

RADIATION PROTECTIVE DEVICE FOR THE LEAD-THROUGH OF CABLES

The present invention relates to a protective device for damping the passage of a pulsating, high-frequency electromagnetic radiation through a fire protecting lead-through or transit intended for the accommodation of metal-encased electric cables with external insulation through an opening in a metal wall, said lead-through comprising a metal frame the opening of which is filled partly with modularly dimensioned packing pieces of which at least one is provided with through-holes for the passage of a cable; partly with stiffening metal plates or stay strips which are inserted between horizontal rows of packing pieces for stabilizing the block formed by the packing pieces and which are in mechanical engagement with the frame; and partly an arrangement for the compression of said block.

It has been known for long that the atmospheric discharge created in thunderstorms, due to the electromagnetic radiation occurring in the form of a wave of short duration, can have seriously disturbing effects on the power network, the telecommunications and signal system, sometimes putting sensitive components out of order, or even causing their breakdown. In the last few decades however, observations have increasingly been made as to the devastating effects caused by nuclear discharge, resembling in many aspects this atmospheric discharge although involving more severe damages due to the higher degree of energy and frequency. A nuclear reaction produces an electromagnetic pulse, EMP in short, that is a very brief transient high-frequency wave giving rise to currents, and thereby voltages, of high magnitudes being induced in the cable network to which may be connected electronic units. Such units include semiconductor elements which are particularly sensitive to EMP and therefore easily broken down. While thunderstorms are more or less locally restricted, EMP is widely spread over very

large areas, the destructive effect thereby being considerably more extensive.

To this end, attempts have been made to achieve protection
5 against electromagnetic pulses of the EMP type, inter alia by
embedment in the packing piece material of electrically charged
particles of aluminium for example. Upon compression and deformation
of the packing pieces, these particles are said to be displaceable in
10 relation to each other while forming an electrically conductive
shield. There are however no further details available whatsoever as
to the shape, dimension and orientation of said particles, and
therefore this shield-forming property seems unlikely to exist. On
the other hand, there could hopefully at most occur a net with very
irregular meshing, which would however constitute no protection
15 against said EMP.

A lead-through of the kind mentioned by way of introduction,
known from inter alia Swedish Patent Specification 152,815, lacks
protection against all types of radiation, including EMP.

The invention is therefore based on the intention of
20 developing a protective device for this type of lead-through which
would effectively discharge the currents, induced in the cables by
EMP, down to earth interrupting in this way the direct radiation
through the frame while simultaneously being easy to design. The
protective device is particularly intended for use in accommodating
25 relatively weakly dimensioned cables for telecommunications and
signalling purposes.

Accordingly the present invention provides a shielding
device for a cable, comprising a metal frame adapted to fit in an
aperture in a wall through which the cable is to be passed, and a set
30 of packing pieces adapted to fit around the cable to take up the space
between the cable and the frame; each packing piece including a shield
member comprising a metal plate having a flanged outer edge and
extending over the entire cross-sectional area of the packing piece
parallel to the wall, and having a flanged inner edge adapted to fit
35 around the cable, whereby, in use, the packing pieces fit together in

the aperture and surround the cables, with the shield members of adjacent packing pieces in contact so as to form a continuous metal shield over the area of the aperture.

The invention also extends to a protective device made of metal shield plates which are each introduced in its own individual packing piece in a plane parallel with the packing piece block, each shield plate associated with its respective through-bored packing piece having an opening adapted to the outer diameter of the cable casing and the edge of said opening being in electrically conductive engagement with the cable casing so that the shield plates, together with the passed-through cables, will cover the entire cross sectional area of each packing piece, forming upon compression of the block a continuous metal shield which is in electrically conductive connection with the frame, the stay strips and the cable casings.

Due to the protective device being designed as a continuous metal shield, the aforementioned disadvantages involving the formation of a net having larger or smaller meshes will be completely eliminated. Tests carried out have indicated a damping effect in the ratio of about 50000:1 between the potentials on the front, i.e. the side subjected to flames, of the lead-through and the rear side thereof, obtaining thereby completely harmless values for semiconductor components.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings, wherein,

Figure 1 is a front view of a prior art lead-through on which the invention is applied,

Figure 2 is a cross-sectional view along the line II-II in Figure 1,

Figure 3 is a view along the line III-III in Figure 2, and

Figure 4 is a perspective view of a packing piece without through-holes for the accommodation of cables.

The lead-through illustrated in Figure 1 comprises a frame 1 of metal which is secured, e.g. by welding, in an opening of a wall 2 made of steel and indicated at the bottom of Figure 2, said frame defining in itself an opening which in a manner known per se is filled

partly with modularly dimensioned packing pieces 3, 4; partly with stay strips 5 of metal, disposed between rows of packing pieces and serving to stabilise the block formed of packing pieces 3, 4; and partly with an arrangement for compressing said block and consisting of conventional components such as a press plate 6, an end seal 7 with clamping means 8 and a pressing screw (not shown); all these parts being made of metal.

The packing pieces can either be so-called zero modules 4 which are not intended for the passage of cables

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and therefore have no through-bores for this purpose, or they can be packing pieces 3 provided with such bores. Said through-bores are formed of semi-circular recesses made in the surface of two packing piece halves of identical shape. A packing piece half of this kind with such a recess is illustrated more closely in Fig. 3. All packing pieces 3,4 consist to advantage of the type of material suggested in e.g. Swedish Patent Specification 176 057 and have specific fire protective characteristics.

According to the invention, the electric cables 9 shown in Figs. 1-3 and intended for through-passage should be provided with an unbroken, and thus non-braided casing 10 of metal, usually lead or aluminum, which is normally enclosed in jackets for reinforcement and insulation. Said cables 9 are primarily intended to transmit control and information signals and are for this reason of comparatively small dimensions. Wherever heavier cable dimensions appear on the drawing, a larger scale has been used to better clarify the construction.

The stay strips 5 should furthermore be made of brass or some other metal having comparatively good conductivity.

In order now to achieve the desired damping of the pulsating radiation mentioned in the introduction, there is introduced according to the invention a shield plate of metal into each packing piece 3,4 in a plane parallel to the wall, so that the plate, together with the cable if applicable, will cover the entire cross-sectional area of each packing piece, creating in this way a continuous metal shield.

Each shield plate 11 is preferably made of brass and has a thickness in the order of tenths of a millimeter.

To enable introduction of the shield plate 11 into a zero module 4, the module 4 is divided into two halves

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along a plane perpendicular to the direction of the cables 9, the plate 11 thereafter being attached to the cut surface of one half by gluing or the like, the other half being similarly fixed to the plate. If the packing
5 pieces are shorter, measured along the cables, compared to the depth of the frame, there is of course no need for such splitting.

As to the through-bored packing piece 3 this piece, consisting of two halves, is cut in the same manner as is
10 the zero module 4. In this case the shield plate 11 associated with its respective packing piece half is provided with a semi-circular cut-out adapted to the recess made in the corresponding packing piece and having a radius such that it projects into the recess of the packing piece 3,
15 the edge thereof facing the cable 9 being bent to form a collar 13 which is intended for electrically conductive contact with the metal casing 10 of the cable 9, after removal of insulation, if any. This is shown in Fig. 3.

In order to obtain a safe, electrically conductive
20 connection between the different shield plates 11, as well as contact with the stay strips 5 and the inside of the frame opening, the outer edge of the shield plates is furthermore bent so as to form a peripheral flange 12.

In order to additionally guarantee a satisfactory
25 connection, the shield plate 11 for each half of a packing piece 3 has also its edge between the flanges 12,13, shown in Fig. 3 for example, bent into a flange which, upon assembly of the packing piece halves, will come into abutting engagement with a corresponding flange on the
30 shield plate 11 of the other packing piece half.

As a result of this design of the shield plate 11 there is accomplished a continuous metal shield which is in electrically conducting engagement with the frame 1, the stay strips 5 and the metal casings 10 of the cables
35 9. The voltage caused by the appearance of an electromagnetic pulse is thus discharged to earth via the frame 1 and the wall 2.

In order to shorten the discharge paths, it is advisable to interlink the stay strips 5 with the aid of one or more connecting rods 14 as shown in Figs. 1 and 2.

CLAIMS

1. A shielding device for a cable, comprising a metal frame adapted to fit in an aperture in a wall through which the cable is to be passed, and a set of packing pieces adapted to fit around the cable to take up the space between the cable and the frame; each packing piece including a shield member comprising a metal plate having a flanged outer edge and extending over the entire cross-sectional area of the packing piece parallel to the wall, and having a flanged inner edge adapted to fit around the cable, whereby, in use, the packing pieces fit together in the aperture and surround the cables, with the shield members of adjacent packing pieces in contact so as to form a continuous metal shield over the area of the aperture.
2. A shielding device for damping the passage of pulsating, high-frequency electromagnetic radiation through a fire-protecting transit accommodating metal-encased electric cables with exterior insulation led through an opening in a metal wall, said transit or lead-through comprising a metal frame having its opening filled partly with packing pieces of which at least one has through-holes for the passage of a cable; partly with stay strips of metal which are inserted between rows of packing pieces for stabilising the block formed by the packing pieces and which are mechanically connected to the frame; and partly an arrangement for compressing said block, characterised by shield plates of metal which are each introduced in its own individual packing piece in a plane parallel with the wall each shield plate associated with its respective through-bored packing piece having an opening adapted to the outer diameter of the cable casing, the edge of said opening being in electrically conductive engagement with the cable casing so that the shield plates, together with the passed-through cables, extend over the entire cross-sectional area of each packing piece, forming upon compression of the block a continuous metal shield which is in electrically conductive connection with the frame, the stay strips and the cable casings.



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3. A shielding device as claimed in claim 2, characterised in each shield plate is bent along its outer edges to form a flange which is in electrically conductive engagement outside the packing piece with corresponding flanges on adjacent shield plates, with the stay
5 strips and with the inner wall frame opening.

4. A shielding device as claimed in claim 2 or 3, characterised in that the opening of each shield plate associated with its respective through-bored packing piece is thrust with its edge into
10 the packing piece bore while being bent to form a collar-shaped flange which is adapted to make electrical contact with a cable casing after its exterior insulation has been stripped off.

5. A shielding device as claimed in claim 2, 3 or 4
15 characterised by one or more connecting rods of metal which provide for an electrically conductive interconnection of the stay strips.

6. A shielding device substantially as hereinbefore described with reference to and as shown in the accompanying drawing.
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