JOINTING METAL CABLE SHEATHS

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References Cited

UNITED STATES PATENTS
1,682,635 8/1928 Smith ........................................ 403/281
1,921,642 8/1933 Stephenson .............................. 403/281
2,173,643 9/1939 Moser ...................................... 174/88 C
3,068,315 12/1962 McGrath ............................... 174/21 R
3,245,027 4/1966 Ziegler ................................. 174/88 C
3,304,104 2/1967 Wilse ...................................... 174/84 R
3,744,130 7/1973 Papadopoulos et al. .................. 29/628
3,769,444 10/1973 Malik .................................... 174/89

ABSTRACT

A method of effecting a fluid-tight joint between an end of a metal cable sheath and another metal body having a throughbore comprises so shaping a length of the metal sheath adjacent to the end to be jointed that the length is radially spaced from the cable core or cores; either (a) introducing between said length of the metal sheath and the core or cores a length of the metal body or (b) both introducing between said length of the metal sheath and the core or cores a tubular metal mandrel and also arranging a length of the metal body to overlap said length of the metal sheath; and (in either case) permanently circumferentially compressing the assembly of metal bodies radially inwardly to effect a substantially fluid-tight joint between the metal sheath and the metal body.

7 Claims, 6 Drawing Figures
JOINTING METAL CABLE SHEATHS

This invention relates to methods of jointing the sheaths of single or multi-core metal sheathed electric cables and is especially, but not exclusively, concerned with jointing corrugated cable sheaths of aluminium or aluminium alloy.

It is the normal practice to effect a permanent fluid-tight connection between the sheath of a metal sheathed electric cable and a metal joint or termination enclosure or between the ends of the sheaths of two metal sheathed electric cables by means of a plumbed joint. However, the mechanical strength of plumbed joints can vary from joint to joint because it is directly dependent on the standard of workmanship of the operative effecting the joint and even those plumbed joints prepared by skilled operatives may be inherently weak in creep strength.

It is an object of the present invention to provide an improved method of effecting a fluid-tight joint between an end of a metal cable sheath and another metal body having a throughbore, which metal body may, for instance, be another length of metal sheath or a part of a metal joint or termination enclosure, the fluid-tight joint having a substantially improved long term mechanical strength as compared with a plumbed joint, even when the plumbed joint is prepared by a skilled operative.

In accordance with the invention the method comprises so shaping a length of the metal sheath adjacent to the end to be jointed that the length is radially spaced from the cable core or cores; introducing between said length of the metal sheath and the core or cores a length of the metal body or introducing between said length of the metal sheath and the core or cores a tubular metal mandrel and arranging a length of the metal body to overlie said length of the metal sheath and permanently circumferentially compressing the assembly of metal bodies radially inwardly to effect a substantially fluid-tight joint between the metal sheath and the metal body.

Where a length of the metal body is introduced between the length of the metal sheath and the core or cores preferably a metal sleeve is arranged to overlie the said length of metal sheath before permanent circumferential compression of the assembly of metal bodies is effected.

Preferably an elastomeric sealing ring is housed between the cable sheath and the contiguous surface of the other metal body. The metal body may be formed with an annular groove to receive the sealing ring but this is not necessary in all cases; where the sheath is located between the metal body and a metal sleeve, the sleeve may be grooved instead of the metal body itself, the ring being positioned on the opposite side of the sheath to the groove.

Preferably also to enhance the mechanical strength of the joint and to ensure that there is good electrical conductivity between the two bodies at least a part of the said surface of the metal body is serrated, knurled or otherwise roughened so that the protruberances of the roughened surface bite into the contiguous surface of the length of metal sheath when the assembly of metal bodies is permanently circumferentially compressed.

When the method of the present invention is to be employed to effect a fluid-tight joint between an end of a metal cable sheath and a part of a metal joint or termination enclosure, preferably an end wall of the enclosure has a sleeve integral with and extending longitudinally from one of its end faces and this sleeve will constitute the length of metal body to which the metal sheath is to be jointed. Preferably this integral sleeve extends outwardly from the end wall of the joint or termination enclosure but it may, if desired, extend inwardly of the enclosure. In this latter case the integral sleeve will be arranged to overlie a part of the metal sheath spaced from the end of the sheath and the length of metal sheath extending beyond the end of the integral sleeve may be folded back to overlie the external surface of the integral sleeve so that, in effect, the integral sleeve lies between a length of metal sheath and the core or cores.

Permanent circumferential compression of the assembly of metal bodies may be effected in any suitable manner and may be effected over substantially the whole length of the assembly or at one or more locations along its length.

Where the metal sheath is a corrugated sheath of aluminium or aluminium alloy or other metal the length of sheath that is to be jointed to the metal body is preferably stretched or otherwise treated to remove, or substantially reduce the size of, the corrugations in said sheath length. Removal or substantial reduction in the size of the corrugations in the length of metal sheath may be effected using the method and apparatus described and claimed in the Complete Specification of our British Pat. Appl. No. 8299/70 (now published under the Ser. No. 1,299,964).

The present invention also includes a fluid-tight joint between an end of a metal cable sheath and another metal body having a throughbore made by the method of the present invention.

The invention will be further illustrated by a description, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a fragmentary side elevational view, partly in section of one embodiment of fluid tight joint between an end of corrugated aluminium cable sheath and a metal joint enclosure;

FIG. 2 is a fragmentary side elevational view, partly in section, of a second embodiment of fluid tight joint according to this invention;

FIG. 3 is a fragmentary side elevational view, partly in section, of a third embodiment of fluid tight joint according to this invention;

FIG. 4 is a fragmentary side elevational view, partly in section, of a fourth embodiment in fluid tight joint according to this invention;

FIG. 5 is a fragmentary side elevational view, partly in section, of a fifth embodiment of fluid tight joint according to this invention; and

FIG. 6 is a fragmentary side elevational view, partly in section, of a sixth embodiment of fluid tight joint according to this invention.

Referring to the drawings, in the fluid-tight joint shown in FIG. 1 and end wall 1 of a joint enclosure has an integral outwardly extending sleeve 2 which is introduced between a stretched length 3 of aluminium sheath and the core or cores. The sleeve 2 has two circumferential grooves 4 in which are housed O-rings 5 and is knurled or serrated at 6. An aluminium sleeve 7 overlies the sheath length 3 and is permanently circumferentially compressed to effect a fluid-tight joint between the sheath and end wall of the joint enclosure. A
poultice 10 is temporarily applied to limit escape of insulating fluid from the core or cores during the jointing process.

In the fluid-tight joint shown in FIG. 2 a mandrel 18 is introduced between a stretched length 13 of aluminum sheets and the core or cores and a sleeve 12 integral with and extending outwardly from an end wall 11 of the joint enclosure is arranged to overlie the sheath length 13, the sleeve being knurled or serrated at 16. The mandrel 18 has two circumferential grooves 19 and O-rings 15 are positioned between the sheath length 13 and the sleeve 12 to overlie these grooves. When the sleeve 12 is permanently circumferentially compressed the O-rings 15 and underlying parts of the sheath length 13 are pressed into the grooves 19 and a fluid-tight joint is effected between the sheath and end wall of the joint enclosure.

FIG. 3 illustrates a fluid-tight joint in which a sleeve 22 integral with and extending inwardly from an end wall 21 of the joint enclosure is arranged to overlie a part of the stretched sheath 30 remote from the end of the sheath and a length 33 of the sheath extending beyond the end of the sleeve is folded back to overlie the external surface of the sleeve in which are grooves 24 housing O-rings 25 and which is knurled at 26. An aluminum sleeve 27 overlies the sheath length 23 and is permanently circumferentially compressed to effect a fluid-tight joint between the sheath and end wall of the joint enclosure.

In the fluid-tight joint shown in FIG. 4 a sleeve 32 integral with and extending outwardly from an end wall of the joint enclosure is introduced between the stretched length 33 of the aluminum sheath and the core or cores, the sleeve having grooves 34 housing O-rings 35. Circumferential clamps 39 are arranged around the sheath length 33 to overlie three of the O-rings and these clamps are tightened to form permanent circumferential depressions in the sheath length which compress the O-rings into the grooves and effect a fluid-tight seal.

The fluid-tight joint shown in FIG. 5 differs from that shown in FIG. 4 in that the three grooves 44 in the sleeve 42 nearer the end wall 41 are flat-bottomed and house flat rubber seals 48. The parts of the sheath length 43 overlying the flat seals 48 are permanently locally circumferentially compressed to effect a fluid-tight joint between the sheath and end wall of the joint enclosure.

In the fluid-tight joint shown in FIG. 6 a sleeve 52 integral with and extending outwardly from an end wall 51 of the joint enclosure is introduced between a stretched length 53 of aluminum sheath and the core or cores, the sleeve having three flat-bottomed circumferential grooves 54 in its radially outer surface. An aluminum sleeve 57 is arranged to overlie the stretched sheath length 53 and the assembly of metal bodies is permanently locally circumferentially compressed in the regions of the grooves 54 to effect a fluid-tight joint between the sheath and end wall of the joint enclosure.

In addition to providing a fluid-tight joint that has a better long term mechanical strength than a plumbed joint, the method of the invention has a further important advantage that less skill is required by the operative in affecting the joint.

What we claim as our invention is:
1. A method of sealing an end of an electric cable having at least one core and a surrounding metallic sheath to an end portion of an enclosure into which said end extends comprising:
   a. shaping a length of said metal sheet adjacent an end thereof to space it from said core and forming a concentric assembly comprising said length of the sheath, a first metallic tubular member, a second metallic tubular member and an elastomeric sealing ring, said length of the sheath lying radially between said first metallic tubular member and said second metallic member, said elastomeric sealing ring lying radially between said first metallic tubular member and said length of the sheath, at least a part of the surface of said first metallic tubular member contiguous with said length of the sheath being roughened;
   b. and after said assembly is formed permanently circumferentially inwardly compressing same until a substantially fluid-tight joint is formed between said metal sheath and said first metallic tubular member.
2. A method as claimed in claim 1 wherein an annular groove is formed in the surface of said second metallic tubular member contiguous with the sheath in alignment with said elastomeric sealing ring.
3. A method as claimed in claim 1 in which said first metallic tubular member projects from said end portion into the interior of said enclosure and wherein said first metallic tubular member overlies a part of said metal sheath spaced from the end of the sheath further than said length thereof and wherein said length thereof is constituted by an end part of the sheath initially extending beyond the first metallic tubular member which is folded back to overlie said first metallic tubular member in contact with an external surface thereof.
4. A method as claimed in claim 1 wherein said elastomeric sealing ring is housed in an annular groove formed in said first metallic tubular member.
5. A method in accordance with claim 1 in which said sheath is corrugated wherein said length of the sheath is shaped by treating at least to substantially reduce the size of the corrugations therein.
6. A method in accordance with claim 5 in which said corrugations are substantially removed.
7. A method in accordance with claim 5 in which said length of the sheath is shaped by stretching it.

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