Dec. 3, 1963 G. A. KNIGHT 3,112,976

ELECTRICAL CONNECTOR

Filed Oct. 14, 1960

FIG. 1

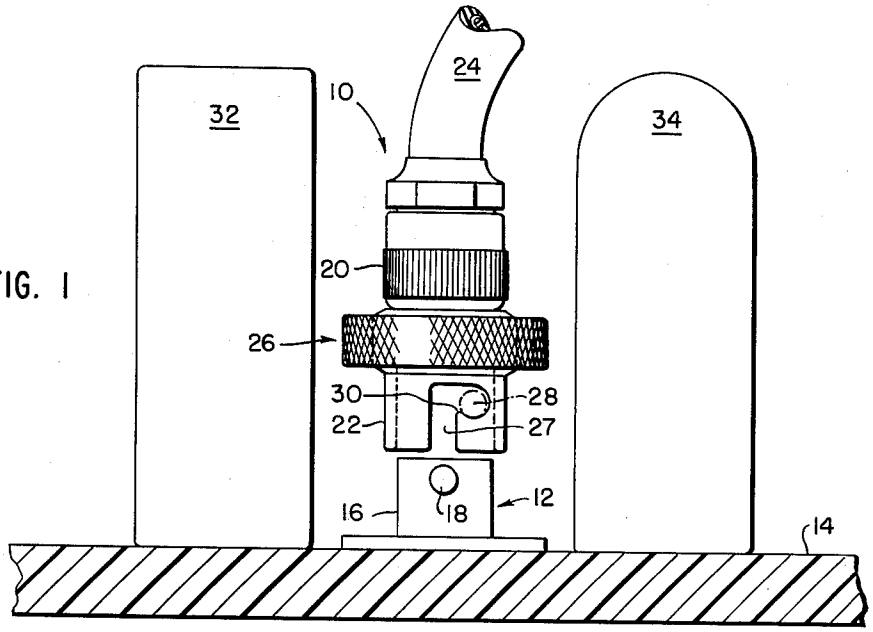


FIG. 2

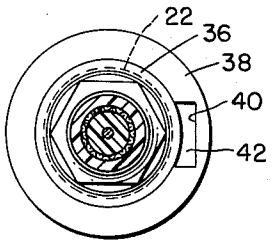
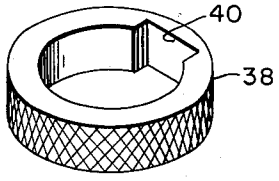


FIG. 3



INVENTOR.
GEORGE A. KNIGHT
BY Kenway, Jenney & Hildreth

ATTORNEYS

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ELECTRICAL CONNECTOR

George Albert Knight, Burlington, Mass., assignor to National Company, Inc., Malden, Mass., a corporation of Massachusetts

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This invention relates to an improved connector for electrical cables or conductors and particularly for small coaxial cables. More particularly it relates to a novel improvement in electrical connectors of the type comprising a pair of connector members which are mechanically connected by a bayonet joint or the like.

Electrical conductors and particularly coaxial conductors are often connected by the use of a connector which comprises two cooperating connector members one on each end of the conductors to be joined. The connector is required to make both a strong mechanical connection, and which prevents inadvertent separation of the connector members and a good electrical contact. A mechanical connection is often made by cooperating, telescopically engageable, cylindrical elements on each connector member. The elements are held together by a bayonet joint or a screw and thread combination or similar arrangement; the mechanical connection between two connectors is made by manually rotating one of the telescoping elements relative to the other. Connector pairs of this type may be used for example to connect a conductor to a board or panel which holds electrical components. One member of the connector may be fixed to the board and the other may be on the end of the conductor which is to be connected to the board. One wishing to engage or disengage the connector member must use his fingers to position the connector members in the proper relationship to each other and to lock them by rotating one of the members. This procedure may present a problem in applications such as miniaturized circuits where space is often very limited and must be used with maximum efficiency. In such applications it is often necessary to place components and connectors as close to each other as possible. Heretofore connectors of the type described required valuable space to be wasted because of the need for leaving sufficient room for one to use his fingers in engaging or disengaging the connector members. Where sufficient room is not left for easy assembly of the connector elements, such assembly and disassembly is extremely difficult and time consuming.

Accordingly, it is the primary object of my invention to provide a novel and improved connector for electrical conductors and particularly coaxial conductors, which provides for ease of engagement or disengagement of connectors of the type described when the connection has to be made at a position inaccessible or inconvenient for use of the fingers.

It is a further object of my invention to provide a novel and improved means for adapting existing connectors to my invention, not originally fabricated according to my invention, so that they may be more easily engaged or disengaged when the connection is required to be made at a point inaccessible or inconvenient for use of the fingers.

Other objects of my invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be made to the following detailed description, and the accompanying drawing,

in which: FIG. 1 is a side elevational view of an electrical connector of a type with which this invention is concerned with one member of the connector being fixed on a panel or the like;

FIG. 2 is an enlarged end view of the female connector member of FIG. 1; and

FIG. 3 is a perspective view of a portion of the connector member of FIG. 2.

With reference to the drawing and particularly to FIG. 1, a connector exemplary of the type with which this invention is concerned comprises a female connector member shown generally at 10 and a male connector member shown generally at 12. The male connector member 12 has a cylindrical element or portion 16 usually used as the outer conductor connector, from which a pin 18 projects radially outward. The connector member 12 is shown attached to a panel 14 by screws or other suitable means (not shown) so as to be fixed in position.

The body 20 of the female connector 10 receives an electrical conductor 24, the electrical connections being made to elements (not shown) within the connector body 20. When the electrical connections have been made, the connector body 20 and the electrical conductor 24 are fixed with respect to each other. A cylindrical element 22 is fixed to the body 20 and is also usually connected to the outer conductor of the cable 24 if it is coaxial. Element 22 is rotatable with respect to and non-detachable from the body 20. The cylindrical element 22 is telescopically receivable over the cylindrical element 16 of the male connector 12 to make the outer conductor connections. The center or inner connection is made by a pin and jack connection (not shown) the pin being enclosed by element 22 and the jack by cylinder 16. Element 22 is also provided with a slot 27, which is generally L-shaped, in which the pin 18 is receivable. Commonly the female connector member 12 is provided with two slots 27 positioned at 180° with respect to each other in which two pins 18 spaced 180° apart are receivable. Since each of these bayonet joint connections are identical I shall describe only one of them.

A seat 28 for seating the pin 18 (pin 18 is shown dotted in seat 28) is formed in the slot 27 by providing the lip 30. In order to prevent the pin 18 from unintentionally unseating once it is seated, suitable well known means such as a resilient element or the like (not shown) is provided as part of the body 20. In order for the pin 18 to be unseated from the seat 28, the cylindrical element 22 must be moved toward the male connector 12 so that the pin 18 can clear the lip 30. The resilient element opposes the movement of the cylindrical element 22 toward male connector 12. Thus in disassembling the connector sufficient force must be exerted in a direction parallel to the axis of the connector 10 to overcome the force of the resilient member so that the pin 18 can clear the lip 30. Likewise in assembling the connection, a force parallel to the axis of the connector 10 must be exerted on the cylindrical element 22 when seating the pin 18 in order that the pin 18 will clear the lip 30, i.e. one must both "push" and "twist" to separate the two parts.

The female connector 10 is engaged with the male connector 12 by telescopically engaging the male connector 12 within the female connector 10. The telescopic engagement of the connector members requires that the slot 27 be positioned with respect to the pin 18 so that the pin 18 is receivable within the slot 27. Once the pin 18 is received within that portion of the slot 27 which is parallel to the axis of the connector member 10, a force must be exerted on the cylindrical element 22 so that pin 18 clears shoulder 30 and then a force must be provided to rotate the cylindrical element 22 so that the pin 18 can enter the seat 28. Normally, the force which is required to position

the slot 27 with respect to the pin 18, to counter the biasing force of the resilient element in the cylindrical element 22, and to rotate the cylindrical element 22 during the engagement or disengagement operations must be supplied by the person performing the operation by gripping the cylindrical element with his fingers and directly applying the required forces to the cylindrical element 22. When the male connector 12 is so positioned with respect to other circuit components 32 and 34, for example, so that there is insufficient space to allow use of the fingers for performing the engagement operations, this type of connector cannot be used.

In accordance with my invention and with reference to FIG. 2, I provide an annular raised portion 36 on cylindrical element 22 and a ring 38. The outside diameter of raised portion 36 and the inside diameter of the ring 38 are substantially the same so that an integral structure is provided by press fitting the ring 38 on the raised portion 36. The ring 38 is provided on its inner surface with a slot 40 extending parallel to the axis of ring 38. When the ring 38 is positioned on the raised portion 36, an opening 42 is thus formed by the sides of the slot 40 and the periphery of the raised portion 36. The depth of the slot 40 in the ring 38 should be such that the opening 42 will receive and seat the tip of a tool such as a small screw driver. The opening 42 should be disposed far enough radially outwardly of the connector axis so that no portion of the connector 10 between the shoulder 36 and the end of the connector 10 connected to the electrical connector 24 interferes with the movement of the screw driver in a direction generally parallel to the axis of connector 10 and into the opening 42.

With a tool seated in the opening 42, the force required to position the female connector 10, overcome the biasing force, and rotate the cylindrical element 22 may be provided by appropriate movement of the tool without requiring manual gripping of the female connector 10. The female connector 10 with the structure of my invention may thus easily be engaged with or disengaged from the male connector 12 even when the male connector 12 is located in a position where connection of the female connector 10 by means of the operator using his fingers would be impossible or inconvenient.

If the connector is provided with two bayonet joints it is preferable that the ring 38 be positioned so that the opening 42 is approximately half way between the bayonet connections in order to minimize binding between the connector members during engagement or disengagement. If the connector is provided with a single bayonet joint it is preferable that the tool receiving opening 42 be located in angular alignment with the bayonet joint.

While I have described my invention in the form in which the tool receiving opening 42 is provided by the slotted ring 38 which fits over the raised portion 36, it should be understood that the opening 42 could be provided by a structure comprising the ring 38 and a second ring comparable to the raised portion 36 with the unit formed by these two elements being pressed onto the cylinder 22. Furthermore, the ring 38 could be positioned directly on the cylindrical element 22 (no raised portion 36 being provided) where it is not necessary that the tool receiving opening 42 be positioned radially outward from the outer surface of cylinder 22.

While thus far I have described my invention as original equipment it is possible to adapt existing connectors to incorporate the improvement offered by my structure. The slotted ring 38, as shown in FIG. 3, may be provided to make the adaptation on these existing connectors. The ring 38 would have an inside diameter such that it might be non-rotatably mounted on the rotatable cylindrical element of existing connectors. To facilitate gripping of the connector many existing connectors are provided with a raised, knurled portion similar to the raised element 36. The ring 38 may easily be press fit onto this raised, knurled portion in order to form the tool receivable opening 42.

It can be seen that there has been provided a novel, improved electrical connector of the type described which may be easily engaged or disengaged when the configuration of the surrounding components makes use of the fingers for these operations inconvenient or impossible. It will of course be apparent to those skilled in the art that various changes in the connector shown in the drawing and described above may be made without departing from the invention. Necessarily, it will be understood that the accompanying drawing and foregoing description are to be taken only in an illustrative sense and not as limiting my invention and that the appended claims cover all structure which logically falls within the language of these claims.

I claim:

1. In combination: an electrical connector, a male connector member, a female connector member, one end of the male member being telescopically receivable within one end of the female member and wherein the connector members are provided with a bayonet joint including a pin projecting radially from one member and receivable in a slot in the other member, one of said connector members being adapted to be mounted in a fixed position on a panel or the like, the other connector member being adapted to be moved into and out of engagement with said one connector member when said one connector member is mounted on a panel or the like, the movable connector member being provided with an annular raised portion, and a ring telescopically fitted over said annular raised portion so as to be a fixed integral part thereof, said ring having a slot in its inner surface extending parallel to the axis of said ring, said slot cooperating with the peripheral surface of said annular raised portion so as to provide a tool engageable opening shaped to receive and capture the tip of a tool such as a screw driver or the like.

2. In an electrical connector of a type including a male connector member and a female connector member with one end of the male member being telescopically receivable within one end of the female member and wherein the connector members are provided with locking means to prevent longitudinal separation of the coaxially assembled connector members, said locking means being engageable in response to relative movement of said connector members angularly about their axis when said connector members are telescopically arranged; one of said connectors being adapted to be mounted in a fixed position on a panel or the like, the other connector member being adapted to be moved into and out of engagement with said one connector member when said one connector member is mounted on a panel or the like, means forming a tool receiving opening in the movable connector, said opening being shaped to receive and seat the tip of a tool such as a screwdriver or the like, said tool receiving opening extending parallel to said axis so that with the tip of a tool seated in said opening the tool will extend in a direction generally parallel to the axis of said connector, the tool receiving opening having bordering side portions engageable with a tool seated in the opening to provide that as the tool is moved about said axis said movable connector member will be angularly displaced about its axis to engage and disengage said locking means.

3. In an electrical connector, a male connector member, a coaxial female connector member, one end of the male member being telescopically receivable within one end of the female member during relative movement between the members along their common axis, the connector members being provided with a bayonet joint including a pin projecting radially from one member and received in a slot in the other member, one of said connector members being adapted to be mounted in a fixed position on a panel or the like, the other connector member being adapted to be moved into and out of locking engagement with said one connector member when said one connector member is mounted on a panel or the like, the movable connector member being

provided with an annular raised portion, means forming a tool receiving opening in said annular raised portion, said opening being shaped to receive and seat the sides of a tip of a tool such as a screwdriver or the like, said tool engageable opening extending parallel to said axis so that with a tool seated in said opening the tool will extend in a direction generally parallel to the axis of said connector, so that with the tool seated the tool may be used to exert a force parallel to said axis in a direction toward said fixed connector, the tool receiving opening having bordering sides engageable with a tool in said opening so slotted that the tool may be moved about said axis to displace said movable member about said axis to connect and disconnect said locking means.

4. In an electrical connector, a male connector member, a female connector member, one end of the male member being telescopically receivable within one end of the female member, the connector members being provided with a bayonet joint including a pin projecting radially from one member and receivable in a slot in the other member, said slot being L-shaped and forming at its inner end a seat for said pin, and biasing means for urging said pin into engagement with said seat, one of said connector members being adapted to be mounted in a fixed position on a panel or the like, the other connector member being adapted to be moved into and out of engagement with said one connector member when said one connector member is mounted on a panel or the like, the movable connector member being provided with a raised portion, means on its periphery forming a tool receiving opening in said raised portion, said opening being shaped to receive and capture the tip of a tool such as a screwdriver or the like in seating engagement, said tool engageable opening extending parallel to said axis so that with a tool seated in said opening the tool will extend in a direction generally parallel to the axis of said connector, and so that with the tool seated the tool may be used to exert a force parallel to the axis of said connector in a direction toward said fixed connector and counter to said biasing means and to displace said movable member about its axis to connect and disconnect said bayonet joint.

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