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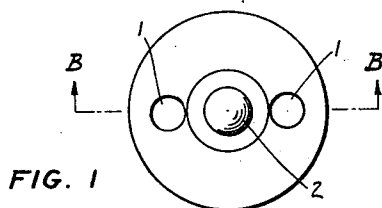
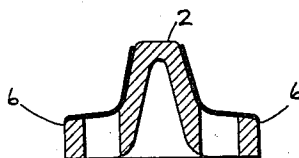
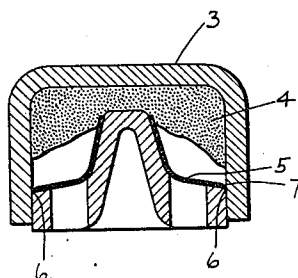
C. E. RICHARDSON

2,188,760

PRIMER

Filed Sept. 3, 1937

2 Sheets-Sheet 1



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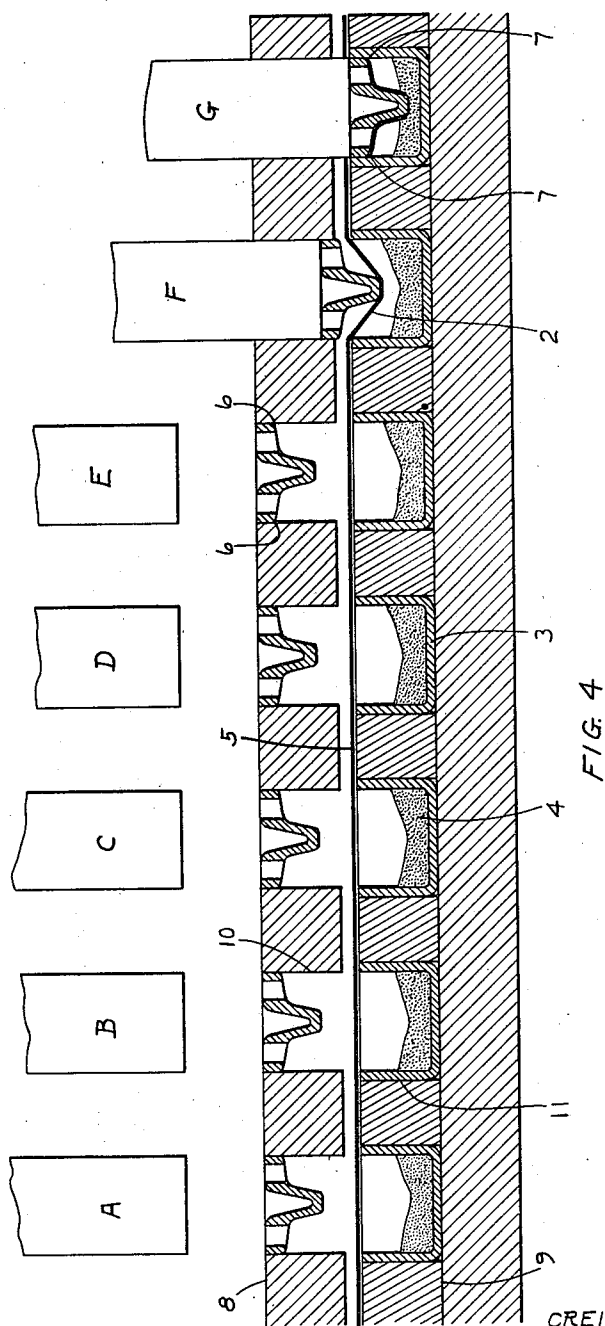
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,188,760

PRIMER

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6 Claims. (Cl. 102—43)

This invention relates to primers for ammunition and more particularly to loose-anvil type primers and anvils therefor.

Prior art anvils for use in primers for ammunition have generally comprised a base plate having a periphery partly circular and an apex formed in the plate which is in intimate contact with the detonating composition in the primer cup and serves as a support against which the detonating composition is driven by the impact of the firing pin. Means had to be provided whereby the flash of the detonating composition could pass around or past the anvil and through the flash hole of the cartridge case to the propellant charge. Numerous methods have been proposed for forming the flash passages in the anvil and the means generally adopted in the industry have been to remove a semi-circular section from the plate on opposite sides of the apex. This method however had several disadvantages. The removal of the opposite semi-circular portions of the anvil leave the anvil radially weakened and subject to easy distortion when being pressed into the primer cup onto the detonating composition. The semi-circular openings are also very difficult to seal with lead foil and practically impossible to seal with varnish. Lead foil as heretofore used could not form an efficient seal because of two distinct disadvantages of the anvils of the prior art. Prior art practice comprised shearing a disc of foil from a sheet placed over the primer cup plate by the downward movement of a punch, the inner edge of the primer cup acting as a shearing edge against the periphery of the punch. The anvil was then pressed into position above the foil, but because of the semi-circular sections removed from the edge of the prior art anvils, the foil lacked adequate support at these points and also because of the removal of these semi-circular sections the cutting of the foil disc could not be performed in the anvil seating operation as is possible with the primer of my invention. Prior art anvils, not being completely circular, are liable to cause serious distortion of the primer cup which, when not perfectly circular, is not easily fitted into the recess of the cartridge case.

An object of the present invention is to provide an anvil for use in primers for ammunition having efficient and adequate flash passages without the mechanical strength of the anvil being materially weakened. A further object is the production of an anvil having flash passages which are easily sealed with a disc of lead foil or by means of varnish and a still further ob-

ject is the production of primers in which the possibility of "en masse" explosions is considerably reduced. Further advantages will be apparent from the following description.

These objects are attained with the pierced anvil of my invention in conjunction with the efficient means of sealing the flash passages thereof with heat-fusible material as more particularly described with reference to the accompanying drawings in which the same numerals are used to designate like parts in all the figures and in which

Figure 1 is a plan view of the anvil made according to my invention.

Figure 2 is a cross-sectional view of Figure 1 on the line B—B.

Figure 3 is a cross-sectional view of a primer cup complete with the anvil of my invention, the detonating composition and the lead foil for sealing the detonating composition beneath the anvil.

Figure 4 is a diagrammatic cross-sectional view showing the means used for simultaneously assembling the anvil and heat-fusible disc in the primer cup, as well as the cutting of the disc of heat-fusible material.

In Figure 1 the flash holes are shown at 1, and 2 is the apex of the anvil. While I have shown only two flash holes, I have also produced anvils having three holes and four holes. I have found in fact that the number and size of the holes are limited only by the available area of the anvil and that all the advantages of my invention are attained with any number of holes of any size within that limitation. I prefer to use only two flash holes however, since I have found that adequate flash passage is obtained with two holes and production of the anvil is somewhat more simple than with three or four holes. The round holes as shown may be either drilled or punched but it is obvious that the holes need not be round and could be made in any other shape and remain within the scope of my invention since an essential feature of my invention is that the formation of flash passages be made between the initial rise of the apex and the circumference of the anvil without converging into the circumference of the anvil and with no encroachment or only slight encroachment into the initial rise of the apex. This is more clearly shown in Figure 2 which is a cross-section on the line B—B of Figure 1. As shown the anvil has a flat base and slightly rounded shoulders 6, both of which features facilitate the centering of the anvil as will be more fully described hereinafter. The apex 2 is shown as having a rounded contour but the

configuration of the apex is not claimed as an essential feature of my invention. For example, anvils have been proposed having the apex of various configurations such as cones, truncated cones, pyramids and truncated pyramids and it is obvious that my invention could be used with any of these. I have referred above to the flat base and rounded shoulders of my anvil and while neither of these features are new in themselves, such features, in conjunction with the fully circular base give a further improvement in the facility with which my anvil is inserted in the primer cup. The rounded shoulder is also of itself of advantage in sealing the detonating composition with the anvil of my invention.

Discs of lead foil or other heat-fusible material, have been generally used for such sealing, the disc being pressed into place over the detonating composition and the anvil then pressed into place about the sealing disc. By this method the detonating composition was first pressed to a compact mass in the bottom of the priming cup. By an alternative method the pressing of the detonating composition and the pressing into place of the sealing disc was done simultaneously by the pressing punch. Efficient sealing by either of these methods was not obtained however, when using the anvils hitherto known to the art as described above. The indentation left by removal of the semi-circular sections left these sections of the anvil without adequate support for the lead foil discs at these points and the foil discs thus had a tendency to fold or collapse at these points either when placing the anvil in position or in the subsequent operations of completing the primer or in the handling of the completed shells. The very small diameter of the sealing discs also made it difficult to insure that the disc was properly centered over the detonating composition. The primers in which the disc were not properly centered were therefore very susceptible to "en masse" explosions since in such primers a partial area of the detonating composition would remain uncovered. This failure to obtain a proper seal is one of the serious disadvantages of using the anvils hitherto known to the art. A further disadvantage of the imperfectly sealed primer is the possibility of loss of detonating composition and the consequent reduction of flash qualities of the primer, and a still further disadvantage is the failure to obtain adequate moistureproofing. Adequate sealing by the use of varnish was also unobtainable with the anvils hitherto available for the same reasons.

The efficient sealing obtained with anvils made according to my invention is clearly illustrated in Figures 3 and 4 in which

3 is the primer cup, 4 is the detonating composition, 5 is the lead foil or other sealing disc, 6 are the shoulders of the anvil and 7 shows the lead foil or other heat-fusible material conforming to the contour of the shoulders.

In Figure 4 is shown a diagrammatic cross-section of the plates used in assembling the anvils in the primer cups and the method of simultaneously cutting the foil disc and seating the anvil referred to above. The anvils are shaken on the plate 8 having opening 10 there-through adapted to support the anvil as shown. The priming cups 3 are likewise shaken on plate 9 until cups come to rest in each of the cavities 11. Each plate has a plurality of cavities, and the cavities of the anvil plate are adapted to position themselves in vertical axial alignment

with the cavities of the primer cup plate when the anvil plate is superposed on the primer cup plate. Punches which I shall refer to hereinafter as anvil seating punches are shown at A, B, C, D, E, F, and G. The first five of these A to E inclusive are shown in their inoperative position. The use of the two plates with the anvil seating punches is well known in the prior art practice and is not claimed as an essential feature of my invention. When producing primers according to my invention however, I interpose a sheet of lead foil or other heat-fusible sheet material between the anvil plate and the primer cup plate.

Seating of the anvil into the primer cup with the anvil apex in intimate contact with, and slightly embedded in the detonating composition is attained by downward movement of the anvil seating punch and it is in this operation when performed according to, and with the anvil of my invention, that efficient protection against "en masse" explosions is obtained. It will be apparent in Figure 4 that the anvil must pass through the heat-fusible sheet material and this is more clearly shown with the anvil-seating punches F and G. Downward movement of the anvil-seating punch F brings the anvil apex 2 into contact with the sheet or heat-fusible material. The downward movement of the anvil-seating punch being continuous the height of the anvil apex above its shoulder is such that the contacting of the anvil apex with the foil is immediately succeeded by contact of the shoulder of the anvil with the heat-fusible material and almost simultaneous contact between heat-fusible material and the inner periphery of the primer cup. The downward pressure of the apex on the heat-fusible material thus causes the latter to stretch but this stretching is almost immediately resisted by the simultaneous periphery contacts referred to above. This initial resistance causes the anvil apex to pierce the heat-fusible material and this piercing is immediately successive to the peripheral contacts referred to above. The anvil apex then serves as a centering guide for the foil in the remainder of the operation. The peripheral contacts being simultaneous, a shearing edge is formed between the periphery of the anvil and the periphery of the primer cup and the heat-fusible material being between the shearing edges is cut in a disc. Since the diameter of the cavity in the primer cup is slightly greater than the diameter of the anvil at the termination of the rounded shoulder, the base of the sheared disc in its conical form will in turn be of slightly greater diameter than the anvil. This slight excess in diameter allows conformity of the sheared disc to the rounded shoulder of the anvil in its continued downward progress in the primer cup and confines the margin of the disc in the tapering recess between the rounded shoulder and the cup wall, thus insuring a tight seal at the periphery of the anvil. Due to the method of assembly, as heretofore described, the disc has a large area of close contact with the periphery of the anvil apex; thus the disc seals and covers the flash holes with an impermeable membrane by being sealed effectively at the edge portion at the rounded shoulder and at the edge portion where contact is made with the apex of the anvil.

It is also evident that as contact is made by the punch, edge of the cup and the sealing material, that air will be trapped between the

lower surface of the sealing material and the interior of the cup containing the primer mixture. As can be seen from the drawings, the anvil is then advanced into the cup in such a manner as to approximately reduce the volume by $\frac{1}{2}$ with a corresponding increase of pressure in accordance with the relation $P_1V_1=P_2V_2$ further causing the sealing material to move against the anvil and assuming the shape thereof.

This efficient protection against "en masse" explosions is particularly necessary when using the modern priming compositions. A mixture of mercury fulminate and potassium chlorate was formerly used as the priming composition for small arms ammunition primers. When a number of primers loaded with this mixture were stored or handled together the explosion of one was sufficient to communicate the explosion to the others in the container, but this resulted in a number of small individual detonations which were not particularly hazardous. With most other compositions and especially the more modern priming compositions however, for example, those containing lead styphnate, the explosion of one is very likely to cause the simultaneous explosion of all the other primers in the container and the resulting explosion is therefore of considerable intensity. Such explosions, commonly termed "en masse" explosions are prevented by the provisions of my invention. It will also be apparent that misfires caused by loss of priming composition are considerably reduced if not completely eliminated by the efficient and adequate sealing attained by my invention. Alternatively the lead foil or other heat-fusible material may be omitted and the holes may be sealed by the use of a varnish or lacquer or any other moisture-proof film-forming fluid. Since the flash holes are relatively small, being of about $\frac{1}{32}$ inch diameter for small arms ammunition anvils, adequate support is obtained whether foil or fluid is used.

Having thus described my invention what I claim is:

1. A primer for ammunition comprising a primer cup, a priming composition in said cup, an anvil having an unbroken peripheral contact with said cup, an apex on said anvil projecting toward said priming composition, flash passages in said anvil between said apex and said unbroken periphery; and an impermeable membrane in continuous circumferential contact with the surface of said anvil apex, covering said flash passages and held in sealing engagement with said anvil at the periphery thereof.

2. A primer for ammunition comprising a

primer cup, a priming composition in said cup, an anvil having an unbroken peripheral contact with said cup, an apex on said anvil projecting toward said priming composition, flash passages in said anvil between said apex and said unbroken periphery; and an impermeable membrane covering said flash passages and held in sealing engagement with said anvil at the periphery thereof.

3. In a primer for ammunition, the combination with a primer cup and a priming mixture in said cup; of an anvil comprising a flat base having flash passages therethrough, a continuous periphery for engagement with said cup, an inwardly rounded shoulder merging with said continuous periphery, and a substantially centrally disposed apex projecting from said base; and an impermeable membrane covering said flash passages and sealed at said rounded shoulder between said anvil and said cup.

4. A priming for ammunition comprising a primer cup a priming composition in said cup, an anvil having an unbroken peripheral contact with said cup, an apex on said anvil projecting toward said priming composition, flash passages in said anvil between said apex and said unbroken periphery; and a sheet of fusible metal in continuous circumferential contact with the surface of said anvil apex, covering said flash passages and held in sealing engagement with said anvil at the periphery thereof.

5. In the assembling of ammunition primers, the method of sealing the priming mixture cavity which comprises interposing a sheet of sealing material between a primer cup and an anvil to be seated in said cup, advancing said anvil against said sheet of sealing material and into said cup thereby shearing a disc of said sealing material from said sheet, and simultaneously seating said anvil in said cup and disposing said disc of sealing material in sealing engagement with said anvil and said cup.

6. In the assembling of ammunition primers, the method which comprises interposing a sheet of fusible metal between a primer cup and an anvil to be seated in said cup, advancing said anvil to engage said sheet to first depress a portion thereof into said cup and thereafter shear a disc from said sheet by the engagement of the periphery of said anvil with the periphery of said cup, the continued advance of said anvil seating said anvil in said cup with the margin of said sheet in sealing engagement with said anvil and said cup at the contact surfaces thereof.

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