

Nov. 30, 1948.

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2,454,838

PLUG ASSEMBLY

Filed April 24, 1943

Fig. 1.

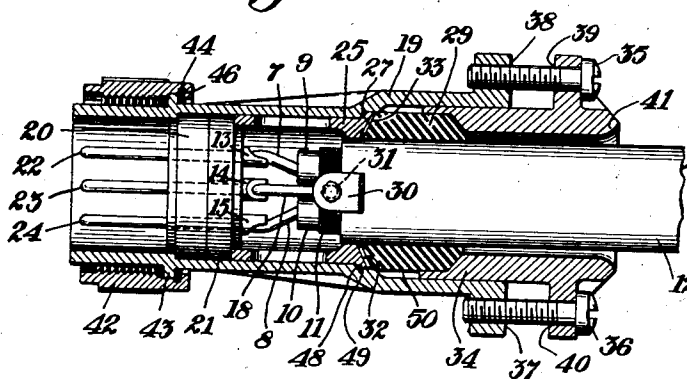


Fig. 2.

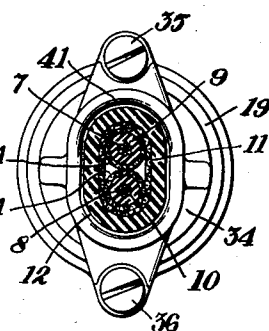


Fig. 3.

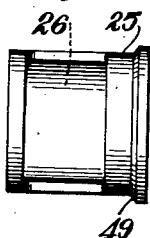


Fig. 5.

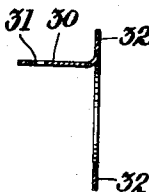


Fig. 4.

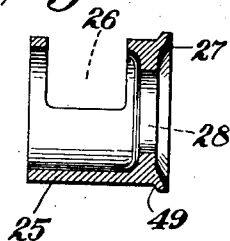
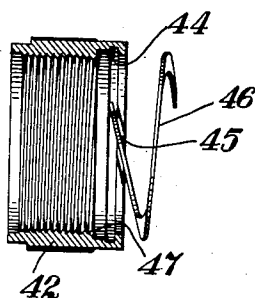


Fig. 6.



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2,454,838

PLUG ASSEMBLY

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Application April 24, 1943, Serial No. 484,366

3 Claims. (Cl. 173-361)

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Our invention relates to a plug assembly for electric cables.

When an electric cable, such as one for carrying high-frequency currents, is connected by means of a plug to a receptacle, it is desirable to provide for the waterproofing of the connections between the conductors of the cable at its extremity and the plug terminals. It is also advantageous to design the plug assembly so that ready access to and inspection of such connections may be made with a minimum of tools.

The present invention has as an object, therefore, the provision of means for accomplishing the above results in an improved manner.

Another object of the invention is to provide a plug assembly designed so as to obviate the tendency of conventional plugs to break connections due to a twist of the cable.

A further object of the invention is to provide a method of attaching the retaining nut to the plug body in a non-separable manner.

The invention still further includes an improved method of grounding the cable to the plug body.

Other objects and advantages of the invention will be apparent from the following description of one embodiment of the invention and from the drawings, in which:

Fig. 1 is a view, partly in section, of a preferred embodiment of the present invention;

Fig. 2 is an end view of Fig. 1;

Fig. 3 is a plan view of one of the parts of Fig. 1;

Fig. 4 is a side sectional view of Fig. 3;

Fig. 5 is a side view of another of the parts of Fig. 1;

Fig. 6 is a side view, partly in section, of two other parts of Fig. 1.

In Fig. 1 is shown a partly sectional view of a plug assembly for an electrical cable in accordance with the present invention. A cable A is provided with a pair of spaced conductors 7 and 8 respectively surrounded by individual insulating coverings 9 and 10, which in turn, may be surrounded by separate metal sheaths 9A and 10A (Fig. 2). Over these separate sheaths 9A and 10A is a common outer sheath 11 which may be formed of copper braid, while an outer insulating covering 12 encloses the sheath 11. The entire cable construction is thus of a more or less conventional type, and it is to be understood that the invention

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is not limited to this or any other particular type of cable.

A tubular body 19 is also shown in Fig. 1 enclosing an extremity of the cable A. A disc 21 of a suitable insulating material with three prongs 22, 23 and 24 in spaced apart relation therein is positioned removably in the body 19. A second insulating disc 20 has three openings therein to receive prongs 22, 23 and 24, and slides over such prongs to set face to face with disc 21 as shown.

The prongs 22, 23 and 24 are respectively provided with terminals 13, 14 and 15 on the inner face of disc 21. Terminal 13 is joined by means such as soldering to conductor 7 of cable A. Terminal 15 is joined to conductor 8. Terminal 14 is joined, preferably by soldering, to the outer sheath 11 of cable A by a connecting wire 18.

Partly enclosing the exposed conductors 7 and 8 and the connecting wire 18, and adjacent the disc 21, is an insert retainer sleeve 25 having a cut-out portion 26 in the outer surface thereof to allow for inspection of or access to the connections between the cable conductors and the prong terminals. This cut-out portion may best be seen by referring to Figs. 3 and 4 which show detailed views of the insert retainer sleeve 25.

A central opening 28 (Fig. 4) in retainer sleeve 25 allows for insertion therein of cable A, this opening having a shape corresponding to the cross-sectional shape of cable A. A sloping shoulder 27 is formed on retainer sleeve 25 as shown in Fig. 4.

A ring-shaped sleeve 29 of rubber or other resilient material encircles the cable A and adjoins a portion of insert retainer sleeve 25. A sloping section 33 of the outer surface of sleeve 29 is designed for parallel relationship with shoulder 27 of insert retainer sleeve 25 as shown in Fig. 1.

Between the shoulder 27 of insert retainer sleeve 25 and the sloping section 33 of resilient sleeve 29 is positioned a grounding ferrule also shown in Fig. 5. This ferrule comprises a ring-shaped disc 32 of conducting material such as copper and has an inwardly-extending tongue-shaped portion 30 bent at right angles to the plane of disc 32, the tongue 30 thus being substantially parallel to the axis of cable A. The tongue 30 is also designed to lie flat on the surface of cable A, and an opening 31 in tongue 30 permits soldering or other connection of tongue 30 to sheath 11 as shown in Fig.

1. Since one face of ring-shaped disc 32 constituting the grounding ferrule lies flat against the shoulder 27 of insert retainer sleeve 25, it will be seen that an electrical connection is established between sheath 11 of cable A and the insert retainer sleeve 25. Since such sleeve 25 as well as body 19 is formed of conductive material, it follows that the cable shielding is effectively grounded to the body of the plug assembly.

A compression sleeve 34 is inserted part way into body 19 so as to contact resilient sleeve 29 as shown in Fig. 1. An end view of this compression sleeve may be seen in Fig. 2. Two threaded openings 37 and 38 are formed in an extending portion of body 19, and two openings 39 and 40 are formed in oppositely-disposed portions of compression sleeve 34. Bolts 35 and 36 are designed for insertion in these openings as shown in Fig. 1.

In assembling the plug, the cover 12 of cable A is cut back to expose the common braided sheath 11. The common sheath 11 (and the individual conductor sheaths 9A and 10A) are then cut back to expose the individual insulating coverings 9 and 10, which are in turn partly removed so as to expose the conductors 7 and 8. Compression sleeve 34 containing bolts 35 and 36 is slipped over the end of the cable, as is also resilient member 29, grounding ferrule 32, and insert retainer sleeve 25, these parts being properly positioned relative to each other. The insulating disc 21 (with the terminals 13, 14 and 15, as well as the prongs 22, 23 and 24 already securely positioned therein) is then brought up. The cable conductor 7 is soldered to terminal 13, conductor 8 is soldered to terminal 15, and connecting wire 18 is soldered to both terminal 14 and sheath 11.

When these connections are completed, insert retainer sleeve 25 is drawn back to partly enclose the connections, followed by the grounding ferrule 32, the resilient member 29, and the compression sleeve 34. The opening 31 in tongue 30 of grounding ferrule 32 now permits the tongue 30 to be soldered through opening 26 to the sheath 11.

Insulating disc 20 is now slipped over the prongs 22, 23 and 24, and the above assembly inserted in body 19. A shoulder 48 on the inner wall of body 19 contacts shoulder 49 on insert retainer sleeve 25 and limits the extent of movement of the sleeve into the body. Bolts 35 and 36 are inserted in openings 38 and 37, respectively, and a tightening of those bolts results in a compression of resilient member 29 between insert retainer sleeve 25 and compression sleeve 34. (The presence of grounding ferrule 32 does not interfere with this operation.) This pressure on resilient member 29 results in a tight union between such member and all points of its enclosure, rendering the cable end of the plug assembly substantially waterproof. An opening 50 between the resilient member 29 and the inner wall of body 19 allows for distortion of the resilient member due to action of compression sleeve 34.

As hereinbefore explained, the opening or window 26 in retainer sleeve 25 permits ready inspection of or access to the soldered connections. Grounding ferrule 32 grounds sheath 11 of cable A to body 19 through retainer sleeve 25.

Compression sleeve 34 is provided with an extending portion 41 which extends away from the body 19 of the plug assembly. This extending portion 41 is designed to loosely encircle the

cable covering 12, and any twisting or bending of cable A at a point removed from the plug assembly will be transmitted to and resisted by such extending portion 41 rather than the body 19. This design tends to substantially reduce the possibility of breakage or damage to the soldered connections between the conductors of cable A and the plug terminals.

The method of inserting the plug assembly into a receptacle of conventional type will not be discussed here. However, the invention does provide for a novel method of associating the engaging nut 42 with the body 19 in a non-separable manner.

As best shown in Fig. 6, engaging nut 42 has an annular slot 44 on the inner surface thereof. An opening 45 is formed in one side of this slot 44. A retaining ring 46 is split as shown in Fig. 6 and designed to be insertable through opening 45 into slot 44, by the method of placing one end of the ring into the opening and then feeding the ring into the opening until the other end of the ring snaps into place in the slot to remain permanently therein.

The outer surface of body 19 has a circular ridge 43 shown in Fig. 1. The engaging nut 42 is placed over the end of the body until ridge 43 contacts a shoulder 47 (Fig. 6) on the inner surface of engaging nut 42. (In use, a gasket is placed between ridge 43 and shoulder 47 so as to render this end of the plug assembly waterproof). When the retaining ring 46 is in place in slot 44 it rotatably positions nut 42 on body 19, but prevents a subsequent removal of the nut.

While we have described above the principles of our invention in connection with specific apparatus, and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of our invention as set forth in the objects of our invention and the accompanying claims.

We claim:

1. In a plug assembly for the extremity of an electric cable having one or more conductors, the combination of a tubular body to receive the end of said cable, a disc-shaped insert of insulating material disposed in said tubular body, a plurality of prongs positioned on one face of said disc-shaped insert, each of said prongs having a terminal on the opposite face of said insert, means forming electrical connections within said body between said terminals, respectively, and the conductors of said cable, an insert retainer sleeve within said body, adjacent said disc-shaped insert, a ring-shaped resilient member within said body, adjacent said retainer sleeve, and around said cable, a compression sleeve partially within said body, adjacent said resilient member, and around said cable, and tightening means on the exterior of said body and said compression sleeve, whereby operation of said tightening means will tend to compress said resilient member between said compression sleeve and said retainer sleeve.

2. The plug assembly defined in claim 1, wherein said cable is equipped with a grounding sheath enclosing said conductors, in combination with a grounding ferrule disposed between said insert retainer sleeve and said ring-shaped resilient member, said ferrule being electrically joined within said retainer sleeve to said sheath so as to ground said sheath to said retainer sleeve.

3. The plug assembly defined in claim 1, wherein said insert retainer sleeve has a cut-out por-

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tion permitting access to and inspection of said electrical connections without altering the position of said retainer sleeve with respect to said cable.

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