

Nov. 1, 1955

T. F. PAULS

2,722,155

MANUFACTURE OF ELECTRIC BLASTING CAPS

Filed Nov. 1, 1950

FIG. 1.

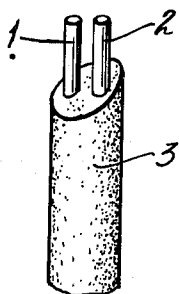


FIG. 2.

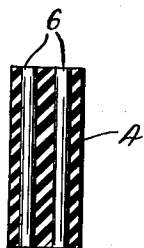


FIG. 3.

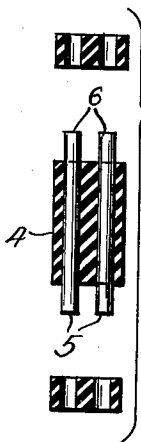


FIG. 4.

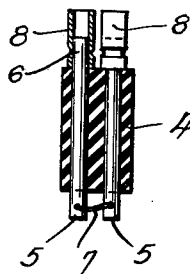


FIG. 5.

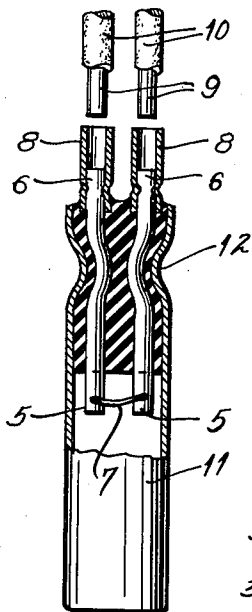


FIG. 6.

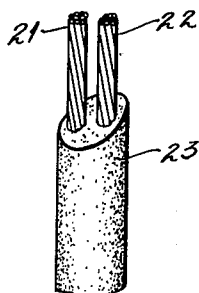


FIG. 7.

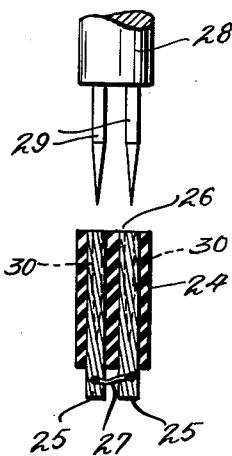


FIG. 8.

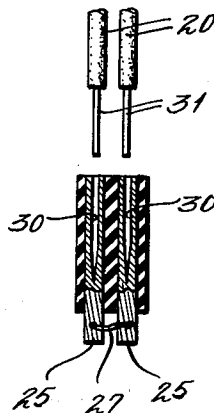
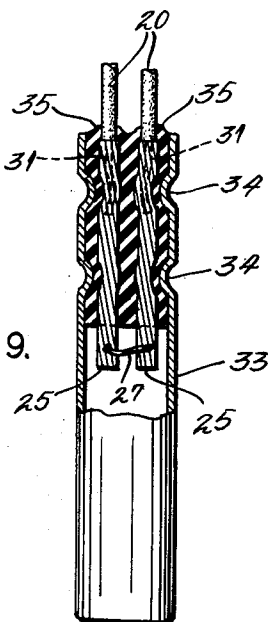


FIG. 9.



INVENTOR:
THERON F. PAULS

BY *Bringing and Sutherland*

ATTORNEYS

1

2,722,155

MANUFACTURE OF ELECTRIC BLASTING CAPS

Theron F. Pauls, Godfrey Township, Madison County, Ill., assignor to Olin Mathieson Chemical Corporation, a corporation of Virginia

Application November 1, 1950, Serial No. 193,439

2 Claims. (Cl. 86—1)

This invention relates generally to electric blasting caps, and particularly to the ignition assembly thereof and to the process of manufacturing the same.

In the ordinary electric blasting cap a suitable cylindrical cup charged with explosive has its open end closed by a plug in which are embedded a pair of lead wires and a resistance filament known in the art as a bridge wire is connected across the inner ends of the lead wires. The bridge wire is thus disposed in the completed cap so that upon becoming heated the igniter component of the cap initiates detonation of the explosive charge. In some cases the igniter component is formed as a bead about the bridge wire, while in other cases the bridge wire is surrounded by loose igniter composition.

The plug and its adjunct parts constitutes not only an igniter assembly, but a closure for the end of the cup, and in the usual blasting cap the open end of the cup is crimped or otherwise deformed so as to retain the plug in proper position therein, constituting in many cases a waterproof closure for the end of the cup.

Heretofore the plugs above referred to have been individually cast about lead wires. Suitable materials for casting such plugs are sulphur, thermoplastic compositions, rubber, and synthetic rubber such as Neoprene. Where the material of which the plug is cast is elastic, the cup may be deformed about the plug so as to form the waterproof closure, while in other instances a plastic medium is applied about the plug.

The object of the present invention, generally stated, is to facilitate and expedite the manufacture of igniter assemblies including those assemblies wherein the plug constitutes a waterproof closure for the end of the cup.

Other objects will become apparent to those skilled in the art when the following description is read in connection with the accompanying drawings.

The present invention contemplates, generally, the production of plugs for use as the igniter assembly and the end closure of a blasting cap by cutting slugs from a length of standard two-wire insulated cable. The outside dimension of the cable employed is coordinated with the inside dimension of the open mouth of the blasting cap so that a slug cut from the cable is readily insertable within the open mouth of the blasting cap.

In the production of plugs in accordance with the present invention, the aforesaid slug has the wires at one end thereof bridged by the usual bridge wire. In order to accomplish this, the insulation is preferably stripped from the wires of the cable for a short distance adjacent one end thereof and the bridge wire soldered to the thus-bared ends of the cable wires. The connection of the bridge wire may be accomplished either before or after the slug is cut from the length of cable stock.

The cable wires at the end of the slug opposite that which is bridged as aforesaid, may be, and preferably are provided with means for ready connection to suitable lead wires. Such a connection preferably takes the form of a slip-joint into which the bared ends of lead wires may be inserted and anchored as by crimping.

2

Two embodiments of the invention are illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of a length of two-wire insulated cable of the character utilized in accordance with the present invention;

Figure 2 is a longitudinal sectional view of a slug cut from the cable of Figure 1;

Figure 3 is a view corresponding to Figure 2 but with the ends of the wires of the slug bared;

Figure 4 is a view corresponding to Figure 3 but showing one end of the wires of the slug bridged and the other end thereof provided with a connecting device;

Figure 5 is a view in side elevation of a complete cap, part being in section to reveal the relation of the plug shown in Figure 4 as assembled with the other components of an electric blasting cap;

Figure 6 is a perspective view of a section of two-wire stranded insulated cable as used in another embodiment;

Figure 7 is a view corresponding to Figure 3 and showing a slug from the cable of Figure 6 ready to be operated upon for the reception of the conductor lead wires, together with a tool for so doing;

Figure 8 is a view corresponding to Figure 7 and showing the slug after operation by the tool shown in Figure 7, one of the conductors being shown in section; and

Figure 9 is a view in side elevation of a completed blasting cap, part being shown in section to reveal the relationship of the several parts.

The cable shown in Figure 1 is a standard article of commerce and consists of a pair of conductor wires 1 and 2 encased in insulation 3 so that the exterior contour thereof is substantially cylindrical. For use in accordance with the present invention it is preferable to select a cable wherein the insulation is formed of rubber or synthetic rubber such as Neoprene, or other pressure-plastic material, and whose outside diameter is no greater than, and preferably the same as, the internal diameter of the cup of the blasting cap with which the cable is to be employed.

Having provided a length of cable of the character shown in Figure 1, short lengths are severed therefrom so as to provide slugs 4 of the character shown in Figure 2. For a short distance adjacent one end of the slug 4 the insulation is removed so as to provide a pair of bared ends 5, and likewise at the other end a short section of insulation is removed so as to provide a pair of bared ends 6. It will be understood that the baring of the ends of conductors 1 and 2 at one end and of the slug may be carried out prior to the time the slug is cut from the length of cable, and, indeed, the cutting operation may be such as to simultaneously bare the ends of the conductors thereadjacent.

The bared ends 5 of the conductors 1 and 2 are interconnected by a bridge wire 7, as shown in Figure 4, the bridge wire being secured thereto by soldering or otherwise.

The bared ends 6 of the slug 4 are provided with a lead wire connecting device, one for each of the wires 1 and 2. In the embodiment shown, the device takes the form of metallic sleeves 8 in one end of which the bared ends 6 of wires 1 and 2 are inserted and secured by deformation, soldering, or otherwise. The upper ends of the sleeves 8 are open for the reception of lead wires as and when it is desired to connect them. In the embodiment shown, the open ends of the sleeves 8 provide a slip-joint connection for the reception of the bared ends 9 of lead wires 10.

Either before or after the lead wires 10 are connected with the sleeves 8, the slug 4 is inserted into the open mouth of the usual blasting cap cup 11. As indicated hereinbefore, it is preferable that the outside diameter of the sleeve 4 be approximately the same as the inside diameter of the cup 11. With the slug 4 disposed in the

open mouth of the cup 11, the latter may be deformed as by crimps 12 so as to anchor the slug 4 in proper position, and where the insulation 3 has elastic properties, it is deformed about, and frequently deforms, the wires 1 and 2 so as to make their anchorage therewithin secure and to provide a waterproof closure for the cup 11. In the process of deformation by the application of radial pressures, the elastic insulation 3 is squeezed in an endwise direction about the lower ends of sleeves 8 so as to embed the latter and thus provide a seal thereat.

It will be understood, of course, that the cup 11 contains the usual explosive charge and that adjacent the bridge wire, a suitable ignition composition is provided, either in the form of a bead or loose material.

Referring now to Figures 6-9 inclusive for a further embodiment of the invention, the cable from which slugs are cut to produce the ignition assembly is a stranded cable, by which is meant that the individual conductors of the cable are composed of a plurality of strands of fine wire. After a slug is cut from such a cable and the bridge wire connected across at the ends of the conductors therein at one end, the invention contemplates operation upon the opposite ends of the embedded conductors so as to hollow the same sufficient for the reception of the bared ends of lead wires. The hollowing may be accomplished by the insertion of a sharp instrument centrally of the individual conductors in the cable so as to spread the respective strands thereof apart. Into the hollow thus provided the bare ends of the lead wires are inserted prior to the time the usual blasting cap cup is crimped about the slug, so that in the crimping operation the several spread strands of the conductors are forced back into to secure engagement with the lead wires.

The cable shown in Figure 6 is a two-conductor stranded insulated cable of a character readily available as an article of commerce, and consists of a pair of conductors 21 and 22 encased in insulation 3. The individual conductors 21 and 22 each consist of a plurality of strands of fine wire twisted together.

From the cable shown in Figure 6, a slug 24 is cut, the insulation stripped for a short distance from the end 5 thereof, and a bridge wire 27 connected across the bared ends.

The slug is then operated upon from the end 26 to hollow the respective conductors 21 and 22 by spreading the individual strands thereof radially outward. This operation is readily accomplishable by the insertion of a two-pronged tool 28, the prongs 29 of which are separated a distance corresponding to the separation between the conductors 21 and 22 in the cable so that the points of the prongs 29 may be approximately centered with the axes of the conductors 21 and 22. The tool 28 is then driven axially inwardly of the conductors 21 and 22 so as to spread the individual strands of the conductors apart and provide hollows 30 therein, as clearly shown in Figure 8. In this operation it is unnecessary to precisely center the prongs 29 with the respective conductors 21 and 22, it being immaterial if the hollows thus formed are somewhat eccentric, even to the point that a substantial portion of the hollows may lie outside the periphery of the conductors, so long as there is a substantial area of tangence between the hollows and the respective conductors so that the usual lead wires, when inserted into the hollows, may make electrical contact with the conductors 21 and 22. Indeed, by inserting the points of the prongs 29 at the interface between the conductors and the insulation, the latter may be peeled from the former to provide hollows wholly outside the confines of the conductors, and by this procedure, this aspect of the invention is equally applicable to solid conductors.

The bared ends 31 of the usual lead wires 20 are then inserted into the hollows 30, respectively, and to an extent such that the insulation about the lead wires 20 abuts the cut ends of conductors 21 and 22.

The resultant assembly of parts is then introduced into the open end of the usual blasting cap cup 33, which is deformed as by crimps 34 to compress the insulation 23 about the conductors 21 and 22, deform the conductors within the slug 24, and in case the insulation 23 is of an elastic character, as preferred, to exude the insulation 23 about the outer ends of conductors 21 and 22 so as to overlap the shoulder of insulation on lead wires 20, as shown at 35 in Figure 9, thus providing a waterproof seal about the ends of the stranded conductors 21 and 22 and over the termini of the insulation on the lead wires.

It will be understood that the cup 33 may be charged with any suitable explosive mixture, including an igniter component adjacent bridge wire 27, which may be either in the form of a bead or in the form of loose composition, adjacent the bridge wire.

From the foregoing description those skilled in the art should readily understand that the present invention provides an igniter assembly for electric blasting caps, detonators, and the like, which may be produced quickly and easily from stock cable and without requiring the tedious casting of each individual plug. The economies of manufacture thereby effected are substantial and, in addition, the blasting cap is produced in a form such that the usual lead wires may be connected either at the place of manufacture or at the place of use, as is desired.

While two complete embodiments of the invention have been disclosed in detail, it is not to be understood that the invention is limited to those embodiments but, on the contrary, that said embodiments are merely illustrative. Accordingly it is to be distinctly understood that such modifications and variations as present themselves to those skilled in the art without departing from the spirit of this invention are contemplated by and within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In the manufacture of electric blasting caps and the like, the process comprising, cutting a slug from a length of two-wire insulated cable, cutting the insulation from the wires adjacent one end of the slug and removing it without disturbing the relationship of the wires within the remaining insulation, attaching a bridge wire to the bared ends of the wire at one end of the slug, inserting the slug in the open end of an explosive-charged cup, sealing the plug in the cup and applying external conductors to the wires of the slug at the ends opposite the bridge wire, and crimping said external conductors into engagement with the wires of the slug.

2. The process of claim 1 in which the wires of the cable are stranded and the insulation is rubber-like, and the external conductors are applied by spreading the strands of wire within the slug to form an axial hollow, then inserting the external conductors into the respective hollows.

References Cited in the file of this patent

UNITED STATES PATENTS

355,611	Howson	Jan. 4, 1887
2,212,474	Johnson et al.	Aug. 20, 1940
2,382,921	Seavey	Aug. 14, 1945
2,429,585	Rogoff	Oct. 21, 1947
2,515,238	Lefren	July 18, 1950

FOREIGN PATENTS

461,239	Great Britain	Feb. 8, 1937
---------	---------------	--------------

OTHER REFERENCES

American Electricians' Handbook by Terrell Croft, revised by Clifford C. Carr, McGraw-Hill Book Co., New York, 1942, pages 253, 254, 255, 278, 279, 282, 286. (Copy in Div. 52.)