United States Patent

Daniels

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[54] COMBUSTIBLE MOISTUREPROOF PERCUSSION PRIMER

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[52] **U.S. Cl.** **102/40,** 102/DIG. 1, 102/45

[51] **Int. Cl.**.....**F42b 5/18,** F42b 19/08

[58] **Field of Search**.....102/38, DIG. 1, 43, 44, 45

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[57] **ABSTRACT**

A percussion primer for initiating firing of a cartridge which is fully combustible and which is impervious to moisture vapor. The primer mix is contained in a consumable moistureproof sealed cup-shaped closed member received in a molded propellant support and backed against a molded propellant anvil which function together as a unit attachable to a cartridge.

5 Claims, 3 Drawing Figures

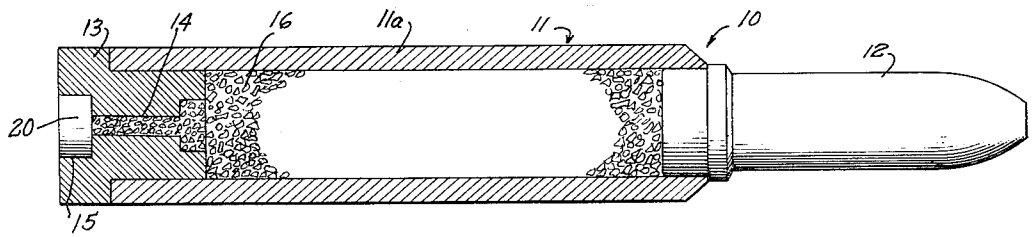


Fig. 1

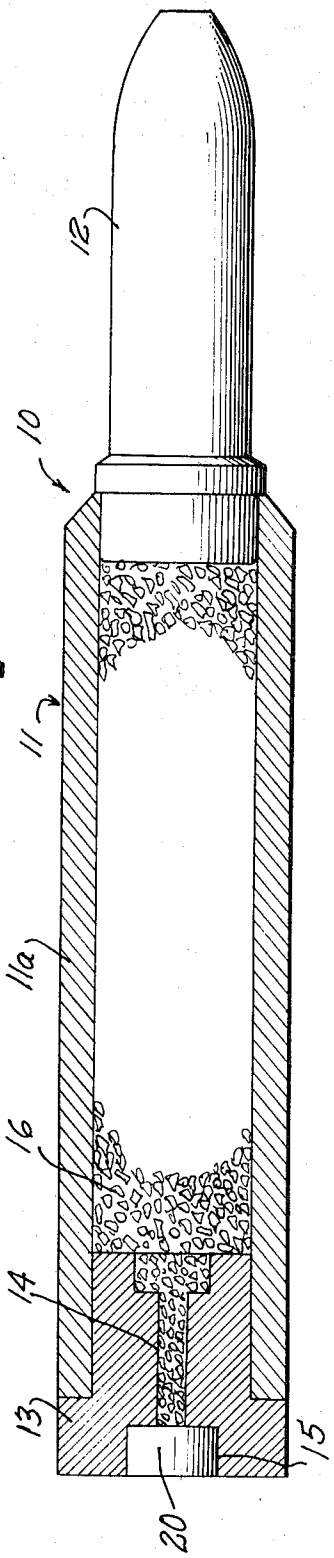


Fig. 2

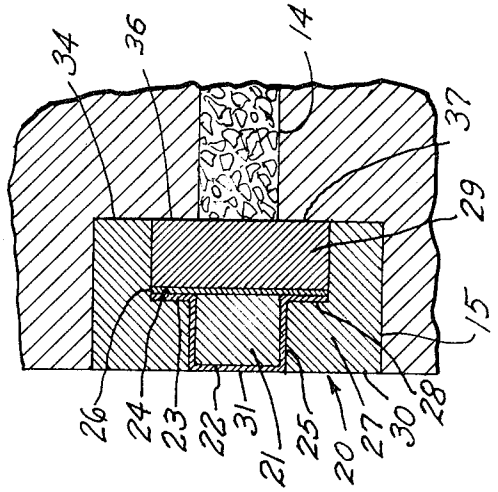
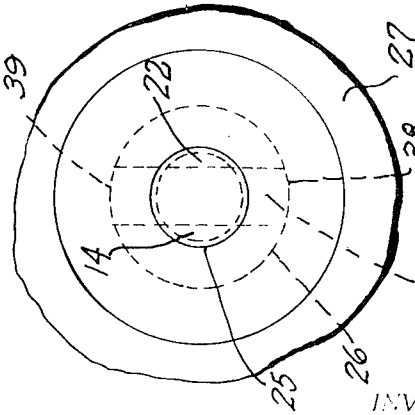


Fig. 3



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COMBUSTIBLE MOISTUREPROOF PERCUSSION PRIMER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to percussion primers and more particularly to a moistureproof fully combustible primer. The invention herein described was made under a United States Department of the Army contract.

2. Prior Art

Recent developments in ammunition construction and cartridge firing weaponry have made possible the use of caseless cartridges which are constructed primarily of molded propellant with a projectile attached thereto. Such cartridges have the advantage of being fully combustible whereby the need for a cartridge case is eliminated.

In prior art cartridges involving metallic cartridge cases, the primer usually consisted of a metal-ended percussion cap in the case of center-fired cartridges. Because of the necessity for ejecting the casing from the weapon after firing and because of the mositureproof nature of the metal casing itself, such metal-ended primers worked adequately. However, metal primers cannot be adapted for use in cartridges which are either constructed entirely of propellant or which are constructed of some casing material which is fully combustible or meltable and which contains the propellant. In such instances the use of metal-ended primers would destroy some of the advantages derived from fully combustible cartridges in that the primer would have to be ejected or otherwise removed from the weapon after firing.

The use of molded propellant as a cartridge and as a container for the sensitive priming mix, which would then be fully combusted, may overcome this disadvantage. However, priming mix is adversely affected by moisture. Military requirements as well as general usage dictate that the cartridge be reliably functional after exposure to moisture. Therefore, the use of molded propellant to contain the priming mix is unsatisfactory inasmuch as it would not protect the mix from moisture and the primer would be subject to failure after exposure to such moisture.

SUMMARY OF THE INVENTION

The disadvantages of the prior art are overcome by the instant invention which provides an hermetically sealed primer mix which is percussion exploded.

The primer mix, which may be of any standard type, is contained in an open-ended cup which, in the preferred embodiment, has an out-turned flange adjacent the open end. A plate is used to close the cup. Both the closure plate and the cup are constructed of a material which is consumed during the firing cycle of the cartridge.

A propellant support is provided to receive the cup and closure. The support has a bore therethrough which has a reduced diameter at one end thereof. The cup is received in the reduced diameter portion having its bottom wall lying in the same plane as the bottom of the support and its flange bottoming on the radial wall of the bore created by the reduced diameter. A propellant anvil which has the same diameter as the large diameter portion of the bore, is received therein to overlie the closure plate and cup. The anvil has an axial dimension so that its axial end lies in substantially the same plane as the adjacent axial end of the support. The elements may then be bonded together to provide a primer assembly which is self-contained and in which the primer mix is hermetically sealed and is impervious to moisture vapor. The assembly is then adapted to be attached to the base of a cartridge. Because the support and anvil are constructed of propellant and because the cup and closure plate are constructed of a material which is either consumed or dissipated during the firing of the cartridge, the entire primer assembly will be consumed during the firing of the cartridge.

It is then an object of this invention to provide a new cartridge primer.

It is a further object of this invention to provide a fully combustible primer wherein the primer mix is hermetically sealed against elemental degradation.

It is yet another object of this invention to provide a primer assembly having a primer mix hermetically sealed in a cup-shaped housing closed by a closure plate, the housing and plate constructed of a material which is dissipated during the firing cycle.

It is yet another and more specific object of this invention to provide a primer assembly wherein the primer mix is hermetically sealed in a housing which is received in a propellant support and which bottoms against a propellant anvil; the support, anvil, housing and mix all adapted to be consumed during during the cycle of a cartridge with which the primer is associated.

Other and further objects of this invention will be apparent to those skilled in this art from the following detailed description of the annexed sheet of drawings which, by way of a preferred embodiment of the invention, illustrate one example of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross-sectional view of a cartridge equipped with the primer of this invention.

FIG. **2** is an enlarged fragmentary cross-sectional view of a base portion of the cartridge of FIG. **1** illustrating the primer assembly of this invention.

FIG. **3** is an end plan view of a modification of the primer of this invention illustrating underlying portions by broken lines.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** is a cross-sectional representation of one form of a caseless cartridge equipped with a primer assembly according to this invention. The cartridge **10** includes a propellant section **11** and a projectile **12**. The propellant section **11** consists of a tubular molded propellant body **11***a* having a base plug **13** inserted in one end thereof and the projectile **12** inserted in the other end and projecting therefrom. The base member **13** is also constructed of propellant and includes an axial fire bore **14** therethrough having an increased diameter portion **15** at its axially outer or base end. The fire bore **14** except for the increased diameter portion **15** contains an ignition charge and the remainder of the central area of the tubular body **11***a* is filled with propellant grains **16**. The increased-diameter portion **15** of the fire tube **14** contains the primer assembly of this invention **20** therein.

Although the invention is described as being used in connection with a specific caseless cartridge, it is to be understood that this invention may be used with any cartridge whether it is constructed of molded propellant, a single grain of propellant, a consumable case cartridge, or a standard metal or plastic case cartridge. It is to be further understood that the primer assembly of this invention is adapted to act as an initial igniter of a main charge and that its use need not be restricted to ammunition.

FIG. **2** illustrates the primer assembly of this invention in a cross-sectional view. The assembly **20** consists of a primer mix **21** received in a combustible cup-shaped housing **22** which has an out-turned flange **23** adjacent the open end thereof. The open end of the cup **22** is closed by a closure plate **24**. The cup and closure plate are attached together in a manner which will prevent entrance of moisture between them into the interior of the cup. They therefore form a moisture-impervious housing. The cup **22** is received in a reduced-diameter portion **25** of an axial bore **26** through a support member **27** with the out-turned flange **23** thereof bottoming against a radial ledge **28** formed by the reduced diameter inner diameter **25** of the bore **26**. An anvil **29** closes the major diameter portion of the bore **26**.

In the preferred embodiment, the support **27** is disc-shaped, having the bore **26** extending along its axis with the reduced diameter portion **25** open to a front end **30** of the support **27**.

The cup 22 is circular and the distance from the flange 23 to the bottom wall 31 of the cup is such that when the cup is received in the reduced diameter portion 25, the bottom wall 31 is coplanar with the wall 30 of the support. Preferably, the cup 22 has a diameter equal to the diameter of the portion 25 of the bore 26 so that the cup is snugly received in the support. The closure plate 24 and the flange 23 have a diameter equal to the major diameter of the bore 26 as does the anvil 29 so that the entire assembly is radially stable. The anvil 29 has an axial length such that its axially outer end 33 lies in the same radial plane as the end 34 of the support 27. In order to further hold the assembly in its assembled condition, the anvil 29 may be adhesively retained in the bore 26.

Thus, the primer assembly can be handled as a single piece having a disc configuration susceptible to mass manufacturing within relatively close tolerance limits. The assembly is then adapted to be received in the base of a cartridge in a recessed area therein such as the increased diameter portion 15 of the bore 14 illustrated in FIG. 1 wherein it will bottom on the ledge 37 created by the increased diameter. Preferably when assembled in the cartridge the primer assembly lies flush with the base.

The support 27 and anvil 29 may be formed of molded propellant or may be formed of a cast or machined structure of a large grain of propellant. A typical molded propellant composition which may be used in forming the anvil and support consists of:

	Percent
Nitrocellulose	77.45
Nitroglycerin	19.50
Barium nitrate	1.40
Potassium nitrate	0.75
Ethyl centralite	0.60
Graphite	0.30

This composition has a burning rate within the limits desired in allocated time for combustion.

The cup 22 and closure plate 24 may be constructed of any material which is either combusted, consumed or otherwise destroyed during the firing cycle of the cartridge and which is impervious to moisture vapor.

The cup and closure may adequately be formed of a plastic film such as a nitrate ester which is combustible or may be formed of a reactive or low melting point metal which would be fully dissipated during the firing cycle of the cartridge.

The primer mix 21 may consist of any explosive mixture which can be detonated by percussion. The assembly is adapted, in the preferred embodiment illustrated, to be used in connection with center fire weapons where the firing pin will strike the bottom wall 31 of the cup compressing the primer mix 21 between the pin and the anvil 29. An acceptable primer mix for such uses is as follows:

	Percent
Lead styphnate	36
Tetracene	12
Barium nitrate	22
Lead dioxide	9
Antimony sulfide	7
Zirconium	9
PETN	5

Entrapment of the primer mix between a firing pin and the anvil will then serve to ignite the primer mix which in turn will either combust or otherwise consume a portion of the cup and closure plate sufficient to ignite the propellant material of the support and anvil. The entirety of the cup and closure are then combusted or otherwise consumed during the burning of the support, anvil, and remainder of the cartridge. The flame from the primer mix will touch off the ignition charge to fire the cartridge.

FIG. 3 illustrates a modification of the primer of this invention. In the modification, the anvil member 29*b* is semirectangular having curved ends 38 and 39 mating with the inner diameter wall of the major diameter portion of the bore 26 of the support member 27. The modified anvil 29 has a width less than the diameter of the cup 22. In this manner, the flame from the primer mix can extend past the sides of the anvil to touch off the ignition charge in the fire tube 14. Because the anvil has a major axis length the same as the major diameter of the bore 26, it will be retained therein in the same manner as the anvil 29. Thus, a unitary assembly is again provided.

It can therefore be seen from the above that my invention provides a percussion primer assembly constructed entirely of consumable materials which are destroyed during the firing cycle and in which the primer mix is hermetically sealed against moisture or other environmental conditions which would adversely affect its ability to detonate.

Although I have herein set forth my invention with respect to certain specific principles and details thereof, it will be understood that these may be varied without departing from the spirit and scope of the invention as set forth in the hereunto appended claims.

I claim as my invention:

1. A percussion primer assembly comprising: a support member, a bore through said support member, said bore having a reduced-diameter end, a cup-shaped housing member having an open end with an out-turned flange therearound, said housing member received in the said reduced diameter end of the said support member bore with the said flange received in the said nonreduced diameter portion of the said bore bottoming against the reduced diameter portion, a closure member in said nonreduced diameter portion overlying said flanged end closing said housing, said housing containing an explosive primer mix, an anvil member received in said nonreduced diameter portion of said bore closing said bore at one end thereof and entrapping said closure member and housing therein, said support member and said anvil member constructed of a combustible propellant, said housing and said closure plate constructed of a material impervious to moisture whereby the said primer mix is sealed against moisture in said housing, and said housing and said closure plate constructed of a consumable material whereby the entirety of the assembly is destroyed during firing.

2. The assembly of claim 1 wherein the said housing and the said closure plate are constructed of a combustible material impervious to moisture.

3. The assembly of claim 1 wherein the said housing and said closure means are constructed of a low melting point metal.

4. The assembly of claim 1 wherein the said housing and said closure means are constructed of a nitrate ester.

5. The assembly of claim 1 wherein the entire assembly is disc-shaped having a top and bottom axial end, said bore lying generally along the axis of said disc, said reduced diameter portion open to said top end, the nonreduced diameter portion open to said bottom end, the bottom wall of said cup-shaped housing terminating in a plane substantially equal to the plane of the said top end, said anvil terminating in a plane substantially equal to the plane of said bottom end, said housing, said closure and said anvil substantially filling said bore.

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