

Description

This invention relates to a connector for use in butt splicing two optical fibres.

Optical fibres are rapidly becoming of importance in data transmission systems such as telephone systems, and there is thus a need for a connector by which two optical fibres can be butt spliced together with the connection introducing the minimum possible losses into the transmission path formed by the fibres. In particular there is a need for such a connector which is quick and easy to use, and which can be readily applied in the field by a workman using simple tooling.

The basic difficulty to be overcome when butt splicing two optical fibres is to ensure that the adjacent end faces of the fibres are accurately axially aligned while also ensuring that the required spacing between the end faces is maintained. The end faces must not touch since this could damage them, nor must they be separated by more than a certain distance, since a greater separation would introduce unacceptable losses into the transmission path through the splice.

In British Patent Specification No. 1,549,928 there is disclosed a connector for use in butt splicing two optical fibres, comprising a tubular member of deformable material, and three elongate members receivable in the tubular member to define a central passage to receive end portions of the two optical fibres to be spliced.

For use of this known connector the three elongate members which are each of circular cross-section, are positioned within the tubular member which is triangular in cross-section, such that the three elongate members define between them the central axially extending passage into which end portions of the two fibres to be spliced are then inserted. Spaces are defined between the elongate members, radially outwardly of the central passage and within apex portions of the triangular section tubular member. Each fibre is supported at three peripherally spaced positions provided by the three elongate members respectively such that the two fibres are axially aligned. The tubular member is then crimped by reducing the triangular section such that the three elongate members are compressed into intimate engagement with the two fibres thereby to form the required splice connection with the two fibres accurately axially aligned. During the crimping the elongate members are deformed into the aforementioned spaces.

A difficulty which arises with this known connector is that due to the circular cross-section of the elongate members, and the triangular cross-section of the tubular member, on crimping the compression of the elongate members causes axial deformation thereof, which deformation can result in the end faces of the two optical fibres being brought into damaging engagement or being unduly separated thereby introducing unacceptable losses into the transmission path through the splice.

Further, the known connector comprises at

least four separate parts, namely the tubular member and the three elongate members, which must be separately produced and then assembled.

According to this invention, a connector for use in butt splicing two optical fibres comprising a tubular member of deformable material, and three elongate members of similar transverse cross-section receivable in the tubular member to define a central passage to receive end portions of the two optical fibres to be spliced and spaces between the elongate members radially outwards of the central passage extending throughout the length of the elongate members, is characterised in that the tubular member is a right-circular cylindrical member, and the three elongate members of similar transverse cross-section are integrally formed in side-by-side relationship joined by two webs extending longitudinally thereof, the transverse cross-section of each elongate member being such that the three elongate members can be folded together by bending of the webs, to define a substantially circular overall cross-section cylindrical support body receivable in the tubular member, innermost parts of the three elongate members together defining the central passage and such that the spaces between the three elongate members disposed radially outwards of the central passage are formed within the support body cylindrical profile and are adapted on radial crimping of the tubular member about the support body to accommodate deformation of the elongate member such that deformation of the support body is substantially only radial and that axial deformation is minimised.

It is known from GB-A-2 045 454 in a fibre optic splice to provide a gripping member within an elastomeric sleeve, the gripping member comprising a plurality of elongate members integrally joined at one end and foldable to define a body having a central passage for fibres and spaces between the members such that the members may be closed together to grip the fibres.

Preferably according to the present invention, the tubular member is of metal, while the support body can be of metal or of plastics material.

The support body can be manufactured by extrusion.

The connector of this invention has the advantages that it is relatively cheap and easy to manufacture, and, more importantly is easy to use since it consists of only two parts. After bringing together of the three integrally formed members of the support body, and positioning of the support body in the tubular member, end portions of two optical fibres to be spliced are inserted into the central passage defined in the support body, and the tubular member is then radially crimped and axially restrained, using a conventional type of crimping tool, to compress the support body to grip the fibres and thus hold them in axial alignment. The three points of support for each fibre provided by the three members of the support body respectively ensure axial alignment of the fibres, while the radial

spaces between the support body members are closed up during the crimping operation such that the support body is deformed substantially only radially, with any slight axial deformation of the support body that takes place being insufficient to cause the end faces of the fibres to engage or be moved apart by an excessive distance.

A further advantage of the connector of this invention is that it can be of small size relative to the known connector discussed above, since only those parts of the three elongate members of the support body, which contact the optical fibres need have a radius similar to that of the three circular cross-section elongate members of the known connector. The three elongate members of the support body of the connector of this invention can be given a cross-section such that together they define a circular cross-section support body of relatively small diameter, that is with a diameter smaller than the maximum dimension defined by the three circular cross-section elongate members of the known connector.

A connector according to this invention will now be described by way of example with reference to the drawings in which:—

Figure 1 is a perspective view of the support member of the connector in its condition as manufactured;

Figure 2 is an end view of the support member of Figure 1;

Figure 3 is a perspective view of the support member of Figures 1 and 2 in its folded condition, and the tubular member of the connector in which the folded support member is to be received;

Figure 4 is a perspective view showing the connector in its assembled state and with two optical fibres received therein;

Figure 5 is a cross-sectional view of the assembly of Figure 4 prior to crimping to form the connection; and

Figure 6 is a view similar to Figure 5 but showing the connector after crimping to form the required connection.

The support body 1 of the connector is an extruded member of deformable metal or plastics material, and comprises three, elongate, similar transverse cross-section (see Figure 2) members 2 integrally formed in side-by-side relationship joined by two webs 3. Each member 2 has a transverse cross-section, as shown in Figure 2, which is such that the three members 2 can be folded together by bending of the webs 3, to define a substantially circular overall transverse cross-section cylindrical support body 1, as best seen in Figure 3.

The tubular member 4 of the connector is a right-circular cylindrical tubular member of deformable metal, and of a size such that the support body 1 in its folded condition as shown in Figure 3, can be received in the tubular member 4, as shown in Figures 4 and 5.

When the support body 1 is in its folded condition, the innermost parts 5 of its three members 2 together define a central passage 6 to

receive and support in axial alignment end portions of two optical fibres 100 to be spliced. Each fibre 100 is supported at three spaced positions around its periphery provided by the three members 2 respectively, and since the two fibres are supported by the same three members 2 of the support body 1, axial alignment of the fibres 100 is ensured.

When the support body 1 is in its initial folded condition there are three spaces 7 between the members 2 throughout the length of the support body 1, disposed radially outwards of the central passageway 6 and within the body 1 as best shown in Figure 3.

For use of the connector, the support body 1 is folded to the cylindrical condition shown in Figure 3, and is then inserted into the tubular member 4. End portions of the two fibres 100 are then inserted into the passage 6 defined by the members 2 of the support body 1, the assembly then being as shown in Figure 5.

The tubular member 4 is then radially crimped and axially restrained to reduce its diameter, using a conventional crimping tool, this compressing the support body 1 to grip the fibres 100, a permanent splice connection thus being formed between the fibres 100.

During crimping the spaces 7 in the support body 1 are closed up to the condition shown in Figures 4 and 6, this deformation of the support body 1 keeping the restrained axial deformation of the support body 1 to a minimum whereby it is ensured that the ends of the two fibres 100 are not urged against each other or moved apart by a distance giving unacceptable losses in the transmission path through the fibres.

There is thus formed a permanent butt splice between the two fibres 100, which splice can be easily produced in the field by a workman since the connector is formed of only two parts, namely the tubular member 4 and the support body 1, and the connection can be formed by means of a simple conventional hand tool to effect the crimping operation.

For most types of optical fibre it is unnecessary to strip the cladding from the fibre core over the portions to be received in the support body of the connector of this invention, the connector being crimped about clad fibre portions. However, when fibres having relatively soft cladding, for example plastics clad silicon fibres, are to be spliced, it is preferable for the cladding to be removed from the fibre cores over the portions of the fibres to be received in the support body of the connector. If this is not done then there is the possibility that during crimping the cladding of the two fibres will not be uniformly deformed, this resulting in the fibres not remaining accurately axially aligned as required. As will be appreciated, if the cladding is removed from the fibres, then the index of refraction of the support body of the connector must be equal to or lower than that of the fibre cladding in order to prevent losses at the splice. If the support body is of metal then the surfaces thereof which engage the fibre cores can

be given a specular coating of, for example, gold or silver, in order to prevent any losses at the splice.

Although in the embodiment described above the fibres 100 are of the same diameter, the connector described can equally well be used with fibres of different diameters provided the smaller diameter fibre is adequately gripped by the support body after crimping. With such use, the smaller diameter fibre will not be supported at these positions when initially inserted into the passage 6 formed by the support body 1, but will be centered and supported as necessary when crimping of the connector is carried out whereby the axes of the two fibres being connected will be aligned.

Claims

1. A connector for use in butt splicing two optical fibres (100), comprising a tubular member (4) of deformable material, and three elongate members (2) of similar transverse cross-section receivable in the tubular member (4) to define a central passage (6) to receive end portions of the two optical fibres (100) to be spliced, and spaces between the elongate members radially outwards of the central passage extending through the length of the elongate members, characterised in that the tubular member (4) is a right-circular cylindrical member, and the three elongate members (2) of similar transverse cross-section are integrally formed in side-by-side relationship joined by two webs (3) extending longitudinally thereof, the transverse cross-section of each elongate member (2) being such that the three elongate members (2) can be folded together by bending of the webs (3), to define a substantially circular overall cross-section cylindrical support body (1) receivable in the tubular member (4), innermost parts (5) of the three elongate members (2) together defining the central passage (6), and such that the spaces (7) between the three elongate members (2) disposed radially outwards of the central passage are formed within the support body cylindrical profile and are adapted on radial crimping of the tubular member (4) about the support body (1) to accommodate deformation of the elongate members (2) such that deformation of the support body (1) is substantially only radial and that axial deformation is minimised.

2. A connector as claimed in claim 1, characterised in that the support body (1) is of plastics material.

3. A connector as claimed in claim 1, characterised in that the support body (1) is of metal.

4. A connector as claimed in claim 3, characterised in that the surfaces of the support body (1) which contact the fibres (100) have a specular coating.

Revendications

1. Connecteur à utiliser dans le raccordement

en bout de deux fibres optiques (100), comprenant un élément tubulaire (4) en matière déformable et trois éléments allongés de section transversale similaire, pouvant être reçus dans l'élément tubulaire (4) afin de définir un passage central (6) destiné à recevoir des tronçons extrêmes des deux fibres optiques (100) à raccorder, et des espaces entre les éléments allongés, radialement à l'extérieur du passage central s'étendant sur toute la longueur des éléments allongés, caractérisé en ce que l'élément tubulaire (4) est un élément en forme de cylindre circulaire droit, et les trois éléments allongés (2), de section transversale similaire, sont réalisés d'un seul bloc, dans une disposition côte à côte, et reliés par deux voiles (3) s'étendant sur leur longueur, la section transversale de chaque élément allongé (2) étant telle que les trois éléments allongés (2) peuvent être repliés ensemble par flexion des voiles (3) pour définir un corps de support cylindrique (1) de section transversale globale sensiblement circulaire, pouvant être reçu dans l'élément tubulaire (4), des parties intérieures (5) des trois éléments allongés (2) définissant ensemble le passage central (6), et telle que les espaces (7) entre les trois éléments allongés (2), disposés radialement à l'extérieur du passage central, sont formés à l'intérieur du profil cylindrique du corps de support et sont conçus, lors d'un sertissage radial de l'élément tubulaire (4) autour du corps de support (1), pour permettre une déformation des éléments allongés (2) afin que la déformation du corps de support (1) ne soit sensiblement que radiale et que la déformation axiale soit minimisée.

2. Connecteur selon la revendication 1, caractérisé en ce que le corps de support (1) est en matière plastique.

3. Connecteur selon la revendication 1, caractérisé en ce que le corps de support (1) est en métal.

4. Connecteur selon la revendication 3, caractérisé en ce que les surfaces du corps de support (1) qui sont en contact avec les fibres (100) ont un revêtement spéculaire.

Patentansprüche

1. Verbinder zur Verwendung beim Stumpfverspleißen zweier optischer Fasern (100), mit einem rohrförmigen Element (4) aus deformierbarem Material und drei länglichen Elementen (2) ähnlichen Querschnitts, die in dem rohrförmigen Element (4) aufnehmbar sind, um einen zentralen Durchgang (6) zur Aufnahme von Endabschnitten der beiden zu verspleißenden optischen Fasern (100) zu bilden, und mit Hohlräumen zwischen den länglichen Elementen radial auswärts des zentralen Durchgangs, die sich über die Länge der länglichen Elemente hinerstrecken, dadurch gekennzeichnet, daß das rohrförmige Element (4) ein gerade kreiszylindrisches Element ist und die drei länglichen Elemente (2) mit ähnlichem Querschnitt einstückig seitlich nebeneinander geformt und durch zwei Stege (3) miteinander verbunden

be given a specular coating of, for example, gold or silver, in order to prevent any losses at the splice.

Although in the embodiment described above the fibres 100 are of the same diameter, the connector described can equally well be used with fibres of different diameters provided the smaller diameter fibre is adequately gripped by the support body after crimping. With such use, the smaller diameter fibre will not be supported at these positions when initially inserted into the passage 6 formed by the support body 1, but will be centered and supported as necessary when crimping of the connector is carried out whereby the axes of the two fibres being connected will be aligned.

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2. A connector as claimed in claim 1, characterised in that the support body (1) is of plastics material.

3. A connector as claimed in claim 1, characterised in that the support body (1) is of metal.

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Revendications

1. Connecteur à utiliser dans le raccordement

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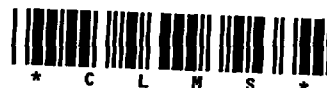
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Patentansprüche

1. Verbinder zur Verwendung beim Stumpfverspleißen zweier optischer Fasern (100), mit einem rohrförmigen Element (4) aus deformierbarem Material und drei länglichen Elementen (2) ähnlichen Querschnitts, die in dem rohrförmigen Element (4) aufnehmbar sind, um einen zentralen Durchgang (6) zur Aufnahme von Endabschnitten der beiden zu verspleißenden optischen Fasern (100) zu bilden, und mit Hohlräumen zwischen den länglichen Elementen radial auswärts des zentralen Durchgangs, die sich über die Länge der länglichen Elemente hinstrecken, dadurch gekennzeichnet, daß das rohrförmige Element (4) ein gerade kreiszylindrisches Element ist und die drei länglichen Elemente (2) mit ähnlichem Querschnitt einstückig seitlich nebeneinander geformt und durch zwei Stege (3) miteinander verbunden



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sind, die sich in ihrer Längsrichtung erstrecken, daß der Querschnitt jedes länglichen Elementes (2) derart ausgebildet ist, daß die drei länglichen Elemente (2) durch Biegen der Stege (3) zusammengefaltet werden können, um einen im Gesamtquerschnitt im wesentlichen kreisförmigen zylindrischen Tragkörper (1) zu bilden, der im dem rohrförmigen Element (4) aufnehmbar ist, daß die innersten Teile (5) der drei länglichen Elemente (2) zusammen den zentralen Durchgang (6) begrenzen und daß die Hohlräume (7) zwischen den drei länglichen Elementen (2), die radial auswärts des zentralen Durchgangs angeordnet sind, innerhalb des zylindrischen Profils des Tragkörpers geformt und dazu ausgebildet sind, daß sie beim radialen Zusammen-

quetschen des rohrförmigen Elementes (4) um den Tragkörper (1) herum die Deformation der länglichen Elemente (2) derart aufnehmen, daß die Deformation des Tragkörpers (1) im wesentlichen nur radial erfolgt und die axiale Deformation auf ein Minimum gebracht ist.

2. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß der Tragkörper (1) aus Kunststoffmaterial besteht.

3. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß der Tragkörper (1) aus Metall besteht.

4. Verbinder nach Anspruch 3, dadurch gekennzeichnet, daß diejenigen Flächen des Tragkörpers (1) die die Fasern (100) berühren, eine Spiegelbeschichtung tragen.

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