US 20060105684A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0105684 A1**

**Lurie et al.** (43) **Pub. Date: May 18, 2006**

(54) **FIBER POLISHING APPARATUS AND METHOD FOR FIELD TERMINABLE OPTICAL CONNECTORS**

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(21) Appl. No.: **10/988,816**

(22) Filed: **Nov. 15, 2004**

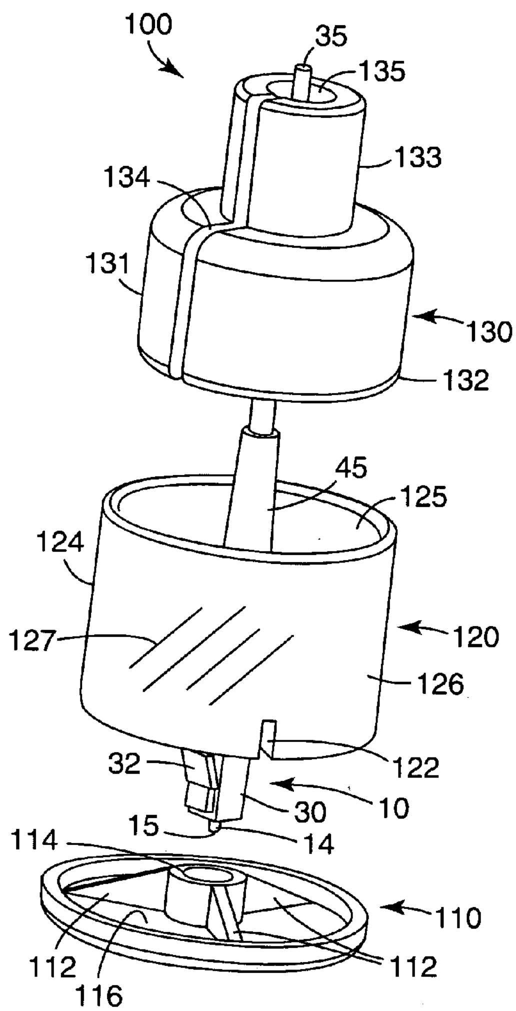
**Publication Classification**

(51) **Int. Cl.**
***B24B 7/30*** (2006.01)
***B24B 41/06*** (2006.01)

(52) **U.S. Cl.** .............................................. **451/41**; 451/390

(57) **ABSTRACT**

A polishing apparatus for an optical fiber connector that includes an optical fiber ferrule and a connector housing, comprises a polishing puck having an aperture to permit passage of the ferrule therethrough and a mount to hold the connector housing at a predetermined angle. The polishing apparatus further includes a stabilizer having a first portion mountable on the polishing puck to provide a grip separate from the connector housing. The polishing apparatus further includes a weighting device, at least a portion of which is disposed in the stabilizer, to provide a direct force on the connector housing, substantially independent from the stabilizer. The polishing apparatus provides a hand-polishing tool that controls the force and tilt placed on a terminated optical fiber connector during the polishing process, thereby providing more repeatable polished ferrules with respect to ferrule geometry such as ferrule radius of curvature (ROC), apex offset, and fiber height.



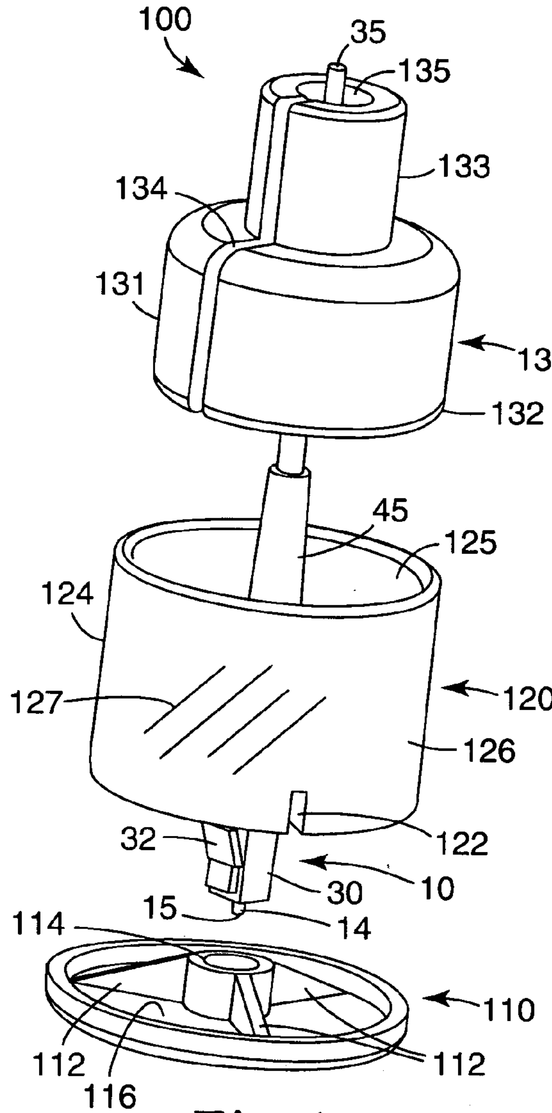

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*Fig. 1*

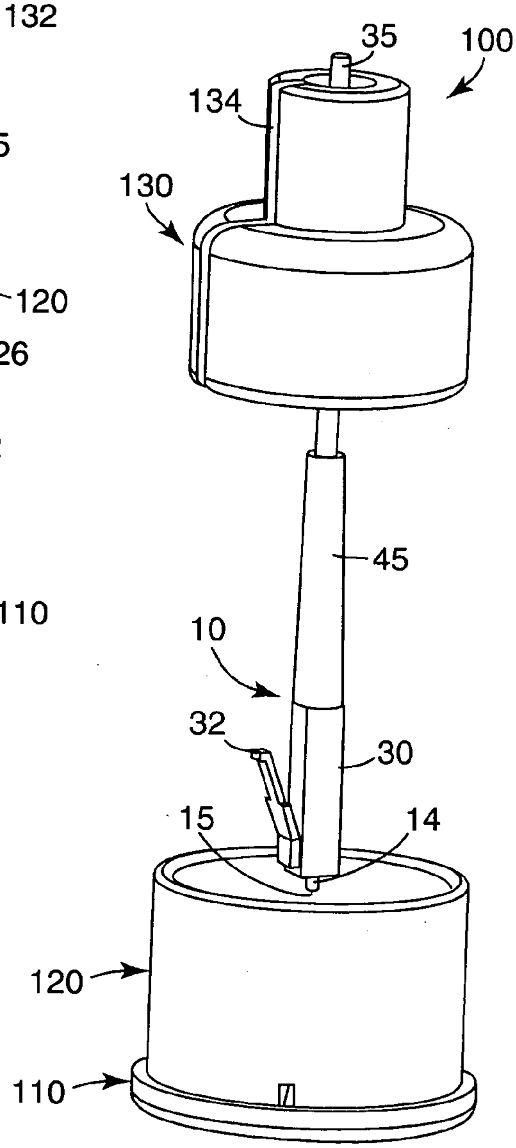
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*Fig. 2*

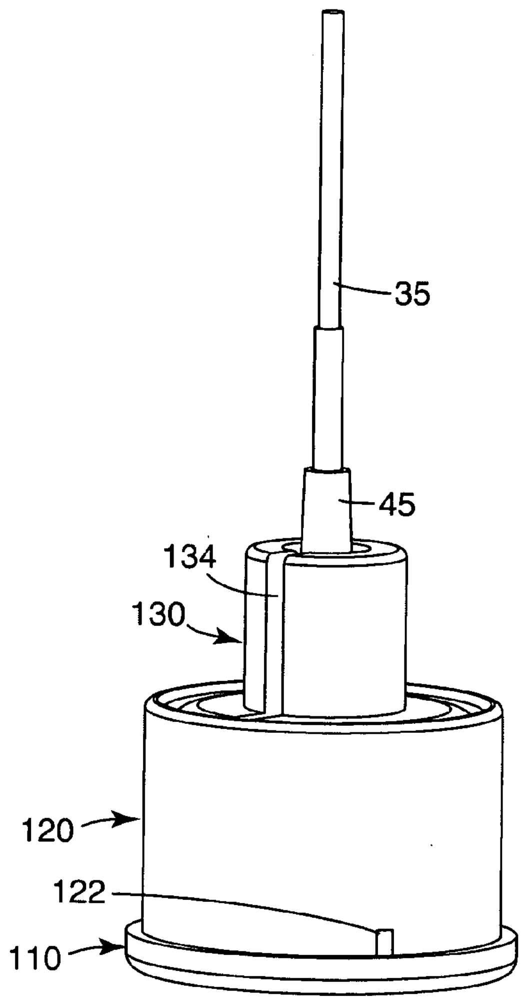


*Fig. 3*

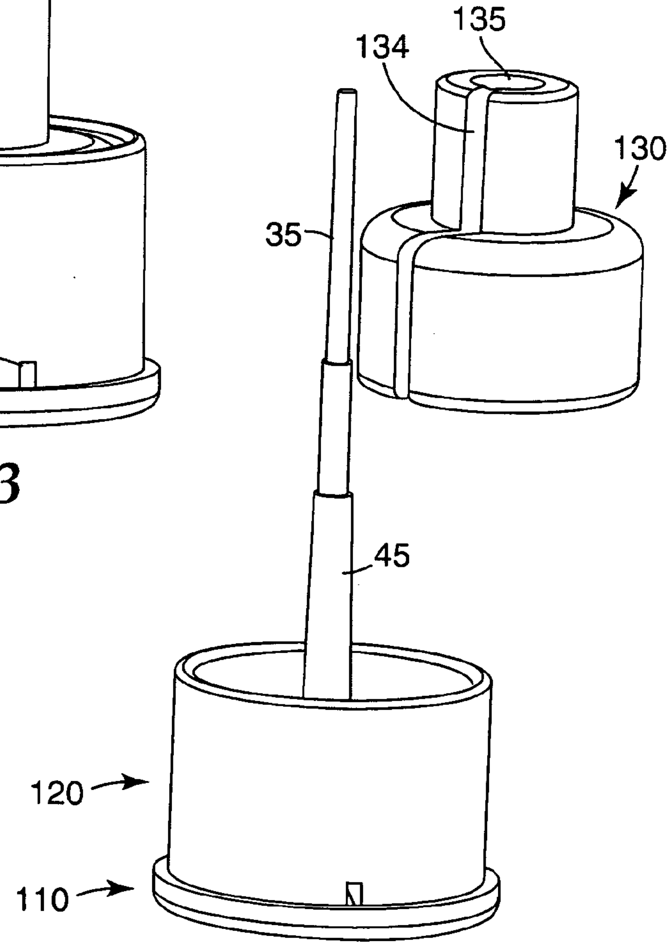


*Fig. 4*

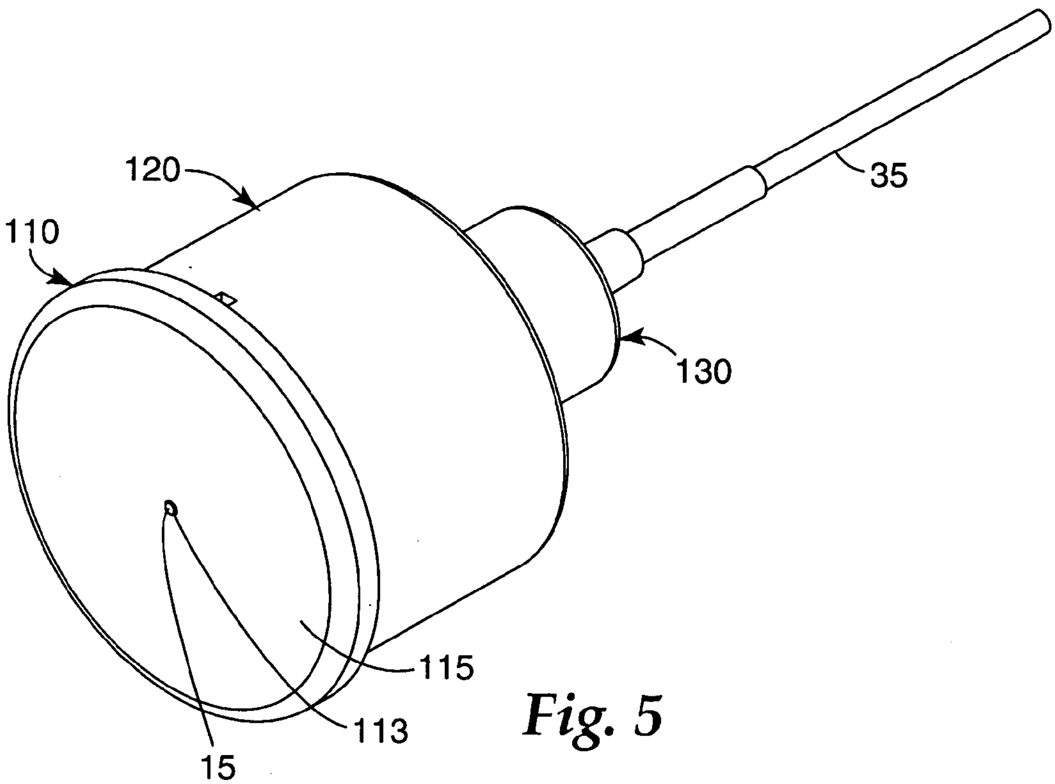


Fig. 5

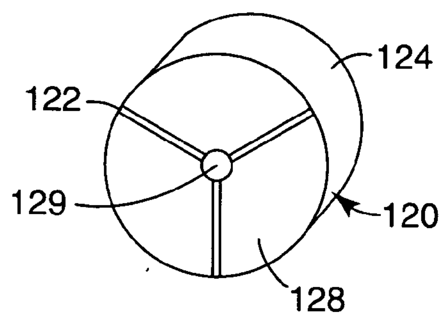


Fig. 6

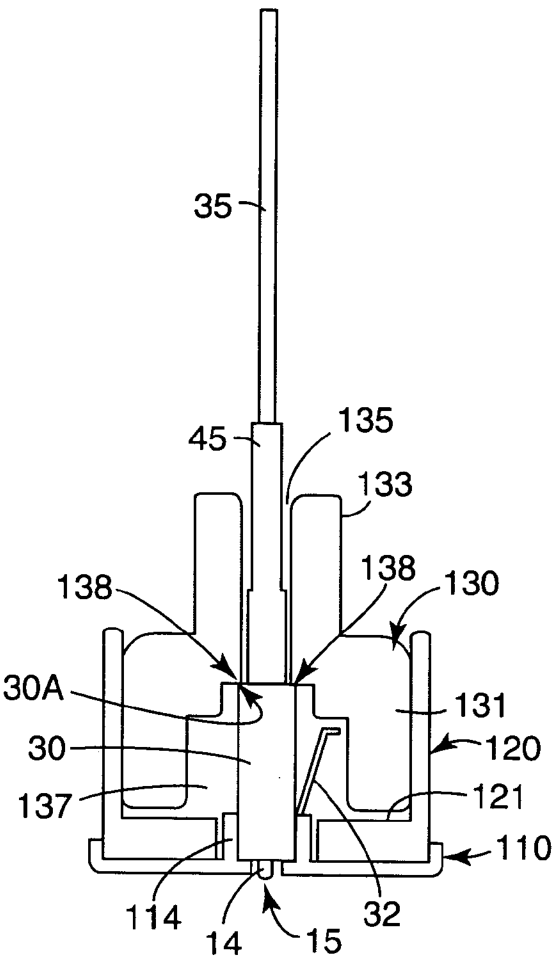
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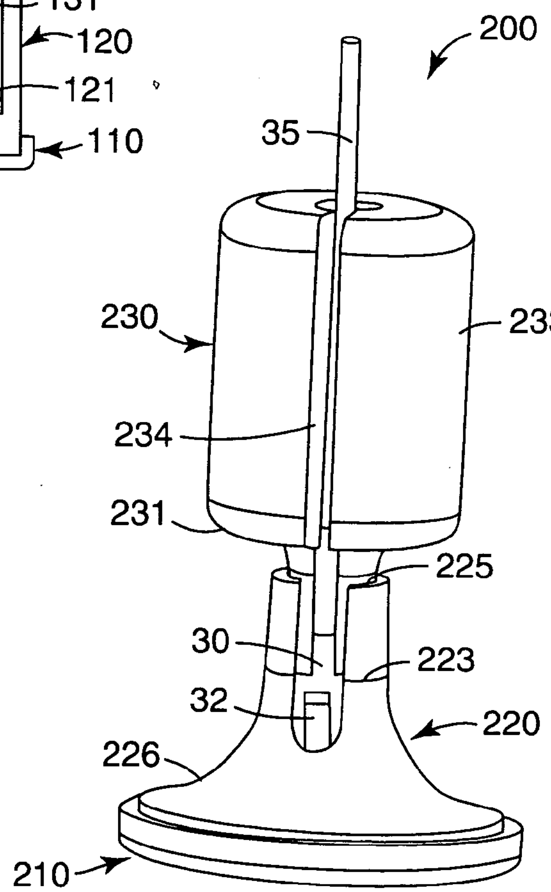
*Fig. 7*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220
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210

*Fig. 8*

# FIBER POLISHING APPARATUS AND METHOD FOR FIELD TERMINABLE OPTICAL CONNECTORS

## BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention is directed to an apparatus and method for polishing terminated optical fiber connectors, in particular, field terminable ferrule-based optical connectors having a thermoplastic adhesive.

[0003] 2. Related Art

[0004] Mechanical optical fiber connectors for the telecommunications industry are known. In recent years, an emphasis has been placed on the use of small form factor (SFF) optical fiber connectors. For example, LC ("Lucent Connectors") optical-type connectors have been described in U.S. Pat. Nos. 5,481,634; 5,719,977; and 6,318,903. Other SFF connectors include MU-type and LX5-type optical connectors. These connectors are used for joining optical fiber segments at their ends and for connecting optical fiber cables to active and passive devices. The LC form factor is about 50% smaller (e.g., with a ferrule polishing area of about 0.5 $mm^2$) than the form factors for other conventional optical connectors, such as ST, FC, and SC (e.g., with a ferrule polishing area of about 3.2 $mm^2$), which can be referred to as large form factor (LFF) connectors.

[0005] Commercially available SFF connectors are not well suited for field installations. Conventional adhesive materials include thermosets, anaerobic and UV curing adhesives, as well as two-part epoxies and acrylates. For example, LC connectors typically use epoxy-based resins (e.g., two part epoxies) for fiber retention within the ferrule portion of the connector. These epoxies require about 10 to 15 minutes to heat cure after application. Once set, the fiber cannot be removed from the ferrule without breaking the fiber, thus making resetting of the optical fiber in the ferrule impractical.

[0006] In addition, because of their small size, most SFF connectors utilize 50% reduced diameter ceramic ferrules for fiber alignment, resulting in about six times reduction in available polishing area. Due to this reduced polishing area, it is more difficult to control the important parameters of SFF connector ferrule geometry, namely the radius of curvature (or "ROC"), the fiber height, and the (radius) apex offset.

## SUMMARY OF THE INVENTION

[0007] According to a first aspect of the present invention, a polishing apparatus for an optical fiber connector that includes an optical fiber ferrule and a connector housing, comprises a polishing puck having an aperture to permit passage of the ferrule therethrough and a mount to hold the connector housing at a predetermined angle. The polishing apparatus further includes a stabilizer having a first portion mountable on the polishing puck to provide a grip separate from the connector housing. The polishing apparatus further includes a weighting device, at least a portion of which is disposed in the stabilizer, to provide a direct force on the connector housing.

[0008] According to another embodiment, a method of polishing an optical fiber connector that includes an optical fiber ferrule and a connector housing, comprises providing the polishing apparatus described above. The stabilizer is mounted on the polishing puck. The method further includes disposing the optical fiber connector in the mount, wherein at least a portion of the ferrule extends through an aperture in the polishing puck. The weighting device is then placed in the stabilizer, where a portion of the weighting device directly contacts at least a portion of the connector housing. The polishing apparatus is then translated across at least one polishing surface for a predetermined amount of polishing strokes.

[0009] The above summary of the present invention is not intended to describe each illustrated embodiment or every implementation of the present invention. The figures and the detailed description that follows more particularly exemplify these embodiments.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will be further described with reference to the accompanying drawings, wherein:

[0011] **FIG. 1** shows an exploded schematic view of a polishing apparatus according to an exemplary embodiment of the present invention.

[0012] **FIG. 2** shows another schematic view of a polishing apparatus according to the embodiment of **FIG. 1**.

[0013] **FIG. 3** shows another schematic view of a polishing apparatus according to the embodiment of **FIG. 1**.

[0014] **FIG. 4** shows another schematic view of a polishing apparatus according to the embodiment of **FIG. 1**.

[0015] **FIG. 5** shows another schematic view of a polishing apparatus according to the embodiment of **FIG. 1**.

[0016] **FIG. 6** shows a schematic view of a stabilizer according to an exemplary embodiment of the present invention.

[0017] **FIG. 7** shows a cross section view of a weighting device according to the embodiment of **FIG. 1**.

[0018] **FIG. 8** shows a schematic view of a polishing apparatus according to an alternative embodiment of the present invention.

[0019] While the invention is amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the scope of the invention as defined by the appended claims.

## DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] The present invention is directed to an apparatus and method for polishing terminated optical fiber connectors, in particular, field terminable ferrule-based optical connectors having a thermoplastic adhesive.

[0021] According to an exemplary embodiment of the present invention, a polishing device or apparatus, such as shown in **FIGS. 1-5** can be utilized to provide consistent, repeatable polishing for SFF (and LFF) optical connectors that are field terminable (i.e., able to be terminated in the field). In particular, polishing apparatus **100** provides a hand-polishing tool that controls the force and tilt placed on a terminated optical fiber connector during the polishing process, thereby providing more repeatable polished ferrules that comply with ferrule geometric parameters such as ferrule radius of curvature (ROC), apex offset and fiber height.

[0022] **FIGS. 1-5** illustrate different schematic views of an exemplary embodiment of the present invention, a polishing apparatus **100**. Polishing apparatus **100** includes the following main parts: a polishing puck **110**, a stabilizer or grip **120**, and a weighting device **130**. Polishing puck **110** is constructed from a rigid material, such as a metal or a molded polymer (e.g., glass or mineral filled plastic). The shape of polishing puck **110** can be any convenient shape, for example, a structure having a circular base, which can remain substantially flat on a polishing media or surface during the polishing process.

[0023] Polishing puck **110** further includes a connector mount **114** that is configured to receive a SFF connector, such as an LC-type connector **10**, having a fiber connector housing **30** and having an optical fiber terminated in the connector ferrule **14**. Typically, ferrule **14** is formed from a ceramic, glass, plastic, or metal material to support an optical fiber inserted therein. In an exemplary embodiment, the SFF connector **10** is preloaded with a thermoplastic adhesive that can rapidly soften at a sufficient elevated temperature and that can rapidly harden when exposed to ambient (e.g., room) temperature. For example, the thermoplastic adhesive utilized can be a thermoplastic resin, such as described in U.S. Pat. No. 4,984,865, incorporated by reference herein in its entirety. In addition, the thermoplastic adhesive can be an ultra high temperature (UHT) thermoplastic adhesive material which provides a high softening point and that is capable of satisfying environmentally stringent Telcordia GR-326 specifications. The construction of an exemplary LC-type optical connector, other suitable adhesives and the pre-loading of an exemplary LC-type optical connector are further described in commonly-owned and co-pending U.S. patent application Ser. No. 10/811,437, incorporated by reference herein in its entirety. An exemplary method of terminating a fiber in a SFF connector is described in a commonly-owned and co-pending U.S. Patent Application entitled "Field Termination Apparatus and Method For Small Form Factor Optical Connectors with Thermoplastic Adhesive" (Attorney Docket No. 60093US002), incorporated by reference herein in its entirety.

[0024] Alternatively, in other embodiments, the connector may be any SFF or LFF connector. In additional alternative embodiments, the fiber terminating process may be accomplished utilizing a thermoplastic adhesive or a thermoset, e.g., a cyanoacrylate, an anaerobic and/or UV curing adhesive, or a two-part epoxy or acrylate.

[0025] Mount **114** provides a snug, slidable fit to hold connector **10** at a predetermined angle, e.g., 90° with respect to the polishing surface or at a small angle from perpendicular (about 5° to about 12°) for angle polished connectors. When in use, a terminated optical fiber connector **10** is placed in mount **114**, so that a portion of ferrule **14** of the optical fiber connector **10** extends through aperture **113** of puck **110**. The bottom surface **115** of puck **110** can then be moved or slid across an appropriate polishing media (not shown) so that the fiber and ferrule end face **15** is suitably polished (e.g., flat or angled), within permissible/compliant ROC and apex offset tolerances. Conventional LC polishing pucks suitable for the apparatus of the present invention are commercially available from optical connector vendors such as OFS (Georgia, USA).

[0026] Polishing apparatus **100** further includes a stabilizer or grip **120**. Stabilizer **120** includes a body **124** that is constructed of a rigid material, such as a metal or molded polymer, which is mountable on polishing puck **110**. As shown in the exemplary embodiment of **FIGS. 1-5**, stabilizer **120** can be snugly disposed, mounted on or affixed to polishing puck **110**, where slots **122** are formed to slidably mount on puck rib structures or ridges **112**. Slots **122** can provide clearance of ridges **112**. In addition the fitting together of the slots and ridges can prevent substantial rotation of the stabilizer **120** on the puck **110**. Precise alignment of the stabilizer and the puck and the retention of the stabilizer in the puck can be created by a friction/interference fit between the outside wall of stabilizer **120** and the inside wall of the lip on the puck (see **FIG. 1**). Other mechanisms for mounting stabilizer **120** to polishing puck **110** can be utilized, as would be apparent to one of ordinary skill in the art. In addition, in this exemplary embodiment, stabilizer **120** can have an opening **125** to permit passage of the optical connector housing **30** and to receive weighting device **130**.

[0027] As shown in **FIG. 6**, stabilizer **120** can optionally include a lower portion, wherein slots **122** are formed in a bottom surface **128**. In addition, the bottom surface **128** of the stabilizer lower portion can be disposed on surface **116** of puck **110**, which reduces the likelihood of the polishing puck **110** flexing significantly during a field polishing process. Stabilizer **120** can also include a lower opening **129** to allow straightforward passage of connector housing **30** and connector latch mechanism **32** to the puck mount **114**. At least a portion of puck mount **114** may extend into lower opening **129**.

[0028] Stabilizer **120** is configured to provide a field technician (who performs polishing in the field) with a stable gripping surface during the polishing procedure, so that force is transferred substantially uniformly to the polishing puck **110**, to help maintain ferrule/end face surface **15** in a substantially flat orientation on the polishing surface or media. In addition, outer surface **126** of stabilizer **120** can include a textured surface **127** to provide for easier gripping by a field technician. Stabilizer **120** can have any convenient shape for gripping. For example, as shown in **FIGS. 1-5**, stabilizer **120** can have a cylindrical shape. Using this design, the connector housing and connector ferrule are also shielded or protected from extraneous swiveling movements and tilting during hand polishing caused by touching a portion or portions of the connector housing, thereby imparting an extraneous force or forces on the ferrule or connector.

[0029] Conventional field mountable SFF connectors can be supplied with a flat ferrule end face or a ferrule having a pre-radius. During polishing of a SFF connector ferrule with a flat end face, a ferrule radius can begin to form. However, as the investigators have determined, utilizing conventional polishing pucks and polishing procedures (such as those utilized with LFF connectors, which have much larger polishing areas, and can undergo many more polishing strokes without significantly changing ROC and apex offset) can lead to the creation of a very small radius, of less than 7 mm, that is offset from the fiber core by more than 50 μm. For example, SFF connectors, which have a ferrule polish area about six times less than the polish area of LFF connectors, can be readily polished in 50 strokes or less, in which ROC may reduce to 4-6.5 mm, and apex offset can drift to 75-100 μm.

[0030] These example dimensions can fall outside of industry acceptable standards, such as Telcordia GR 326 (Issue 3, core) specifications, which require a ROC of 7-25 mm, an apex offset of 0-50 μm, and a fiber height (i.e., distance of fiber tip to ferrule end face) of +50 nm to −125 nm (depending on the radius). Thus, for consistent field polishes that yield standards-compliant connectors, the polishing apparatus **100** of exemplary embodiments of the present invention is configured to allow the field technician to impart a more uniform (and/or less random) force on the polishing puck **110** during field polishing. The polishing apparatus **100** of exemplary embodiments can also reduce technician bias and reduce connector to connector polishing variations and/or technician to technician polishing variations.

[0031] As shown in **FIGS. 1-5**, polishing apparatus **100** further includes a weighting device **130** that is designed to apply a substantially uniform, static force to a connector mounted in the polishing apparatus **100** that is substantially independent of the force applied by the field technician holding down the stabilizer. In an exemplary embodiment, weighting device **130** is formed from a dense material, such as brass or another suitable metal, which has a shaft portion or hollowed interior region **135** throughout. The hollowed region **135** allows the weighting device to substantially surround the optical fiber cable **35** and boot **45** when the connector is mounted in the polishing puck **110**. Weighting device **130** is also shaped to directly contact at least a portion of a mounted optical connector **10**, such as a portion of connector housing **30**.

[0032] As shown in **FIG. 7**, a cross section view, for example, weighting device **130** has a counter-bored interior region **137**. A shoulder surface **138** of the interior device region contacts portion **30**A of the connector housing to apply a substantially uniform downward force on the mounted connector **10** during polishing. In an exemplary embodiment, when in use, the weighting device **130** directly contacts portion **30**A of the connector housing, yet does not contact surface **121** of the lower portion of stabilizer **120**.

[0033] In addition, in this exemplary embodiment, the weighting device **130** can be formed to have a center of gravity near, at or below the contact portion **30**A of the connector housing to provide even more stability. For example, as shown in **FIG. 1**, weighting device **130** can include a lower section **131** and an upper section **133**, where lower section **131** has a greater mass than upper section **133**. Thus, with polishing apparatus **100**, the likelihood of an application of a direct force to the connector or connector body by a field technician is reduced, thereby reducing unwanted tilting or swiveling forces being applied to the connector housing and thus being transferred to the ferrule and fiber end. The application of the weighting device allows a more uniform downward force on the connector, substantially independent of operator influence.

[0034] When in use, the weighting device **130** can be substantially disposed within the stabilizer **120**, such as illustrated in **FIG. 3**. For example, the weighting device can be adapted to be slidably received by opening **125** of stabilizer **120**, such as shown in **FIG. 4**. In addition, weighting device **130** can include a slot **134** formed in the side surface of the device **130** so that the weighting device can be applied to the connector and removed easily past the fiber cable **35**.

[0035] As the investigators have determined through machine polishing, a force of about 0.25 $lb_f$ per connector with a polishing pad having 70-72 durometer (Shore A) can be applied to an LC-type connector. Preferably, from about 0.1 $lb_f$ (0.44 N) to about 0.5 $lb_f$ (2.22 N) depending on the durometer of the polishing pad can be applied to an LC-type connector having a pre-radiused ferrule. A flat ferrule may require additional polishing strokes to yield a ferrule ROC of about 8 mm-14 mm. The application of more weight can yield a smaller ROC and the application of less weight can yield a larger ROC. Thus, according to the present invention, weighting device **130** can be designed to provide the appropriate amount of force to the connector during polishing, depending on the desired application and polishing pad used beneath polishing media.

[0036] In addition, according to an alternative embodiment, the weighting device can be designed as a spring loaded mechanism, either separate from or integral with the stabilizer, to provide a pre-set force to the connector housing during polishing.

[0037] Thus, as would be apparent to one of ordinary skill in the art, the components of polishing apparatus **100** can vary in shape and size. For example, **FIG. 8** shows an alternative embodiment of a polishing apparatus **200**, which includes a polishing puck **210** (having a similar construction to puck **110** described above), a stabilizer **220**, and a weighting device **230**. In this alternative embodiment, stabilizer **220** is configured to have a bell-shape, with a wide lower portion mountable on puck **210**. An opening **225** permits passage of the terminated connector housing **30**. A slot **223** can be provided to permit the protrusion of latch mechanism **32**. In a manner similar to that described above, a gripping region **226** permits a field technician to handle the polishing apparatus **200** and provide a substantially uniform polishing force to puck **210**, without the field technician having to directly contact connector housing **30**. A weighting device **230** is partially received by stabilizer **220** through opening **225**. The weighting device has a lower portion **231** and an upper portion **233**, where the lower portion **231** is configured to directly contact at least a portion of the connector housing **30** in order to provide a substantially uniform downward force on the mounted connector during polishing. Weighting device **230** can also include a slot **234** formed in the side surface of the device **230** so that the weighting device can be applied to the connector and removed easily past the fiber cable **35**.

## EXAMPLES

[0038] A polishing-yield comparison test was performed on two groups of LC connectors having terminated fibers (single mode and multi-mode fibers were utilized in each test group) with a thermoplastic (or Hot Melt) adhesive, available from 3M Company, St. Paul. Minn. The hand-polishing method included one or more of the following steps:

**[0039]** 1. The fiber stub and ½ of the Hot Melt bead is removed with a 9 μm silicon carbide lapping film (dry). The ferrule is air polished (i.e., with no backing pad) before placing the connector in the puck. (Alternatively, 3-15 μm silicon carbide, aluminum oxide, or other lapping films could be used.)

**[0040]** 2. Optionally, the ferrule can then be polished on 2 μm aluminum oxide lapping film (dry), for 10-12 "figure-8" (or circular) strokes with very light hand pressure before adding the weighting device. The weighting device is added and the ferrule is polished for approximately 10 strokes or about 4-6 strokes after the remaining Hot Melt is fully removed. Multi-mode fiber connectors could be considered finished at this step, or, alternatively, step 3 could be applied for a cleaner cosmetic finish. (Alternatively, 1-3 μm aluminum oxide, diamond, silicon carbide, or other lapping films could be used.)

**[0041]** 3. For single mode fiber connectors (or multi-mode fiber connector cosmetics), a polish (wet) is performed on a 0.5 μm diamond lapping film for about 6 strokes, and the puck is rotated about 180° after about 3 strokes. (Alternatively, 0.1-1.5 μm diamond, aluminum oxide, or other fine lapping films could be used.) The puck rotation can be used to average the way a field technician holds the polishing puck and/or stabilizer, since some technicians may heavily favor their thumb with extra pressure.

**[0042]** 4. For single mode fiber connectors, a polish (wet) is performed on 20 nm silicon dioxide lapping film for about 10 strokes, and the puck is rotated about 180° after about 5 strokes. (Alternatively, other sub-micron aluminum oxide, cerium oxide, or silicon dioxide lapping films could be used.)

**[0043]** As shown in Table 1, a first group of LC-Connectors having pre-radiused ferrules ranging from 9-16 mm were polished. The LC connectors of this group were terminated using a thermoplastic adhesive, such as described in commonly-owned and co-pending U.S. patent application Ser. No. 10/811,437, incorporated by reference above. The LC connector fiber terminated ferrules were polished (as per the above method) using only a polishing puck, similar to polishing puck **110** shown in **FIG. 1**. The net yield shown in Table 1, using only the puck, was about 48%. The sample size included 27 LC connectors. After polishing, ten (10) connectors had ROC<7 mm and five connectors had apex offsets >50 μm, with one connector failing for both criteria.

TABLE 1

| LC Hot Melt Connectors Polished with Standard LC Puck only | Radius of Curvature (mm) | Apex Offset (μm) |
|---|---|---|
| Number of Samples: | 27 | 27 |
| Minimum: | 2.71 | 10.74 |
| Maximum: | 18.67 | 86.52 |

TABLE 1-continued

| LC Hot Melt Connectors Polished with Standard LC Puck only | Radius of Curvature (mm) | Apex Offset (μm) |
|---|---|---|
| Mean: | 8.17 | 36.94 |
| Standard Deviation: | 3.75 | 18.18 |
| Percent Passed: | 63.0% | 81.5% |

**[0044]** Table 2 below displays the average results a second group of LC connectors having pre-radiused ferrules ranging from 9-16 mm. The second group of LC connectors, also terminated using a thermoplastic adhesive, were polished (as per the above method) using a polishing apparatus similar to polishing apparatus 100 shown in **FIGS. 1-5**, which included a polishing puck, a stabilizer, and a weighting device. The sample size of this test group was 40 LC connectors. All polished connectors met the ROC and apex offset requirements of Telcordia GR-326 Issue 3.

TABLE 2

| LC Hot Melt Connectors Polished with Stabilizer & Weight | Radius of Curvature (mm) | Apex Offset (μm) |
|---|---|---|
| Number of Samples: | 40 | 40 |
| Minimum: | 7.36 | 5.25 |
| Maximum: | 13.99 | 46.77 |
| Mean: | 9.54 | 24.45 |
| Standard Deviation: | 1.65 | 11.69 |
| Percent Passed: | 100.0% | 100.0% |

**[0045]** Thus, the above polishing method and polishing apparatus of the present invention can be used to enable manual, field polishing technicians to achieve predictable high quality and yield performance. This method and apparatus can aid installers of fiber optic networks, such as Local Area Networks (LANs) or Premise buildings, for the field termination of small form factor connectors, such as the exemplary LC connectors described above. In addition, the above method and apparatus can be utilized for the field polishing of flat or pre-radiused ferrule-base large form factor connectors, such as ST connectors, FC connectors, and SC connectors. The reliability of the above method and apparatus can reduce the need to use costly interferometers to measure the ferrule geometry, as installers are usually blind to the geometry results of a field polish.

**[0046]** The present invention should not be considered limited to the particular examples described above, but rather should be understood to cover all aspects of the invention as fairly set out in the attached claims. Various modifications, equivalent processes, as well as numerous structures to which the present invention may be applicable will be readily apparent to those of skill in the art to which the present invention is directed upon review of the present specification. The claims are intended to cover such modifications and devices.

What is claimed is:

**1**. A polishing apparatus for an optical fiber connector that includes an optical fiber ferrule and a connector housing, comprising:

a polishing puck having an aperture to permit passage of the ferrule therethrough and a mount to hold the connector housing at a predetermined angle;

a stabilizer having a first portion mountable on the polishing puck to provide a grip separate from the connector housing; and

a weighting device, at least a portion of which is disposed in the stabilizer, to provide a direct force on the connector housing.

**2**. The polishing apparatus of claim 1, wherein the weighting device comprises a weight having a shaft portion, the weight receivable through an opening of the stabilizer.

**3**. The polishing apparatus of claim 2, wherein the shaft portion of the weight receives a cabled portion of the optical fiber connector.

**4**. The polishing apparatus of claim 2, wherein the weight includes an interior cavity, and wherein a surface defining a portion of the interior cavity is disposed on a portion of the optical fiber connector housing.

**5**. The polishing apparatus of claim 1, wherein the stabilizer includes a shaft to receive the ferrule and connector housing, and wherein an outer surface of the stabilizer is textured.

**6**. The polishing apparatus of claim 1, wherein the first portion of the stabilizer comprises one or more slots slidably mountable on one or more ridges formed on the polishing puck.

**7**. The polishing apparatus of claim 1, wherein the mount is adapted to receive a small form factor optical fiber connector.

**8**. The polishing apparatus of claim 1, wherein the small form factor optical fiber connector is a LC-type connector having an optical fiber terminated by a thermoplastic adhesive material.

**9**. The polishing apparatus of claim 1, wherein the mount is adapted to receive a large form factor fiber optic connector.

**10**. The polishing apparatus of claim 1, wherein the weighting device comprises a spring loaded mechanism, a portion of which adapted to directly contact at least a portion of the connector housing.

**11**. The polishing apparatus of claim 1, wherein the weighting device provides a force of about 0.1 $lb_f$ to about 0.5 $lb_f$ on the connector housing.

**12**. A method of polishing an optical fiber connector that includes an optical fiber ferrule and a connector housing, comprising:

providing a polishing apparatus that includes

a polishing puck having an aperture to permit passage of the optical fiber ferrule therethrough and a mount to hold the connector housing at a predetermined angle;

a stabilizer having a first portion mountable on the polishing puck to provide a grip separate from the connector housing; and

a weighting device, at least a portion of which is disposed in the stabilizer, to provide a direct force on the connector housing;

mounting the stabilizer on the polishing puck;

disposing the optical fiber connector in the mount, wherein at least a portion of the ferrule extends through an aperture in the polishing puck;

disposing the weighting device in the stabilizer, wherein a portion of the weighting device directly contacts at least a portion of the connector housing; and

translating the polishing apparatus across at least one polishing surface for a predetermined amount of polishing strokes.

**13**. The method according to claim 12, wherein the optical fiber connector comprises a small form factor optical fiber connector having an optical fiber terminated by a thermoplastic adhesive material, and wherein prior to the disposing the optical fiber connector in the mount step, the method comprises removing a portion of the thermoplastic material with at least one of a lapping film polish in air and a lapping film attached to a compliant polishing pad.

**14**. The method according to claim 12, wherein the optical fiber connector comprises a small form factor optical fiber connector having an optical fiber terminated by a thermoplastic adhesive material, and wherein prior to the disposing the weighting device in the stabilizer step, the method comprises polishing the ferrule on a lapping film using a predetermined amount of at least one of figure-8 and circular strokes.

**15**. A method of installing an optical fiber network, comprising a method of polishing an optical fiber connector that includes an optical fiber ferrule and a connector housing according to claim 12.

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