

PATENT SPECIFICATION (11)

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(54) ELECTRIC CABLE JOINT ENCLOSURES AND MEANS FOR MAKING THEM

(71) We, BRITISH INSULATED CABLES LIMITED, a British Company, of 21 Bloomsbury Street, London, W.C.1, 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:—

This invention relates to enclosures for electric cable joints, more especially (but not exclusively) for joints of low voltage power cables, for example consumers' service joints.

Conventionally such joints have been enclosed in cast iron boxes with their lids appropriately apertured for filling with a hot-pouring insulating compound. Pressed sheet metal boxes and earthenware boxes have sometimes been used, but without any basic change in the structure of the box.

Now that compression jointing and mechanical connections have largely replaced soldering in making the electrical connections in such joints it has become feasible to avoid the use of heating equipment, for example gas cylinders, on site by using cold-setting resinous filling compounds. However such compounds are expensive compared with the usual bituminous hot-pouring compound, and to compensate for this it is desirable to take advantage of the greater mechanical strength of the cold-setting resinous compounds by forming the joint enclosures of a material that is more readily formed into an intricate shape to minimise the volume of compound and is preferably such that the enclosures are intrinsically cheaper than the boxes referred to. Experiments have been carried out with various designs of plastics box: these designs have not been entirely satisfactory because if made of cheap material with poor mechanical properties and consequently with very thick walls they have tended not to withstand thermal cycling or if made of more expensive material in sheet form sufficiently thin, to be economically formed to

the desired shape they have tended to be too flimsy when heated by the curing exotherm of the filling compound (i.e. the heat evolved by the curing reaction) to support the weight of the compound without deformation.

In accordance with the present invention, an electric cable joint enclosure comprises a pair of half-shells formed from stiff plastics sheet material assembled with first and second edge portions thereof in face-to-face contact on opposite sides of the joint cavity and together forming stiffening flanges that extend over at least a major part of the length of the enclosure. Adjacent the first edge portion of at least one half-shell is means for forming when that edge portion is uppermost a pouring aperture that communicates with the joint cavity for entry of compound, and passages for venting of displaced air are provided if the shape of the joint cavity makes it necessary (as it usually will). The preferred means for forming a pouring aperture is a recess created by forming the sheet material, which recess may but need not co-operate with a similar recess in the other half-shell.

Apart from the filling arrangements just described, the joint cavity is preferably shaped to correspond closely with the shape of the jointed cables (this expression as used herein including connectors used in jointing the cables) to be contained therein, allowing so far as possible only sufficient clearance to obtain in all cases a sufficient thickness of compound to ensure adequate electrical insulation, waterproofing and mechanical protection in the completed joint. Apart from the saving in resin, such shaping improves rigidity, in many cases.

Mechanical connectors are preferably used.

The flanges are preferably flat and preferably coplanar. Each end of the enclosure is preferably shaped to conform with the shape of the or each cable that is to enter at that end, so that very simple sealing

means suffices. In many cases it is possible to use identical half-shells, with a consequent saving in tooling cost.

5 The shells may be made by vacuum forming or pressing, examples of suitable sheet materials being stiff polyvinyl chloride (p.v.c.), copolymers of acrylonitrile, butadiene and styrene (a.b.s.), "rigid" polyethylene and high-impact polystyrenes of appropriate thickness. By way of example
10 it is mentioned that for a typical service joint stiff p.v.c. sheeting of the kind used in making corrugated building sheets and about 1.5 mm thick is suitable.

15 The half-shells may be secured together in various ways. It may in some cases be sufficient to secure the half-shells together by adhesive tape alone but in other cases bolts, clips or staples may be used, and the lower joint between the half-shells may be
20 sealed with adhesive tape, or they may be supplied already sealed together at the lower flange by an adhesive or by welding, preferably either ultrasonic welding or solvent welding.

25 The main advantages of the invention are that the flanges stiffen the shells to resist deformation by the weight of the resin when softened by the curing exotherm and that by placing the filling aperture and vent passages adjacent to an edge of the half-shell the necessary shaping is simplified.

30 The invention includes joints incorporating the enclosure described in which filling resin preferably adheres to the half-shells.

35 The invention will be further described, by way of example, with reference to the accompanying drawings in which:

40 Figure 1 is a perspective view of two half-shells constituting one form of enclosure in accordance with the invention;

45 Figure 2 is a perspective view showing a modified form of enclosure assembled about jointed cables and ready for introduction of resin, and

50 Figures 3 and 4 are transverse cross-sections on planes indicated at III—III and IV—IV in Figure 2 through a completed joint in accordance with the invention.

55 The enclosure shown in Figure 1 comprises two half-shells, 1, 2 which are identical (and not mirror images of one another) made of the pvc sheeting hereinbefore referred to. The edge portions of the half-shells, 3, 4, 5 are flat and coplanar and when the half-shells are assembled they are in face-to-face contact over the major part of their area at the top and bottom of the enclosure.

60 The shape of the cavity formed when the half-shells of the enclosure are assembled can be most readily understood if it is regarded as consisting of a main section and a number of enlargements. The main section
65 at each end of the enclosure is of circular

cross-section, seen at 6, surrounding the mains cable and increasing somewhat in diameter towards the centre of the joint. A central enlargement 7 is of cylindrical form and accommodates phase connectors and two
70 assymmetrically placed enlargements 8 receive a pair of neutral connectors. Further enlargements merge into branch cavities 9 through which the service (branch) cables enter the joint enclosure. Above each of
75 the enlargements 8, the corresponding half-shell is formed at its edge to define an aperture 10, and when the joint is otherwise complete liquid resin is poured into one of these apertures to fill the joint. To avoid
80 trapping air, the three high points of the cavity are vented by shallow enlargements 11, 12 passing upwardly to the adjacent aperture.

85 The modification shown in Figure 2, which is currently the preferred design, differs only in that the central enlargement 7 is vented direct to the atmosphere through a separate aperture 13 and the enlargement
90 12 is less clearly differentiated from the branch cavity 9. The aperture 13 also acts as a reservoir of resin to compensate for any contraction during curing.

95 Figure 2 shows the mains cable 14 and two branch cables 15 in position, and also shows a lead 16, connected to one of the neutral connectors, emerging through one of the apertures 10 (the one not seen in this figure and preferably used as a vent aperture) for connection to an external earthing
100 electrode.

105 In the cross-section of Figure 3 are seen the phase conductors of the mains cable and one of the branch cables, 17 and 18 respectively, with the mains and branch neutral conductors (19 and 20 respectively) connected by a neutral connector 21 which is shown for the purpose of illustration as being of the preferred form of connector described and claimed in accordance with
110 copending British Patent Application No. 15596/71 (now Patent No. 1,366,684), in which the mains cable neutral wires 19 are bunched and received in a channel-shaped recess 22 having a ribbed base 23 and
115 damped by a series of screws 24 threaded in an insert 25 slidably engaged with the connector body, and the branch cable neutral conductor is received in a separate bore in the connector body and clamped by a series
120 of screws 26. A second bore 27 is provided for an earthing lead (as 16).

125 The main cross-section forming Figure 4 shows the phase conductors 17, 18 connected by insulation-piercing mechanical connectors 28 of the form shown in Figure 11 of copending Patent Application No. 24417/72 (Serial No. 1,395,063) of Burndy Corporation and BICC-Burndy Ltd. and claimed therein. (The construction of the
130

connector will be apparent from the drawing.) These may be enclosed in individual insulating covers (not shown) as claimed in copending British Patent Application No. 9844/72 (Serial No. 1,376,313) which are of assistance in avoiding accidental short-circuits whilst jointing is in progress and the mains cable energised. In this cross-section the neutral wires 19 of the main manner.

The extreme ends of the half-shells are stepped down to fit closely at 29, 30 (Figures 1 and 2) round the entering cables; these ends can then be sealed with putty or even adhesive tape. As already indicated, the longitudinal edges of the half-shells may be secured by bolts passed through the holes 31 (Figure 1) and/or by adhesive tape 32 (Figure 2) or the edge portions 3 may be permanently secured together.

If only one branch cable is to be accommodated, one of the cable entry apertures at 30 may be closed, e.g. with a cable offcut or a stopper or with putty; or if more than two service cables are required the shape of the enclosure may be modified to admit them.

WHAT WE CLAIM IS:—

1. An electric cable joint enclosure comprising a pair of half-shells formed from stiff plastics sheet material assembled with first and second edge portions thereof in face-to-face contact on opposite sides of the joint cavity and together forming stiffening flanges that extend over at least a major part of the length of the enclosure, at least one of the said half-shells being formed adjacent one of the edge portions with means forming when the first edge portion is uppermost a pouring aperture that communicates with the joint cavity, passages for venting of displaced air being provided if the shape of the joint cavity makes it necessary.

2. An electric cable joint enclosure comprising a pair of identical half-shells formed from stiff plastics sheet material assembled with first and second edge portions thereof in face-to-face contact on opposite sides of the joint cavity and together forming stiffening flanges that extend over at least a major part of the length of the enclosure, at least one of the said half-shells being formed adjacent one of the edge portions with means forming when the first edge portion is uppermost a pouring aperture that communicates with the joint cavity, passages for venting of displaced air being provided if the shape of the joint cavity makes it necessary.

3. An enclosure as claimed in Claim 1 or Claim 2 in which the said stiffening flanges are flat.

4. An enclosure as claimed in Claim 3 in which the said stiffening flanges are coplanar.

5. An enclosure as claimed in any one of Claims 1—4 having the said pair of half-shells sealed together at the lower flange by an adhesive or by welding.

6. An enclosure as claimed in any one of Claims 1—4 assembled about jointed cables with the said half-shells secured together by adhesive tape and with the first edge portion uppermost.

7. An enclosure as claimed in any one of Claims 1—4 assembled about jointed cables with the said half-shells secured together by bolts, clips or staples and with the first edge portion uppermost.

8. An enclosure as claimed in Claim 7 having the lower joint between the half-shells sealed with adhesive tape.

9. An enclosure as claimed in Claim 6 or Claim 7 or Claim 8 in which the joint cavity is shaped to correspond closely with the jointed cables contained therein.

10. An enclosure as claimed in Claim 9 in which each end of the enclosure is shaped to conform with the shape of the or each cable that enters at that end.

11. An enclosure as claimed in any one of the preceding claims in which each half-shell is made of polyvinyl chloride or of a copolymer of acrylonitrile, butadiene and styrene or of "rigid" polyethylene or a high-impact polystyrene.

12. An enclosure as claimed in any one of the preceding claims in which the said half-shells define between them a cavity comprising a main section for surrounding a mains cable, enlargements to accommodate connectors and at least one branch cavity for a service cable to enter the enclosure.

13. An electric cable joint enclosure substantially as hereinbefore described with reference to the accompanying drawings insofar as the description is applicable to both Figure 1 and Figure 2.

14. An electric cable joint enclosure substantially as hereinbefore described with reference to and as shown in Figure 1 of the accompanying drawings.

15. An electric cable joint in which jointed cables are enclosed in an enclosure in accordance with any one of the preceding claims having its first edge portion uppermost and embedded in a cold-setting synthetic resin that fills the said enclosure.

16. A joint as claimed in Claim 15 in which the electric connections between the jointed cables are made by mechanical connectors surrounded by the said cold-setting synthetic resin.

17. An electric cable service joint sub-

connector will be apparent from the drawing.) These may be enclosed in individual insulating covers (not shown) as claimed in copending British Patent Application No. 9844/72 (Serial No. 1,376,313) which are of assistance in avoiding accidental short-circuits whilst jointing is in progress and the mains cable energised. In this cross-section the neutral wires 19 of the main manner.

The extreme ends of the half-shells are stepped down to fit closely at 29, 30 (Figures 1 and 2) round the entering cables; these ends can then be sealed with putty or even adhesive tape. As already indicated, the longitudinal edges of the half-shells may be secured by bolts passed through the holes 31 (Figure 1) and/or by adhesive tape 32 (Figure 2) or the edge portions 3 may be permanently secured together.

If only one branch cable is to be accommodated, one of the cable entry apertures at 30 may be closed, e.g. with a cable offcut or a stopper or with putty; or if more than two service cables are required the shape of the enclosure may be modified to admit them.

WHAT WE CLAIM IS:—

1. An electric cable joint enclosure comprising a pair of half-shells formed from stiff plastics sheet material assembled with first and second edge portions thereof in face-to-face contact on opposite sides of the joint cavity and together forming stiffening flanges that extend over at least a major part of the length of the enclosure, at least one of the said half-shells being formed adjacent one of the edge portions with means forming when the first edge portion is uppermost a pouring aperture that communicates with the joint cavity, passages for venting of displaced air being provided if the shape of the joint cavity makes it necessary.

2. An electric cable joint enclosure comprising a pair of identical half-shells formed from stiff plastics sheet material assembled with first and second edge portions thereof in face-to-face contact on opposite sides of the joint cavity and together forming stiffening flanges that extend over at least a major part of the length of the enclosure, at least one of the said half-shells being formed adjacent one of the edge portions with means forming when the first edge portion is uppermost a pouring aperture that communicates with the joint cavity, passages for venting of displaced air being provided if the shape of the joint cavity makes it necessary.

3. An enclosure as claimed in Claim 1 or Claim 2, in which the said stiffening flanges are flat.

4. An enclosure as claimed in Claim 3 in which the said stiffening flanges are coplanar.

5. An enclosure as claimed in any one of Claims 1—4 having the said pair of half-shells sealed together at the lower flange by an adhesive or by welding.

6. An enclosure as claimed in any one of Claims 1—4 assembled about jointed cables with the said half-shells secured together by adhesive tape and with the first edge portion uppermost.

7. An enclosure as claimed in any one of Claims 1—4 assembled about jointed cables with the said half-shells secured together by bolts, clips or staples and with the first edge portion uppermost.

8. An enclosure as claimed in Claim 7 having the lower joint between the half-shells sealed with adhesive tape.

9. An enclosure as claimed in Claim 6 or Claim 7 or Claim 8 in which the joint cavity is shaped to correspond closely with the jointed cables contained therein.

10. An enclosure as claimed in Claim 9 in which each end of the enclosure is shaped to conform with the shape of the or each cable that enters at that end.

11. An enclosure as claimed in any one of the preceding claims in which each half-shell is made of polyvinyl chloride or of a copolymer of acrylonitrile, butadiene and styrene or of "rigid" polyethylene or a high-impact polystyrene.

12. An enclosure as claimed in any one of the preceding claims in which the said half-shells define between them a cavity comprising a main section for surrounding a mains cable, enlargements to accommodate connectors and at least one branch cavity for a service cable to enter the enclosure.

13. An electric cable joint enclosure substantially as hereinbefore described with reference to the accompanying drawings insofar as the description is applicable to both Figure 1 and Figure 2.

14. An electric cable joint enclosure substantially as hereinbefore described with reference to and as shown in Figure 1 of the accompanying drawings.

15. An electric cable joint in which jointed cables are enclosed in an enclosure in accordance with any one of the preceding claims having its first edge portion uppermost and embedded in a cold-setting synthetic resin that fills the said enclosure.

16. A joint as claimed in Claim 15 in which the electric connections between the jointed cables are made by mechanical connectors surrounded by the said cold-setting synthetic resin.

17. An electric cable service joint sub-



stantially as hereinbefore described with reference to the accompanying drawings insofar as the description is applicable to both Figure 1 and Figure 2.

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