Sept. 30, 1947. A. H. GOREY 2,428,214

ELECTRICAL CONNECTING PLUG AND RECEIVING MEMBER OR RECEPTACLE THEREFOR

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Fig. 1.

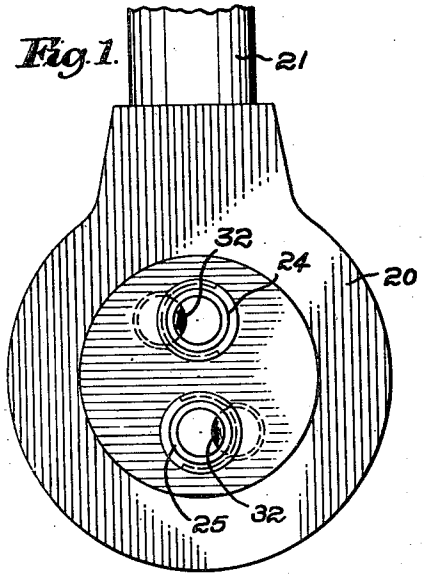


Fig. 2.

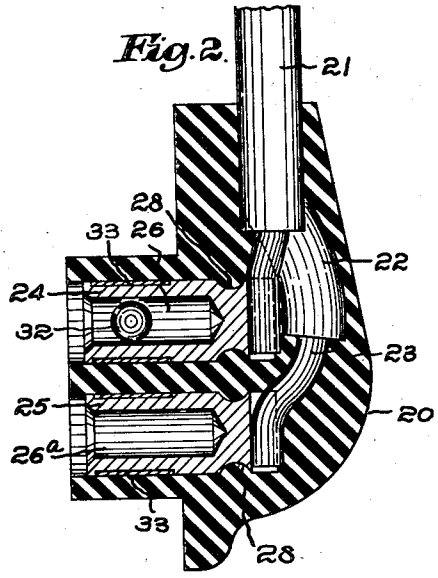


Fig. 3.

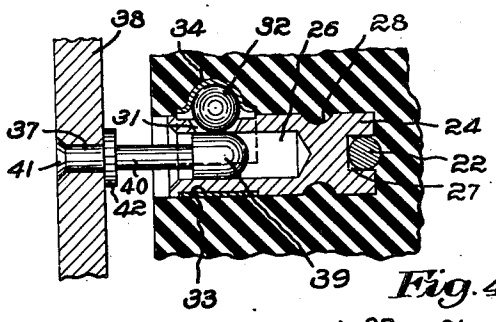
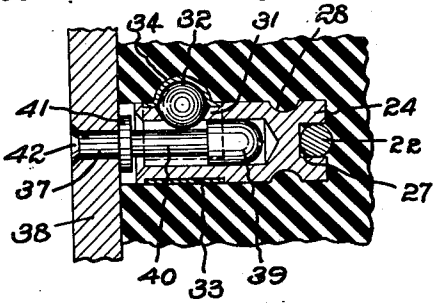


Fig. 4.



INVENTOR.
Archie H. Gorey

BY
Emery, Booth, Townsend, Miller and Vanderpoel
Attys

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Fig. 5.

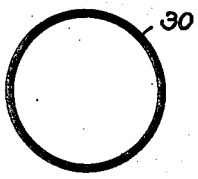


Fig. 6.

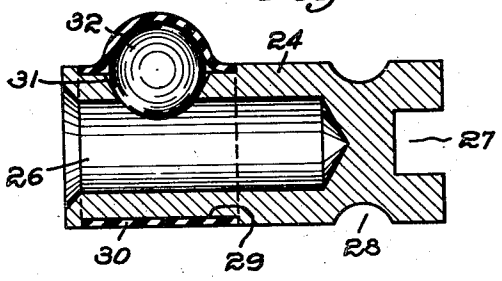


Fig. 7.

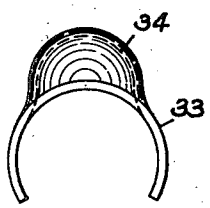


Fig. 8.

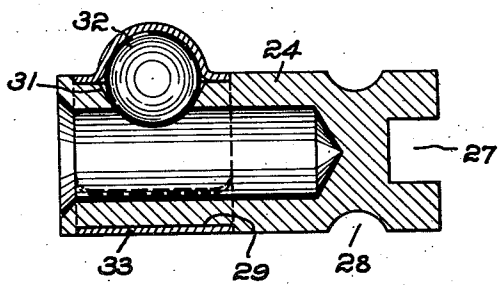


Fig. 9.

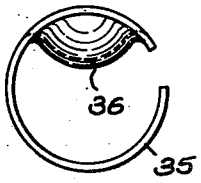
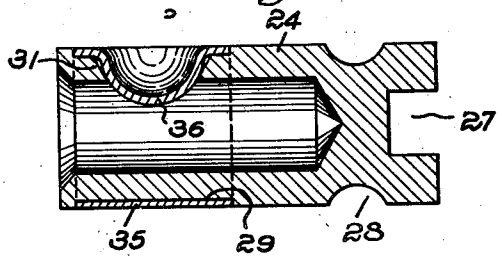


Fig. 10.



INVENTOR.
Archie H. Gorey

BY
Emery, Booth, Townsend, Miller & Emerson
Attys

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2,428,214

ELECTRICAL CONNECTING PLUG AND RECEIVING MEMBER OR RECEPTACLE THEREFOR

Archie H. Gorey, Rochester, N. Y., assignor to Graflex, Inc., Rochester, N. Y., a corporation of Delaware

Application October 18, 1945, Serial No. 623,135

6 Claims. (Cl. 173—332)

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This invention relates to a new and improved electrical connecting plug and receiving member or receptacle constituting contactors.

In order that the principle of the invention may be readily understood, I have disclosed the preferred embodiment thereof with certain modifications in the accompanying drawings wherein—

Fig. 1 is a front elevation of one of the contactor structures consisting of a housing containing the improved plug and receiving member or receptacle;

Fig. 2 is a vertical, central cross section through Fig. 1;

Fig. 3 is a detail in central, vertical section showing one of the plugs and one of the receiving members or receptacles as the parts appear when partially assembled;

Fig. 4 is a view similar to Fig. 3, but wherein the plug and receiving member or receptacle are completely assembled;

Fig. 5 is a detail in side elevation of one of the ball retaining rings therein made of a flexible rubber-like material;

Fig. 6 is a vertical central cross section of one of the receiving members or receptacles with the ball and retaining ring of Fig. 5 in place;

Fig. 7 is a detail similar to Fig. 5, but of a different type of ball-retaining ring, herein of metal;

Fig. 8 is a view similar to Fig. 6 of one of the receiving members or receptacles with the ball retaining member of Fig. 7 in place;

Fig. 9 is a side elevation of a spring member having a ball-shaped portion instead of a ball but with the same function as a ball; and

Fig. 10 is a view similar to Figs. 6 and 8, but with the retaining member of Fig. 9 in place.

There long has been a need for a small, compact, electrical, receiving member or receptacle and plug, particularly for use in connection with low voltage apparatus. While there are a great number of such plugs and receiving members or receptacles therefor now on the market, all of them have one or more faults that are overcome by my invention. All of the plugs and receiving members or receptacles heretofore made, if usable at all, had to be manufactured with the utmost accuracy and precision in order to make them workable, and any slight injury to any of the parts would render them inoperative or would lower the efficiency of the structure.

My invention provides an electrical plug and receiving member or receptacle that overcomes

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all such faults and allows a great deal of tolerance in the manufacture of such low voltage apparatus, and a small amount of distortion of the parts of such apparatus will have no effect upon the efficiency of the electrical connection.

The objects of the invention are: to provide satisfactory means for connecting electrical circuits by means of a separable plug and receiving member or receptacle, which means, because of its structure, will provide a great latitude in dimensional tolerance in its manufacture; to provide a plug and receiving member or receptacle wherein a good contact is secured at each terminal and which is not dependent for good contact on any other terminal of the plug and receiving member or receptacle; to provide an electrical plug and receiving member or receptacle having extremely low cost of manufacture and one wherein a reasonably wide dimensional tolerance can be allowed while yet maintaining satisfactory electrical contact; and to provide an electrical plug and receiving member or receptacle that is self-locking when in contact position, yet capable of being readily removed or separated from contact condition.

Referring first to Figs. 1 and 2, therein is shown at 20 a molded housing, body or shell of suitable flexible material such as rubber, having molded therein a cable 21 herein made up of two wires 22 and 23, the former of which is connected to a receiving member or receptacle 24, and the latter of which is connected with a second, like receiving member or receptacle 25. The construction of the said receiving members or receptacles is shown most clearly in Fig. 6, wherein one only of the two, like receiving members or receptacles is represented, namely, the receiving member or receptacle 24, and its description equally applies to the receiving member or receptacle 25.

In Figs. 2, 3, 4 and 6, the receiving member or receptacle member 24 is shown as a cylinder of brass or other suitable material providing an axial cavity 26, and having an inner end notch 27 into which the wire 22 is attached, and having an annular peripheral groove 28 herein shown as near the notch 27, which groove serves to anchor the receiving member or receptacle 24 into the molded housing, body or shell 20, and also having preferably nearer its front end a peripheral groove 29 into which is fitted a flexible band 30. The said receiving member or receptacle 24 is also provided in its cylindrical wall with a countersunk opening 31, into which is fitted a ball 32 held therein by the band 30

which band can be variously made, as, for example, of rubber tubing or similar material, so as to apply inward pressure on the ball 32, while at the same time preventing the material of the housing, body or shell 20 flowing into the opening 31 during the process of molding the housing, body or shell 20.

A second manner of holding the ball 32 in place is illustrated in Figs. 7 and 8, wherein is represented, instead of the rubber band 30 of Figs. 2, 3, 4, 5 and 6, a metallic ring-like member 33 having formed therewith a dome-like formation 34 to receive the ball 32, and equally serving to hold the ball 32 in place and to prevent the molding compound of the housing, body or shell 20 from entering the opening 31 during the molding process. The member 33 is preferably less than a complete ring. The structure shown in Figs. 7 and 8 is the preferred construction.

Still another structure serving the same purpose is shown in Figs. 9 and 10. Therein a metallic band 35, also shown as an incomplete ring, is provided with an inverted, inwardly extending, dome-like portion 36 that has the same function served by the ball 32, and likewise serves to prevent the molding compound from entering the opening 31 during the molding process. Thus I have provided a formation presenting a partial or complete ball-like surface.

The housing, body or shell 20 is molded from suitable flexible material such as rubber, which allows the ball 32 or the inverted dome-like member 36 of the ring 35, or other like portion, to move outwardly when a pin 37 of a plug 38 of the structure is pushed into the cavity 26 of the receiving member or receptacle 24 or 25. The dome-like member 34 of the ring 33 also yields or moves outwardly with the ball 32 when the pin 37 is inserted.

The said pin 37 is provided with an enlarged head 39 that functions to hold or retain the housing, body or shell 20 in place on the plug 38 when the ball 32 or the inverted, inwardly extending, dome-like portion 36 passes over the head 39 onto the reduced diameter 40 of the pin 37 of the plug 38. Moreover the pins 37 are self-cleaning because of the rubbing action between the pins 27 and the balls 32. The said pin 37 may have a head 41 upset into the plug 38 and an integral enlargement 42 received against the opposite surface of the plug, so that the pin 37 is firmly positioned in the plug 38.

Inasmuch as the housing, body or shell 20 is flexible, the spacing of adjacent pins 37 of the plug 38 can vary considerably without interfering with the proper functioning of the pins 37, because of the fact that the rubber of which the housing, body or shell 20 is composed will stretch or compress, according as a pair of pins 37 of the plug 38 are somewhat too close together or too wide apart.

Inasmuch as the ball 32 is itself always under compression from the nature of the housing, body or shell 20, a firm contact will exist between the pin or pins 27 and the receiving members or receptacle therefor.

Any number of receiving members or receptacles and any number of pins of a plug can be combined with respect to a single plug 38 with a firm contact is each case.

The structure herein disclosed can be manufactured at low cost and is very effective in use.

Having thus described several embodiments of the invention, it is to be understood that although

specific terms are employed, they are used in a generic and descriptive sense, and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. In an electrical appliance and for use with a housing or body of flexible, molded material having therein electrical wiring connections; at least one electrical-contact plug-receiving member or receptacle of substantially cylindrical shape and about which said flexible material housing or body is molded, an element of substantially ball-shape laterally engaging said member or receptacle, the latter having a lateral aperture through which a portion of the surface of said ball-shaped element projects laterally through the wall of said member or receptacle for contact with the lateral surface of a contact plug when the latter is inserted into said member or receptacle, the said ball-shaped element being pressed by the substance of the flexible molded-material housing or body inwardly into effective contact with the lateral wall of the inserted plug.

2. An electrical appliance in accordance with claim 1, but wherein there is a band received upon the outer cylindrical surface of said member or receptacle outside of said substantially ball-shaped element and which band receives inward pressure from the structure of the flexible, molded housing or body and transmits such pressure onto the said substantially ball-shaped element.

3. In an electrical contactor structure, a housing or body of soft, flexible, molded material, a metallic receptacle of substantially cylindrical shape and laterally about which the said housing or body is molded, the said receptacle having an opening in its lateral wall, an element having a rounded surface formation received in said opening in the lateral wall of said receptacle, a substantially circular band received circumferentially upon the outer surface of said receptacle so as to overlie the opening in the lateral wall of said receptacle outside of said rounded surface formation and at least partially encircling said receptacle, and pressed inwardly by the housing or body because of the molded, flexible character of said housing or body, thereby to press said rounded surface formation inwardly into firm contact with a plug when inserted into said receptacle, the said housing or body having electrical wiring embedded therein and in electrical contact with said receptacle.

4. An electrical contactor structure in accordance with claim 3, but wherein the said band is an incomplete ring received upon the outer wall of such receptacle, and wherein the said ring has integrally formed therewith a dome-shaped outwardly-extending formation, and wherein the rounded surface formation is a ball received within said outwardly extending formation.

5. An electrical contactor structure in accordance with claim 3, but wherein the said band is an incomplete ring received upon the outer wall of such receptacle, and wherein the said rounded surface formation is a formation inwardly extending from the said substantially circular band into the opening in the lateral wall of said receptacle.

6. An electrical contactor structure in accordance with claim 3, but wherein the band is a complete ring of flexible material, and wherein the element with a rounded surface is a ball.

ARCHIE H. GOREY.

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