

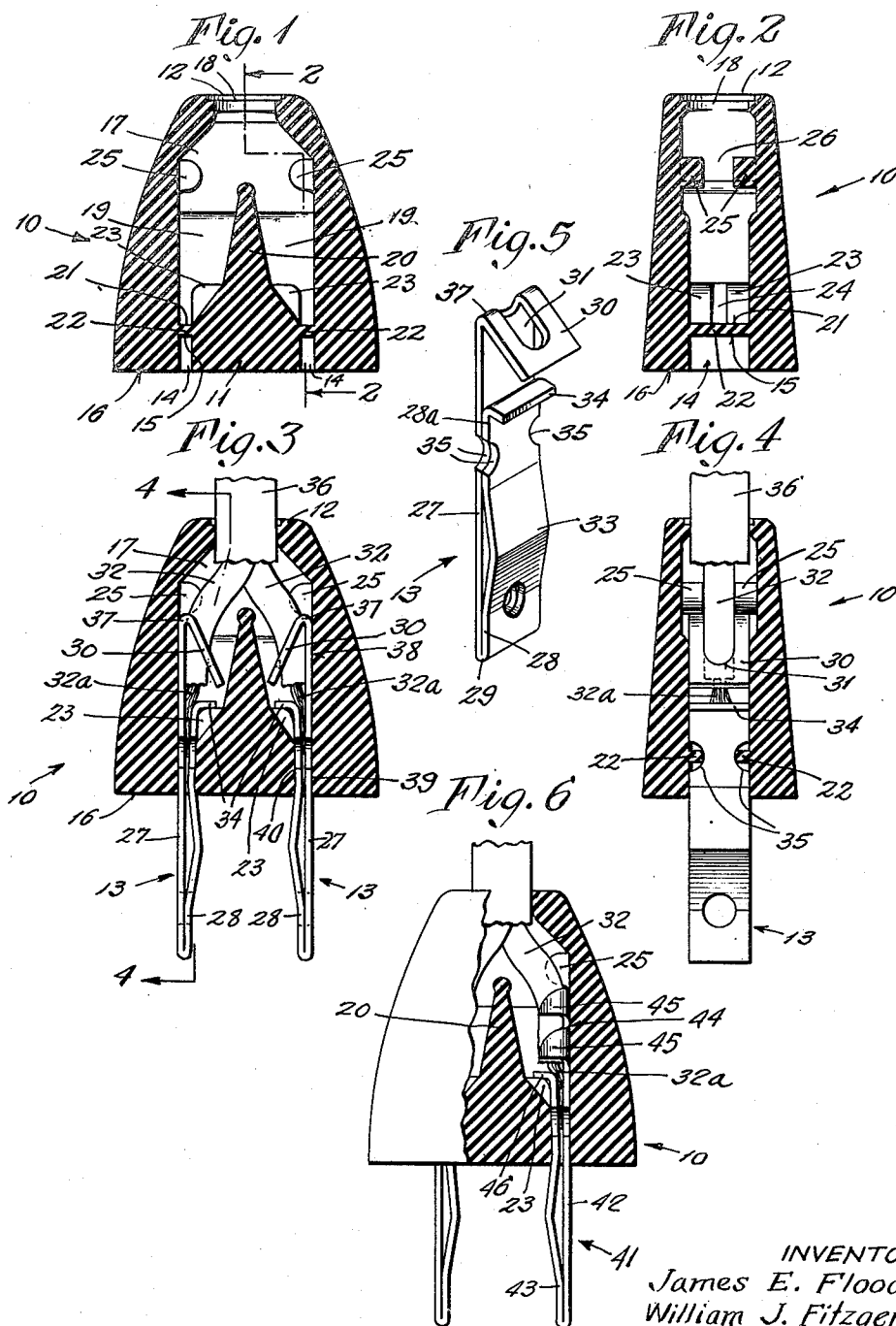
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ATTACHMENT PLUG

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ATTACHMENT PLUG

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This invention relates to electrical attachment plugs, and more particularly to plugs of the type having resilient yieldable prongs which are inserted in a molded, resilient body after the molding thereof.

An object of the invention is to provide an improved molded attachment plug of the type above, wherein the lead wires are secured to the contact prongs and the latter secured in the plug body in such a manner that the wires are held against pull-out, while at the same time the attaching of the lead wires to the prongs and insertion of the prongs in the body may be quickly and conveniently accomplished.

Another object of the invention is to provide an improved molded attachment plug with insertable prongs and having lead wires which are held against pull out as above, and wherein there are improved simple and positive means for accurately locating the prongs of the plug during their insertion into the plug body.

A further object of the invention is to provide an electrical attachment plug as above which is extremely economical to manufacture.

In accomplishing the above objects there is provided, in the specific embodiments of the invention illustrated herein as exemplary thereof, a molded plug body formed of resilient substance such as rubber, plastic or other suitable substances of this general class, the said body having prong-receiving and carrying cavities of novel and unique configuration, arranged with opposed internal shoulders for engagement with end portions of folded prong strips to provide for accurate location and secure anchorage of the prongs the cavities also being disposed to effect positive insulation between the prongs and enable the plug body to be readily molded and stripped from the molds.

In conjunction with the novel formations of the plug body a pair of novel resilient prongs is provided, each prong comprising a single continuous resilient metal strip folded back on itself and so arranged as to enable it to be pulled into and partly through a body cavity of the plug and to enable the end portions of the strip to engage the opposed shoulders in the cavity for accurate and secure anchorage therein. One end portion of the prong strip is also shaped to receive and clamp not only the conductor portion of a lead wire but also the insulating jacket or sleeve thereof thereby to become securely affixed to the wire. The end portion of the prong which clamps to the lead wire so cooperates with the shoulder which it engages in the interior of the plug body

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that the prong and both the conductor and insulating sleeve portions of the wire are securely held in the body against pull-out. This is an extremely important feature in an electric plug, where in use it is the rule rather than the exception to disconnect the plug from its cooperating connector by a pull on the lead wires.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a longitudinal section taken through a resilient plug body made in accordance with the invention.

Fig. 2 is a longitudinal section taken on line 2-2 of Fig. 1.

Fig. 3 is a view like Fig. 1 but with the resilient contact prongs and electric cord applied to and carried by the plug body.

Fig. 4 is a section taken on the line 4-4 of Fig. 3.

Fig. 5 is a perspective view of a contact prong made in accordance with the invention, and

Fig. 6 is a view like Fig. 3 but showing a modified form of prong.

Referring to Figs. 1 and 2 the body 10 of the present improved attachment plug is shown as having a somewhat frusto-conical shape, with a flat front or base portion 11 from which the contact prongs are to project, and with a generally tubular rear portion 12 for receiving the electric lead wires or cord. Between the portions 11 and 12 the plug body 10 is generally tapering as shown.

The body 10 is similar to that shown in my co-pending application Serial No. 743,596 and is formed of resilient moldable substance, such as rubber, synthetic or natural, or vinyl chloride or vinyl chloride-vinyl acetate plastic or other suitable compositions having the properties of resilience and moldability.

In accordance with the invention the plug body 10 is provided with novel-shaped cavities having unique opposed shoulders, and novel yieldable contact prongs 13 are provided to be inserted and carried in said cavities, said prongs being in the form of folded strips the end portions of which respectively cooperate with said shoulders to accurately locate and to anchor the prongs in the body, said end portions also functioning to connect with and securely anchor the lead wires in an advantageous manner, against pull-out.

Accordingly, as shown in Figs. 1 and 2, the portion 11 of the plug body is formed with a pair of shallow slot-like recesses or cavities 14 which are of generally rectangular cross-section and

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are spaced apart the usual distance established for contact prongs of attachment plugs. The cavities 14 are blind, that is, they are closed at their bottoms and terminate in walls 15 each of which is located the same distance from the front or base surface 16 of the plug body.

A third cavity 17 is provided in the plug body 10, the said cavity having a generally circular mouth 18 and communicating therewith a pair of elongate chambers 19, the latter being coextensive with each other and being separated by a central partition or wall 20 having a tapering section as shown in Figs. 1 and 3. The bottom walls 21 of the cavities 19 are brought closely adjacent the bottoms 15 of the recess or cavities 14, so that only a thin frangible dividing web 22 exists between each of said pairs of cavities.

In the lower portions of the chambers 19 adjacent the bottoms 21 thereof pairs of lugs or shoulders 23 are provided, jutting out from the dividing wall 20, Fig. 1. The shoulders 23 have a relatively small thickness as shown in Fig. 2 so that a space 24 exists between them which follows the contour of the dividing partition 20 between the chambers 19. Also, spaced from opposite sides of the point or tip of the partition 20 pairs of lugs or shoulders 25 are provided, separated by spaces 26, Figs. 1 and 2. The shoulders 23 and 25 are opposed to each other, and engage and cooperate with the end portions of the prong strips 13 to locate and anchor the latter in a novel manner as will hereinafter be disclosed.

Referring to Fig. 5 each contact prong 13 is formed of a single continuous strip of resilient metal and comprises a pair of sides or legs 27 and 28 folded back on each other at 29, the said fold 29 constituting the tip of the prong. The leg 27 extends beyond the leg 28 and has an extremity or end portion which includes a lug 30 folded backward at an acute angle and having an aperture 31 of large enough size to receive both the conductor and insulating sleeve portions of a lead wire 32 to be clamped by the lug 30 and thereby affixed to the prong. The leg 28 of each contact prong 13 has an offset spring portion 33 and an end portion 34 which latter is bent at substantially right angles and extends on the same side of the prong as the lug 30.

Each leg 27, 28 of the prongs 13 has a pair of oppositely located notches 35 aligned with each other and serving to aid in anchoring the prong after its insertion into the plug body 10, as will be later brought out.

In assembling the attachment plug, the prongs 13 are first attached to the ends of the lead wires 32 constituting the cord 36 which is to extend from the plug. The securing of the ends of the lead wires 32 to the prongs 13 is carried out as follows: The wires 32 are passed through the apertures 31 in the lugs 30 of the prongs, making sure that the sleeve insulation of the wires also passes through said apertures, as shown in Fig. 3, whereupon the lugs 30 are bent inward against the legs 27, thereby biting into the sleeve insulation and clamping and anchoring the lead wires 32 securely against removal. The conductor portions 32a of the wires are interposed between the legs 27 and 28 of the prongs, and are either soldered thereto or welded by applying welding electrodes to the adjacent opposite external surfaces of the legs.

In either case the conductor portions of the lead wires are securely, metallicity cohered to the legs of the prongs 13, and in addition the

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sleeve insulation of the wires is securely gripped and anchored. By this organization a union is effected between the lead wires 32 and the prongs 13 which has a maximum of strength and is extremely effective in preventing pull-out of the lead wires from the contact prongs.

After the joining of the lead wires 32 to the prongs 13, the plug body 10 is pierced at the web portions 22 thereof by a pair of prong pick-up needles of the usual type, which are passed through first the cavities 14 of the body, then the webs 22, and then the chambers 19 to project beyond the mouth 18 of the cavity 17. The prongs 13 are hooked on the needles passing through the body 10, whereupon the needles are withdrawn, carrying the prongs 13 with them and causing the prongs to further pierce or break through the webs 22 and to become located in operative position in the body as shown in Fig. 3. The plug is now completely assembled.

It will be noted that the end portions 28a of the prongs 13 are substantially in engagement with the shoulders 23 in the cavity portions 19 of the body 10, such engagement being effected by insertion of the prongs in the plug body and serving as a stop to positively and accurately locate the prongs during the insertion thereof. Also, the bends 37 of the prongs between the legs 27 and the lugs 30 are located substantially in engagement with the shoulders 25 in the cavity portions 19, having by-passed said shoulders during insertion of the prongs by forcing the shoulders apart as permitted by the shape of the shoulders and the resiliency of the plug body 10. The conductors 32 occupy parts of the spaces between the shoulders 25 and enable the bends 37 to seat fully against the shoulders for positive butting engagement therewith. The legs 27 of the prongs 13 extend along and engage the aligned walls 38 and 39 of the cavities 14 and 19 respectively, and the legs 28 engage the opposite walls 40 of the cavities 14 and also the shoulders 23, such engagements serving to hold the prongs 13 in parallelism and serving to maintain the relationship of the shoulders 23 and 25 to the end portions of the prongs 13 whereby the latter are securely anchored in the plug body. Also, the notches 35 of the prongs 13 provide clearance for and accommodate the portions of the webs 22 which have been pierced and separated during the assembly operation of the prongs to the plug body.

By this arrangement each prong 13 is securely locked in the plug body 10 against inadvertent shifting or removal therefrom and it is also properly located for insertion into a cooperable female connector.

We have found that by so anchoring the lead wires 32 to the prongs 13, and anchoring the prongs in the plug body 10 by provision of the opposed shoulders 23 and 25, and by the interlocking action of the pierced webs 22 with the prong notches 35, an assembly is provided which is extremely rugged, and especially effective in preventing pull-out of the lead wires during use of the plug. This is of great advantage when it is considered that as a rule plugs of this type are removed or detached from the cooperable connectors by merely applying sufficient separating pull to the cord or wires, without grasping the plug body and applying the pull there as should be done.

Also, by the present invention, the prongs 13 while resilient and yieldable in themselves to a certain extent are stoutly constituted and will

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resist permanent deformation to a considerable degree due to the fact that both of the legs 27, 28 fully enter the plug body 10 and are firmly supported therein against lateral movement while at the same time having positive individual anchoring or locking engagement with the plug body.

During use of the attachment plug of this invention the legs 27 and 28 of the prongs 13 will be forced together to a slight extent to eliminate some of the space existing between them as provided by the offset portions 33 of the prongs, and as a consequence continual pressure will be exerted by the prongs on the contact elements of the cooperable female connector, thus insuring effective electrical contact.

Another embodiment of the invention is shown in Fig. 6, wherein a modified form of contact prong is provided in conjunction with the plug body 10. In this figure, parts similar to those already described in connection with the previous figures have been given similar reference characters.

The prong 41 shown in Fig. 6 has legs 42 and 43 folded back on each other, the leg 43 being similar in all respects to the legs 28 of the prong 13 described above.

The leg 42 is positioned with pairs of oppositely located spaced tabs 45 between which the lead wire 32, including the insulating sleeve thereof, is brought. The tabs 45 are then bent inward toward each other so as to securely clamp and anchor the insulating sleeve of the wire. The conductor portion 32a of the wire is interposed between the legs 42 and 43 of the prong, and is either soldered thereto or welded in the same manner as described above.

The leg 43 of the prong 41 has a lug 46 at its extremity, bent at right angles to the leg and engageable with the shoulders 23 within the plug body 10. The end portion 44 of the prong leg 42 is located for engagement with the shoulders 25 in the plug body 10, the latter being preferably closely spaced so as to pinch the lead wire 32 and have abutting engagement with arcuate edge portions of the pair of tabs 45 at the tip of the prong leg 42. Therefore, since both end portions of the prong strip 41 respectively engage the opposed shoulders 23 and 25, the anchorage and securement of the prong will be similar to that of the prong 13 already described. Also, at the time that the prong 41 are inserted in the plug body 10 the lugs 46 of the prongs will, by engagement with the shoulders 23, function as stops which serve to accurately locate the prongs in the body. Due to the fact that the tabs 45 of the prongs securely grip the insulation sleeves of the lead wires 32 in addition to the conductor portions 32a of said wires being metallicity cohered to the prongs, pull-out of the wires and consequent failure of the plug is effectively prevented.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

We claim:

1. An electrical connector plug comprising a one-piece resilient molded body having a cord-receiving cavity and a pair of spaced prong-carrying cavities therein communicating with the first-named cavity, said cord-receiving cavity being wider than the prong-carrying cavity and having projections comprising a pair of spaced lugs extending outwardly from the wall of the cord cavity adjacent the inner end of each prong-

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carrying cavity, each prong-carrying cavity having an inwardly facing abutment in one surface thereof; resilient contact prongs carried respectively in said cavities, each prong comprising a folded metal strip, one end portion of the strip engaging the projections in the cord cavity and the other end engaging the abutment in the associated prong-carrying cavity to prevent longitudinal shifting of the prong, and the body having a portion located wholly between and engaging both prongs to maintain the latter in spaced relationship; and a lead wire comprising a conductor portion and an insulating sleeve portion, said wire extending into the cord-receiving cavity of the body and between the lugs and the conductor portion thereof being electrically connected with the contact prong, the part of said prong engaging the projection in the cord-receiving cavity embracing and clamping the insulating sleeve portion of the lead wire to aid in preventing pull-out of the wire.

2. An electrical connector comprising a body having a resilient part and having a cavity in said part; a contact member carried in said cavity, said member being of reduced cross section at a point in the body removed from the mouth of the cavity, and the resilient part of said body having in said cavity a transverse wall pierced by the contacting member, the broken-through wall portion being displaced by and engaging the contact member on all sides under continual compression at said reduced cross section, said displaced wall portion tending to lock the member in the body.

3. An electrical connector plug comprising a one-piece resilient molded body having a cord-receiving cavity and a pair of spaced prong-carrying cavities therein communicating with the first-named cavity, said cord-receiving cavity being wider than the prong-carrying cavities and having a pair of flexible projections extending from opposite walls of the cord-receiving cavity adjacent the inner end of each prong-carrying cavity, said projections flexing to enable the prong to move into the prong-carrying cavity and each prong-carrying cavity having an abutment in one surface thereof facing toward said projections; and contact prongs having conductors connected thereto carried respectively in said cavities, each prong comprising a metal strip having a lateral projection intermediate the ends, the inner end of the prong engaging the projections extending into the cord-receiving cavity with the conductor extending between said projections, and the lateral projection on the prong engaging the abutment in the associated prong-carrying cavity to prevent longitudinal shifting of the prong, and the body having a portion located wholly between and engaging both prongs to maintain the latter in spaced relation, said prong having a notch intermediate its ends, and said body having a pierced wall in each prong-carrying cavity extending into said notch to further anchor the prong.

4. An electrical connector plug comprising a one-piece resilient molded body having a cord-receiving opening, and having a pair of prong-receiving and carrying cavities therein, communicating with said opening, said body having in each cavity a pair of spaced projections extending outwardly from the wall of the cavity and forming shoulders located adjacent the cord-receiving opening in the body and having a third shoulder in each cavity located opposite the said pair of shoulders; and resilient contact prongs

carried respectively in said cavities, each prong comprising a folded metal strip having an inner end and a projecting portion intermediate the ends of the prong, the inner end of the prong engaging the pair of shoulders to support the prong against inward movement into the cord-receiving opening and the projecting portion of the prong engaging the third sholder in the cavity to prevent longitudinal shifting of the prong outwardly of the body, and the space between the pair of shoulders providing clearance for a lead wire attached to the prong to extend from said end portions of said strip.

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