April 6, 1971 C. C. CLEVELAND 3,573,989

METHOD OF MANUFACTURING GALVANIC BATTERIES

Filed Sept. 10, 1964

FIG.1.

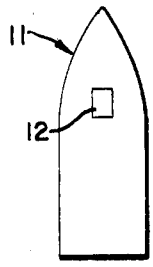


FIG.2.

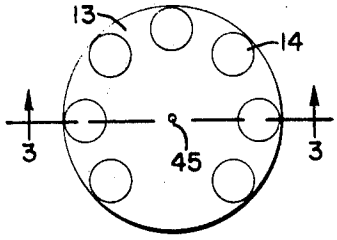


FIG.3.

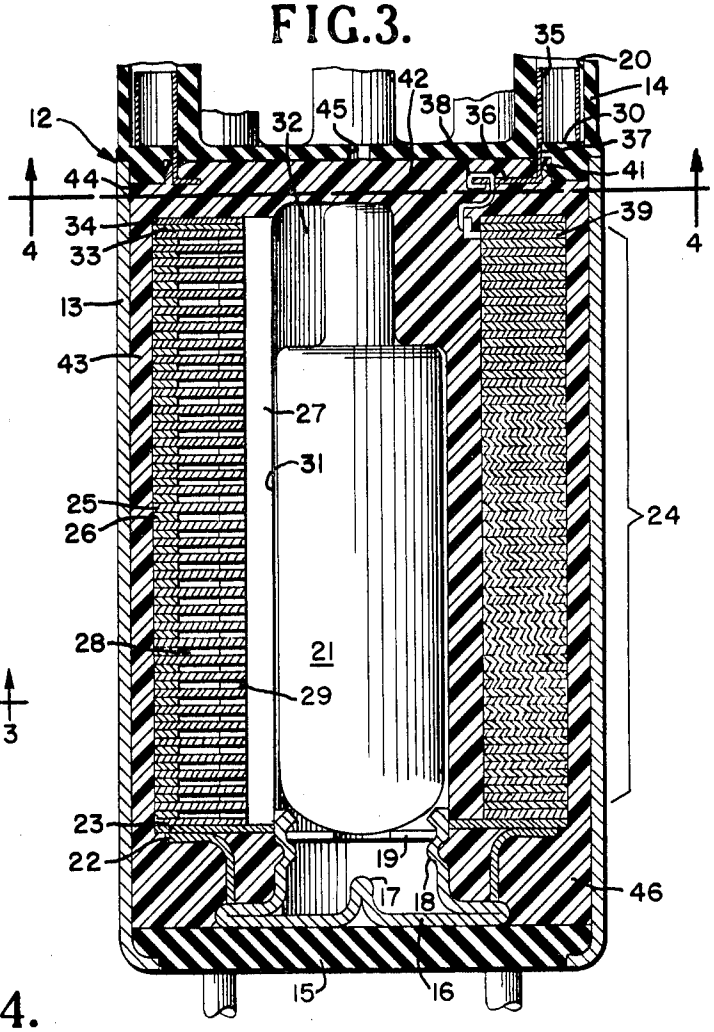
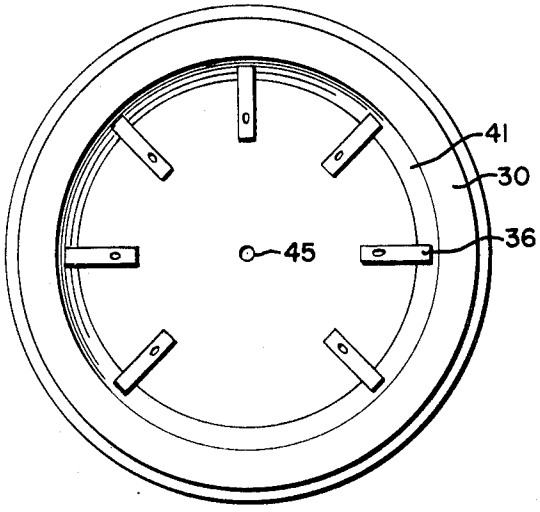


FIG.4.



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United States Patent Office 3,573,989 Patented Apr. 6, 1971

3,573,989

METHOD OF MANUFACTURING GALVANIC BATTERIES

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Continuation-in-part of application Ser. No. 119,258, June 21, 1961. This application Sept. 10, 1964, Ser. No. 395,988

Int. Cl. H01m 1/00, 17/00

U.S. Cl. 136—90 8 Claims

This application is a continuation-in-part of application, Ser. No. 119,258, filed June 21, 1961 and which is to become abandoned.

This invention relates generally to a galvanic battery or reserve energizer of the type utilized as a power source in a spin type projectile and more particularly to an improved method of manufacturing a reserve energizer having an improved terminal contact blocking means.

Heretofore, it has been the practice in the field of reserve energizers to block entry around the battery contacts of the molding compound lining the interior of the energizer casing by use of paints and epoxy resins. Such paints and resins have not been found satisfactory in the manufacturing process because of the low strength of the paints and the long curing time of the resins.

The general purpose of this invention is to provide a sealing compound and a unique application thereof in the manufacture of reserve energizers which possess none of the aforedescribed disadvantages. To attain this, the present invention contemplates the coating of the interior of the castellated turret carrying the electrical contacts with a vinyl plastisol material which lends itself to mechanized turret assembly and thereafter injecting a molding compound through an opening in said turret. The vinyl plastisol material is of sufficient strength to prevent the molding compound from fouling up the electrical contacts when the molding compound is applied through said opening under pressure.

An object of the invention is to provide a castellated turret assembly having a new and improved sealed electrical contact.

Another object is to provide a novel method of manufacturing a reserve energizer which provides for the mechanization of the turret sub-assembly manufacture while assuring that the exterior portions of the energizer contact terminals are prevented from coming in contact with the molding compound when the latter is applied under pressure to the interior portions of said energizer and turret subassembly.

Another object is to provide a seal around the electrical contacts of a reserve energizer of sufficient strength to prevent egress of the molding compound from within the energizer during the molding operation.

A further object of the invention is to provide a sealing means around the electrical contacts of a reserve energizer which lends itself easily to mechanized production.

Other objects and many of the attendant advantages of this invention will be more readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the several views thereof and in which:

FIG. 1 illustrates a projectile containing a battery of reserve energizer embodying the present invention;

FIG. 2 is a somewhat enlarged plan view of the reserve energizer;

FIG. 3 is a greatly enlarged section taken along line 3—3 of FIG. 2; and

FIG. 4 is a detailed view of the interior of the castellated turret taken along line 4—4 of FIG. 3 before the molding compound has been inserted.

Referring now to FIG. 1 there is illustrated a projectile 11 containing a battery or reserve energizer 12, of cylindrical configuration, the axis of which is located along the spin axis of the projectile. The projectile also contains a proximity fuzing system, not shown, or any other electrical equipment requiring a power source of the type herein described. It is to be understood that the flight trajectory of the projectile may be at any angle to the horizon and that the spin thereof may be in either direction.

FIG. 2 illustrates a plan view of the energizer 12 which comprises a casing 13 and a plurality of electrical contact means 14. The electrical contact means 14 may be any suitable connecting device, such, for example, as a plug type contact shown in greater detail in FIG. 3.

Referring now to FIG. 3 the energizer 12 comprises a battery case 13 and a base member 15 composed of any suitable material. Supported by the base member 15 is a breaker platform 16 having an impression 17 therein and a friction contact means 18 thereon. In frictional contact with the contact means 18 is a suitable ampule support means, such, for example, as the disk 19 illustrated.

The frictional contact between the contact means 18 and the disk 19 is sufficient to maintain the electrolyte containing glass ampule 21 in the position illustrated in FIG. 3 during normal handling and shipping of the device. This frictional contact is, however, insufficient to maintain the ampule 21 in this position when the projectile is fired. Upon firing of the projectile, the ampule support disk 19 and the ampule 21 carried thereon are released in response to set-back force of the ampule allowing the ampule to strike the impression 17 with the sufficient force to cause fragmentation thereof and release of the electrolyte.

Supported by the breaker platform 16 is a stack support 22 which abuts the cell support disk 23. Supported by the cell support disk 23 is a plurality of cells 24 comprising a plurality of annular plates 25 and a paper separator 26 interposed between each pair of plates 25.

The annular plates 25 have a scallop 27 along the inner diameter. The paper separators are provided with a cell channel 28 and an entry port 29 therein.

The scallop 27 of each plate is aligned with the scallop of the adjacent plate to form a fill channel 31 in the ampule cavity 32 into which the entry port 29 opens to allow for filling of the individual cells with electrolyte.

After the ampule 21 has been broken by the set-back forces occurring upon firing of the projectile, the deceleration of the projectile, after leaving the gun muzzle, allows the electrolyte to flow along the fill channel 31. Due to the spin of the projectile 11, the electrolyte is forced through the entry port 29 into the cell channel 28 of each of the individual cells to activate the battery. It is to be understood, that the cells 24 may be either series or parallel connected, as the case may be, or the energizer may comprise groups of series connected cells together with groups of parallel connected cells. The necessary coatings and connections to provide a compatible energizer for the desired electrical equipment will be readily apparent to one skilled in the art.

Abutting the last cell in the cell stack is an insulating washer 33 of any suitable material and a stack height adjusting washer 34. The height adjusting washer may be fabricated to any desired thickness, may be omitted or a plurality of washers may be used, as the case may be, to obtain the desired stack height.

The electrical contact means 14 comprises a contact receiving means 20 having a base 30 integrally formed therewith. A female contactor 35 is pressed into the con-

tact receiving means **20** and has a connecting tab **36** extending through aperture **37** in the base **30** into the interior of the battery **12**. The tab **36** is bent at a right angle and a lead wire **38** which may be connected to any appropriate cell, such, for example, as cell **39**, is connected thereto. It is to be understood that other connections, as required, may be made in like manner to the other electrical contact means **14**.

About the tab **36** and along the interior of the turret is applied a vinyl plastisol material **41** such, for example, as Darex No. T–362 supplied by Dewey and Almy Chemical Company. This material is of sufficient strength to prevent egress of the molding compound **42** from the interior of the casing **13** during the molding operation, as will hereinafter be described in greater detail and lends itself to mechanization of the turret sub-assembly manufacture and heat tunnel curing in a short period of time.

The plastisol material **41** may be applied as a continuous ring as illustrated in FIG. 4 or may be applied around each individual connecting tab, as desired.

In the manufacture of the battery **12**, the battery casing **13** sub-assembly is manufactured, the connectors **35** pressed into place and the vinyl plastisol compound **41** is applied around the connecting tab **36** at the aperture **37** in the order given. The cells **24** are stacked as shown in FIG. 3 and the outer stack liner **43** composed of a suitable molding compound is applied thereto.

The cells are pressed into place within the battery casing **13** and a mold in the shape of the fill channel **31** and the ampule cavity **32** is fitted within the cell stack. The molding compound **42** which seals the upper portion of the battery casing **13** and forms the inner stack liner **44** is forced, under pressure, through the access hole **45** in the casing **13**. The vinyl sealing compound **41** prevents egress of the molding compound from within the casing **13** around the aperture **37** and therefore, prevents the molding compound from fouling the connector **35**.

The mold is removed and the ampule **21** together with the stack support **22** and cell support disk **23** is inserted into the ampulse cavity **32** and the molding compound **46** is forced between the stack support **22** and the casing **13**.

The unit is now pushed through a draw ring, the base member **15** inserted and the casing is trimmed and turned over to complete the unit.

There has been illustrated and described an improved battery or reserve energizer for use in a spinning projectile having improved terminal contact blocking means which prevents egress of the molding compound from within the battery during the manufacturing process which would result in poor electrical contact at the terminals.

Obviously many modifications and variations of the present invention are possible in light of the aforegoing teachings. It is therefore to be understood, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An improved method of manufacturing a spin-filled reserve energizer having an annular stack of voltage cells for surrounding an electolyte carrying frangible ampule and partially encased by a molding compound and housing therefore comprising the steps of:

sealing with vinyl plastisol a plurality of conductive connecting tabs extending from a plurality of connectors at the point where said tabs extend through apertures in a plurality of contact receiving means carrying said connectors and mounted on one end casing of said energizer; and

thereafter forcing a molding compound through an opening in said one end casing and into intimate contact with said annular stack and said vinyl plastisol whereby said plastisol is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied to said vinyl plastisol under pressure.

2. An improved method of manufacturing a spin-filled reserve energizer having an annular stack of voltage cells for surrounding an electrolyte carrying ampule and partially encased by a molding compound and housing therefor comprising the steps of:

pressing a plurality of conductive connectors into fixed intimate contact with a plurality of contact receiving means mounted on a cap of insulating material forming one end of said energizer,

sealing with vinyl plastisol a plurality of connecting tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of contact receiving means, and

forcing a molding compound through an opening in said cap of insulating material into intimate contact with said annular stack and said vinyl plastisol whereby said vinyl plastisol is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied under pressure to said vinyl plastisol.

3. A method of manufacturing a reserve energizer used as a power source in a spinning projectile comprising the steps of:

pressing a plurality of conductive connectors into fixed intimate contact with a plurality of contact receiving means mounted on a cap of insulating material forming one end of said energizer,

sealing with vinyl plastisol a plurality of conductive connecting tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of contact receiving means,

applying a molding compound to the exterior walls of an annular stack of voltage cells for surrounding a frangible ampule carrying electrolyte and electrically connecting to said tabs,

encasing the extremities of said molding compound with a cylindrical housing, and

forcing a molding compound through an opening in the cap of insulating material into intimate contact with said annular stack of cells and said vinyl plastisol whereby said vinyl plastisol is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said compound is applied to said vinyl plastisol under pressure.

4. A method of manufacturing a reserve energizer used as a power source in a spin type projectile comprising the steps of:

pressing a plurality of conductive connectors into intimate fixed contact with a plurality of contact receiving means mounted on a cap of insulating material forming one end of said energizer,

sealing with vinyl plastisol a plurality of conductive tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of said contact receiving means,

applying a molding compound to the exterior walls of an annular stack of cells comprising the voltage supply of said source,

encasing the extremities of said molding compound with a cylindrical housing,

inserting a mold in the shape of a glass ampule within an annular opening in said annular stack of cells and in the shape of a fill channel in a longitudinal section wholly interrupting a portion of said molding compounding adjacent the exterior walls of said annular stack of cells,

attaching said cap of insulating material to said cylindrical housing,

forcing a molding compound through an opening in

said cap into intimate contact with said cell stack, said mold and said vinyl plastisol,

removing said mold from within said cell stack and adjacent the exterior portion of said cell stack,

inserting an ampule carrying electrolyte within said annular stack of cells and a stack support means within said cylindrical housing,

forcing a molding compound between said stack support means and said cylindrical housing, and

pressing into place a base member of insulating material abutting said stack support means and securable in place by and flanges of said cylindrical housing whereby said vinyl plastisol is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied to said vinyl plastisol under pressure.

5. In a method of manufacturing a reserve energizer used as a power source in a spinning projectile wherein a plurality of conductive connectors are pressed into fixed intimate contact with a plurality of contact receiving means mounted on a cap of insulating material forming one end of said energizer, and a molding compound and exterior housing therefor is applied to the extremities of an annular stack of voltage cells adapted to be energized upon breakage of a frangible ampule carrying electrolyte, the improvement comprising:

sealing with vinyl plastisol a plurality of conductive connecting tabs extending from said connectors to a voltage tap on said cells at the point where said tabs extend through apertures in said plurality of contact receiving means and thereafter,

applying a molding compound under pressure through an opening in said cap whereby said vinyl plastisol is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied thereto under pressure.

6. An improved method of manufacturing an electrically insulated cap carrying the voltage outlet means for a reserve energizer and securable to one end of a casing surrounding an annular stack of voltage cells in said energizer which comprises the steps of:

pressing a plurality of conductive outlet connectors into fixed intimate contact with a plurality of contact receiving means mounted on said cap, and

sealing with vinyl plastisol a plurality of electrical connecting tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of contact receiving means, whereby when a molding compound is forced through an opening in said cap into intimate contact with said annular stack and said vinyl plastisol the plastisol will prevent the extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied to said vinyl plastisol under pressure.

7. An improved method of manufacturing a spin-filled reserve energizer having an annular stack of voltage cells for surrounding an electrolyte carrying ampule and partially encased by a molding compound and housing therefor comprising the steps of:

pressing a plurality of conductive connectors into fixed intimate contact with a plurality of contact receiving means mounted on a cap of insulating material forming one end of said energizer,

sealing with vinyl sealing compound a plurality of connecting tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of contact receiving means, and

forcing a molding compound through an opening in said cap of insulating material into intimate contact with said annular stack and said vinyl sealing compound whereby said vinyl sealing compound is of sufficient strength to prevent extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied under pressure to said vinyl sealing compound.

8. An improved method of manufacturing an electrically insulated cap carrying the voltage outlet means for a reserve energizer and securable to one end of a casing surrounding an annular stack of voltage cells in said energizer which comprises the step of:

pressing a plurality of conductive outlet connectors into fixed intimate contact with a plurality of contact receiving means mounted on said cap, and

sealing with vinyl sealing compound a plurality of electrical connecting tabs extending from said connectors at the point where said tabs extend through apertures in said plurality of contact receiving means, whereby when a molding compound is forced through an opening in said cap into intimate contact with said annular stack and said vinyl sealing compound the sealing compound will prevent the extrusion of said molding compound through the aperture in each of said contact receiving means when said molding compound is applied to said vinyl sealing compound under pressure.

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U.S. Cl. X.R.

136—175, 133