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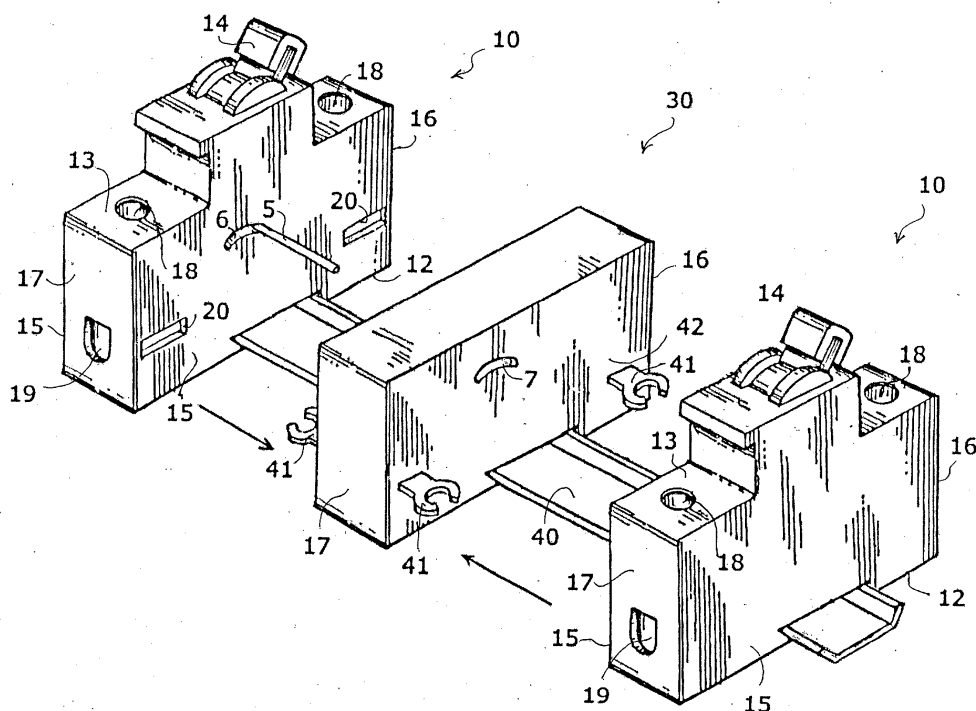
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(54) **Electrical apparatus with switch and by-pass device**

(57) Two unipolar switches (10), each enclosed in a box-shaped container made of insulating material, are designed for being mounted on a common support (40) with their respective sides parallel to each other and have connection terminals accessible from faces (13, 17) adjacent to the sides. In order to realize an electrical apparatus in which the two switches are shunted in high frequency by a by-pass device, each of the switch containers (10) is provided on at least one side (15) with an opening (20) corresponding to each of the connection

terminals and the by-pass device (30) is enclosed in a box-shaped container of insulating material designed for being mounted with its sides (42) parallel to the sides of the switches (10) on the common support (40) and has two electric terminals (41) projecting from each side (42) in positions such that, when the by-pass device (30) is mounted on the common support (40) between the two switches (10), the terminals (41) can become inserted in the openings (20) on the sides (15) of the switch containers (10).



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Description

[0001] The present invention concerns an electrical apparatus comprising two unipolar switches, each enclosed in a box-shaped container of insulating material and designed for being mounted on a common support with their respective sides parallel to each other and having connection terminals accessible from faces adjacent to the sides.

[0002] As is well known, the conductors of the electricity distribution network can be used for the transmission of control, measurement and data signals. An already existing network can thus be exploited for a function that would otherwise call for a specific and complex cable network.

[0003] Typical examples of applications of this kind are conveyed wave remote control installations, in which a control device situated in any desired part of the building can activate an actuator device situated in some other part, and also intercom installations that make possible voice communication between different rooms served by the same electricity distribution network.

[0004] A more recent example is the use of the electricity distribution network for connecting to Internet. By means of this connection the electricity distribution operator can inform his users about the conditions of the service and the users, in their turn, can benefit from the high-speed interconnection services made possible by cabled data transmission.

[0005] A problem that has to be solved whenever it is desired to use the electricity distribution network for signal transmission derives from the existence of the usual main switches, be they automatic or manual, that serve to separate the installations in a single apartment from the network. Let us consider, for example, a user who disposes of a terminal by means of which he can receive conveyed wave information from the electricity distributor. If the automatic main switch trips, the installation within the apartment will remain cut off from the electricity distribution network and the data transmission network. In the example under consideration the user cannot use his terminal to find out whether the tripping of the switch was caused by an intervention of the electricity distribution operator, some breakdown in the network or an overload of his own installation.

[0006] With a view to solving this problem, there are known the so-called by-pass devices, i.e. arrangements that shunt the local installation switches for signals only. Such by-pass devices perform their function by exploiting the fact that signals are transmitted at high frequencies, while electricity is distributed at low frequencies. A typical by-pass device is a high-pass filter substantially constituted by a transformer coupled by means of capacitors to the network, respectively, upstream and downstream of the switch; the device is thus a double dipole with two input terminals and two output terminals. The by-pass device, of course, must assure a degree of

insulation between input and output at least equal to the insulation provided by the switch with which it is associated.

[0007] The connections between the known by-pass devices and the switch call for the use of four conductors to be connected to a like number of input and output terminals of the switch and therefore the tightening of eight terminal clamps. This implies a relatively laborious installation and, in any case, the use of relatively long interconnecting wires and therefore the risk of insulation problems between the input and the output of the switch.

[0008] The present invention sets out to obviate the problems that have just been mentioned.

[0009] According to the invention this aim is attained by virtue of the fact that each of the switch containers has on at least one side an opening corresponding to each of the connection terminals and the fact that the by-pass device, enclosed in a box-shaped container of insulating material and designed for being mounted on a common support with its sides parallel to the sides of the switches, has a pair of electrical terminals projecting from each side in positions such that, when the by-pass device is mounted on the common support between the two switches, its terminals can be inserted in the openings in the sides of the switch containers.

[0010] The invention will be understood more clearly from the detailed description about to be given of a particular embodiment thereof, which is to be considered as an example and not limitative in any way, said description making reference to the attached drawing, the single figure of which shows a perspective view of an electrical apparatus in accordance with the invention in a mounting phase.

[0011] In the illustrated example the electrical apparatus is constituted by two unipolar switches 10 and a by-pass device 30.

[0012] Each of the unipolar switches 10 is enclosed in a box-shaped container made of insulating material, plastic material for example. The container has a rear face 12 of such conformation as to permit its being coupled with a supporting rail 40, a front face 13 from which there projects a switch-operating lever 14, two opposite side faces 15, an upper face 16 and a lower face 17. Two openings 18 on the front face permit the insertion of a screwdriver to tighten or loosen the screws of two electrical connection clamps, not visible in the figure, that constitute the switch terminals. Both the upper face 16 and the lower face 17 (only the lower face can be seen in the figure) are provided with respective openings 19 aligned with the terminal clamps that permit the insertion of the ends of two electrical conductors (not shown) to be gripped by the terminal clamps. The internal side faces 15 of the two switches, i.e. their respective sides that face the other switch, are provided with slots 20, which are likewise aligned with their respective terminal clamps.

[0013] One of the two switches, in this example an automatic switch, is provided with a pin 5 that projects from

a slot 6 of a side face 15, the other switch is provided with a similar slot (which cannot be seen in the figure) and the by-pass device 30 is provided with a through slot 7 that passes from one side to the other. When the two switches are mounted by the side of the by-pass device, the pin 5 passes through the slot 7 and engages with a tripping device that can be accessed through the corresponding slot of the other switch, so that the tripping of the automatic switch will also open the other switch.

[0014] The by-pass device 30 is enclosed in a container similar to the ones of the switches 10 and is mounted on the same supporting rail 40. Two electric terminals 41 project from each of the sides 42 of the container in positions such that, when the two switches are made to slide along the rail towards the by-pass device (as indicated by the arrows in the figure), the terminals 41 of the by-pass device enter into the slots 20 on the sides of the switches. These terminals 41, at least in this example, are made of sheet metal and have a horse-shoe shape, so that, once they have become inserted in the slots 20 while the clamps are slackened, they will pass under the heads of the locking screws of their respective terminal clamps. The tightening of these screws onto the ends of the conductors that are to be connected to the switches assures the electrical and mechanical connection of the by-pass device 30 to the two switches 10. On completion of the mounting operation, the operating levers of the two switches 10 may be mechanically coupled to each other, for example, by means of the usual slotted crosspiece (not shown in the figure).

[0015] The by-pass device may be connected either - as in the example just described - to an automatic switch consisting of two elements, one of which is a simple unipolar switch and the other a unipolar switch with protection, or to an automatic three-pole or four-pole switch. In the latter case, of course, the conductor ends of the by-pass device are connected to the two corresponding ends of the conductors that serve also as signal transmission conductors. A typical case is the one of the four-pole switch: the by-pass device is inserted between the neutral pole and one of the phase poles.

[0016] As can be seen, the electric apparatus in accordance with the invention has various advantages as compared with prior art equipment performing the same function:

- the connections between the by-pass device and the switches are very short,
- the layout of the connections is optimal for assuring the maximum degree of insulation, because the distance between the terminals is as large as possible,
- the mechanical and electrical connection between the by-pass device and the switches is made automatically and in a very simple manner and also without having to use any external connection elements.

[0017] Although only a single embodiment of the present invention has here been illustrated and described, it is evident that numerous variants and modifications are possible within the ambit of the underlying inventive concept. For example, the place of the screw-type terminal clamps of the switches could be taken by some other type of connection terminal, plug-in terminals for example: in that case the terminals of both the by-pass device and the switches could be different from the ones described above and could, for example, be likewise of the plug-in type.

Claims

1. Electrical apparatus comprising two unipolar switches (10), each enclosed in a box-shaped container made of insulating material and designed for being mounted on a common support (40) with their respective sides parallel to each other and having connection terminals accessible from faces (13, 17) adjacent to the sides, **characterized in that** each of the switch containers (10) is provided on at least one side (15) with an opening (20) corresponding to each of the connection terminals and that it comprises a by-pass device (30) enclosed in a box-shaped container of insulating material designed for being mounted with its sides (42) parallel to the sides of the switches (10) on the common support (40) and from each side of which there project two electric terminals (41) in positions such that, when the by-pass device (30) is mounted on the common support (40) between the two switches (10), said terminals (41) can become inserted in the openings (20) on the sides (15) of the switch containers (10).
2. Electric apparatus in accordance with Claim 1, wherein the connection terminals are clamps with respective tightening screws and the terminals of the by-pass device (41) are shaped in such a way as to be clenched by the screws of the terminal clamps.

