Feb. 12, 1963 J. A. ZIMMERMAN, JR 3,077,572

ELECTRICAL CONNECTOR

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Fig. 1

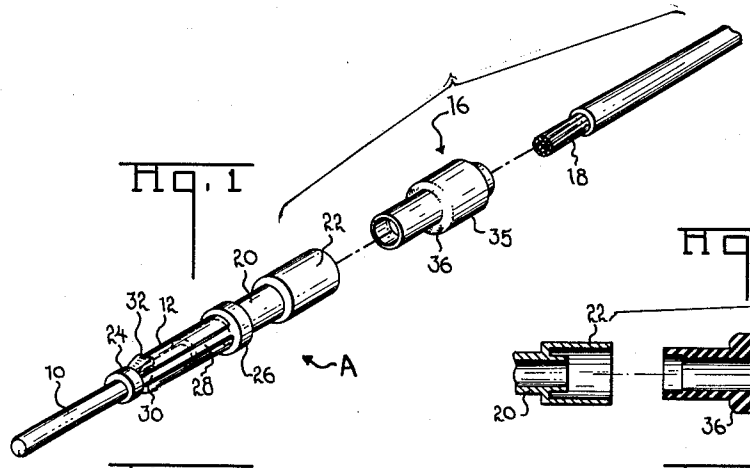

Fig. 2

Fig. 5

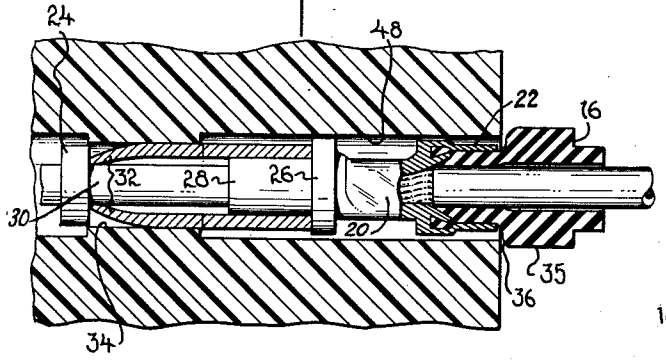

Fig. 3

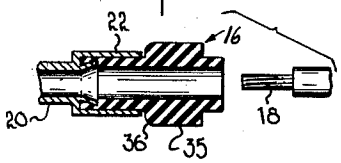

Fig. 4

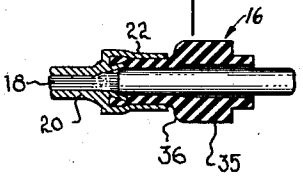

Fig. 6

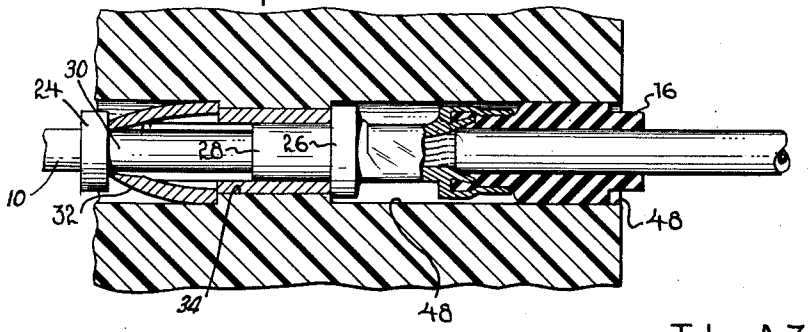

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Fig. 8

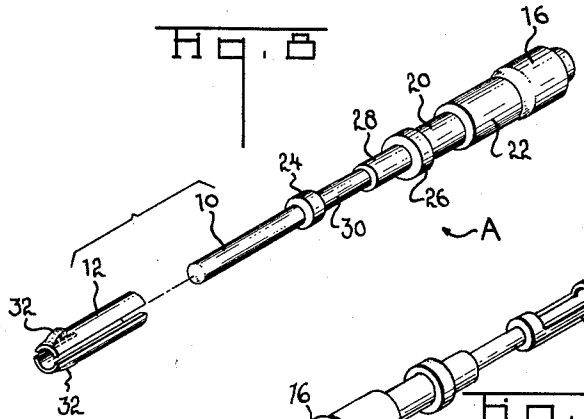
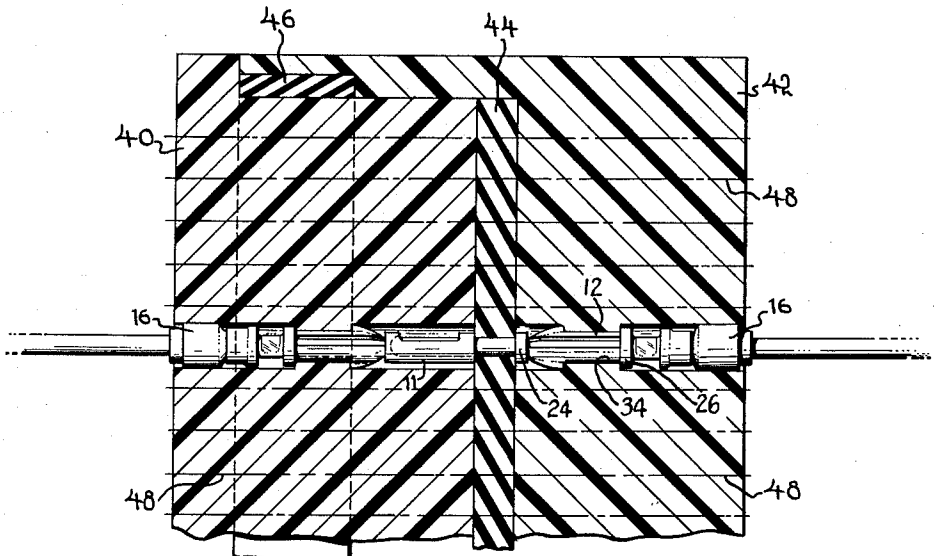


Fig. 8A

Fig. 7



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ELECTRICAL CONNECTOR

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1 Claim. (Cl. 339—217)

In designing separable electrical connections, the problem of sealing the connection against its environment has long posed a problem. It is an object of the invention to make such a connection which is easy to manufacture, simple to apply, and in final application provides a sealed connection that resists the onslaught of unfavorable environmental characteristics.

It is also an object of this invention to provide a connector that seals itself and maintains such seal when placed in use.

It is also an object of this invention to provide such a connector that may easily be fitted into a connector block and retained in such block in sealed engagement.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

FIGURE 1 is an exploded perspective view illustrating a connector embodying principles of this invention;

FIGURES 2–4 are plan views of the connector shown in FIGURE 1 illustrating various stages of assembly;

FIGURE 5 is a plan view, partially broken away, showing the connector of FIGURE 1 prior to being fitted into a block;

FIGURE 6 is a view similar to FIGURE 5 illustrating the connector assembled in the block;

FIGURE 7 shows a pair of mating blocks with connectors therein;

FIGURE 8 is an exploded view similar to FIGURE 1 illustrating the assembly for retaining the connector in the block.

FIGURE 8A is a view similar to FIGURE 8 illustrating the female element in the connection.

The male element "A" of an electrical connection may include a pin 10, with a retaining sleeve 12, wire receiving means 20 and a seal-receiving means 22, a resilient sealing element 16 and the conductor 18. (The female element is identical except for a receptacle 11 instead of the pin 10, FIGURE 7 and FIGURE 8A, and need not be described.)

As shown in FIGURES 2–4 the wire receiving portion includes a wire receiving ferrule 20 which accommodates a bare wire 18 and is adapted to be crimped thereto. A seal receiving ferrule 22 extends from the wire receiving ferrule 20 at a short distance from one end thereof and is concentric therewith. The space between the end of the wire receiving ferrule 20 and the seal receiving ferrule 22 accepts one end of the resilient sealing member 16 (which may be stepped for easier insertion). After the resilient sealing member 16 is inserted into the seal receiving ferrule 22, the wire receiving ferrule 20 is outwardly tapered (e.g. by a mandrel) so that it securely grasps the seal therein, as shown in FIGURE 3.

A conductor 18 is inserted into the assembly so that the uninsulated end of the conductor is positioned within

wire receiving ferrule 20 and the insulation on the wire abuts the projecting end of the ferrule (note FIGURE 4). The wire receiving ferrule 20 is then crimped onto the conductor 18 and the seal receiving ferrule 22 is deformed slightly (FIGURE 4) so as to cooperate with the tapered end of the wire receiving ferrule 20 to grasp the resilient member in secure gripping relationship.

The pin 10 has a pair of spaced flanges 24 and 26 of different diameters on shank 28 which has a reduced portion 30. The pin retaining sleeve 12 may be formed of this flat stock and curled around the shank 28, with an open seam to provide a degree of resiliency. The pin retaining member 12 is bulged outwardly with tabs 32 struck in one end thereof. As shown in FIGURES 5 and 6 the member 12 is seated between the flanges 24 and 26.

The blocks to be joined (FIGURE 7) include a rigid member 42 having a plurality of male connectors therein and a corresponding block 40 having an equal number of receptacles (to avoid repetition, only one set of connectors is shown in FIGURE 7). The blocks are adapted to mate and a resilient seal 44 is provided therein. A peripheral seal 46 may surround the juncture of the mating surfaces of the blocks.

Each block has a plurality of apertures 48 (FIGURES 5 and 6) each having a diameter slightly larger than the flange 26 but smaller than the major diameter of the resilient seal 16. Within each aperture 48 is a portion 34 having a reduced diameter so that the tab 32 and the flange 26 locate the connector assembly in its proper assembled position, note FIGURE 6.

When the connector assembly enters the aperture 48, the tapered nose on the forward end of the pin retaining member 12 permits it to be contracted for insertion into the reduced portion 34 of the aperture 48 (FIGURE 5). After the pin retaining member 12 has passed through the reduced portion 34 it again expands outwardly so that the tabs 32 and the flange 26 restrain longitudinal movement of the assembly. The reduced portion 34 retains the shank 28 and the sleeve 12 in firm engagement due to the springiness of the metal stock.

The resilient seal 16 has a major diameter 35 slightly rounded at 36 so that it will fit into the aperture in the block. Since the aperture is smaller than the major diameter 35 of the resilient sealing means 16, the seal will be compressed and longitudinally extruded, as shown in FIGURE 6. This effects a sealed connection which firmly grasps the wire by compression and protects the connection against the intrusion of moisture. The two blocks are joined and peripherally sealed as shown in FIGURE 7.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

I claim:

A device of the character described including: a shank with a pair of spaced flanges, said shank having a reduced diameter portion, a radially expandable sleeve surrounding said shank, said sleeve being tapered toward the reduced diameter portion of the shank, at least one tab on the sleeve in the area of the reduced diameter portion of the shank, a ferrule adapted to be crimped onto a conductor extending from the major diameter portion of the shank, means for sealing the conductor against the intrusion of moisture, comprising a resilient sealing member held in compression on the conductor at least at its front juncture with the ferrule, and means on the shank for effecting an electrical connection, a rigid member having an aperture therein, said device adapted to fit the aper-

ture in the rigid member, and said tab frictionally engaging the inner surface of said aperture, said aperture being counterbored at each end so that the minor diameter is larger than the diameter of the shank but less than the diameter of one of said flanges, and the major diameter is greater than the diameter of the flanges but less than the fully expanded diameter of the tab.

References Cited in the file of this patent

UNITED STATES PATENTS

2,008,650	Weatherhead	July 16, 1935
2,410,321	Watts	Oct. 29, 1946
2,477,849	Adams	Aug. 2, 1949
2,689,337	Burtt et al.	Sept. 14, 1954
2,691,146	Pollock	Oct. 5, 1954
2,695,394	Watts	Nov. 23, 1954
2,702,878	Heibel	Feb. 22, 1955
2,758,291	Richards	Aug. 7, 1956
2,769,965	Frey	Nov. 6, 1956

FOREIGN PATENTS

567,798	Great Britain	Mar. 5, 1945