(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 September 2008 (25.09.2008)

PCT

(10) International Publication Number
WO 2008/115506 A1

(51) International Patent Classification:
G02B 6/38 (2006.01)

(21) International Application Number:
PCT/US2008/003569

(22) International Filing Date: 19 March 2008 (19.03.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/726,185 21 March 2007 (21.03.2007) US

(71) Applicant *(for all designated States except US)*: **CORNING CABLE SYSTEMS LLC** [US/US]; Intellectual Property Department, SP-TI-3-1, Corning, New York 14831 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **COOKE, Terry L** [US/US]; 908 38th Avenue NE, Hickory, North Carolina 28601 (US). **LUTHER, James P** [US/US]; 2471 Rolling Ridge Drive, Hickory, North Carolina 28602 (US). **ROSSON, Joel C** [US/US]; 280 44th Avenue Circle NW, Hickory, North Carolina 28601 (US). **WAKJIRA, Jillcha F** [US/US]; 1910 20th Avenue Drive, NE Apt. 74, Hickory, North Carolina 28601 (US).

(74) Agent: **CARROLL, Michael E Jr.**; Corning Cable Systems LLC, 800 17th Street NW, PO Box 489, Hickory, North Carolina 28603-0489 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(54) Title: FERRULE HOLDER AND ASSOCIATED FIBER OPTIC CONNECTOR HAVING ANTI-WITHDRAWAL AND ANTI-ROTATION FEATURES

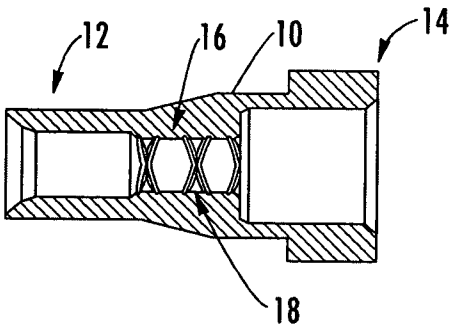


FIG. 1

(57) Abstract: The present invention relates generally to ferrule holders and associated fiber optic connectors used in optical communications networks, optical devices, and the like to optically couple optical fibers. More specifically, the present invention relates to a ferrule holder and an associated fiber optic connector having improved anti-withdrawal and anti-rotation features, such as a twin-threaded configuration, a single-threaded configuration, a splined configuration, a broached configuration, a counter-bored configuration, a dented configuration, a finned configuration, etc. These anti-withdrawal and anti-rotation features assist in holding an optical fiber in secure optical and/or physical contact with a ferrule within the ferrule holder and associated fiber optic connector.

WO 2008/115506 A1

FERRULE HOLDER AND ASSOCIATED FIBER OPTIC CONNECTOR HAVING ANTI-WITHDRAWAL AND ANTI-ROTATION FEATURES

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates generally to ferrule holders and associated fiber optic connectors used in optical communications networks, optical devices, and the like to optically couple optical fibers. More specifically, the present invention relates to a ferrule holder and an associated fiber optic connector having improved anti-withdrawal and anti-rotation features, such as a twin-threaded configuration, a single-threaded configuration, a splined configuration, a broached configuration, a counter-bored configuration, a dented configuration, a finned configuration, etc. These anti-withdrawal and anti-rotation features assist in holding an optical fiber in secure optical and/or physical contact with a ferrule within the ferrule holder and associated fiber optic connector.

Technical Background of the Invention

[0002] A conventional fiber optic connector includes, among other parts, an outer housing, an alignment sleeve, an inner structure that is configured to retain an optical fiber cable, a heat shrink and/or boot that is/are configured to retain and protect the optical fiber cable, and a ferrule holder that is configured to hold a ferrule. This ferrule is in optical and/or physical contact with an optical fiber that typically enters the ferrule holder opposite the ferrule. In operation, the fiber optic connector is mated with another fiber optic connector, such as a plug with a receptacle, for example, bringing the corresponding ferrules into optical and/or physical contact. This, of course, brings the corresponding optical fibers into optical contact, thereby creating an optical connection. The ferrules may be single or multi-fiber ferrules. The ferrule holders holding these ferrules may assume a variety of shapes, but are typically substantially cylindrical, and

are manufactured from a metallic material or plastic material, due to the fact that such materials are relatively easy to machine or cast.

[0003] The optical fiber that enters the ferrule holder opposite the ferrule is typically secured in the ferrule holder and to the ferrule using an adhesive, preventing withdrawal and rotation of the optical fiber in relation to the ferrule holder and the ferrule. One major problem that the fiber optic industry currently struggles with, however, is that of delamination of the adhesive, caused by the poor bonding that exists between an optical fiber and a metallic material ferrule holder, for example. In addition, the adhesive used is prone to shrinking and detaching from the underlying substrate.

[0004] A variety of techniques have been developed to deal with the problems described above, including the use of various mechanical anchoring mechanisms and adhesive compositions. None of these techniques, however, provide adequate anti-withdrawal and anti-rotation characteristics. The techniques fail existing pull and twist tests in the face of the delamination and shrinkage problems described above. Thus, what is still needed in the art is a ferrule holder and associated fiber optic connector having improved anti-withdrawal and anti-rotation features.

BRIEF SUMMARY OF THE INVENTION

[0005] In various embodiments, the present invention provides a ferrule holder and associated fiber optic connector having improved anti-withdrawal and anti-rotation features, such as a twin-threaded configuration, a single-threaded configuration, a splined configuration, a broached configuration, a counter-bored configuration, a dented configuration, a finned configuration, etc. These anti-withdrawal and anti-rotation features assist in holding an optical fiber in secure optical and/or physical contact with a ferrule within the ferrule holder and associated fiber optic connector.

[0006] In one embodiment, the present invention provides a ferrule holder for use in a fiber optic connector or the like, including: a first end portion defining a bore that is configured and sized to receive an optical fiber; a second end portion defining a bore that is configured and sized to receive a ferrule; and a center portion defining a bore that is configured and sized to receive the optical fiber disposed between the first end portion and the second end portion, wherein an inside surface of the center portion includes an anti-withdrawal and anti-rotation geometry for holding the optical fiber in secure optical and/or physical contact with the ferrule. The anti-withdrawal and anti-rotation geometry includes a structure selected from the group consisting of a twin thread, a single thread, a spline, a broach, a counter-bore, a dent, one or more fins, and a combination thereof. The ferrule holder also includes an adhesive disposed on the inside surface of the center portion for holding the optical fiber in secure optical and/or physical contact with the ferrule.

[0007] In another embodiment, the present invention provides a device for use in a fiber optic connector or the like, including: a first end portion defining a bore that is configured and sized to receive a first optical fiber; a second end portion defining a bore that is configured and sized to receive a second optical fiber; and a center portion defining a bore that is configured and sized to receive the first optical fiber disposed between the first end portion and the second end portion, wherein an inside surface of the center portion includes an anti-withdrawal and anti-rotation geometry for holding the first optical fiber in secure optical and/or physical contact with the second optical fiber. Again, the anti-withdrawal and anti-rotation geometry includes a structure selected from the group consisting of a twin thread, a single thread, a spline, a broach, a counter-bore, a dent, one or more fins, and a combination thereof. The device also includes an adhesive disposed on the inside surface of the center portion for holding the first optical fiber in secure optical and/or physical contact with the second optical fiber.

[0008] In a further embodiment, the present invention provides a fiber optic connector including a ferrule holder, including: a first end portion defining a bore that is configured and sized to receive an optical fiber; a second end portion defining a bore that is configured and sized to receive a ferrule; and a center portion defining a bore that is configured and sized to receive the optical fiber disposed between the first end portion and the second end portion, wherein an inside surface of the center portion includes an anti-withdrawal and anti-rotation geometry for holding the optical fiber in secure optical and/or physical contact with the ferrule. The anti-withdrawal and anti-rotation geometry includes a structure selected from the group consisting of a twin thread, a single thread, a spline, a broach, a counter-bore, a dent, one or more fins, and a combination thereof. The fiber optic connector also includes an adhesive disposed on the inside surface of the center portion for holding the optical fiber in secure optical and/or physical contact with the ferrule.

[0009] It is to be understood that both the foregoing general description and the following detailed description provide exemplary embodiments of the present invention, and an overview or framework for understanding the nature and character of the present invention as it is claimed. The accompanying drawings are included in order to provide a further understanding of the present invention, and are incorporated into and constitute a part of this specification. The accompanying drawings illustrate the various exemplary embodiments of the present invention, and together with the detailed description, serve to explain the principles of operation thereof. The accompanying drawings are meant to be illustrative, and not limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention is illustrated and described herein with reference to the various drawings, in which like reference numbers are used to denote like method steps and/or device components, as appropriate, and in which:

[0011] FIG. 1 is a planar side view illustrating one embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a twin-threaded configuration.

[0012] FIG. 2 is a planar side view illustrating another embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a single-threaded configuration.

[0013] FIG. 3 is a planar side view illustrating a further embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a splined configuration.

[0014] FIG. 4 is a planar side view illustrating a still further embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a broached configuration.

[0015] FIG. 5 is a planar side view illustrating a still further embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a counter-bored configuration.

[0016] FIG. 6 is a planar side view illustrating a still further embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a dented configuration.

[0017] FIG. 7 is a planar side view illustrating a still further embodiment of the ferrule holder of the present invention, specifically the ferrule holder having a finned configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0018] In various embodiments, the present invention provides a ferrule holder and associated fiber optic connector having improved anti-withdrawal and anti-rotation features, such as a twin-threaded configuration, a single-threaded configuration, a splined configuration, a broached configuration, a counter-bored configuration, a dented configuration, a finned configuration, etc. These anti-withdrawal and anti-rotation features assist in holding an optical fiber in secure optical and/or physical contact with a ferrule within the ferrule holder and associated fiber optic connector.

[0019] Referring to **FIG. 1**, in one embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes twin threads **18** manufactured into its inside surface. These twin threads **18** physically enhance the

anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provide additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include twin threads **18** manufactured into their inside surfaces. Again, these twin threads **18** physically enhance the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provide additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This twin-threaded configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0020] Referring to **FIG. 2**, in another embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is

configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes a single thread **20** manufactured into its inside surface. This single thread **20** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provides additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include a single thread **20** manufactured into their inside surfaces. Again, this single thread **20** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provides additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This single-threaded configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0021] Referring to **FIG. 3**, in a further embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule.

As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes a spline **22** manufactured into its inside surface. This spline **22** physically enhance the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provides additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include a spline **22** manufactured into their inside surfaces. Again, this spline **22** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provides additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This splined configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0022] Referring to **FIG. 4**, in a still further embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this

embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes a broach **24** manufactured into its inside surface. This broach **24** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provides additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. The broach **24** may vary in length and depth, as appropriate. For example, the broach **24** may run the entire length of the retention bore **16**, or only a small portion of the length of the retention bore **16**. Alternatively, a plurality of retention bores **16** each include a broach **24** manufactured into their inside surfaces. Again, this broach **24** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provides additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This broached configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0023] Referring to **FIG. 5**, in a still further embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in

the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes a counter-bore **26** manufactured into its inside surface. This counter-bore **26** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provides additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include a counter-bore **26** manufactured into their inside surfaces. Again, this counter-bore **26** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provides additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This counter-bored configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0024] Referring to **FIG. 6**, in a still further embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to

receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes a dent **28** manufactured into its inside surface. This dent **28** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provides additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include a dent **28** manufactured into their inside surfaces. Again, this dent **28** physically enhances the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provides additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This dented configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0025] Referring to **FIG. 7**, in a still further embodiment, the ferrule holder **10** of the present invention includes a first end **12** including a bore that is configured and sized to receive an optical fiber (not illustrated) and a second end **14** including a bore that is configured and sized to receive a ferrule (not illustrated). The first end **12** including the bore that is configured and sized to receive the optical fiber is substantially cylindrical, in the event that a single optical fiber is used, or substantially rectangular, in the event that multiple optical fibers are used. Similarly, the second end **14** including the bore that is configured and sized to receive the ferrule is substantially cylindrical, in the event that a single-fiber ferrule is used, or substantially rectangular, in the event that a multi-fiber ferrule is used. It should be noted that any suitable shapes may be used. In this embodiment, the outside and inside diameters of the first end **12** including the bore that is configured and sized to receive the optical fiber are substantially smaller than the outside and inside diameters of the second end **14** including the bore that is configured and sized to receive the ferrule. As described above, the ferrule holder **10** is manufactured from a metallic material, plastic material, or the like. A retention bore **16** is disposed between the bores of the first end **12** and the second end **14** of the ferrule holder **10**. This retention bore **16** is configured to receive and retain the optical fiber, holding it in optical and/or physical contact with the ferrule. In this embodiment, the retention bore **16** includes one or more non-intersecting and non-conjoined fins **30** manufactured into its inside surface. These one or more fins **30** physically enhance the anti-withdrawal and anti-rotation characteristics of the retention bore **16**, acting as an anchor, as well as provide additional surface area for an adhesive (not illustrated) disposed between the optical fiber and the retention bore **16** to adhere to, if used, effectively eliminating delamination and shrinkage problems. Alternatively, a plurality of retention bores **16** each include one or more fins **30** manufactured into their inside surfaces. Again, these one or more fins **30** physically enhance the anti-withdrawal and anti-rotation characteristics of the retention bores **16**, acting as anchors, as well as provide additional surface area for an adhesive disposed between the optical fiber and the retention bores **16** to adhere to, if used. This finned

configuration allows the ferrule holder **10** to pass existing pull and twist tests, as the adhesive-fiber-matrix is effectively strengthened. Thus, robust optical contact between the optical fiber and the ferrule is ensured, even in the face of destructives forces applied to the optical fiber.

[0026] It should be noted that any suitable anti-withdrawal and anti-rotation geometry is with respect to the retention bore(s) **16** (**FIGS. 1-7**) is contemplated by the present invention. Likewise, the present invention is not limited in its application to a ferrule holder **10** (**FIGS. 1-7**). It may be applied variously to any housing that is used to hold an optical fiber during fiber optic connector assembly, for example. Both ceramic and non-ceramic ferrules are contemplated by the present invention.

[0027] Although the present invention has been illustrated and described herein with reference to preferred embodiments and specific examples thereof, it will be readily apparent to those of ordinary skill in the art that other embodiments and examples may perform similar functions and/or achieve like results. All such equivalent embodiments and examples are within the spirit and scope of the present invention and are intended to be covered by the following claims.

What is claimed is:

1. A ferrule holder for use in a fiber optic connector or the like, comprising:

a first end portion defining a bore that is configured and sized to receive an optical fiber;

a second end portion defining a bore that is configured and sized to receive a ferrule; and

a center portion defining a bore that is configured and sized to receive the optical fiber disposed between the first end portion and the second end portion, wherein an inside surface of the center portion comprises an anti-withdrawal and anti-rotation geometry for holding the optical fiber in secure optical and/or physical contact with the ferrule, wherein the anti-withdrawal and anti-rotation geometry does not extend to an outer end of the second end portion.

2. The ferrule holder of claim 1, wherein the ferrule holder is a portion of a fiber optic connector.

3. The ferrule holder of claims 1 or 2, wherein the bore of the second end portion includes an inside bore diameter that is greater than an inside bore diameter of the center portion bore

4. The ferrule holder of claims 1-3, wherein the anti-withdrawal and anti-rotation geometry comprises a structure selected from the group consisting of a twin thread, a single thread, a spline, a broach, a counter-bore, a dent, one or more fins, and a combination thereof.

5. The ferrule holder of claims 1-4, further comprising an adhesive disposed on the inside surface of the center portion for holding the optical fiber in secure optical and/or physical contact with the ferrule.

6. The ferrule holder of claims 1-5, wherein the ferrule holder comprises one of a metallic material and a plastic material.

7. The ferrule holder of claims 1-6, wherein the ferrule holder is formed by one of machining and casting.

8. The ferrule holder of claims 1-7, wherein the anti-withdrawal and anti-rotation geometry does not extend to an outer end of the first end portion.

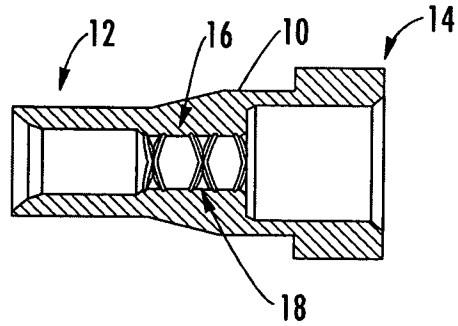


FIG. 1

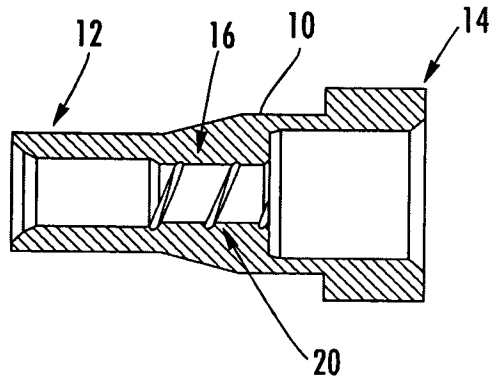


FIG. 2

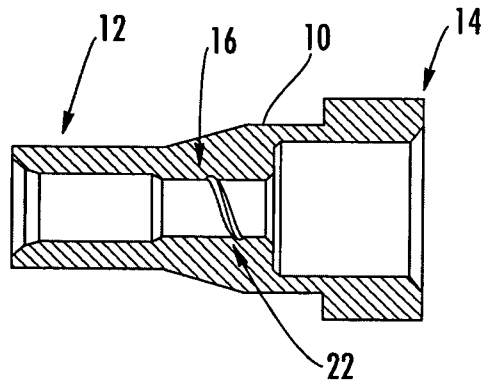


FIG. 3

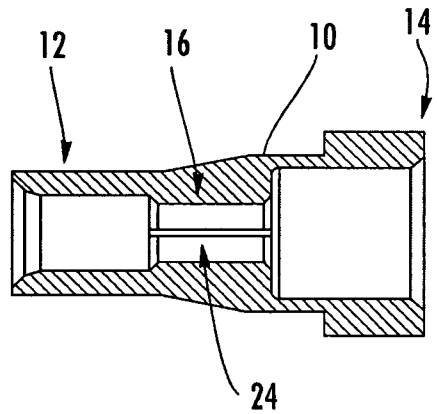


FIG. 4

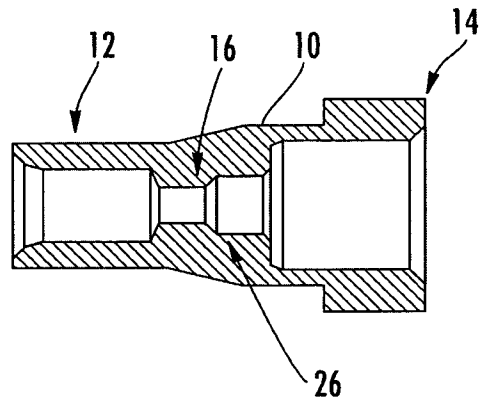


FIG. 5

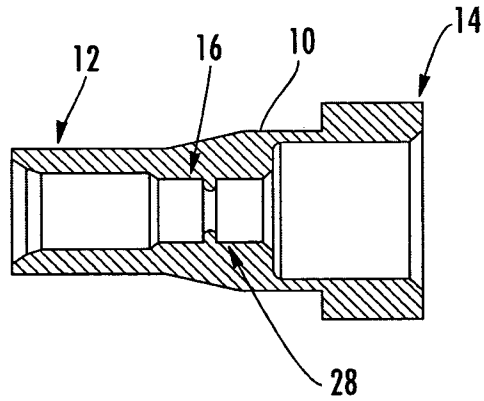


FIG. 6

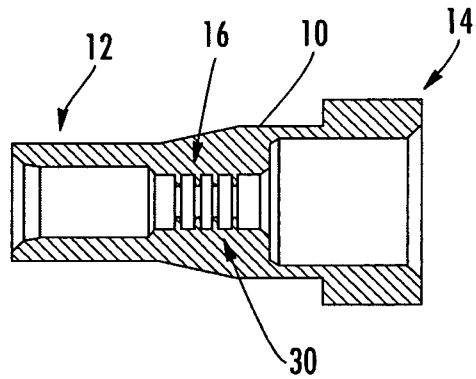


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/003569

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B6/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 880 290 A (KUMAZAWA TETSUO [JP] ET AL) 14 November 1989 (1989-11-14) abstract; figures 1,2,4 column 1, line 21 - line 44 column 1, line 66 - column 2, line 3 column 2, line 23 - line 50 column 3, line 3 - line 9	1-8
X	US 5 381 497 A (TOLAND DAVID S [US] ET AL) 10 January 1995 (1995-01-10) abstract; figures 7-9 column 3, line 48 - column 5, line 40	1-8
X	JP 60 150009 A (NIPPON ELECTRIC CO) 7 August 1985 (1985-08-07) abstract; figures 1-5	1-8

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 July 2008	08/07/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Jakober, François

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/003569

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/244108 A1 (BILLMAN BRADLEY S [US] ET AL) 3 November 2005 (2005-11-03) abstract; figures 4,14,17	1-8
X	US 5 071 218 A (NISHIMOTO HIROAKI [JP]) 10 December 1991 (1991-12-10) figure 4	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2008/003569

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4880290 A	14-11-1989	JP 2644733 B2 JP 63075703 A	25-08-1997 06-04-1988
US 5381497 A	10-01-1995	NONE	
JP 60150009 A	07-08-1985	NONE	
US 2005244108 A1	03-11-2005	NONE	
US 5071218 A	10-12-1991	JP 3114805 U	26-11-1991