) according to claim 9 or 10, when depending on claim 4, wherein said rocker (12) positioning means (18) are suitable to cooperate with said rocker (12) in order to reduce clearances which could be present between the second tooth (13b) and the second secondary control member (16), when the second secondary control member is in the second operative position, and
 - 40 12. The interlock device (1) according to any claim 9 to 11, when depending on claim 4, wherein said positioning means include a spring (18) comprising a first (19) and a second (20) elastic arm which are suitable to be bent under the action of said first (13a) and second (13b) tooth, respectively, so that when the rocker (12) is in the first angular position, the second arm (20) has stored the maximum elastic energy while the first arm (19) is unloaded, and when the rocker (12) is in the second angular position, the first arm (19) has stored the maximum elastic energy while the second arm (19) is unloaded.
 - 45 13. The interlock device (1) according to any preceding claim, comprising centring means (25a, 25b) suitable to cooperate with the first (Sw-sx) and second (Sw-dx) circuit breakers in order to accurately position the interlock device relative to said circuit breakers (Sw-sx, Sw-dx).
 - 50 14. The interlock device (1) according to claim 13, when depending on claim 6, wherein the centring means (25a, 25b) are outwardly projecting tongues relative to the interlock device main shell (4).
 - 55 15. The interlock device (1) according to any preceding claim, wherein said first (15) and second (16) secondary control members are such as to cover a curvilinear path upon moving between said first and second operative positions.
 16. A kit of parts (1, Sw-sx, Sw-dx) including a first electrical circuit breaker (Sw-sx), a second electrical circuit breaker (Sw-dx), and an interlock device (1) according to any preceding claim, adapted to prevent said circuit breakers from being both in a closed state.
 17. The kit of parts (1, Sw-sx, Sw-dx) according to claim 16, wherein the first (Sw-sx) and second (Sw-dx) circuit breakers comprise openings (10, 11) being at least on facing side walls (2c, 3b) of respective outer shells (2, 3); the interlock device (1) being sandwiched between said facing side walls (1), and the first (15) and second (16) secondary control members of the interlock device being operatively movable through said openings (10, 11) of said facing side walls (2c, 3b).
 18. The kit of parts (1, Sw-sx, Sw-dx) according to claim 17, wherein said openings (10, 11) of the facing side walls (2c, 3b) of the circuit breakers (Sw-sx, Sw-dx) outer shells (2,3) are two bent slots.

Patentansprüche

1. Eine Verriegelungsvorrichtung (1) zum Verhindern, dass ein erster (Sw-sx) und ein zweiter (Sw-dx) elektrischer Trennschalter beide in einem geschlossenen Zustand sein können, wobei jeder der Trennschalter folgende Merkmale aufweist:
- eine Außenschale (2, 3); und
 - ein Primärsteuerbauteil (L-sx, L-dx), das sich an einer Frontwand (2a, 3a) der Schale befindet und zwischen einer Deaktivierungsposition (AUS) und einer Aktivierungsposition (AN) des Trennschalters bewegbar ist; wobei die Verriegelungsvorrichtung (1) sandwichartig zwischen einander zugewandten Seitenwänden (2c, 3b), die zu der Schale des ersten (Sw-sx) bzw. zweiten (Sw-dx) Trennschalters gehören, angeordnet sein soll und folgende Merkmale aufweist:
 - ein erstes (15) und ein zweites (16) Sekundärsteuerbauteil, die zwischen einer ersten und einer zweiten Betriebsposition bewegbar sind, wobei die Sekundärsteuerbauteile angepasst sind, um dem ersten (L-sx) bzw. dem zweiten (L-dx) Primärsteuerbauteil wirksam zugeordnet zu sein, so dass die erste und die zweite Betriebsposition der Deaktivierungs- bzw. Aktivierungsposition der Primärsteuerbauteile entsprechen; und
 - eine Sperreinrichtung (12), die in der Lage ist, das erste und das zweite Sekundärsteuerbauteil in der ersten Betriebsposition selektiv zu sperren, wenn die Verriegelungsvorrichtung sandwichartig zwischen den beiden Trennschaltern angeordnet ist; wodurch die Sekundärsteuerbauteile (15, 16) angepasst sind, um durch jeweilige Öffnungen (10, 11) der einander zugewandten Seitenwände (2c, 3b) des ersten (Sw-sx) und zweiten (Sw-dx) Trennschalters wirksam bewegbar zu sein; wobei die Verriegelungsvorrichtung (1) **dadurch gekennzeichnet ist, dass** die Sperreinrichtung ein Schwingelement (12) aufweist, das sich um eine voreingestellte Achse zwischen einer ersten und einer zweiten Winkelposition, die unterschiedlich und vorbestimmt sind, drehen kann.
2. Die Verriegelungsvorrichtung (1) gemäß Anspruch 1, bei der das Schwingelement (12) eine erste (14a) und eine zweite (14b) Ineingriffnahmeoberfläche umfasst, derart, dass:
- wenn das Schwingelement (12) in der ersten Winkelposition ist, das erste (15) Sekundärsteuerbauteil und die zweite (14b) Ineingriffnahmeoberfläche geeignet sind,
- um mit der ersten Ineingriffnahmeoberfläche (14a) bzw. dem zweiten (16) Sekundärsteuerbauteil aneinander zu stoßen, und wenn das Schwingelement (12) in der zweiten Winkelposition ist, das zweite (16) Sekundärsteuerbauteil und die erste (14a) Ineingriffnahmeoberfläche geeignet sind, um mit der zweiten (14b) Ineingriffnahmeoberfläche bzw. dem ersten (15) Sekundärsteuerbauteil aneinander zu stoßen.
3. Die Verriegelungsvorrichtung (1) gemäß Anspruch 1 oder 2, bei der:
- wenn das Schwingelement (12) in der ersten Winkelposition ist, das erste (15) Sekundärsteuerbauteil in der ersten Betriebsposition ist, während das zweite (16) Sekundärsteuerbauteil zwischen der ersten und der zweiten Betriebsposition bewegbar ist, und wenn das Schwingelement (12) in der zweiten Winkelposition ist, das zweite (16) Sekundärsteuerbauteil in der ersten Betriebsposition ist, während das erste (15) Sekundärsteuerbauteil zwischen der ersten und der zweiten Betriebsposition bewegbar ist.
4. Die Verriegelungsvorrichtung (1) gemäß Anspruch 2, bei der das Schwingelement einen ersten (13a) und einen zweiten (13b) Zahn aufweist, die winkelmäßig voneinander um die voreingestellte Drehachse beabstandet sind, wobei die erste (14a) und die zweite (14b) Ineingriffnahmeoberfläche zu dem ersten (13a) bzw. dem zweiten (13b) Zahn des Schwingelements (12) gehören.
5. Die Verriegelungsvorrichtung (1) gemäß einem der Ansprüche 1 bis 4, bei der die voreingestellte Drehachse des Schwingelements (12) horizontal ist.
6. Die Verriegelungsvorrichtung (1) gemäß einem der vorherigen Ansprüche, die eine Hauptschale (4) aufweist, die zwei Kommunikationsöffnungen (8, 9) umfasst, durch die das erste (15) bzw. zweite (16) Sekundärsteuerbauteil wirksam bewegbar sind.
7. Die Verriegelungsvorrichtung gemäß Anspruch 6, bei der die Hauptschale (4) einen kastenartigen Abschnitt (6) und einen Frontdeckel (7), der mit dem kastenartigen Abschnitt (6) entfernbar verbunden ist, aufweist, und bei der jede der Kommunikationsöffnungen (8, 9) sich teilweise frontal auf dem Frontdeckel (7) und teilweise auf einer jeweiligen Seitenwand der Hauptschale (4) erstreckt; wobei die seitlichen und die Frontabschnitte der Kommunikationsöffnungen (8, 9) für die wirksame Bewegung bzw. für die Verbindung/Trennung der Sekundärsteuerbauteile (15, 16) von der Hauptschale (4) beabsich-

tigt sind.

8. Die Verriegelungsvorrichtung (1) gemäß Anspruch 7, bei der das erste (15) und das zweite (16) Sekundärsteuerbauteil, wenn sie in der ersten Betriebsposition sind, schließlich den Frontabschnitten der Kommunikationsöffnungen (8, 9) zugewandt sind.

9. Die Verriegelungsvorrichtung (1) gemäß einem der Ansprüche 1 bis 8, bei der das Schwingelement angepasst ist, um eine Zwischenwinkelposition zwischen der ersten und der zweiten Winkelposition anzunehmen, und wobei die Verriegelungsvorrichtung eine Positionierungseinrichtung (18) für das Schwingelement (12) aufweist, die geeignet ist, um mit dem Schwingelement zusammenzuwirken, um das Schwingelement in die Zwischenwinkelposition zu bringen und das Schwingelement in der Zwischenwinkelposition zu halten, wenn die Sekundärsteuerbauteile (15, 16) in der ersten Betriebsposition sind.

10. Die Verriegelungsvorrichtung (1) gemäß Anspruch 9, bei der die Zwischenwinkelposition des Schwingelements (12) mittig zwischen der ersten und der zweiten Winkelposition ist.

11. Die Verriegelungsvorrichtung (1) gemäß Anspruch 9 oder 10 bei Abhängigkeit von Anspruch 4, bei der die Positionierungseinrichtung (18) für das Schwingelement (12) geeignet ist, um mit dem Schwingelement (12) zusammenzuwirken, um Zwischenräume zu reduzieren, die vorhanden sein könnten:

zwischen dem zweiten Zahn (13b) und dem zweiten Sekundärsteuerbauteil (16), wenn das zweite Sekundärsteuerbauteil in der zweiten Betriebsposition ist, und zwischen dem ersten Zahn (13a) und dem ersten Sekundärsteuerbauteil (15), wenn das erste Sekundärsteuerbauteil (15) in der zweiten Betriebsposition ist.

12. Die Verriegelungsvorrichtung (1) gemäß einem der Ansprüche 9 bis 11 bei Abhängigkeit von Anspruch 4, bei der die Positionierungseinrichtung eine Feder (18) umfasst, die einen ersten (19) und einen zweiten (20) elastischen Arm aufweist, die geeignet sind, um unter der Wirkung des ersten (13a) bzw. zweiten (13b) Zahns gebogen zu werden, so dass:

wenn das Schwingelement (12) in der ersten Winkelposition ist, der zweite Arm (20) die maximale elastische Energie gespeichert hat, während der erste Arm (19) entlastet ist, und wenn das Schwingelement (12) in der zweiten Winkelposition ist, der erste Arm (19) die maximale elastische Energie gespeichert hat, während der zweite Arm (19) entlastet ist.

13. Die Verriegelungsvorrichtung (1) gemäß einem der vorherigen Ansprüche, die Zentriereinrichtungen (25a, 25b) aufweist, die geeignet sind, um mit dem ersten (Sw-sx) und zweiten (Sw-dx) Trennschalter zusammenzuwirken, um die Verriegelungsvorrichtung relativ zu den Trennschaltern (Sw-sx, Sw-dx) genau zu positionieren.

14. Die Verriegelungsvorrichtung (1) gemäß Anspruch 13 bei Abhängigkeit von Anspruch 6, bei der die Zentriereinrichtungen (25a, 25b) sich nach außen erstreckende Zungen relativ zu der Hauptschale (4) der Verriegelungsvorrichtung sind.

15. Die Verriegelungsvorrichtung (1) gemäß einem der vorherigen Ansprüche, bei der das erste (15) und das zweite (16) Sekundärsteuerbauteil derartig sind, um auf ein Bewegen zwischen der ersten und der zweiten Betriebsposition hin einen krummlinigen Weg abzudecken.

16. Ein Satz Teile (1, Sw-sx, Sw-dx), der einen ersten elektrischen Trennschalter (Sw-sx), einen zweiten elektrischen Trennschalter (Sw-dx) und eine Verriegelungsvorrichtung (1) gemäß einem der vorherigen Ansprüche, angepasst, um zu verhindern, dass die Trennschalter beide in einem geschlossenen Zustand sind, umfasst.

17. Der Satz Teile (1, Sw-sx, Sw-dx) gemäß Anspruch 16, bei dem der erste (Sw-sx) und der zweite (Sw-dx) Trennschalter Öffnungen (10, 11) aufweisen, die sich zumindest auf einander zugewandten Seitenwänden (2c, 3b) jeweiliger Außenschalen (2, 3) befinden; die Verriegelungsvorrichtung (1) sandwichartig zwischen den einander zugewandten Seitenwänden (1) angeordnet ist, und das erste (15) und zweite (16) Sekundärsteuerbauteil der Verriegelungsvorrichtung durch die Öffnungen (10, 11) der einander zugewandten Seitenwände (2c, 3b) wirksam bewegbar sind.

18. Der Satz Teile (1, Sw-sx, Sw-dx) gemäß Anspruch 17, bei dem die Öffnungen (10, 11) der einander zugewandten Seitenwände (2c, 3b) der Außenschalen (2, 3) der Trennschalter (Sw-sx, Sw-dx) zwei gebogene Schlitz sind.

50 Revendications

1. Dispositif de verrouillage (1) destiné à empêcher que des premier (Sw - sx) et deuxième (Sw - dx) disjoncteurs électriques puissent se trouver tous deux dans un état fermé, chacun des disjoncteurs comprenant :

- une coque extérieure (2, 3) ; et
- un élément de commande primaire (L - sx, L -

dx) situé sur une paroi avant (2a, 3a) de ladite coque et mobile entre une position de désactivation (OFF) et une position d'activation (ON) du disjoncteur ;

le dispositif de verrouillage (1) étant destiné à être pris en sandwich entre des parois latérales qui se font face (2c, 3b) qui appartiennent respectivement à la coque des premier (Sw - sx) et deuxième (Sw - dx) disjoncteurs électriques, et comprenant :

- des premier (15) et deuxième (16) éléments de commande secondaires qui sont mobiles entre des première et deuxième positions opérationnelles, les éléments de commande secondaires étant adaptés de façon à être associés de manière opérationnelle respectivement aux premier (L - sx) et deuxième (L - dx) éléments de commande primaires, de telle sorte que les première et deuxième positions opérationnelles correspondent auxdites positions de désactivation et d'activation des éléments de commande primaires, respectivement ; et

- des moyens de verrouillage (12) capables de verrouiller de manière sélective les premier et deuxième éléments de commande secondaires dans la première position opérationnelle, lorsque le dispositif de verrouillage est pris en sandwich entre les deux disjoncteurs ; grâce à quoi :

les éléments de commande secondaires (15, 16) sont adaptés de façon à être mobiles de manière opérationnelle à travers des ouvertures respectives (10, 11) desdites parois latérales qui se font face (2c, 3b) des premier (Sw - sx) et deuxième (Sw - dx) disjoncteurs ;

le dispositif de verrouillage (1) étant **caractérisé en ce que** lesdits moyens de verrouillage comprennent un culbuteur (12) qui peut tourner autour d'un axe préréglé entre des première et deuxième positions angulaires qui sont distinctes et prédéterminées.

2. Dispositif de verrouillage (1) selon la revendication 1, dans lequel le culbuteur (12) comprend des première (14a) et deuxième (14b) surfaces de mise en prise telles que :

lorsque le culbuteur (12) se trouve dans la première position angulaire, le premier élément de commande secondaire (15) et la deuxième surface de mise en prise (14b) sont adaptés pour venir en butée avec la première surface de mise en prise (14a) et le deuxième élément de commande secondaire (16), respectivement ; et lorsque le culbuteur (12) se trouve dans la deuxième position angulaire, le deuxième élément de commande secondaire (16) et la pre-

mière surface de mise en prise (14a) sont adaptés pour venir en butée avec la deuxième surface de mise en prise (14b) et le premier élément de commande secondaire (15), respectivement.

3. Dispositif de verrouillage (1) selon la revendication 1 ou la revendication 2, dans lequel :

lorsque le culbuteur (12) se trouve dans la première position angulaire, le premier élément de commande secondaire (15) se trouve dans la première position opérationnelle, tandis que le deuxième élément de commande secondaire (16) est mobile entre les première et deuxième positions opérationnelles ; et

lorsque le culbuteur (12) se trouve dans la deuxième position angulaire, le deuxième élément de commande secondaire (16) se trouve dans la première position opérationnelle, tandis que le premier élément de commande secondaire (15) est mobile entre les première et deuxième positions opérationnelles.

4. Dispositif de verrouillage (1) selon la revendication 2, dans lequel le culbuteur comprend des première (13a) et deuxième (13b) dents qui sont espacées de manière angulaire indépendamment l'une de l'autre autour dudit axe de rotation préréglé, les première (14a) et deuxième (14b) surfaces de mise en prise appartenant respectivement auxdites première (13a) et deuxième (13b) dents du culbuteur (12).

5. Dispositif de verrouillage (1) selon l'une quelconque des revendications 1 à 4, dans lequel ledit axe de rotation préréglé du culbuteur (12) est horizontal.

6. Dispositif de verrouillage (1) selon l'une quelconque des revendications précédentes, comprenant une coque principale (4) qui comprend deux ouvertures de communication (8, 9) à travers lesquelles lesdits premier (15) et deuxième (16) éléments de commande secondaires sont respectivement mobiles de manière opérationnelle.

7. Dispositif de verrouillage selon la revendication 6, dans lequel la coque principale (4) comprend une partie en forme de boîte (6) et un couvercle avant (7) qui est relié de manière amovible à la partie en forme de boîte (6), et dans lequel chacune desdites ouvertures de communication (8, 9) s'étend en partie de face sur le couvercle avant (7) et en partie sur une paroi latérale respective de la coque principale (4) ; les parties latérales et avant des ouvertures de communication (8, 9) étant destinées respectivement au déplacement opérationnel et à la connexion / déconnexion des éléments de commande secondaires (15, 16) de la coque principale (4).

8. Dispositif de verrouillage (1) selon la revendication 7, dans lequel les premier (15) et deuxième (16) éléments de commande secondaires, quand ils se trouvent dans la première position opérationnelle, font face aux parties avant des ouvertures de communication (8, 9).
9. Dispositif de verrouillage (1) selon l'une quelconque des revendications 1 à 8, dans lequel le culbuteur est adapté de manière à prendre une position angulaire intermédiaire entre les première et deuxième positions angulaires et dans lequel le dispositif de verrouillage comprend des moyens de positionnement (18) de culbuteur (12) qui sont appropriés pour coopérer avec ledit culbuteur afin d'amener le culbuteur dans la position angulaire intermédiaire et de l'y maintenir, lorsque lesdits éléments de commande secondaires (15, 16) se trouvent dans la première position opérationnelle.
10. Dispositif de verrouillage (1) selon la revendication 9, dans lequel la position angulaire intermédiaire dudit culbuteur (12) est centrée entre les première et deuxième positions angulaires.
11. Dispositif de verrouillage (1) selon la revendication 9 ou la revendication 10, quand elle dépend de la revendication 4, dans lequel les moyens de positionnement (18) dudit culbuteur (12) sont appropriés pour coopérer avec ledit culbuteur (12) de façon à réduire les jeux qui pourraient être présents :
- entre la deuxième dent (13b) et le deuxième élément de commande secondaire (16), lorsque le deuxième élément de commande secondaire (16) se trouve dans la deuxième position opérationnelle ; et
- entre la première dent (13a) et le premier élément de commande secondaire (15), lorsque le premier élément de commande secondaire (15) se trouve dans la deuxième position opérationnelle.
12. Dispositif de verrouillage (1) selon l'une quelconque des revendications 9 à 11, quand elle dépend de la revendication 4, dans lequel lesdits moyens de positionnement comprennent un ressort (18) qui comprend des premier (19) et deuxième (20) bras élastiques qui sont appropriés pour être pliés sous l'action desdites première (13a) et deuxième (13b) dents, respectivement, de telle sorte que :
- lorsque le culbuteur (12) se trouve dans la première position angulaire, le deuxième bras (20) ait stocké l'énergie élastique maximum tandis que le premier bras (19) soit déchargé ; et
- lorsque le culbuteur (12) se trouve dans la deuxième position angulaire, le premier bras (19) ait stocké l'énergie élastique maximum tandis que le deuxième bras (20) soit déchargé.
13. Dispositif de verrouillage (1) selon l'une quelconque des revendications précédentes, comprenant des moyens de centrage (25a, 25b) appropriés de manière à coopérer avec les premier (Sw - sx) et deuxième (Sw - dx) disjoncteurs de façon à positionner de manière précise le dispositif de verrouillage par rapport auxdits disjoncteurs (Sw - sx, Sw - dx).
14. Dispositif de verrouillage (1) selon la revendication 13, quand elle dépend de la revendication 6, dans lequel les moyens de centrage (25a, 25b) sont des languettes qui font saillie vers l'extérieur par rapport à la coque principale (4) du dispositif de verrouillage.
15. Dispositif de verrouillage (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits premier (15) et deuxième (16) éléments de commande secondaires sont tels qu'ils couvrent un chemin curviligne lors d'un déplacement entre lesdites première et deuxième positions opérationnelles.
16. Ensemble de pièces (1, Sw - sx, Sw - dx) comprenant un premier disjoncteur électrique (Sw - sx), un deuxième disjoncteur électrique (Sw - dx), et un dispositif de verrouillage (1) selon l'une quelconque des revendications précédentes, adapté de manière à empêcher que lesdits disjoncteurs puissent se trouver tous deux dans un état fermé.
17. Ensemble de pièces (1, Sw - sx, Sw - dx) selon la revendication 16, dans lequel les premier (Sw - sx) et deuxième (Sw - dx) disjoncteurs comprennent des ouvertures (10, 11) qui se trouvent au moins sur les parois latérales qui se font face (2c, 3b) des coques extérieures respectives (2, 3) ; le dispositif de verrouillage (1) étant pris en sandwich entre lesdites parois latérales qui se font face (1), et les premier (15) et deuxième (16) éléments de commande secondaires du dispositif de verrouillage étant mobiles de manière fonctionnelle à travers lesdites ouvertures (10, 11) desdites parois latérales qui se font face (2c, 3b).
18. Ensemble de pièces (1, Sw - sx, Sw - dx) selon la revendication 17, dans lequel lesdites ouvertures (10, 11) des parois latérales qui se font face (2c, 3b) des coques extérieures (2, 3) des disjoncteurs (Sw - sx, Sw - dx) sont deux fentes fléchies.

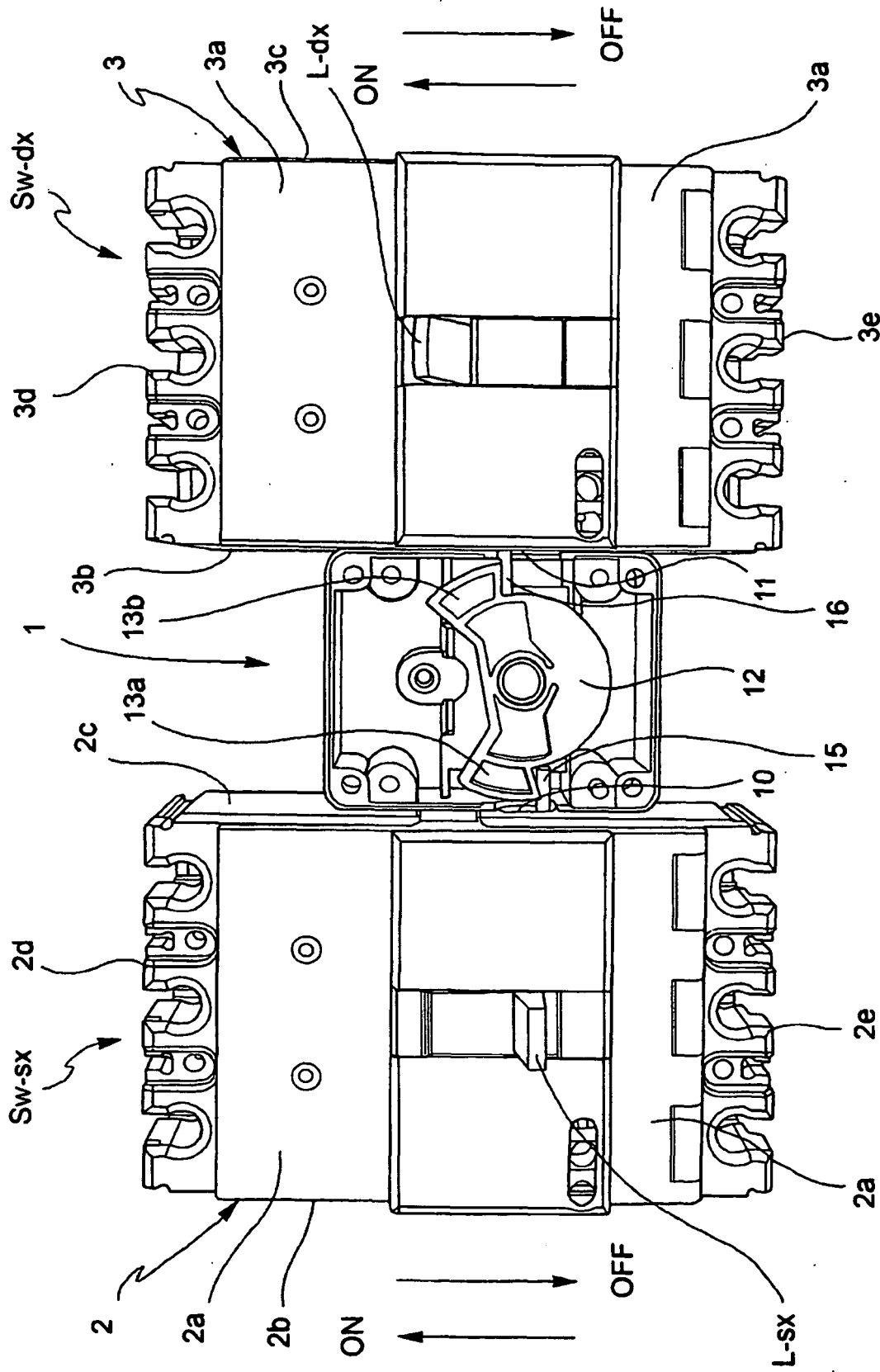


FIG. 1

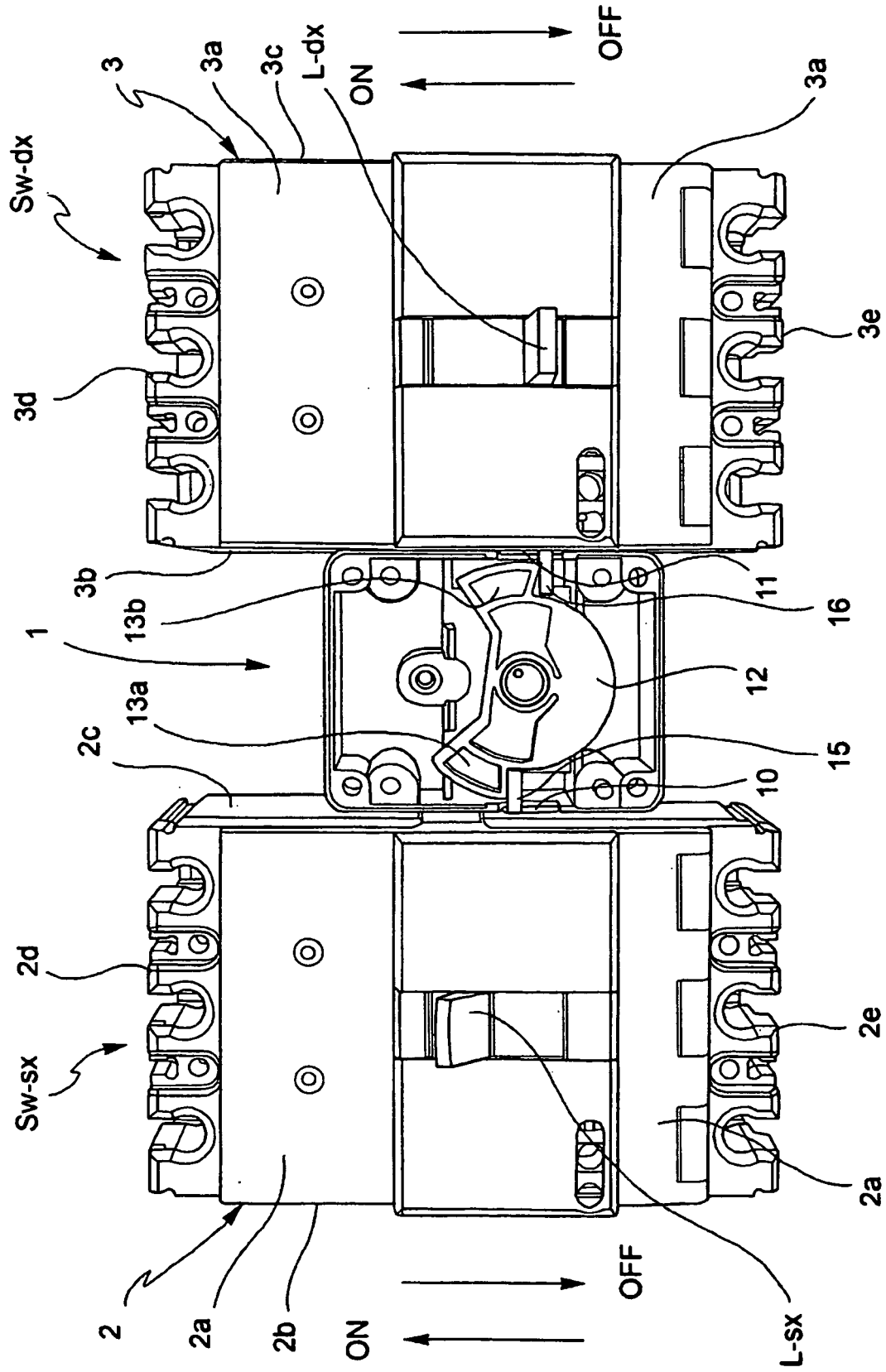


FIG. 2

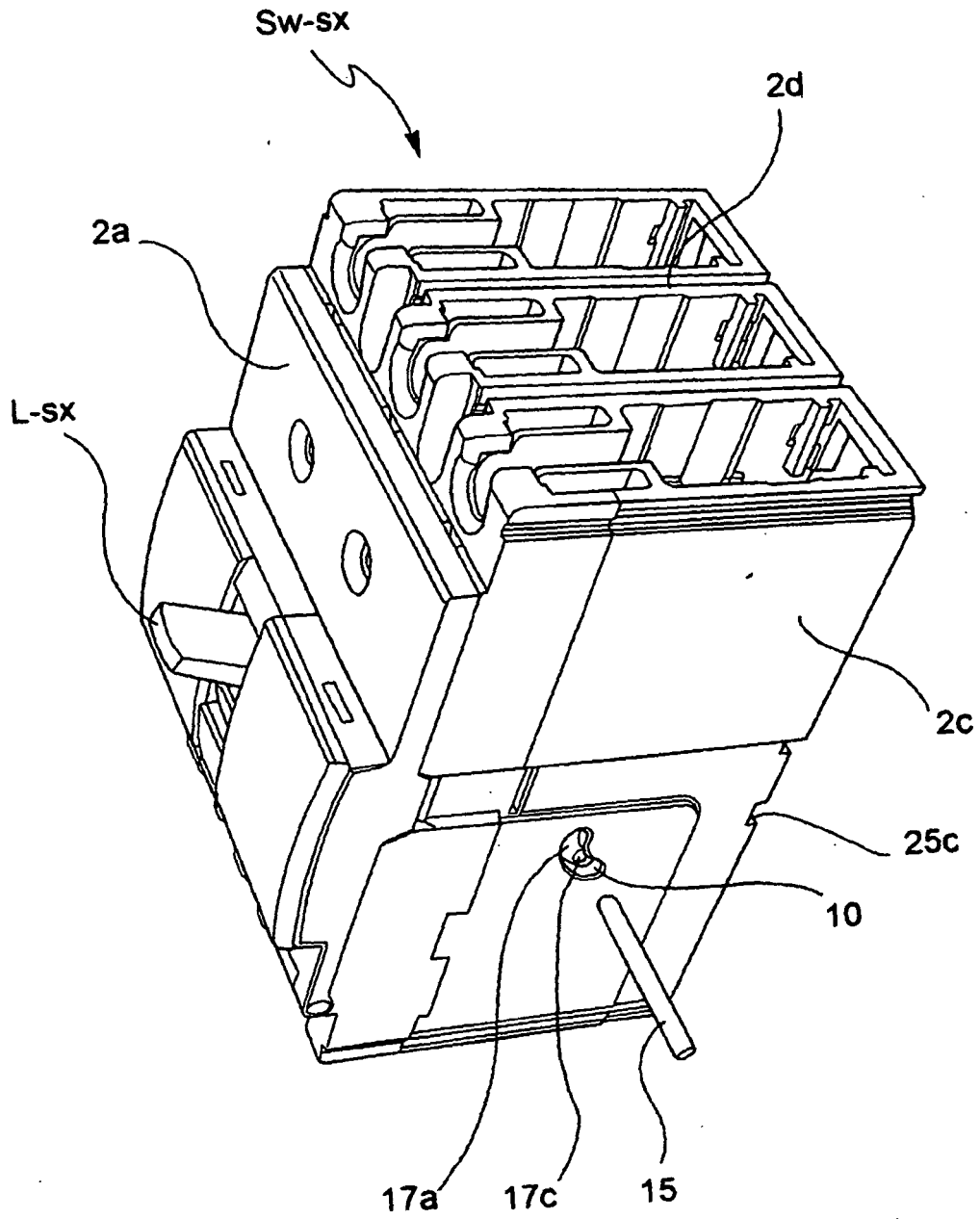


FIG. 3

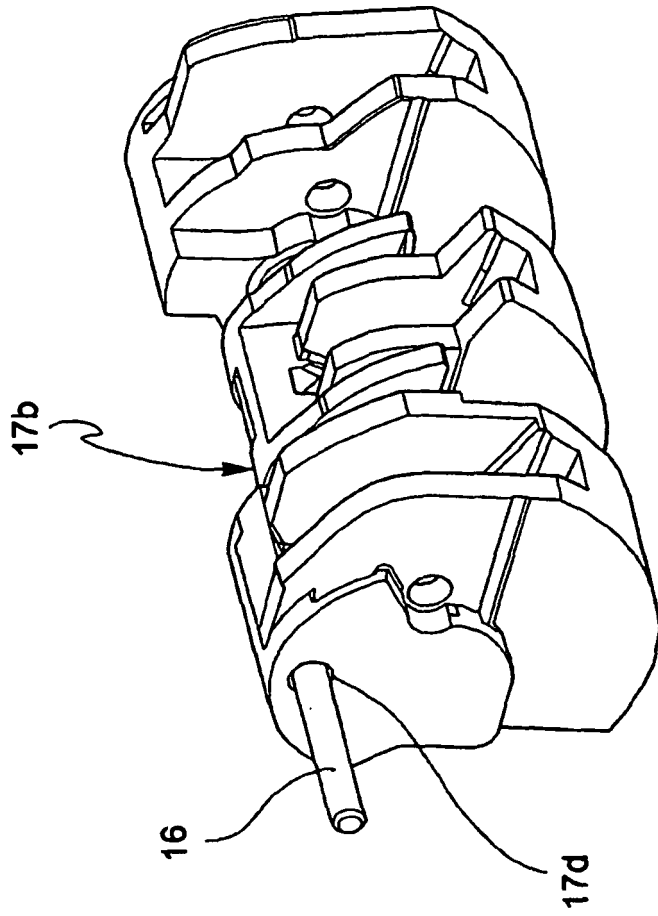


FIG. 4

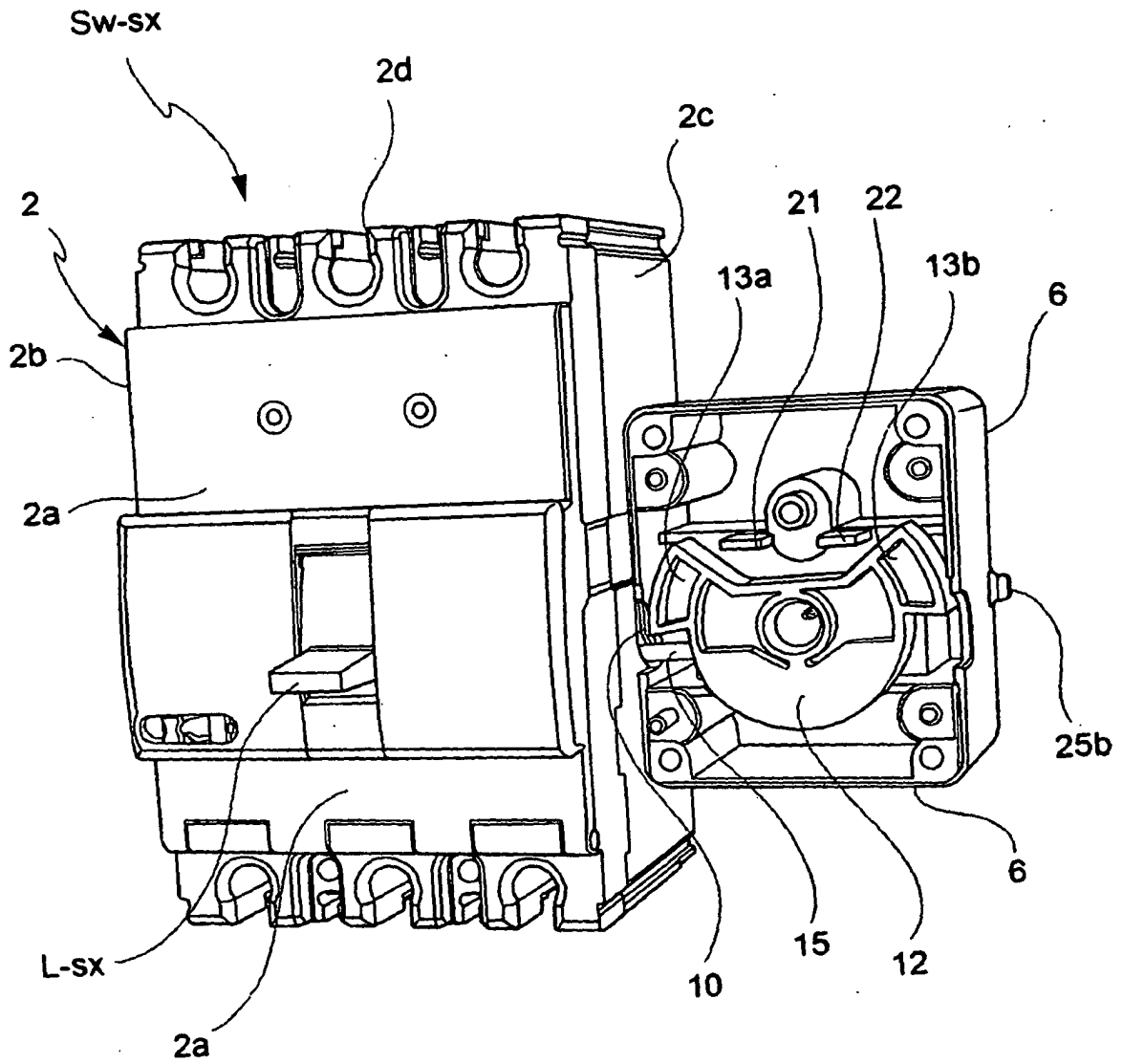


FIG. 5

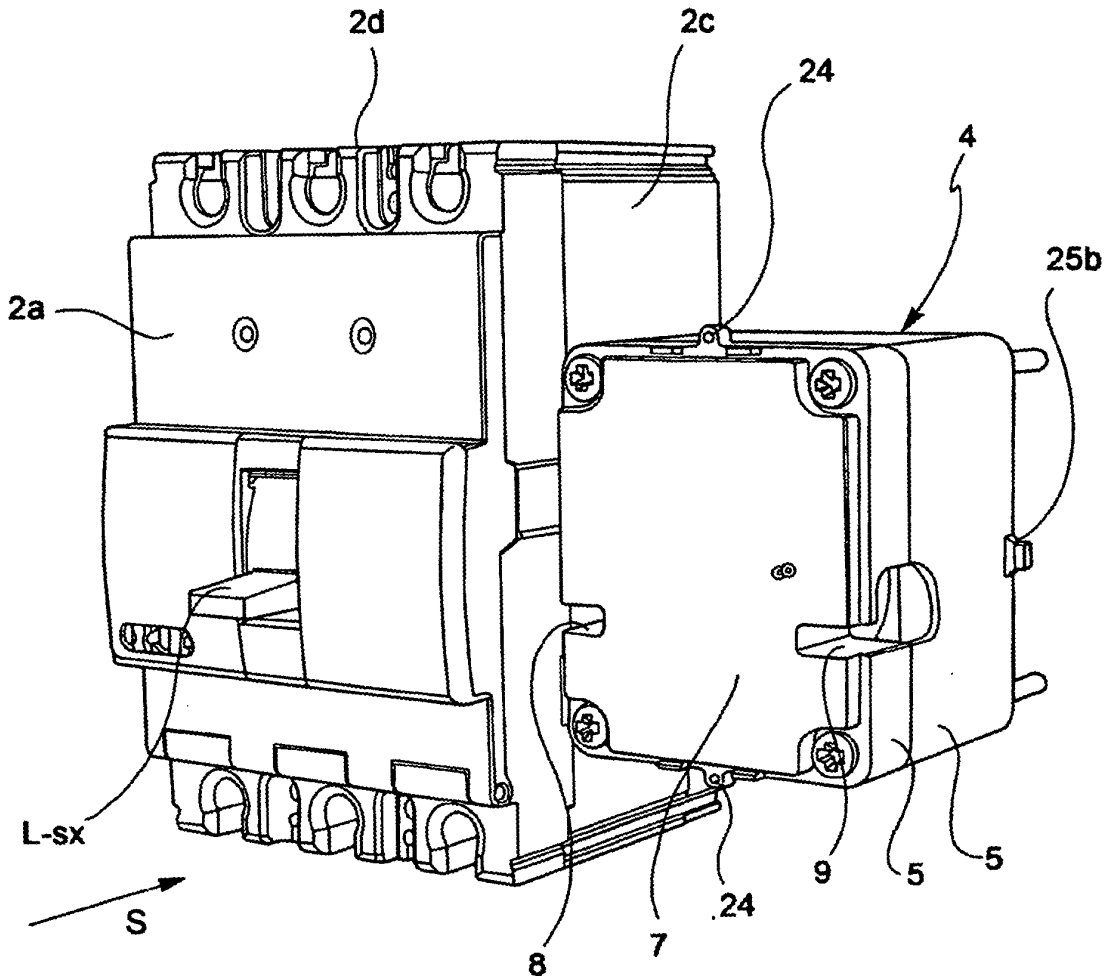


FIG. 6

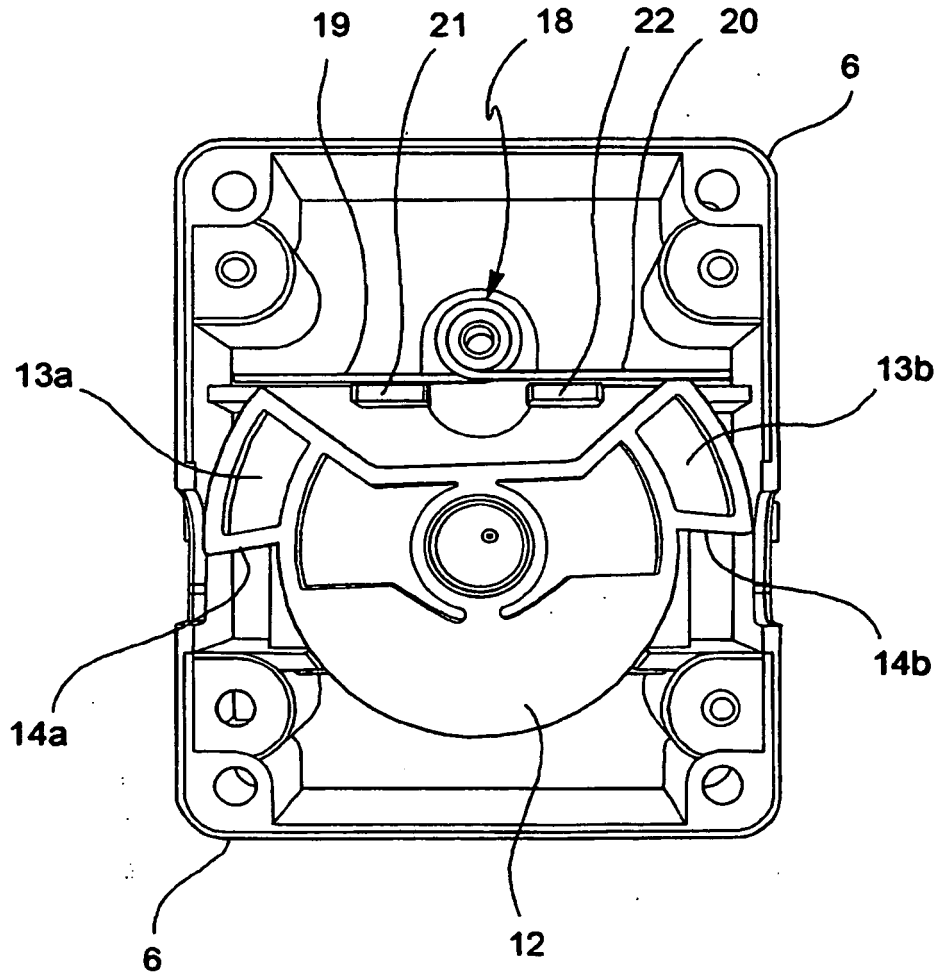


FIG. 7

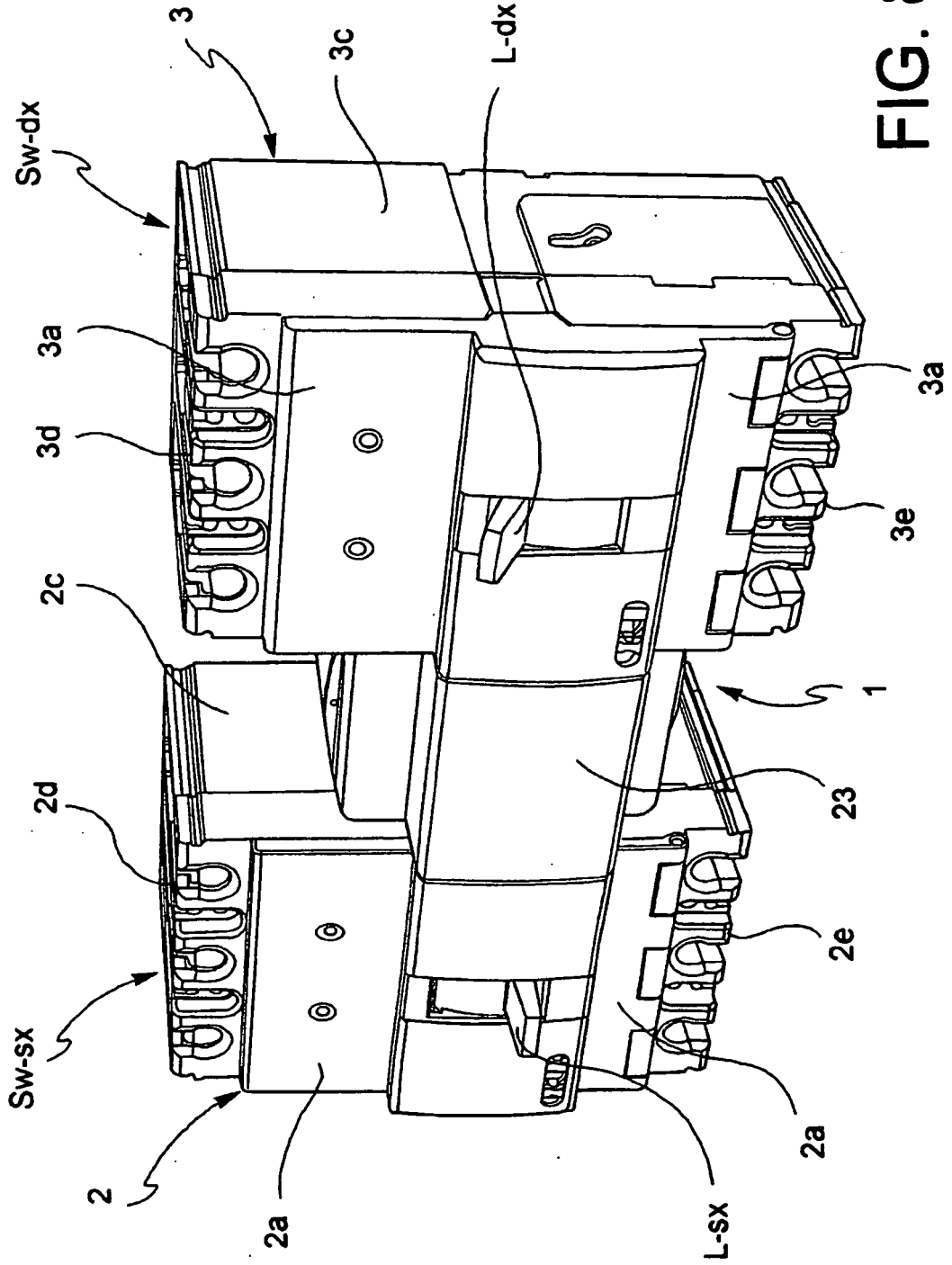


FIG. 8

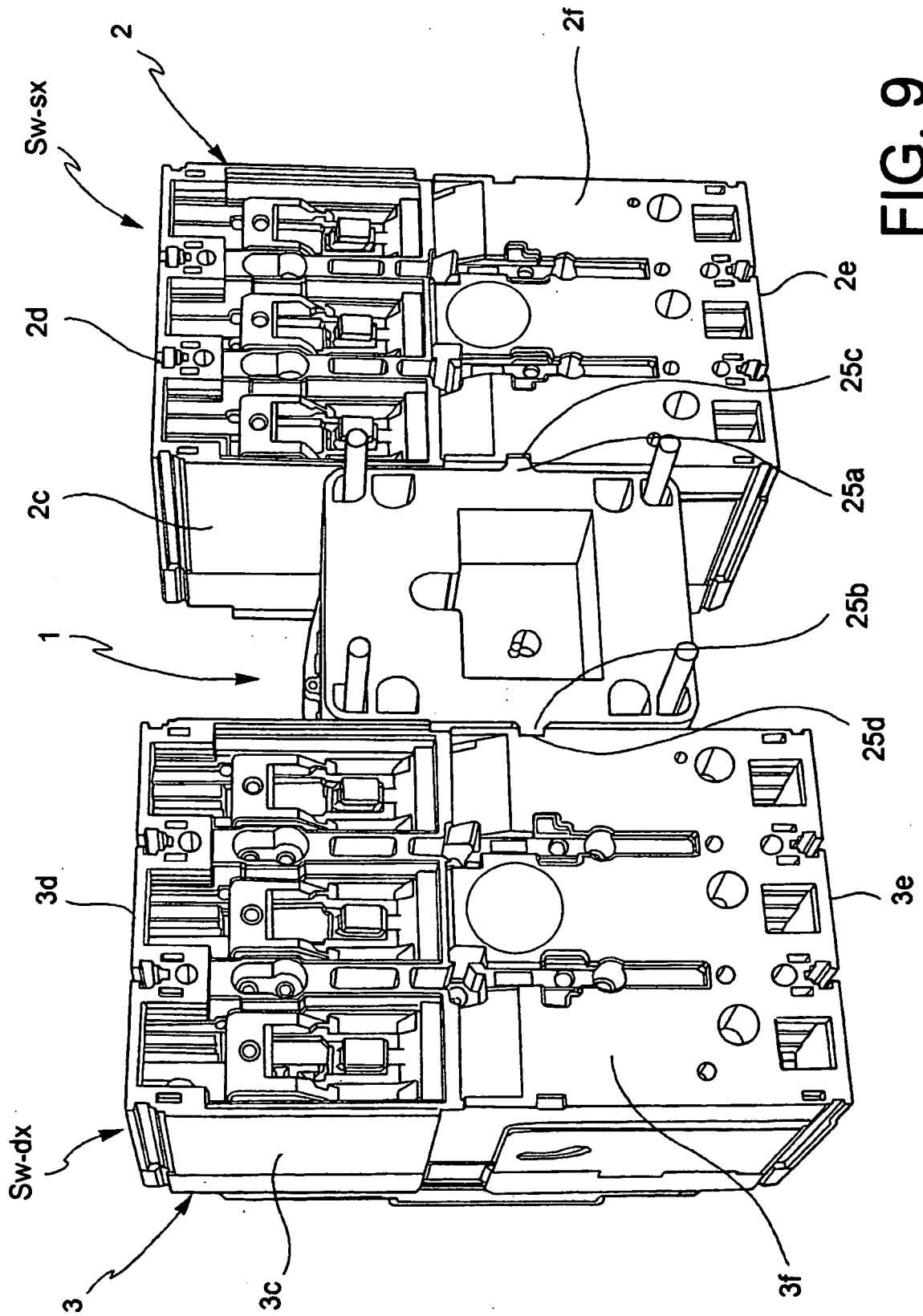


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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