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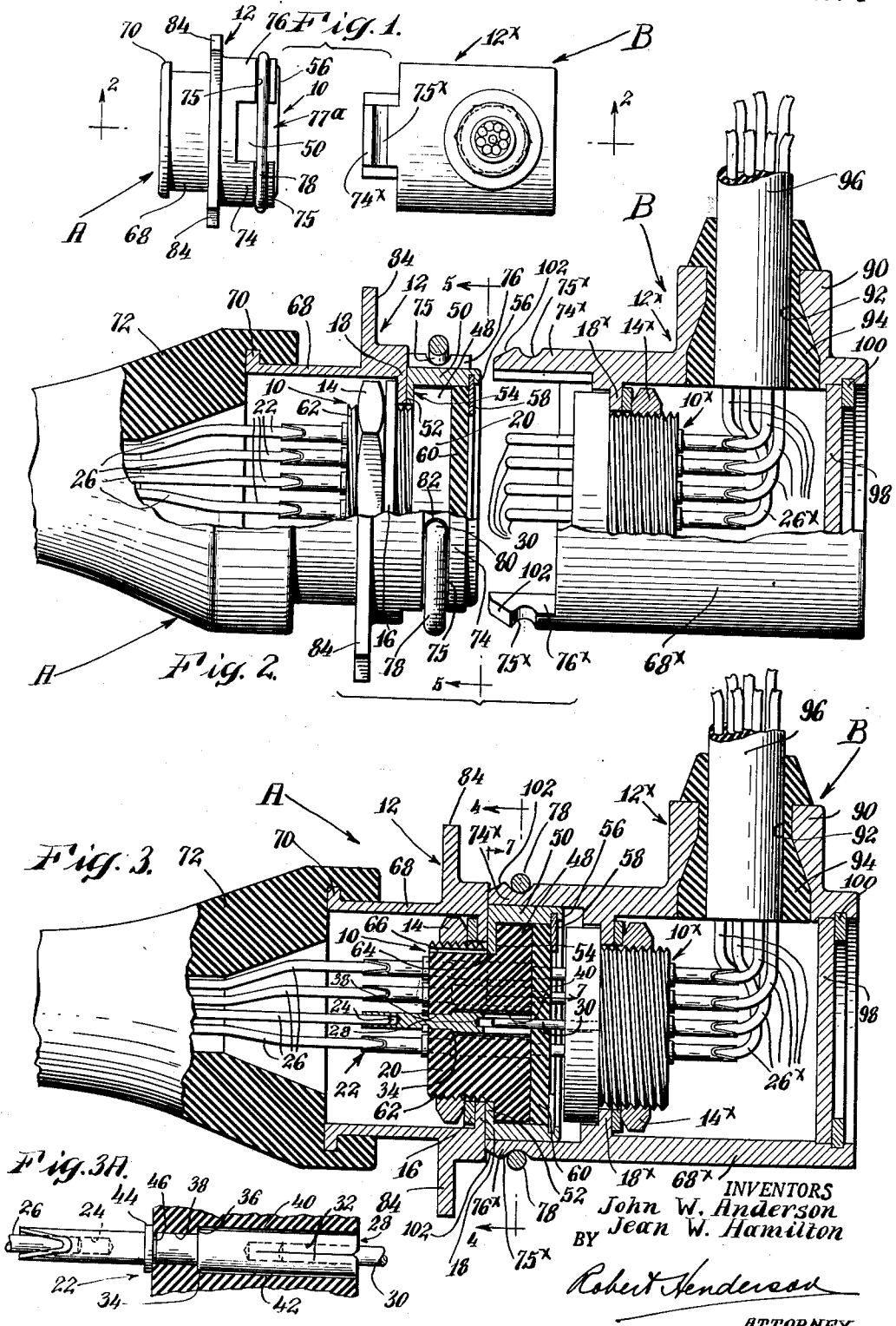
J. W. ANDERSON ET AL

2,677,811

QUICKLY DISCONNECTIBLE CONTACT PLUG ASSEMBLY

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2 Sheets-Sheet 1



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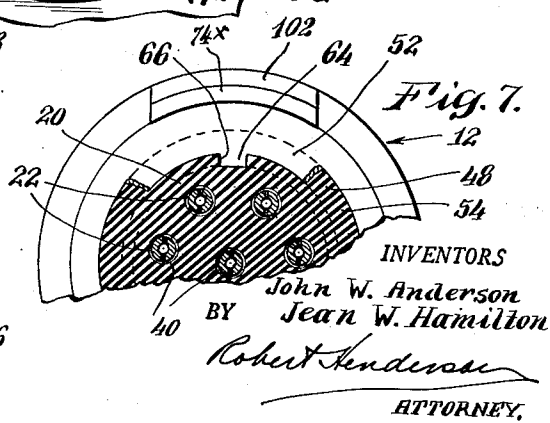
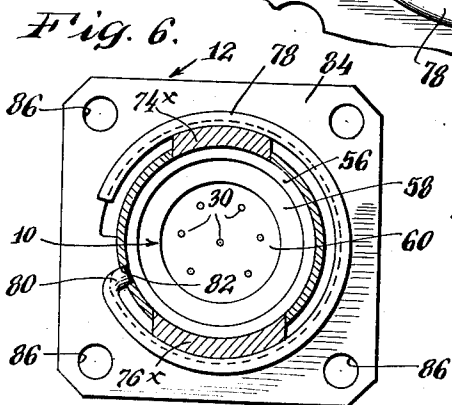
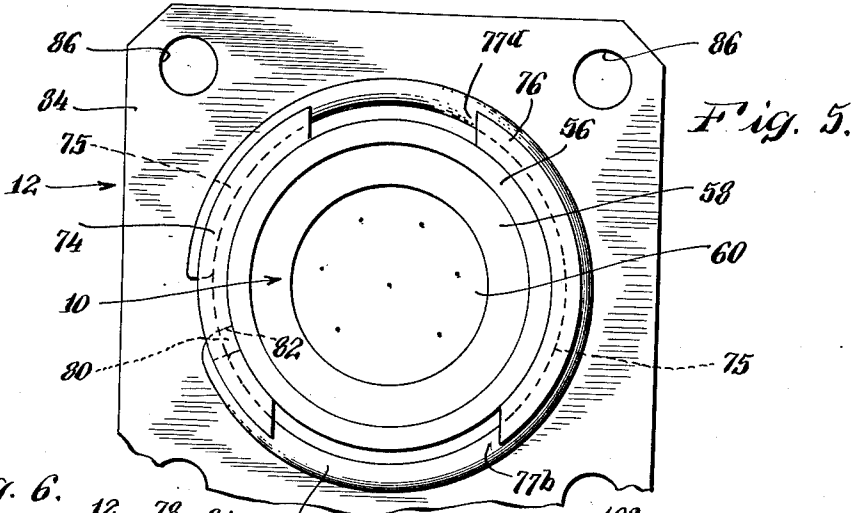
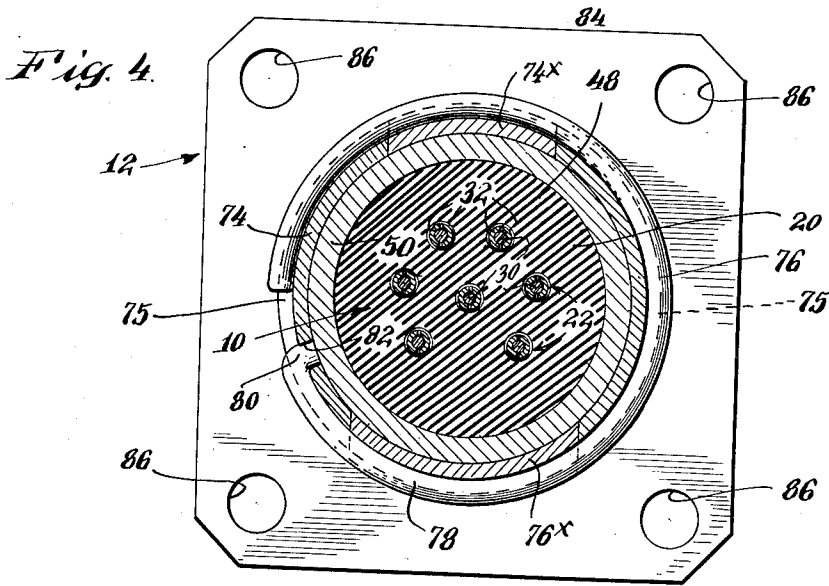
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QUICKLY DISCONNECTIBLE CONTACT PLUG ASSEMBLY

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2 Sheets-Sheet 2



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QUICKLY DISCONNECTIBLE CONTACT PLUG ASSEMBLY

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5 Claims. (Cl. 339-91)

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This invention relates to inter-connectible plugs by which plural wires in one cable can be readily connected with mating wires in another cable and more particularly relates to means by which such plugs may be connected and disconnected merely by being forcefully brought together axially or forcefully separated axially, the force required for such separation being sufficient to avoid unintentional separation.

Accordingly, an important object of this invention is the provision of a simple connection plug assembly in which mating plugs may be connected and disconnected merely by forceful axial movement of one of said plugs relatively to the other.

Another important object is the provision of such a plug arrangement in which two plugs are releasably held together by yieldable means which, however, will yield only to a relatively substantial axial plug-separating force.

Another important object is the provision of such a plug arrangement in which at least one plug has means for preventing ingress of dirt, water, etc. thereinto.

The foregoing and still other objects are accomplished by the present invention of which a preferred embodiment is shown for illustrative purposes in the accompanying drawings without, however, limiting the invention to that particular embodiment.

In the drawings:

Figure 1 is a side elevational view of a preferred embodiment of a quickly disconnectible plug assembly according to the present invention; two mating parts of said assembly being shown as separated.

Fig. 2 is an enlarged side view of the plug assembly according to Fig. 1, the parts thereof being 90° removed from their Fig. 1 positions, the lower part of this figure being in side elevation and the upper part being in axial section substantially on the line 2-2 of Fig. 1.

Fig. 3 is a full axial sectional view of the parts shown in Fig. 2 substantially on the line 2-2 of Fig. 1, said parts, however, being in their fully interconnected condition; and Fig. 3A is an enlarged fragment of Fig. 3.

Fig. 4 is a transverse sectional view on the line 4-4 of Fig. 3.

Fig. 5 is an end view of one of the mating parts of the assembly as viewed from the line 5-5 of Fig. 2.

Fig. 6 is a reduced scale view somewhat similar to Fig. 4 except that expansible locking means are shown in their condition as when the two mating parts are only partially interconnected.

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Fig. 7 is a fragmentary transverse sectional view on the line 7-7 of Fig. 3.

The disclosed contact plug assembly, as best seen in Figs. 1-3 inclusive, comprises two mating connection plugs A and B. Plug A comprises a female connector, subordinate or sub-assembly 10 clamped in place within a metal shell 12 by a nut 14 which, with an intervening lock washer 16, securely holds the said assembly in place against an internal annular flange 18 of said shell.

The sub-assembly 10 comprises an internal, generally cylindrical body 20 of relatively hard, molded dielectric material into which are fixed a plurality of similar axially extending female contacts 22 preferably formed of somewhat resilient, conductive metal. Each of these contacts has a hollowed inner end 24 into which the stripped end of a wire 26 is soldered and a hollowed contact-pin-receiving outer end 28 which is longitudinally slitted to render the latter end slightly expansible to receive therewithin a contact pin 30 of a mating connection plug. The resiliency of the metal of which the contact 22 is formed assures a firm grasp of the pin 30 by said contact to maintain a highly efficient electrical connection therebetween. If desired the longitudinal slitting of the contact 22 may be such as to form plural resilient contact fingers 32 (Fig. 4) to connect with the pin 30.

The outer end 28 of the contact 22 is at least slightly larger in diameter than the latter's inner end, this enlargement being defined at its inner end by an annular shoulder 34. The said contact is disposed within an axial aperture in the dielectric body 20, which aperture is internally shouldered as at 36, dividing the aperture into a small diameter inner end 38 within which the inner end 24 of the contact fits quite accurately and a larger diameter outer end 40 into which the outer end 28 of the contact is disposed with an annular clearance 42 preferably only sufficient to enable the outer end 28 of the contact to expand slightly upon receiving contact pin 30. The shoulder 34 of the contact seats against shoulder 36 thereby limiting the contact 22 to leftward movement (as viewed in the drawings) and a snap ring 44 seats within an external annular groove 46 in the contact 22 and abuts against the inner end face of the dielectric body 20 to prevent any axial movement of the contact within said body. As thus disposed, the outer end of the contact 22 preferably is flush with the outer end face of the dielectric body.

The dielectric body 20 has a relatively large

diameter outer end 48 enclosed by an annular, metal subshell 50 which has a radial flange 52 at its inner end extending inwardly and overlying a shoulder 54 of the dielectric body 20. The free outer marginal portion 56 of the subshell is somewhat reduced in thickness and rolled or swaged in to hold a washer 58 in contact with a marginal portion of a relatively thick disc 60 which, preferably, is formed of soft gum-like, dielectric material such as might be quite easily pierced as hereinafter explained.

The inner end of the dielectric body is of reduced diameter and is threaded as at 62 to receive the nut 14. When the latter is tightened, the lock washer 16 abuts the left or inner face of the flange 18 while the outer surface of said flange is in abutting relationship with the sub-shell's flange 52 to hold the sub-assembly 10 firmly within the shell 12. As best seen in Fig. 7, the shell's inner flange 18 is formed with a tongue 64 which extends into an axial groove 66 formed in the threaded portion 62 of the dielectric body to prevent angular movement of the sub-assembly 10 relatively to the shell 12.

The shell 12 is formed with a complete, cylindrical flange 68 which surrounds the inner ends of contacts 22 and is spaced substantially from the latter. The inner edge of the flange 68 is flanged outwardly as at 70 and a protective grommet 72 of soft rubber or other suitable material is shaped internally to conform to and extend about the inner end of the flange 68. The grommet also surrounds and protects the wires 26 and extends tightly about a covering (not shown) which binds together and insulates said wires as a single cable.

The outer end of the shell 12 is formed as an integral, partly cylindrical flange which is thus characterized because it is cut away at diametrically opposite points to give it the character of two opposite, axially extending tongues 74, 76 which, as viewed from their ends, appear as opposite arcuate flanges defining parts of a cylinder and defining between them opposite flange-breaches 77a, 77b which are at least slightly different in size. The tongues 74, 76 are formed with co-planar circumferential grooves 75 within which is disposed a part-circular, wire, contractile spring 78, one end 80 of which is turned in and seats within a recess 82 in flange 74 to constrain it against bodily dislodgment from said grooves. The shell 12 is formed with an external mounting flange 84 with bolt holes 86 therein to permit the entire sub-assembly 10 to be mounted upon a panel, junction box wall or the like.

A male plug B designed to be connected to the female plug A may be a straight connector or an elbow connector as shown in the drawings. The plug B is very similar to plug A and, in the following description, the reference characters applied to similar parts of plug B are formed by adding x to the characters applied to corresponding parts of plug A. Plug B has a connector sub-assembly 10x, secured within a shell 12x which has a cylindrical flange 68x and an inner annular flange 18x to which the assembly 10x is fastened. Plug B differs from plug A chiefly in that the contacts are pins 30 which, when the two plugs are interconnected, telescope into contacts 22 to effect connections therewith; and sub-assembly 10x does not have a part comparable to the soft rubber-like disc 60.

The shell 12x is given the character of an elbow or angle connection by having a collar 90, integral with flange 68x, defining a cable aperture

92, lined with a grommet 94 through which a cable 96 extends into the shell to enable wires 26x to be connected to the inner ends of the contact pins 30. The outer end of flange 68x is closed by a removable disc or plate 98 held in place by a snap ring 100. The plate 98 may be temporarily removed to facilitate association of the cable 96 with the plug and to give access to the nut 14x to permit tightening of the sub-assembly 10x in place in the shell.

The shell 12x at its outer end has a partly cylindrical flange in the form of two axially extending tongues 74x and 76x which, when the two plugs A and B are interconnected as in Fig. 3, fit complementally between the tongues 74 and 76 of plug A to form, with the latter tongues, a complete cylindrical flange which is substantially encircled by the contractile spring 78. The tongues 74x and 76x have external, circumferential grooves 75x which, when the two plugs A and B are in fully interconnected relation, are coplanar with grooves 75. Thus the contractile spring 78, seated in the grooves 75 and 75x, serves to hold the two plugs together against becoming accidentally disconnected.

As the tongues 74x and 76x are slightly different in size, corresponding to the different sizes of the breaches 77a and 77b, it follows that the two plugs can be pushed axially together to interconnect them in only one angular relationship. This, together with the fact that the sub-assemblies 10 and 10x are held against rotation within their respective shells, assures that the two plugs can be connected only with the contact pins 30 in proper connection relationship with the contacts 22 with which they are intended to mate.

The tongues 74x and 76x are outwardly beveled at their free ends as at 102 to enable said tongues to function as wedges to expand the spring 78 slightly so that they may move axially into position between tongues 74 and 76. When they reach the latter position, the spring, by its inherent resiliency, drops into the grooves 75 and 75x to lock the two plugs together. The depth of the grooves 75x and the contour of the walls thereof preferably are such as to enable the latter to exert a wedging effect to expand the spring 78 slightly to permit separation of the two plugs. The grooves 75, on the other hand, are relatively deep and their walls connect so abruptly with the outer surfaces of the tongues 74 and 76 that movement of the tongues 74x and 76x to and from fully connected positions does not cause the spring to become fully dislodged from said grooves. Ordinarily, it has been found satisfactory to so relate the dimensions and contours of the beveled surfaces 102 and grooves 75x and the size and strength of spring 78, that a force of not more than 20 lbs. suffices to push the plugs into their connected relationship and a force of not less than 10 lbs. is required to pull them apart.

The disc 60, preferably, is imperforate when originally installed but the first interconnection of plugs A and B will cause the contact pins 30 to push through the said disc, thence, into the contacts 22. This affords an indication of the softness and penetrability considered to be desirable for the material of which the disc is formed. The disc, of course, may possess different characteristics if desired, in which event suitable perforations to receive the contact pins 30 may have to be formed therein before assembly of the disc in the device. If the stated preferred characteristics of the disc 60 are present,

the perforations therein are precisely positioned and substantially close upon withdrawal of the pins 30, thereby excluding dirt and dust from the contacts 22; also, the disc exerts a wiping or cleaning effect upon the contact pins 30 as the latter pass through the disc, thereby assuring a clean and efficient electrical connection at the contacts.

It should be apparent that the improvements disclosed and described herein are such as to yield the hereinbefore stated objects; also that the inventive concept may be embodied in other structures without departing from the invention as set forth in the following claims.

What we claim is:

1. A connection plug assembly comprising a pair of axially associable plugs having rigid outer shells and axially interconnectible electrical contacts carried in said plugs, said shells comprising alternately interdisposable coaxial tongues of similar inside and outside diameters having circumferentially extending grooves which are in circumferential alignment when said contacts are interconnected, and a resilient ring adapted to seat in said grooves to hold the two shells together.

2. A connection plug assembly comprising a pair of axially associable plugs having rigid outer shells and axially interconnectible electrical contacts carried in said plugs, said shells comprising circumferentially complementary coaxial tongues of similar inside and outside diameters having circumferentially extending, external grooves which are in circumferential alignment when said contacts are interconnected, and a resilient ring in said grooves of one shell and adapted to expand to permit relative axial movement of the tongues of the two shells to bring said grooves into and out of circumferential alignment and to contract into said grooves, when the latter are thus aligned, to hold the two shells together.

3. A connection plug assembly according to

claim 2, the said tongues of each shell being spaced apart, the spaces between tongues of one shell being non-uniform in circumferential dimension, and the tongues of the other shell being similarly non-uniform in circumferential dimension whereby to prevent interassociation of the two shells in any except a single angular relationship.

4. A connection plug assembly according to claim 2, the said electrical contacts in one plug being sleeves and the contacts in the other plug being elongate cylindrical pins adapted to extend axially into said sleeves with a snug fit, and the assembly, further, including a flat transverse disc of soft, gum-like, dielectric material overlying and in axial-support-deriving association with the outer ends of said sleeves and adapted to be penetrated by said pins and to embrace the latter intimately and wipe them, over substantial parts of their lengths, when the contacts of the two plugs are interconnected.

5. A connection plug assembly according to claim 4, the plug with the sleeve contacts therein having said disc associated therewith as a sub-assembly which is removable as a unit from its related shell, and the said sub-assembly comprising unifying means having radially inwardly extending flanges overlying opposite marginal face portions of said plug and disc to hold the two latter together.

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