Feb. 19, 1946. F. H. COLEMAN 2,395,104

METHOD FOR FILLING PRIMERS

Filed Dec. 17, 1942

Fig. 1

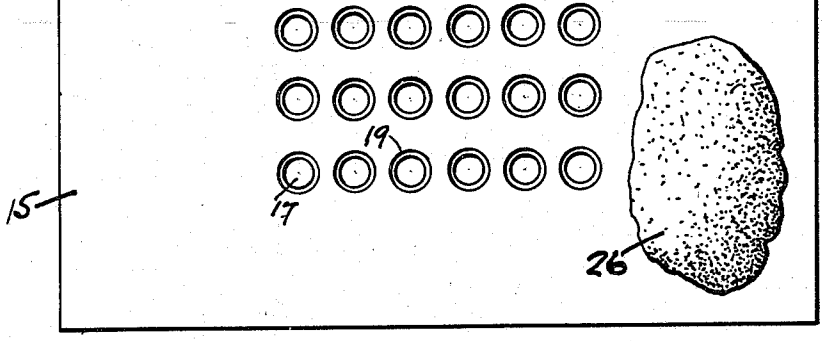



Fig. 2.

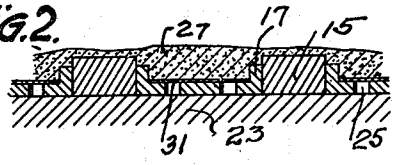



Fig. 3

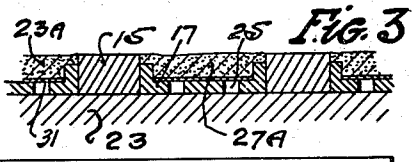



Fig. 4.

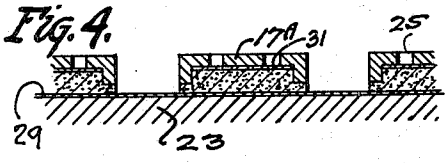
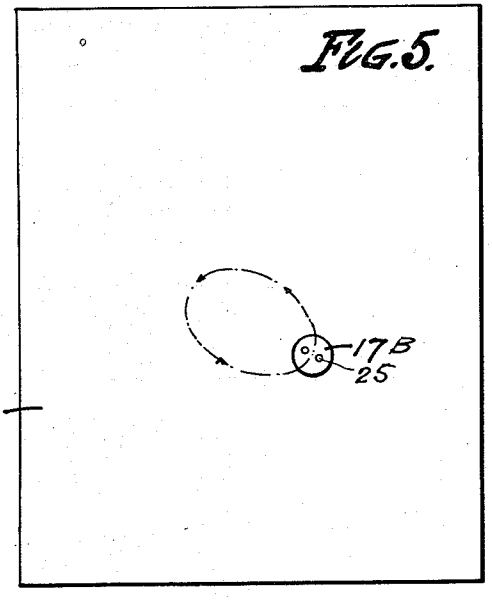



Fig. 5.



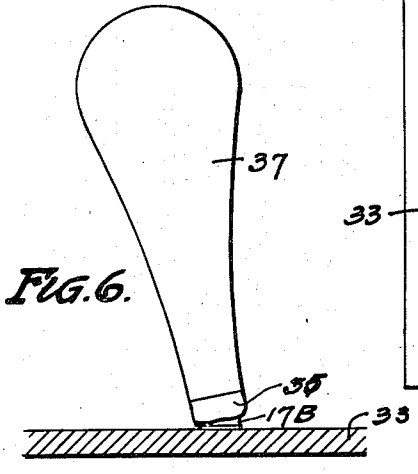




Fig. 6.

Fig. 8.

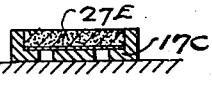
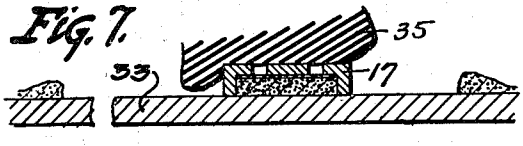



Fig. 7.




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# UNITED STATES PATENT OFFICE

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## METHOD FOR FILLING PRIMERS

Fred H. Coleman, Philadelphia, Pa.

Application December 17, 1942, Serial No. 469,290

1 Claim. (Cl. 86—31)

This invention relates to primers of the class which are set off by impact, as of a firing pin, to accomplish the detonation of the charge in shells, bombs, torpedoes or the like; the primers effecting the ignition of the charges, either directly or, possibly more usually, through trains of ignition or explosive materials which build up a more powerful detonating agent, and which often accomplish a momentary delay in detonation which permits penetration of the shell, torpedo, or the like after impact before detonation occurs.

Primers of this general type have been made for many years and their dimensions and construction and the priming compositions or mixtures used are old and well known.

A typical primer now largely used comprises a shallow flat cup-shaped housing exteriorly about .245 in. diameter, and .054 in. deep, having a mixture chamber some .200 in. diameter and .020 to .025 in. deep, the bottom of the housing being penetrated with holes in some .050 in. diameter. In this housing there is sometimes placed a metal disc .002 to .003 in. thick which covers the holes, but practice here is by no means uniform.

In filling, the interior of the housing is coated with shellac solution and the housing filled with a priming mixture, a typical mixture comprising, very roughly, two parts of fulminate of mercury, one part potassium chlorate, one and one-half parts ter-sulphide of antimony, and two parts of ground glass, all finely pulverized, with a binder of shellac in solution, added from time to time in varying amounts as mixture dries, sufficient to make and maintain a mixture having the consistency of damp sand.

Each housing resting on a fixture is filled by hand, a very small spatula being used to transfer increments of the mixture to the housing, the spatula being drawn outward from the housing and the mixture wiped off against the edge of the housing rim. The filled housing resting on its fixture is then centered beneath a rapidly turning spindle having a polished spherically arcuate end, usually about one inch radius, and the spindle pushed down to compact the mix and smooth up its surface in the housing, the resulting surface being slightly concave.

After filling, visual inspection of the primers is made which ordinarily culls out some five to twenty percent, and subsequently firing tests and rough handling tests of samples are made varying from shop tests of the primers to actual ballistic tests.

The failures showing up in the primers as indicated by the large number of culls and also at times in later tests, has induced the present inventor to make other and differing tests.

These tests disclose that there is a very great variation in strength or speed of firing, from an apparently instantaneous and sharp explosion to a sluggish and muffled explosion, and that in any batch of primers there are a considerable number which fire so slowly or weakly that they appear to be on the border line of actual failure to fire at all. It is also believed from these tests that some of the primers actually firing, fire so slowly or weakly that they probably would have been duds, insofar as any detonation of a shell charge in actual service is concerned, and whether this be true or not, that there is a definite and clearly unwarranted variation in the primers.

Obviously the failure per se of a primer is of little importance and the loss negligible, but failure of a shell to detonate not only results in momentary loss of valuable ammunition, but even more serious loss when ammunition is harmless which should have been deadly.

The object of the present invention is:

To accomplish the filling of a primer housing which is preferably of well known type, with a priming mixture, likewise well known, by steps which accomplish the filling with substantially absolute uniformity, certainty of firing result, and safety in rough handling.

The means by which the foregoing object is accomplished, and the method of its accomplishment, will readily be understood from the following specification upon reference to the accompanying drawing, in which:

Figs. 1, 5 and 6, are approximately full size, and Figs. 2, 3, 4, 7 and 8 are views enlarged about four times.

Fig. 1 is a plan view of a filling plate or holder showing eighteen holes for housings and cups therein.

Fig. 2 is a fragmentary sectional elevation taken as through the hole 19 of Fig. 1, showing one housing and parts of two adjacent housings with loose material thereabove.

Fig. 3 shows the same housing with the filler pressed down and surplus struck off.

Fig. 4 shows the same housings inverted and the holder removed, all three views indicating overfilling of the housings.

Fig. 5 is a face view of the finishing plate with a filled inverted housing thereon.

Fig. 6 shows the bottom of the housing engaged by a tool for further compacting the filler

and accomplishing rubbing against the plate of Fig. 5 to complete the operation;

Fig. 7 a sectional view of the tip of the tool with the primer embedded in the tip, the rubbing operation being substantially complete; and

Fig. 8 is a sectional view of the completed primer.

In carrying out the method of primer filling in accordance with my invention, the chemical ingredients of the formula, such as above described, or other desired formula, are mixed thoroughly with sufficient shellac solution to produce a soft plastic mixture of somewhat the consistency of soft butter, but one which may be agitated by stirring to keep the ingredients, which are of widely different specific gravities, intimately mixed. This mixture is maintained in the state described by the addition from time to time of solvent used in the shellac solution.

Referring now to the drawing, a plate-like holder **15**, of a thickness of about one and one-fourth times the overall depth of the housings **17** which are to be filled, is provided with a plurality of grouped holes **19**, eighteen of these holes being shown, each adapted to snugly receive, without binding, a housing **17**, of the standard type to be filled. This holder, which preferably is of metal, is placed on a solid flat base **23**, which also may be of metal, and the housings with their open tops upward are placed in the holes with their bottoms resting on the base, and the holes **25**, through their bottoms, substantially closed by the base.

A mass or batch **26** of the freshly agitated or stirred mixture is placed in a pile on the margin of the holder, as shown in Fig. 1, and, as shown in Fig. 2, the mixture **27** is distributed over the housings, the distribution preferably being made by a thumb or a finger with sufficient circulatory and/or oscillatory movement and pressure to insure the complete filling and overfilling of the housings, with the mixture, **27**—A, Fig. 3, level with the top of the holder. Any surplus material above the top of the holder is preferably scraped off as by a straight edge or spatula, which, in view of the wetness of the mass, may be of steel or other metal, and the surplus promptly returned to the container in which mixing has taken place.

The holder, with the overfilled housings therein, is then inverted, preferably on a flatly supported sheet of paper **29**, Fig. 4, the plate slightly raised, and the housings **17**—A, if they do not freely drop out, are pushed out in inverted position on to the sheet.

Prior to filling the housings, if discs are to be used, a small quantity of shellac is preferably put in each housing to cause adherence of the disc and a disc **31** inserted. Subsequently the housings are placed in the holder and filling accomplished. Should discs not be used, filling of the housings also fills the holes **25** through their bottoms, but such filling of the holes does not seem objectionable. Discs being shown, such hole filling is not shown.

Immediately after removal from the holder, a housing **17**—B is picked up, usually by the aid of a light pair of tweezers (not shown), and placed, as shown in Fig. 5, mixture side down, as at **17**—B, Figs. 5 and 6, on a plate **33**, preferably steel, having a finely grained mat surface, or at least a surface that is unpolished, and which is preferably of the maximum hardness it is practicable to obtain. The upwardly positioned bottom of the housing is contacted by a tool, preferably having a resilient tip **35**, as of soft rubber, the tool having a suitable handle **37**. The tip of the tool is seated solidly on the housing and pressed down hard thereon, effecting shifting engagement with the housing, and, still under pressure, is inclined to one side and the top of the handle moved with a circulatory movement to shift the direction of pressure application around and on the housing. Concurrently, the housing is shifted by shift of the tool tip, with a circulatory and/or oscillatory movement compressing and rubbing the mixture against the mat surface of the plate, and displacing surplus, until the surface of the mixture forms, approximately, a plane coincident with the plane of the surface of the rim.

In the completed primer the mixture **27**—E has a substantially smooth surface and is approximately flush with the top of the rim of the housing **17**—C, as shown in Fig. 8. After completion of the operation the finished primer is reinverted, as in Fig. 8, and set aside for cleaning and drying, and the operation repeated on the remaining primers of the batch.

As batches are completed, the primers are cleaned and dried, such steps, however, being usual and well known, are here mentioned only.

It is found that in spite of the highly explosive nature of the material that the rubbing of the mixture in the housings against the mat surface of the plate does not ignite the material, this apparently being due mostly to the dampness of the mix and the heat dispersing capacity of the plate against the primers are finished.

Tests of primers thus loaded disclose, as far as can be detected, ample ruggedness against danger in rough handling, absolute certainty of firing and a manner of firing that is substantially uniform.

I claim:

The method of loading primers, which includes assembling and holding a plurality of cup-shaped primer housings with their open faces upward in adjacent fixed positions, depositing on and over said housings an intimately mixed plastic mass of firing mixture of desired composition, kneading and compacting said mixture while still homogeneous into said housings and thereabove to establish substantially complete and uniform filling thereof and an overfilling mass thereabove, and subsequently completing operations on said filled housings individually, by supporting each said housing successively, on a hard unpolished surface and rubbing the projecting mixture against said unpolished surface until said projecting mixture is forced into said housing and/or rubbed off against said surface and the surface of the mixture approximates a plane substantially coincident with the plane of the surface of the rim.

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