July 2, 1940. G. B. BENANDER 2,206,714

METHOD OF MAKING ATTACHMENT CAPS

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Fig. 1.

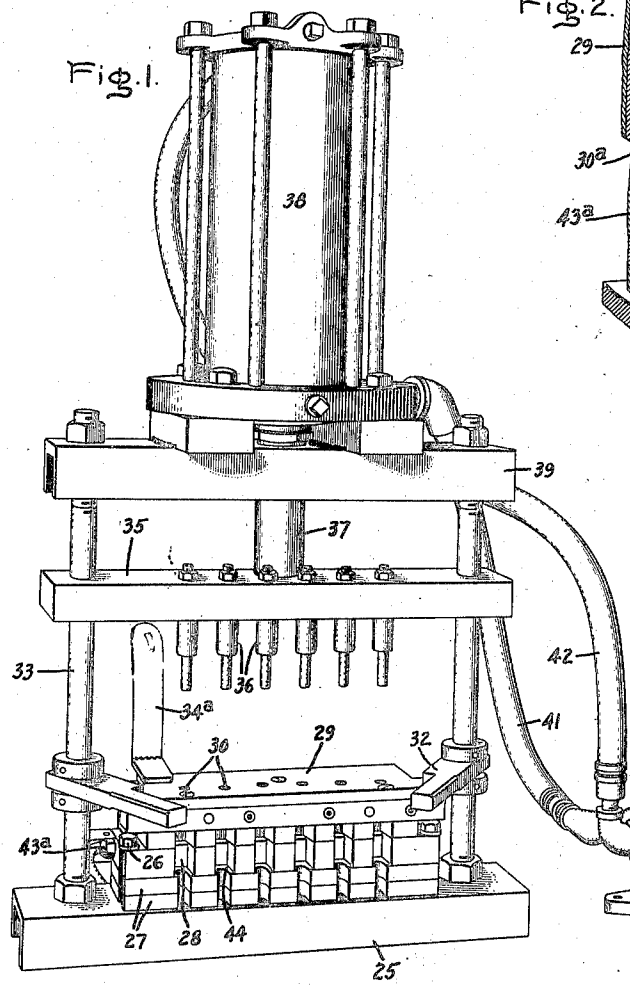


Fig. 2.

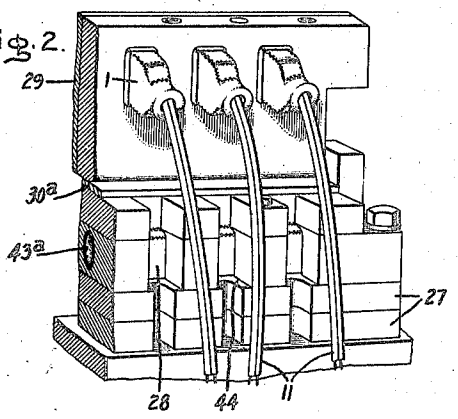


Fig. 3.

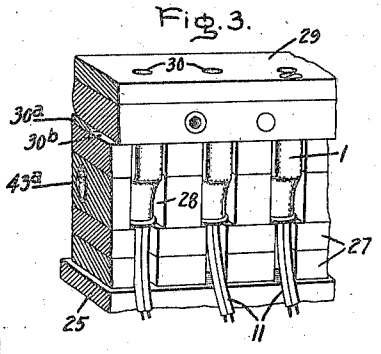


Fig. 4.

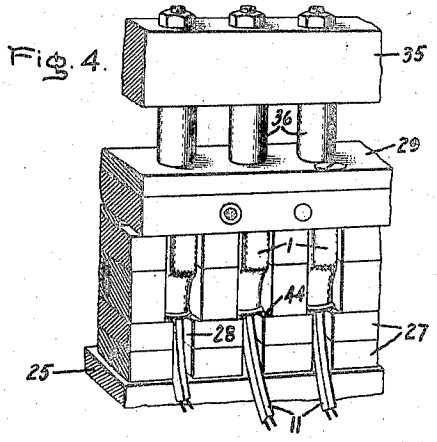
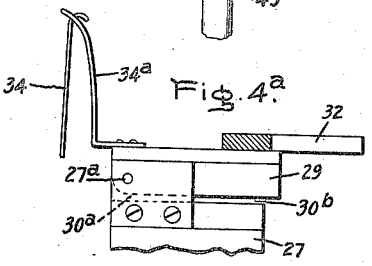


Fig. 4a.



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Fig. 5.

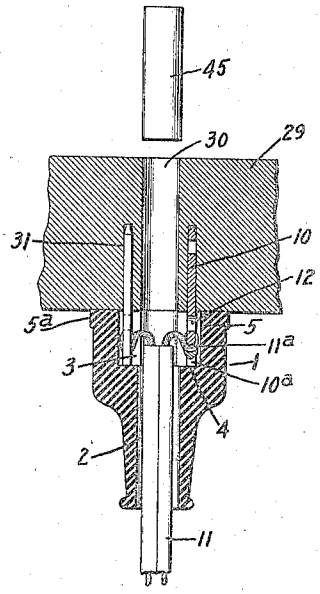


Fig. 8.

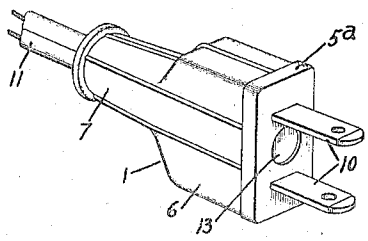


Fig. 9.

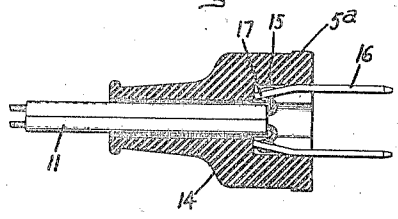


Fig. 6.

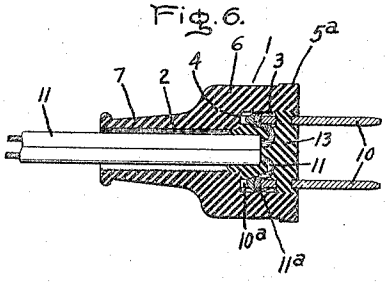


Fig. 10.

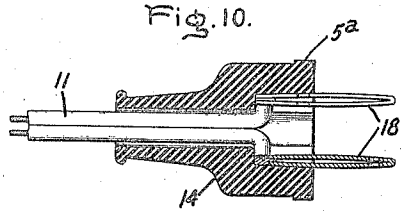


Fig. 11.

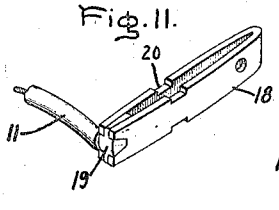


Fig. 12.

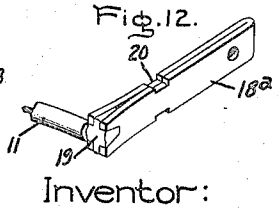
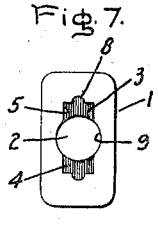


Fig. 7.



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UNITED STATES PATENT OFFICE

2,206,714

METHOD OF MAKING ATTACHMENT CAPS

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Application May 8, 1937, Serial No. 141,584

1 Claim. (Cl. 18—59)

The present invention relates to attachment caps such as are used for detachably connecting electrical conductors to convenience outlets, for example.

One object of my invention is to provide an improved cap which is simple in structure, durable and capable of being manufactured at low cost.

A further object of my invention is to provide an improved method and apparatus for use in manufacturing my improved caps.

For a consideration of what I believe to be novel and my invention, attention is directed to the following specification and the claims appended thereto.

In the drawings, Fig. 1 is a perspective view of a press used in the carrying out of my invention; Fig. 2 is a detail perspective view of a part of the press shown in Fig. 1, illustrating one step in the manufacture of a cap; Fig. 3 is a view similar to Fig. 2 showing the parts in a different position and illustrating a second step in carrying out the invention; Fig. 4 is a perspective view illustrating a further step in carrying out the invention; Fig. 4a is an end view of a part of the press; Fig. 5 is a detail sectional view of a part of the press shown in Figs. 1 to 4; Fig. 6 is a sectional view of a completed cap; Fig. 7 is a face view of the casing used in making the cap; Fig. 8 is a perspective view of a completed cap; Fig. 9 is a sectional view of a modified form of cap; Fig. 10 is a view similar to Fig. 9 showing a further modification; Fig. 11 is a perspective view of the upright shown in Fig. 10, and Fig. 12 is a detail view of another form of upright.

In carrying out my invention, I first form a casing 1 of suitable shape having a passage 2 for electrical conductors and a chamber 3 having shoulders 4 at its inner end. The walls 5 of the chamber 3 are spaced from each other a distance equal to the spacing of the uprights of standard attachment caps. Surrounding the rim of the casing is a flange 5a. Preferably, the casing is formed of rubber by a suitable molding operation. However, while I now prefer to use a molded rubber casing, I may, if found desirable, form the casing of some other material, either a thermo-plastic or a thermo-setting material.

In the present instance, I have illustrated a cap having a rectangular body portion 6 provided with a round extension 7 through which the wire passes. However, the body of the cap may be round or of other desired shape. The chamber 3 is shown as being rectangular in cross-section and of a width equal to the width of the uprights or contact prongs to be used. The two end walls of the chamber are provided with central vertical grooves 8. Also, for convenience in molding, the side walls of the chamber have grooves 9 which conform with the contour of passage 2. Or, viewed from another aspect, the passage 2 for the wires extends entirely through the cap and is enlarged at one end to form the chamber 3. I then mount in the chamber 3 a pair of uprights or contact prongs 10 to the inner ends of which the conductor wires 11 have been attached by suitable means such as by soldering or welding. The uprights fit against the end walls of the chamber as shown in Figs. 5 and 6 with their inner ends in engagement with shoulder 4 and are held firmly between the side walls of the chamber. The shoulders 4 serve to position the uprights correctly in the chamber. The projections formed on the inner ends of the uprights by the ends of the wires and the solder fit in grooves 8 so that the prongs can fit tightly against the end walls of the chamber and stand straight. As shown in Figs. 5 and 6, the uprights 10 have notches 10a in their inner ends in which the ends 11a of the wires of the cord 11 are located and attached by soldering, welding or in other suitable manner, the wires being bent up on each side of the uprights adjacent the inner ends of the notches and fastened in this position. This forms a convenient and satisfactory arrangement for attaching the wires to the inner ends of the uprights. Also, in the inner ends of the uprights are openings 12.

After the wires have been attached to the inner ends of the uprights and the uprights have been positioned in the casing, the space in chamber 3 between the uprights is filled with an insert comprising a moldable substance 13 which is put into the space in its uncured condition, after which it is cured or permitted to harden. By a moldable substance, I mean a substance which is capable of being compressed or flowed into the chamber and then hardened by curing with heat or by standing. I may use either a thermo-plastic substance or a thermo-setting substance. Preferably, I employ rubber as the substance 13, uncured rubber being forced into the space by a suitable press and then cured while in the press. A portion of the moldable substance, such as uncured rubber, flows through

the openings 12 as shown in Fig. 6 and adheres to the end walls of chamber 3. Also, the substance adheres more or less firmly to the side walls of the chamber 3. As a result, the inner ends of the uprights are firmly fixed in position in the casing. The moldable substance also flows around the bared ends of the wires and their connections to the inner ends of the uprights, thus forming a strain relief for the connections. As a result, a pull on the cord is taken by the cap body itself and not by the connections with the uprights.

A completed cap is shown in Fig. 8 and as will be seen, I provide a cap which has a smooth unitary appearance and in which the uprights are firmly embedded in the materials forming the completed cap. As stated above, I employ preferably rubber for both the casing and the insert, and when rubber is employed the insert when vulcanized becomes well attached to the casing walls forming therewith a more or less integral structure.

In Fig. 9 is shown a modified construction wherein the cap casing 14 has smooth end walls, the grooves 8 as shown in Figs. 5, 6 and 7 being omitted. To make room for the projections 15 formed on the inner ends of the uprights 16 by the wires and solder, the inner ends of the uprights are bent inwardly as indicated at 17. Otherwise the construction shown in Fig. 9 is the same as that shown in Figs. 5 to 8 inclusive.

In Figs. 10 and 11 is shown a modified form of upright 18, the same comprising a strip of material bent double and having the end of the wire 19 soldered between the two adjacent ends of the legs of the strip. With this construction, the two legs of the strip may be entirely in engagement with each other or they may be bowed somewhat as shown in Figs. 10 and 11 so as to provide an upright which is capable of being compressed so that it may make a yielding contact with the contact of the convenience outlet or other device with which the cap is used. The upright 18 is shown as being provided with notches 20 in its opposite edges into which material forming the insert is located for assisting in anchoring the uprights in the body. These notches 20 perform the same function as the openings 12 in the uprights shown in Figs. 5 and 6. Fig. 12 shows an upright 18a similar to that shown in Figs. 10 and 11 except that the two legs of the strip are in engagement with each other, the inner adjacent ends of the legs being spaced apart to accommodate the wire end and solder.

For manufacturing caps embodying my invention, I provide a press comprising a base plate 25 on which is mounted by means of bolts 26 a series of plates 27 having spaced notches in their sides to form side and top opening recesses or cavities 28 of a contour to receive and hold a casing 1. Each cavity has a shoulder 44 to form support for a cap casing. Suitably hinged to the upper edge of plates 27, as shown at 27a is a cover plate 29 having openings 30, one for each recess 28, and located over the center of the recess. Between the rear edge of cover plate 29 and the top of the uppermost plate 27 is a spacing strip 30a which serves to space the underside of the cover plate from the top plate 27 as indicated at 30b. The width of this space corresponds with that of flange 5a on the rim of the cap casing. On each side of each opening 30 (see Fig. 5) is a slot 31 of a size to receive the outer end of an upright. The cover 29 is adapted to rest on the top of spacing strip 30a on its closed position and to be moved on its pivots 27a from closed position to open position as shown in Fig. 2 where it stands at right angles to plates 27. The cover is held in closed position by a pair of arms 32 pivotally mounted on rods 33 which are attached to base 25. When the cover is closed, arms 32 are turned to a position over the top of the cover to hold it down. When the cover is to be opened, it is necessary merely to swing the arms 32 away from their positions over the cover, after which the cover may be readily opened. In the present instance, the cover is shown as being opened by a rod 34 attached at one end to the end of an arm 34a fixed on the cover and at the other end to a suitable foot treadle. Slidably mounted on rods 33 is a plunger bar 35 which carries a series of plungers 36, one for each cavity 28, the plungers being in line with the openings 30. The plunger bar 35 is attached to the piston rod 37 of a hydraulic press, the piston of the press being located in cylinder 38. Cylinder 38 is carried on a cross plate 39 fixed on the upper ends of rod 33. At 40 is indicated a suitable valve for controlling the admission of compressed air or other operating fluid to the cylinder 38 on opposite sides of the piston therein, hose connection 41 extending from the valve to one end of the cylinder and hose connections 42 extending from the valve to the other end of the cylinder. The admission conduit to the valve is indicated at 43. The construction of the valve 40 and the cylinder and piston is not shown in detail as the specific construction forms no part of the present invention. Such presses are of well known construction. In the present instance, the press is electrically heated, electric heating units being indicated at 43a.

In constructing caps in accordance with my invention, the ends of the conductor wires are first attached to the uprights after which the uprights with the wires attached thereto are positioned in the casing as shown in Fig. 5. Following this, the casing with the uprights therein is mounted on the cover of the press, the cover being open as shown in Fig. 2. This is accomplished by pushing the contact ends of the uprights into the openings 31 as shown in Fig. 5. In the present instance, a six cavity press is shown and accordingly six of the casings 1 with the uprights therein are mounted on the open cover after the manner shown in Fig. 2. The uprights fit sufficiently tight in the openings 31 to hold the uprights in position and the uprights fit sufficiently tight in the casing to hold it in position. After the cover of the press has been loaded as shown in Fig. 2, the cover is closed as shown in Fig. 3, bringing the cap casings into the cavities 28 as illustrated. The ends of the cap casings rest on shoulders 44 of the cavities so that the casings are held between the face of the cover and such shoulders, the flanges 5a being located in the space 30b. Also the body portions 5 of the casings fit snugly between the side walls of the cavities so they are firmly supported and are in good heat conducting contact therewith. After the cover is closed, the locking arms 32 are moved to the positions shown in Fig. 1 to lock the cover in its closed position. Following this, a plug of uncured rubber indicated at 45 in Fig. 5 is placed in each of the openings 30, the plug being of a size sufficient to furnish the material required for the insert. The press is then closed bringing the lower ends

of the plungers **36** into the openings **30**, thus forcing the material of the plugs **45** into the chambers **3** between the inner ends of the uprights. This serves to force the material of the plugs **45** firmly around the uprights and through the openings **20**, filling or substantially filling the chambers **3**. The press is heated by suitable means, as for example, by steam or electricity and after the press has been closed, it is left in the closed position a sufficient length of time for the rubber forming the insert to cure. After the rubber is cured, the press is opened and the finished plugs are removed by pulling the uprights out of the openings **31**.

By the use of this machine and method of manufacture, the caps can be quickly manufactured at low cost. One operator may operate several presses, loading one press while another press is closed, and curing the caps therein.

It will be seen that a cap embodying my invention comprises the minimum number of parts, i. e., a cap body and uprights, there being no screws required for holding the wires to the uprights or for holding the parts assembled. Also, the wires are firmly attached to the uprights and a strain relief is provided so that connections of the wires to the uprights is not likely to be broken. In addition, the insert holds the wires from twisting together in case the core is twisted with respect to the cap.

What I claim as new and desire to secure by Letters Patent of the United States is:

The method of manufacturing an attachment cap which comprises forming a rubber casing having a passage for a cord and an enlarged chamber at one end of the passage merging therewith and forming shoulders, mounting prong contact members having cord wires attached thereto in spaced relation in said chamber with said cord positioned in said passage and the inner ends of the prongs resting against said shoulders, forcing uncured rubber into the chamber between the contact members to fill it completely and embed the ends of the contact members and also into a portion of the passage to embed the wires and then vulcanizing the rubber to bond it to the walls of the chamber and passage thereby to hold the contacts in position and form a strain relief for the cord wires.

GEORGE B. BENANDER.