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(54) **Interlocking device for electrical apparatuses and interlocking group including said device**

(57) An interlocking device (10) for interlocking a first and a second electrical apparatus (Sw_dx, Sw_sx) is described, said electrical apparatuses (Sw_dx, Sw_sx) respectively including a first and a second manoeuvring element (L_dx, L_sx) independently movable between a first and a second operating position (OFF, ON), and said device (10) comprising:

- a support body (20) adapted to be operatively interposed between the first and the second electrical apparatus (Sw_dx, Sw_sx); and

- a covering shell (30) coupled to the support body (20) and movable with respect to the support body (20) to alternatively assume a first and a second operating configuration.

The interlocking device is characterised in that the covering shell (30) is slidably mounted to the support body (20) to translate along a sliding direction (X) so that in the first and second operating configuration it is adapted to cover the first and the second manoeuvring element (L_dx, L_sx), respectively.

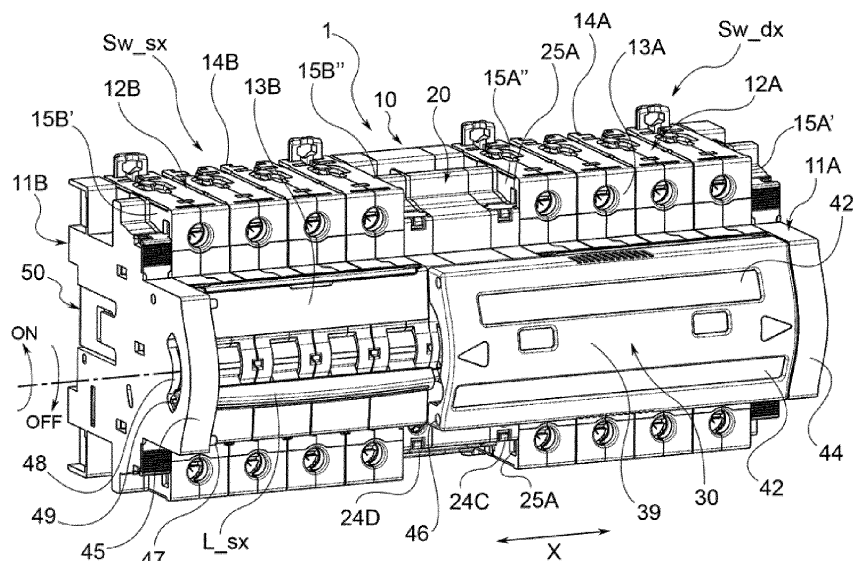


FIG. 1

Description

[0001] The present description concerns the technical field of electrical apparatuses and, more particularly, it concerns an interlocking device as defined in the preamble of claim 1.

[0002] In the technical field of electrical apparatuses it is known to use interlocking devices that can be operatively associated with a plurality of electrical apparatuses for interlocking the apparatuses themselves.

[0003] For example it is known to interlock electrical circuit breakers, for example to prevent the undesired simultaneous connection of a load to two electric power sources intended to operate in a mutually exclusive manner (like, for example, a primary power source and an auxiliary power source).

[0004] An interlocking device of the type discussed above is described for example in the patent application published with number EP 1916682.

[0005] The interlocking device described in such a patent application comprises a pair of inhibition levers that are suitable for being rigidly coupled with respective manoeuvring elements of the electrical apparatuses to be interlocked. The manoeuvring elements of the electrical apparatuses are independently movable between a first and a second operating position of the manoeuvring elements. The inhibition levers are independently movable between a first and a second operating position of the manoeuvring levers. Through a lock element slidably mounted between a first and a second locking position, the inhibition levers can be alternatively and selectively locked in one of the aforementioned operating positions. In such a way the manoeuvring element of the apparatus which is coupled with the locked inhibition lever, is in turn locked in a predetermined operating position of the manoeuvring element.

[0006] In an interlocking device of the type described above, if the locked manoeuvring element were, for example by mistake, forced to assume the other operating position, the corresponding inhibition lever could break making the interlocking device useless and making the device operate in vain. It should be noted, in particular, that in the case in which the electrical apparatuses to be interlocked are electrical circuit breakers, a possible damaging of the interlocking device could lead to serious risks for the people and/or for the electrical systems to which the electrical circuit breakers are connected.

[0007] One particular purpose of the present description, is that of providing an interlocking device that is particularly effective in preventing possible accidental breaking of the interlocking device due to forcing of the manoeuvring elements of the electrical apparatuses to be interlocked.

[0008] One general purpose of the present invention, is that of providing an alternative interlocking device with respect to interlocking devices of the prior art discussed above.

[0009] These and other purposes are achieved with

an interlocking device as defined in the attached claim 1 in a general embodiment and in the dependent claims in some particular embodiments.

[0010] Another object of the present invention is an interlocking group as defined in any one of claims 11 to 15.

[0011] The invention shall become clearer from the following detailed description of its embodiments, given as an example and therefore in no way to limit in relation to the attached drawings, in which:

- figure 1 is a perspective view of a group of parts comprising an interlocking device for electrical apparatuses according to one currently preferred embodiment, in which the group of parts is represented in a first operating configuration;
- figure 2 is a perspective view of the group of parts of figure 1, in which the group of parts is represented in a second operating configuration;
- figure 3 is a perspective view of the group of parts of figure 1, in which the group of parts is represented in a third operating configuration;
- figure 4 is a perspective view of an enlarged detail of the group of parts of figure 3, in which the enlarged detail is seen from a different angle with respect to such a figure;
- figure 5 is a partially exploded perspective view of the group of parts of figure 2;
- figure 6 is a perspective view of the interlocking device of figure 1, in which the interlocking device is represented in an operating configuration corresponding to the configuration of figure 2;
- figure 7 is a side plan view of the interlocking device of figure 6, in which the interlocking device is represented in an operating configuration corresponding to the configuration of figure 3;
- figure 8 is a perspective view of the interlocking device of figure 6 in which one component has been removed;
- figure 9 is an exploded perspective view of the component of the interlocking device that was removed in figure 8; and
- figure 10 is an exploded perspective view from a different angle of the component of figure 9.

[0012] In the attached figures same or similar elements are indicated with the same reference numerals.

[0013] With reference to figures 1-3, a group of parts, or interlocking group 1, has been generally indicated with reference numeral 1, comprising an interlocking device 10 according to a currently preferred embodiment and a first and a second auxiliary body 11A, 11B. The group 1 is coupled with a first and a second electrical apparatus Sw_dx, Sw_sx.

[0014] According to one embodiment, the electrical apparatuses Sw_dx, Sw_sx each comprise a respective apparatus body 12A, 12B preferably having a box-shaped body. The apparatus bodies 12A, 12B each com-

prise a front wall 13A, 13B, a back wall 14A, 14B opposite to the front wall 13A, 13B, and a pair of side walls opposite to each other 15A', 15A" and 15B', 15B". Each pair of side walls 15A', 15A" and 15B', 15B" is joined and arranged substantially perpendicular to the front wall 13A, 13B and to the back wall 14A, 14B of the respective apparatus body 12A, 12B.

[0015] According to one embodiment, on the front walls 13A, 13B, the apparatus bodies 12A, 12B are respectively provided with a first and a second manoeuvring element L_dx, L_sx, or first and second manoeuvring lever L_dx, L_sx. Each manoeuvring lever L_dx, L_sx is independently mobile between a first and a second operating position OFF, ON. In figures 1 and 3, the first lever L_sx is represented respectively in the first operating position OFF and in the second operating position ON. In figure 2, the second lever L_dx is represented in the first operating position OFF.

[0016] In the example, the electrical apparatuses Sw_dx, Sw_sx are, not for limiting purposes, two modular electrical circuit breakers Sw_dx, Sw_sx, more particularly two tetrapolar circuit breakers. In the case being used as an example, in which the electrical apparatuses Sw_dx, Sw_sx are electrical circuit breakers, the operative positions OFF and ON are respectively associated to an open state and a closed state of such circuit breakers.

[0017] As it is known, the interlocking device 10 has the function of interlocking the electrical apparatuses Sw_dx, Sw_sx. For example, the device 10 is suitable for interlocking the electrical circuit breakers Sw_dx, Sw_sx, so as to prevent an undesired simultaneous connection of a load to two electric power sources intended to operate in a mutually exclusive manner (such as, for example, a primary and an auxiliary power source). According to one embodiment, the device 10 is in particular an interlocking device of the mechanical type, suitable, that is, for mechanically interfering with the manoeuvring levers L_dx, L_sx for interlocking the circuit breakers Sw_dx, Sw_sx. Preferably, the interlocking device 10 is a modular device.

[0018] In figure 6, the device 10 is represented by itself, that is to say without the other components of the group 1 and without the circuit breakers Sw_dx, Sw_sx. As can be observed in such a figure, the device 10 comprises a support body 20. According to one advantageous embodiment, the support body 20 is a box-shaped body. Preferably such a box-shaped body comprises a front wall 21, a back wall 22 opposite to the front wall 21, and a pair of side walls opposite to each other 23A, 23B joined to the front and back walls 21, 22. It should also be noted that the fact of providing a box-shaped body, advantageously makes it possible to integrate auxiliary functions in the interlocking device. For example, the support body 20 can be provided on the inside with an indicating device that is suitable for indicating the electrical state of the electrical circuit breakers Sw_dx, Sw_sx. For this reason, with reference to figure 8, in the example the support

body 20 is equipped with a pair of device levers 21A, 21B each independently movable between a first and a second lever position. The levers 21A and 21B are for example associated to an indicating device of the aforementioned type and can be rigidly coupled each with a respective lever L_dx and L_sx so as to rotate as a unit with such levers. According to further embodiments, the levers 21A, 21B could however also not be foreseen.

[0019] As can be observed in figures 1-3, the support body 20 is adapted to be operatively interposed between the circuit breakers Sw_dx, Sw_sx. In the example, the support body 20 is interposed between the pair of walls 15A", 15B", respectively of the circuit breaker Sw_dx and of the circuit breaker Sw_sx.

[0020] According to an advantageous embodiment, the support body 20 comprises a plurality of box-shaped bodies, or box-shaped body modules, coupled to each other. For this, in the example, the support body 20 is formed in particular by three box-shaped body modules 20A, 20B, 20C. Even more in particular, in the example the body 20 is formed by a central body module 20C and by two side body modules 20A, 20B coupled with the central module 20C. Preferably, if provided, the aforementioned levers 21A, 21B, are provided on the two modules 20A, 20B. As can be observed in the figures, according to a preferred embodiment, at least the modules 20A, 20B are substantially the same as one another. According to a preferred embodiment the modules 20A, 20B, 20C are coupled to each other in a substantially irremovable manner, for example by riveting such modules to one another. According to an economically advantageous embodiment, the module 20C has a respective open side facing towards one of the modules 20A, 20B. For example, the module 20C may not be provided with one of the respective side walls (not visible in the figures) facing the modules 20A, 20B. This advantageously makes it possible to obtain the module 20C through moulding using a single mould.

[0021] According to one embodiment, the device 10 can be coupled with the circuit breakers Sw_dx, Sw_sx in a substantially irremovable manner. For such a purpose, hooks 24A, 24B (figure 6) of a *per se* known type can be provided at the sides of the support body 20. The hooks 24A, 24B are adapted to be inserted in respective hooking openings 25A, 25B (some of such openings are visible in figures 1 and 5) provided respectively on the side walls 15A", 15B" of the electrical circuit breakers. In particular, when the device 10 is coupled with the circuit breakers Sw_dx, Sw_sx, the side walls 15A", 15B" respectively face the side walls 23A, 23B of the support body 20. In the example, for decoupling the interlocking device 10 from the circuit breakers Sw_dx, Sw_sx, it is necessary to remove, through a tool, such as for example a screwdriver, front portions 24C, 24D of the body 20 (fig. 8). In such a way it is possible to access the hooks 24A, 24B so as to remove them from the device 10.

[0022] Going back to figures 1-3, the device 10 comprises a covering shell 30. The shell 30 is coupled to the

support body 20 and is movable with respect to the support body so as to alternatively assume a first operating configuration (figure 1) and a second operating configuration (figure 2). More in particular, the covering shell 30 is slidably mounted on the support body 20 so as to translate along a sliding direction X. The shell 30 is suitable for translating along the direction X so that in the first and in the second operating configuration it is suitable for respectively covering the lever L_{dx} (figure 1) and the lever L_{sx} (figure 2). The covering shell 30, has the main function of substantially preventing manual access to the manoeuvring lever L_{dx} or L_{sx} that is covered by such a shell. In other words, the shell 30 is suitable for alternatively coupling a considerable portion of the front walls 13A, 13B of the circuit breakers Sw_{dx}, Sw_{sx} so as to prevent frontally accessing the manoeuvring lever L_{dx}, or L_{sx} that is covered by the covering shell.

[0023] With reference to figures 9-10, according to one advantageous embodiment that makes it possible to make the device 10 in a particularly economically advantageous manner, the covering shell 30 comprises a first shell 30A, or relatively inner shell 30A, and a second shell 30B, or relatively outer shell 30B, which is coupled to the first shell. In particular, as shall become clearer later on, the outer shell 30B is mounted overlapped to the inner shell so as to keep the covering shell 30 and the support body 20 coupled to each other.

[0024] The outer shell is suitable for defining a cavity 31 (fig. 10) inside which the inner shell is received. Preferably, the outer shell is essentially counter-shaped with respect to the inner shell.

[0025] Preferably, the inner and outer shells are fixed to one another in a substantially irremovable manner, for example through gluing or in other ways that are suitable for allowing a stable fixing between the shells. Alternatively, according to a less preferred embodiment, the inner and outer shells could be coupled to each other also in a removable manner by providing suitable means for coupling between the two shells available to a man skilled in the art.

[0026] As can be observed in figure 10, the inner shell 30A is equipped with inhibition elements 32, preferably formed by inhibition tabs 32. Such tabs are arranged on one side of the inner shell intended to operatively face the support body 20. The inhibition tabs 32, in the example three inhibition tabs 32, are suitable for mechanically interfering in abutment against the manoeuvring lever L_{dx} or L_{sx} which is covered by the covering shell 30. In general, the tabs 32 have the purpose of preventing the manoeuvring lever L_{dx} or L_{sx} which is covered by the shell 30 from taking up the second operating position ON. According to one embodiment, the tabs 32 are suitable for maintaining the lever L_{dx} or L_{sx} which is covered by the shell 30 in the position OFF, or substantially in the position OFF, to keep the respective circuit breaker Sw_{dx} or Sw_{sx} in the open state.

[0027] According to one embodiment, the inner shell 30A comprises first abutment elements 33 that are suit-

able for alternatively cooperating with the lever L_{sx} and with the lever L_{dx} in the second operating position ON so as to keep the shell 30 respectively in the first (figure 1) and in the second (figure 2) operating configuration. The first abutment elements 33 preferably comprise a pair of abutment walls 33 opposite to each other which substantially extend perpendicular with respect to the sliding direction X. Preferably, the abutment walls 33 can also have an inhibiting function analogous to that of the inhibition tabs 32.

[0028] According to one embodiment, the inner shell 30A is equipped with first coupling elements 34 that are suitable for cooperating with second coupling elements 35 (fig. 8) which are provided on the support body 20 to slidably couple the covering shell 30 to the support body. According to one preferred embodiment, the second coupling elements 35 are provided on the modules 20A and 20B. As can be observed in figure 10, the first coupling elements 34 preferably comprise a pair of coupling channels 34 that are provided on two opposite edges of the inner shell. The second coupling elements preferably comprise a plurality of coupling tongues 35 (fig. 8), having, in the example, a substantially "L"-shaped profile, which are intended to be inserted in the channels 34. During the movement of the shell 30 between the first and the second operating configuration, the tongues 35 slidably pass through an open side 36 of the channels 34 (fig. 10) having a mainly longitudinal extension.

[0029] The outer shell 30B is adapted to be fitted and fixed to the inner shell so as to keep the channels 34 and the tongues 35 coupled to each other. For such a purpose, the outer shell is preferably provided with second abutment elements 37 that are adapted to alternatively mechanically interfere in abutment against the tongues 35. According to one embodiment, the second abutment elements 37 comprise a pair of abutment side walls 37 opposite to each other suitable for mechanically interfering in abutment against the tongues 35 so as to prevent the tongues 35 from becoming decoupled from the channels 34 during the sliding of the shell 30. In particular, the walls 37 are suitable for preventing the tongues 35 from coming out from the channels 34 through the side openings 38 (figure 10) arranged at opposite ends of the channels 34. The abutment walls 37 are joined and extend crosswise with respect to a front wall 39 of the outer shell. The abutment walls 37, advantageously act also as end stop elements suitable for cooperating with the tongues 35 to stop the sliding of the shell 30 respectively at the first and second operating configuration.

[0030] Preferably, the outer shell comprises further side walls 41 (fig. 10) interposed between the abutment walls 37, which are suitable for covering the open sides 36 of the channels 34.

[0031] According to a preferred embodiment, the inner and outer shells comprise respective shell portions 42, 43 (figure 9) made from transparent material. The transparent portions 42, 43 are arranged mutually facing one another so as to allow visual access to the circuit breakers

Sw_{sx}, Sw_{dx} through the covering shell 30. Preferably the outer shell comprises at least one window 42, and more preferably a plurality of windows 42, provided on the respective front wall 39.

[0032] The inner shell preferably comprises at least one respective front wall 43, facing the windows 42, which is entirely made from transparent material. According to one embodiment even a single portion of the wall 43 can be made from transparent material. Alternatively, according to a currently preferred embodiment, the entire inner shell can be made with a transparent material. It should be observed, moreover, that according to one embodiment, the windows 42 can also be formed by through openings, instead of by portions of the outer shell made with a transparent material. Advantageously, the fact of providing a portion of the inner shell made of transparent material and a facing window provided on the outer shell, also made from transparent material or as a through opening, makes it possible to always have access to important information relative to the circuit breakers Sw_{dx}, Sw_{sx}, like for example the rating data of the circuit breakers and/or the operative state of the latter, without requiring having to move the shell 30.

[0033] Returning now to figure 1, according to one embodiment, the first and the second auxiliary body 11A, 11B are removably coupled respectively to the side walls 15A', 15B' of the circuit breakers Sw_{dx}, Sw_{sx} so that the interlocking device 10 and the circuit breakers Sw_{sx}, Sw_{dx} are interposed between the auxiliary bodies 11A, 11B.

[0034] According to one embodiment, in addition or as an alternative with respect to what has been described previously or to what will be described later, the first 11A and the second 11B auxiliary body comprise respective body portions 44, 45 frontally projecting beyond the front walls 13A, 13B of the circuit breakers Sw_{sx}, Sw_{dx}. The projecting portions 44, 45 are suitable for alternatively interfering in abutment against the covering shell 30 when such a shell assumes the first and the second operating configuration (fig.1, fig. 2), respectively. For such a purpose, it should be observed that in the case in which the auxiliary bodies comprise the projecting portions 44, 45, it is preferable, but not strictly necessary, to provide also end stop elements between the support body 20 and the shell 30 to stop the sliding of such a shell in the first and second operating configuration, respectively.

[0035] According to one embodiment, in order to ensure a greater safety and reliability of the group 1, first and second connecting elements 46, 47 can be provided on the shell 30 and on the projecting portions 44, 45, respectively. Preferably, the first connecting elements comprise two pairs of holes 46 provided on the outer shell whereas the second connecting elements comprise two pairs of pins 47 provided on the projecting portions 44, 45 of the auxiliary bodies. In particular the pins 47 are suitable for engaging inside the holes 46 so as to provide an end support to the shell 30 at the first and second

operating configuration so as to minimise possible tilting of the shell 30 in a direction that is substantially perpendicular with respect to the sliding direction X.

[0036] According to one preferred embodiment, at least one of the auxiliary bodies 11A, 11B, in the example the body 11B, is provided with interconnection elements 49 for coupling an accessory device, such as for example an auxiliary indicating device or a device for releasing the circuit breaker of the *per se* known type (not represented), with one of the circuit breakers Sw_{sx}, Sw_{dx}. Preferably, such interconnection elements comprise an auxiliary lever 49 which is mobile through a slot 48 provided on one of the auxiliary bodies 11A, 11B. In the example, the auxiliary lever 49 is suitable for being rigidly connected to the lever L_{sx} and to an accessory device of such a circuit breaker, respectively.

[0037] According to one advantageous embodiment, in addition or as an alternative to what has previously been described or to what shall later be described, the group 1 comprises a containment band 50, or containment bar 50. Preferably, such a containment band is formed by a strip of sheet metal that is folded so as to have a substantially "C"-shaped profile. The band 50 is removably coupled to the first and to the second auxiliary body 11A, 11B. More in particular the band 50 is suitable for embracing the auxiliary bodies 11A, 11B, the circuit breakers Sw_{sx}, Sw_{dx} and the interlocking device 10 so as to form a substantially single block group together with the circuit breakers Sw_{sx}, Sw_{dx}. This advantageously makes it possible to reduce the risk of dangerous manoeuvres, for people or for the plants, being carried out, for example during subsequent mounting/demounting operations of the group 1 coupled with the circuit breakers Sw_{dx}, Sw_{sx}, for example inside an electric panel in which such circuit breakers can be installed. Indeed, in order to disassemble the group 1, it is necessary to intentionally release the band 50 from the auxiliary bodies 11A, 11B. Consequently, thanks to the band 50, the risk of an accidental disassembling of the group 1 from the circuit breakers Sw_{sx}, Sw_{dx} is significantly reduced.

[0038] Now that we have described the structure of the interlocking device 10 and of the group 1, we shall now describe how the device 10 and the group 1 operate with reference to the embodiment illustrated in the figures.

[0039] Let us initially consider the group 1 with the shell 30 in the first operating configuration (fig. 1). In such a configuration the lever L_{dx} is covered by the shell 30 and cannot therefore be accessed from the front side of the circuit breaker Sw_{dx}. Moreover, the pins 47 of the auxiliary body 11A are inserted in the holes 46 of the shell 30. In the configuration of figure 1 the lever L_{dx} cannot assume the ON position since it is maintained in the OFF position, or substantially in the OFF position, through the inhibition tabs 32. The lever L_{sx}, which is not covered by the shell 30, is on the other hand freely mobile between the ON and OFF positions. Since in figure 1 the lever L_{sx} is in the OFF position, the covering

shell 30 can be made to slide along the direction X, for example manually, until it assumes the second operating configuration (fig. 2). Vice versa, with reference to the configuration of figure 3, in which the shell 30 is in the first operating configuration but the lever L_{sx} is in the ON position, it is not possible to make the shell 30 slide along the direction X. Indeed, in such a configuration the lever L_{sx} is suitable for mechanically interfering in abutment against one of the abutment walls 33. For such a purpose, it should in particular be observed that in the example, as can be noted more clearly in figure 4, in which an enlarged detail of the configuration of figure 3 is represented, the lever L_{sx} indirectly interferes in abutment against the wall 33 through the lever 21B.

[0040] As far as the second operating configuration of the shell 30 illustrated in figure 2 is concerned, such a configuration substantially corresponds to that of figure 1, with the difference that the pins 47 of the auxiliary body 11B are inserted in the holes 46 of the shell 30 and that the lever L_{sx} is the lever covered by the shell 30, whereas the lever L_{dx} is freely mobile between the positions OFF and ON. In order to keep the description brief, the configuration of figure 2 shall not be described in detail. In any case it should be observed, that if from the configuration of figure 2 the lever L_{dx} were to assume the ON position, the sliding of the shell 30 along the direction X would be prevented in an analogous manner as what was discussed above with reference to figure 3.

[0041] It is obvious that numerous modifications and/or variants can be made with respect to what has been described above purely as a non limiting example.

[0042] For example from what has been discussed above according to one embodiment, the shell 30 may also be made as a single shell, for example made in a single piece, instead of being a shell formed by two shells coupled to each other.

[0043] According to further embodiments (not shown in the figures), the support body 20 can comprise a number of box-shaped bodies, or body modules, different from three. For such a purpose it is worth observing for example that the interlocking device 10 can be made with a shell 30 that is shorter in the sliding direction X, for example for interlocking electrical apparatuses that are shorter in such a direction, such as bipolar circuit breakers. In such a case the support body 20 is preferably formed only by two body modules 20A, 20B directly coupled with one another, whereas the body module 20C is eliminated. Alternatively, according to one less preferred embodiment, the support body 20 could also however be formed by a single box-shaped body.

[0044] According to one embodiment (not illustrated in the figures), in the case in which the levers 21A, 21B are not provided, the first abutment elements mentioned above could be made, instead of by the walls 33, directly by the walls 37 of the outer shell. For such a purpose the walls 37 could be suitably shaped, for example by increasing the respective surface extension towards the front wall 21 of the body 20, so as to be able to directly

mechanically interfere in abutment alternatively with the manoeuvring levers L_{dx}, L_{sx} of the circuit breakers Sw_{dx}, Sw_{sx}. In this case, according to one embodiment, the walls 37 would therefore be suitable both for mechanically interfering in abutment against the manoeuvring levers on the side outside the shell 30 and for mechanically interfering in abutment against the coupling tongues 35 from the inner side of the shell 30. In other words, in this case the walls 37 would simultaneously carry out both the function of the first abutment elements and the function of the second abutment elements.

[0045] Based upon what has been described above, it is thus possible to understand how an interlocking device according to the present description makes it possible to achieve the purposes mentioned above.

[0046] The fact of providing a covering shell that is slidably mounted to a support body and that is suitable for alternatively covering the manoeuvring elements of the electrical apparatuses advantageously makes it possible to substantially prevent access to the manoeuvring element which is each time covered by the shell. In such a way it is thus possible to avoid forcing the manoeuvring element that is covered by the shell. An interlocking device according to the present description thus has a relatively simple structure, while at the same time making it possible to interlock, in a particularly safe and reliable manner, the electrical apparatuses to be interlocked.

[0047] It should moreover be observed that an interlocking device according to claim 2 can be made in a particularly cost-effective manner through moulding, since it makes it possible for example to make the support body by simplifying the structure of the relative moulds. Moreover, an interlocking device according to such an embodiment has a structure that is particularly versatile. Indeed, as discussed above, for example, it is possible to simply make both a support body, formed with three box-shaped modules coupled with one another for using the interlocking device with modular tetrapolar circuit breakers and a support body formed by two box-shaped modules coupled to each other for the use of the interlocking device with modular bipolar circuit breakers.

It is also worth observing that, as discussed above, also an interlocking device according to one of claims 6 to 8 makes it possible to obtain the shell 30 with a geometry that is relatively simple in relation to the process of injection moulding. Moreover, an interlocking device according to such embodiments, facilitates the assembly of the interlocking device simplifying the coupling of the shell 30 to the support body 20. Again, an interlocking device according to such embodiments, is particularly reliable with respect to possible accidental damage of the interlocking device thanks to the fact that the first and the second coupling elements between the shell and the support body are always protected inside the shell 30.

It should also be observed that, as discussed above, an interlocking group according to claim 14 is particularly effective in reducing the risk of carrying out potentially dangerous manoeuvres for people and/or systems, for

example during subsequent assembly/disassembly operations in an electric panel.

[0048] Without affecting the principles of the invention, the embodiments and the details can be widely varied with respect to what has been described and illustrated purely as a non-limiting example, without for this reason departing from the scope of the invention as defined in the attached claims.

Claims

1. Interlocking device (10) for interlocking a first and a second electrical apparatus (Sw_dx, Sw_sx), said electrical apparatuses (Sw_dx, Sw_sx) respectively including a first and a second manoeuvring element (L_dx, L_sx) independently movable between a first and a second operating position (OFF, ON), and said device (10) comprising:
 - a support body (20) adapted to be operatively interposed between the first and the second electrical apparatus (Sw_dx, Sw_sx); and
 - a covering shell (30) coupled to the support body (20) and movable with respect to the support body (20) to alternatively assume a first and a second operating configuration,

characterised in that the covering shell (30) is slidably mounted to the support body (20) to translate along a sliding direction (X) so that in the first and second operating configurations is adapted to cover the first and the second manoeuvring element (L_dx, L_sx), respectively.
2. Interlocking device (10) according to claim 1, wherein the support body (20) is a box-shaped body comprising a plurality of box-shaped body modules (20A, 20B, 20C) coupled to each other.
3. Interlocking device (10) according to claim 1 or 2, wherein the covering shell (30) comprises inhibition elements (32) adapted to mechanically interfere in abutment against the manoeuvring element (L_dx, L_sx) which is covered by said shell (30) so as to prevent said covered manoeuvring element (L_dx, L_sx) from assuming the second operating position (ON).
4. Interlocking device (10) according to claim 3, wherein the first and the second electrical apparatuses (Sw_dx, Sw_sx) are a first and a second electrical circuit breaker (Sw_dx, Sw_sx) and wherein said first and second operating position (OFF, ON) are respectively associated to an open state and to a close state of said circuit breakers, the inhibition elements (32) being adapted to maintain said covered manoeuvring element (L_dx, L_sx) substantially in the first operating position to keep the respective electrical circuit breaker (Sw_dx, Sw_sx) in the open state.
5. Interlocking device (10) according to any one of the previous claims, wherein the covering shell (30) comprises first abutment elements (33) suitable for cooperating, directly or indirectly, alternatively with the second (L_sx) and the first (L_dx) manoeuvring element in the second operating position (ON) to keep the covering shell (30) in the first and in the second operating configuration, respectively.
6. Interlocking device (10) according to any one of the previous claims, wherein the covering shell (30) comprises a first shell (30A) and a second shell (30B) coupled to each other, the second shell (30B) being mounted overlapped to the first shell (30A) to keep the covering shell (30) and the support body (20) coupled to each other.
7. Interlocking device (10) according to claim 6, wherein the covering shell (30) comprises first coupling elements (34) and the support body (20) comprises second coupling elements (35) suitable for cooperating with the first coupling elements (34) to slidably couple the covering shell (30) to the support body (20), said first shell (30A) comprising the first coupling elements (34) and said second shell (30B) comprising second abutment elements (37) adapted to mechanically interfere in abutment against the second coupling elements (35) for keeping said first and second coupling elements (34, 35) coupled to each other.
8. Interlocking device (10) according to claim 7, wherein said second abutment elements (37) are stop elements suitable for cooperating with said second coupling elements (35) to stop the sliding of the covering shell (30) at said first and second operating configuration.
9. Interlocking device (10) according to any one of claims from 6 to 8, wherein the first shell (30A) comprises a respective portion made of transparent material (43) and wherein the second shell (30B) comprises a through opening (42) or a respective portion made of transparent material (42), said transparent portion (42) or said through opening (42) of the second shell (30B) facing said transparent portion (43) of the first shell (30A) to allow to visibly access said electrical apparatuses (Sw_dx, Sw_sx) through the covering shell (30).
10. Interlocking device (10) according to any one of the previous claims, wherein said device (10) is a modular device.
11. Interlocking group (1) comprising an interlocking de-

vice (10) as defined in any one of the previous claims, a first auxiliary body (11A) and a second auxiliary body (11B), said first and second electrical apparatus (Sw_dx, Sw_sx) each comprising an apparatus body (12A, 12B) including a front wall (13A, 13B) on which the respective manoeuvring element (L_dx, L_sx) is provided, a back wall (14A, 14B) opposite to the front wall (13A, 13B), and a pair of side walls opposite to each other (15A', 15A'', 15B', 15B''), the support body (20) of the interlocking device (10) being interposed between a pair of said side walls (15A', 15B'') respectively of the first and the second electrical apparatuses (Sw_dx, Sw_sx), and the first and the second auxiliary bodies (11A, 11B) being each removably coupled to one of said side walls (15A', 15B') respectively of the first and second electrical apparatuses (Sw_dx, Sw_sx) so that the interlocking device (10) and said electrical apparatuses (Sw_dx, Sw_sx) are interposed between said auxiliary bodies (11A, 11B) .

12. Interlocking group (1) according to claim 11, wherein said first and second auxiliary body (11A, 11B) comprise respective body portions (44, 45) frontally projecting beyond the front walls of said electrical apparatuses (Sw_dx, Sw_sx), said projecting portions (44, 45) being suitable for alternatively interfering in abutment against the covering shell (30) when said covering shell (30) respectively assumes the first and the second operating configuration.
13. Interlocking group (1) according to claim 12, wherein the covering shell (30) comprises first connecting elements (46) and said projecting portions (44, 45) comprise second connecting elements (47), the first and the second connecting elements (46, 47) being suitable for mutually cooperating to provide an end support to the covering shell (30) at the first and second operating configuration.
14. Interlocking group (1) according to any one of claims 11 to 13, comprising a containment band (50) removably coupled to the first and second auxiliary bodies (11A, 11B), the containment band (50) embracing said auxiliary bodies (11A, 11B), said electrical apparatuses (Sw_dx, Sw_sx) and the interlocking device (10) so as to form a substantially single block group.
15. Interlocking group (1), according to any one of claims 11 to 14, wherein at least one of said first and second auxiliary bodies (11A, 11B) comprises interconnecting elements (48, 49) for coupling an accessory device to one of said electrical apparatuses (Sw_dx, Sw_sx).

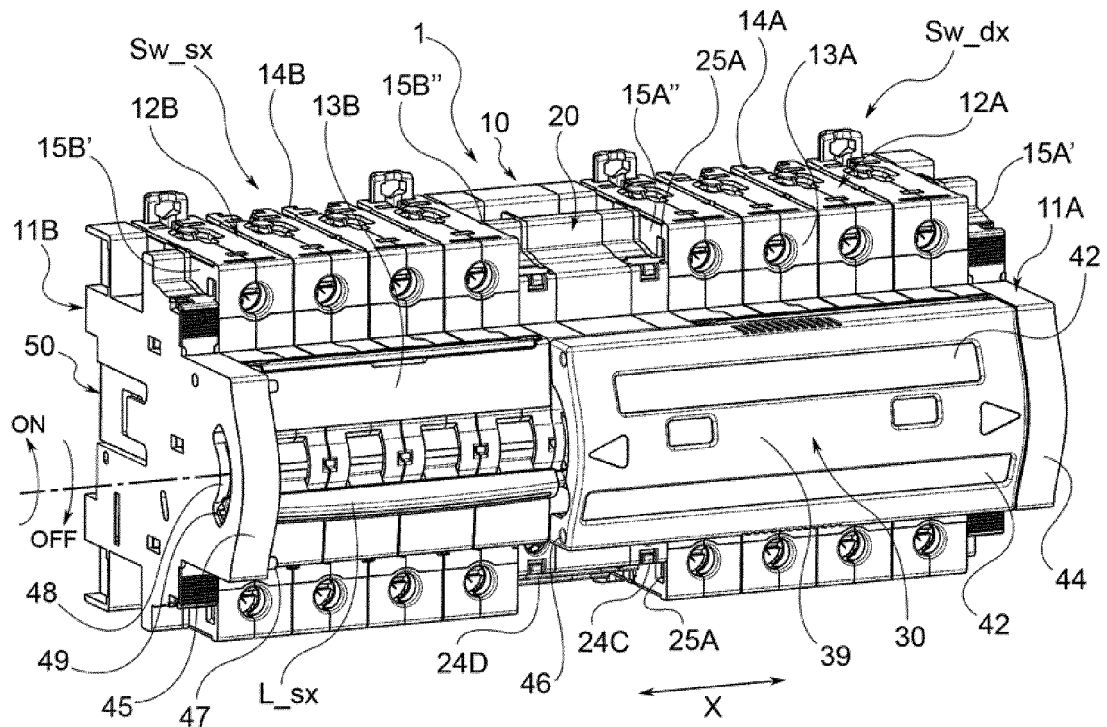


FIG. 1

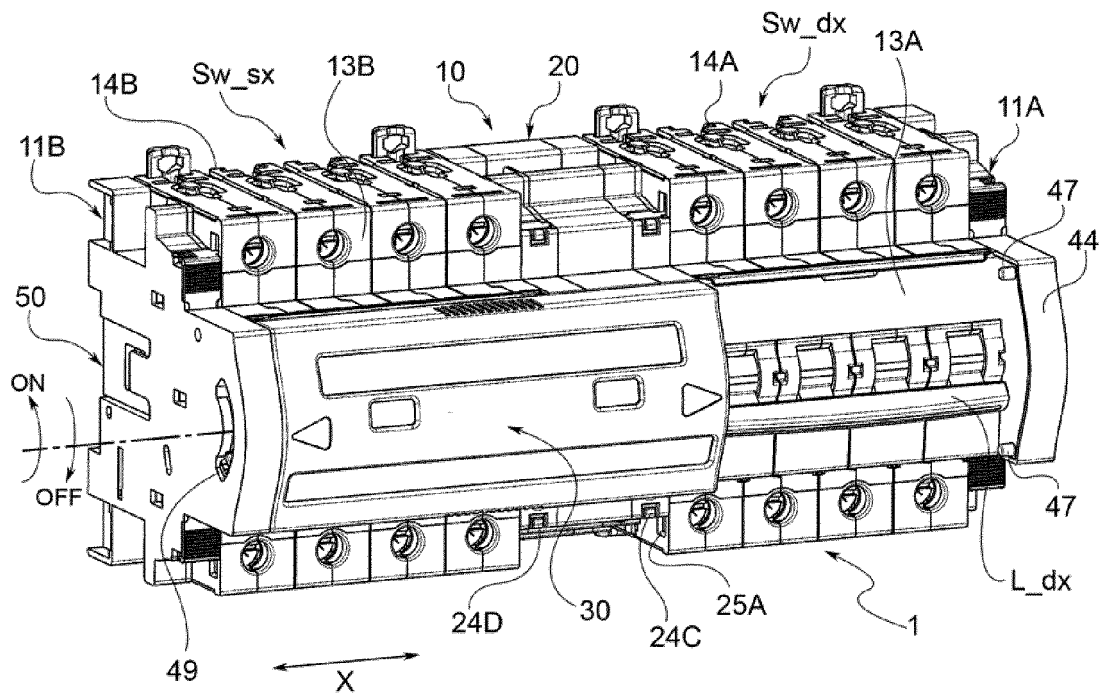


FIG. 2

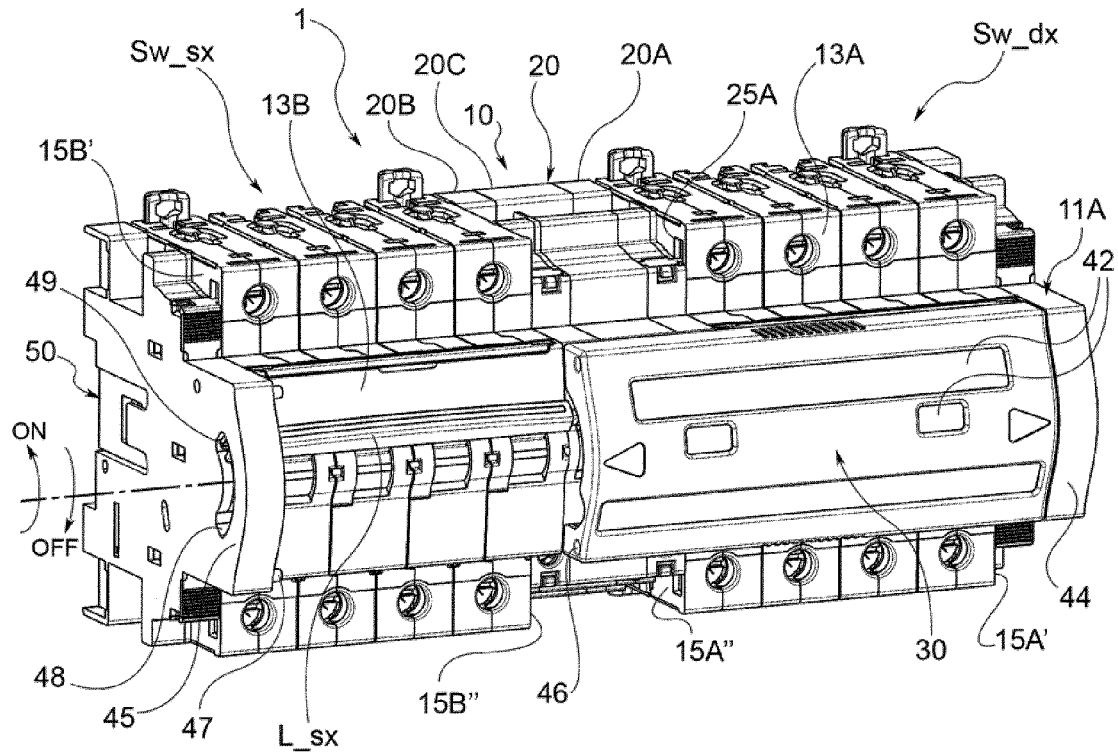


FIG. 3

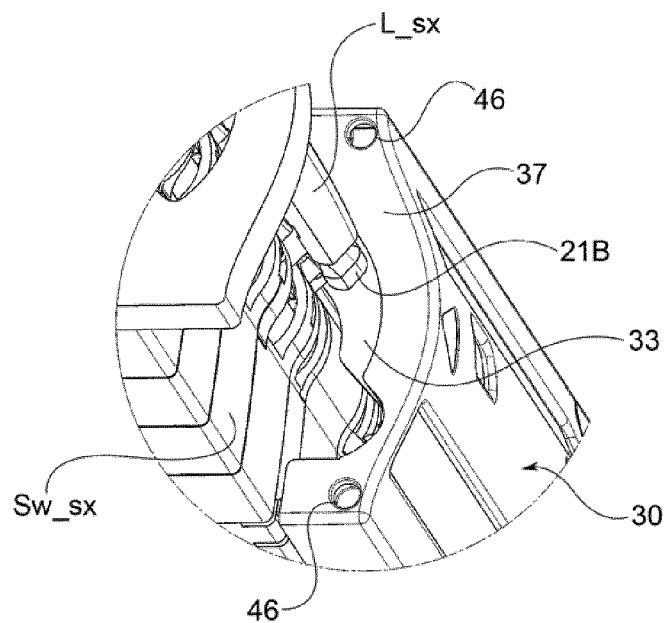


FIG. 4

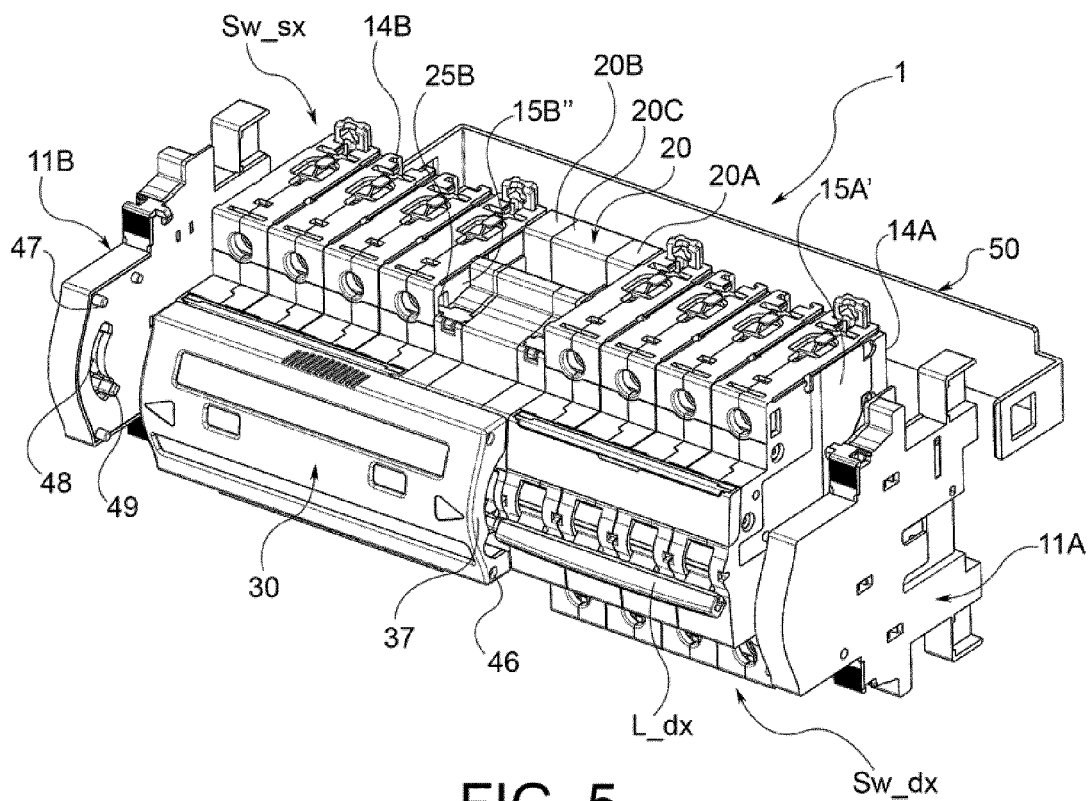


FIG. 5

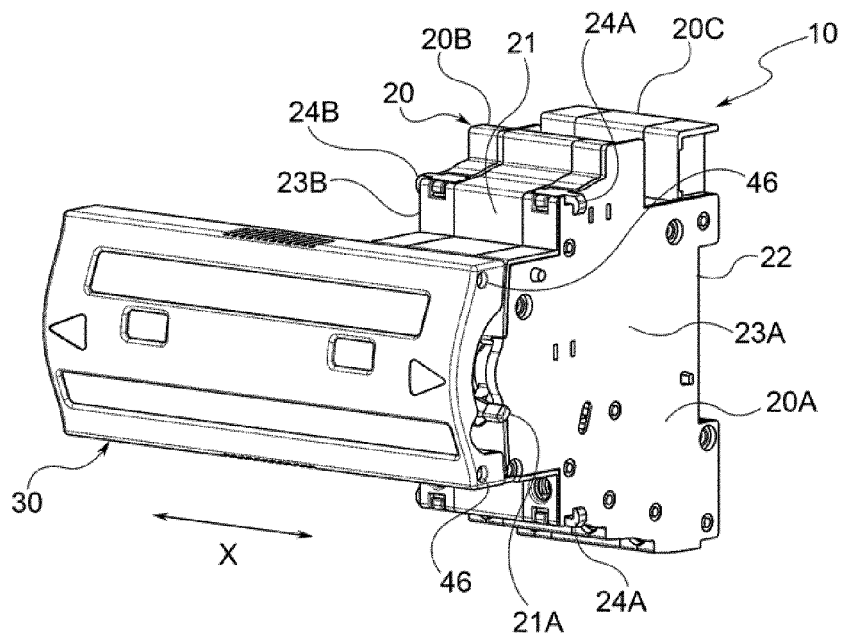


FIG. 6

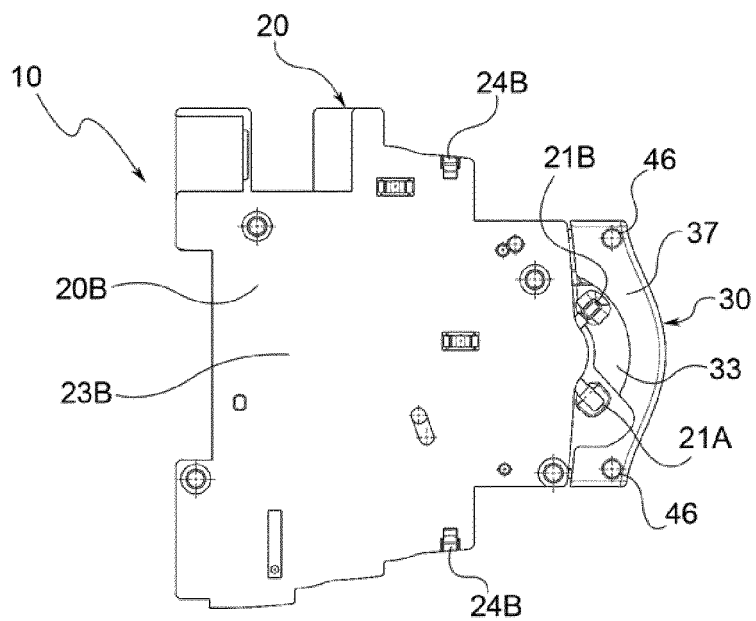


FIG. 7

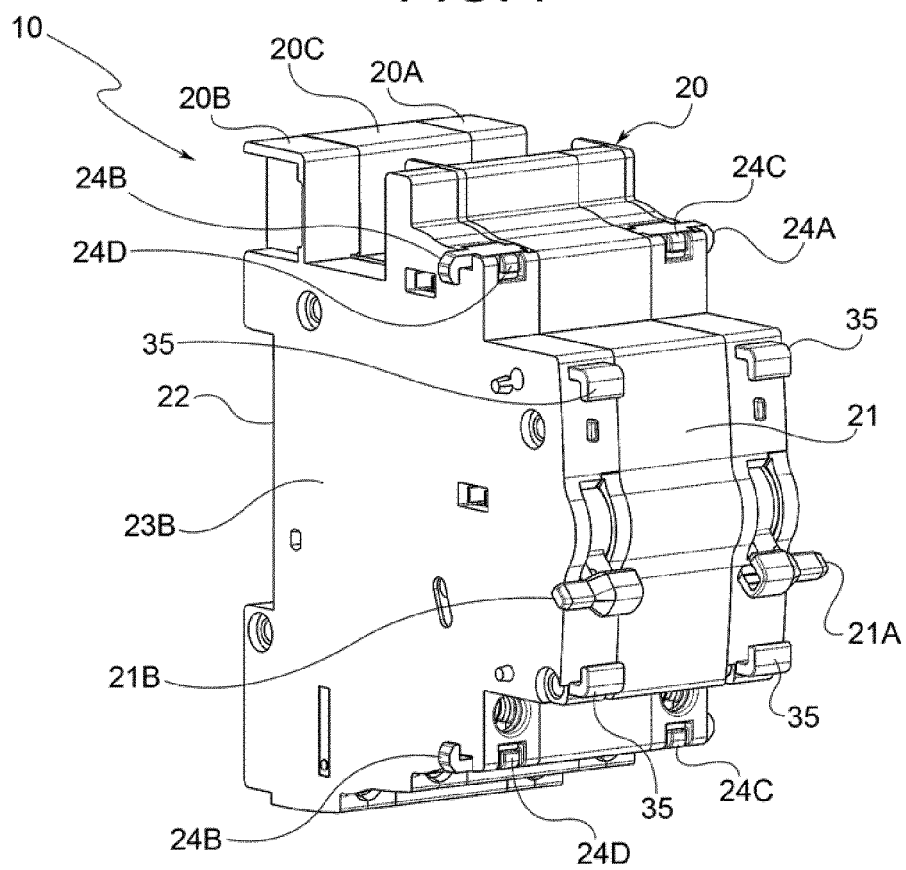


FIG. 8

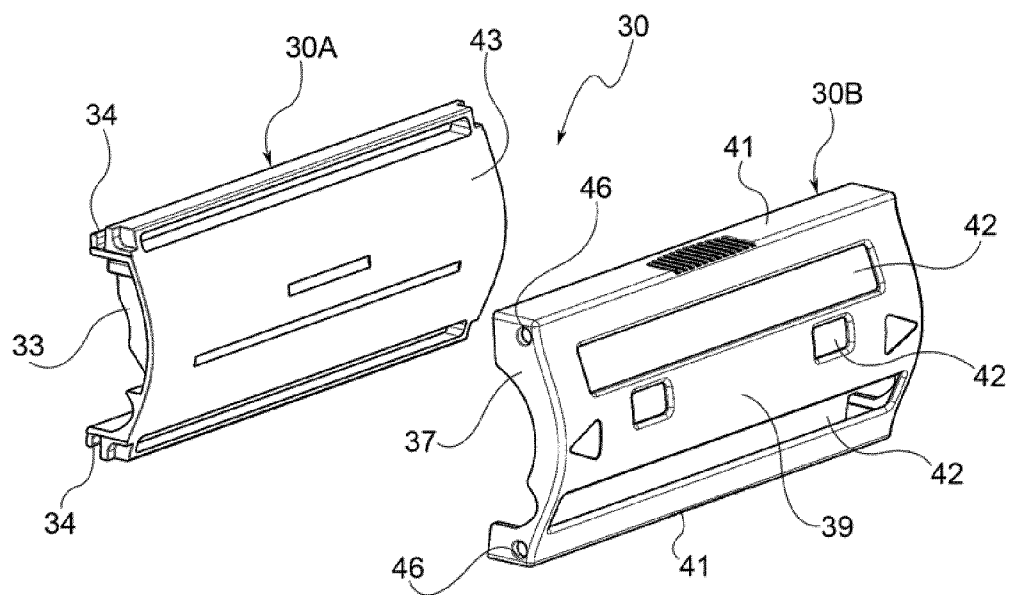


FIG. 9

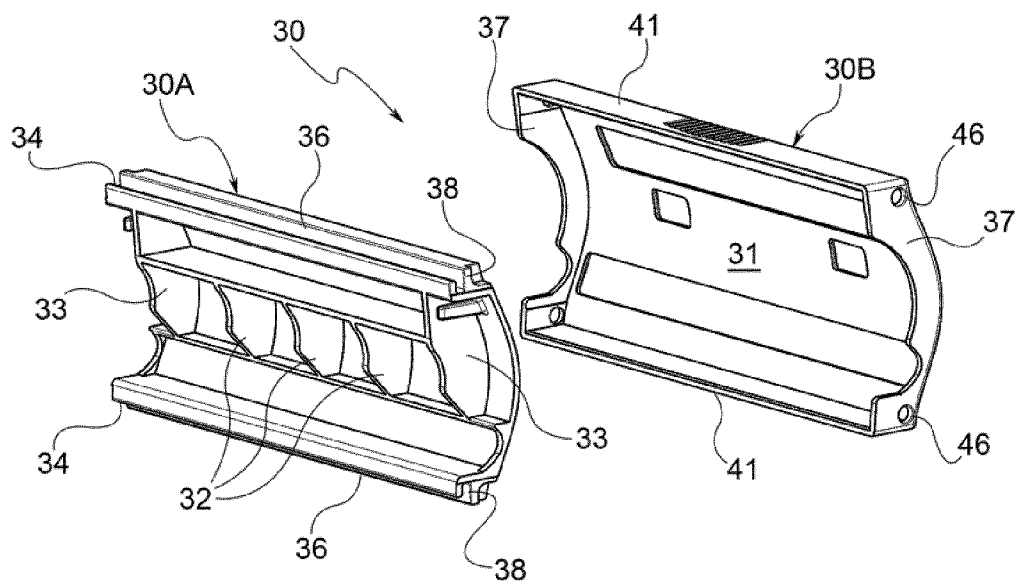


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 7399

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 1 916 682 A1 (BTICINO SPA [IT]) 30 April 2008 (2008-04-30) * abstract; figure 3 *	1-15	INV. H01H9/26
A	US 2003/155222 A1 (SCHNACKENBERG PAUL [US]) 21 August 2003 (2003-08-21) * abstract; figure 4 *	1	ADD. H01H71/10
			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 12 July 2012	Examiner Simonini, Stefano
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12-07-2012

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