Dec. 22, 1931. G. P. McGRAW 1,837,723

METHOD OF MANUFACTURING ELECTRICAL CONNECTING PLUGS

Filed June 12, 1928

Fig. 1.

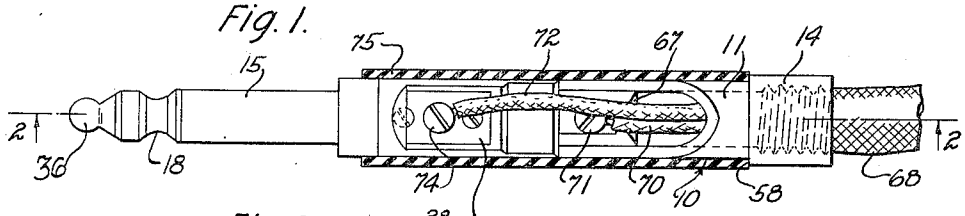


Fig. 2.

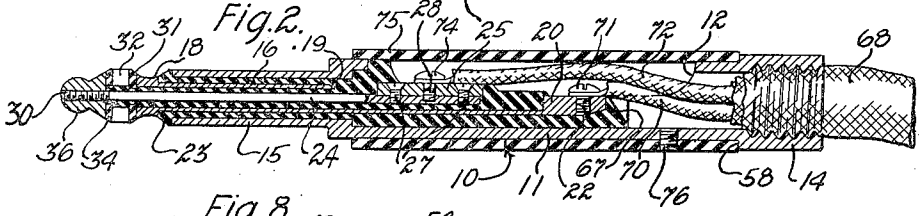


Fig. 8.

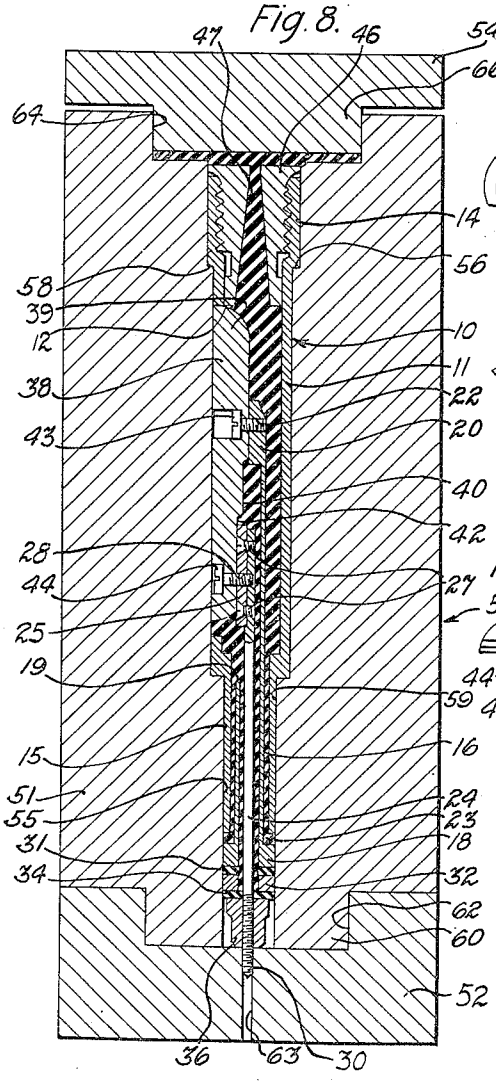


Fig. 3.

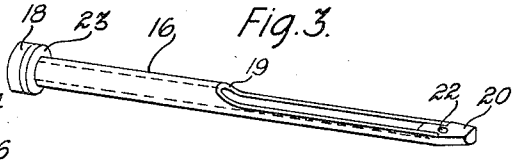


Fig. 4.

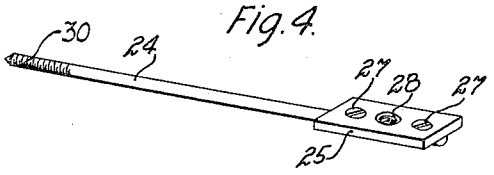


Fig. 6.

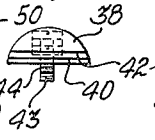


Fig. 5.

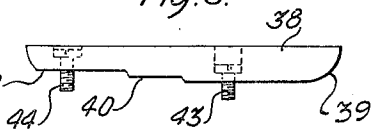
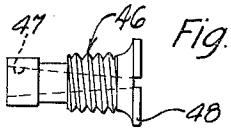


Fig. 7.



Inventor
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by H. A. Patterson Atty.

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UNITED STATES PATENT OFFICE

GEORGE POLLOCK McGRAW, OF DOWNERS GROVE, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

METHOD OF MANUFACTURING ELECTRICAL CONNECTING PLUGS

Application filed June 12, 1928. Serial No. 284,851.

This invention relates to a method of manufacturing electrical connecting plugs and has as its object the provision of an effective, economical and expeditious method for constructing this type of apparatus.

In a method embodying the invention the partially formed metal parts of the connecting plug which are to be electrically insulated from each other are first loosely assembled and the plug is then placed in a die which conforms to the shape thereof and which serves to predeterminedly position certain of the loosely assembled parts. Insulating material, such as a synthetic resin or a rubber compound in a plastic state, is then inserted into the plug from one end thereof so that the insulating material will fill all the interstices between the metal parts and no side pressure is exerted on the metal parts to force any of them out of their predetermined positions. Pressure is applied to the insulating material and the die is heated in any well known manner to cure the insulating material. The molded insulator is then allowed to cool and harden and the plug is removed from the die, after which the shaping of the assembled plug is completed.

It is believed that a clear understanding of the invention may be had by reference to the following description taken in conjunction with the accompanying drawings, showing a device by means of which the method embodying the invention may be practiced and an article resulting from practicing that method, and in which,

Fig. 1 is a plan view of a three conductor electrical connecting plug, the outer insulating cover of which is shown in section;

Fig. 2 is a longitudinal sectional view thereof taken on the line 2—2 of Fig. 1 looking in the direction indicated by the arrows;

Fig. 3 is a perspective view of a partially shaped conductor or connector which forms a part of the plug;

Fig. 4 is a perspective view of another partially shaped conductor or connector which forms another part of the plug;

Fig. 5 is a side view of a part temporarily attached to the plug to mold the insulating material to the desired shape;

Fig. 6 is an end view of the part shown in Fig. 5;

Fig. 7 is a side view of another temporary part through which the plastic insulating material is forced into the plug, and,

Fig. 8 is a longitudinal sectional view of a die block in which the partially assembled plug is placed and which is employed during one of the steps of the method.

The accompanying drawings, in which like reference characters represent the same parts in the various views, illustrate a completed connecting plug made in accordance with one method embodying the invention and shows several of the steps performed in practicing that method. In the practice of the method, a tubular metal casing designated generally by the numeral 10 is formed with a central portion 11 a portion of which is cut away as shown at 12, an end portion 14 of increased diameter and an end portion 15 at the other end thereof of reduced diameter. A second tubular member 16 (Fig. 3) is formed having an enlarged collar 18 and having a part thereof cut away as shown at 19. A small plug 20 having a tapped hole 22 is fixed in the end of the member 16, and a disk 23 of insulating material which fits tightly on the tubular member 16 is slipped on the tube and brought into contact with the collar 18, as is shown in Fig. 3. The tubular member 16 with the disk 23 thereon is next inserted into the casing 10 from the left end thereof until the disk 23 abuts the end of the tubular portion 15 (Figs. 2 and 8).

A rod 24 having one end thereof threaded as shown at 30 and a rectangular plate 25 provided with a threaded aperture 28, which is affixed by screws 27—27 to the end opposite the threaded end thereof, is then inserted into the tubular member 16 from the right end thereof, as shown in Figs. 1 and 2, so that the threaded part 30 will project beyond the left end of the tubular member 16. A disk 31 of insulating material, a metal disk 32 and a second disk 34 of insulating material whose outer diameters correspond to the outer diameters of the reduced end portion 15 of the casing 10, the disk 23 and the collar 18 and whose inner diameter are slightly larg-

er than the diameter of the rod 24 are placed thereon in the order named and loosely held in place by a partially formed tip 36 threaded on the rod 24.

A partially cylindrical metal piece 38, having a part thereof shaped as shown at 39 to conform to the shape of the cutaway part 12 of the casing 10 and having steps 40 and 42 of predetermined shape cut in the other end thereof, is positioned adjacent the casing 10, as shown in Fig. 8 by means of screws 43 and 44 which are threaded into the tapped holes 22 and 28 in the plug 20 and the plate 25, respectively, thereby serving to position the terminal ends 20 and 25 of the members 16 and 24 respectively within the casing 10. A plug 46, having a conical bore 47 therethrough and having a raised portion 48 which may be grasped by a wrench, is threaded into the end portion 14 of the casing 10 to form the plastic insulator so that any excess thereof may be easily removed from the plug and to protect the threads in the end portion 14.

The partially formed plug is next inserted in a die, designated generally by the numeral 50, comprising a main body portion 51 and end portions 52 and 54, which may be heated in any well known manner. The body portion 51 has a cylindrical bore 55 therethrough which conforms substantially to the shape of the plug, having at the upper end thereof, as shown in Fig. 8 a diameter slightly larger than the outer diameter of the end portion 14 of the casing 10, then reduced sharply to conform substantially to the diameter of the main body 11 of the casing 10. A shoulder 56 is thus formed upon which a shoulder 58 formed on the casing 10 by the reduction in diameter thereof may rest. The bore 55 is again gradually reduced in diameter as shown at 59 until it conforms to the outer diameters of the end portion 15 of the casing 10 and the disks 31, 32 and 34, and serves to position these disks. The length of the main portion 51 of the die from the shoulder 56 to the lower extremity corresponds to the length of the partially completed plug from the shoulder 58 to the outer end of the threaded member 36. The main portion 51 of the die has a projecting portion 60 which closely fits in a depression 62 in the end portion 52, in which end portion is formed a cylindrical bore 63 in alignment with the bore 55 in the body portion 51 and of a diameter corresponding to the diameter of the rod 24, the end 30 of which projects into the bore 63 and is thus positioned.

A supply of insulating material, such as synthetic resin or rubber compound in a plastic condition, is next placed in a cylinder 64 formed in the top of the main portion 51 of the die 50 and forced into the partially assembled plug through the threaded plug 46 by a plunger 66 formed on the end portion 54 which may be actuated by suitable mechanism (not shown). This will cause the plastic insulator to fill all the spaces between the metal elements of the plug and to be cured therein so as to insulate the metal parts from each other. After the insulating material has been cured and allowed to harden, the end portions 52 and 54 are removed from the body portion 51 and the plug is removed from the die by tapping the portion 30 which projects from the end of the portion 60 of the die. The plug 46 is removed from the end of the casing 10 (Fig. 8), and the metal piece 38 is removed from the plug 20 and the plate 25. The plug is then shaped to the desired form as shown in Fig. 1 where the tip portion 36 is machined to conform substantially to the shape of a ball positioned on the end of a cone, the collar 18 is shaped with an annular groove therein, and the excess insulating material is removed at 67.

In the completed plug the tip portion 36 will form what is called the "tip" connector, the collar 18, the "ring" connector and the portion 15, the "sleeve" connector. The completed plug connectors may now be connected to electrical conductors in the following manner: A cable 68 is provided comprising three conductors, one of which is connected to the sleeve connector, one to the ring connector, and one to the tip connector. The conductor to be connected to the sleeve connector is scraped bare of insulation for a short distance and then bent back over the outer covering of the cable and the cable is threaded into the enlarged portion 14 of the plug, thereby making the connection between one of the conductors and the sleeve connector through the tubular portion 11 of the plug 10. A second conductor 70 is connected to the ring connector by means of a screw 71 threaded into the hole 22 in the plug 20 fixed in the end of the tubular portion 16 on which the ring connector 18 is formed. The third conductor designated 72 is attached to the tip connector 36 by means of a screw 74 threaded in the threaded aperture 28 of the plate 25 and through the rod 24 to the tip connector 36. A tubular member 75 of insulating material is slipped on the plug (Figs. 1 and 2) and held in place by a set screw 76 to insulate the uncovered portions of the conductors.

What is claimed is:

1. A method of producing an electrical connecting plug, which consists in partially forming the electrical connecting elements thereof, assembling said electrical connecting elements, molding an insulating material in the plug to insulate each of the electrical connecting elements from all of the other electrical connecting elements, and completing the shaping of the assembled plug.

2. A method of producing an electrical connecting plug, which consists in assem-

bling partially completed parts thereof, introducing molding material into the plug from one end thereof applying pressure longitudinally of the plug to force the insulating material between elements thereof, and completing the shaping of the parts.

3. A method of manufacturing electrical connecting plugs, which consists in assembling partially completed parts, introducing molding material into the plug from the end thereof, subjecting the molding material to pressure to force it to the other end of the plug, and shaping the parts to their proper dimensions.

4. A method of producing an electrical connecting plug, which consists in positioning parts thereof in predetermined relation, and insulating the parts by forcing insulating material longitudinally thereof.

5. A method of producing an electrical connecting plug, which consists in assembling partially formed electrical connecting elements thereof with insulating material therebetween, and shaping the unformed electrical connecting elements to the desired shape.

6. A method of producing an electrical connecting plug, which consists in assembling partially completed parts thereof, forcing insulating material therebetween from one end of the plug, and shaping the unformed portions to the desired shape.

7. A method of producing an electrical connecting plug, which consists in positioning parts thereof in predetermined spaced relation so as to provide an opening in one end of the plug, and forcing moldable insulating material through the open end of the plug to insulate the parts from each other.

8. A method of producing an electrical connecting plug, which consists in positioning parts thereof in predetermined relation, and forcing insulating material therebetween from one end thereof.

9. A method of producing an electrical connecting plug, which consists in positioning parts thereof in predetermined relation, insulating the parts by forcing insulating material longitudinally thereof, and curing the insulating material in the plug.

10. A method of producing an electrical connecting plug, which consists in positioning partially completed parts thereof in predetermined spaced relation so as to provide an opening in one end of the plug, insulating the parts by forcing insulating material longitudinally thereof, curing the insulating material within the plug, and shaping the unformed portions of the plug to the desired shape.

11. A method of forming a connecting plug, which consists in assembling a plurality of partially formed connecting elements and insulating members in predetermined spaced relation, forcing insulating material longitudinally of the elements to complete the insulation of the elements from each other and to secure the elements in a predetermined position, and shaping the elements and the members to the desired shape.

12. A method of forming a connecting plug, which consists in assembling a plurality of partially formed cylindrical connecting elements one within the other, forcing insulating material longitudinally of the elements to insulate them from each other, and shaping the elements and material to the desired shape.

13. A method of forming a connecting plug, which consists in assembling a plurality of connecting elements comprising contacting portions and connecting portions, insulating the connecting portions from each other solely by forcing insulating material longitudinally of the elements, and completing the shaping of the assembled plug.

In witness whereof, I hereunto subscribe my name this 31st day of May A. D., 1928.

GEORGE POLLOCK McGRAW.