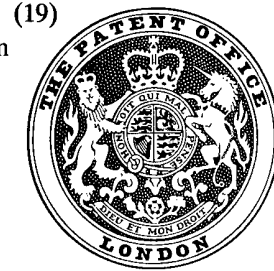


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(54) CABLE FITTING BOX PROVIDED WITH A SEALING MEMBER

(71) We, N.K.F. KABEL B.V., a Limited Liability Company existing under the laws of the Kingdom of the Netherlands and residing at Schieweg 9, Delft, in The Province of South Holland, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: 5

This invention relates to a cable fitting box, for an electric cable, and of the kind which in operation contains a fluid dielectric medium, said fitting box comprising a sealing member formed of an elastic material and a fastening assembly which in operation is fastened to the sealing member, and wherein in operation said sealing member encloses the cable insulation to preclude entry of the fluid dielectric medium axially along the insulation of the cable. 10

The expression "cable fitting box" as used throughout this specification is understood to include a cable fitting box of the aforesaid kind for mounting on an electrical cable and particularly to terminal fitting boxes for cables, for example, electric power cables and includes entry fitting boxes for electric cables and to joint fitting boxes for electric cables. 15

The boxes when in the assembled and mounted condition are filled with a dielectric medium, for example a highly viscous liquid such as oil or an insulation gas under pre-ssure. In general, the electrical properties of such mounted cable fitting boxes are detrimentally affected if leaks of the dielectric medium occur which enable the dielectric medium to flow away. If the aforesaid dielectric media penetrate axially into parts of the cable a deterioration of the electrical proprties of the cable may result. This can especially be the case with high voltage power cables where the insulation can be provided with a conducting or a semi-conducting coating which serves as a core shield. 20

In prior art constructions an annular sealing member of a flexible rubber material is usually used for sealing synthetic resin material high-voltage cables in a fitting box which member is clamped by means of metal hold-down means against the cable insulation (see, for exaple, United States Patent No. 3,721,745). Synthetic resin material filled cable fitting boxes alternately expand and shrink owing to variations in electrical loads which are accompanied by an increase or a decrease of the temperature of the cable. With the prior art construction of the sealing members there is the risk that the cable insulation can become constricted at the place of application of the sealing member. Over a period of time the seal will then prove to be insufficiently resistance against the dielectric medium, which, in general, is under pressure inside the fitting. In addition, unwanted field concentrations occur in the insulation material of the cable which may give rise to deterioration problems known as treeing. An axial movement of the cable with respect to the box can also occur in addition to the radial expansion temperature cycles due to the load variations to which the cable is normally exposed. The sealing member must therefore also be able to take up this axial movement. This is not possible or is only possible to a limited extent with the construction according to United States Patent No. 3,721,745 owing to friction forces which occur between the cable insulation and the sealing ring which is clamped thereto. 25 30 35 40

Furthermore, a good seal is also important because core shields of cables are usually, as explained above, not resistant to the commonly used dielectric media, such as, for example, insulation oil.

According to the present invention there is provided a cable fitting box, for an electric cable, and of the kind which in operation contains a fluid dielectric medium, said fitting box 45

comprising a sealing member formed of an elastic material and a fastening assembly which in operation is fastened to the sealing member, and wherein in operation said sealing member encloses the cable insulation to preclude entry of the fluid dielectric medium axially along the insulation of the cable, characterised in that the elastic sealing member comprises a hollow cylindrical part adopted to form a seal by resiliently gripping around a coating of the cable insulation and wherein said cylindrical part has a radially outwardly extending flange intermediate its end, and said fastening assembly comprises means for rigidly clamping the radially outwardly extending flange at its periphery so as to exert on it a force in a direction parallel to the axis of the cable, so that in operation, when gripped by the hollow cylindrical part of the sealing member axial movement of the cable relative to the fastening means can take place.

In one embodiment the hollow cylindrical part the sealing member consists of a weakly electrical conductive material.

The flange may be provided at its periphery with a toroidal shaped thickening for cooperation with the clamping means of the cable fitting box, the ends of the cylindrical part of the sealing member.

The sealing member may consist of a synthetic or natural rubber which may be made weakly electrically conductive, for example, by the addition of graphite powder, which may be advantageous from the electrical point of view. In addition, the fitting box may comprise known electric field-controlling means which are accommodated in the space occupied by the dielectric medium.

The cable fitting box of the invention in the mounted condition, on the cable can be evacuated of air and thereafter filled with the dielectric medium, for example oil or a gas, to a pressure exceeding 1 atmosphere, for which an opening which can be closed is provided in a suitable place. By way of illustration an embodiment of a cable fitting box embodying the invention will now be described in further detail with reference to the accompanying drawing.

In the drawing Figure 1 shows, partly in cross-section a portion of a cable fitting box in the form of a terminal fitting box for a synthetic resin insulated high-voltage power cable and Figure 2 shows in more detail, a cross-sectional view of the feed-in construction of the cable fitting box of Figure 1 a more detailed view, Figure 2, indicated as being within the inserted broken lines of Figure 1. In Figure 1 reference 1 indicates a portion of a glazed porcelain insulator, the wall whereof has been partly removed to display the interior. The terminal fitting box at the end of the porcelain insulator is covered at the bottom with a base plate 2 with raised edge 3 which is connected to the porcelain insulator by means of a ceramic cement 4. The Figure also shows fastening means 5 which are connected to the metal base plate by means of bolts. A cable 6 is inserted into the interior of the porcelain insulator 1 through an opening in the base plate 2. To this end the base plate 2 is provided with fastening and sealing means consisting of a metal cylindrical cable entrance 7 (Figure 2) provided at the bottom with a screwthread which screws on to the screwthread at the inside of a metal cap 8. The purpose of this cap 8 is to hold down the sealing rings 9, 10 and 11 so that a moisture-tight seal can be obtained.

At the side facing away therefrom, the cylindrical cable entrance 7 is provided with a circular recess 11 in which an O-ring 12 of an elastic material is accommodated, a screw thread 13 which screws onto a screwthread at the inner wall of a metal fastening cylinder 14 and a beveled edge portion around which the metal armouring wires 6C can be folded back and clamped by means of a pressure ring 17 which is enclosed against a projecting edge at the inner wall of the fastening cylinder 14. Before the cable 6 is introduced into the terminal fitting box portions of the cable including a portion of a sheath 6A, metallic earth shield 6B, armouring 6C and a weakly conductive paper tape winding 6D are removed so that the cable insulation provided with a semiconductive coating 6E is exposed. Sealing member 16 is pushed on this exposed portion. The sealing member 16 is of an oil-resistant elastic material, for example of a natural or a synthetic rubber, and comprises a cylindrical portion 16A having an inside diameter which is slightly smaller than the outside diameter of the semiconductive coating 6E of the cable insulation. The pushing action on the sealing member 16 can be facilitated by applying a lubricant for example, graphite powder to the surface of the cable insulation. The sealing member 16 also has an outwardly extending flange 16B, which in the embodiment illustrated is situated approximately in the central position between the two ends of the cylindrical part 16A. In the embodiment shown in the drawing the flange is provided around the periphery with a toroidal-shaped thickening 16B which when assembled is enclosed between a clamp 18 and the fastening cylinder 14 which are interconnected by means of a plurality of bolts, two of which are shown in the drawing: the clamp 18 and cylinder 14 thus rigidly clamp the flange 16B in position by exerting on it forces in a direction parallel to the axis of the cable. After the cable 6 has been introduced and mounted in the manner shown in the Figures of the accompanying drawings the open

space in the porcelain insulator is evacuated and thereafter filled with insulating oil. It was found for the cable fitting under varying electrical loads passed through the cable and the cable fitting which caused both axial and radial cable movements relative to the fastening assembly, that the oil-filled part remained sealed without leakage past the sealing member

5 16. This was due to the resilient flexibility of the elastic annular sealing member; and that it was also found the insulation 6E was not constricted. 5

WHAT WE CLAIM IS:-

1. A cable fitting box, for an electric cable, and of the kind which in operation contains a fluid dielectric medium, said fitting box comprising a sealing member formed of an elastic material and a fastening assembly which in operation is fastened to the sealing member, and wherein in operation said sealing member encloses the cable insulation to preclude entry of the fluid dielectric medium axially along the insulation of the cable, characterised in that the elastic sealing member comprises a hollow cylindrical part adapted to form a seal by resiliently gripping around a coating of the cable insulation and wherein said cylindrical part has a radially outwardly extending flange intermediate its ends, and said fastening assembly

10 15 15

15 comprises means for rigidly clamping the radially outwardly extending flange at its periphery so as to exert on it a force in a direction parallel to the axis of the cable, so that in operation, when gripped by the hollow cylindrical part of the sealing member axial movement of the cable relative to the fastening means can take place.

2. A cable fitting box according to Claim 1 in which the sealing member consists of a weakly electrically conductive material. 20

3. A cable fitting box as claimed in Claim 1 or Claim 2 in which the flange of the sealing member is provided at its periphery with a toroidal shaped thickening for cooperation with the clamping means of the cable fitting box.

4. A cable fitting box as claimed in Claim 1 substantially as hereinbefore described with reference to the accompanying drawings. 25

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COMPLETE SPECIFICATION

2 SHEETS

This drawing is a reproduction of the Original on a reduced scale

Sheet 1

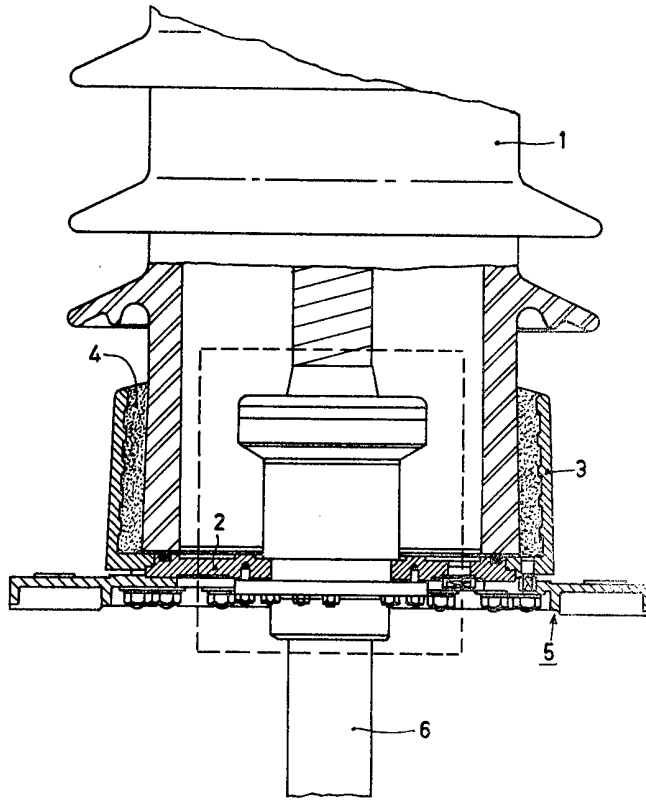


Fig. 1

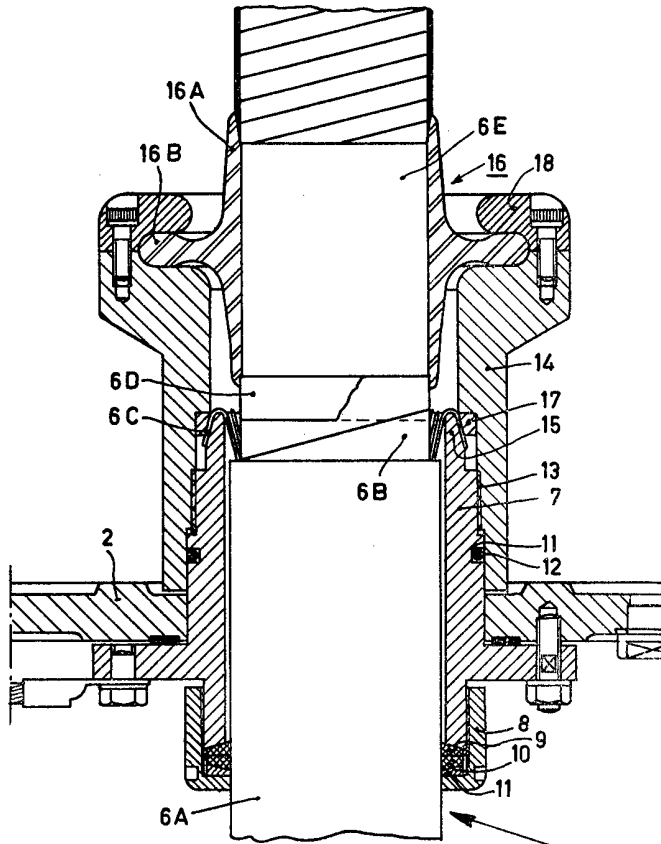


Fig. 2