

PATENT SPECIFICATION

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(54) OPTICAL FIBRE ASSEMBLIES

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, Pennsylvania, United States of America, 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:—

The invention relates to the termination of optical fibre cables.

According to one aspect of the invention a kit for terminating an optical fibre cable comprises a plastics ferrule having an optical fibre receiving through passageway with a fibre centering funnel section tapering towards a front end; a metal ring for crimping about the ferrule to secure the ferrule to the cable; a bush formed with a through passageway having a flared mouth at one end adapted to receive the front end of the ferrule as a force fit; and a cap formed with a central passageway, and co-operable attachment means provided on the bush and cap, the cap being locatable on the ferrule releasably to secure the ferrule to the bush with radial compression of the front end of the ferrule about an optical fibre where located therein.

The invention includes an optical fibre connector where erected from the kit.

Examples of the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is an exploded perspective view of the main elements of a kit according to the invention;

Figure 2 is an axial cross-sectional view of a connector bush;

Figure 3 is an axial cross-sectional view of a connector ferrule;

Figure 4 is an axial cross-sectional view of part of a connector at a stage in assembly;

Figure 5 is an axial cross-sectional view of a splice bush;

Figure 6 is an axial cross-sectional view of a polishing bush;

Figure 7 is an axial cross-sectional view of part of a second example of connector assembly.

The optical fibre cable 11 is of known type comprising a bundle of light transmitting fibres of plastics or glass enclosed in a sheath.

The kit includes a cylindrical strain relief member 12 of resilient material, a metal crimping ring 13, a locking cap 14, a ferrule 15 and a bush 16.

The ferrule (Figure 3) is moulded from plastics material with a bundle receiving passageway 18 having a funnel-section rear 19, a portion of contact cross-section 20, a second portion of funnel-section 21 and a second portion 22 of constant cross-section opening to the front face of the ferrule. Externally the ferrule has a cylindrical rear 23, a circumferential rib 24 and a frusto-conical nose 25.

The strain relief member has a sharply tapering forward end and a more gradually tapering rear end.

The cap member is cylindrical having an internal screw thread and an annular inwardly directed flange 27 at one end.

The bush (Figure 2) is moulded with a passageway 28 having a flared ferrule-receiving mouth 29 defined by two axially spaced annular ribs 30, 31 of arcuate axial cross-section and different radii and apertures 34 for receiving fasteners for attaching the bushing to associated components.

To terminate the cable, the sheath is stripped from the cable end, and a small amount of potting compound such as epoxy resin is applied to the exposed fibres. The strain relief member 12 (if required), crimping ring 13 and cap 16 are slipped sequen-

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tially over the free end of the cable which is then inserted into the ferrule passageway until the fibres protrude from the nose. During insertion, the individual fibres are guided
5 gently together or centered by the tapered portions 19 and 21 so that in portion 22 the fibres are gathered together but not tightly packed. This procedure assists in avoiding breakage of fibres which might occur if the
10 bundle had to be forced into the ferrule as with some known devices.

The ferrule nose is then forced into, for example, a polishing bushing 36 (Figure 6) having a mouth formed with the ribs 30, 31
15 which squeeze the nose to clamp and centre the fibres tightly. The ferrule is held in the bushing by the cap while the potting substance sets. The crimp ring is deformed to secure the ferrule and strain relief member
20 to the cable and if necessary to limit any rearward movement of the cap. The crimp ring and potting prevent the fibres being pulled away from the nose of the ferrule during handling.

25 The fibres and the tip of the ferrule nose are polished by conventional means to form a smooth surface having good light transmitting properties. As the ferrule is plastics, no scratching of the optical face occurs during polishing. If a metal ferrule were used
30 metal particles could scarify the face during polishing reducing the transmission properties.

35 The potting material could be applied to the fibres after insertion into the ferrule. It would also be possible to polish many cables in a single operation by mounting the bushes on a disc associated with a polishing wheel.

40 The splice bush 38 (Figure 5) is effectively a double mouthed modification of the bush shown in Figure 3, a central portion 39 of the passageway being cylindrical. The bush exterior can be threaded or provided with other means for attachment to cap members.

45 In an alternative connector assembly shown in Figure 7, plug and socket housing 58 and 59, respectively, are adapted to receive ferrule and cable assemblies similar to that shown in Figure 1 and a resilient O ring
50 61 and rigid washer 62 are interposed between the end of a cap 63 and the ferrule rib or flange 64.

55 The socket housing is formed with a double mouthed ferrule-receiving passageway defined by annular ribs 65, 66 67, 68 and a central cylindrical portion 69. Where a ferrule assembly is mounted in the passageway the tip extends beyond the mid point of the cylindrical portion 69 with at least two
60 environmental seals being formed between the nose of the ferrule and ribs 67 and 68.

The plug housing is formed with a ferrule-receiving passageway having a convergent mouth defined by a single annular rib 71.
65 The nose of the ferrule assembly protrudes

beyond the mating face of the housing. When the housings are mated to bring the faces of the housings into abutment, the noses of the ferrules will be retained in a condition of axial thrust by the resiliency of the O rings.
70 Environmental seals will be formed between the nose of the plug ferrule and ribs 65, 66.

A further advantage of the connector assembly is that the cables are not permanently fixed in the bushes or housing enabling them readily to be replaced or interchanged when desired. The axial float permits compensation for tolerances caused during polishing and the O rings provide a preloading effect so that a predetermined tensile
75 load must be imposed on the cable before intimate contact between transmission faces is disturbed.

WHAT WE CLAIM IS:—

1. A kit for terminating an optical fibre
85 cable comprises a plastics ferrule having an optical fibre receiving through passageway with a fibre centering funnel section tapering towards a front end; a metal ring for crimping about the ferrule to secure the
90 ferrule to the cable; a bush formed with a through passageway having a flared mouth at one end adapted to receive the front end of the ferrule as a force fit; and a cap formed with a central passageway, and co-
95 operable attachment means provided on the bush and cap, the cap being locatable on the ferrule releasably to secure the ferrule to the bush with radial compression of the front end of the ferrule about an optical fibre
100 where located therein.

2. A kit according to claim 1 in which an external shoulder is provided on the ferrule for co-operation with an annular flange on the cap to locate the cap on the ferrule.
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3. A kit according to claim 1 or claim 2 in which the flared mouth is defined by two axially spaced ribs of arcuate axial section and different radii and the front end of the ferrule has a tapered nose receivable as a
110 force fit in the mouth.

4. A kit according to any one of the preceding claims in which the flared mouth is formed on both ends of the bush passageway, a central portion of the passageway
115 being of substantially constant cross-sectional size.

5. A kit according to claim 2 or claim 3 or claim 4 where dependent from claim 2 including annular resilient means locatable between the shoulder and the flange.
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6. A kit according to any one of the preceding claims including a strain relieving sleeve for the cable.

7. A kit for terminating an optical fibre
125 cable substantially as described with reference to the accompanying drawings.

8. An optical fibre connector assembly where erected from a kit according to any one of the preceding claims.
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9. An optical fibre connector substantially as described with reference to Figure 7 of the accompanying drawings.

For the Applicants:
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