

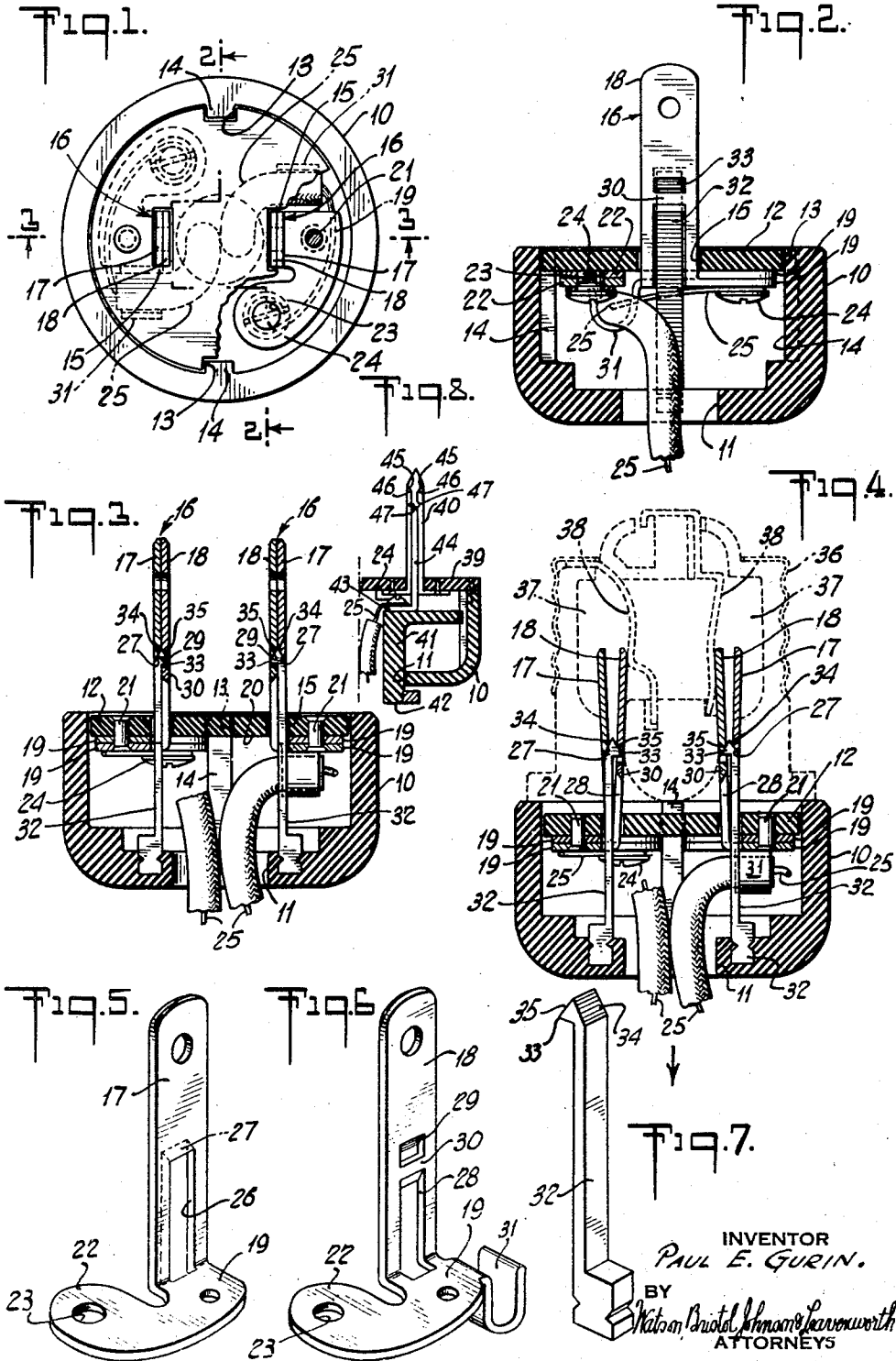
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ELECTRICAL ATTACHMENT PLUG

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ELECTRICAL ATTACHMENT PLUG

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The present invention relates to electrical attachment plugs and, more particularly, to the type commonly known as male connectors having one or more terminal prongs extending therefrom to be received in a recess or recesses in a female receptacle connector to make electrical contact with suitable contact means in the latter.

A general object of the present invention is to provide such an electrical male attachment plug which is of simple and economical construction that meets with fire underwriters' requirements and which, in mounting to a female receptacle, may be so manipulated as to move laterally prong structure thereof for temporarily locking the male plug to the female receptacle in an efficient manner, while assuring that after said mounting any pull upon the electrical cord or conductors connected thereto will tend to maintain or increase the locking action effectively to avoid accidental detachment.

A more specific object of the invention is to provide such an electrical locking male attachment plug characterized by at least one pair of metallic contact fingers, together serving as a terminal prong and which may be laterally spread apart for temporary locking in a receptacle recess, the plug including a pair of body members, one of which carries the cooperating pair of metallic contact fingers serving as a prong and the other carrying a camming structure, whereby when one of the two body members are moved relative to each other in an axial direction the camming structure will tend to spread the contact fingers laterally apart and to maintain them in such spread-apart relation for secure locking in the receptacle recess; the plug being provided with one or more electrical conductor anchorages so that a pull thereon, which may occur accidentally as a result of a person tripping over the conductor extending between the plug and an electrical appliance, will tend to maintain or increase the locking function of the spread-apart contact fingers thereby effectively avoiding accidental detachment, while permitting ready detachment of the plug by simple movement of the body members relative to each other in the direction opposite to that which accomplishes the locking.

Another object of the present invention is to provide such an electrical male attachment plug, which is featured by a cup-shaped shell of insulating material in which is slidably received a circular base plate of insulating material with the latter equipped with at least one pair of co-

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operating contact fingers to serve as a terminal prong, the shell carrying a camming finger juxtaposed to the contact fingers whereby upon movement of the base plate down into the shell the camming finger will cause the contact fingers to be spread apart at their outward free ends for temporary locking in a receptacle recess, the base effectively carrying an electrical conductor anchorage for electrical contact with prong contact finger structure whereby when the electrical conductor or wire is fastened to the anchorage and extends out through a hole in the shell a pull on the conductor or wire will cause the camming means on the shell to spread the contact fingers laterally apart to lock them in a receptacle recess, or, after being so mounted and temporarily locked in position, such pull will efficiently tend to maintain or increase such locking action.

A further object of the present invention is to provide structural embodiments of the device which are readily constructed and permit efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is an enlarged top plan view, with parts broken away, of an embodiment of the electrical locking male attachment plug of the present invention;

Fig. 2 is a transverse section taken substantially on line 2-2 of Fig. 1, showing conductor wires, parts of which are broken away, connected thereto;

Fig. 3 is a view similar to Fig. 2 taken substantially on line 3-3 of Fig. 1, with the parts in their initial position prior to manipulation for accomplishing locking action;

Fig. 4 is a view similar to Fig. 3, indicating in dotted lines parts of a typical female receptacle, with parts of the male plug shown manipulated to locking positions;

Fig. 5 is an enlarged perspective view of one of

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the contact fingers of a pair which together serve as a terminal prong;

Fig. 6 is a view similar to Fig. 5 showing the other contact finger of the same pair;

Fig. 7 is a view similar to Figs. 5 and 6 of the camming finger of the structure shown in Figs. 1 to 4, inclusive; and

Fig. 8 is a relatively small half-sectional view of a modified form of the male plug structure shown in Figs. 1 to 7, inclusive.

Referring to the drawing like numerals identify similar parts throughout and it will be seen therefrom that the preferred embodiment of the present invention comprises a cup-shaped shell 10 of insulating material having an axial hole 11 in the back or bottom thereof through which a connecting cord or electrical conductors or wires may extend. The shell 10 slidably receives therein a disc or circular base plate member 12 of suitable insulating material, which preferably is notched in the edge thereof, such as at diametrically opposed points 13, 13, slidably to receive guide fins 14, 14 extending axially and arranged on the inner wall of the shell.

The base plate 12 has a pair of laterally spaced-apart rectangular apertures 15, 15, each of which receives therethrough a terminal prong structure or assembly 16 of metal having good electrical conductivity. Each terminal prong assembly 16 preferably comprises a pair of resilient metallic contact fingers 17 and 18, with each having a laterally extending footing 19 adapted to be seated against the back face 20 of the base plate 12 and anchored together to the base plate by means of a rivet 21. Each footing 19 is preferably provided with an ear 22 having a threaded hole 23 therein threadably to receive together a terminal anchorage screw 24 for the usual purpose. As shown in the drawing, each of the two terminal screws 24, 24 connects an insulated conductor or wire 25 to one of the pair of terminal prongs 16, 16, and those conductors or wires extend from out of the shell through the axial hole 11.

Of each pair of contact fingers 17 and 18, together constituting a terminal prong 16, one thereof, for example, contact finger 17, has an elongated slot 26 extending longitudinally thereof from the footing 19 to an outer end at 27 there to provide an oblique camming face facing rearwardly, as shown in Figs. 3, 4 and 5. The cooperating contact finger 18 has a similar slot 28 also terminating at its outward end in an oblique camming face 29 facing rearwardly and sloped in the opposite direction. The contact finger 18 preferably is provided with a stop bar 30 extending transversely of slot 28, for a purpose to be explained later. Preferably the footing 19 of finger 18 is provided with a conductor anchoring hook 31 to take the strain off of terminal screw 24.

The shell 10 carries therein a pair of laterally spaced-apart, axially extending, camming fingers 32 fixed to the shell preferably during the molding of the latter. Each camming finger 32 is slidably received by the cooperating slots 26 and 28 of each prong structure 16, and the head end of the camming finger is preferably provided with a laterally extending nose 33 adapted to engage beyond the transversely extending stop bar 30 on contact finger 18. The head end of each camming finger 32 is provided with a pair of forwardly facing oblique camming faces 34 and 35 adapted to cooperate with the rearwardly facing oblique camming faces 27 and 29 of the spring

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fingers 17 and 18. If desired, one or more of the cooperating camming surfaces on fingers 17, 18 and 32 may be roughened to minimize too ready sliding action that may at times tend to an unwanted demountation of parts under certain conditions.

The spring fingers 17 and 18 are preferably made from resilient metallic material of good electrical conductivity and, although in the embodiment shown in Figs. 1 to 7, inclusive, the camming fingers 32 may be formed of material other than metal of good electrical conductivity, such as hard rubber, they are, for purposes of manufacturing economy and simplicity, made of metal. In assembling the parts, the camming fingers 32, 32, fixed in the shell 10, are slidably received in the elongated slots 26, 26 of the contact fingers 17, 17 with their noses 33, 33 snapped into the apertures intervening the oblique camming surfaces 29, 29 and the cross bar stops 30, 30 of the spring fingers 18, 18. Thus the cross bars 30, 30 serve to limit outward movement of the prong structures 16, 16 relative to the camming fingers 32, 32. If the unit is marketed in assembled condition the purchaser can readily demount the parts for anchorage of conductors to the prong assemblies 16, 16 by flexing the fingers 18, 18 inwardly and withdrawing camming fingers 32, 32 with shell 10 from the prong assemblies and plate 12. After the conductors 25, 25 are anchored to base plate 12 and connected to screws 24, 24, the parts are reassembled in the above manner. This assembled structure with the base plate 12 loosely and slidably received in the top of the cup-shaped shell 10 is then ready for use in the usual manner and constitutes a structure similar to that shown in Fig. 3.

In operation the attachment plug of the present invention is to be associated with a female receptacle and, as shown in Fig. 4 by way of example, the female receptacle may be of typical construction, as indicated in dotted lines at 36, comprising a pair of recesses 37, 37 having terminal contacts 38, 38 therein. In those recesses 37, 37 the prong structures 16, 16 are received in the usual manner and, without manipulation of the plug structure for purposes of temporarily locking it to the receptacle, the inner spring fingers 18, 18 of the pair of prongs 16, 16 make face contact with the receptacle contacts 38, 38 in the usual manner. However, as desired, the male attachment plug of the present invention is preferably temporarily locked to the female receptacle by holding the shell 10 in fixed position and pulling on the conductors 25, 25 in the direction of the arrow in Fig. 4. As a result, the oblique camming surfaces 34 and 35 of each of the camming fingers 32, 32 are caused to slide along the oblique camming surfaces 27 and 29 of spring fingers 17 and 18 with rearward movement of the latter as the base plate 12 is pulled down into the shell 10. As a result, the free ends of the resilient spring fingers 17 and 18 of each prong assembly 16 are spread or sprung apart, as shown in Fig. 4, to lock the prong structure 16, 16 in the recesses 37, 37 of the female receptacle 36. This spreading or springing action of each of the pairs of spring fingers 17 and 18 is permitted without interference by the camming fingers 32, 32 due to the provisions of the slots 26 and 28 in the spring fingers. It will be understood, of course, that slot 28 may be omitted from the spring finger 18 if the parts are carefully made and fitted together, so long as the aperture for the spring finger nose 33 is provided.

However, it has been found that for commercial production it is preferable to slot both of the spring fingers 17 and 18 longitudinally from their footings 19, 19 for considerable extent and to provide the aperture adjacent the camming surfaces 29 of spring finger 18 by the transverse stop bar 30.

As previously remarked, the male attachment plug of the present invention may be employed in the usual manner of use of common types of male attachment plugs without manipulation for temporary locking, since the prong assemblies 16, 16 in their initial conditions, when inserted in female receptacle recesses, make electrical contact with contact members in the recesses in the usual manner. The contact members of common types of female receptacles, such as that indicated in dotted lines in Fig. 4, are usually made from relatively thin sheet metal and have considerable springiness to assure good electrical contact with relatively stiff male prongs. Accordingly, the springing apart of the pair of contact fingers 17 and 18, which together form each prong assembly 16 of the present structure, by the camming operation of the camming finger 32 is readily permitted in a manner resulting in lateral deviation of the free end of the contact finger 18 as well as that of 17, due to the resilient springiness of the contact member in the female receptacle recess. Of course it will be understood that should some special type of female receptacle be employed, where the contact members therein are relatively stiff so as to reduce camming deviation of the contact fingers 18, 18, the temporary locking action will be permitted by greater deviations of the free ends of the contact fingers 17, 17, when the camming fingers 32, 32 are thrust inwardly relative to the contact fingers 17, 18 and 17, 18, or vice versa.

With the male plug attachment of the present invention temporarily locked to the female receptacle, as shown in Fig. 4, it will readily be seen that any accidental tug or pull on the conductors 25, 25 will, instead of tending to detach the male plug, merely maintain or tend to increase the locking action. Thus, for example, in household use where conductor cords usually extend between female wall receptacles near the baseboard to floor lamps and other appliances with parts thereof lying on the floor, if one should trip over the cord or engage it accidentally during cleaning operations, the male plug will remain securely locked in the female receptacle. However, the structure provides for ready detachment of the male plug at will. If the shell 10 is grasped in the fingers and drawn out away from the female receptacle, the camming fingers 32, 32 will slide out relative to the pairs of contact fingers 17 and 18 permitting the latter, due to their resiliency, to return to their original positions shown in Fig. 3, with the noses 33, 33 of the camming fingers eventually engaging the stop bars 30, 30 thereafter to withdraw with the shell 10 the prong structures 16, 16 and their supporting base plate 12.

Similar functions may be embodied in the male attachment plug structures of modified form as shown in Fig. 8. For example, the shell 10 may have fitted to it a face plate 39 on which may be mounted a cooperating pair of laterally spaced-apart metallic spring fingers 40, 40 received through a hole in the plate 39 and preferably anchored to the back face of the latter. The shell 10 may slidably receive therein a spool 41 of insulating material having a central bore 42

through which is received the electrical conductors 25, each anchored by the screw 24 to a spool-supported footing 43 of a camming finger 44 slidably received between the pair of contact spring fingers 40, 40. The latter preferably have at their outer ends outwardly facing oblique camming faces 45, 45 against which rearwardly facing camming surfaces 46, 46 of an enlarged spear-head-shaped outer end of camming finger 44 seat. Accordingly, when such a male plug structure is applied to a female receptacle in the usual manner, if the shell 10 is held fixed a tug on the conductors 25 will cause the spool 41 to slide rearwardly in the shell causing camming finger oblique surfaces 46, 46 to slide against oblique camming surfaces 45, 45 of contact fingers 40, 40 to spring them apart to locking position.

It will be noted that in the structure of Fig. 8 the conductors 25 are anchored to and in electrical contact with the camming fingers 44 rather than with the contact fingers 40, 40. Accordingly those camming fingers 44 are preferably made from metal of good electrical conductivity so as to assure electrical connection between the conductors 25 and the contact members in the female receptacle recesses, via camming fingers 44 and at least one of each pair of contact fingers 40, 40. If desired, the contact fingers 40, 40 of each pair thereof may be provided with opposed notches 47, 47 on the inner faces thereof, as shown, into which opposed corners of the spear-head of the camming finger 44 may snap when the structure is manipulated to locked position. Since a portion of the spool 41 extends out through the axial hole 11 of the shell 10, the male plug structure of Fig. 8 may be readily detached by pushing inward on the back end of the spool so as to return the camming fingers 44 to the position shown in Fig. 8.

It will thus be seen that the objects set forth above, among others made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electrical locking male attachment plug comprising, in combination, a pair of body members of insulating material movable relative to each other in an axial direction, a terminal prong carried by one of said body members and extending out from the front side thereof in an axial direction for insertion into a receptacle recess, said prong comprising a pair of metallic contact finger means adapted to be spread laterally apart for temporary locking in the receptacle recess, a metallic camming finger means mounted on the other of said body members juxtaposed to said contact finger means, anchorage means on one of said body members for fastening thereto an electrical conductor adapted to make electrical contact with the metallic finger means thereon, and an oblique camming face on the latter of said metallic finger means facing

toward the rear of its supporting body member whereby pull on an electrical conductor anchored thereto will spread and tend to keep spread said contact finger means in locking position with relative axial movement of said body members.

2. An electrical locking male attachment plug comprising, in combination, a pair of body members of insulating material movable relative to each other in an axial direction, a terminal prong carried by one of said body members and extending out from the front side thereof in an axial direction for insertion into a receptacle recess, said prong comprising a pair of metallic contact fingers adapted to be spread apart for temporary locking in the receptacle recess, a camming finger mounted on the other of said body members juxtaposed to said contact fingers, anchorage means on the first-mentioned body member for fastening thereto an electrical conductor adapted to make electrical contact with at least one of said contact fingers, and cooperating camming surfaces on at least one of said contact fingers and said camming finger whereby pull on an electrical conductor fastened to said anchorage will tend to move said contact fingers and said camming finger longitudinally relative to each other to spread and tend to keep spread the former in locking position.

3. An electrical locking male attachment plug comprising, in combination, a pair of body members of insulating material movable relative to each other in an axial direction, a terminal prong carried by one of said body members and extending out from the front side thereof in an axial direction for insertion into a receptacle recess, said prong comprising a pair of resilient metallic contact fingers adapted to be spread apart for temporary locking in the receptacle recess, a pair of oblique camming faces on said fingers facing rearwardly and sloped in opposite directions, a camming finger mounted on the other of said body members juxtaposed to said contact fingers and having a pair of forwardly facing oblique camming faces for cooperation with those of said contact fingers to spread the latter apart when they are moved rearwardly with respect to said camming finger, and an anchorage on the first-mentioned body member for fastening thereto an electrical conductor adapted to make electrical contact with at least one of said contact fingers whereby pull on an electrical conductor fastened to said anchorage will tend to move said contact fingers rearward relative to said camming finger.

4. An electrical locking male attachment plug comprising, in combination, a cup-shaped shell of insulating material having a conductor outlet hole therein, a circular base of insulating material slidably received in said shell for relative axial movement, a terminal prong mounted on said base and extending out from the front side thereof in an axial direction for insertion into a receptacle recess, said prong comprising a pair of resilient metallic contact fingers adapted to be sprung apart for temporary locking in the receptacle recess, a pair of oblique camming faces on said fingers facing rearwardly and sloped in opposite directions, a camming finger mounted on said shell juxtaposed to said contact fingers and having a pair of forwardly facing oblique camming faces for cooperation with those of said contact fingers to spring the latter apart when they are moved rearwardly with respect to said camming finger, and an anchorage on the back side of said base for fas-

tening thereto an electrical conductor adapted to make electrical contact with at least one of said contact fingers whereby pull on a terminal conductor fastened to said anchorage and extending out through the hole in said shell will tend to move said base down into said shell and said contact fingers rearward relative to said camming finger.

5. An electrical locking male attachment plug comprising, in combination, a pair of body members of insulating material movable relative to each other in an axial direction, a terminal prong carried by one of said body members and extending out from the front side thereof in an axial direction for insertion into a receptacle recess, said prong comprising a pair of resilient metallic contact fingers adapted to be sprung apart for temporary locking in the receptacle recess, both of said contact fingers being longitudinally slotted with the outer ends of the slots providing a pair of oblique camming faces facing rearwardly and sloped in opposite directions, a camming finger mounted on the other said body members and slidably received in at least one of the slots of said contact fingers, said camming finger having on its outer end a pair of forwardly facing oblique camming faces for cooperation with those of said contact fingers to spring the latter apart when they are moved rearwardly with respect to said camming finger, and an anchorage on the first-mentioned body member for fastening thereto an electrical conductor adapted to make electrical contact with at least one of said contact fingers whereby pull on a terminal conductor fastened to said anchorage will tend to move said contact fingers rearward relative to said camming finger.

6. An electrical locking male attachment plug comprising, in combination, a cup-shaped shell of insulating material having an axial outlet hole therein, a circular base of insulating material slidably received in said shell, a pair of laterally spaced-apart terminal prongs mounted on said base and extending out from the front side thereof in an axial direction for insertion into receptacle recesses, each of said prongs comprising a pair of resilient metallic contact fingers fixed to said base so that their outer free ends may be divergently spread apart for temporary locking in one of the receptacle recesses, each of said contact fingers being longitudinally slotted and having an oblique camming face at the outer end of said slot with the two oblique camming faces of each of said pair of contact fingers facing rearwardly and sloped in opposite directions, transversely extending abutment means foreshortening the slot of one of said contact fingers of each pair thereof to provide a withdrawal-limiting stop, a pair of laterally spaced-apart camming fingers fixed in said shell and extending axially out of the same each being slidably received through said base and in the elongated slot of one contact finger of a pair thereof with its head end having a laterally extending nose received beyond said stop of the companion contact finger of that pair to limit axial movement of said base out of the shell, each of said camming fingers being provided on its head end with a pair of forwardly facing oblique camming faces for cooperation with those of said contact fingers to spring the latter apart when they are moved rearwardly with respect to said camming finger with movement of said base down into said shell, and a pair of anchorages on said base each for fastening thereto an elec-

trical conductor adapted to make electrical contact with one of said pair of contact fingers whereby pull on terminal conductors fastened to said anchorages will tend to move said contact fingers rearward relative to said camming fingers.

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