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W. J. KROEGER ET AL
AMMUNITION FOR RECOILLESS FIREARMS

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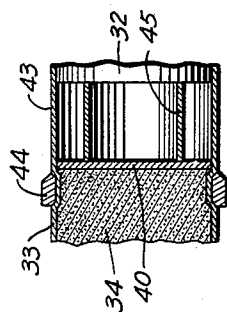


FIG. 2.

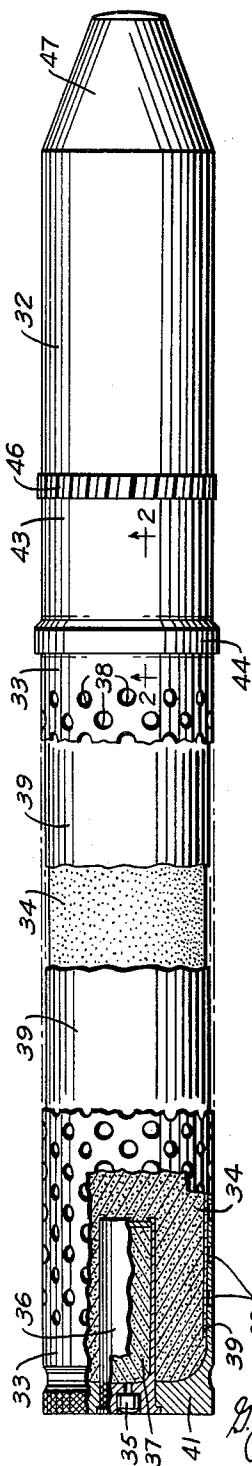


FIG. 1.

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AMMUNITION FOR RECOILLESS FIREARMS

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amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

The present application is a continuation-in-part of application Serial No. 536,590 filed on May 20, 1944 in the names of William J. Kroeger and C. Walton Musser for "Recoilless Firearms, Ammunition Thereof, and Ballistic Design Thereof," now abandoned.

Our invention relates to ammunition usable with firearms of the recoilless type, and it has special reference to ammunition used in non-recoil guns wherein the forces of rearward reaction that result from projectile discharge are neutralized by forwardly acting counterforces simultaneously set up by the propellant charge's combustion.

Broadly stated, the object of our invention is to provide ammunition which permits the ready or essentially instantaneous radial expansion of the gases issuing from the cartridge case as a result of propellant combustion, so that the said gases can fill the especially expanded chamber and escape rearwardly through Venturi openings or orifices specially provided in the breech of the aforementioned recoilless firearm.

Other objects and advantages will be apparent upon an inspection of the aforementioned parent application; some of them will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a view of a complete ammunition round made in accordance with our present invention, parts of the unique cartridge case and contents having been broken away to disclose internal components; and

Fig. 2 is a section taken from line 2—2 of Fig. 1 to show certain relationships of the propellant powder retaining disk and the base of the projectile.

As here illustrated, the complete round of our novel ammunition includes a projectile 32 whose rear end is seated within the front section 43 or mouth of a cartridge case 33. The cartridge case contains a propellant powder 34; and powder-igniting means shown in the form of a primer 35 and a booster 36 which contains a booster powder charge 37. The wall of the cartridge case preferably is of durable metal, such as steel or brass, although it may be of other material. A prerequisite for the case is that it be of sufficient thickness and strength as to remain intact during firing. Perforating the case wall are a large number of relatively small openings 38 distributed

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throughout substantially the entire length and circumference of the case in the uniform manner indicated. These case wall openings 38 constitute an aggregate area which preferably is nearly $\frac{1}{3}$ of the total surface area of the represented cartridge case 33 (although as low as 20% of the total wall area is usable). As clearly brought out in the aforementioned parent application there is a definite required relationship between this aggregate opening area and the bore area of the recoilless firearm barrel in which the ammunition is to be used. In the case of the illustrated 57 mm. round, the opening area is roughly six times the bore area of the gun's barrel (not shown) with which it is usable.

For preventing the propellant powder 34 from falling out of these openings during loading and prior to firing, and for acting as a diaphragm capable of withstanding pressures before rupturing, a thin layer of frangible material 39, such as a heavy paper, is placed inside the perforated case 33 between the case wall and the powder. Such a lining disintegrates early in the combustion cycle of the propellant powder and thus enables escape of combustion gases and burning powder radially through the openings and into the enlarged gun chamber (not shown) immediately surrounding the case.

The unique case construction shown permits the named radial expansion of powder gases into the surrounding chamber of the gun (not shown) within which the ammunition is used, without rupture of the metal of wall openings 38 or other damage to the case. In open-breech guns of the type with which the ammunition here disclosed is useful, such security against failure of this kind is exceedingly important, for were the breech orifice of the gun (not shown) to be blocked by metal or other obstructions recoil neutralization would be violently upset and dangerously high pressures would occur.

The propellant powder represented at 34 substantially fills the entire volume of the cartridge case interior that is behind a forward retaining disk 40. That disk preferably is of frangible material such as cardboard about $\frac{3}{8}$ inch thick. Its purpose is to prevent the propellant powder from occupying the cartridge case in the extreme forward portion where no wall openings are provided and thereby to safeguard the unperforated area of the case wall against rupture upon firing.

Obviously, a number of different types of propellant powder 34 may be employed depending upon the desired burning characteristics and other requirements of the particular gun and

firing objective. In practice we have used conventional double base powders and found them to exhibit satisfactory properties; however, conventional single base powders may also be employed.

For igniting the propellant charge 34 use may be made of any suitable primer and booster combination such as that shown at 35—36. Primer 35 may satisfactorily be of a standard percussion type such as is used in ammunition for caliber .50 firearms of conventional design. This primer serves to ignite a charge of booster explosive 37 which satisfactorily may be any type of powder conventionally used for this purpose. By combustion of this booster charge the entire mass of propellant powder 34 is ignited.

Both the primer 35 and the booster 36 are carried by the cartridge case head 41 in the central position shown where the attachment is rendered mechanically secure by force fitting or other suitable expedient. In this position the primer 35 is engageable by a firing pin (not shown) protruding through the center of the breech block (not shown) of a gun and there actuated by the gun's particular firing mechanism (not shown).

In the particular recoilless type gun for which our inventive ammunition has specially been provided, it is important that the round be centrally positioned with respect to the barrel bore and chamber of the gun (not shown) with which the round is used. To aid this central positioning, the forward section 43 or mouth end of the cartridge case is designed so that it may protrude into the bore of the barrel (not shown). Restraining this forward protrusion at the point where the case head 41 would snugly fit against the breech block (not shown) of the gun is a stop shoulder ring 44 which encircles and is mechanically secured to the forward portion of the case 33, as by a shrink fit of the character indicated in Fig. 2. The front face of this stop ring may either be square for direct contact with the rear of the barrel (not shown) or have the rearward flaring shown.

This ring 44 restrains the cartridge case against longitudinal movement in the forward direction and thus insures that the case head will at all times hold the primer 35 in proper position for effective engagement by the gun's firing pin (not shown) which is located in the adjacent breech block (not shown).

As here shown, the ammunition projectile 32 communicates with the front section 43 of the just described cartridge case and is suitably held therein by the represented force fit overlap connection which permits ready forward release of the projectile upon combustion of the propellant powder. In instances where the projectile may not extend completely back (see Fig. 2) to the cartridge case's stop ring 44, the desired position of the powder-retaining disk 40 just ahead of that ring may be maintained by any suitable spacer such as that shown at 45 in Fig. 2.

The represented projectile 32 makes use of a rotating band 46, which in the drawings is shown pre-engraved. Such pre-engraving is useful in assuring more ready passage of the projectile through a rifled bore of a gun barrel (not shown). For the particular 57 mm. round here described that band may satisfactorily be made of brass or other metal (such as gilding about one-quarter inch wide). Following conventional practice the pre-engraving on the band is dimensioned to provide with the barrel's rifling a small diametral clearance in order to insure positive registration

with the barrel's rifling, prevent objectionable yaw while within the bore and at the instant of leaving the gun, and at the same time permit the desired free passage of the projectile through the rifle barrel (not shown) upon combustion of the propellant charge.

The illustrated projectile is shown as provided with a fuze in the projectile's nose 47. The projectile which may be used can be of various types, such as high explosive, armor piercing, etc., and may be supplied with a fuze in the base if desired.

From the foregoing description of the various ammunition round components and explanation of functions thereof, it will be seen that we have provided a unique and highly valuable ammunition round which is especially useful in recoilless type weapons such as those first disclosed in the aforementioned parent application. It will be obvious to those skilled in the art that a number of modifications may be made to the illustrated ammunition without materially departing from the spirit and scope of the present invention.

Our invention is therefore extensive in its adaption and is not to be restricted to the specific form here shown and described by way of illustration.

We claim:

1. In ammunition for recoilless firearms having a gas expansion chamber, the combination of a projectile, a cartridge case communicating at its front with said projectile and being closed at its rear by a metal head, propellant powder within said case, a metal wall for said case forming for said powder a cylindrical enclosure and being perforated by a relatively large number of openings distributed throughout the circumference and length thereof and constituting a substantial percentage of the total case wall area, and an inner frangible lining for said case which prevents passage of said powder through said wall openings prior to firing but which disintegrates upon combustion of the powder and then allows essentially instantaneous radial escape of all the powder gas to the case exterior.

2. In ammunition for recoilless firearms having a gas expansion chamber behind the barrel, the combination of a projectile, a cartridge case communicating at its front with said projectile and being closed at its rear, propellant powder within said case, a metal wall for said case forming for said powder a cylindrical enclosure perforated by a plurality of openings distributed throughout the circumference and length thereof and constituting at least 20 per cent of the case's total wall area, and an inner frangible lining for said case which prevents passage of said powder through said wall openings prior to firing but which disintegrates upon combustion of the powder and then allows all the powder gas to escape radially and essentially instantaneously.

3. In ammunition for recoilless firearms having a rear gas expansion chamber whose radius is much greater than that of the barrel, the combination of a projectile, a cartridge case communicating at its front with said projectile and being closed at its rear, propellant powder within said case, a metal wall for said case forming for said powder a cylindrical enclosure perforated by a plurality of openings distributed throughout the circumference and length thereof and constituting at least twice the cross sectional area of said projectile, and an inner frangible lining for said case which prevents passage of said powder through said wall openings prior to firing but which disintegrates upon combustion of the pow-

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der and then allows all the powder gas to escape radially and essentially instantaneously.

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