

SAFETY PLUG FOR SWITCHING OR DISCONNECTING RAILS

The invention relates to a safety plug for switching or disconnecting rails of the telecommunication technique provided with a collective earth terminal, according to the preamble of claim 1.

From the DE-A-37 09 875, a safety plug of the type referred to hereinbefore is known in the art. This safety plug is composed of two casing half-shells, into the interior of which a protective hybrid having two parallel conductor tracks is inserted. The conductor tracks are connected over conductor contacts with the a-b wires or a'-b' wires of the telecommunication line. Further, voltage surge arresters arranged side-by-side are provided, which are held between the conductor tracks of the protective hybrid and an earthing sheet. The earthing sheet disposed underneath the protective hybrid comprises two resilient sheet-metal lugs for holding the voltage surge arresters, said sheet-metal lugs being angled for forming U-shaped chambers transversely to the longitudinal sides of the earthing sheet. In order to connect the voltage surge arresters to earth, two additional sheet-metal lugs are required. These sheet-metal lugs have each a leg being spaced to the conductor tracks. It is disadvantageous, with this safety plug, that by the arrangement of two side-by-side voltage surge arresters and by the earthing sheet comprising several sheet-metal lugs, the width and the thickness of the casing are considerably increased.

When inserting the safety plug into a switching or disconnecting rail, thus the jumper side of the rail is hidden, so that for terminating and removing cable wires, first the safety plug has to be pulled out. Another disadvantage is that the casing of the safety plug is a two-part construction.

It is therefore the object of the invention to provide a safety plug of the type referred to hereinbefore, the casing of which is as small as possible and for the application of which the cables

terminated at the jumper side of a switching or disconnecting rail are accessible, even after insertion of the safety plug.

The solution of this object is achieved by the characterizing features of claim 1. The voltage surge arresters are only contacted with the collective earth terminal after plugging the safety plug onto a switching or disconnecting rail, thus an earth connection being established. According to the invention, the collective earth terminal is disposed outside the safety plug casing, thereby the casing being substantially smaller. By making the casing of the safety plug smaller, the cable wires terminated at the jumper side of the switching or disconnecting rail are accessible even after plugging the safety plug on, so that jumper actions, such as the removal of cable wires terminated already, can be performed without removing the safety plug. Furthermore, the safety plug is composed of a one-part casing, so that the safety plug will be considerably less expensive.

Further advantageous embodiments of the invention are defined in the other subclaims. Special reference is made to the embodiment according to Figs. 6, 7 and 8, wherein the lugs of the collective earth terminal for contacting the voltage surge arresters have a small length only.

In the following, the invention is described in more detail, based on several embodiments of a safety plug represented in the drawings. There are:

Fig. 1 a longitudinal section of the safety plug inserted into a terminal rail in the first embodiment,

Fig. 2 the main view of the safety plug,

Fig. 3 a cross-section along line III-III,

Fig. 4 a cross-section along line III-III, with collective earth terminal,

Fig. 5 a perspective view of the safety plug in the second embodiment, with collective earth terminal, terminal rail and mounting bracket,

Fig. 6 a longitudinal section of the safety plug inserted into a terminal rail, in the second embodiment,

Fig. 7 the rear view of the safety plug,

Fig. 8 a longitudinal section of the safety plug,

Fig. 9 the main view of the safety plug,

Fig. 10 a cross-section along line X-X,

Fig. 11 a cross-section along line XI-XI,

Fig. 12 a longitudinal section of the safety plug in the third embodiment,

Fig. 13 the rear view of the collective earth terminal, with a plugged-on safety plug,

Fig. 14 a cross-section of the safety plug,

Fig. 15 the main view of the safety plug,

Fig. 16 a cross-section along line XVI-XVI,

Fig. 17 the main view of the safety plug of the fourth embodiment, and

Fig. 18 a cross-section along line XVIII-XVIII.

The safety plug 1 is composed of a one-part plastic casing 2, the front side 10 of the casing 2 being open. Said front side 10 is closed by inserting a lug 11 of a collective earth terminal 5 into an insertion channel 48 or by a sheet-metal part 50, as will be described below.

In the interior 12 of the casing 2 are inserted two strip-type conductor contacts 13, 14 of a metal material, the ends 15, 16 of which extend out of the casing 2 of the safety plug 1 and are fixed in the casing 2 by means of holding webs 49. Said ends 15, 16 form, together with a plastic web 17 disposed integrally with the casing 2 between the ends 15, 16, the insertion channel 18 of the safety plug 1. The plastic web 17 comprises a latch lug 43.

The parts of the conductor contacts 13, 14 disposed in the casing 2 are loosely inserted into guide grooves 21, 22 and serve for contacting the voltage surge arresters 3. The two parts of the conductor contacts 13, 14 disposed in the casing 2 are shaped in different manners.

The conductor contact 13 is U-shaped, and the conductor contact 14 is S-shaped, both angled ends 19, 20 of the conductor contacts 13, 14 being received in a guide groove 23 extending parallelly between the guide grooves 21, 22.

The two ends 19, 20 of the conductor contacts 13, 14 are, furthermore, rectangularly bent off in the direction of the open front side 10 for forming shorting brackets 25, 26. The ends of the shorting brackets 25, 26 engage into the insertion channel 48, in the position of rest.

The parts of the conductor contacts 13, 14 disposed in the casing 2 are spring-loaded, so that they are pressed in after insertion of the voltage surge arresters 3 into the guide grooves 21, 22 and 23 only.

The voltage surge arresters 3 are inserted into the safety plug 1 from the open front side 10, and resiliently rest with one terminal 29 against a melt element 30 disposed between the conductor contacts 13, 14 and the voltage surge arresters 3. By the resilient abutment, a safe contact is guaranteed.

At the other pole side 28, the voltage surge arrester 3 in the first embodiment according to Figs. 1 to 4 is held as a counter-support by the resilient latch hooks 6, 7 disposed at the longitudinal casing sides 8, and are thus fixed in the casing 2 of the safety plug 1. The ends 32 of the latch hooks 6, 7 are directed towards each other to the longitudinal axis 9 of the casing 2.

In the second embodiment according to Figs. 5 to 11, the latch hooks 6, 7 are disposed centrally on the longitudinal axis 9, on which is further provided a central web 33. The central web 33 comprises two clamping edges 34 for both-sides contact of the voltage surge arresters 3 and a guide web 35 for guiding the lugs 11 of the collective earth terminal 5, as will be described in more detail below. The voltage surge arresters 3 are thus held on both sides by a latch hook 6, 7 and by the clamping edge 34 of the central web 33 in the casing 2 of the safety plug 1.

In the third embodiment (Figs. 12 to 16), the voltage surge arresters 3 are held by extension webs 24 of the casing 2. The extension webs 24 engage into the open front side 10, for the two voltage surge arresters 3 two extension webs 24 each being provided.

In the fourth embodiment (Figs. 17 and 18), the voltage surge arresters 3 are held in the casing 2 by a sheet-metal part 50 having a U-shaped cross-section with rectangularly bent-

off side walls 51. The side walls 51 comprise openings 52 into which the latch hooks 54 disposed at the two narrow sides 45 of the casing 2 engage and thus fix the sheet-metal part 50 at the casing 2. By the sheet-metal part 50, the open front side 10 of the safety plug is closed. Against the interior 55 of the sheet-metal part 50 rest the pole sides 28 of the voltage surge arresters 3, the exterior 55 of the sheet-metal part 50 is oriented towards the insertion channel 48. The voltage surge arresters 3 are thus electrically connected with the sheet-metal part 50. The interior 55 of the sheet-metal part 50 serves, furthermore, as a contact surface for the shorting brackets 25, 26.

In the following, the construction and the insertion of the safety plug 1 into the switching or disconnecting rail 4 is explained in more detail.

According to Fig. 5, the switching or disconnecting rail 4 made of plastic is plugged onto lugs 37 of a metal mounting bracket 36 connected with an earth line, and is latched there. Such a switching or disconnecting rail latchable onto a mounting bracket 36 comprises a lower portion and an upper portion latched therewith. At the switching or disconnecting rail 4, on the one side (cable side), the cable wires 38 coming from the subscribers, and on the other side (jumper side), the jumper wires 39 leading to the exchange installations are terminated at insulation displacement contact pieces 40, 41 disposed in two rows. The insulation displacement contact piece 40 of the one row is connected over a fork-type contact piece 47 with the insulation displacement contact piece 41 of the other row.

In parallel to the switching or disconnecting rail 4, a metal collective earth terminal 5 is plugged on. The collective earth terminal 5 comprises, at the front sides, two fork-type contact pieces 57 engaging over the lugs 37 of the mounting bracket 36 and electrically connecting thus the collective earth terminal 5 with the mounting bracket 36.

The collective earth terminal 5 includes several lugs 11 with interposed slots 42. Per double-wire (a-b wire) is provided one lug 11.

If a voltage surge protection is required for the cable wire 38 connected to the switching or disconnecting rail 4, then for each double-wire is inserted a safety plug 1 into the rail 4 between the two rows of insulation displacement contact pieces 40, 41 into the fork-type contact 47. The latch lug 43 of the insertion portion 18 of the safety plug engages into the rail 4. The fork-type contacts 47 engage over the conductor contact ends 15, 16, so that the cable wires 38, 39 are electrically connected with the conductor contacts 13, 14. One lug 11 each of the collective earth terminal 5 engages into one insertion channel 48 of a safety plug 1.

In the first embodiment of the safety plug 1 (Figs. 1 to 4), the lugs 11 press the hooks 6, 7 holding the voltage surge arresters 3 away - as is shown in Fig. 4 - and contact the one pole side 28 of the voltage surge arresters 3 being thus connected with earth. The voltage surge arresters 3 are pressed by the resilient conductor contact pieces 13, 14 against the lugs 11 of the collective earth terminal 55, thereby a safe contact between the lugs 11 and the pole side 28 of the voltage surge arresters 3 being established. When pulling the safety plug 1 out from the switching or disconnecting rail 4, the latch hooks 6, 7 engage again behind the one pole side 28 of the voltage surge arresters 3 and refix it in the casing 2 of the safety plug 1.

In the second embodiment of the safety plug 1 (Figs. 5 to 11), the lugs 11 respectively cover one half of the front side 10 of the safety plug 1, so that the slot 42 existing between the lugs 11 extends centrally on the longitudinal axis 9 of the safety plug 1 and receives the latch hooks 6, 7 and the guide web 35 of the central web 33. For a better guiding of the lugs 11, there are arranged, furthermore, two additional guide webs 44 at the front side 10 at the narrow sides 45.

In the third embodiment (Figs. 12 to 16), the lugs 11 are pressed, when inserting the safety plug 1 into the insertion channel 48, under the extension webs 24, as is shown in Fig. 12. In order to facilitate the insertion, the lugs 11 are slightly bent off at the front side 46 in this embodiment.

In the fourth embodiment (Figs. 17 and 18), the lugs 11 are shortened with respect to the embodiments described

above, since the lug 11 in this embodiment needs only be electrically contacted with the sheet-metal part 50. For guiding the lug 11 is provided one guide angle 53 each at the longitudinal sides 8 of the housing 2, so that in the insertion channel 48, the lug 11 of the collective earth terminal 5 is disposed between the guide angles 53 and the sheet-metal part 50.

If several safety plugs 1 are connected side-by-side at their longitudinal sides 8, a safety plug rail 31 is formed.

In the following, the voltage surge case is shortly explained. When a voltage surge occurs, the voltage surge or the over-current is conducted over the cable wires 38, 39, the insulation displacement contacts 40, 41, the fork-type contact 47, the conductor contacts 13, 14, the melt element 30 to the one pole side 29 of the voltage surge arrester 3.

The voltage surge arrester 3 filled with a noble gas ignites, thereby the voltage surge being conducted to the other pole 28 of the voltage surge arrester 3 electrically connected with the collective earth terminal 5. The voltage surge is thus conducted over the fork-type contacts 41 and the collective earth terminal 5 to the mounting bracket 36 being connected with an earth line.

In case of a permanent ignition of the voltage surge arrester 3, the melt element 30 will melt because of the generated heat, thereby the resilient shorting bracket 25, 26 contacting the lug 11 of the collective earth terminal 5 or the sheet-metal part 50 connected with the collective earth terminal 5, and shorting the voltage surge arrester 3 (fail-safe behaviour). A destruction of the safety plug 1 by over-heating is thus prevented.



Patent Claims

1. A safety plug for switching or disconnecting rails (4) of the telecommunication technique provided with a collective earth terminal (5), comprising a casing (2) with voltage surge arresters (3) and conductor contacts (13, 14), characterized by that the casing (2) comprises an insertion channel (48) extending along the one pole side (28) of the voltage surge arresters (3), and that the collective earth terminal (5) is provided with a lug (11) engaging into the insertion channel (48) for connecting the voltage surge arresters (3) to earth.

2. A safety plug according to claim 1, characterized by that the conductor contacts (13, 14) comprise shorting brackets (25, 26) engaging, after melting of the melt element (30), into the insertion channel (48).

3. A safety plug according to claim 1, characterized by that each voltage surge arrester (3) is held in clamping manner in the casing (2) of the safety plug (1) by two resilient hooks (6, 7).

4. A safety plug according to claim 3, characterized by that the resilient hooks (6, 7) are disposed at the longitudinal casing sides (8) of the safety plug (1).

5. A safety plug according to claim 3, characterized by that the resilient hooks (6, 7) are directed towards each other on the longitudinal axis (9) of the safety plug (1).

6. A safety plug according to claim 1, characterized by that the casing (2) comprises along the pole sides (28) of the voltage surge arresters (3) a sheet-metal part (50), against which the pole sides (28) of the voltage surge arresters (3) rest.

7. A safety plug according to claims 1 and 5, characterized by that the sheet-metal part (50) is provided with openings (52), into which engage the latch hooks (54) disposed at the narrow sides (45) of the casing (2).



8. A safety plug according to claims 1 and 5, characterized by that the interior (55) of the sheet-metal part (50) serves as a contact surface for the shorting brackets (25, 26) and for the pole sides (28) of the voltage surge arresters (3), and the exterior (56) of the sheet-metal part (50) serves as a contact surface for the lug (11) of the collective earth terminal (5).

9. A safety plug according to claim 1, characterized by that the voltage surge arresters (3) are disposed in series on the longitudinal axis (9) of the casing (2).

10. A safety plug according to claim 1, characterized by that several safety plugs (1) are adapted side-by-side as a safety plug rail (31).