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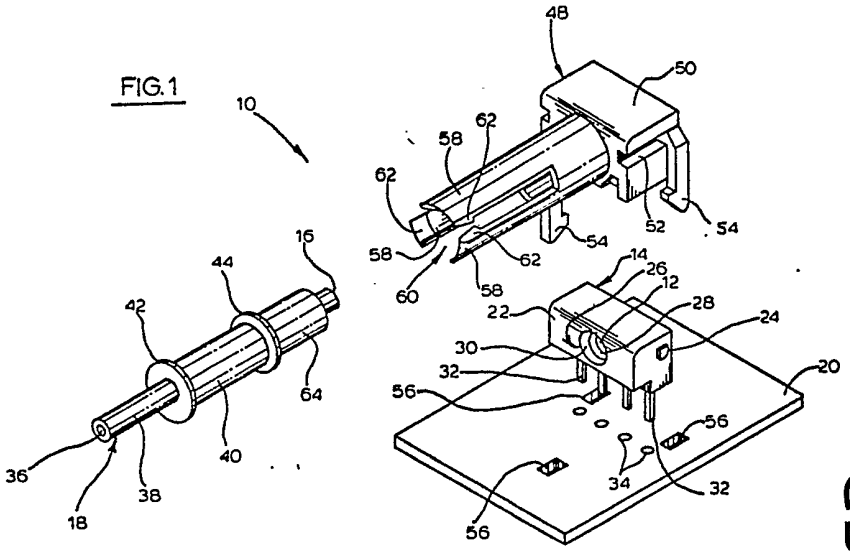
(54) Fiber optic connector assembly

(57) A connector assembly for connecting an optoelectronic device (14) mounted on the printed circuit board (20) with the end of an optic fiber (18) is provided in one embodiment. The optoelectronic device has a housing (22) including an optical port (26) surrounding an optical lens. The optical port has means (28, 30) for guiding a fiber end (16) in alignment with the lens. A cylindrical ferrule (40) having a flange (42) at one end is secured around the fiber. A unitary connector assembly housing (48) is provided for receiving and maintaining the fiber end and the optical lens in connected relation. The housing (48) includes a portion (50) for receiving the optoelectronic device and means defining the elongated passageway (60) for receiving the fiber and ferrule. The passageway communicates with the optical port. An open end, through which the fiber and ferrule are received, has expandable and engageable means (58, 62) for removeable cooperation with the ferrule flange (42) for positioning the fiber end against the optical port.

FIG.1



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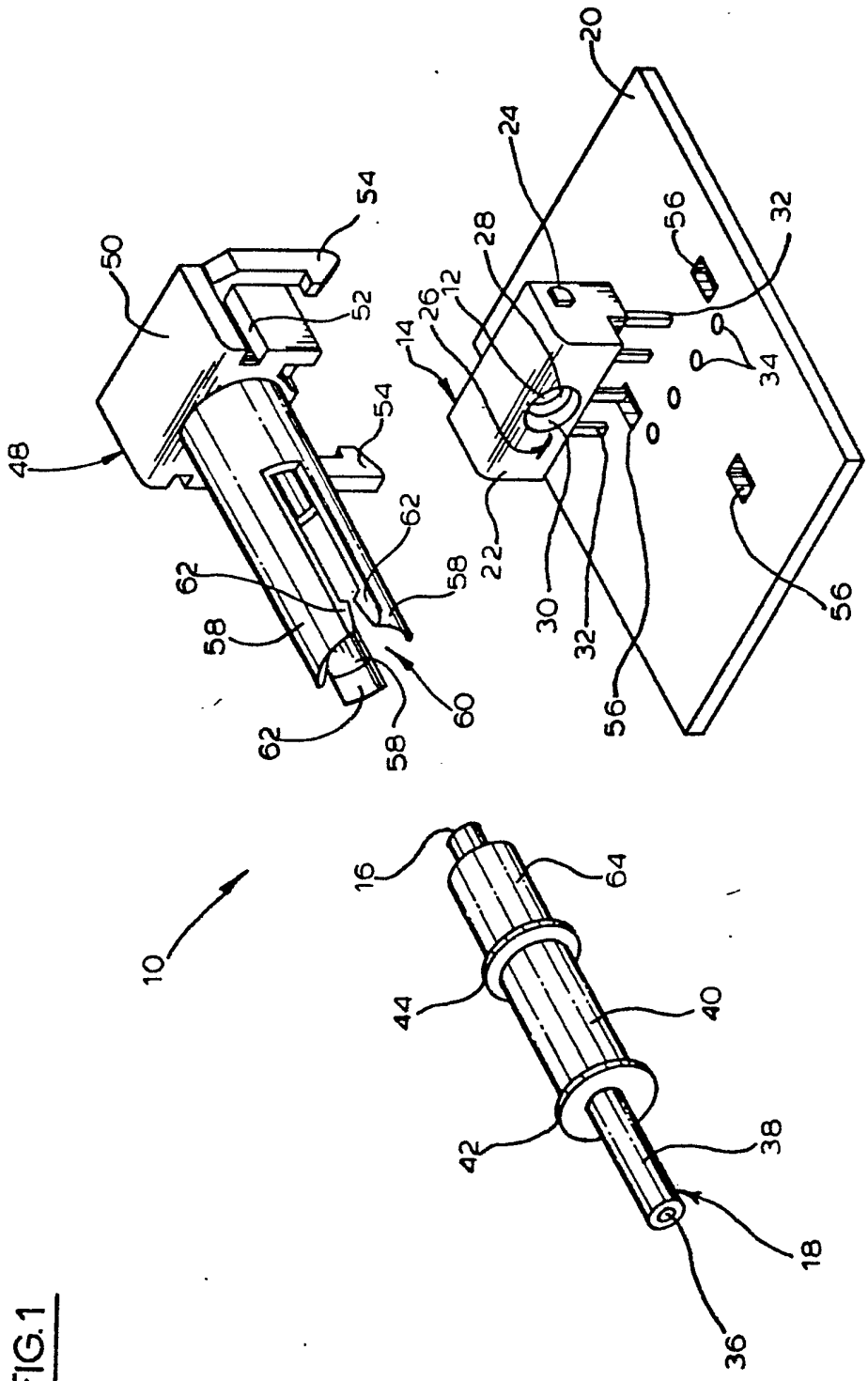
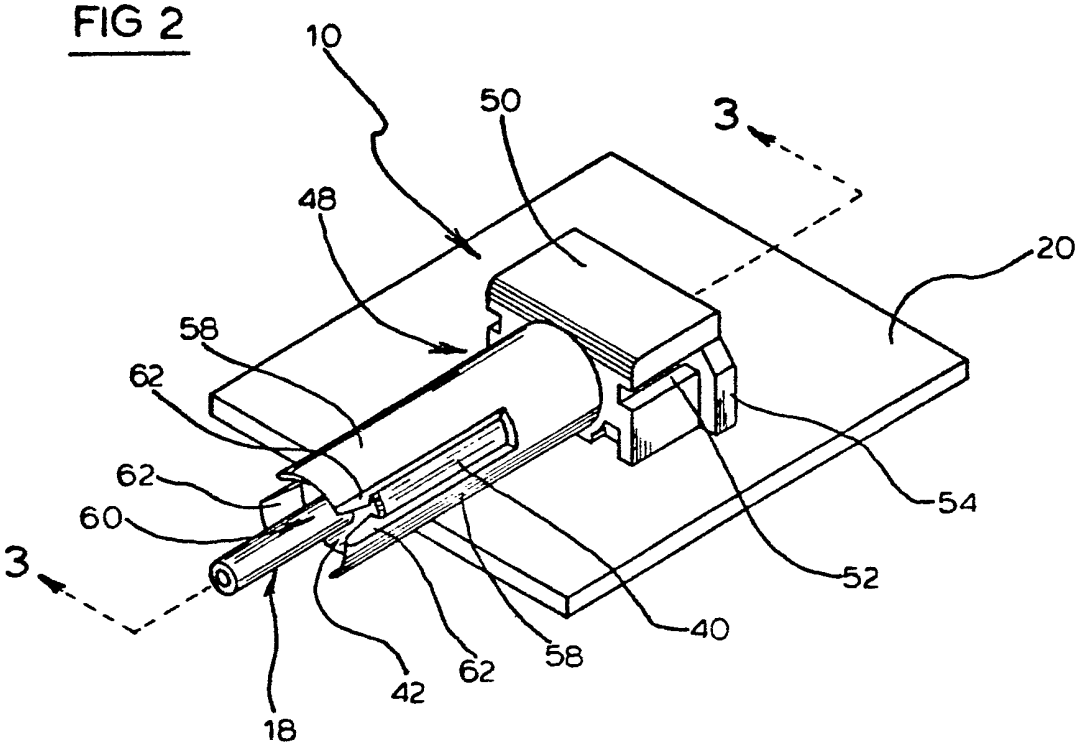


FIG.1

FIG 2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50
3
48
20
58
62
62
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60
3
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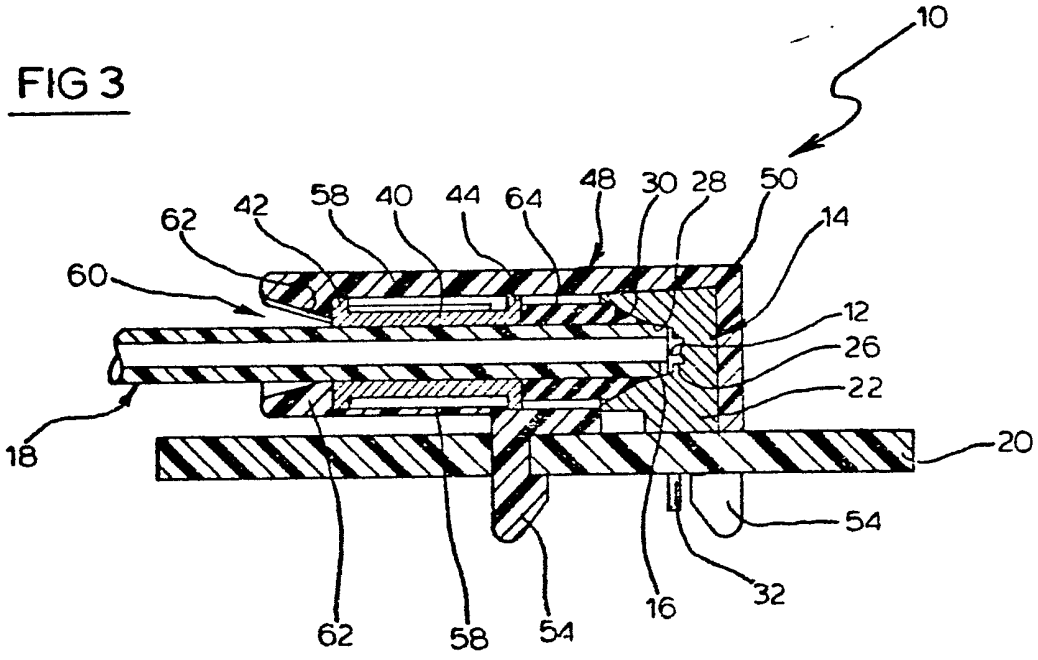
40
42
62
58
18

FIG 3


10
62
42
58
40
44
64
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12
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32

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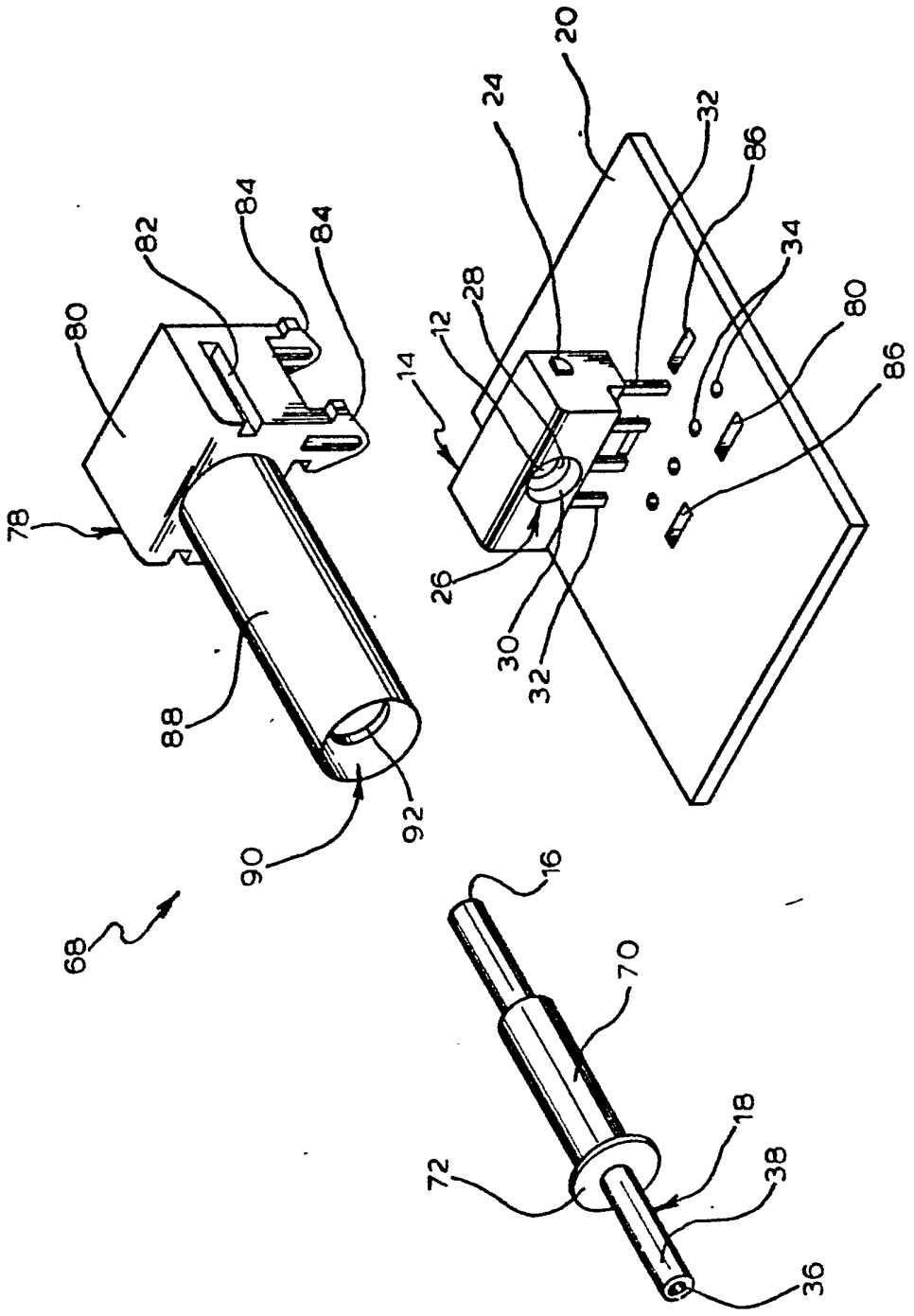

FIG4

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FIG 5

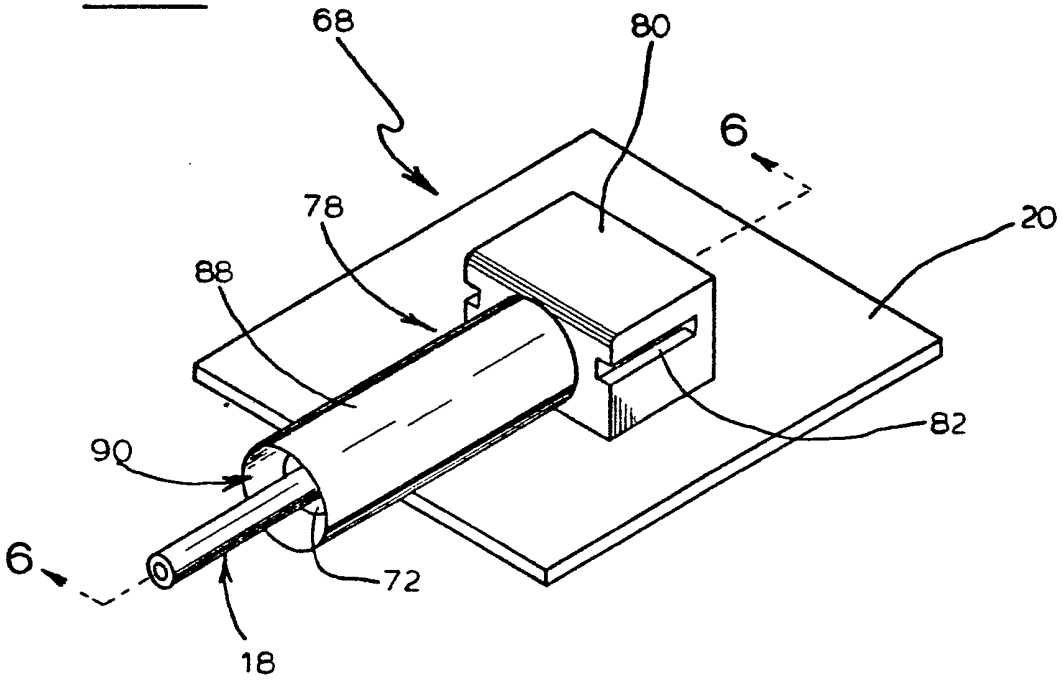
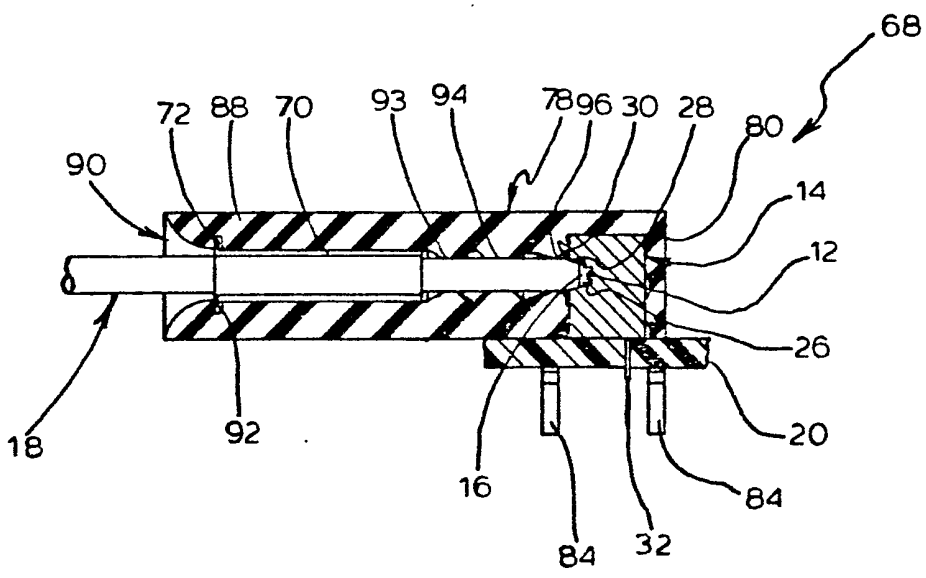


FIG 6



SPECIFICATION

Fiber optic connector assembly

The present invention relates to a connector assembly for connecting an optoelectronic device with the end of an optic fiber.

Most fiber optic connector assemblies are either difficult to manufacture, difficult to assemble and/or expensive to make and use. While it may be necessary to have a great degree of accuracy in the alignment of different optic elements with one another when dealing in telecommunication or digital applications, it is not always necessary to have the same degree of accuracy where the application does not demand it. Such applications are usually found in the consumer electronic markets which would use fiber optics for communication between two relatively short distances. One example of such application may be in the automotive industry.

It is, therefore, an object of the present invention to provide a simple, easy to make and assemble, low cost fiber optic connector assembly to connect one end of an optic fiber with an optoelectronic device.

The present invention provides the combination of an optoelectronic device including a housing having an optical port for the lens of the device and a connector assembly for connecting the end of an optic fiber with the optical lens of the device, said assembly including a cylindrical ferrule having a flange at one end adapted to be secured around the fiber at a predetermined distance from the end of the fiber and a connector assembly housing for receiving the ferrule bearing fiber end for maintaining the fiber end and the lens in connected relation, said connector assembly housing including a portion receiving the optoelectronic device, and means defining an elongated passageway for receiving the ferrule bearing fiber end, said passageway communicating with said optoelectronic device receiving portion of said connector assembly housing in alignment with said optical port and an open end through which the fiber and ferrule are received, said open end including expandable engageable means for removable co-operation with said ferrule flange for positioning said fiber end against said optical port, said housing of said optoelectronic device including guiding and alignment means surrounding the optical port for guiding the fiber end into alignment with the lens of the optoelectronic device.

Specific embodiments of the present invention will now be described by way of example and not by way of limitation with reference to the accompanying drawings in which :

Figure 1 is an exploded perspective view of one embodiment of a connector assembly of the present invention which connects the end of an optic fiber with an optoelectronic device;

Figure 2 is a perspective view of the connector assembly of Figure 1 in an assembled condition;

Figure 3 is a sectional view taken generally along the line 3-3 of Figure 2;

Figure 4 is an exploded perspective view of the combination of an optoelectronic device and a connector assembly of the present invention which connects an optic fiber end with the optoelectronic device;

Figure 5 is a perspective view of the Figure 4 combination in an assembled condition; and

Figure 6 is a sectional view taken generally along the line 6-6 of Figure 5.

With reference now to the accompanying drawings, Figures 1 to 3 show a connector assembly, generally designated 10, which is designed for connecting the optical lens 12 of an optoelectronic device, generally designated 14, with the end 16 of an optic fiber, generally designated 18. The optoelectronic device 14 is adapted to be mounted on a printed circuit board, generally designated 20, in a manner which will be discussed in greater detail hereinafter.

Looking at the Figure 1, the optoelectronic device 14 is seen to include a housing 22 having protrusions 24 formed on either side thereof. An optical port 26 surrounds the lens 12 and provides communication therewith. Guiding and alignment means in the form of a funnel 28, 30 of the housing 22 initially engage the fiber end 16 so that it will be accurately positioned with respect to the optical lens 12. The bottom of the optoelectronic device 14 is provided with a plurality of printed circuit board leads 32 which are receivable in corresponding holes 34 formed in the printed circuit board 20. After insertion into the holes 34, the leads 32 are soldered to the board.

The optic fiber 18 has a core 36 made of suitable light transmissive material such as a glass or clear plastics. The core 36 is encased in a cable jacket 38 made of material that is well known in the art.

An open ended cylindrical ferrule 40 is provided and is adapted to be crimped around the optic fiber 18. The ferrule 40 has two annular flanges 42 and 44 formed at either end thereof. When the ferrule is crimped on the fiber 18, the flanges 42 and 44 are located at predetermined distances from the end 16 of the optic fiber 18.

The connector assembly 10 has a unitary connector assembly housing, generally designated 48, for receiving the optoelectronic device 14 and optic fiber 18 therein. The housing 48 is made of plastics or other suitable material. The connector assembly housing 48 has a portion or cavity 50 for receiving the optoelectronic device 14 upwardly therein. The portion 50 has slots 52 on either side thereof for receiving protrusions 24 on the side walls of the device 14. This serves to position the optoelectronic device 14 within the connector assembly housing 48 so that lens 12 assumes the proper location. The housing 48 is sufficiently forgiving to allow the optoelectronic device to be pushed into the cavity 50, the protrusions 24 finally snapping into the slots 52 to retain the device in the housing, the device then fitting between the front and rear walls of the cavity 50.

A plurality of depending mounting legs 54 are formed on the housing 48. The legs 54 are adapted to be received in corresponding holes 56 formed in the printed circuit board 20. Legs 54 are adapted to interengage with the holes 56 so that the housing 48

is securely fastened to the board 20.

An elongated passageway is defined by three cantilevered flexible fingers 58 extending from the portion 50 of the connector housing 48 which receives the optoelectronic device 14. This passageway has an open end 60 through which the end 16 of the optic fiber 18 is received and moved toward the other end thereof.

Shoulders 62 are formed on the free ends of fingers 58 adjacent the open end 60 of the passageway. The shoulders 62 are adapted to engage the annular flange 42 of ferrule 40. In this manner, not only is the end 16 of the optic fiber 18 positioned adjacent the optical lens 12, but, accidental withdrawal of the optic fiber 18 from the passageway is prevented.

In order to seal the interface between the end 16 of the optic fiber 18 and the lens 12 against the environment, a hollow, open ended cylindrical elastomer insert 64 is provided to be received on the end 16 of the fiber so that it abuts against the radially outwardly extending surface of the second annular flange 44 of the ferrule 40 which faces the funnel 28, 30. As is best shown in Figure 3, the free end of the insert 64 is pressed against the rim portion 30 and the free end of the jacket 38 is pressed against the inner portion 28 of the funnel. This forms an annular seal around the optical port 26.

Figures 4 and 6 show the combination of an optoelectronic device 14 and a connector assembly, generally designated 68, which is designed for connecting the optical lens 12 of the optoelectronic device with the end 16 of an optic fiber, generally designated 18. The optoelectronic device 14 and the optic fiber 18 are identical with that which has already been described with respect to Figures 1 to 3 and the same reference numerals are used in Figures 4 to 6.

An open ended cylindrical ferrule 70 is provided and is adapted to be crimped around the optic fiber 18. The ferrule 70 has an annular flange 72 formed at one end thereof. When the ferrule 70 is crimped on to the fiber, the flange 72 is located a predetermined distance from the end 16 of the optic fiber 18.

The connector assembly 68 has a unitary connector assembly housing, generally designated 78, which receives the optoelectronic device 14 and optic fiber 18 therein. The connector assembly 68 is made of a resilient elastomeric material. The connector housing 78 has a portion or cavity 80 receiving the optoelectronic device 14 upwardly therein. The portion 80 has slots 82 on either side thereof for receiving protrusions 24 snapped therein. This serves to position the optoelectronic device 14 within the connector housing 78 so that lens 12 assumes the proper location.

A plurality of depending mounting legs 84 are formed on the connector housing 78. The legs 84 are adapted to be received in corresponding holes 86 formed in the printed circuit board 20. Legs 84 are adapted to interengage with the holes 86 so that the connector housing 78 is securely fastened to the board 20.

An elongated passageway is defined by the interior of a generally cylindrical portion 88 which extends from the portion 80 of the connector housing 78 which receives the optoelectronic device 14. This passageway has a flared open end 90 through which the end 16 of the optic fiber 18 is received and moved toward the other end thereof.

An annular slot 92 is formed adjacent the open end 90 and is adapted to receive the edge of the annular flange 72 of ferrule 70. In this manner, not only is the end 16 of the optic fiber 18 held adjacent the optical lens 12, but, accidental withdrawal of the optic fiber 18 from the passageway is prevented.

It is desired that this connector assembly 68 also be environmentally sealed. To that end, there is provided three restricted openings 93, 94 and 96 formed in the interior of the passageway between the optical port 26 and ferrule 70 as is best shown in Figure 6. The restricted openings 93, 94 and 96, which have frusto-conical lead-in portions, not only prevent dust and/or moisture from interfering with the interface between the end 16 of optic fiber 18 and the lens 12, but, also make it easier to insert the optic fiber 18 through the passageway.

Attention is drawn to our co-pending Application No. 8235150 (Serial No. 2112170) from which this application has been divided and which also claims matter disclosed herein.

CLAIMS

1. The combination of an optoelectronic device including a housing having an optical port for the lens of the device and a connector assembly for connecting the end of an optic fiber with the optical lens of the device, said assembly including a cylindrical ferrule having a flange at one end adapted to be secured around the fiber at a predetermined distance from the end of the fiber, and a connector assembly housing for receiving the ferrule bearing fiber end for maintaining the fiber end and the lens in connected relation, said connector assembly housing including a portion receiving the optoelectronic device, and means defining an elongated passageway for receiving the ferrule bearing fiber end, said passageway communicating with said optoelectronic device receiving portion of said connector assembly housing in alignment with said optical port and an open end through which the fiber and ferrule are received, said open end including expandable engageable means for removable cooperation with said ferrule flange for positioning said fiber end against said optical port, said housing of said optoelectronic device including guiding and alignment means surrounding the optical port for guiding the fiber end into alignment with the lens of the optoelectronic device.

2. The combination of claim 1 wherein said guiding and alignment means comprises a funnel around the periphery of the optical port.

3. The combination of claim 2 wherein said funnel has a first frusto-conical portion adjacent the optical port and a second frusto-conical portion extending outwardly from said first frusto-conical portion at a greater angle than the first frusto-conical portion.

4. The combination of any preceding claim

wherein said optoelectronic device is adapted to be mounted on a printed circuit board which has apertures formed therein, said connector assembly housing including depending legs receivable through such apertures and having locking means formed at the ends thereof to engage the circuit board.

5. The combination of any preceding claim wherein said connector assembly housing is made of a generally resilient elastomeric material, said passageway being defined by a generally hollow cylindrical portion having an interior with an annular shoulder formed at the open end to define said engageable means.

6. The combination of claim 5 wherein said passageway has at least one restricted opening inwardly of its open end seatably to engage with the optic fiber to prevent dust and/or moisture from interfering with the interface between the end of the optic fiber and the lens of the optoelectronic device.

7. The combination of claim 6 wherein a plurality of said restricted openings is provided.

8. The combination of claim 6 or 7 wherein the restricted opening or each of the restricted openings has a frusto-conical lead-in portion to assist in inserting an optic fiber through said passageway.

9. The combination of an optoelectronic device including a housing having an optical port for the lens of the device and a connector assembly for connecting the end of an optic fiber with the optical lens of the device substantially as hereinbefore described with reference to, and as shown in, Figures 4, 5 and 6 of the accompanying drawings.

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