

Oct. 5, 1971

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3,609,904

EXTRACTABLE PLASTIC CARTRIDGE

Filed May 7, 1969

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Fig. 1.

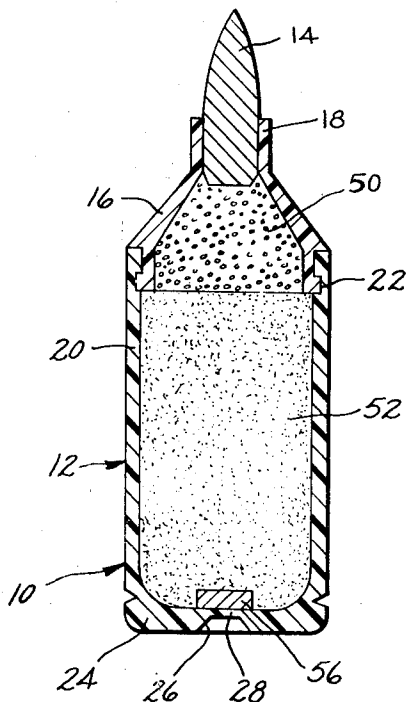


Fig. 5.

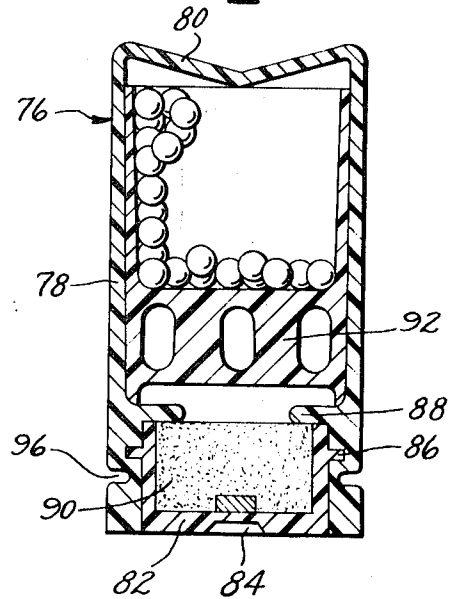
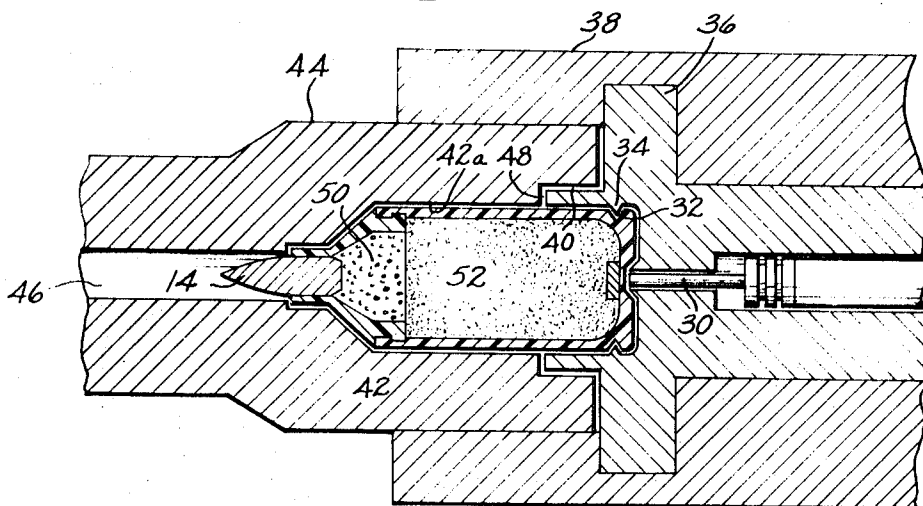


Fig. 2.



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Fig. 3.

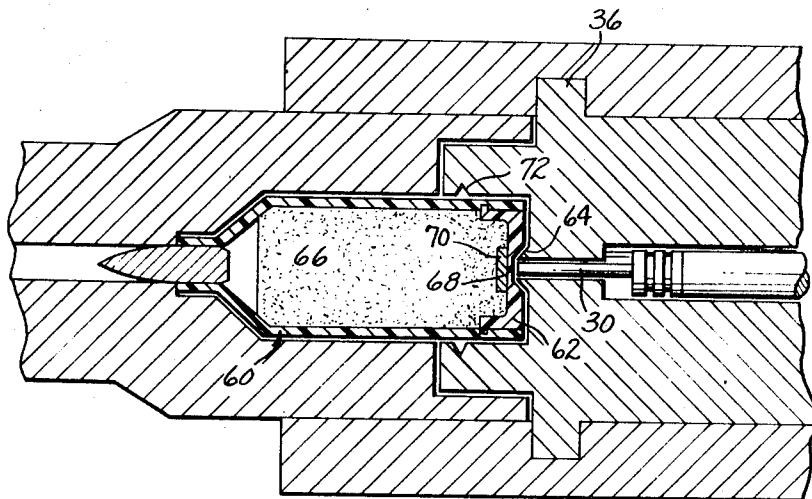


Fig. 4.

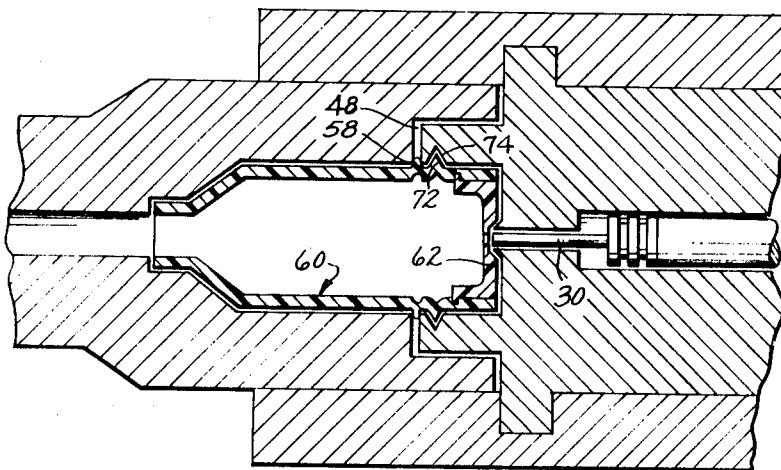
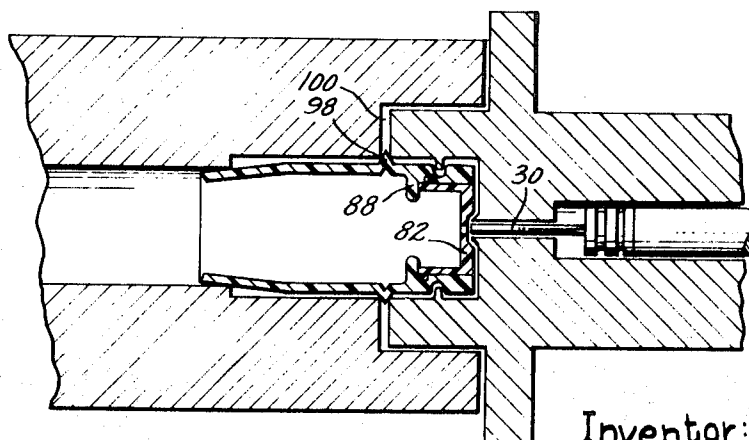


Fig. 6.



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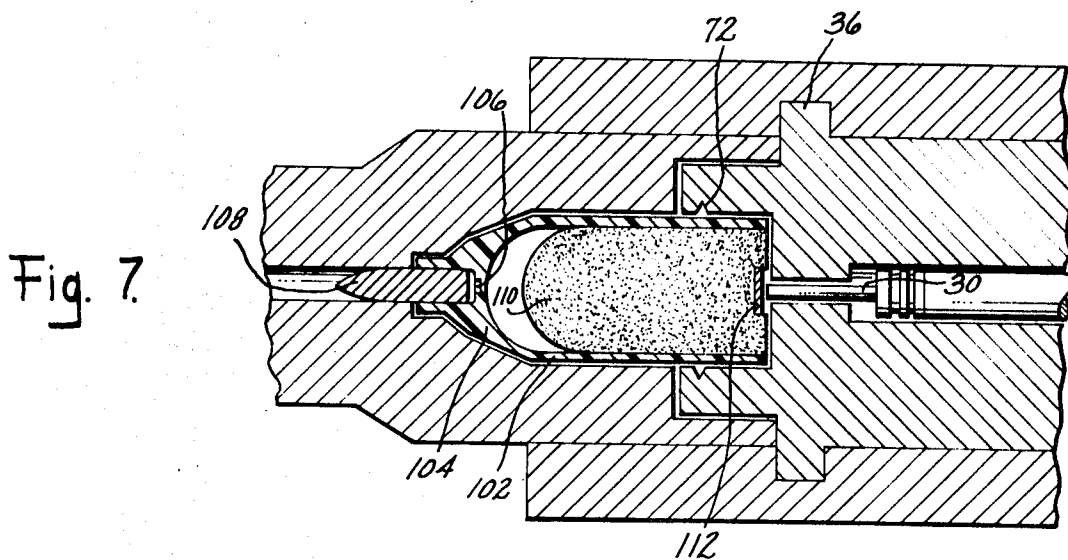
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3,609,904

EXTRACTABLE PLASTIC CARTRIDGE

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U.S. Cl. 42-76

2 Claims

ABSTRACT OF THE DISCLOSURE

A portion of a deformable cartridge casing is permanently deformed by the explosive gas pressure of the cartridge at firing to form rim means on the outer periphery thereof. This rim means can be utilized to function as a positive gas seal, to extract the cartridge from the chamber, depending on the recess into which the rim is deformed, and/or to prevent the cartridge casing from being explosively expelled from the chamber.

This invention relates to a broad new concept in ammunition design which utilizes the explosive gas pressure generated by the firing of a cartridge to deform a portion(s) of a deformable cartridge casing to effect one or more functions.

In general, the invention relates to an extractable cartridge casing which has some of the advantages of an expendable case while retaining some of the advantages of an extractable case. More specifically, the invention relates to the concept of using explosive gases generated by firing of a cartridge to permanently deform a portion of a deformable casing into a gap, groove, or recess means in the gun chamber thus forming an outwardly projecting rim portion which interengages with the gap, groove, or recess means in the gun chamber to effect one or more functions such as gas sealing, extractor means, or stop means preventing the cartridge casing from being explosively expelled from the gun barrel.

The present invention is an outgrowth of applicant's work with expendable cartridges wherein deformable plastic casings are designed to be explosively expelled from the bore of the gun along with the projectile means. It was found that for some uses it was desirable to provide an extraction and ejection cycle in order to guarantee a clear chamber after each cycle, e.g., for aircraft firing systems where jet engines cannot digest any foreign particles without severe consequences.

Under the present invention, the cartridge would still have some of the advantages of the expendable case cartridge, i.e., light weight, low cost, and a non-vulnerable cartridge. An additional advantage is the replaceable obturator concept wherein the gases are sealed by the cartridge casing and since the cartridge casing is replaced for each firing, in effect a new obturator is used with each firing. The present invention is not intended to supplant the expendable case concept. Both types of ammunition could be used for different applications. For example, the extractable casing would not be suitable for tanks where it is desirable not to have empty ammunition cases in the confined area inside the tank. Aircraft could use the extractable plastic casings while ground troops could use either the expendable or extractable casings.

An object of this invention is to provide a low cost, extractable, cartridge casing.

Another object of this invention is to utilize the explosive firing gas pressure to deform a portion of a shell to perform one or more necessary functions of the firing system.

Other objects and advantages will be apparent after

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reading the appended claims and the following description in which:

FIG. 1 shows an elevation view in cross-section of a center fire type extractable cartridge as envisioned by the present invention;

FIG. 2 shows a side view of the cartridge of FIG. 1 in firing position in an associated gun;

FIG. 3 shows a schematic view of a modified extractable cartridge in position in a gun chamber before firing;

FIG. 4 shows a schematic view of the modified extractable cartridge shown in FIG. 3 in a gun chamber after firing;

FIG. 5 shows an elevation view in cross-section of a shotshell type extractable cartridge which can be used in the present invention; and

FIG. 6 shows a schematic side view of a shotshell, of the type shown in FIG. 5, in position in the gun chamber after firing.

FIG. 7 shows a schematic view of the plastic shell of pending U.S. application Ser. No. 686,508 in position in a gun chamber before firing.

Referring to the drawings, FIG. 1 shows a cartridge 10 having a two-piece casing 12 and a projectile 14 extending forwardly from the front or mouth end of the cartridge. Casing 12 includes a forward neck portion 16 which tapers to a smaller diameter at the mouth end 18 in which the projectile 14 can be secured by any well-known conventional means such as interference fit, adhesive, etc. The neck portion 16 is attached to the forward end of a tubular body portion 20 by a rim and groove means 22 or by any other well-known means. The rear or breech end of the tubular body portion 20 is closed off by a transverse end wall 24 which has a central recess 26 formed therein to define a narrower wall section 28 through which a stab-type firing pin 30 (see FIG. 2) can easily be projected. An extractor groove means 32 is formed on the outer periphery of the tubular body portion to engage with an extractor ring 34 formed on the forward end of a shrouded bolt means 36.

The bolt means 36 is slidable mounted in a receiver 38 and has a bolt chamber means 40 which cooperates with an axially extending gun chamber means 42 in the gun barrel 44 to accommodate and support the cartridge 10. The gun chamber means 42 communicates with an axially aligned bore means 46 through which the projectile is explosively expelled.

The rear end of the gun chamber 42 and the front end of the bolt chamber 40 are separated by a distance or annular gap 48 to be described later.

Positioned within the cartridge 10 is a loose or molded propellant 50 located within the neck portion 16 and a main molded propellant means 52 in the tubular body portion 20. A recess 54 is formed in the rear of the molded propellant 52 to receive and support a combustible primer 56. Obviously, the main propellant 52 can also be in loose or liquid form in which case the primer means would have to be altered in order to hold the primer in position and protect it from the environment.

As mentioned previously, FIG. 2 shows a stab-type firing pin 30 which must be able to be projected through the thin wall section 28 in order to strike the primer 56. Upon ignition, the propellant means 52 and 50 are ignited whereupon the combustion gases expel the projectile 14 through the gun barrel 42 and out of the muzzle.

The cartridge casing, whether of one-piece or two-piece construction preferably, is made of plastic material, such as polyethylene, polypropylene, polycarbonates, etc., although it is obvious that a deformable metallic material such as copper, brass, aluminum, or steel could be used also. The limiting criteria, of course, is

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that the material must be capable of being deformed into the gap, recess, etc. The tubular body portion 20 particularly must be made of a deformable material, which upon firing, will deform into the annular gap 48 to form a permanent rim means 58 (not shown in FIGS. 1 and 2). The rim means will function as a positive gas seal to prevent gas leakage which may work back between the outer periphery of the cartridge casing tubular body portion 20 and the inside wall 42a of the gun chamber means 42. Without the rim 58, the explosive gases would leak through the gap 48 formed between the gun chamber means 42 and bolt chamber means 40.

A second function of the rim in FIGS. 1 and 2 is to act as a stop means to limit axial movement of the casing tubular portion in the gun chamber 42 after firing. The extractor function in FIGS. 1 and 2 is met by the extractor ring 34 and groove 32.

It is noted that the firing system shown in FIG. 2 is a self-obturator system and that the firing pin is self-sealing. The bolt can be sealed also for additional protection. See applicant's pending application Ser. No. 789,233, filed Jan. 6, 1969, for one such type of firing pin and bolt sealing means.

FIG. 3 shows a modified one-piece cartridge casing 60 made of deformable plastic material as explained above. The rear end of plastic casing 60 is closed off by a plastic base cup 62 which has a central recess 64 similar to recess 26 in FIGS. 1 and 2. A molded propellant charge 66 having a recess 68 for a combustible primer 70 are similar to that shown for FIGS. 1 and 2. FIG. 3 also shows the shrouded bolt means 36 as having an extractor groove means 72 into which the deformable plastic casing is explosively and permanently deformed upon firing to form an extractor rim 74 on the outside periphery of the casing 60. (See FIG. 4).

FIG. 4 shows the system of FIG. 3 after firing. The extractor rim 74 and groove 72 permits the cartridge casing to be withdrawn from the gun chamber. It will be necessary to provide other means in order to withdraw a loaded or unfired round from the chamber. At the same time, upon firing, the casing 60 is permanently deformed at gap 48 to form annular rim 58 which acts to limit axial movement of the cartridge casing as well as to seal off the explosive gases.

FIGS. 5 and 6 show that the concept of the present invention can also be applied to shotshells. FIG. 5 shows a shotgun shell 76 having a deformable plastic tubular body member 78 in which the mouth end 80 is crimped or closed off in any conventional well-known manner. The breech end of the tubular body member is closed off by a plastic propellant-primer cup 82 having a central recess 84 through which a stab-type firing pin, as explained above, moves. The plastic cup 82 is attached to the body by any well-known means such as the snap-in rim and groove means 86 shown in FIG. 5. An annular support flange 88, integrally formed with the inside wall of the body casing 78, supports a molded propellant charge 90 and a wad column-shot container 92. Shot pellets 94 are located within the shot containing portion of the wad column 92. Obviously, any wad type of wad column can be used without affecting the invention. Finally, an extractor groove 96 is found on the breech end of the tubular body member 78.

FIG. 6 shows the plastic shell of FIG. 5 after firing in which a permanently deformed rim 98 is extruded into the split chamber gap 100, as explained previously.

FIG. 7 shows the plastic shell shown in pending application Ser. No. 686,508, filed Nov. 29, 1967, in the gun chamber similar to that shown in FIG. 3 of the drawings.

Shell casing 102 has a transverse wall means 104

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which may be imperforate or which may have an opening therethrough. The drawing shows a blind hole 106 but as mentioned in pending application Ser. No. 686,508, openings have been used successfully. A projectile 108 is positioned in the front end of casing 102 and a propellant means 110 is positioned in the opposite end of the shell. A priming means 112 is positioned in the propellant means and in caused to be ignited by the impact of firing pin 30.

The plastic shells of FIGS. 1 to 6 differ from FIG. 7 in that they show a wall means to close off the rear or breech end of the shell so that upon firing, the explosive propellant gases act against this wall to prevent the shell casing from being expelled through the gun barrel. The rim means formed in these designs, while they may assist in keeping the shell casing in the gun chamber, are not the primary reason for the retention of the shell casing in the chamber. In FIG. 7 there is no transverse wall means at the rear end of the shell casing to act against and thus, the rim means which is formed in this instance is the primary deterrent to expulsion of the case. The gas sealing function of the designs in all cases is the same.

Obviously, other types of plastic shells can also be utilized in exercising the invention, such as the plastic casings shown in pending applications Ser. No. 868,508, filed Nov. 29, 1967, and Ser. No. 755,649, filed Aug. 27, 1968. Also other combinations of propellant means and priming means are possible.

What is claimed is:

1. A firing system comprising a gun barrel having a receiver means attached at the breech end thereof, an axially extending bore in said gun barrel, a chamber means formed in the breech end of said gun barrel and communicating with said bore at the front end and with the receiver means at the rear end, a cartridge having a deformable casing being positioned in and supported by said chamber means, recess means in said chamber means into which said deformable cartridge casing is explosively deformed so as to seal the explosive gases from escaping past the cartridge to said receiver means, separate extractor means provided to extract the cartridge casing from the gun chamber, said extractor means comprising a groove means formed in the side wall of said cartridge casing and lug means integrally formed with an axially reciprocating gun bolt, said lug means engaging said groove means either before firing of the cartridge or after firing to enable the reciprocating bolt to move the cartridge casing into and out of the gun chamber.

2. A firing system as recited in claim 1 wherein said chamber means is a split chamber consisting of a gun barrel chamber portion and a gun bolt chamber portion, at least a portion of the breech end of the deformable cartridge casing being supported by an overlapping end portion of a reciprocating bolt means to form a gun bolt chamber portion, said recess means comprising the space between the forward end of the bolt chamber portion and the gun barrel chamber portion.

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U.S. Cl. X.R.

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