

Description

BACKGROUND OF THE INVENTION

The present invention relates to an improved ferrule used to form an optical connector for optical fibers. The optical fiber connector ferrule comprises of a main body made of a synthetic resin material and having a radially extending flange, an optical fiber extending through the main body and having a polished end at one end of the main body, and a metal sleeve constituting a part of an outer surface of the ferrule, an end of the metal sleeve rearward of the end of the optical fiber is embedded in this synthetic resin material at the boundary between the flange and the remainder of the body. The present invention also relates to a method for producing an optical fiber connector ferrule. The ferrule is used to connect optical fibers by joining pairs thereof in a holding sleeve. Mechanical properties of optical connector ferrules greatly affect the connecting characteristics of optical fibers.

Optical connector ferrules using a metal sleeve on the outer periphery thereof have previously been proposed in the art. An example of such an optical connector ferrule in which a metal sleeve is provided around the outer periphery of one portion thereof is disclosed in Japanese Published Unexamined Patent Applications Nos. 42207/81 and 27112/83. A modification of such a structure in which the metal sleeve is prevented from separating from the synthetic resin material forming the body of the ferrule is disclosed in Japanese Utility Model Publication No. 38487/81. In the optical ferrule of the Utility Model Publication, radial holes are formed in the metal sleeve into which flows the synthetic resin material at the time of molding.

Fig. 1 is a cross-sectional schematic illustration of an optical connector ferrule as disclosed in the above-mentioned Japanese Published Unexamined Patent Applications. In this ferrule, a body 3 of synthetic resin material is formed with a radially extending flange 31. A coated optical fiber 1 extends through most of the length of a central longitudinal bore in the body 3. A forward end 2 of the optical fiber 1 is stripped of its protective coating. A metal sleeve 4 is disposed around the forward end of the body 3, extending from the forward side of the flange 31 to the forward end of the body 3.

An optical connector ferrule having a slightly different construction to that shown in figure 1 is described in JP-A-5 827 112. This ferrule is similar in that it has a main cylindrical body made from plastic with a radially extending flange and an optical fiber extends through the main body via a penetration hole. However, the metal sleeve not only extends from the forward end of the body to

the forward side of the flange but in fact a very small part of the metal sleeve is actually embedded into the flange.

Epoxy resins typically used to form the body 3 of the optical ferrule have a shrinkage upon curing at about 0.490 to 0.670 percent. This degree of shrinkage is larger than the coefficient of thermal expansion of the metals typically used to form the metal sleeve 4. Accordingly, the resin and sleeve have a tendency to separate following curing. If the inner diameter of the metal sleeve 4 is, for instance, 2 mm, the resin may shrink by about 10 microns, producing an equal amount of eccentricity in the position of the optical fiber. This results in a large amount of loss when a connection is made.

In order to prevent separation of the metal sleeve from the main body of the ferrule, as proposed in the above-mentioned Japanese Utility Model Publication, radial holes may be formed in the metal sleeve so that the resin flows therein during molding, thereby tightly securing the metal sleeve to the body of resin material. However, providing such holes in the metal sleeve requires extra processing, significantly increasing the overall cost of the ferrule. Moreover, the resin flowing through the holes in the metal sleeve changes the overall outer diameter of the ferrule, which is disadvantageous in achieving accurate alignment between connected optical fibers.

A problem with the conventional optical ferrule is a lack of bending strength. In the conventional optical connector ferrule as shown in Fig. 1 wherein the metal sleeve extends from the side of the flange to the forward end of the resin body, the maximum bending strength is about 2 kg. It is desirable that the bending strength of the connector be at least twice that value.

Another important problem with the conventional optical connector ferrule arises during the polishing of the end surface of the bared optical fiber 1. To polish the end of the optical fiber 1, it is necessary to polish the resin material and metal simultaneously, which is quite difficult to do because of the different hardnesses among the three materials.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an optical connector ferrule in which the above-mentioned problems of the prior art are eliminated.

More specifically, it is an object of the present invention to provide an optical connector ferrule which provides a high adhesion strength between the metal sleeve and body of resin material, which optical ferrule can be produced inexpensively.

It is a further object of the present invention to

provide such an optical connector ferrule which can reduce the time required for the polishing operation.

It is a further object of the present invention to provide such an optical connector ferrule having an improved bending strength.

According to the invention as described above this will be achieved in that the metal sleeve has a corrugated shape having staggered cylindrical portions of alternate relatively large and relatively small diameter.

Yet further, the invention attains the above and other objects by providing a process for producing an optical connector ferrule comprising the steps of:

providing a first mold having a cylindrical passage with an increased diameter portion of a first end forming a concentric annular recess and a hollow member having a conically shaped inner surface disposed at a second end thereof and formed coaxially with said cylindrical passage;

providing a second mold having a cylindrical passage which is coaxial with said cylindrical passage of said first mold when said second mold is abutted with the said first mold;

placing a metal sleeve in said cylindrical passage in said first mold, said metal sleeve extending from said member at said second end into said annular recess by a predetermined distance;

abutting said first and second molds;

disposing an optical fiber through the communicating cylindrical passages in the said first and second molds, said optical fiber having a bared end on which a protective coating has been stripped and which extends through said hole in said member at said second end;

injecting a synthetic resin material into said first and second molds to fill remaining portions of said longitudinal passages and said annular recess;

removing the product thus formed from said first and second molds after said synthetic resin material has hardened; and

cutting said bared end and polishing an end surface of the said bared end of said optical fiber.

If desired, the optical fiber may be replaced by a metal pin during molding. In this case, once the resin has hardened, the metal pin is removed and the optical fiber secured in the resulting hole with an adhesive or the like.

In still another embodiment of the invention at least one of the inner and outer surfaces of the metal sleeve has irregularities formed thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional schematic illustration of a conventional optical connector ferrule;

Figs. 2A and 2B are cross-sectional schematic

illustrations of optical connector ferrules produced in accordance with the present invention; Fig. 3 is a cross-sectional view showing two optical connector ferrules of the invention joined with a connecting sleeve;

Figs. 4A through 4C illustrate steps in manufacturing an optical connector ferrule of the invention;

Fig. 5 illustrates in a cross-sectional view an alternative way of manufacturing an optical connector ferrule of the invention;

Fig. 6 is a cross-sectional view showing the optical connector ferrule after being extracted from the mold shown in Fig. 4C;

Fig. 7 shows an alternative form of a metal sleeve which may be used in another embodiment of the invention;

Fig. 8 is a cross-sectional schematic view of yet another embodiment of an optical connector ferrule of the invention;

Figs. 9A and 9B are cross-sectional end and side views, respectively, of still another embodiment of an optical connector ferrule of the invention;

Fig. 10 is a cross-sectional view showing another type of metal sleeve which can be employed in an optical connector ferrule of the invention;

Fig. 11 shows a completed optical connector ferrule employing the metal sleeve of Fig. 10; and

Fig. 12 shows still another embodiment of an optical connector ferrule of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 2A, there is shown therein in cross section a schematic diagram of a first preferred embodiment of an optical connector ferrule of the present invention. In Fig. 2A and subsequent drawings, like reference numerals employed in Fig. 1 indicate similar parts.

In the embodiment shown in Fig. 2A, a portion of the rear end of the metal sleeve 5 is embedded in the resin material of the main body 3 at the junction between the flange 31 and the remainder of the main body 3. Additionally, the inner surface of the sleeve 5 and the outer surface of the forward portion of the main body 3, that is, the portion of the main body 3 forward of the flange 31, are roughened. More particularly, the inner surface of the sleeve 5 is roughened prior to injection of the resin material during the molding process so that the resin material of the main body 3 conforms tightly to the inner surface of the metal sleeve 5. The manufacturing process will be discussed in more detail below with reference to Figs. 4A

through 4C and Fig. 5.

Further, the ferrule of the present invention differs from the conventional ferrule of Fig. 1 in that the forward end of the body 3 protrudes in a conical form past the forward end of the metal sleeve 5.

In the embodiment of Fig. 2A, as will be explained in more detail below, the optical fiber 1 having the bared end 2 is inserted into the mold which is used to form the main body 3 before the injection of the resin material. On the other hand, in the embodiment of Fig. 2A, a molding pin 51 is provided in place of the optical fiber 1 during the molding process. After the resin material has hardened, the pin 51 is then extracted and the optical fiber 1 inserted into the longitudinal opening formed by the presence of the pin 51 during the molding process. The optical fiber 1 is secured in the optical passage with an adhesive.

In either the embodiment of Fig. 2A or 2B, the following dimensions may be used: outer diameter of ferrule = 2.499 ± 0.001 mm, length from forward end of optical fiber to flange = 8 mm, thickness of flange = 4 mm, distance from rear side of flange to rear end of main body = 4 mm, and length of exposed metal sleeve = 7 mm.

It is preferred that the inner surface of the metal sleeve 5 be roughened by forming a screw thread therein. For instance, the depth of the screw thread may be about 0.24 mm.

An arrangement whereby two ferrules of the type illustrated in Fig. 2A are joined together is shown in Fig. 3. As shown in this figure, two optical ferrules are joined by inserting them into opposite ends of a sleeve 8 made of metal or plastics. Preferably, a longitudinally extending slit 81 is formed in the sleeve 8 so as to make the sleeve resilient in the radial direction to firmly hold the two optical ferrules together. It is noted that, because the forward bared ends 2 of the optical fibers 1 extend in the conical part of the main bodies 3 past the forward ends of the metal sleeves 5, there is no interference between adjacent metal sleeves 5 in achieving alignment between the ends of the two optical fibers.

Referring now to Figs. 4A through 4C, a preferred embodiment of a process for producing an optical connector ferrule of the type illustrated in Fig. 2A will be discussed. In Figs. 4A to 4C, a lower mold 9 has a central part having a cylindrical passage formed therein. A flange-forming annular recess 91 is formed at an upper end of the mold 9. At the lower end of the cylindrical longitudinal passage is inserted a member 92 having a conically shaped inner surface. A supporting part 93 retains the member 92 in the lower end of the mold 9. An upper mold 10, shown in Fig. 4C, has a longitudinally extending cylindrical passage 12 lo-

cated coaxially with the cylindrical passage in the lower mold 9 when the upper mold 10 is set in place as illustrated in Fig. 4C.

As shown in Fig. 4B, first, a metal sleeve 5 is inserted into the cylindrical passage in the lower mold 9. The length of the metal sleeve 5 is such that the upper (rearward) end thereof protrudes somewhat into the annular recess 91. Preferably, the metal sleeve 5 is provided with a screw thread on its inner surface. The mold is dimensioned such that a tight fit is achieved between the outer surface of the metal sleeve 5 and the inner surface of the longitudinal passage in the mold 9 so as to prevent the flow of resin therethrough. The hole in the member 92 should be accurately centered, preferably, to an accuracy of 3 microns or less. The diameter of this hole is preferably approximately 130 microns.

Next, after the upper mold 10 has been placed over the lower mold 9 as illustrated in Fig. 4C, the end 2 of an optical fiber 1 from which the protective coating has been stripped is inserted through the hole in the end piece 91. Preferably, the length of the bared end 2 is approximately 10 mm, typically leaving an outer diameter of about 125 microns. Following this the synthetic resin is injected through an injection hole 11 provided in the upper mold 10, thereby forming the main body 3 of the optical ferrule. After solidification of the synthetic resin material, the upper mold 10 is removed and the product removed. The product at this state is as shown in Fig. 6. All that remains to be done is to cut the forward bared end 2 of the optical fiber 1 and to polish it. Preferably, a length of approximately 0.5 mm of the bared end 2 is left protruding from the forwardmost end of the body 3. Accordingly, it is not necessary to polish the material of the metal sleeve 2 or the body 3 while polishing the end of the optical fiber 1.

An alternative method of manufacturing an optical connector ferrule of the invention is illustrated in Fig. 5. As depicted therein, a molding pin 51 preferably made of metal, is placed coaxially with the cylindrical passages of the lower mold 9 and upper mold 10 after they have been assembled. A forward tapered end of the pin 51 is made to protrude through the hole in the member 92. When the pin 51 has been properly positioned, synthetic resin material is injected into the combined molds, as in the process described above. The product thus formed is extracted from the molds, and, with the pin 51 removed, the optical fiber is inserted through the hole left by the pin 51 with the bared end 2 protruding through the hole in the conical portion of the body 3. The fiber 1 is then secured with an adhesive or the like.

In either of the processes discussed above, preferably a releasing agent is applied to the outer

periphery of the metal sleeve 5 and/or the inner periphery of the cylindrical passage in the lower mold 9 so as to facilitate the removal of the product.

As described above, the inner surface of the metal sleeve may be roughened by forming a screw thread therein. However, the present invention is not limited to such an embodiment. That is, a treatment such as a chemical etching treatment can be employed to roughen the inner surface of the metal sleeve.

Optical ferrules constructed in accordance with the invention as described above were tested. Specifically, a connect-and-disconnect operation was performed 1000 times, whereupon no separation of the metal sleeve from the body of synthetic resin for the optical ferrules of the invention was observed. Further, a heat-cycle test was performed wherein conventional optical ferrules and optical connector ferrules of the invention were subjected to heat cycling in a range of -30°C to $+70^{\circ}\text{C}$ 1000 times over a period of 50 days. Five of 20 samples of the conventional optical ferrule exhibited some separation between the metal sleeve and the main body of synthetic resin material. No such separation in an equal number of samples of the optical connector ferrule of the present invention was observed.

Optical connector ferrules of the invention were tested for bending strength. With the metal sleeve penetrating 2.5 mm into the resin material at its rearward end, it was found that the bending strength was approximately 5 kg, approximately twice that attainable with the conventional optical ferrule with no metal sleeve and more than twice the value of a conventional optical connector ferrule with a metal sleeve not penetrating the material of the main body.

Further, tests were conducted to compare the amount of time required for performing the polishing operation of optical connector ferrules of the prior art and the invention. For the conventional case, typically 10 minutes was required to complete the polishing operation, while an optical connector ferrule of the invention required only approximately 3 minutes. Moreover, as a consequence, it can be expected that the service life of the polishing machine can be greatly extended.

In Fig. 7 is shown an alternative form of the metal sleeve 5. As shown therein, a flared portion 52 is provided at the rearward end. The bending strength of the optical connector ferrule is thereby further improved.

In an embodiment illustrated in the cross-sectional schematic view of Fig. 8, a reinforcing part 32 is provided forward of the flange 31. It has been found in this case, for the dimensions listed above, that the bending strength of the optical connector

ferrule is at least 6 kg.

In Figs. 9A and 9B, ceramic balls 90, 90' are provided at the forward end of the main body 3 embedded in the resin material of the main body 3. The balls may, for example, have a diameter of 0.820 mm.

Another type of metal sleeve 5 which may be used with the invention is illustrated in Fig. 10. In this case, the metal sleeve 5 has a corrugated shape having staggered cylindrical portions of different diameters D_{in} and D_{out} . For instance, dimensions of $D_{in} = 1.8$ mm and $D_{out} = 2.499 \pm 0.001$ mm may be employed. A completed optical connector ferrule employing the metal sleeve 5 of Fig. 10 is illustrated in Fig. 11. A similar embodiment is shown in Fig. 12 wherein the disposition of the smaller- and larger-diameter portions of the metal sleeve 5 is changed. In the embodiments of Fig. 11 and 12, because the resin enters the larger-diameter portions, the adhesion between the synthetic resin forming the main body 3 and the metal sleeve 5 is further increased. In the embodiment of Fig. 11, additional strength is provided by the resin portion A, and in the embodiment of Fig. 12 by the resin portion B. In the embodiments of Figs. 11 and 12, it is not necessary to roughen the inner surface of the metal sleeve 5, providing economic advantages over the embodiment of Figs. 2A and 2B, for instance, in some cases.

In the embodiment of Fig. 12, the portion C is the first portion of the optical connector ferrule to touch the connecting sleeve. Accordingly, the embodiment of Fig. 12 is less subject to abrasion.

This completes the description of the preferred embodiments of the invention. Although preferred embodiments have been described, it is believed that numerous modifications and alterations thereto would be apparent to one of ordinary skill and the art without departing from the scope of the invention as claimed.

Claims

1. Optical fiber connector ferrule comprising a main body (3) made of a synthetic resin material and having a radially extending flange (31), an optical fiber (1) extending through the said main body having a polished end at one end of said main body, and a metal sleeve (4) constituting a part of an outer surface of said ferrule, an end of said metal sleeve rearward of said end of said optical fiber being embedded in said synthetic resin material at the boundary between the flange and the remainder of the body, characterized in that the metal sleeve (5) has a corrugated shape having staggered cylindrical portions of alternate relatively large and relatively small diameter.

periphery of the metal sleeve 5 and/or the inner periphery of the cylindrical passage in the lower mold 9 so as to facilitate the removal of the product.

As described above, the inner surface of the metal sleeve may be roughened by forming a screw thread therein. However, the present invention is not limited to such an embodiment. That is, a treatment such as a chemical etching treatment can be employed to roughen the inner surface of the metal sleeve.

Optical ferrules constructed in accordance with the invention as described above were tested. Specifically, a connect-and-disconnect operation was performed 1000 times, whereupon no separation of the metal sleeve from the body of synthetic resin for the optical ferrules of the invention was observed. Further, a heat-cycle test was performed wherein conventional optical ferrules and optical connector ferrules of the invention were subjected to heat cycling in a range of -30°C to $+70^{\circ}\text{C}$ 1000 times over a period of 50 days. Five of 20 samples of the conventional optical ferrule exhibited some separation between the metal sleeve and the main body of synthetic resin material. No such separation in an equal number of samples of the optical connector ferrule of the present invention was observed.

Optical connector ferrules of the invention were tested for bending strength. With the metal sleeve penetrating 2.5 mm into the resin material at its rearward end, it was found that the bending strength was approximately 5 kg, approximately twice that attainable with the conventional optical ferrule with no metal sleeve and more than twice the value of a conventional optical connector ferrule with a metal sleeve not penetrating the material of the main body.

Further, tests were conducted to compare the amount of time required for performing the polishing operation of optical connector ferrules of the prior art and the invention. For the conventional case, typically 10 minutes was required to complete the polishing operation, while an optical connector ferrule of the invention required only approximately 3 minutes. Moreover, as a consequence, it can be expected that the service life of the polishing machine can be greatly extended.

In Fig. 7 is shown an alternative form of the metal sleeve 5. As shown therein, a flared portion 52 is provided at the rearward end. The bending strength of the optical connector ferrule is thereby further improved.

In an embodiment illustrated in the cross-sectional schematic view of Fig. 8, a reinforcing part 32 is provided forward of the flange 31. It has been found in this case, for the dimensions listed above, that the bending strength of the optical connector

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In Figs. 9A and 9B, ceramic balls 90, 90' are provided at the forward end of the main body 3 embedded in the resin material of the main body 3. The balls may, for example, have a diameter of 0.820 mm.

Another type of metal sleeve 5 which may be used with the invention is illustrated in Fig. 10. In this case, the metal sleeve 5 has a corrugated shape having staggered cylindrical portions of different diameters D_{in} and D_{out} . For instance, dimensions of $D_{in} = 1.8$ mm and $D_{out} = 2.499 \pm 0.001$ mm may be employed. A completed optical connector ferrule employing the metal sleeve 5 of Fig. 10 is illustrated in Fig. 11. A similar embodiment is shown in Fig. 12 wherein the disposition of the smaller- and larger-diameter portions of the metal sleeve 5 is changed. In the embodiments of Fig. 11 and 12, because the resin enters the larger-diameter portions, the adhesion between the synthetic resin forming the main body 3 and the metal sleeve 5 is further increased. In the embodiment of Fig. 11, additional strength is provided by the resin portion A, and in the embodiment of Fig. 12 by the resin portion B. In the embodiments of Figs. 11 and 12, it is not necessary to roughen the inner surface of the metal sleeve 5, providing economic advantages over the embodiment of Figs. 2A and 2B, for instance, in some cases.

In the embodiment of Fig. 12, the portion C is the first portion of the optical connector ferrule to touch the connecting sleeve. Accordingly, the embodiment of Fig. 12 is less subject to abrasion.

This completes the description of the preferred embodiments of the invention. Although preferred embodiments have been described, it is believed that numerous modifications and alterations thereto would be apparent to one of ordinary skill and the art without departing from the scope of the invention as claimed.

Claims

1. Optical fiber connector ferrule comprising a main body (3) made of a synthetic resin material and having a radially extending flange (31), an optical fiber (1) extending through the said main body having a polished end at one end of said main body, and a metal sleeve (4) constituting a part of an outer surface of said ferrule, an end of said metal sleeve rearward of said end of said optical fiber being embedded in said synthetic resin material at the boundary between the flange and the remainder of the body, characterized in that the metal sleeve (5) has a corrugated shape having staggered cylindrical portions of alternate relatively large and relatively small diameter.



2. The optical connector ferrule of claim 1, wherein the said end of said optical fiber extends beyond a forward end of said metal sleeve.

3. A method of producing an optical connector ferrule, comprising the steps of:

providing a first mold having a cylindrical passage with an increased diameter portion of a first end forming a concentric annular recess and a hollow member having a conically shaped inner surface disposed at a second end thereof and formed coaxially with said cylindrical passage;

providing a second mold having a cylindrical passage which is coaxial with said cylindrical passage of said first mold when said second mold is abutted with the said first mold;

placing a metal sleeve in said cylindrical passage in said first mold, said metal sleeve extending from said member at said second end into said annular recess by a predetermined distance;

abutting said first and second molds;

disposing an optical fiber through the communicating cylindrical passages in the said first and second molds, said optical fiber having a bared end on which a protective coating has been stripped and which extends through said hole in said member at said second end;

injecting a synthetic resin material into said first and second molds to fill remaining portions of said longitudinal passages and said annular recess;

removing the product thus formed from said first and second molds after said synthetic resin material has hardened; and

cutting said bared end and polishing an end surface of the said bared end of said optical fiber.

4. The method of producing an optical connector ferrule of claim 3, wherein at least one of the inner and outer surfaces of said metal sleeve has small surface irregularities therein or said sleeve has an irregular form as defined in claim 1.

5. A method of producing an optical connector ferrule, comprising the steps of:

providing a first mold having a cylindrical passage with an increased diameter portion at a first end forming a concentric annular recess and a hollow member having a conically shaped inner surface disposed at a second end thereof and formed coaxially with said cylindrical passage;

providing a second mold having a cylindrical passage which is coaxial with said cylindrical passage of said first mold when said second mold is abutted with said first mold;

placing a metal sleeve in the said cylindrical passage in said first mold, said metal sleeve extending from said member at said second end into said annular recess by a predetermined distance;

abutting said first and second molds;

disposing a metal molding pin through the communicating cylindrical passages in the said first and second molds, said pin having a narrowed end extending through said hole in said member at said second end;

injecting a synthetic resin material into said first and second molds to fill remaining portions of said longitudinal passages and said annular recess;

removing the product thus formed from said first and second molds after said synthetic resin material has hardened;

removing said metal pin from the product thus formed;

inserting an optical fiber into the hole left by said metal pin with a bared end of the fiber from which a protective coating has been stripped extending through the hole in said member at said second end; affixing said optical fiber to said body with an adhesive; and

cutting said bared end and polishing an end surface of said bared end of said optical fiber.

6. The method of producing an optical connector ferrule of claim 5, wherein at least one of the inner and outer surfaces of said metal sleeve has small surface irregularities therein or said sleeve has an irregular form as defined in claim 1.

Revendications



* C L H S *

1. Embout pour connecteur de fibres optiques, comprenant un corps principal (3) formé d'une matière à base d'une résine de synthèse et ayant un flasque (31) dépassant radialement, une fibre optique (1) disposée dans le corps principal et ayant une extrémité polie à une première extrémité du corps principal, et un manchon métallique (4) constituant une partie d'une surface externe de l'embout, une extrémité du manchon métallique, en arrière de ladite extrémité de la fibre optique, étant enrobée dans la matière à base de résine de synthèse à la limite entre le flasque et le reste du corps, caractérisé en ce que le manchon métallique (5) a une forme ondulée comprenant des parties cylindriques décalées ayant en alternance des diamètres relativement grand et relativement petit.

2. Embout pour connecteur optique selon la revendication 1, dans lequel ladite extrémité de la fibre optique dépasse de l'extrémité antérieure du manchon métallique.

3. Procédé de fabrication d'un embout pour connecteur optique comprenant les étapes suivantes :

la réalisation d'un premier moule ayant un passage cylindrique comprenant une portion de diamètre accru à une première extrémité, formant une cavité annulaire concentrique, et un organe creux ayant une surface interne de forme conique, disposé à sa seconde extrémité et formé coaxialement au passage cylindrique,

la réalisation d'un second moule ayant un passage cylindrique qui est coaxial au passage cylindrique du premier moule, lorsque le second moule est mis en butée contre le premier moule,

la disposition d'un manchon métallique dans le passage cylindrique présent dans le premier moule, le manchon métallique dépassant dudit organe à la seconde extrémité, dans la cavité annulaire, sur une distance prédéterminée,

la mise en butée du premier et du second moule,

la disposition d'une fibre optique dans les passages cylindriques qui communiquent, dans le premier et le second moule, la fibre optique ayant une extrémité dénudée dont le revêtement protecteur a été retiré et qui passe dans le trou formé dans ledit organe, à la seconde extrémité,

l'injection d'une matière à base d'une résine de synthèse dans le premier et le second

moule afin que les parties restantes des passages longitudinaux et la cavité annulaire soient remplies,

l'extraction du produit ainsi formé du premier et du second moule après le durcissement de la matière à base de résine de synthèse, et

la découpe de l'extrémité dénudée et le polissage d'une surface d'extrémité de l'extrémité dénudée de la fibre optique.

4. Procédé de fabrication d'un embout pour connecteur optique selon la revendication 3, dans lequel l'une au moins des surfaces interne et externe du manchon métallique a de petites irrégularités de surface, ou le manchon a une forme irrégulière telle que définie dans la revendication 1.

5. Procédé de fabrication d'un embout pour connecteur optique, comprenant les étapes suivantes :

la réalisation d'un premier moule ayant un passage cylindrique comprenant une portion de diamètre accru à une première extrémité formant une cavité annulaire concentrique, et un organe creux ayant une surface interne de forme conique disposé à une seconde extrémité et formée coaxialement au passage cylindrique,

la réalisation d'un second moule ayant un passage cylindrique et qui est coaxial au passage cylindrique du premier moule, lorsque le second moule est en butée contre le premier moule,

la disposition d'un manchon métallique dans le passage cylindrique formé dans le premier moule, ce manchon métallique dépassant dudit organe à la seconde extrémité dans la cavité annulaire, sur une distance prédéterminée,

la mise en butée du premier et du second moule,

la disposition d'une tige métallique de moulage dans les passages cylindriques communiquant formés dans le premier et le second moule, la tige ayant une extrémité rétrécie passant dans le trou formé dans ledit organe, à la seconde extrémité,

l'injection d'une matière à base d'une résine de synthèse dans le premier et le second moule afin que les parties restantes des passages longitudinaux et la cavité annulaire soient remplies,

l'extraction du produit ainsi formé du premier et du second moule après durcissement de la matière à base d'une résine de synthèse,

l'extraction de la tige métallique du produit



ainsi formé,

l'introduction d'une fibre optique dans le trou laissé par la tige métallique, avec une extrémité dénudée de la fibre, dont le revêtement protecteur a été retiré, qui passe dans le trou formé dans ledit organe à la seconde extrémité,

la fixation de la fibre optique au corps par un adhésif, et

la découpe de l'extrémité dénudée et le polissage d'une surface d'extrémité de l'extrémité dénudée de la fibre optique.

6. Procédé de fabrication d'un embout pour connecteur optique selon la revendication 5, dans lequel l'une au moins des surfaces interne et externe du manchon métallique a de petites irrégularités de surface, ou le manchon a une forme irrégulière telle que définie dans la revendication 1.

Ansprüche

1. Faseroptik-Steckerfassung mit einem Hauptgehäuse (3), das aus einem Kunstharzmaterial hergestellt ist und einen sich radial erstreckenden Flansch (31) aufweist, eine sich durch das Hauptgehäuse erstreckende optische Faser (1), die ein poliertes Ende an einem Ende des Hauptgehäuses aufweist, und eine metallische Muffe (4), die einen Teil einer äußeren Oberfläche der Fassung bildet, wobei ein Ende der metallischen Muffe hinter dem Ende der optischen Faser in das Kunstfasermaterial an der Grenze zwischen dem Flansch und dem übrigen Gehäuse eingebettet ist, dadurch gekennzeichnet, daß die metallische Muffe (5) eine gewellte Form mit versetzten zylindrischen Abschnitten alternierend relativ großen und relativ kleinen Durchmessers aufweist.
2. Optische Steckerfassung nach Anspruch 1, bei welcher sich das Ende der optischen Faser über ein vorderes Ende der metallischen Muffe hinaus erstreckt.
3. Verfahren zur Herstellung einer optischen Steckerfassung, mit folgenden Schritten:

Bereitstellung einer ersten Form, die einen zylindrischen Kanal mit einem Abschnitt vergrößerten Durchmessers eines ersten Endes aufweist, der eine konzentrische ringförmige Ausnehmung bildet, und mit einem hohlen Teil, das eine konisch geformte innere Oberfläche aufweist, die an dessen zweiten Ende angeordnet und coaxial mit dem zylindrischen Kanal ausgebildet ist;

Bereitstellung einer zweiten Form, die einen zylindrischen Kanal aufweist, der coaxial mit dem zylindrischen Kanal der ersten Form verläuft, wenn die zweite Form an die erste Form anstößt;

Anordnen einer metallischen Muffe in dem zylindrischen Kanal in der ersten Form, wobei sich die metallische Muffe von dem Teil an dem zweiten Ende in die ringförmige Ausnehmung um eine vorbestimmte Entfernung hinein erstreckt;

die erste und zweite Form aneinander anstoßen lassen;

Anbringen einer optischen Faser durch die in Verbindung stehenden zylindrischen Kanäle in der ersten und zweiten Form, wobei die optische Faser ein freigelegtes Ende aufweist, an welchem eine schützende Beschichtung abgestreift wurde, und welches sich durch das Loch in dem Teil an dem zweiten Ende erstreckt;

Einspritzen eines Kunstharzmaterials in die erste und zweite Form, um verbleibende Abschnitte der länglichen Kanäle und der ringförmigen Ausnehmung auszufüllen;

Entfernung des auf diese Weise gebildeten Erzeugnisses aus der ersten und zweiten Form, nachdem das Kunstharzmaterial ausgehärtet ist; und

Schneiden des freigelegten Endes und Polieren einer Endoberfläche des freigelegten Endes der optischen Faser.

4. Verfahren zur Herstellung einer optischen Steckerfassung nach Anspruch 3, bei welchem zumindest eine der inneren und äußeren Oberflächen der metallischen Muffe in sich geringfügige Oberflächenunregelmäßigkeiten aufweist, oder die Muffe eine unregelmäßige Form aufweist, wie in Anspruch 1 festgelegt.
5. Verfahren zur Herstellung einer optischen Steckerfassung, mit folgenden Schritten:

Bereitstellung einer ersten Form, die einen zylindrischen Kanal aufweist, mit einem Abschnitt vergrößerten Durchmessers an einem ersten Ende, der eine konzentrische ringförmige Ausnehmung bildet, und mit einem hohlen Teil versehen ist, das eine konisch geformte innere Oberfläche aufweist, die an dessen zweiten Ende angeordnet und coaxial mit dem zylindri-



schen Kanal ausgebildet ist;

Bereitstellung einer zweiten Form, die einen zylindrischen Kanal aufweist, der coaxial mit dem zylindrischen Kanal der ersten Form verläuft, wenn die zweite Form an die erste Form anstößt;

Anordnen einer metallischen Muffe in dem zylindrischen Kanal in der ersten Form, wobei sich die metallische Muffe von dem Teil an dem zweiten Ende in die ringförmige Ausnehmung um eine vorbestimmte Entfernung erstreckt;

die erste und zweite Form aneinander zur Anlage bringen;

Anordnung eines metallischen Formstiftes durch die in Verbindung stehenden zylindrischen Kanäle in der ersten und zweiten Form, wobei der Stift ein verjüngtes Ende aufweist, das sich durch das Loch in dem Teil an dessen zweiten Ende erstreckt;

Einspritzen eines Kunstharzmaterials in die erste und zweite Form, um verbleibende Abschnitte der länglichen Kanäle und der ringförmigen Ausnehmung auszufüllen;

Entfernen des derart gebildeten Erzeugnisses aus der ersten und zweiten Form, nachdem das Kunstharzmaterial ausgehärtet ist;

Entfernen des metallischen Stiftes von dem derart gebildeten Erzeugnis;

Einführen einer optischen Faser in das Loch, das von dem metallischen Stift zurückgelassen wurde, mit einem freigelegten Ende der Faser, von welchem eine schützende Beschichtung abgestreift wurde, wobei sich das freigelegte Ende durch das Loch in dem Teil an dem zweiten Ende erstreckt;

Befestigung der optischen Faser an dem Gehäuse mit einem Kleber; und

Schneiden des freigelegten Endes und Polieren einer Endoberfläche des freigelegten Endes der optischen Faser.

6. Verfahren zur Herstellung einer optischen Steckerfassung nach Anspruch 5, bei welchem zumindest eine der inneren und äußeren Oberflächen der metallischen Muffe in sich geringfügige Oberflächenunregelmäßigkeiten aufweist, oder die Muffe eine unregelmäßige

Form aufweist, wie in Anspruch 1 festgelegt.



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