

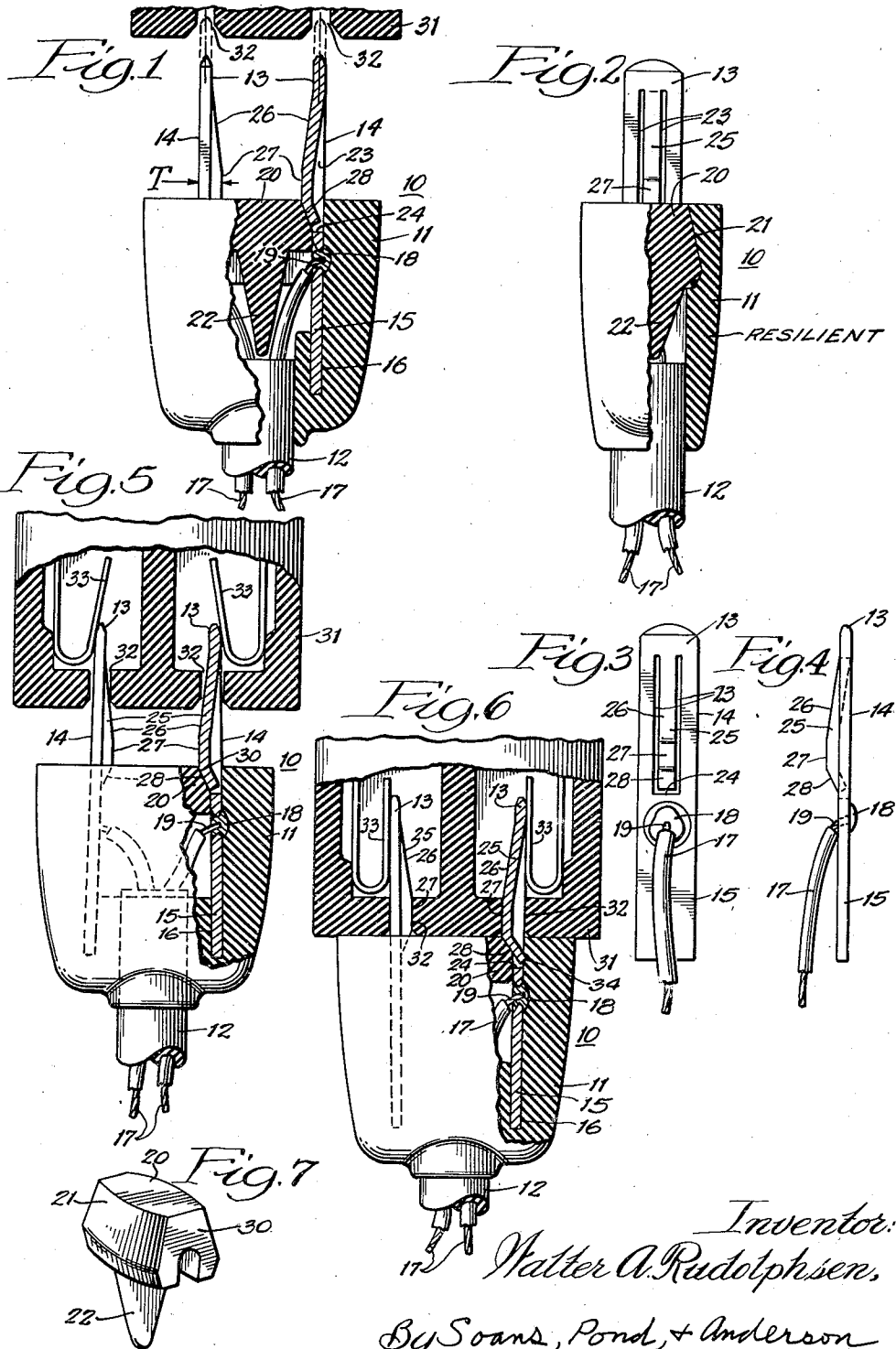
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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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My invention relates, generally, to electrical connector means for conductor cords, and it has particular relation to electrical attachment or connector plugs having spring type contact prongs.

It has been previously found that in many instances connector plugs having the standard type plain flat projecting contact prongs, failed to couple with or become attached to associated receptacles or sockets with sufficient retentive force to prevent their pulling or dropping out. This fault or defect was usually due to the prongs becoming bent out of the alignment in which they are originally provided, or becoming otherwise worn. To overcome this difficulty and objection, connector plugs have been provided, the contact prongs of which have different spring arrangements intended to give a tighter connection and greater coupling force. Such prior spring type connector or attachment plugs however, have not proved to be entirely satisfactory in certain respects. The object of the present invention is to provide connector plugs of the spring terminal type which are materially superior to the prior art connector plugs in certain important features as will appear hereinafter.

More specifically, an important object of my invention is to provide connector plugs of the spring contact prong or blade type having all free ends on the contact prongs or blades enclosed in the body part of the plugs. That is, there are no exposed or outside free ends on the contact prongs of my improved connector plugs. Another important feature combined with this free-end enclosing feature, is that in my improved connector plugs the spring portions of the contact prongs receive partial support from the resilient body members as will appear hereinafter.

The above important objects, and certain further objects and advantages of the invention will be made more apparent on reference to the accompanying drawing and the following detailed description of one preferred embodiment thereof.

In the drawing:

Fig. 1 is a fragmentary, partially vertical sectional view of a connector plug embodying the novel features of the present invention;

Fig. 2 is a fragmentary, partially vertical sectional view taken on one side of the connector or attachment plug shown in Fig. 1;

Fig. 3 is a side elevational view of one of the contact prongs or blades of the plug shown in Fig. 1;

Fig. 4 is an elevational view taken on one edge of the contact prong shown in Fig. 3;

Fig. 5 is a fragmentary partially vertical sectional view showing the connector plug of Fig. 1 part way inserted into a receptacle;

Fig. 6 is a view similar to Fig. 5 showing the connector plug fully inserted or pushed into the receptacle; and,

Fig. 7 is a perspective view of an insert part of the plug shown in Fig. 1.

Referring now to the drawing, a connector plug is designated generally at 10 which embodies the novel features of my invention. The connector plug 10 comprises a resilient body member 11 having a relatively large cavity in the front end thereof and a hole in the rear end through which a conductor cord 12 may be inserted. The particular body member 11 shown is somewhat flat in shape and may be molded from a suitable rubber composition. It will be understood that the body member 11 may be made in certain other suitable shapes, and from certain other materials.

The body member 11 serves to support a pair of contact prongs 13 which project in parallel alignment from the front end thereof. The prongs 13 are formed from flat strips of conducting metal such as copper or certain copper alloys, and comprise a projecting portion 14 and an inner support portion 15. The prongs 13 are inserted in the body member 11 and fit against the sides of the front cavity or opening therein with the innermost ends thereof fitting tightly in a pair of recesses 16 in the rear portion of the body member 11. The conductors 17 of the conductor cord 12 are connected to the contact blades 13 by buttons 18 of solder flowed into apertures provided in the enclosed ends 15, as shown at 19. These solder connections serve to retain the contact prongs 13 in place when the connector plug 10 is pulled from a receptacle with which it has been connected.

In order to help maintain the contact blades 13 in proper spaced apart relationship, and to also close the cavity in the front end of the body member 11, an insert 20 is inserted therein. The insert 20 has outwardly sloping sides 21 which cooperate in locking relationship with under-cut sides of the cavity in the body member 11, as shown in Fig. 2. This arrangement serves to retain the insert in place with considerable resistance to removal. A separator section 22 depends integrally from the underside of the insert 20 and serves to separate the conductors 17 in the cavity in the body member 11, as shown in Fig. 1. The insert 20 may be formed of suitable material, such as molded rubber, and it may

have the same composition as the body member 11.

Referring now to Figs. 3 and 4 of the drawing, it will be seen that parallel slots 23 are cut lengthwise in the outer portions 14 of the contact prongs 13. A crosswise slot 24 is cut between the back or inner ends of the lengthwise slots 23, thereby forming a relatively narrow wedging or spring tongue 25 in each of the contact prongs 13. The slots 23 provide substantial clearance between the tongues 25 and the main part of the projecting portions 14. These spring tongues 25 are bent out from the contact prongs 13 and are shaped into three different portions 26, 27 and 28, as indicated. The portion 26 is relatively long and slants out from its integral connection with the outer end of each contact prong 13 at a small angle with the main flat part thereof. The spring tongues 25 then straighten out into relatively short flat sections 27, and the rear or free ends 28 of the tongues 25 are bent back towards the contact prongs 13, as shown. It will be understood that the spring tongues 25 do not have to conform closely to the particular shape described but may vary somewhat. However, the shape shown and described has been found to be particularly satisfactory.

When the contact prongs 13 are fitted into place in the body member 11 with the bent out spring tongues 25 facing each other, and the insert 20 is inserted therebetween, the inner free ends 28 are enclosed within the front end of the plug 10. The end walls 30 of the insert member 20 are slanted to conform to and fit the inclined free portions 28. The projecting ends 14 of the contact prongs 13 are normally parallel to each other and spaced apart a distance corresponding to the separation of the socket openings in a standard receptacle. This arrangement is shown in Fig. 1 of the drawing where the front end of a receptacle 31 is shown with spaced apart terminal or socket openings 32 therein. The receptacle 31 may be of any suitable standard type. The front ends of the contact prongs 13 are projected in broken lines to show that the openings 32 in the receptacle 31 are somewhat wider than the thickness of the tip portions of the contact prongs 13. In Figure 1 it will be noted that the distance T from outside the spring tongue portions 27 to the opposite side of the prongs 13 is substantially greater than the width of the openings 32. The edges of the openings 32 are beveled as shown to make for easier insertion therein.

In Fig. 5 of the drawing, the connector plug 10 is shown with the contact prongs 13 part way inserted into the receptacle 31. In the position shown, the slanting portions 26 of the spring tongues 25 are bearing against the inner sides of the terminal or socket openings 32, and the front ends of the contact prongs 13 have engaged the spring terminals 33 of the receptacle 31. As the connector plug 10 is pushed further in towards the receptacle 31, the spring tongues 25 continue to be wedged or forced against the inner sides of the openings 32, thereby spreading apart the contact prongs 13 from their parallel alignment.

In Fig. 6, the connector plug 10 is shown completely pushed in with its front end against the receptacle 31. As will be noted, the receptacle terminals 33 have been considerably bent back with the outer ends 14 of the contact prongs 13 bearing flatwise thereagainst. The straightened out portions 27 of the spring tongues 25 bear flat against the inner sides of the socket openings 32, while the main flat part of the contact prongs 13

bear similarly against the outer sides of these openings 32. It will be noted that the inner free ends 28 of the tongues have been forced into the openings formed in the outer ends 14 of the contact prongs 13 by cutting and bending out the spring tongues 25 and have distorted or laterally stretched the body member 11 as indicated at 34. The resistance of the body member 11 against the distortion at points 34 serves to partially support the spring tongues 25 when the connector plug 10 is inserted in the receptacle 31. The spreading of the contact prongs 13 and the wedging of the spring tongues 25 in the socket openings 32 serve to tightly couple and connect the connector plug 10 to the receptacle 31. Repeated and extended use of the connector plug 10 does not substantially alter this strong coupling arrangement. Also, the flat parts of the outer ends 14 of the contact prongs 13 bear flatwise against the terminals 33 of the receptacle 31 with a greater than normal contact force, thereby providing improved electrical connection therebetween.

Having the free ends 28 of the spring tongues 25 enclosed within the front end of the connector plug 10 in the manner shown and described is an important feature of the invention. It prevents the catching and the distortion of the tongues through accident and use. And, as noted, the distortion or lateral stretching of the rubber or resilient body member 11 by the inner free ends 28 serves to partially support the spring tongues 25.

Since certain changes may be made in the foregoing construction and different embodiments of my invention may be made without departing from the principle thereof, it is intended that all matter described hereinbefore or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense, and that the accompanying claims shall be accorded the broadest construction permitted by the prior art.

I claim the following as my invention:

1. An electrical connector plug of the class described, comprising, in combination, a body member of resilient stretchable material, a pair of flat contact prongs supported at their inner ends within said body member and projecting outwardly therefrom, each of said prongs having an integral free-ended cut-out spring tongue extending rearwardly from the outer end thereof and bent out of the plane of the prong to lie at a small angle thereto; the rear free end portions of said tongues lying within the front end of said body member and adapted to thrustingly engage opposite sides of said body member when pressed in towards their respective prongs, said pressing in of the spring tongues being effected by a sliding wedge engagement of said tongues with the socket openings and being opposed by the combined spring resistance of said tongues and the resistance to stretching of said body member acting on the free ends of said tongues.

2. An embodiment of claim 1, wherein the free end portions of the tongues lying within the front end of the body member are oppositely inclined to project toward the opposite sides of the body member so as to have a biting engagement with the latter when the prongs are fully inserted in a socket member.

3. An electrical connector plug of the class described, comprising, in combination, a body member of resilient stretchable material formed with a central cavity in its front end and a pair of recesses in its rear portion, a pair of flat

spring metal contact prongs having their rear ends tightly fitted in said recesses and projecting beyond the face of said body member, each of said prongs having an integral free-ended cut-out tongue extending rearwardly from the outer end thereof and bent out of the plane of the prong to lie at a small angle thereto; the rear free end portions of said tongues lying within the front end of said body member and adapted to thrustingly engage opposite sides of said body member when said prongs are fully inserted in a socket member, and a removable one-piece plug inserted in and closing said central cavity of the body member and having opposed surfaces forming abutments for the inner sides of said free end portions of the tongues.

4. An embodiment of claim 3, wherein the free end portions of the tongues lying within the front end of the body member are inclined to project toward the opposite sides of the body member, and the opposed abutment surfaces of the plug are correspondingly inclined.

5. An electrical connector plug of the class described, comprising a body of resilient material, and a pair of parallel flat spring metal prongs embedded in and projecting forwardly of the face of said body, said prongs having cut-out longitudinal tongues integral at their outer ends with the outer ends of said prongs, and said tongues being shaped to provide inwardly inclined portions adapted to have sliding wedge engagement with the inner walls of socket openings, intermediate portions parallel with said prongs adapted to lie flat against said inner walls when the plug is fully inserted in the socket member, and outwardly inclined free end portions disposed within the plug body and adapted to be forced into gripping engagement with opposite sides of the plug body by the wedging action of said inwardly inclined portions and to be held in such engagement by the flat contact of said intermediate portions with the inner walls of the socket openings.

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