April 22, 1969 P. J. HENSLEY 3,439,635

CASELESS AMMUNITION WITH THE PRIMER OPERATIVELY SUPPORTED TO THE AFT END OF THE PROJECTILE

Filed Dec. 28, 1967 Sheet 1 of 2

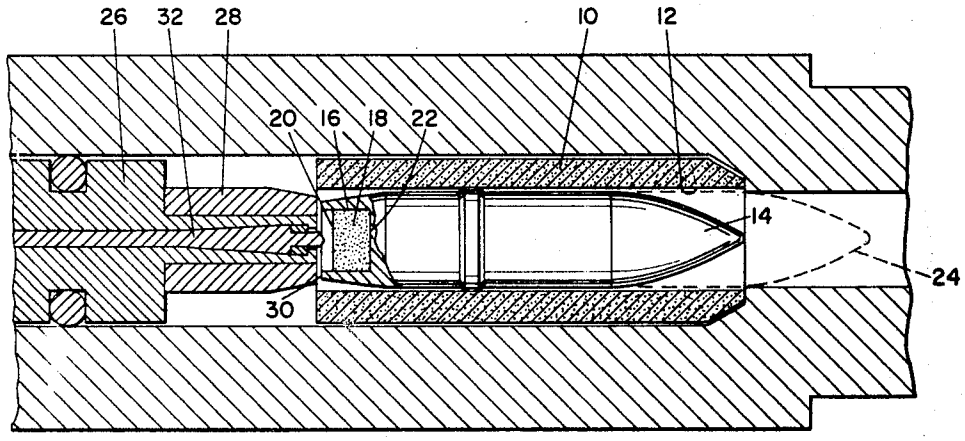


FIG. 1

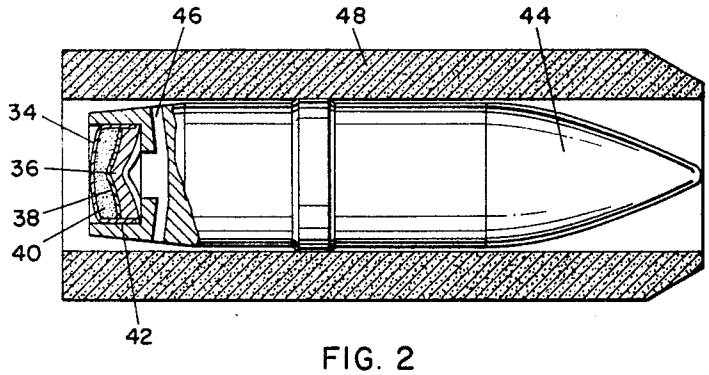


FIG. 2

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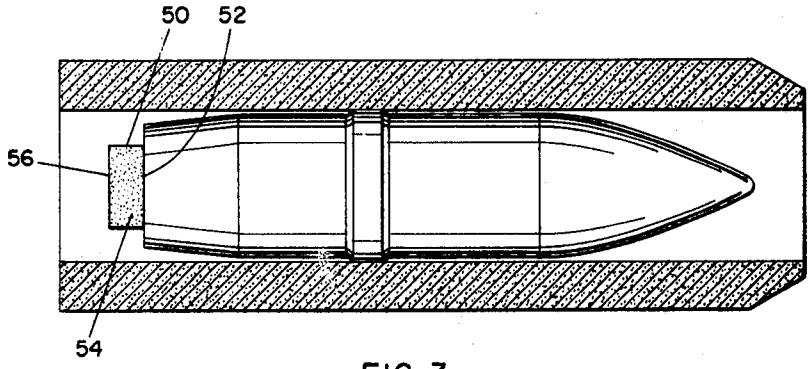


FIG. 3

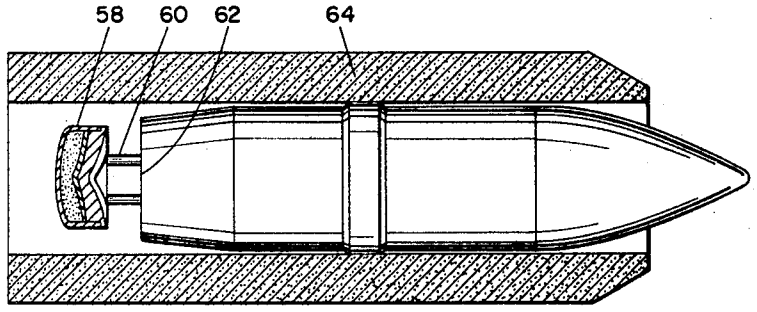


FIG. 4

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CASELESS AMMUNITION WITH THE PRIMER OPERATIVELY SUPPORTED TO THE AFT END OF THE PROJECTILE

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ABSTRACT OF THE DISCLOSURE

A round of caseless ammunition is provided with the primer operatively supported to the aft end of the projectile. Both conventional and combustible primers can be employed.

This invention relates to a novel method for priming a round of caseless ammunition. More particularly, this invention relates to a round of caseless ammunition wherein the projectile provides the support necessary for operation of the primer.

One of the major problems in the state of the development of caseless ammunition has been the poor reliability of the round. Heretofore, combustible primers have been used exclusively with caseless ammunition since it is required that the chamber of the firearm in which these rounds are fired be clean after each firing. The poor reliability of the caseless round is attributed to the combustible primer, and in particular to the lack of a rigid anvil in the combustible primer. The function of an anvil in a primer is to provide support for the priming mixture so that it is crushed by the action of a firing pin. Propellant formulations which are suitable for use as a propellant charge in caseless ammunition do not have the rigidity necessary to provide the support for reliable ignition of combustible primers. Attempts to increase the reliability of combustible primers have included the addition of highly sensitive explosive materials to the priming mixture.

Conventional type primers have not been used with caseless ammunition, since there is no method to remove the noncombustible parts of the conventional primer from the chamber of the firearm. Conventional primers used with cartridge type ammunition are secured to the base of the cartridge case and are removed from the chamber of the firearm when the spent cartridge case is ejected. The metal cartridge case of cartridge type ammunition provides the support needed for operation of the primer.

It is an object of this invention to provide a highly reliable priming system for caseless ammunition.

It is another object of this invention to provide a simple, economical, and safe method of priming caseless ammunition.

It is another object of this invention to provide a round of caseless ammunition wherein the projectile, provides the support necessary for reliable operation of the primer.

It is still another object of this invention to provide a round of caseless ammunition wherein the primer can be of the combustible or conventional type.

Other objects of this invention will, in part, be obvious and will, in part, appear hereinafter. For a complete understanding of the nature and the objects of this invention, reference is made to the following detailed description and drawings.

In accordance with this invention, there is provided a round of caseless ammunition having in combination, a propellant charge with an axial bore throughout, a projectile, and a primer in axial alignment with the projectile and operatively supported to the aft end of the projectile.

The projectile with the primer supported to its aft end is positioned and secured within the axial bore of the propellant charge. The diameter of the axial bore is substantially equal to or greater than the maximum outside diameter of the projectile so that the projectile can be housed within the bore of the propellant charge. The wall of propellant formed by the axial bore in the propellant charge can surround the primer and the projectile. A round of caseless ammunition in which the projectile is housed in propellant as described is referred to hereinafter as a telescoped round of caseless ammunition. The telescoped rounds of this invention include rounds in which the primer and the entire length of projectile are surrounded by propellant and those in which the primer and a part of the length of the projectile are surrounded by propellant.

Telescoped rounds of caseless ammunition having the primer supported to the aft end of the projectile are illustrated in the accompanying drawings.

FIG. 1 represents a vertical section of a longitudinal view of a telescoped round in the loaded and firing positions wherein a combustible primer is supported within an axial recess at the aft end of the projectile.

FIG. 2 illustrates a vertical section of a longitudinal view of a telescoped round of caseless ammunition with a conventional metal primer supported within an axial recess at the aft end of the projectile.

FIG. 3 illustrates a vertical section of a longitudinal view of an embodiment of a telescoped round with a combustible primer supported to the base of the projectile.

FIG. 4 illustrates a vertical section of a longitudinal view of an embodiment of a telescoped round with a conventional metal primer supported to the aft end of the projectile.

In FIG. 1 a telescoped round is shown having a propellant charge **10** with an axial bore **12** throughout, and a projectile **14** secured within the axial bore **12**. The projectile **14** has an axial recess **16** in the aft end. The axial recess **16** in the aft end of projectile **14** is filled with conventional priming mixture **18**. The priming mixture **18** is sealed into axial recess **16** with a disc of moistureproof combustible material **20**. The base **22** of the axial recess provides the support necessary for reliable ignition of the priming mixture **18**.

When a telescoped round is to be fired the projectile **14** is chambered at position **24** by the forward movement of a reciprocating bolt **26**. The projectile **14** is moved forward in relation to the propellant charge **10** to the chambered position **24**. In this position forward obturation is substantially accomplished.

The reciprocating bolt **26** has a bolt extension **28** with a reduced diameter which enters into the axial bore **12** of the propellant charge, contacts the rim **30** forming the extreme aft end of the projectile, and chambers the projectile **14**. The bolt travel is predetermined by weapon design to effectively chamber the projectile **14**. The telescoped round is fired when a firing pin **32** is driven forward into the primer mixture **18**. The crushing action

provided by the firing pin **32** being driven into the primer mixture **18** supported by the projectile **14**, initiates the priming mixture **18**. The blast from the primer is reflected off the bolt extension **28** and ignites the propellant charge **10**.

In FIG. 2 a conventional metal primer comprised of a cup **34**, an anvil **36** having circular cuts along its edges to provide a passage way for flames, a waterproof combustible seal **38**, and a priming mixture **40** is installed in an axial recess **42** in the base of the projectile **44**. The projectile **44** has radial vents **46** drilled from the outside of the projectile to center of the bottom of axial recess **42**. The radial vents **46** provide the paths for the flames from the detonated primer mixture **40** to reach the propellant charge **48**. The primer cup **34** and anvil **36**, leave the chamber of the firearm with the projectile **44**.

FIG. 3 illustrates an embodiment of a telescoped round with a combustible primer supported at the base of the projectile and in axial alignment therewith. In FIG. 3 a combustible primer cup **50** is adhesively secured to the base of projectile **52**. The primer cup is filled with a conventional priming mixture **54** which is held in place with a combustible seal **56**. The primer is initiated by crushing of the priming mixture **54** provided by the action of a firing pin (not shown) impinging on the priming mixture **54** which is supported by the base of the projectile **52**.

FIG. 4 illustrates an embodiment of a telescoped round with a conventional metal primer supported to the aft end of the projectile and in axial alignment therewith. In FIG. 4 support members **60** are secured at one end to the base of the projectile **62** and at the opposite end to the conventional primer **58**. The space between the base of the projectile **62** and the primer **58** provides a path whereby the primer flames can reflect off the base of the projectile to ignite the propellant charge **64**. The projectile provides the support necessary for operation of the primer **58**. The primer **58** leaves the barrel of the firearm attached to the projectile **62**.

In accordance with this invention the projectile must be chambered prior to initiation of the primer to provide the support necessary for reliable operation of the primer. Therefore, the aft end of the projectile must provide a surface, spaced from the primer, for receiving the chambering means so that the primer is not initiated during chambering of the projectile. This surface can be a peripheral area or an extension member at the base of the projectile spaced from the primer.

The propellant charge can have any outside configuration desired. The propellant charge can be prepared from a single base, double base, triple base, or composite propellant granules. The propellant charge can be made by a molding technique wherein small granules of propellant are bonded together by a suitable binder. In this method a mold is filled with granules of propellant, a binder is added, and the mold is pressurized at from about 500 p.s.i. to about 2000 p.s.i. for from fractions of a second to about a minute. The propellant charge is then removed from the mold and dried. A suitable binder for single base, double base and triple base propellant is a mixture of collodian and acetone. A binder suitable for composite type propellant is dependent on the type of composite but in general it is of the same composition as the binder of the composite.

The primers which can be employed in this invention include both combustible and conventional types.

The combustible type primer in its simplest form can consist simply of a standard priming mixture pressed into the aft end of a projectile and sealed with a waterproof combustible seal such as adhesive backed foiling paper. Combustible primers can also be preprepared. The primer body can be made from propellant or other combustible material. The primer body is tightly packed with priming mixture and sealed with a waterproof combustible seal. The primer can then be secured to the aft end of the projectile. The base of the preprepared combustible primer must be contiguous with the aft end of the projectile for operative support to be provided by the projectile.

All types of conventional primers can be used in this invention. The noncombustible portion of the conventional primer leaves the chamber of the firearm with the projectile. Operative support for the conventional primer is provided by securing the primer to the aft end of the projectile so that flames from the initiated primer have an open path whereby they can contact the propellant charge for its ignition.

The priming mixtures employed with combustible and conventional primers contain the usual priming mixture ingredients such as potassium chlorate, antimony sulfide, lead sulphocyanide, trinitrotoluol, or other standard primer ingredients. The exact composition and amount of priming mixture will depend on the formulation and size of the propellant charge to be ignited, and should be chosen to provide sufficient pressure and heat for reliable ignition of the propellant charge.

The projectile is secured inside the bore of the propellant charge with adhesive such as nitrocellulose in methyl ethyl ketone which will form a bond between the projectile and the propellant surface. Other adhesives which can be used include polyisocyanate resins, epoxy resins and cellulose acetate lacquers. Other means of securing the projectile in the bore of the propellant charge include use of a readily combustible material such as styrofoam in the form of a solid ring or rings. These rings can be adhesively secured to both the projectile and the bore of the propellant charge to secure the projectile therein. Only a small amount of adhesive is required since the function of the adhesive is to prevent the projectile from loosening during handling operations.

The telescoped rounds of caseless ammunition of this invention can be prepared in any size desired. The amount of propellant in the propellant charge, the caliber of the projectile, and overall round configuration can be determined by one skilled in the art depending on such factors as the firearm for which the round is designed, and the desired range for the projectile.

What I claim and desire to protect by Letters Patent is:

1. A telescoped round of caseless ammunition having in combination a propellant charge with an axial bore throughout; a projectile; and a primer in axial alignment with the projectile; said projectile and primer positioned within the bore of the propellant charge; means for operatively supporting the primer to the aft end of the projectile; means at the aft end of the projectile, spaced from said primer, for receiving chambering means for the projectile; and means for securing the projectile within the bore of the propellant charge.

2. The telescoped round of caseless ammunition of claim **1** wherein the primer is of the combustible type.

3. The telescoped round of caseless ammunition of claim **1** wherein the primer is of the conventional type.

4. The telescoped round of caseless ammunition of claim **1** wherein the means for operatively supporting the primer to the aft end projectile comprises a projectile with an axial recess in its base, and the primer is of the combustible type secured within said axial recess.

5. The telescoped round of caseless ammunition of claim **4** wherein the primer is comprised of a priming mixture and a combustible seal, said priming mixture held in the axial cavity in the base of the projectile by the combustible seal.

6. The telescoped round of caseless ammunition of claim **1** wherein the projectile has an axial recess in its base and radial vents passing from the base of the axial recess to the outside of the projectile; the means for operatively supporting the primer to the aft end of the projectile comprises the axial recess; and the primer is of the conventional type secured within said axial recess.

7. The telescoped round of caseless ammunition of claim 1 wherein the means for operatively supporting the primer to the aft end of the projectile comprises the base of the projectile and the primer is of the combustible type secured to the base of the projectile.

8. The telescoped round of caseless ammunition of claim 1 wherein the means for operatively supporting the primer to the aft end of the projectile comprises support members secured at one end to the aft end of the projectile, and secured at the opposite end to the primer, said primer being of the conventional type.

References Cited

UNITED STATES PATENTS

2,866,412	12/1958	Meyer et al.	102—38
3,345,945	10/1967	Quinlan et al.	102—38
3,398,684	8/1968	Kuavle	102—99 X

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U.S. Cl. X.R.

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