United States Patent

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[15] **3,651,447**

[45] **Mar. 21, 1972**

[54] ELECTRIC DEVICE AND COAXIAL CONNECTION

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[22] Filed: **June 29, 1970**

[21] Appl. No.: **50,733**

[52] **U.S. Cl.**.....**339/102 R**, 339/110 C, 339/177 R, 339/228, 339/260

[51] **Int. Cl.**.....**H01r 13/58**, H01r 17/06

[58] **Field of Search**.....136/135 R; 339/8, 102, 110, 339/177, 182, 183, 224, 228, 184 R, 260, 261

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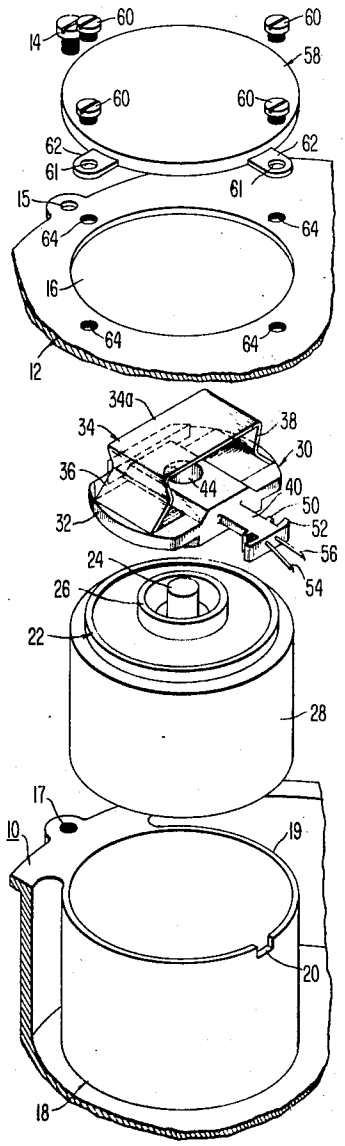
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[57] **ABSTRACT**

An electric device and a terminal connection which includes a connector for electrically connecting the device to conductors of a circuit. The terminals of the device are coaxial and located at the same end of the device. The connector has a handle which facilitates disconnecting it and which folds compactly when the electric device and terminal connection are packaged. The connector is so mounted that it retains its orientation whenever it is disconnected from the electric device.

6 Claims, 7 Drawing Figures



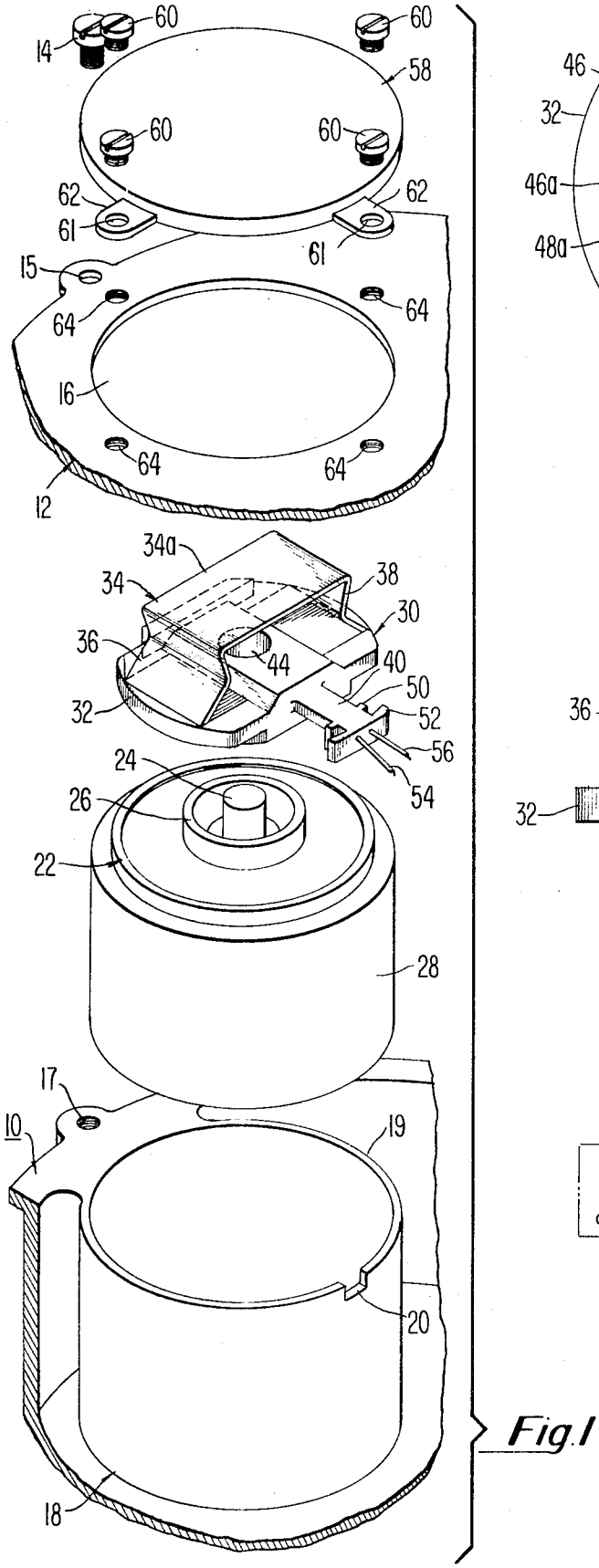


Fig.1

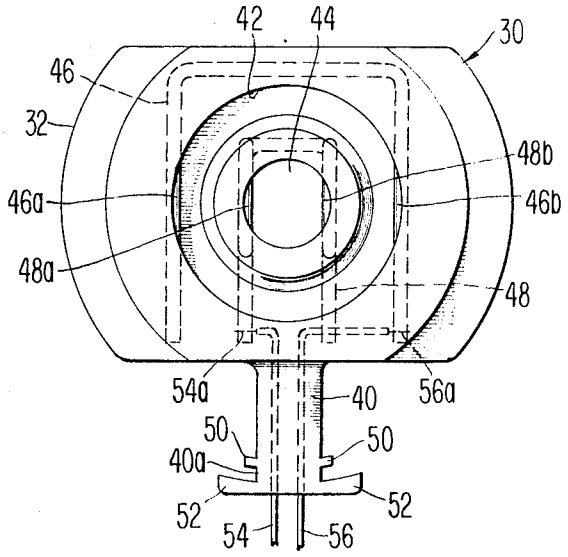


Fig.2

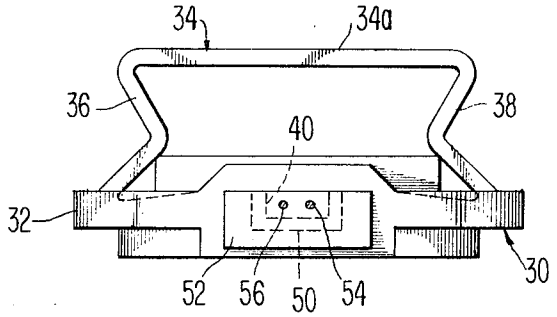


Fig.3

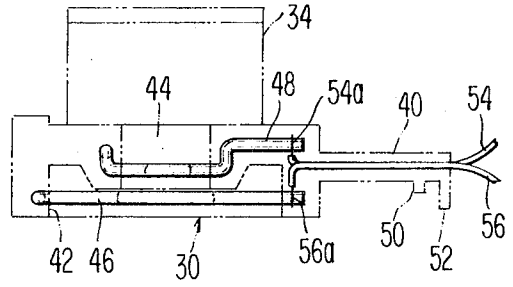


Fig.4

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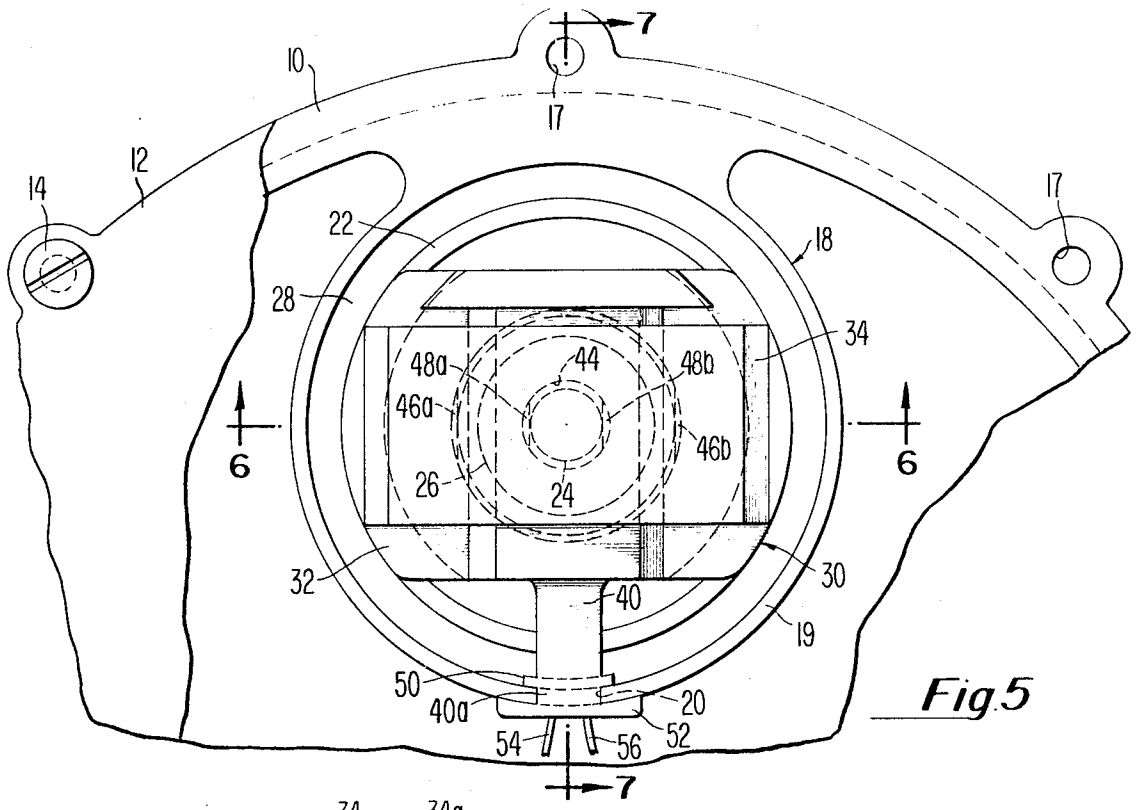


Fig.5

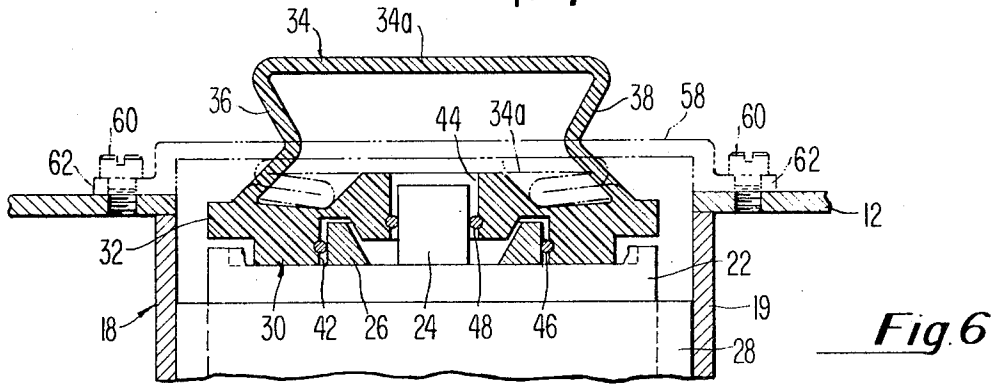


Fig.6

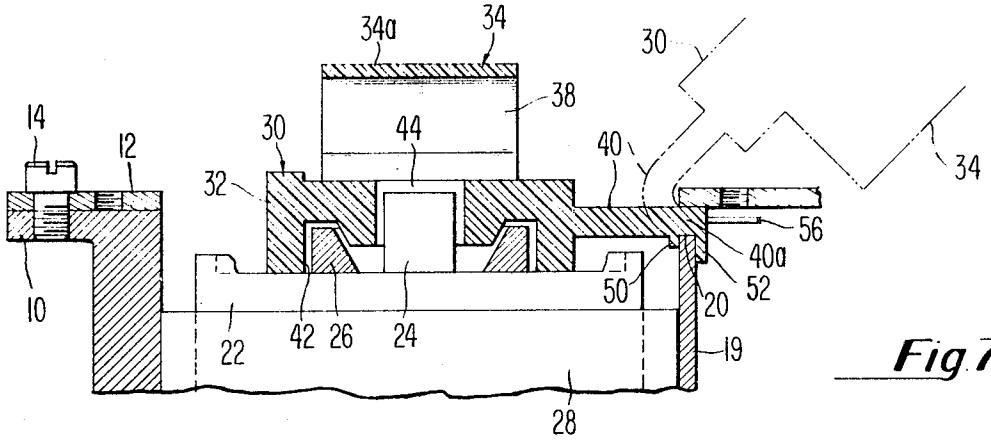


Fig.7

ELECTRIC DEVICE AND COAXIAL CONNECTION

BACKGROUND OF THE INVENTION

This invention relates generally to electrical connections and particularly to a terminal connection for connecting a multiterminal electric device to an associated circuit. While not limited thereto, the invention finds special application to the terminals and connection for an electric cell, commonly called a battery, and therefore the invention will be described hereinafter in connection with such use.

One form of battery connection consists of a two-terminal snap-type fastener. That type of fastener is deficient in the respect that the terminal contacts spread when subjected to shock. Furthermore, the snap-type contacts have to be oriented both for purposes of making the connection and avoiding shorting. Also, because of the very short effective spring arm of the female segments of the snap-type fastener, the yield point of the material is too easily reached. With the spring-pressure type of connection, such as that sometimes used when batteries are connected in series, additional pressure is required, usually obtained by employing a stronger spring, in order to overcome or break through the oxide coating which, in time, forms on the contacting surfaces.

SUMMARY OF THE INVENTION

An object of the invention, therefore, is to provide improvements in multiterminal electric devices and their terminal connections.

Another object of the invention is to provide a coaxial connection for multiterminal electric devices in which the connector element is easily oriented for connection in any radial position.

A further object of the invention is to provide such a connection in which the connector contacts are not significantly affected by the mass of the electric device so that spreading of the contacts due to shock is eliminated, or substantially reduced.

Another object of the invention is to further minimize the possibility of permanently spreading or deforming the connector contacts by substantially embedding them in an elastic material so that, when the connector is disconnected, the contacts will be aided by the elasticity of the material in returning to their original position.

A further object of the invention is to provide a coaxial connection for multiterminal electric devices in which the connector contacts have relatively long effective spring arms so as to increase significantly the factor of safety with respect to the ultimate yield of the contact material.

A further object of the invention is to provide a coaxial connection which facilitates the connection of cells in series by providing a wiping action for the connector contacts.

Still a further object of the invention is to provide such a connection which can more easily break through the oxide coating on the contacting surfaces.

Another object of the invention is to provide an electrical connector which folds compactly when restrained by the cover of a receptacle and which unfolds to facilitate disconnection when the restraining cover is removed.

A further object of the invention is to provide, for an electric device, an electrical connector having a mounting which permits it to retain its orientation relative to the electric device whenever it is disconnected therefrom.

Still another object of the invention is to provide a multiterminal electric device and connection which are simple to use and inexpensive to manufacture.

In accordance with the above objects and considered first in one of its broader aspects, an electric device in accordance with the invention has at least most of its terminals coaxial and located at the same end.

The invention will be more clearly understood when the following detailed description of the preferred embodiment thereof is read in conjunction with the accompanying drawing which is described below.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an isometric exploded view, partly fragmentary, of apparatus containing an electric device and coaxial connection constructed in accordance with the invention.

FIG. 2 is an enlarged bottom view of a connector shown in FIG. 1.

FIG. 3 is a side elevation of the connector shown in FIG. 2.

FIG. 4 is a front elevation, partly in phantom, of the connector.

FIG. 5 is an enlarged fragmentary plan view of the assembled apparatus of FIG. 1 but with certain parts omitted to more clearly reveal other parts.

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5.

FIG. 7 is a sectional view taken along line 7—7 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the details of the drawing, a housing **10** (FIGS. **1** and **5**) for containing the invention and other related apparatus, not shown, is provided with a housing cover **12** secured to the housing **10**, as by means of screws **14** which pass through openings **15** in the housing cover **12** and are threaded into tapped holes **17** in the housing **10**. The cover **12** is provided with an opening **16** (FIG. **1**) which is in line with the inside diameter of a receptacle **18** which is integral with the housing **10**. The receptacle **18** is formed with an opening or notch **20** in the upper end of its side wall **19**.

An electric device, which is illustrated in one form as an electric cell or battery **22**, has at least most of its terminals coaxial and located at the same end of the device. In the illustrated battery **22**, both of its terminals **24** and **26** are coaxial and located at the same end of the battery **22**. The polarities of the terminals **24** and **26** may be as desired, however, in a particular construction the terminal **24** was chosen to be negative and the terminal **26** was chosen to be positive. As shown most clearly in FIGS. **1**, **6** and **7**, the terminal **26** is annular and the terminal **24**, in this example, has a portion disposed within the annular terminal **26**. It is preferable that the terminals **24** and **26** have a circular outside periphery, so as to facilitate making the battery connection, as will appear more fully later on. It is also preferable that the contact surfaces of the terminals **24** and **26**, which in the present embodiment of the invention are the outside diameters of the terminals **24** and **26**, be of uniform diameter along their effective lengths so as to eliminate or minimize spreading, due to shock, of the connector contacts, as will also appear more clearly later on. In the particular apparatus shown, the battery **22** is freely contained in an elastic cup-shaped filler **28** which is freely contained in the interior of the receptacle **18**.

A connector **30** comprises a body portion **32**, a handle **34** integral with the body **32** and having pleated portions **36** and **38**, and a lateral protrusion **40** integral with the body **32**, all of which portions **32**, **34** and **40** are constructed of an electrical insulating elastic material such as urethane, for example. The body **32** is formed with coaxial openings **42** and **44** for receiving therein the terminals **26** and **24**, respectively. Partially embedded in the body **32** are flexible conductive connector contacts **46** and **48**, which may be in wire form, each preferably substantially U-shaped, as shown most clearly in FIG. **2**. The contact surfaces of the wire contact **46** are contained on exposed portions **46*a*** and **46*b*** which extend into the opening **42** while the contact surfaces of the wire contact **48** are similarly contained on exposed surfaces **48*a*** and **48*b*** which extend into the opening **44**. The protrusion **40** is formed with laterally and downwardly extending fingers **50** and **52** which straddle the side wall **19** of the receptacle **18**. A terminal portion **40*a*** of the protrusion **40**, between the fingers **50** and **52**, fits into the notch **20** of the receptacle **18** and together with the fingers **50** and **52** serves to locate the connector **30** so that it is always properly oriented for connection, whenever it is disconnected.

The connector **30** is further provided with two flexible insulated conductors **54** and **56** which are connectable to an associated circuit, not shown, which is to be powered by the battery **22**. The conductors **54** and **56** are partially embedded in

the protrusion **40** and body **32**, and with an uninsulated end **54***a* of the conductor **54** connected to the contact **48** and an uninsulated end **56***a* of the conductor **56** connected to the contact **46**.

In the particular assembly illustrated, the battery connection is made by first lowering the battery **22** and cup filler **28** into the receptacle **18**, and then allowing the connector **30** to flex about the elastic protrusion **40**, from the phantom position toward the solid-line position shown in FIG. **7**, and then manually pressing downwardly on the handle **34** to the extent necessary to make the connection. This will cause the exposed portions **48***a* and **48***b* of the contact **48** to expand and ride over the terminal **24**, and similarly cause the exposed portions **46***a* and **46***b* of the contact **46** to expand and ride over the terminal **26**. Because of the locating function of the fingers **50** and **52** and the locating portion **40***a* of the protrusion **40** which fits into the notch **20**, the connector **30** is properly automatically oriented with respect to the terminals **24** and **26**, so that the operator does not have to orient the connector **30** to make the connection, but merely has to press upon it. The feature of automatically orienting the connector **30** permits rapid inspection or replacement of the battery **22** and, together with the confining effect of the cover **12** on the region at the fingers **50** and **52** and locating portion **40***a* (FIG. **7**), assures that the connector **30** will always be in place when disconnected, and not liable to be misplaced.

It will now be perceived more clearly from an inspection of FIG. **6** that if the apparatus is subjected to shock, the contacts **46** and **48** will not spread significantly, if at all, but will merely ride up and down on the terminals **24** and **26**.

After the connection is made, the battery **22** and connector **30** may be enclosed by means of a receptacle cover **58**, shown in phantom in FIG. **6**, which may be secured to the housing cover **12**, as by means of screws **60** passing through holes **61** and pads **62** of the receptacle cover **58** and threaded into tapped holes **64** in the housing cover **12**. Because of the pleats **36** and **38** of the handle **34**, downward movement of the receptacle cover **58**, in the act of attaching it to the housing cover **12**, will cause the handle **34** to fold compactly in the region of the pleats **36** and **38** and cause the gripping portion **34***a* of the handle **34** to be pressed substantially flat against the body **32** of the connector **30**. Thus, when the receptacle cover **58** is attached, the handle **34** serves as an elastic filler, so that together with the bottom of the filler cup **28** the handle **34** limits up-and-down movement of the battery **22**. Also, because of the elasticity of the handle **34**, whenever the receptacle cover **58** is removed the handle **34** will flex outwardly to assume its normal looped configuration in which it is conveniently shaped for gripping by the fingers of an operator for disconnecting the connector **30** from the battery terminals **24** and **26**.

By omitting the cover **12** and the locating elements **50**, **52**, **40***a* and **20**, the connector **30** can be oriented and connected to the battery terminals **24** and **26** in any radial position.

We claim:

1. A connection for a multiterminal electric device comprising coaxial terminals at the same end and constituting at least most of the terminals of said electric device, and a connector comprising a plurality of conductors each for contacting one of said terminals, a body of electrical insulating material having coaxial openings each shaped to receive one of said terminals, and an elastic handle connected to said body normally extending away from said body and elastically moveable to a substantially flat position against said body.

2. A connection for a multiterminal electric device comprising coaxial terminals at the same end and constituting at least most of the terminals of said electric device, and a connector comprising a plurality of conductors each for contacting one of said terminals, and a body of electrical insulating material having coaxial openings each shaped to receive one of said terminals, said body further comprising an elastic protrusion extending radially relative to said coaxial openings, and locating means connected to said protrusion for engaging the side of a receptacle into which said electric device is placed for locating said openings relative to said terminals.

3. A connection according to claim **1** wherein said body is elastic and said conductors are flexible and partially embedded in said body.

4. A connection according to claim **2** wherein said locating means comprises a portion which is insertable into an opening in the side of said receptacle.

5. A connection according to claim **2** wherein said locating means comprises fingers straddling the side of said receptacle.

6. A connection according to claim **2** wherein each of said conductors is connected to a flexible conductor which is at least partially embedded in said protrusion.

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