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54 Units for detecting differential currents in electric systems.

57 This unit comprises a box-like body associable, side by side, with electric switches and selective safety means adapted to avoid unintentional errors in coupling and including rod-like guide elements (3,3a) protruding from the coupling wall (1a) of said unit and intended to be inserted within corresponding cavities (4,4') in the body of the switch (2). The rod-like elements (3,3a) have a constant transverse cross section while the corresponding cavities (4,4') provided in the body of the switch have such dimensions and depth as to allow the complete insertion of said rod-like elements only when the nominal currents of the switch are equal or lower than those of the unit. In particular, the cavities (4) provided in a high nominal current switch have a portion (4a) with smaller transverse cross section than the inlet portion (4b), so as to prevent the complete insertion of said rod-like elements (3) if the nominal current of the differential unit is lower than that of the switch.

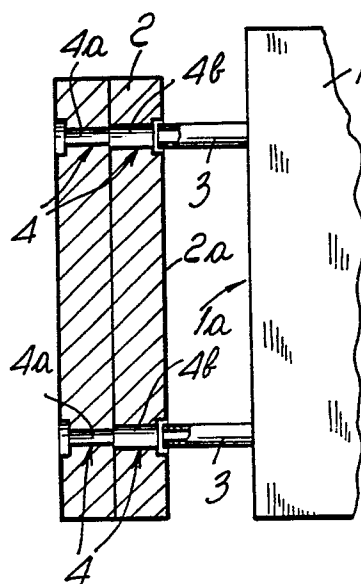


Fig. 1

UNIT FOR DETECTING DIFFERENTIAL CURRENTS IN ELECTRIC SYSTEMS

The present invention relates to a unit or device for detecting differential currents in electric systems, associable, side by side, with an automatic electric switch or the like.

As is known, differential units or devices are constituted by box-like bodies containing devices for detecting the differential currents which may arise in the electric circuit in which they are inserted; said box-like bodies are coupled, side by side, to automatic electric switches, in order to allow the automatic opening of the movable contacts of the switch upon the onset of differential currents in the circuit or system.

It is thus fundamentally important, for the protection of the system and the safety of people, that the coupling between the unit and the switch be performed taking into account the nominal currents thereof, since an incorrect coupling, for example, between a unit with lower nominal current and a switch with higher nominal current could determine the overheating and therefore the damaging of said differential unit so as to not allow the opening of the contacts of the switch in the presence of differential currents. Naturally, the possible coupling of a differential unit preset for a higher nominal current with a switch for lower current can cause neither damage to the unit nor danger of failure in contact opening; in practice, however, such a coupling is uneconomical.

In order to avoid these incorrect couplings, it is therefore necessary to pay attention to the characteristics of the individual devices, and this entails a certain loss of time and does not ensure against the danger of unintentional errors which are always possible.

The aim of the present invention is therefore to provide a differential unit capable of eliminating the above described disadvantages and dangers and most of all structured so as to allow its lateral coupling only to automatic switches preset for nominal currents equal or lower than those for said unit, thus avoiding intentional or unintentional couplings which may be dangerous for the integrity of said unit and of the circuit in which it is inserted and for the safety of people due to a failure in opening the movable contacts of the switch.

An object of the invention is to provide differential units having coupling elements structured and distributed so as, besides allowing their rapid and safe coupling only to switches for nominal currents equal or in any case compatible with those of the differential units, to be capable of facilitating the coupling operations and also of establishing a criterion for the univocal coupling of units and switch-

es in terms of the respective nominal currents.

Not least object is to provide units having devices for selective coupling with respect to the switches, structured so as to be simple to manufacture, highly reliable and such as to not affect significantly the unitary cost of said units.

This aim, these and other objects which will become apparent from the following description are achieved by a unit for detecting differential currents in electric systems, as defined in the appended claims.

The invention is described hereinafter in greater detail according to a preferred but not exclusive practical embodiment, with reference to the accompanying drawings, given only by way of non-limitative example, wherein:

figure 1 is a schematic view of a differential unit for low nominal current, according to the invention, during an attempted coupling to a switch for higher nominal current;

figure 2 is an also schematic view of the same unit as figure 1 for low nominal current during its stable coupling to a switch for equal or lower nominal current, and

figure 3 is a schematic view of a differential unit for high nominal current having guiding means dimensioned so as to allow its coupling to switches both for equal nominal current and for lower nominal current.

With reference to the above figures, the differential unit according to the invention is constituted by a conventional box-like body 1, containing known differential-current detection devices and associable, side by side, with movable-contact automatic switches 2.

According to the invention, in order to allow the correct matching of differential units with switches in compliance with the respective nominal currents, rod-like guiding elements 3 are provided on the coupling wall 1a of the unit 1. Such guiding elements 3 protrude perpendicular to said wall 1a, are in a number adequate to impart stability to the coupling and have, according to the invention, a constant transverse cross section along their entire extension as well as the same length.

Corresponding seats or cavities 4 (figure 1) are provided in the body of the switch 2 and have a depth which is substantially equal to the length of the guiding elements 3. In the example according to fig. 1, the unit 1 is preset for low nominal currents and the switch is dimensioned for greater nominal currents: in this case, to avoid unintentional matching therebetween, the seats or cavities 4 are defined by two portions 4a-4b having dif-

ferent transverse cross sections and in particular the portions 4a are narrower than the elements 3; consequently the insertion of the guiding elements 3 is possible only in the initial portion 4b; in this manner the coupling is not executable and thus any intentional or unintentional error is eliminated.

Naturally, in the case of switches with nominal current lower than that of the unit 1, the correct and stable coupling is possible if the cavities 4' of the switches 2' (figure 2) have the same cross section for their entire depth; in fact, in this case the guiding elements 3 can enter the seats 4' until the wall 1a of the unit 1 abuts against the wall 2a of the switches.

Still according to the invention, for economic reasons and for productive and commercial convenience, the coupling, besides being possible between units and switches for high nominal current, is also possible between units 1' for high nominal current and low-current switches, since in these cases no damage can be caused to the differential units due to thermal reasons. This coupling is allowed, according to the invention, by providing (figure 3) on the units 1' for high nominal current protruding guide elements 3a shorter than the preceding ones and having equal transverse cross section; said elements 3a can in fact be inserted, allowing a stable coupling, both in the seats 4 provided in switches 2 for high nominal current and in the seats 4' provided in switches 2' for low nominal current, since their length is equal to, or shorter than, the depth of the portion 4b.

Naturally, in the practical embodiment of the invention, illustrated in the figures by way of example, by providing guiding elements 3 and seats or cavities 4 with different dimensions in length and depth, as well as in different relative positions and in variable number according to the requirements, a wide range of possible combinations between units and switches is obtained, though always in compliance with the respective nominal currents. For example, both the seats or cavities 4 and the guiding elements 3, 3a may have a cross section which is inversely depending on the nominal current in, respectively, the switch and the unit, and in this case the elements 3 may have constant length and each cavity may have a constant cross-section.

In any case, the scope of the protection of the present invention comprises all those possible variations which imply structural and functional characteristics which are equivalent to those described and illustrated; thus, for example, the differential units may be coupled to guiding elements completely insertable in the seats of any switch, so long as at least one thereof and its respective seat are executed according to the invention; the coupling not in compliance with the respective nominal

currents is in fact prevented even by the presence of only one of said rod-like guiding elements and of its seat structured and dimensioned according to the invention.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A unit for detecting differential currents, having the shape of a box-like body (1,1') associable with electric switches (2,2') or the like, characterized by rod-like guiding elements (3,3a) protruding from the coupling wall (1a) of said unit and intended to be inserted within corresponding cavities (4,4') provided in the body of the switch, said cavities, at least for a section thereof, and said rod-like elements having dimensions and shape depending on the nominal current of the switch and of said unit, respectively, as to allow the complete insertion of said rod-like elements only when the nominal currents of the switch are equal or lower than those of the unit to be coupled and to prevent at least the complete insertion of said rod-like elements if the differential unit has a nominal current lower than that of the switch.

2. A unit according to claim 1, characterized in that said rod-like guiding elements (3,3a) have a length inversely correlated to the nominal current in the unit and constant cross-section and said cavities (4,4'), in at least their portion (4a) far from the cavity inlet, have a cross-section inversely correlated to the nominal current in the switch (2,2') so as to allow correct coupling of the unit to switches having equal and lower nominal currents, with no danger of damage to the differential unit, the coupling being allowed by the complete insertion of shorter guiding elements 3a of high nominal current of differential units within the inlet portion (4b), having greater cross section, of the cavities (4,4') of the switches.

3. A unit according to the preceding claims, characterized by a single cavity (4) in the switch (2) with two portions (4a, 4b) with different cross sections and, in the unit (1,1'), a plurality of guiding elements (3,3a) completely insertable in their respective cavities, providing stability for the coupling, one of said guiding elements being engageable with said single seat with two cross sections.

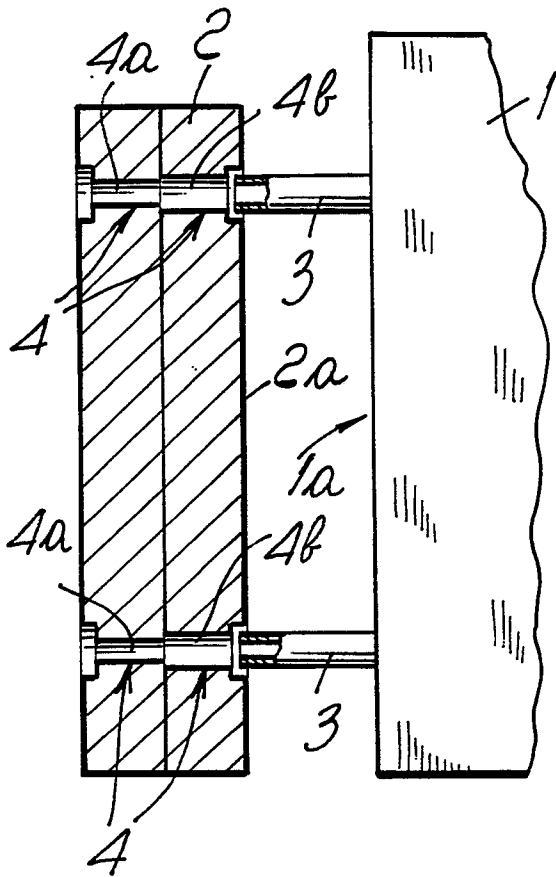


Fig. 1

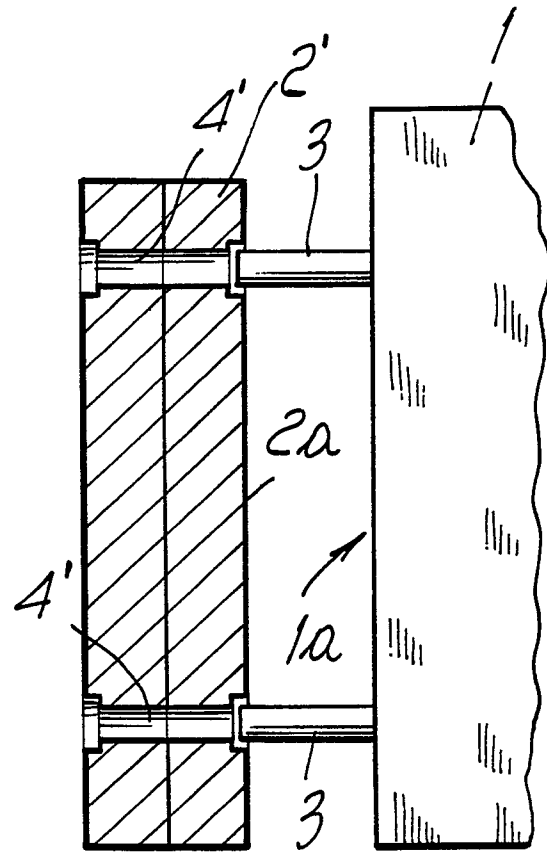


Fig. 2

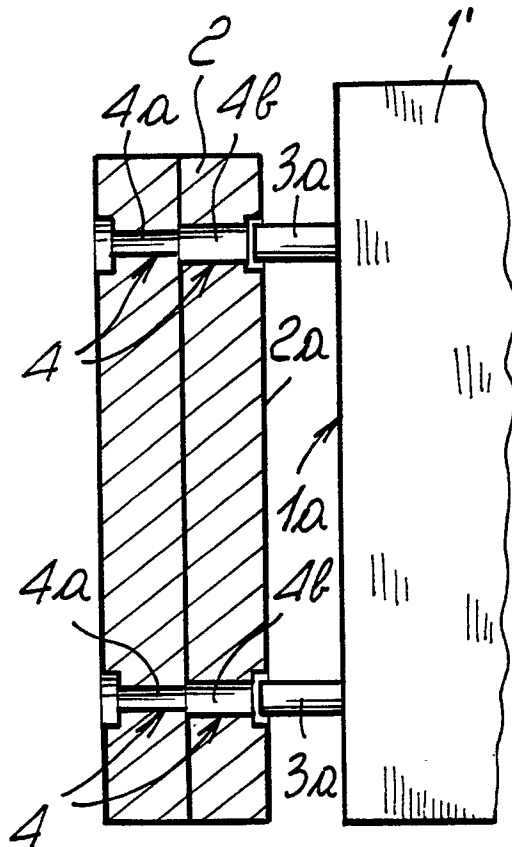


Fig. 3