



Ground bus and protective plug for a connecting or isolating block in telecommunications and data technology

5 The invention relates to a ground bus and a protective plug for a connecting or isolating block in telecommunications and data technology.

 DE 38 13 889 C1 discloses a connecting or isolating block for telecommunications technology with
10 at least one insertable protective plug with a housing in which at least one surge arrester is arranged, each surge arrester being in electrically conducting connection, after insertion, by one terminal with in each case a strip-shaped conductor contact piece which
15 is arranged in the housing and has an insert tongue and by the other terminal with a ground bus which is fastened on a mounting lug, the ground bus being arranged parallel to one longitudinal side of the connecting or isolating block. The ground bus has an
20 insert tongue for each protective plug. Parallel to the direction of insertion into the connecting or isolating block, the housing of the protective plug has an insert channel, into which the associated insert tongue of the ground bus can be introduced to such an
25 extent that it is in electrically conducting connection with all the surge arresters arranged in them [sic]. The parts of the conductor contact pieces arranged in the housing are loosely laid in guide grooves and serve for the contacting of surge arresters. The two parts
30 of the side contact pieces arranged in the housing are differently designed. One conductor contact piece is of a U-shaped design and the other of an S-shaped design, both angled-away ends of the conductor contact pieces being accommodated in a guide groove which runs
35 parallel between the guide grooves. The two ends of the conductor contact pieces are additionally bent away at right angles in the direction of the open front side to form short-circuiting links. In the rest position, the ends of the short-circuiting links engage in the



insert channel. The parts of the side contact pieces arranged in the housing are resiliently prestressed, so that they are pressed into the guide grooves only after the surge arresters have been inserted. The surge
5 arresters are inserted into the protective plug from the open front side and bear resiliently with one terminal in a melting pellet fitted between the conductor contact pieces and the surge arresters. On the side of the other terminal, the surge arrester is
10 held, as a counter abutment, by the resilient latching hooks arranged on the longitudinal sides of the housing, and is consequently fixed in the housing of the protective plug. The insert tongues of the ground bus then press the latching hooks holding the surge
15 arresters to one side and establish contact with the one terminal of the surge arrester, which is consequently connected to ground. A disadvantage of the known protective plugs is their complex construction, which makes automatic production
20 difficult.

The invention is therefore based on the technical problem of providing a protective plug and a ground bus for a connecting or isolating block which are of a more simple construction and ensure a reliable
25 electrical connection between the ground bus and the protective plug even when there are relatively great tolerances.

The technical problem is solved by the devices with the features of patent claims 1 and 8. Further
30 advantageous developments of the invention emerge from the subclaims.

For this purpose, the insert tongues of the ground bus are of a resilient design, whereas the corresponding ground contact in the protective plug is
35 arranged in a mechanically rigid manner in the plug housing. In this case, the geometry of the resilient insert tongues is made to match the geometry of the ground contacts. On account of the rigid design of the ground contact in the protective plug, assembly and

automation in the production of the protective plug become easy, accompanied at the same time by a great current/surge-current carrying capacity of the ground connection and simple geometry from a production engineering viewpoint, since the ground contact can be designed as a solid part. The resilient design of the insert tongues can be realized by simple means from a production engineering viewpoint. No forces are transmitted into the interior of the plug to develop the necessary contact forces. The stresses occurring are mainly absorbed in the heavy-duty resilient materials of the ground bus.

In a preferred embodiment, the functional elements and the ground contact of the protective plug are arranged on a printed-circuit board, whereby the ground contact itself does not have to be supported in the plug housing. As a result, dimensional variations of the geometry of the housing or aging processes of the plastics used for the plug housing do not adversely affect the available contact forces. The ground contact is preferably arranged on the underside of the printed-circuit board and designed as a solid contact.

The corresponding insert tongues of the ground bus are then preferably designed as forked contact [sic], which resiliently clamp and contact the ground contact from the sides.

To achieve as good a contact as possible, the geometries of the insert tongues and of the ground contacts are made to match one another. In a preferred embodiment, the ground contact is designed as a solid, cuboidal platelet and the forked contact is designed in the form of a segment of an arc of a circle at the points of contact with the ground contact. If, on the other hand, the ground contact is of a spherical or cylindrical form, the contact points of the forked contacts are planar.

In a further preferred embodiment, an additional supporting surface for the printed-circuit board is arranged in the housing, so that printed-

circuit boards of various lengths and loaded with various components can be used in the same plug housing.

5 The plug housing is preferably divided into two in the longitudinal direction, the two housing parts preferably being latched together. By being divided longitudinally, when the protective plug is stretched or pulled the forces do not act in the direction of the connection of the housing parts.

10 The subdivision of the housing parts preferably takes place here in such a way that a first housing part defines a relatively large installation region, which essentially receives the functional elements arranged on the front side of the printed-circuit
15 board, whereas the second housing part serves for receiving the ground contact. Therefore, the insert channel for the insert tongue of the ground bus is also arranged in the second housing part. This unsymmetrical division of the housing parts has the
20 effect of a very compact arrangement on the connecting or isolating block, so that the plug housing does not hinder the accessibility of neighboring contacts.

In a further preferred embodiment, at least one measuring or isolating point is arranged in the plug
25 housing, is preferably arranged on the underside of the printed-circuit board and is accessible from the outside, from the side facing away from the insert part. Each core is preferably assigned a measuring or isolating point, although both measuring or isolating
30 points can be wired simultaneously through a test plug.

The invention is explained in more detail below on the basis of a preferred exemplary embodiment. In the figures:

Figure 1 shows an exploded representation of a
35 connecting or isolating block with a mounting trough, ground bus and protective plug,

Figure 2 shows a partial representation of the ground bus with the protective plug in the contacted state,

Figure 3 shows a perspective view from below of a protective plug without the second housing part, with a short printed-circuit board,

5 Figure 4 shows a perspective view from below of a protective plug without the second housing part, with a long printed-circuit board and two isolating contacts,

10 Figure 5 shows a cross-sectional representation of a protective plug according to Figure 4 with the second housing part,

Figure 6 shows a perspective plan view of a complete protective plug and

Figure 7 shows a perspective view from below of the complete protective plug.

15 Represented in Figure 1 is an exploded representation of a system, comprising a connecting or isolating block 1, a mounting trough 2, a ground bus 3 and a protective plug 4. The connecting or isolating block 1 comprises two clamping-latching elements 5, which latch into openings 6 of the mounting trough 2, whereby a part of the mounting trough 2 lying in front of the openings 6 is connected in an electrically conducting manner to a ground contact 7 of the connecting or isolating block 1.

25 The ground bus 3 comprises a base 8 with a bead 9 aligned parallel to the longitudinal direction of the connecting or isolating block 1. Arranged on the base 8 are ten insert tongues 10, which are arranged essentially perpendicular to the longitudinal axis of the base 8, the insert tongues 10 being arranged equidistant from one another. The insert tongues 10 are resiliently designed as forked contacts. The forked contacts are described in more detail later with reference to Figure 2. Furthermore, arranged on the sides of the ground bus 3 are two U-shaped bends 11, on the lower legs of which there is respectively arranged a further forked contact 12, which can be electrically connected to the ground contact 7 of the connecting or isolating block 1. As a result, the ground bus 3 can

30

35

be connected to ground via the ground contact 7 and the mounting trough 2.

The protective plug 4, in which for example surge protection elements are arranged, comprises two housing parts 13, 14, in which a printed-circuit board with functional elements is arranged, part of the printed-circuit board protruding out of the housing and forming an insert part 15. This insert part 15 can be inserted into a contact (not represented) in the connecting or isolating block 1. This contact is respectively assigned two insulation displacement contacts on the cable and jumper side of the connecting or isolating block 1. By inserting the insert part 15 in this contact, the insulation displacement contacts are electrically connected to the functional elements on the printed-circuit board. With the insertion of the insert part 15, the assigned insert tongue 10 at the same time penetrates into an insert channel of the protective plug 4 and contacts a ground contact in the protective plug 4, which is to be explained below with reference to Figure 2. In this case, the contacting of the ground contact in the protective plug 4 takes place at a time before the functional elements are connected to the insulation displacement contacts, so that there is always a secure ground connection of the functional elements.

Perspectively represented in Figure 2 is part of the ground bus 3 with the fitted-on protective plug 4, the housing part 14 being partially broken open for better representation of the contacting operation. The insert tongue 10, designed as a forked contact, has a downwardly directed curvature 16, so that the upper side of the housing part 14 terminates in a virtually planar manner with the base 8 of the ground bus 8 [sic], whereby neighboring connecting or isolating blocks are not hindered during the wiring. Furthermore, the insert tongues 10 have a slight curvature 17 in the upward direction, whereby the resilient action of the insert tongue 10 is increased.

On the side facing away from the base 8, the insert tongues 10 have contact points 18, which establish the actual electrical contact with respect to a ground contact 19 on the printed-circuit board in the protective plug 4. The contact points 18 are designed in the inward direction in the form of segments of an arc of a circle. When the insert tongue 10 is inserted into the insert channel of the protective plug 4, the two contact points 18 press resiliently against the planar side walls of the ground contact 19 and consequently establish a mechanical and electrically stable contact, the ground contact 19 being fastened in a mechanically rigid manner on the printed-circuit board. In this case, the resiliently designed contact points 18 can compensate very easily for mechanical tolerances of the ground contact 19 or of the printed-circuit boards or of the housing of the protective plug 4 and ensure a reliable electrical contact. As can easily be seen, the quality of the electrical contact between the contact points 18 and the ground contact 19 can be improved by their geometries being made to match one another. If, for example, the ground contact 19 is designed as an upright cylindrical pin, the contact points 18 are preferably designed as planar surfaces.

For reasons of mechanical stability, the first housing part 13, forming a relatively large installation space, is formed with beads 20, 21 at the sides and the rear side. Furthermore, the housing part 13 has openings 22, 23, into which complementary latching lugs of the second housing part can be latched. Furthermore, on the rear side of the protective plug 4 there is a slit 24, via which an optional isolating or measuring point on the printed-circuit board can be wired through a measuring or test plug.

In Figure 3, the protective plug 4 is represented without the second housing part 14. Resting on a support of the first housing part 13 is a printed-circuit board 25, on the underside of which the

ground contact 19 is arranged in a mechanically rigid manner. The ground contact 19 is either mounted in a through-hole through the printed-circuit board 25 or electrically plated-through at a point to the upper side and electrically connected to the ground leads of the functional elements arranged on the upper side, such as for example a surge arrester. The first housing part 13 is designed with positional securements 26, which partly penetrate the printed-circuit board 25 and fix it with respect to the housing part 13.

Represented in Figure 4 is a relatively long printed-circuit board 25, on which two isolating contacts 27 which can be wired from outside via the slit 24 are additionally arranged.

In Figure 5, the protective plug 4 according to Figure 4 is represented in cross section with the second housing part 14. The protective plug 4 comprises a first housing part 13, a second housing part 14 and the printed-circuit board 25. The printed-circuit board 25 in this case rests on supporting surfaces 28 of the housing part 13. Arranged on the upper side of the printed-circuit board 25 are a surge arrester 29, two PTC thermistors 30 and two diodes 31, which form a graded protection device. Arranged on the underside of the printed-circuit board 25 are the ground contact 19 and the two isolating contacts 27. The ground contact 19 penetrates the printed-circuit board 25 and is electrically connected to the center tap 32 of the surge arrester 29. The ground contact 19 is accessible from the outside via an opening 33. The isolating contact 27 is securely connected to the printed-circuit board 25, or clamped in, in the region of the supporting surface 37. Toward the rear side, the isolating contact 27 is formed with a cranked offset and is connected in an electrically conducting manner to the functional elements on the upper side of the printed-circuit board 25 via an electrical contact pad 34 of the printed-circuit board 25. The isolating contact 27 in this case lies electrically behind the

functional elements, so that the isolating contact 27 is protected against surges. Arranged in the second housing part 14, on the end face, is the insert channel 35, through which the insert tongue of the ground bus
5 can penetrate into the protective plug 4. The printed-circuit board 25 has a plurality of apertures, through which the positional securement 26 and various latching means 36 of the first housing part 13 pass and form a latching connection with the second housing part 14.
10 The part of the printed-circuit board 25 protruding out of the first and second housing parts 13, 14 forms the insert part 15. As clearly revealed by the representation, all the current-carrying parts are insulated with respect to the outside by means of the
15 housing parts 13, 14.

In Figures 6 and 7, the protective plug 4 is perspectively represented in the completely assembled state.

List of reference numerals

1	connecting or isolating block
2	mounting trough
3	ground bus
4	protective plug
5	clamping-latching element
6	opening
7	ground contact
8	base
9	bead
10	insert tongue
11	U-shaped bend
12	forked contact
13	first housing part
14	second housing part
15	insert part
16	curvature
17	curvature
18	contact point
19	ground contact
20	bead
21	bead
22	opening
23	opening
24	slit
25	printed-circuit board
26	positional securement
27	isolating contact
28	supporting surface
29	surge arrester
30	PTC thermistor
31	diode
32	center tap
33	opening
34	plated-through-hole
35	insert channel
36	latching means
37	supporting surface

Ground bus and protective plug for a connecting or isolating block in telecommunications and data technology

Patent claims

1. A ground bus for a connecting or isolating block in telecommunications and data technology, comprising a base on which insert tongues which can be inserted into insert channels of a protective plug are arranged according to the number of double cores to be wired, and comprising at least one ground contact, via which the ground bus can be connected to ground, wherein the insert tongues (10) are of a resilient design.
2. The ground bus as claimed in claim 1, wherein the insert tongues (10) are designed as forked contacts.
3. The ground bus as claimed in claim 1 or 2, wherein the insert tongue (10) is formed with a downwardly directed curvature (16).
4. The ground bus as claimed in claim 2 or 3, wherein the forks of the forked contacts are angled away outward on the side facing away from the base (8).
5. The ground bus as claimed in one of claims 2 to 4, wherein the contact points (18) of the forks are designed in a planar form or in the form of a segment of an arc of a circle.
6. The ground bus as claimed in one of the preceding claims, wherein the ground contact (12) is designed as a forked contact.
7. The ground bus as claimed in claim 6, wherein the forked contact can be connected to a ground contact (7) of the connecting or isolating block (1).
8. A protective plug for a connecting or isolating block in telecommunications and data technology, with a ground bus as claimed in one of the preceding claims, comprising a housing in which functional elements are arranged, an insert channel for receiving an insert

tongue of a ground bus, at least one ground contact, which in the fitted-on state can be electrically connected to the insert tongue, and an insert part, wherein the ground contact (19) is mounted in a mechanically rigid manner in the plug housing.

9. A protective plug as claimed in claim 8, wherein the functional elements (29 - 31) and the ground contact (19) are arranged on a printed-circuit board (25).

10. The protective plug as claimed in claim 9, wherein the functional elements (29 - 31) are arranged on the upper side and the ground contact (19) is arranged on the underside of the printed-circuit board (25).

11. The protective plug as claimed in one of claims 8 to 10, wherein the ground contact (19) is formed in the contact region as a cuboidal platelet or in a cylindrical form.

12. The protective plug as claimed in one of claims 9 to 11, wherein supporting points (28) for the printed-circuit board (25) exist in and on the housing.

13. The protective plug as claimed in one of claims 10 to 12, wherein the housing is of a two-part design, the first housing part (13) defining a relatively large installation region, which essentially receives the functional parts (29-31), and the second housing part (14) serving for receiving the ground contact (19), arranged on the underside of the printed-circuit board (25), and being formed with the insert channel (35).

14. The protective plug as claimed in claim 13, wherein the two housing parts (13, 14) can be latched together.

15. The protective plug as claimed in one of claims 8 to 14, wherein at least one measuring and isolating point (27) is arranged in the housing and is accessible from the outside, from the side facing away from the insert part (15).