July 9, 1968 V. F. LIPINSKI 3,392,362

ELECTRICAL CONNECTOR

Filed May 4, 1966

Fig. 2.

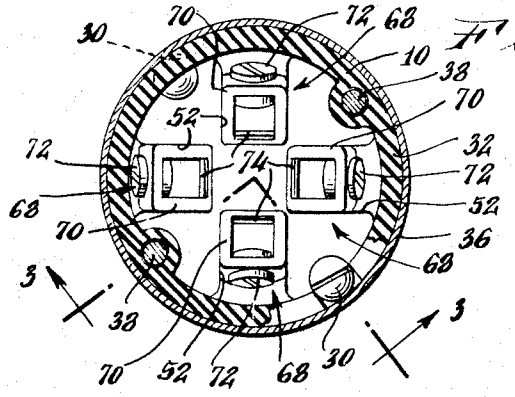


Fig. 6.

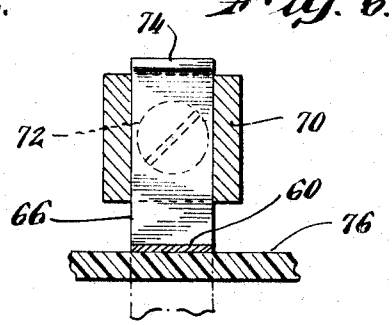


Fig. 1.

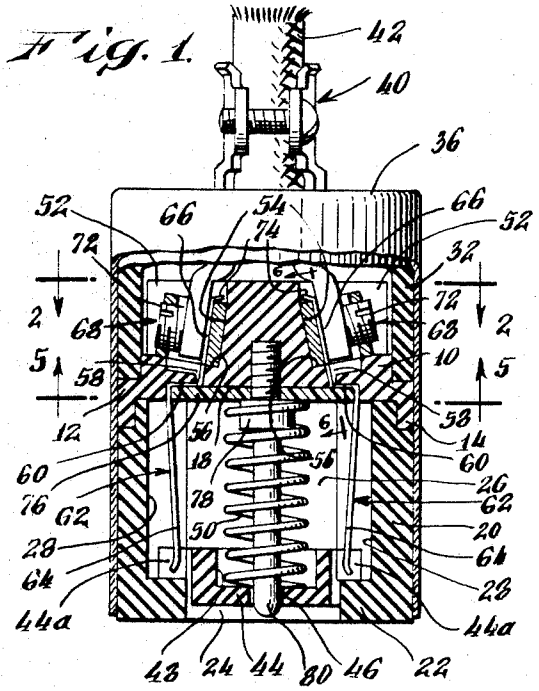


Fig. 3.

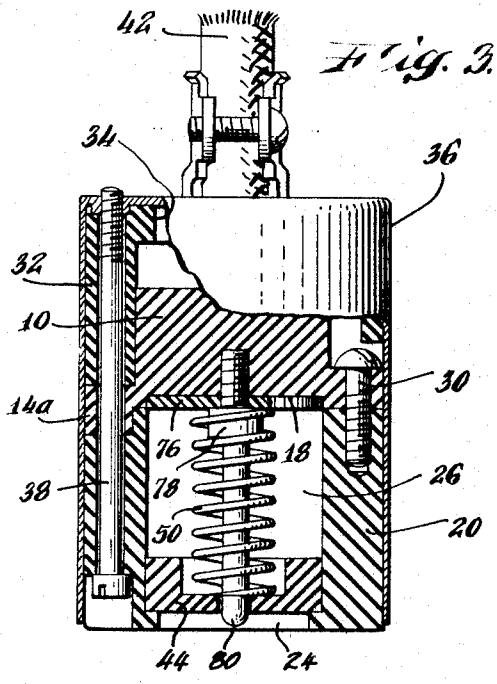


Fig. 4.

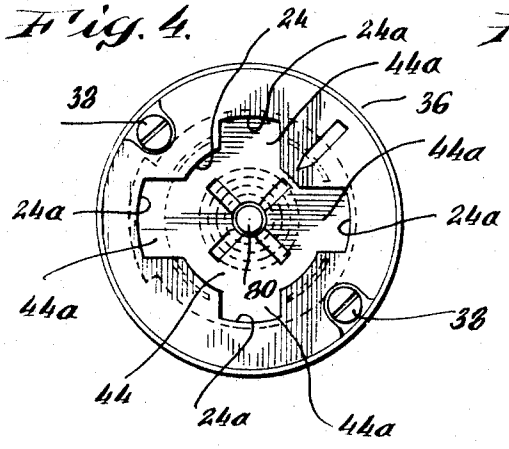
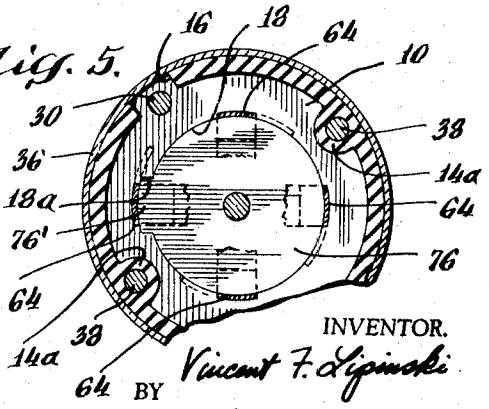


Fig. 5.



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ELECTRICAL CONNECTOR

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ABSTRACT OF THE DISCLOSURE

A keyed dead front electrical connector is disclosed which includes one piece female contacts. The connector body is substantially cylindrical and has a bore at one end, for receiving a male plug, and a plurality of wiring chambers at the other end. The contacts are substantially Z-shaped. One end of each contact extends into a wiring chamber through a slot between the bore and the wiring chamber, the other end extending into the bore. The contacts are held in place by an insulating disc which bears against the central portions of the contacts.

This invention relates to an electrical connector and, more particularly, to such a connector having improved contact-terminal means.

One well known type of electrical connector is the type wherein the female connector body portion comprises a body defining a central axial bore with axial grooves which contain the female contacts. The male connector cap portion of the connector comprises a projecting central post of insulating material which is selectively insertable into the bore. Contact lugs extend outwardly from the post and are arranged to engage the female contacts when the connector cap and body are connected. Mounted within the bore is a spring-loaded axially movable shutter which normally keeps the end of the bore closed until it is depressed by the male post during connection of the connector body and cap. In addition, certain classes of these connectors include a central axial pin in the bore which extends through an opening in the shutter to position the shutter spring and function as a key. The post then includes a passage into which the pin may advance.

In connectors constructed in accordance with the known prior art, the female contacts are usually of two piece construction and, at least one piece is separately riveted to their respective wiring terminals. A construction of this type requires a number of separate operations during assembly of the connector body which increases the cost of the connector. More importantly, the two piece construction includes a riveted joint which is prone to loosen and has been found in practice to be a source of excessive heat, particularly under full load conditions.

Accordingly, it is a primary object of the present invention to provide a connector having improved contact-terminal construction. Other objects are to provide such a connector without riveted joints; to provide such a connector which may be assembled from fewer pieces; and to provide such a connector wherein fewer assembly operations are required. Other objects, features, and advantages of this invention will be apparent from the following

description, the appended claims, and the figures of the attached drawing wherein:

FIG. 1 is a side view, substantially in cross section, of a connector body constructed in accordance with this invention;

FIG. 2 is a cross section taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a cross section taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a front end view of the connector body of FIG. 1;

FIG. 5 is a cross section taken substantially along the line 5—5 of FIG. 1; and

FIG. 6 is an enlarged detail taken substantially along the line 6—6 of FIG. 1;

The objects of this invention are achieved in one form by means of an electrical connector body which comprises an insulating body defining an axial central bore in one end thereof and a plurality of wiring chambers in the other end. Each of the chambers communicates with the bore by a slot. Substantially Z-shaped unitary conductive contact members, each having two elongated ends connected by an intermediate offset central portion, are mounted in the body member, each with a first end positioned in one of the wiring chambers and extending through the corresponding slot; the offset central portion extending along the base of the bore, and an elongated resilient second end forming a female contact which is positioned in the bore. An insulating retaining member is mounted in the base of the bore and extends across the central offset portion of each of the contact members. Means are provided for securing the retaining member against the base of the bore. Clamping means are provided in the chambers for securing an electrical conductor to the first end of each of the contact members.

With particular reference to the drawings, there is illustrated a connector body in accordance with this invention comprising a central body member **10**, a forward body member **20** and a rearward body member **32**. The central body member **10** is formed of insulating material and substantially cylindrical in shape. The body member **10** is bounded at its forward end by an encircling radial flange **12** and an axially extending lip **14**. The lip is thickened to form bosses **14***a* defining passages for receiving the screws **38** used in assembling the connector body. In addition, the lip is cut away at two diametrically opposed locations to provide keyways **16** for properly aligning the body member portions of the connector body with one another. The forwardmost face of the central body member **10** is provided with a shallow circular recess **18** which also defines a radially offset keyway **18***a* at one point on its circumference, as shown in FIG. 5. The flange **12** and lip **14** engage the mating end of a cylindrical forward body member **20**.

The forward end of forward body member **20** includes a radially inwardly extending shoulder **22** that defines a central opening **24** which communicates with an axial bore **26**. The opening **24** is formed with four radially extending keyways **24***a* for selectively receiving the male lugs of a post type connector cap to be connected to the connector body. Along the sides of the bore **26** are four circumferentially spaced axial grooves **28** which extend inwardly of the shoulder **22**. The forward body member

20 is secured to the central body member 10 by means of screws 30 which extend through openings in body member 10 and are anchored in body member 20.

The insulating rearward body member 32 is cup-shaped and has a skirt around an open end in peripheral contact with the flange 12 of the central body member 10, and its rear face defines a circular opening 34. The body members 10, 20 and 32 are mounted within a cup-shaped metal shell 36. The body members are secured to one another and to the shell 36 by means of elongated screws 38 which extend from the front face of the connector body and are anchored into threaded engagement with threaded openings in a rear radial wall of shell 36. The shell 36 further defines a rear central opening (not shown) aligned with the opening 34, and retains, in the usual manner, a pair of cable clamp members 40 for clamping an electrical cable 42.

The opening 24 in the forward end of bore 26 is closed by the usual sliding shutter 44 which includes radial extensions 44*a* for slidably engaging the grooves 28 within the bore. The plunger 44 includes a central opening 46 and a rearward recess 48 housing the front end of a coil spring 50.

Referring to FIGS. 1 and 2, it will be noted that the central body member 10 defines four radial wiring chambers 52 which have substantially parallel sides and a sloping back surface 54 which terminates at a ledge 56. Each of the wiring chambers 52 communicates with recess 18 by means of a slot 58. It will also be noted from FIG. 1 that the recess 18 includes grooves 60 extending radially outwardly from the slots 58 to form radial channels.

The shape of each of the female contact members 62 is herein characterized as "Z-shaped" but it is best illustrated in FIG. 1. As will be seen from this figure, each of these members includes: a radially extending central offset portion which is mounted within a groove 60, a resilient elongated contact leg 64 mounted in one of the grooves 28 of the bore 26; and an elongated terminal leg 66 which extends through a slot 58 and upwardly into a wiring chamber 52 substantially parallel to the back surface 54 thereof. It will be noted that each of the terminal legs 66 extends through a wiring clamp 68. These clamps are of the well known clamp terminal type which comprises a tubular body 70 of rectangular cross section drilled and tapped in its front wall to receive a threaded slug 72 which serves to secure a conductor within the clamp against the back wall thereof. It will also be noted that the terminal leg 66 of each female contact member terminates in a hooked end 74 for engaging the upper end of the rear wall of one of the clamp tubular bodies 70 to position and secure it in a wiring chamber. A retaining disc 76 of insulating material is mounted within the recess 18 and bears against the radially extending central offset portion of the female contact members positioned within the grooves 60. The retaining disc 76 is secured in position by means of a flange 78 formed on a pin 80 which extends centrally axially of the bore 26 through opening 46 in the shutter 44. The spring 50 is positioned by and about pin 80 and has its rearward end bear against disc 76 and its forward end seated in recess 48. The end of the pin 80, located rearwardly of the flange 78, is secured firmly in the central body member 10 by means of a threaded connection, force fit or otherwise. It will be apparent from FIG. 5 that one of the female contacts is slightly radially offset from the other three contacts to provide for grounding polarity. A slight radial projection 76' on the retaining disc 76 is positioned in keyway 18*a* to retain this contact member in position.

It is believed that the many advantages of this invention will now be apparent to those skilled in the art. All the advantages of the prior art construction are retained, but most of its disadvantages are eliminated. Each of the female contact members is a single element extending from a wiring clamp in a wiring chamber into the bore of the connector body. Thus, vulnerable, riveted, high resistant joints found in the prior art are eliminated. Each of the wiring clamps is positioned in a wiring chamber by the hooked end 74 of a corresponding contact member 62 to both position and secure it in the connector body. Each terminal leg 66 is positioned in a wiring clamp for direct contact with a cable conductor wire that is forced against it by a slug 72 to effect good electrical and mechanical connection. A single securing means, namely the disc 76, serves to retain all the female contact members and all the associated wire clamps within the connector body.

In order to wire the connector body of this invention, it is merely necessary to loosen the screws 38 and remove the steel shell 36, including the rear body member 32, from the central body member 10 and attached forward body member 20. The cable is inserted through opening 34 and the individual conductor wires are then inserted into and secured within the wiring clamps by means of the threaded slugs 72, as shown in FIG. 1. The shell and rear body member are remounted on body members 10–20, and secured by the screws 38; the cable clamp 40 is then tightly secured to the cable 42.

It will be apparent to those skilled in the art that a number of variations and modifications may be made in this invention without departing from its true spirit and scope. Accordingly, the foregoing description is to be construed as illustrative only, rather than limiting. This invention is limited only by the scope of the claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical connector which comprises: an insulating body defining a bore extending inwardly from one end thereof and a plurality of wiring chambers in the other end, each of said wiring chambers communicating with said bore by a slot; a plurality of substantially Z-shaped unitary conductive contact members, each having a first end positioned in one of said wiring chambers and extending through a corresponding slot, a central offset portion extending along the base of said bore, and an elongated resilient second end positioned in said bore forming a female contact; an insulating retaining member mounted at the base of said bore against the central portions of said contact members; means for securing said retaining member in clamping engagement against said central portions; and clamping means for securing an electrical conductor to the first end of each of said contact members.

2. The connector of claim 1 wherein channels are formed in said member at the base of said bore to locate and receive said offset portions.

3. The connector of claim 1 wherein each of said clamping means comprises: a sleeve enclosing the first end of a contact member and arranged to receive one end of a conductor inserted therein; and screw means in said sleeve to clamp together said sleeve, said conductor and said first end.

4. The connector of claim 3 wherein the first end of each contact member extends completely through its corresponding sleeve and includes a hooked portion engaging an edge of said sleeve to position said sleeve.

5. The connector of claim 1 wherein said retaining member is substantially disc-shaped.

6. The connector of claim 1 wherein said securing means comprises a pin extending axially of said bore from its base.

7. The connector of claim 1 wherein said retaining member defines a central opening and wherein said securing means comprises a pin extending axially of said bore from its base and passing through said opening, said pin further including a flange in securing engagement against said retaining member.

8. The connector of claim 1 wherein said retaining member is disc-shaped and defines a central opening; said securing means comprises a pin extending axially of said bore from its base and passing through said opening; said

pin includes a flange in securing engagement against said retaining member; a shutter axially movably mounted in said bore and having a central opening through which said pin extends; and a coil spring bearing against said base and said shutter to bias said shutter to close the bore at said one connector end thereof.

9. The connector of claim **8** wherein each of said clamping means comprises a sleeve disposed in a wiring chamber and bearing against a wall thereof; a first end of a contact member being disposed within a sleeve having a hooked portion engaging an edge of said sleeve to position said sleeve against said wall.

10. The connector of claim **9** wherein screw means

are mounted in said sleeve to force a conductor disposed therein against said first end.

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