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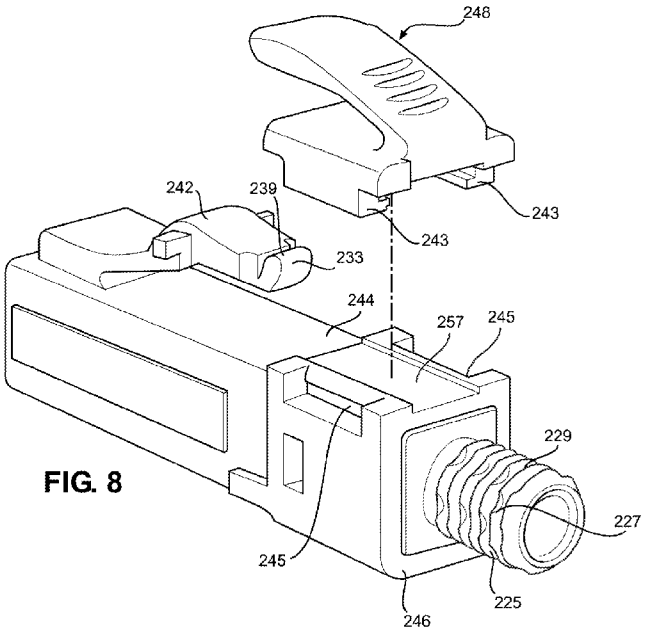


FIG. 8

(57) Abstract: The present disclosure relates to a telecommunications connector. The connector includes a housing, a ferrule assembly terminated to a fiber optic cable provided at least partially within the housing. A latch is attached to the housing at a front end of the latch, a rear end of the latch being a free end elastically movable relative to the rest of the housing. A latch trigger is attached to the housing at a rear end of the latch trigger, a front end of the latch trigger being a free end that is elastically movable relative to the rest of the housing and that is configured to contact the rear end of the latch when pressed down to elastically move the latch. The connector housing including the latch and the latch trigger configured such that the entire telecommunications connector is configured to lie within a footprint of a fiber optic adapter that the telecommunications connector is mounted to when viewed from a lateral side view.

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LOW-PROFILE TELECOMMUNICATIONS CONNECTORS

CROSS-REFERENCE TO RELATED APPLICATION

This application is being filed on February 16, 2022 as a PCT International Patent Application and claims the benefit of U.S. Patent Application Serial No. 63/151,209, filed on February 19, 2021, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates generally to telecommunications systems. More particularly, the present disclosure relates to optical fiber communications systems and fiber optic connectors used in optical fiber communications systems.

BACKGROUND

Fiber optic communications systems are becoming prevalent in part because service providers want to deliver high bandwidth communication capabilities (e.g., data and voice) to customers. Fiber optic communications systems employ a network of fiber optic cables to transmit large volumes of data and voice signals over relatively long distances. Optical fiber connectors are an important part of most fiber optic communication systems. Fiber optic connectors allow two optical fibers to be quickly optically connected without requiring a splice. Fiber optic connectors can be used to optically interconnect two lengths of optical fiber. Fiber optic connectors can also be used to interconnect lengths of optical fiber to passive and active equipment.

A typical fiber optic connector includes a ferrule assembly supported at a front end of a connector housing. A spring is used to bias the ferrule assembly in a forward direction relative to the connector housing. The ferrule functions to support an end portion of at least one optical fiber (in the case of a multi-fiber ferrule, the ends of multiple fibers are supported). The ferrule has a front end face at which a polished end of the optical fiber is located. When two fiber optic connectors are interconnected, the front end faces of the ferrules abut one another and the ferrules are forced rearward relative to their respective connector housings against the bias of their respective springs. With the fiber optic connectors connected, their respective optical fibers are coaxially aligned such that the end

faces of the optical fibers directly oppose one another. In this way, an optical signal can be transmitted from optical fiber to optical fiber through the aligned end faces of the optical fibers. For many fiber optic connector styles, alignment between two fiber optic connectors is provided through the use of an intermediate fiber optic adapter.

A fiber optic connector is often secured to the end of a corresponding fiber optic cable by anchoring strength members of the cable to the connector housing of the connector. Anchoring is typically accomplished through the use of conventional techniques such as crimps or adhesives. Anchoring the strength members of the cable to the connector housing is advantageous because it allows tensile load applied to the cable to be transferred from the strength members of the cable directly to the connector housing. In this way, the tensile load is not transferred to the ferrule assembly of the fiber optic connector. If the tensile load were to be applied to the ferrule assembly, such tensile load could cause the ferrule assembly to be pulled and result in optical disconnection between the connector and its corresponding mated connector.

An example of a prior art fiber optic connector 20 is illustrated in FIGS. 1 and 2. The connector 20 depicted is what is known in the art as an LC style fiber optic connector 20. As shown in FIGS. 1 and 2, a conventional LC connector 20 includes a connector housing 22 defining a front housing portion 24 and a rear housing portion or rear body 26. A typical LC connector 20 includes a ferrule assembly 28 defined by a ferrule 30, a hub 32, and a spring 34. A rear end 36 of the ferrule 30 is secured within the ferrule hub 32. When the LC connector 20 is assembled, the ferrule hub 32 and the spring 34 are captured between the front housing portion 24 and the rear housing portion 26 of the connector housing 22, and a front end 38 of the ferrule 30 projects outwardly beyond a front end 40 of the connector housing 22 as noted above. The spring 34 is configured to bias the ferrule 30 in a forward direction relative to the connector housing 22. According to some versions, the front housing portion 24 may be formed from a molded polymer. The rear housing portion 26 may be formed from various materials such as polymers or metals.

In the depicted example of the prior art LC connector 20, a strain relief boot 56 is shown as being slid over a rear end 58 of the rear housing portion 26 and snaps over a boot flange 60 to retain the boot 56 with respect to the connector housing 22. The rear housing portion 26 may define a crimp region 62 for crimping a fiber optic cable's strength layer to the rear housing portion 26, normally with the use of a crimp sleeve (not shown). An exterior surface 64 of the rear housing portion 26 defining the crimp region 62 can be

textured (e.g., knurled, ridged, provided with small projections, etc.) to assist in retaining the crimp on the housing 22.

Still referring to FIGS. 1 and 2, the front housing portion 24 defines a latch 42 extending from a top wall 44 of the front housing portion 24 toward a rear end 46 of the of the front housing portion, the latch 42 extending at an acute angle with respect to the top wall 44 of the front housing portion 24. The rear housing portion 26 of the depicted connector 20 also includes a latch trigger 48 that extends from the rear end 46 of the front housing portion 24 toward the front end 40. The latch trigger 48 also extends at an acute angle with respect to the top wall 44. The latch trigger 48 is configured to come into contact with the latch 42 for flexibly moving the latch 42 downwardly.

As is known in the art, when the fiber optic connector 20 is placed in an LC format adapter 100, an example of which is shown in FIGS. 3-5, for optically coupling light from two optical fibers together, the latch 42 functions to lock the fiber optic connector 20 in place within the adapter 100. The fiber optic connector 20 may be removed from the adapter 100 by depressing the latch trigger 48, which causes the latch 42 to be pressed in a downward direction, freeing catch portions 52 of the latch 42 from the fiber optic adapter 100.

The front housing portions 24 are inserted into, for mating with similar format connectors, inner passages 202 of adapter 100. The depicted adapter 100 is a duplex adapter that includes two side-by-side passages 202 and two ferrule alignment structures 204 therewithin. Each alignment structure 204 is configured to axially align the ferrules 30 for mating two similar connectors 20.

In dense panel environments, where a large number of connectors, such as connector 20, are placed in a side-by-side or in a vertically-stacked arrangement, access becomes a big issue. Since the latch triggers 48 have to be accessed and pushed down for unlatching the latches 42 from the adapters 100, removal of connectors can become difficult and cumbersome. In dense panel designs, even though it is normally fairly easy to insert and latch connectors such as connectors 20 by pushing from an end of the connector's boot, removal is difficult because the latches 42 are far forward on the connectors.

Improvements in connector design are desired to facilitate use in high density environments.

SUMMARY

One aspect of the present disclosure relates to a telecommunications connector (e.g., a fiber optic connector) having features to improve density and also facilitate connector latching and unlatching in dense environments.

Another aspect of the disclosure relates to modular connector designs where housings of the connectors can accommodate a plurality of latch trigger options, as well as high density pull tabs, for forming simplex or duplex connectors utilizing common housing portions.

According to one aspect, the disclosure is directed to a telecommunications connector, for example, a fiber optic connector, that includes a connector housing, wherein a ferrule assembly terminated to a fiber optic cable is provided at least partially within the connector housing. A latch defining a front end and a rear end is provided on the connector housing, the latch attached to the connector housing at the front end of the latch, wherein the rear end of the latch provides a free end that is elastically movable relative to the rest of the connector housing. A latch trigger defining a front end and rear end is also provided on the connector housing, the latch trigger attached to the connector housing at the rear end of the latch trigger, wherein the front end of the latch trigger provides a free end that is elastically movable relative to the rest of the connector housing and wherein the front end of the latch trigger is configured to contact the rear end of the latch when pressed down to elastically move the latch. The connector housing includes the latch, and the latch trigger is configured such that the entire telecommunications connector is configured to lie within a footprint of a fiber optic adapter that the telecommunications connector is mounted to when viewed from a lateral side view.

According to another aspect of the disclosure, a telecommunications assembly comprises at least two fiber optic adapters in a vertically stacked arrangement, wherein an uppermost surface of a first fiber optic adapter contacts a lowermost surface of a vertically adjacent second fiber optic adapter, each fiber optic adapter including a fiber optic connector mounted thereto, wherein the fiber optic connectors are vertically and horizontally aligned.

A variety of additional aspects will be set forth in the description that follows. The aspects relate to individual features and to combinations of features. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the broad inventive concepts upon which the embodiments disclosed herein are based.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a conventional LC style fiber optic connector;

FIG. 2 is a cross-sectional view that longitudinally bisects the fiber optic connector of FIG. 1;

FIGS. 3-4 are two perspective views of a conventional duplex adapter for mating with the fiber optic connector of the present disclosure;

FIG. 5 is a cross-sectional view of the duplex adapter of FIGS. 3-4;

FIG. 6 is a front perspective view of an embodiment of a fiber optic connector having features that are examples of inventive aspects in accordance with the present disclosure;

FIG. 7 is a rear perspective view of the fiber optic connector of FIG. 6;

FIG. 8 illustrates the fiber optic connector of FIG. 7 in an exploded configuration, with the latch trigger shown removed from the rest of the connector housing;

FIG. 9 illustrates the side profile differences between a conventional LC style fiber optic connector such as that shown in FIGS. 1 and 2 and the fiber optic connector of FIGS. 6-8;

FIG. 10 is a side view of two of the fiber optic connectors of FIGS. 6-8 mounted in adapters in a vertically stacked arrangement, illustrating the low-profile aspect of the latch trigger of the connectors, the two vertically stacked connectors shown with pull tabs mounted thereon that facilitate removal in high density environments;

FIG. 11 is a rear perspective view of the fiber optic connector of FIG. 7 shown with a pull tab mounted thereon for facilitating removal in high density applications;

FIG. 12 illustrates the fiber optic connector of FIG. 11 in an exploded configuration;

FIG. 13 is a rear perspective view of another embodiment of a fiber optic connector having features that are examples of inventive aspects in accordance with the present disclosure, the fiber optic connector provided in the form of a duplex connector that is formed by mounting a duplex/double-wide latch trigger to two simplex connector housings of the connectors of FIGS. 6-12;

FIG. 14 illustrates the duplex connector of FIG. 13 mounted to a duplex fiber optic adapter that has features similar to those of the adapter shown in FIGS. 3-5, the duplex connector shown with a duplex/double-wide pull tab mounted to the connector housings to facilitate removal;

FIG. 15 illustrates the concept of value-added labeling that can be used on the connectors of FIGS. 6-14, where an example connector is shown with a QR or bar code applied to the pull tab of the connector that can be used to help with port identification such as in a data center; and

FIG. 16 illustrates a close-up view of the pull tab of the connector of FIG. 15 detailing the value-added labeling feature.

DETAILED DESCRIPTION

Referring now to FIGS. 6-12, an example embodiment of a connector 220 having features that are examples of inventive aspects in accordance with the present disclosure is illustrated. The illustrated connector 220 is a fiber optic connector that is used for aligning optical fibers. However, it should be noted that the inventive features discussed herein may be applicable to other types of connectors that are not necessarily fiber optic connectors.

The illustrated connector 220 is considered an LC format connector, meaning that the connector 220 can mate to other LC type connectors via an LC type adapter such as the adapter 100 shown in FIGS. 3-5, as noted above. As such, it should be noted that certain structures and functionality of those structures are similar to the LC connector 20 discussed above with respect to FIGS. 1-2.

Still referring to FIGS. 6-12, the connector 220 includes a connector housing 222 defining a front housing portion 224 and a rear housing portion 226. The rear housing portion 226 may also be referred to as a rear body 226. According to some embodiments, the front housing portion 224 may be formed from a molded polymer. In certain embodiments, the rear body 226 may also be formed from a polymer. Other materials are possible for the rear body 226 such as metal.

In the illustrated example of the connector 220, the rear body 226 is inserted into the front housing portion 224 from a rear end 241 of the front housing portion 224. The rear body defines latching tabs 221 having a tapered profile that extend transversely from opposite sides of the rear body 226. The latching tabs 221 are configured for snap-fitting into windows 223 provided on the front housing portion 224 to capture the rear body 226 within the front housing portion 224 during assembly.

Even though not illustrated in detail and as is known in the art, the connector 220 includes a ferrule assembly in the form of a ferrule, a hub, and a spring that is inserted within an inner passage defined by the front housing portion 224 similar to that of the

conventional LC connector 20 discussed above. When the connector 220 is assembled, the ferrule hub and the spring are to be captured between the front housing portion 224 and the rear body 226 of the connector housing 222. A front end of the ferrule projects outwardly beyond a front end 240 of the connector housing 222. The spring of the ferrule assembly normally biases the ferrule in a forward direction relative to the connector housing 222.

The rear body 226 may include a projection defining a crimp region 262 for crimping a fiber optic cable's strength layer to the rear body 226, normally with the use of a crimp sleeve (not shown). An exterior surface 264 of the rear body defining the crimp region 262 can be textured (e.g., knurled, ridged, provided with small projections, etc.) to assist in retaining the crimp on the housing 222. A strain relief boot (similar to the boot 56 shown in FIGS. 1 and 2) may be snap fit over the crimp region 262 of the rear body 226 to retain the boot with respect to the connector housing 222.

Still referring to FIGS. 6-12, as noted above, the exterior surface of the crimp region 262 can be textured (e.g., knurled, ridged, provided with small projections, etc.) to assist in retaining strength members (e.g., aramid yarns) on the rear body. In the depicted example, the exterior surface may define a series of parallel rings or ridges 225 extending in a front-to-back direction along the crimp region 262. As shown, each of the rings 225 may define discretely spaced scalloped portions 227 that are positioned peripherally around the rings 225. The scalloped portions 227 define teeth 229 thereinbetween. As illustrated, the scalloped portions 227 (and the teeth 229) are provided in an offset or staggered relationship between adjacent rings 225 as the rings 225 extend front to back. In this manner, when the strength members are pressed underneath a crimp sleeve against the exterior surface of the crimp region 262, the strength members will tend to spread out and follow zig-zagging patterns as they are captured underneath the crimp sleeve, leading to increased yarn and jacket retention. The staggered design of the scallops 227 and the teeth 229 provided therebetween force the strength members laterally into the scallops 227 in a zig-zagging pattern, such that the strength members do not simply lay parallel along the crimp region 262 in a front-to-back direction, but make multiple lateral bends over multiple edges, to increase the amount of pull force needed to separate the cable from the connector 220.

Further details relating to such a scalloped crimp region are discussed and illustrated in PCT Publication No. WO 2021/243076 entitled

"TELECOMMUNICATIONS CONNECTOR WITH LATCH RELEASE MECHANISM," the entire disclosure of which is incorporated herein by reference.

Still referring to FIGS. 6-12, similar to the conventional LC connector 20 shown in FIGS. 1-2, the front housing portion 224 of the connector housing 222 defines a latch 242 extending from a top wall 244 of the front housing portion 224 toward a rear end 246 of the front housing portion 224. Similar to the conventional LC connector 20, the latch 242 generally extends at an acute angle with respect to the top wall 244 of the front housing portion 224.

Compared to the latch 42 of a conventional LC connector, however, the latch 242 of the connector 220 defines a lower side profile as illustrated in the comparison depicted in FIG. 9.

The latch 242 of the connector 220 is integrally formed with or attached to the front housing portion 224 of the connector housing 222 at a front end 231 of the latch 242. The latch 242 extends from the connection point to a free, rear end 233 of the latch 242. As known in conventional LC connectors, the latch 242 is designed with a certain amount of elastic flexibility for latching and unlatching thereof from an adapter such as adapter 100. The latch 242 is the portion of the connector 220 that is designed to secure connector 220 to an adapter. The latch 242 functions similar to that of a conventional LC connector 20 as shown in FIGS. 1-2 in coupling the connector 220 to an adapter such as adapter 100.

Toward a middle portion 235 of the latch 242, a pair of shoulders or catch portions 252 are provided for mating with latching shoulders of an adapter (see shoulders 208 of adapter 100 in FIG. 5) to secure the connector 220 to an adapter such as the adapter 100 shown in FIGS. 3-5.

The latch 242 is designed such that as the latch 242 extends from the middle portion 235 toward the rear end 233, the latch 242 is generally parallel or is angled slightly downward relative to the top wall 244 of the front housing portion 224. The shape of the latch 242 allows the latch 242 to have a lower profile as compared to that of a conventional LC connector. In a conventional LC connector 20, the entire latch 42 (from the fixed end to the free end) extends upwardly at an acute angle as the latch 42 extends from the front housing portion 24.

As shown, the latch 242 of the connector 220 of the present disclosure defines a lip 239 at the rear end 233.

It should be noted that the latch 242 and the pair of shoulders 252 provided on the latch 242 are still positioned in the same position as a conventional LC connector 20 when

viewed from the side such that the connector 220 can mate with a conventional LC format adapter. As noted above, the front housing portions 224 of the connectors 220 can be unitarily molded with the latches 242 as a one-piece element.

The lower side profile provided by the latch 242 of the connector 220 is also maintained by a latch trigger portion 248 of the connector 220. In the depicted embodiment, the latch trigger 248 is a removable structure that is removably mounted adjacent the rear end 246 of the front housing portion 224.

For removability, the latch trigger 248 defines a pair of flexible elongated parallel tabs 243 that are configured to snap-fit into a pair of parallel slots 245 provided on the top wall 244 at the rear end 246 of the front housing portion 224. The tabs 243 of the latch trigger 248 are simply aligned with the slots 245, and the trigger 248 is snapped onto the top wall 244 of the front housing portion 224 in a downward direction.

Once mounted, the latch trigger 248 is designed to extend from the rear end 246 of the front housing portion 224 toward the front end of the connector housing 240 at an acute angle with respect to the top wall 244. As shown and as provided in a conventional LC connector, the trigger 248 is angled upward as the trigger 248 extends from the rear end 246 of the front housing portion 224 to a free front end 249, opposite to that of the angling of the latch 242. The latch trigger 248 is configured to come into contact with the lip 239 defined at the rear end 233 of the latch 242 for flexibly moving the latch 242 downwardly when pressed.

As is known in the art, when the fiber optic connector 220 is placed in an LC format adapter such as the adapter 100, for optically coupling light from two optical fibers together, the latch 242 functions to lock the fiber optic connector 220 in place within the adapter, and the fiber optic connector 220 is removed from the adapter by depressing the latch trigger 248, which contacts the latch 242 and causes the latch 242 to be pressed in a downward direction, freeing the catch portions 252 of the latch 242 from the fiber optic adapter.

As noted above, the design and the angle of the latch trigger 248 maintains the low profile nature of the connector 220. The connector 220 is designed such that the entire connector 220 lies within the footprint of a fiber optic adapter that the connector 220 is mounted to when viewed from a lateral side view. Thus, two adapters populated with connectors 220 can be vertically stacked without any portion of the connectors 220 touching each other.

FIG. 10 is a side view of two of the fiber optic connectors 220 of FIGS. 6-8 mounted in adapters in a vertically stacked arrangement, illustrating the low-profile aspect of the latch trigger 248 of the connectors 220. With the design of the connector 220, when mounted in vertically stacked adapters, the entirety of a given connector 220 remains below a horizontal plane P defined by a lowermost surface 251 of an adjacent upper adapter. Stated in another way, the design of the connector 220 is such that, when mounted in a fiber optic adapter, the entirety of a given connector 220 remains below a horizontal plane P defined by an uppermost surface 253 of the populated adapter.

With such a design, when two adapters populated by the connectors 220 of the present application are vertically stacked in an abutting relationship, the connectors 220 are able to be vertically or horizontally aligned without portions thereof contacting adjacent above or below connectors 220.

In dense panel environments, where a large number of connectors, such as connectors 220, are placed in a side-by-side or in a vertically-stacked arrangement, access becomes a big issue. Since the latch triggers 248 have to be accessed and pushed down for unlatching the latches 242 from the adapters, removal of connectors 220 can become difficult and cumbersome. In dense panel designs, even though it is normally fairly easy to insert and latch connectors such as connectors 220 by pushing from an end of the connector's boot, removal is difficult because the latches 242 are far forward on the connectors 220.

As shown in FIGS. 11 and 12, the latch trigger 248 is designed to provide a channel or passthrough 255 underneath the latch trigger 248 that communicates with a slide surface 257 provided on the top wall 244 of the front housing portion 224 for accommodating a slidable pull tab 261 that fits between the latch trigger 248 and the top wall 244.

The pull tab 261 is captured between the latch trigger 248 and the top wall 244 of the front housing portion 224 when the latch trigger 248 is snap-fit to the front housing portion 224. The pull tab 261 is designed to be non-removable unless the latch trigger 248 is first removed. The pull tab 261 as shown includes a front end 263 defining a catch portion 265, an elongate middle portion 267, and a rear grip portion 269. The elongate middle portion 267 is configured to fit between the latch trigger 248 and the top wall 244 of the front housing portion 224 as shown in FIGS. 11 and 12 so as to slide on the slide surface 257.

The catch portion 265 is configured to contact and interact with the lip 239 defined at the rear end 233 of the latch 242 for transferring a linear motion of the pull tab 261 to a downward movement of the rear end 233 of the latch 242 when the pull tab 261 is slidably pulled. By using the pull tab 261, access to the connector latch 242 that is close to the front of the connector housing 222 is not required. The pull tab 261 provides accessibility at a distance from a rear end of the connector 220 for unlatching the connector 220 from an adapter.

FIG. 10 illustrates the side view of the connectors 220 when mounted to adapters and the positioning of the grip portions 269 of the pull tabs 261 for providing access in dense environments.

The removability aspect of the latch trigger 248 from the rest of the connector housing 222 provides a certain amount of modularity where the front housing portions 224 of the connectors 220 can accommodate a plurality of different latch triggers (such as simplex or duplex options), as well as different high density pull tabs.

Such a connector design is shown in FIGS. 13 and 14. The fiber optic connector 320 depicted in FIGS. 13 and 14 is provided in the form of a duplex connector that is formed by mounting a duplex/double-wide latch trigger 348 to two of the simplex connector housings 222 of FIGS. 6-12. In FIG. 14, the duplex connector 320 is shown mounted to a duplex adapter having features that are similar to those of the adapter 100 shown in FIGS. 3-5. The duplex connector 320 is shown with a duplex/double-wide pull tab 361 mounted to the connector housings 222 to facilitate removal. As shown, the double-wide pull tab 361 defines two separate middle portions 367 and two separate catch portions 365 for interacting with the latches 242 of two separate connectors 220, but defines a single common rear grip portion 369 for simultaneously unlatching the latches 242 of the connector housings 222 forming the duplex connector 320.

FIGS. 15-16 illustrate the concept of value-added labeling that can be used on the connectors 220/320 of FIGS. 6-14. An example simplex connector 220 of the present disclosure is shown with a QR or bar code 271 applied to the grip portion 269 of the pull tab 261 of the connector 220. Such labeling can be used to help with port identification in a data center. FIG. 16 illustrates a close-up view of the pull tab 261 of the connector 220 of FIG. 15 detailing the value-added labeling feature 271.

It should be noted that other types of labeling, indicia, or coding could be applied to the connectors 220/320 to designate information. For example, connectors of different types may have different colored portions for identification of types. In certain examples,

the front housing portions 224 can be molded with different colors to identify different types such as MM, SM/UPC, and or APC connectors.

The color coding can be applied to different portions such as the removable latch trigger 248/348 and/or the strain relief boot, while other portions such as the front housing portions 224 can be the same or a neutral color to be used on all of the different types of connectors.

Although in the foregoing description, terms such as "top," "bottom," "front," "back," "rear," "right," "left," "upper," "lower," "forward," and "rearward" may have been used for ease of description and illustration, no restriction is intended by such use of the terms. The connectors described herein can be used in any orientation, depending upon the desired application.

The above specification, examples and data provide a description of the inventive aspects of the disclosure. Many embodiments of the disclosure can be made without departing from the spirit and scope of the inventive aspects of the disclosure.

CLAIMS:

1. A telecommunications connector comprising:

a connector housing, wherein a ferrule assembly terminated to a fiber optic cable is provided at least partially within the connector housing;

a latch defining a front end and a rear end provided on the connector housing, the latch attached to the connector housing at the front end of the latch, wherein the rear end of the latch provides a free end that is elastically movable relative to the rest of the connector housing;

a latch trigger defining a front end and rear end provided on the connector housing, the latch trigger attached to the connector housing at the rear end of the latch trigger, wherein the front end of the latch trigger provides a free end that is elastically movable relative to the rest of the connector housing, and wherein the front end of the latch trigger is configured to contact the rear end of the latch when pressed down to elastically move the latch; and

the connector housing including the latch and the latch trigger configured such that the entire telecommunications connector is configured to lie within a footprint of a fiber optic adapter that the telecommunications connector is mounted to when viewed from a lateral side view.

2. The telecommunications connector of claim 1, wherein the connector housing includes a rear housing portion that is coupled to a front housing portion with a snap-fit interlock, wherein at least a portion of the ferrule assembly is captured between the rear housing portion and a front end of the front housing portion.

3. The telecommunications connector of claim 1, wherein the latch is integrally molded with the rest of the connector housing.

4. The telecommunications connector of claim 1, wherein the latch trigger is removably mounted to the connector housing.

5. The telecommunications connector of claim 4, wherein the latch trigger, when mounted to the rest of the connector housing, defines a channel with a top surface of the connector housing for slidably accommodating a pull tab to be mounted on the telecommunications connector.

6. The telecommunications connector of claim 5, further comprising a pull tab slidably mounted on the telecommunications connector, the pull tab configured to contact at least a portion of the latch and transfer a linear motion of the pull tab to an elastic downward movement of the rear end of the latch when the pull tab is slidably pulled.

7. The telecommunications connector of claim 6, wherein the pull tab includes indicia for providing connectivity information regarding the telecommunications connector.

8. The telecommunications connector of claim 2, wherein a cable terminated by the ferrule assembly is crimped to a crimp region of the rear housing portion.

9. The telecommunications connector of claim 8, wherein the crimp region defines a plurality of spaced apart crimp rings stacked longitudinally, each crimp ring defining discretely spaced scalloped portions that are positioned peripherally around the rings, wherein the scalloped portions between adjacent rings are provided in a staggered position in a longitudinal direction.

10. The telecommunications connector of claim 9, wherein the scalloped portions define teeth therebetween that are configured to be deformed against strength members of the cable terminated by the ferrule assembly.

11. The telecommunications connector of claim 1, wherein the connector housing is configured to be latched to an LC format fiber optic adapter.

12. The telecommunications connector claim 1, further comprising two of the connector housings provided in a side-by-side arrangement each including a latch, wherein a single latch trigger coupled to both of the connector housings is configured to simultaneously contact the rear end of each latch when pressed down to elastically move both latches.

13. The telecommunications connector of claim 12, wherein the telecommunications connector defines a duplex fiber optic connector configured to be latched to a duplex LC format fiber optic adapter.

14. The telecommunications connector of claim 12, further comprising a single pull tab slidably mounted relative to both of the connector housings defining latches, the pull tab configured to contact both latches simultaneously and transfer a linear motion of the pull tab

to an elastic downward movement of the rear ends of the latches when the pull tab is slidably pulled.

15. A telecommunications assembly comprising:

at least two fiber optic adapters in a vertically stacked arrangement, wherein an uppermost surface of a first fiber optic adapter contacts a lowermost surface of a vertically adjacent second fiber optic adapter, each fiber optic adapter including a fiber optic connector mounted thereto, wherein the fiber optic connectors are vertically and horizontally aligned.

16. The telecommunications assembly of claim 15, wherein, when mounted, an entirety of one of the fiber optic connectors is positioned below a horizontal plane defined by the lowermost surface of an adjacent upper fiber optic adapter.

17. The telecommunications assembly of claim 16, wherein, when mounted, an entirety of one of the fiber optic connectors is positioned below a horizontal plane defined by the uppermost surface of the fiber optic adapter to which the fiber optic connector is mounted.

18. The telecommunications assembly of claim 15, wherein an entirety of each telecommunications connector lies within a footprint of a fiber optic adapter to which the telecommunications connector is mounted when viewed from a lateral side view.

19. The telecommunications assembly of claim 15, wherein each fiber optic connector defines a connector housing and a ferrule assembly terminated to a fiber optic cable is provided at least partially within the connector housing, each fiber optic connector also including a latch defining a front end and a rear end provided on the connector housing, the latch attached to the connector housing at the front end of the latch, wherein the rear end of the latch provides a free end that is elastically movable relative to the rest of the connector housing and a latch trigger defining a front end and rear end provided on the connector housing, the latch trigger attached to the connector housing at the rear end of the latch trigger, wherein the front end of the latch trigger provides a free end that is elastically movable relative to the rest of the connector housing, and wherein the front end of the latch trigger is configured to contact the rear end of the latch when pressed down to elastically move the latch.

20. The telecommunications assembly of claim 20, wherein the latch trigger of each fiber optic connector is removably mounted to the respective connector housing.

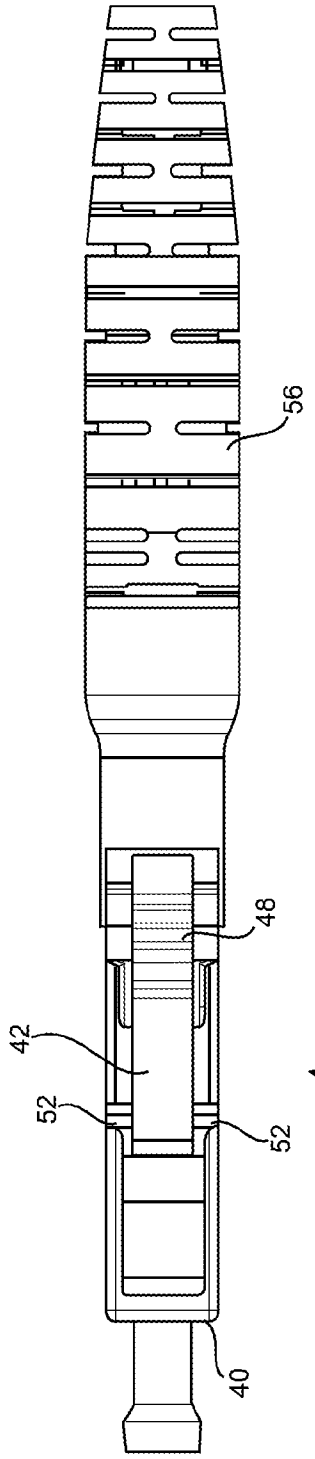


FIG. 1
(Prior Art)

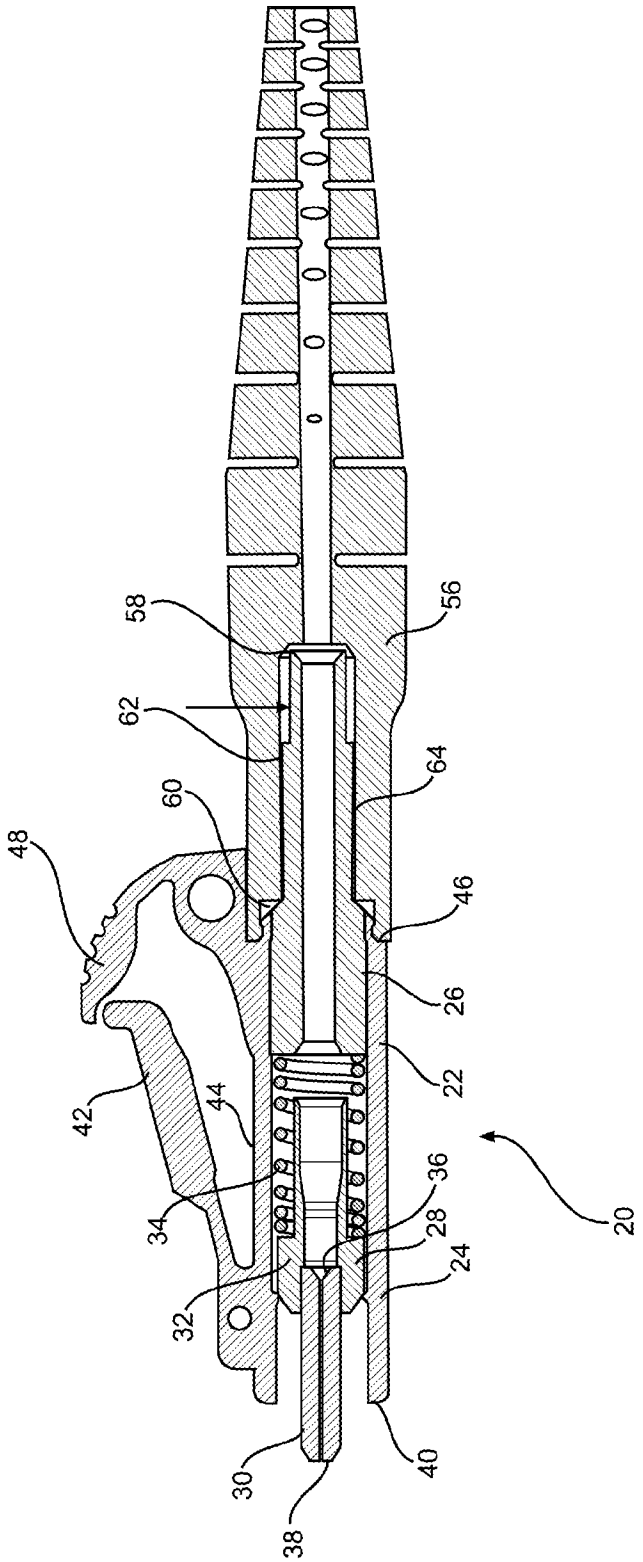


FIG. 2
(Prior Art)

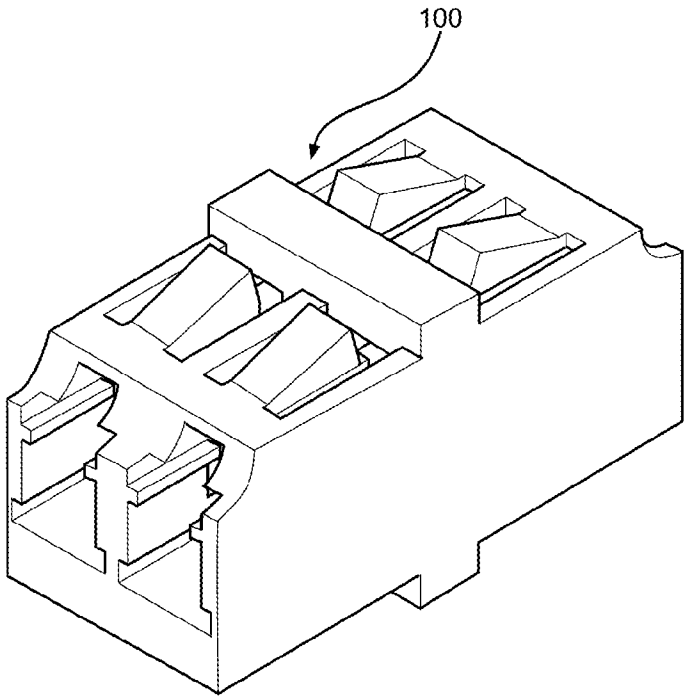


FIG. 3
(Prior Art)

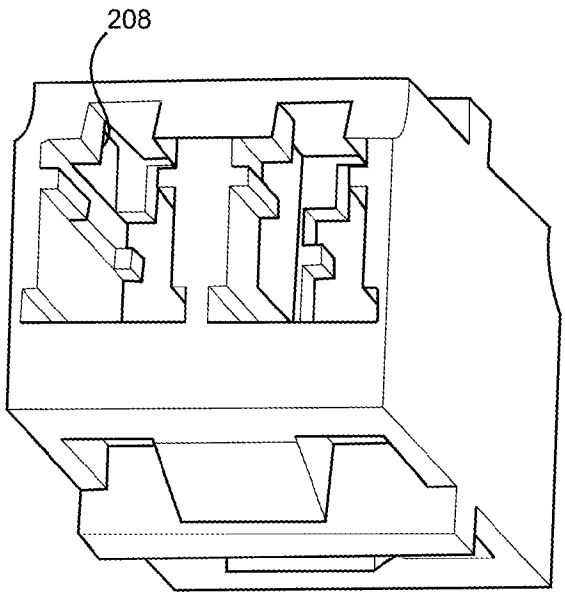


FIG. 4
(Prior Art)

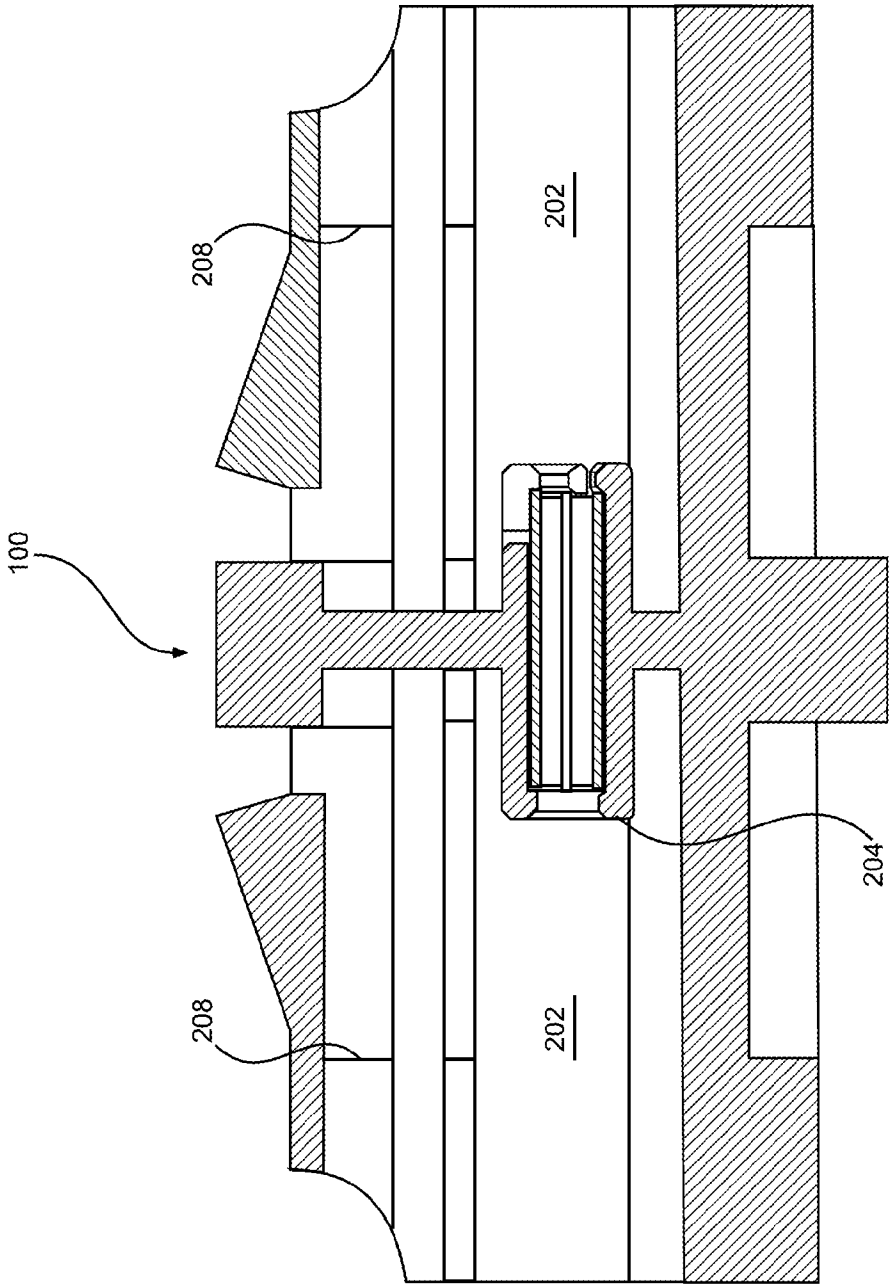


FIG. 5
(Prior Art)

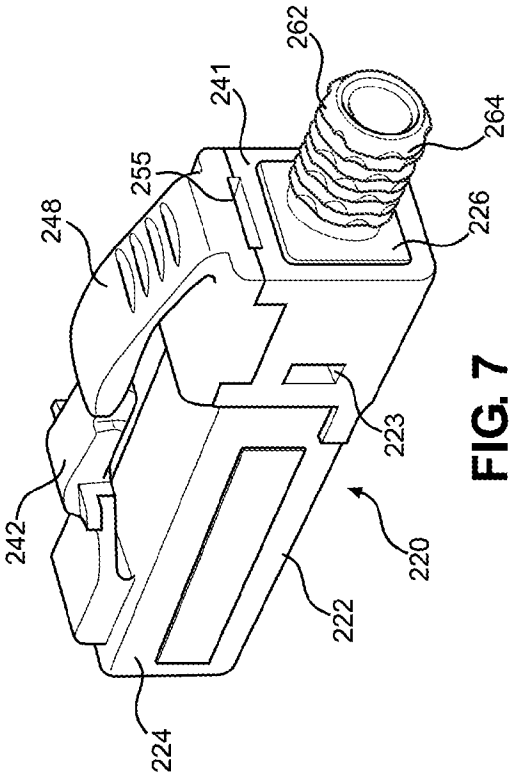

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FIG. 7

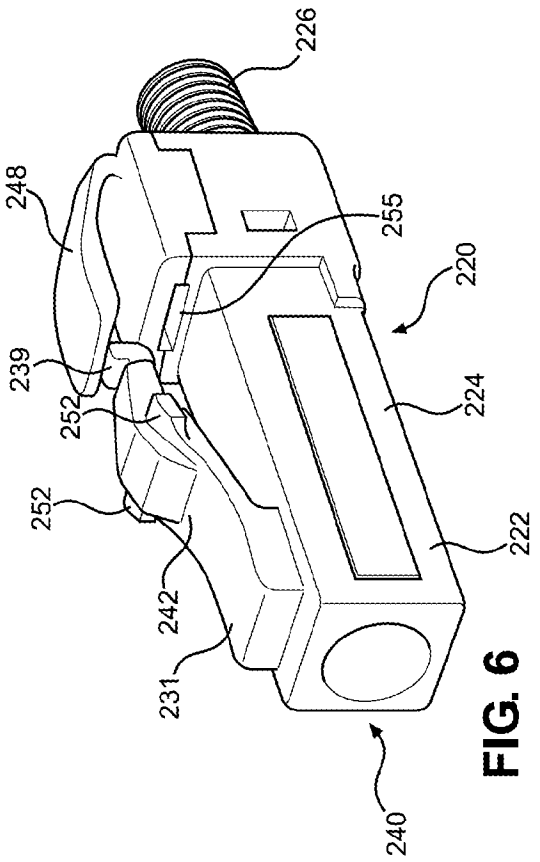

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FIG. 6

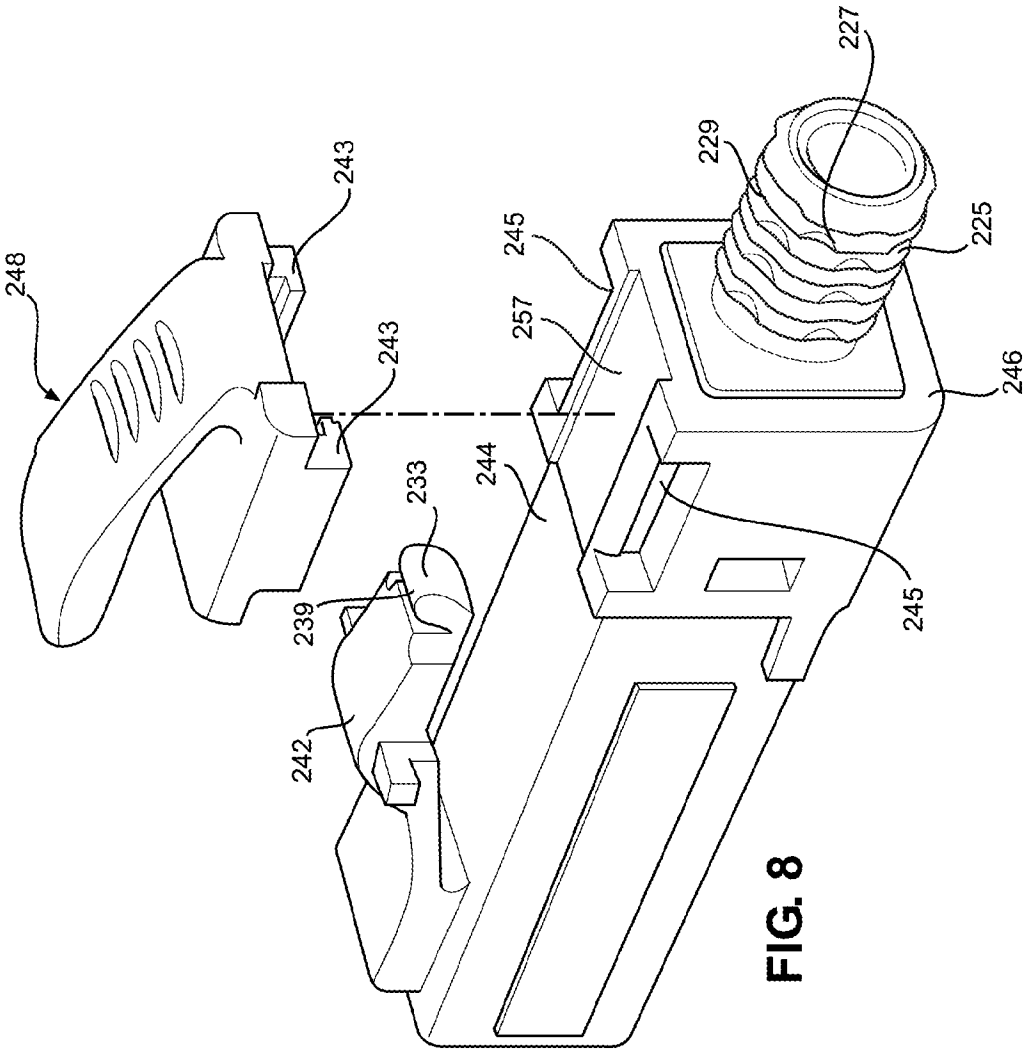


FIG. 8

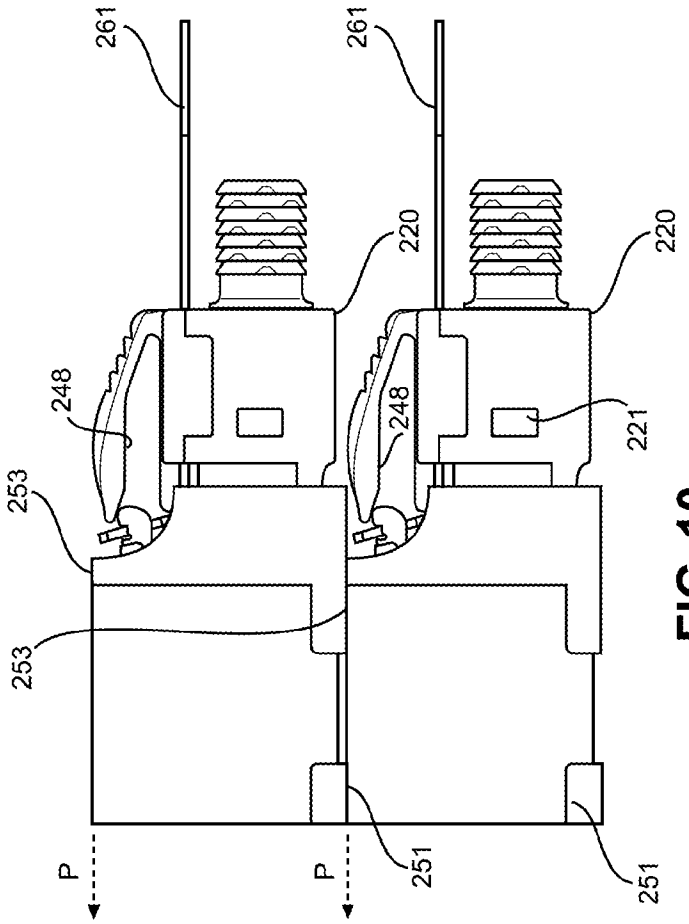

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FIG. 10

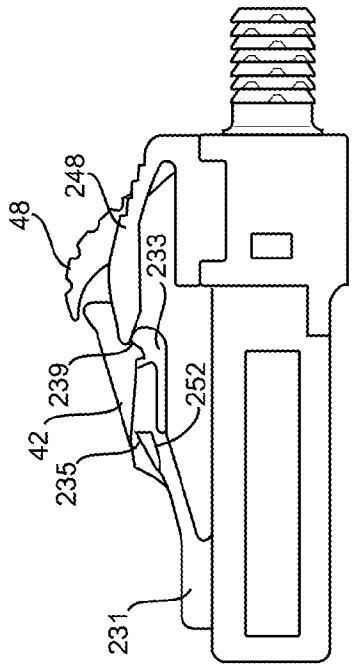

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FIG. 9

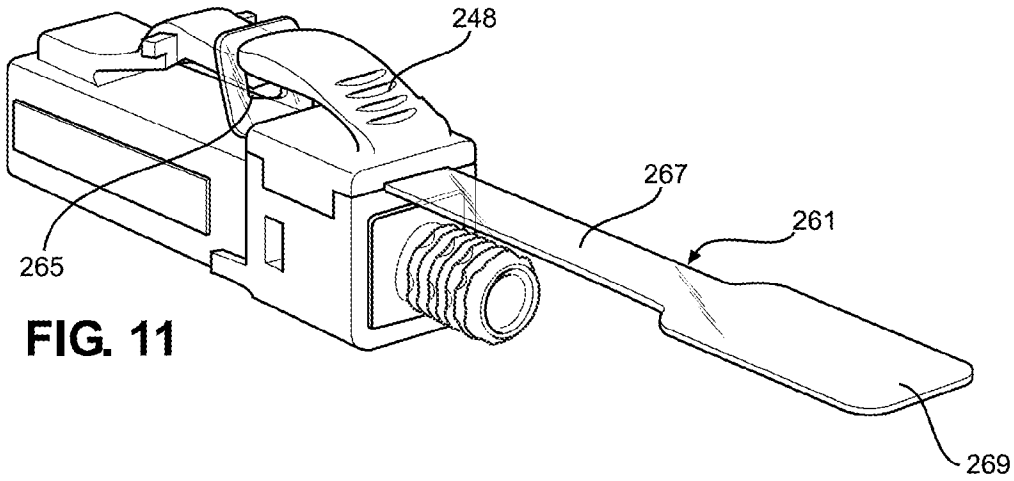


FIG. 11

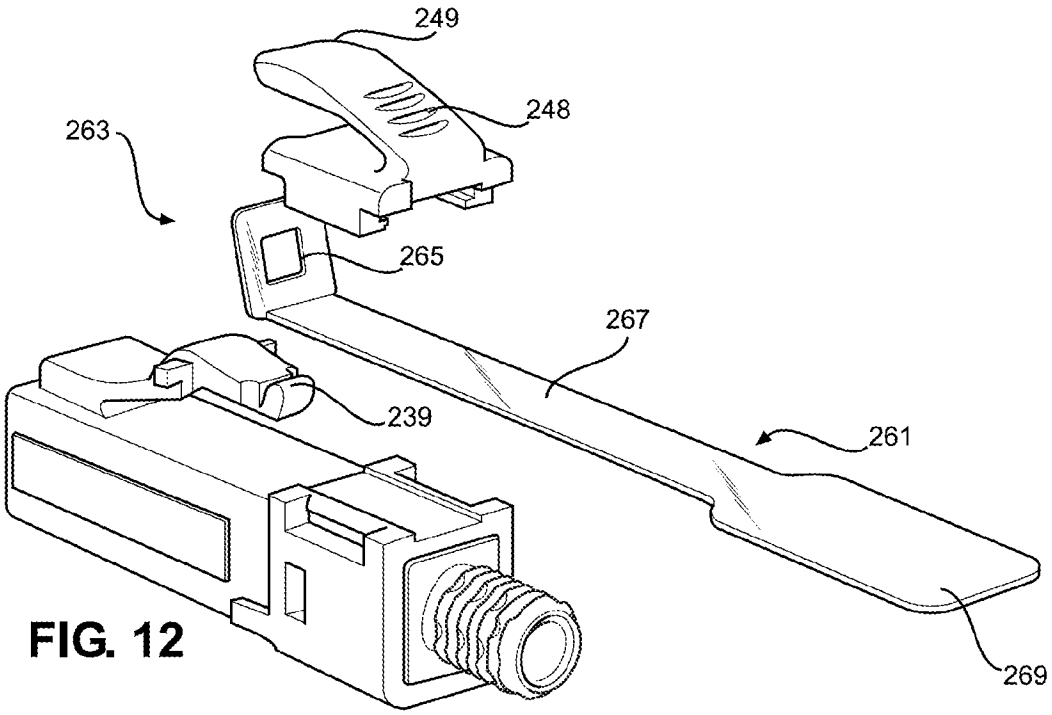


FIG. 12

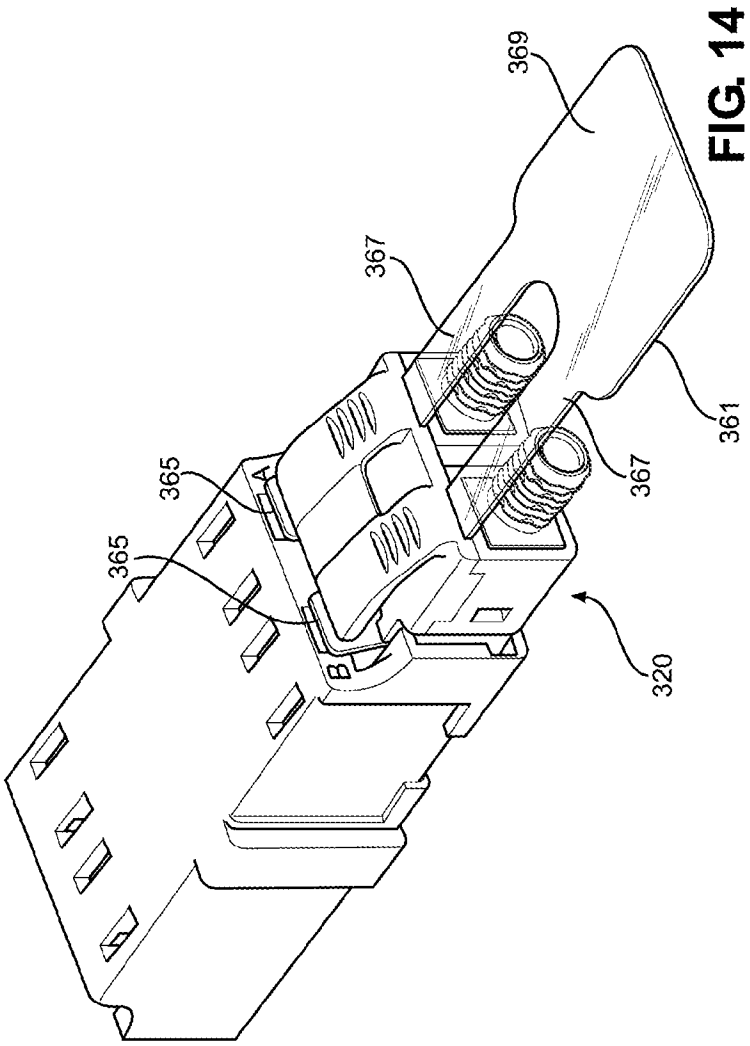


FIG. 14

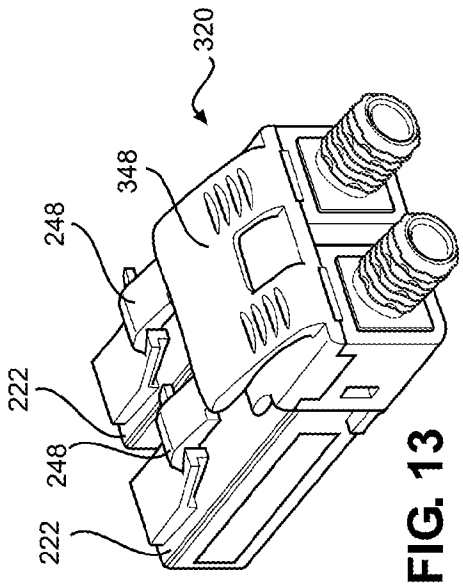


FIG. 13

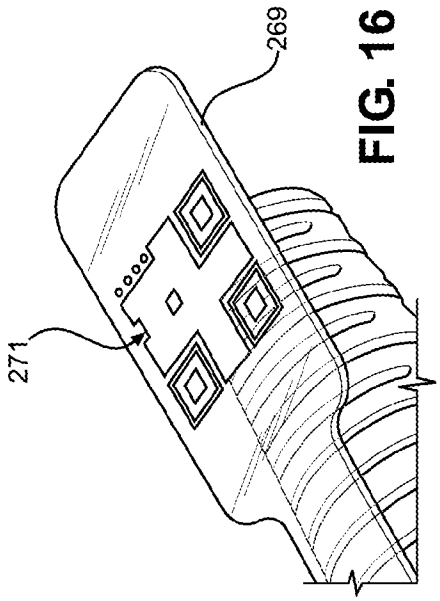


FIG. 16

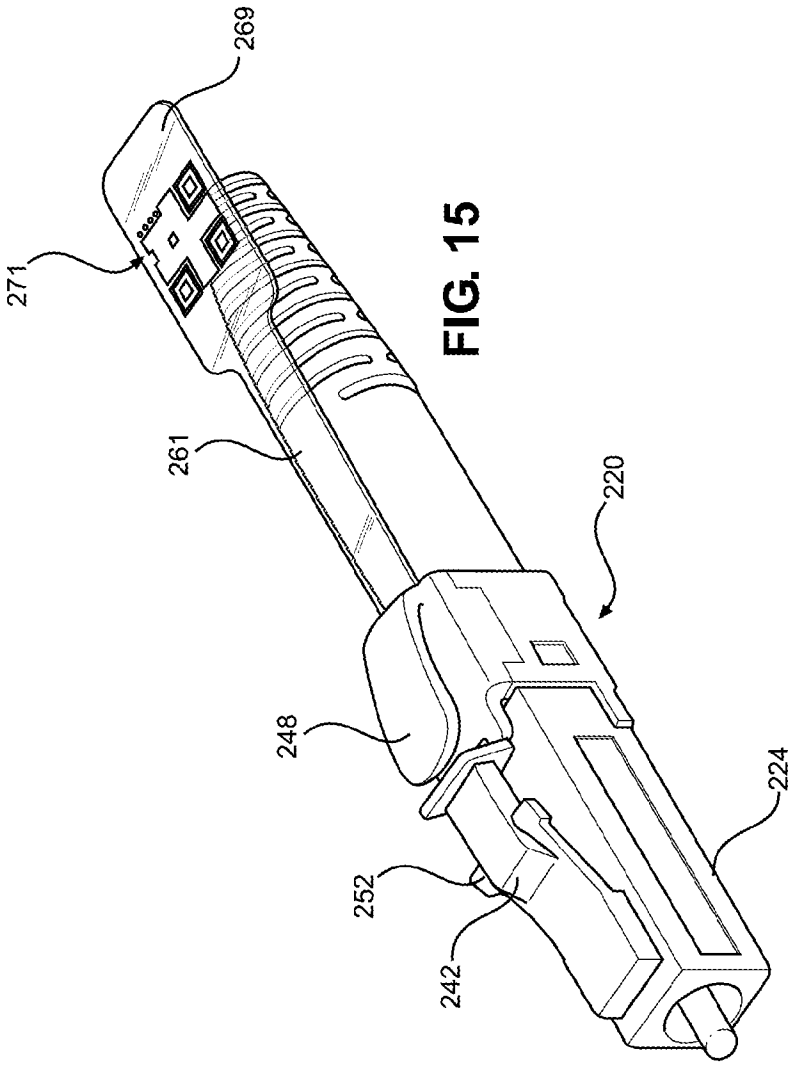


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2022/016634

A. CLASSIFICATION OF SUBJECT MATTER

G02B 6/38(2006.01)i; **G02B 6/42**(2006.01)i

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 6/38(2006.01); G02B 6/36(2006.01)

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

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: connector, latch, trigger, adapter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018-226959 A1 (COMMSCOPE TECHNOLOGIES LLC) 13 December 2018 (2018-12-13) paragraph [0114] and figures 26-41	15
Y		19-20
A		1-14,16-18
Y	US 2020-0081195 A1 (SENKO ADVANCED COMPONENTS INC.) 12 March 2020 (2020-03-12) paragraph [0022], claim 1 and figure 1	19-20
A	US 2015-0016780 A1 (ADC TELECOMMUNICATIONS, INC.) 15 January 2015 (2015-01-15) paragraphs [0113]-[0155] and figures 1-100	1-20
A	US 2009-0269014 A1 (PAUL N. WINBERG et al.) 29 October 2009 (2009-10-29) paragraphs [0038]-[0101] and figures 1-11B	1-20

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2022	**31 May 2022**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **189 Cheongsa-ro, Seo-gu, Daejeon** **35208, Republic of Korea**	**PARK, HYE LYUN**
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2022/016634

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2019-079419 A1 (COMMSCOPE TECHNOLOGIES LLC) 25 April 2019 (2019-04-25) claim 1 and figure 1	1-20

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2022/016634

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