

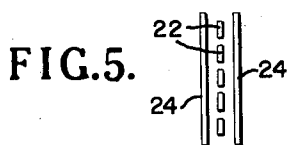
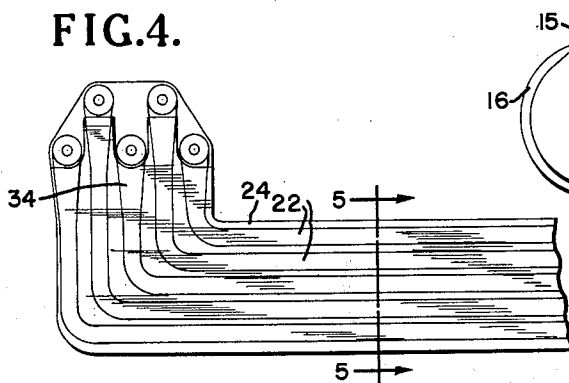
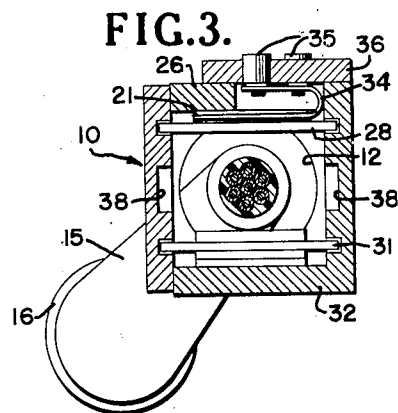
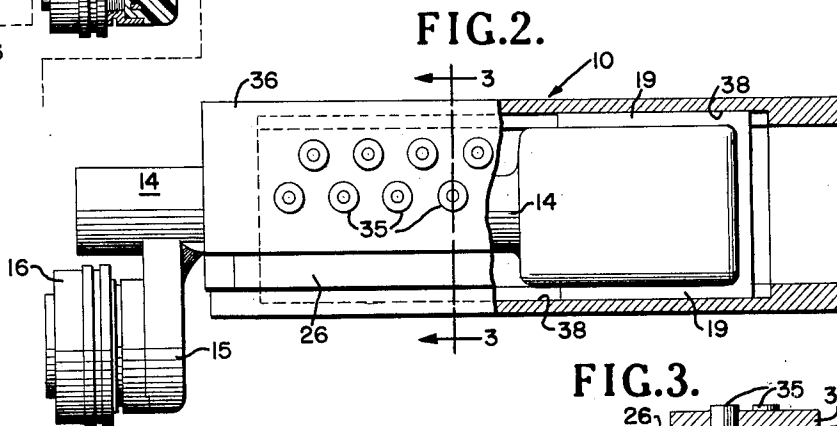
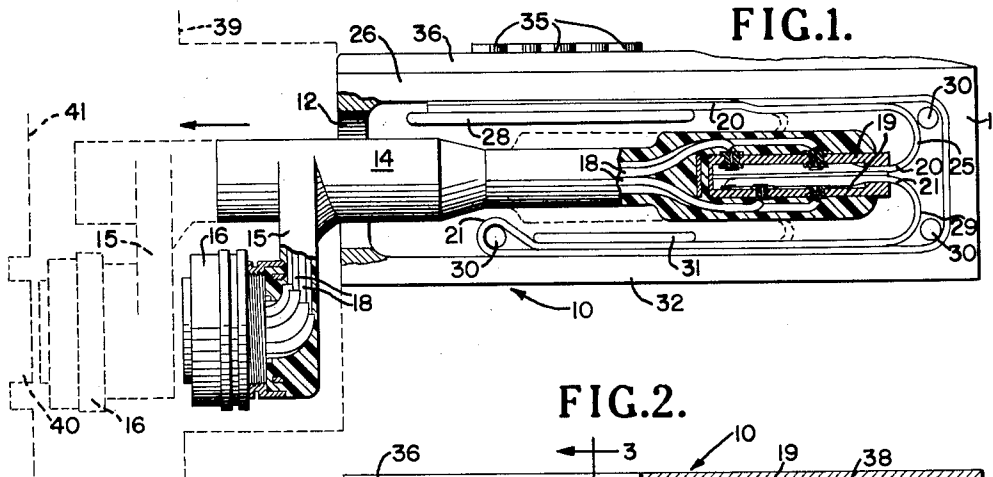
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RETRACTABLE ELECTRICAL CONNECTOR

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RETRACTABLE ELECTRICAL CONNECTOR

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(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to electrical connectors, and more particularly to a retractable electrical connector for facilitating the blind mating of two structures which must be electrically connected.

In the past, many devices have been proposed to facilitate the electrical connection of blind mated parts. When the parts to be connected were small, one or more keyed guide prongs were provided and the parts relatively rotated until the prongs were properly aligned with mating slots and the structures then moved together and mated. An example of such a structure would be the guide prongs provided to insure proper insertion of vacuum tubes in vacuum tube sockets. While such arrangements are satisfactory when the mating structures may be manually manipulated, such arrangements are not generally satisfactory when the structures to be mated are of considerable size. Frequently, it is neither practical nor desirable to provide apparatus to manipulate large structures in order to obtain alignment of guide prongs and sockets when mating large structures.

Formerly, this need for manipulation of large structures was avoided by providing connectors coupled to pigtail or flexible folded cables. However, such arrangements are not entirely satisfactory due to the difficulty in controlling the final positions of the slack portions of the pigtail or folded cables once the structures have been mated. Since the slack portions sag as the structures are mated, the pigtail or folded cables were frequently pinched between the structures being mated and at times were actually severed. The general purpose of the present invention is to provide an electrical connector device which does not suffer from the aforementioned inherent defects and yet facilitates the blind mating of structures which must be electrically connected.

It is therefore a primary object of the present invention to provide a new and improved retractable electrical connector.

It is another object of this invention to provide an electrical connector which may be partially withdrawn from one of two structures to be blind mated and electrically connected to the other of the two structures prior to the mating thereof.

It is a further object of this invention to provide a retractable electrical connector in which the various positions of the movable conductors are readily controlled.

With these and other objects in view, the present invention contemplates a sleeve connector secured to a molded member having electrical conductors embedded therein and electrically coupled to the sleeve connector. The molded member is slidably mounted in a housing to permit the sleeve connector to be withdrawn, connected to a mating connector, and then retracted. A flexible printed cable is electrically connected between the conductors embedded in the molded member and a terminal board formed on one wall of the housing to enable extraction and retraction of the sleeve connector while maintaining electrical continuity between the sleeve connector and the terminal board.

Other objects, advantages and novel features of the

invention will become readily apparent upon consideration of the following detailed description when read in conjunction with the accompanying drawing wherein:

FIG. 1 is an elevational view, partially in section, of a retractable electrical connector embodying the principal features of the present invention;

FIG. 2 is a plan view of the connector of FIG. 1 and is partially broken away to illustrate the guiding arrangement which facilitates longitudinal movement of the molded member relative to the housing;

FIG. 3 is a sectional view taken along the line 3-3 of FIG. 2 and illustrates the manner in which the flexible cable is connected to the terminal board;

FIG. 4 is a fragmentary view of an end portion of flexible printed cable; and

FIG. 5 is a sectional view taken along the line 5-5 of FIG. 4 with the insulating elements and conductive strips shown separated for purposes of clarity.

Attention now is directed to the drawing wherein like numerals of reference designate like parts throughout the several views, and more particularly to FIGS. 1 to 3 thereof for a detailed description of the present invention. The connector assembly comprises a hollow housing, designated generally by the reference numeral 10, having a closed end 11 and an open end defined by an aperture 12. A molded member or cable 14 is disposed within the hollow housing 10 and is provided with an offset portion 15 on which is mounted a conventional sleeve connector 16. It is, of course, obvious that the offset portion 15 need only be utilized when it is desired that the axis of the sleeve connector 16 be offset from the axis of the molded member 14. Otherwise, the sleeve connector 16 may be mounted directly on the outer end of the molded member 14. A plurality of conductors 18 are embedded in the molded member 14 and offset portion 15 at the time of molding. One end of each of these conductors is electrically connected, as by soldering, to the prongs of the sleeve connectors 16. The other end of each conductor 18 is connected to one of a pair of terminal boards 19, as by soldering or other suitable methods. The terminal boards 19 are also embedded in the molded member 14 at the time of molding.

A pair of flexible printed cables 20 and 21 each have an end thereof electrically connected to the terminal boards 19. As can be best seen in FIGS. 4 and 5, the printed cables comprise conductive strips 22 embedded in plastic insulating material 24. The conductive strips 22 are completely surrounded by the insulating material 24 except at the terminal portions thereof where sufficient plastic material is removed to expose the ends of the conductive strips and enable soldering of the strips to terminal boards or other devices. As may be clearly seen in FIG. 1, the cable 20 is provided with a return bend or fold 25 and the free end thereof is clamped against a wall 26 of the housing 10 by means of a retainer plate 28. The cable 21 is provided with a return bend or fold 29 and then is passed around positioning pins 30 with the free end thereof disposed between the free end of the cable 20 and the wall 26 of the housing 10. A retainer plate 31 is provided to clamp a lower portion of the cable 21 against a wall 32 of the housing 10.

The cables 20 and 21 are provided with offset portions 34 (FIG. 4) which are bent back upon themselves (FIG. 3). The conductors in the cables 20 and 21 are soldered to sockets 35 which form parts of a terminal board 36 secured to the outside of the wall 26 of the housing 10. The sockets 35 are of the type suitable to accommodate pin connectors.

As may be clearly seen in FIG. 2, the terminal boards 19 project laterally beyond the molded member 14 and are accommodated in grooves 38 formed in opposite walls of the housing 10. This arrangement enables sliding move-

ment of the molded member 14 relative to the housing 10 while relative rotation between these elements about their common axis is precluded.

Operation

In order that a better understanding of the invention may be had, the manner in which it is utilized will now be described. The connector assembly is first mounted in a structure 39 (FIG. 1), one of the two structures which is to be blind mated, and electrical connection between the connector assembly and the structure 39 is made by means of pin connectors (not shown) inserted in the sockets 35. The molded member 14 is then partially withdrawn from the housing 10 to the position shown in dotted lines in FIG. 1. The cables 20 and 21, being flexible, will have facilitated this movement and assumed the positions shown by dashed lines. The sleeve connector 16 is then coupled to a mating connector 40 mounted in a structure 41 in the conventional manner. The structure 41 is the second of the two structures which are to be blind mated. After the coupling of the sleeve connectors 16 and 40 has been completed, the structures 39 and 41 may then be brought together and connected in any suitable manner. As the structures 39 and 41 are being moved together, the molded member 14 is pushed back into the housing 10 until it again reaches the position shown in solid lines in FIG. 1. During both the outward and inward movement of the molded member 14, the terminal boards 19 in the grooves 38 have guided the movement thereof.

From the foregoing it will be readily apparent that the present invention provides a new and improved retractable electrical connector possessing advantages not found in prior art devices. Since both the rigid and flexible portions of the cables interconnecting the sleeve connector 16 and terminal board 36 are completely confined within the housing 10, it is obvious that the possibility of damage to the connecting leads as the two structures 39 and 41 are brought together has been eliminated. It is equally obvious that the illustrated structure is susceptible of many modifications depending only upon the nature of the structures which are to be blind mated.

It is to be understood that the aforescribed embodiment is intended to be illustrative only and not limiting in any sense. Manifestly, numerous other arrangements may be readily devised by those skilled in the art to achieve a similar device which will still embody the principles of the present invention and fall within the spirit and scope thereof.

What is claimed is:

1. A retractable electrical connector for electrically connecting together two structures prior to blind mating of the two structures, comprising a hollow housing having an open end and an oppositely disposed closed end, a terminal board mounted on said housing near the open end thereof, an electrical cable normally within said housing and coaxially aligned therewith, said cable having a rigid portion partially extending through the open end of said housing and a flexible portion entirely within said housing and being electrically connected to said terminal board, said flexible portion being folded back upon itself in a direction parallel to the axis of said housing in such a manner that a smooth bend is formed in said flexible portion, whereby the rigid portion of said cable may be partially withdrawn from said housing to facilitate the making of an electrical connection between said two structures prior to blind mating thereof so that the cable is protected from injury when said two structures are blind mated, said housing having longitudinal grooves formed in the interior wall thereof, said rigid portion of said cable having projections extending radially outwardly therefrom to slidably engage said grooves to facilitate longitudinal movement of the rigid portion of said cable relative to said housing while precluding relative rotational movement therebetween, the rigid portion of said cable comprising a molded member of dielectric material having electrical conductors embedded therein, and a sleeve connector mounted on one end of said molded member exteriorly of said housing.
2. An electrical connector as defined in claim 1 wherein said sleeve connector is mounted on said molded member in a position offset from the longitudinal axis thereof, and the length of the interior of said housing is greater than the length of said molded member.
3. A connector as defined in claim 1 wherein the flexible portion of said cable comprises a flat printed cable.
4. An electrical connector as defined in claim 2 wherein the flexible portion of said cable comprises a flat printed cable.

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