April 29, 1958 E. WILLIS 2,832,941

ELECTRICAL CONNECTOR

Filed June 28, 1954 2 Sheets-Sheet 1

FIG.1.

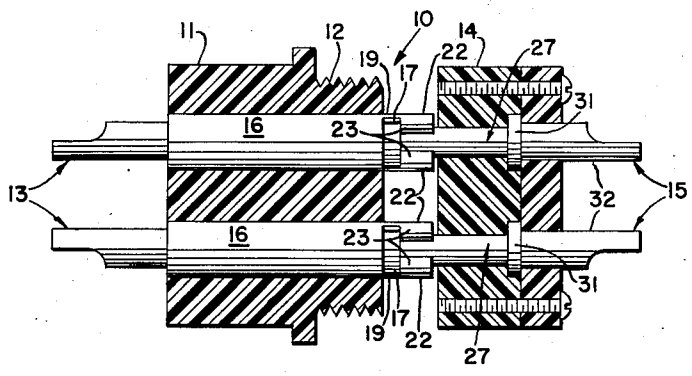


FIG.2.

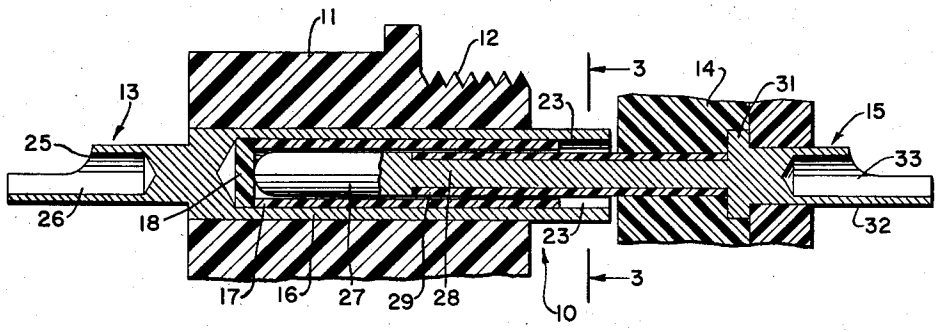
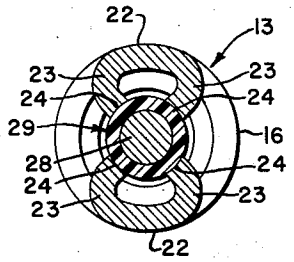


FIG.3.



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Filed June 28, 1954 2 Sheets-Sheet 2

FIG.4.

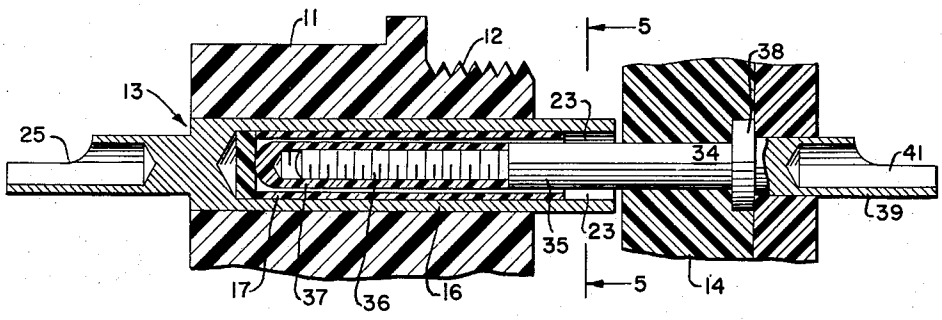


FIG.5.

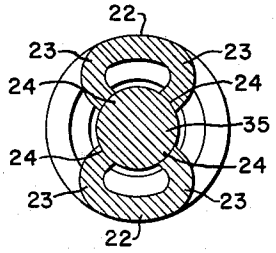
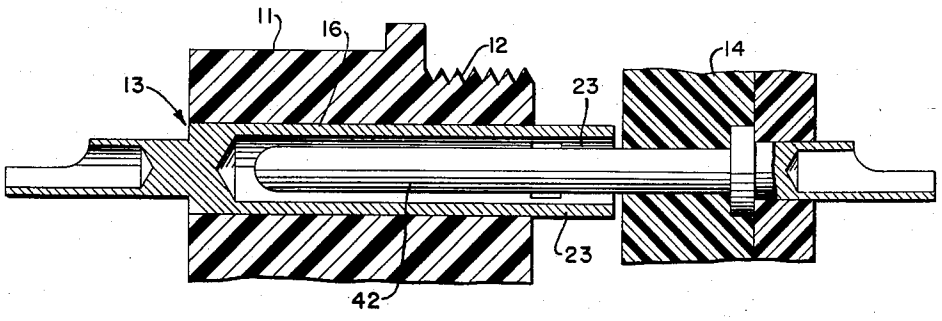


FIG.6.



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2,832,941

ELECTRICAL CONNECTOR

Eugene Willis, Finksburg, Md.

Application June 28, 1954, Serial No. 439,937

1 Claim. (Cl. 339—176)

(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.

The present invention relates to axially separable electrical connectors and more particularly to the type for conveniently connecting and disconnecting cables or conduits containing one or a multiplicity of conductor wires constituting component parts of electrical circuits. The invention includes male and female elements having new and improved means for firmly securing the cooperating elements in connected relation thereby to establish an exceptionally good electrical connection therebetween.

Moreover, the invention is directed to a separable connector having new and improved means for gripping and wiping the conductor pin thereof as the pin is inserted in the socket member. The connector is adapted to a wide field of use, such, for example, as in radio control work, electronic devices, industrial machines, electric fuzes, charging circuits, aircraft monitor circuits and various switch arrangmeents.

An object of the present invention is to provide an electrical connector having new and improved high pressure longitudinal disposed contact elements for frictionally engaging an elongated contact pin.

Another object of the invention is to provide an electrical connector having new and improved means for establishing an electrical connection between the pin and socket element thereof.

Still another object of the invention is to provide a new and improved socket element having cantilever contact members for grippingly engaging an elongated conductor.

A still further object of the invention is to provide a separable connector having new and improved complementary male and female conducting elements including cantilever contact elements for insuring positive electrical contact between the male and female elements.

Other objects and many of the attendant advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a view illustrating a pair of separable connectors constructed in accordance with the present invention with the connectors in elevation and the supporting means therefor in section;

Fig. 2 is an enlarged sectional view of one of the connectors illustrated in Fig. 1;

Fig. 3 is an enlarged cross sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 2 illustrating an alternative arrangement of the connector of Fig. 1;

Fig. 5 is an enlarged cross sectional view taken on the line 5—5 of Fig. 4; and,

Fig. 6 is a sectional view of another alternative arrangement of the device of Fig. 1.

Referring now to the drawings wherein like reference characters designate like parts throughout the several

views and more particularly to Fig. 1 thereof, the numeral **10** indicates a general arrangement of a pair of separable connectors constructed in accordance with a preferred embodiment of the present invention and the supporting means asscoiated therewith. The aforesaid arrangement comprises a plug **11** having a pair of sockets **13** molded therein and a support **14** having a pair of elongated conductor pins **15** mounted therein, the plug being threaded as at **12** thereby to provide means for securing the plug to a panel or the like. The plug and support are composed of any suitable insulating material. Although the arrangement of Fig. 1 discloses a pair of separable connectors it will be apparent that, if desired, a multiplicity of such connectors may be used.

As more clearly shown on Fig. 2, the socket **13** comprises a tubular member **16** composed of suitable conductive material and having a sleeve **17** composed of insulating material arranged therein. The sleeve is closed at one end by a disc **18** which may be molded integrally therewith or, if desired, the disc may be made separately from the sleeve and secured thereto by a suitable adhesive. The socket **13** has formed on the other end thereof a pair of diametrically disposed relatively narrow spring tongues **19**, each tongue having cantilever springs **22** integrally formed therewith and a pair of ears **23** carried thereby, each of the ears terminating in a relatively narrow longitudinal line contact portion **24** which provides a maximum contact pressure at four diametrically disposed points along the pin **15** as best shown on Fig. 3. By the aforesaid arrangement the ears **23** move outwardly against the action of the spring tongues **19** as the contact pin **15** is inserted into the tubular member or socket **16** which provides a positive gripping and wiping action therebetween. Thus by the gripping action an exceptionally good electrical connection is established between the socket and pin and by the wiping action any accumulation of oxide or other contaminations will be removed from the pin and contact surfaces of the ears. The element **16** is further provided with a terminal **25** having a bore **26** formed therein whereby a suitable conductor or electric wire may be attached thereto.

As more clearly shown on Fig. 2 pin **15** comprises an elongated contact element **27** disposed at one end thereof and a portion **28** somewhat smaller in diameter than the contact **27** and having a sleeve **29** composed of insulation material molded thereon. The pin is further provided with a flange **31** integrally formed thereon and a terminal **32** having a bore **33** formed therein. The flange provides means whereby the pin may be attached to the support **14**, the terminal **32** providing means whereby a suitable conductor or the like may be attached to the pin.

It will be noted in the aforesaid arrangement that the contact element **27** is normally in engagement with the insulating sleeve **17** in member **16** and the contact surfaces **24** on ears **23** are normally in engagement with the insulating sleeve **29** on the pin **15** when the connector is in an assembled condition and thus the electrical connection is normally interrupted and will remain interrupted until the pin is withdrawn from the element **17**. It will be understood however that as the pin is withdrawn from the socket **16** the contact surfaces **24** on the ears **23** frictionally engage the contact element **27** on pin **15** and thus an electrical circuit is established through the pin and socket.

By the aforesaid arrangement a device has been devised which is admirably suited for use in an electric fuze for a bomb whereby the arming of the fuze occurs as the bomb is released and falls away from an aircraft in flight. It will be understood that in such an arrangement the plug assembly **11** may be carried by the aircraft and the pin assembly **14** may be carried by the bomb whereupon an electrical circuit is established therethrough as

the bomb falls away from the aircraft by reason of frictional engagement of the aforesaid plurality of contact surfaces with the elongated contact on the pin.

Referring now to the arrangement of Fig. 4 it will be noted that the same type of socket shown on Fig. 2 is disclosed. The contact pin **34** thereof is somewhat different than the pin structure of Fig. 2 and comprises an elongated contact element **35** having a threaded shank **36** formed thereon for threaded engagement with a cap or sleeve **37** composed of suitable insulating material. The contact pin **34** is also provided with a flange **38** and a terminal **39** having a bore **41** formed therein. The flange provides means whereby the pin may be attached to the support and the terminal providing means whereby a suitable conductor may be attached thereto. In the aforesaid arrangement it will be noted that the cap **37** and a portion of the elongated contact **35** is in snug engagement with the insulating sleeve **17** and the contact surfaces **24** on the ears are in gripping engagement with the contact element **35** on the pin. The socket **13** may also be advantageously employed with a tube pin such, for example, as the type used in radio tubes and the like as illustrated in Fig. 6, the pin being indicated by the numeral **42**. In this arrangement, however, it will be understood that, if desired, the insulating sleeve **17** may or may not be used with the socket member.

From the foregoing, it will be apparent that an electrical connector of the pin and socket type has been devised in which new and improved means are provided for grippingly engaging an elongated contact in such a manner as to establish a plurality of diametrically disposed longitudinal surfaces of contact along the pin and which also prevents rattling or vibration between the aforesaid member by reason of the snug fit therebetween and the gripping characteristics of the cantilever springs. Moreover, the aforesaid arrangement may be also used advantageously in connection with a switch wherein a desired controlled movement is required to either complete and/or to interrupt an electrical circuit.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

An electrical connector comprising, in combination, a male plug composed of conducting material and having an enlarged forward portion and a reduced diameter rearward portion, an insulating tube conformingly encircling said rearward portion, a socket composed of conducting material for receiving said male plug and having an opening at one end for insertion of said plug therewithin, an insulating sleeve disposed within said socket a predetermined distance from the open end thereof and disposed between said plug and socket for preventing electrical connection therebetween until said plug has been withdrawn to a position in contiguity to said open end, and cantilever spring means including a plurality of contact surfaces integrally formed at said open end for establishing an electrical connection between said socket and said plug.

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