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3,474,560

CASELESS CARTRIDGE CHAMBER-SLEEVE EJECTOR AND BINARY FEED SYSTEM

Filed April 4, 1968

2 Sheets-Sheet 1

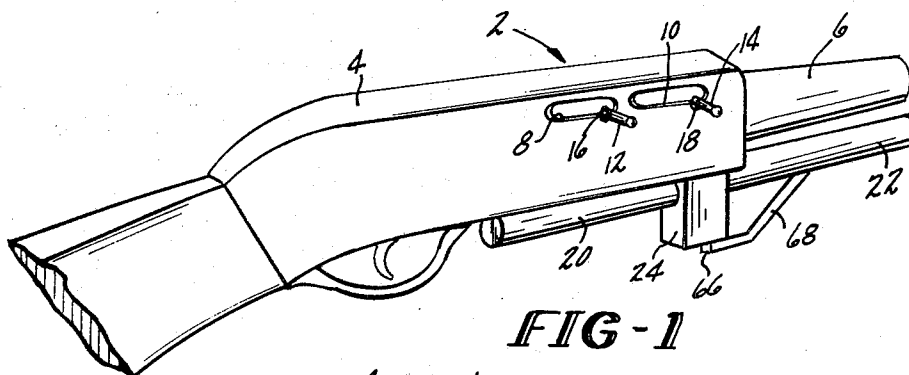


FIG-1

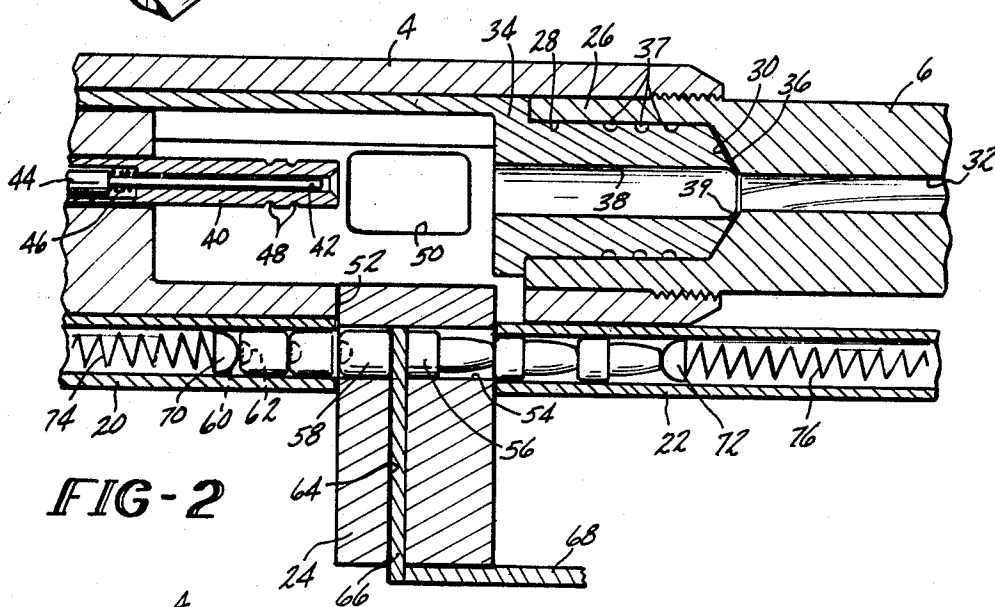


FIG-2

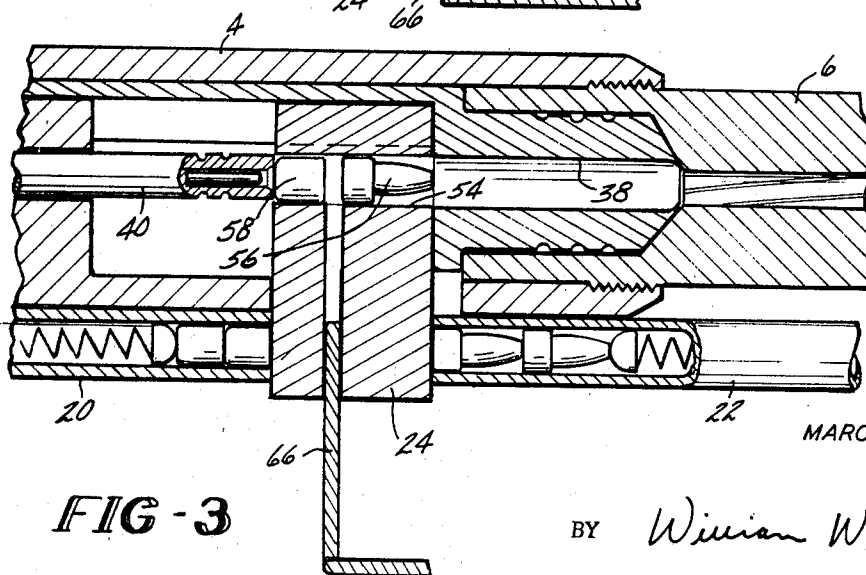


FIG-3

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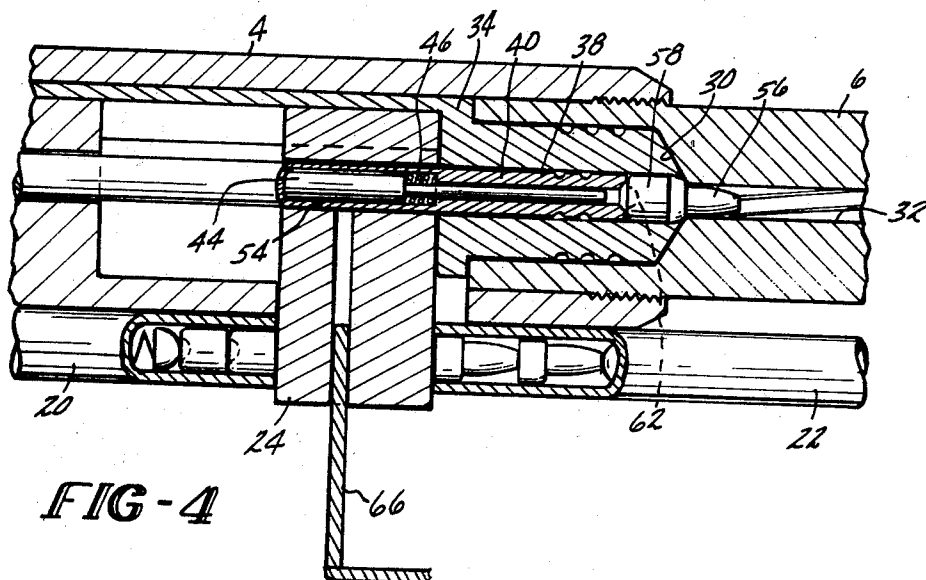


FIG-4

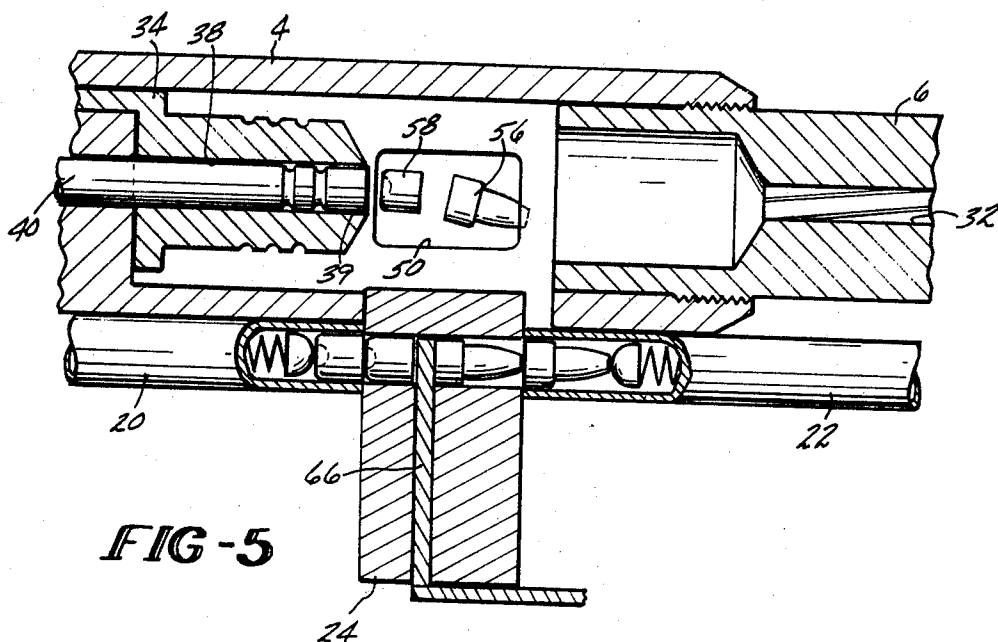


FIG-5

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1

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CASELESS CARTRIDGE CHAMBER-SLEEVE EJECTOR AND BINARY FEED SYSTEM

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6 Claims

ABSTRACT OF THE DISCLOSURE

In a firearm utilizing caseless ammunition, first and second coaxial tubular magazines for feeding propellant pellets and projectiles respectively into back-to-back position in a rising block member and a bolt slidable through the rising block to transfer the pellet and projectile therefrom into a firing chamber in a movable sleeve.

This invention relates to a firearm or other device utilizing caseless ammunition in the form of a propellant pellet and a projectile, which pellet and projectile are separate, unjoined members.

There has been a long felt need in the firearm industry to develop a gun which utilizes caseless ammunition. The advantage of caseless ammunition over conventional types of ammunition lie in the lower cost of production resulting from the elimination of the expensive casing, and in the simplification of the firing mechanism on the gun in which an extractor for the spent casing can be omitted.

The firearms of the prior art which are designed for use with caseless ammunition have proven unsatisfactory in a number of aspects. The prior art caseless guns which fire a projectile with a separate and unconnected propellant pellet require hand loading, e.g. the projectile is manually seated in the firing chamber and the propellant pellet is manually placed in the firing chamber behind the projectile for firing. This type of manual loading procedure is obviously cumbersome, time consuming, and therefore undesirable.

Other prior art caseless firearms are designed to fire a compound caseless cartridge which includes a propellant pellet adhered to the rear face of a projectile. The latter type of firearm may include a magazine rather similar to a conventional magazine for automatically feeding ones of the compound caseless cartridges into a firing chamber. Such conventional magazines cannot be used with the distinct and separate type caseless ammunition because proper alignment between the propellant pellet and the projectile is not insured by such a magazine.

A second problem in the prior art caseless firearms concerns the extraction of a round of caseless ammunition which, once loaded into the firing chamber, is not fired. Once a round of caseless ammunition is loaded into the firing chamber of a weapon, the absence of a casing upon which an extractor can operate prevents the loaded round from being easily removed from the firing chamber should the round misfire, or should the operator decide not to fire the device. The prior art caseless weapons require that an unfired loaded round be somehow manually removed from the firing chamber, or that the weapon remain loaded.

It is, therefore, an object of this invention to provide a device for use with caseless ammunition of the type including a projectile and a separate unconnected propellant pellet, wherein the ammunition is automatically loaded into the weapon.

2

It is a further objective of this invention to provide a device of the character described having separate magazines for the propellant pellets and projectiles respectively.

It is yet another object of this invention to provide a device of the character described wherein a loaded unspent round of ammunition can be easily and safely removed from the firing chamber.

Other features, objects, and advantages of the invention will become apparent from the following detailed description and accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view of the receiver portion of a firearm embodiment of this invention showing the magazines, rising block, and externally accessible handles on the bolt and sleeve;

FIGURE 2 is a side elevational view taken in section through the receiver portion of the firearm of FIGURE 1 showing the rising block in its lower portion receiving a projectile and a propellant pellet from the magazines;

FIGURE 3 is similar to FIGURE 2 but with the rising block in its upper position transferring the projectile and pellet to a position for pickup by the bolt;

FIGURE 4 is similar to FIGURE 3 but with the projectile and pellet in the firing chamber and ready for firing; and

FIGURE 5 is a side elevation view taken in section through the receiver portion of the firearm showing the means whereby an unspent caseless cartridge is ejected from the receiver after having been seated for firing in the firing chamber.

Referring now to FIGURE 1, an embodiment of this invention in the form of a firearm indicated generally by the numeral 2 is shown. The firearm 2 includes a receiver or housing portion 4 connected to the rear end of a barrel 6. A pair of aligned slots 8 and 10 are formed in one side wall of the receiver 4 through which slots 8 and 10 protrude handles 12 and 14 respectively. The handles 12 and 14 are respectively connected to a bolt 40 and a sleeve 34 (see FIGURE 2) to provide means accessible from the exterior of the firearm for manually reciprocating the bolt 40 and sleeve 34 inside of the receiver 4. Each slot 8 and 10 is provided with a downwardly enlarged portion 16 and 18 respectively wherein the handles 12 and 14 can be frictionally locked in a conventional manner. A pair of coaxial tubular magazines 20 and 22 are mounted on the receiver 4 and the barrel 6 respectively. A vertically reciprocating rising block 24 is interposed between the magazines 20 and 22, the rising block 24 being operable in a manner hereinafter described. The receiver 4 also contains a conventional hammer, hammer spring, sear, and trigger which are not shown, but which operate in a well known manner to actuate a firing pin in the bolt.

FIGURE 2 is a vertical sectional view taken through the receiver 4 and showing the cartridge feeding and firing mechanism of the firearm. The barrel 6 includes a rearwardly extending portion 26 which lies within the receiver 4 and which defines a chamber 28 opening into the receiver. It is noted that the interface 30 between the chamber 28 and the barrel bore 32 is tapered at a first predetermined angle, thereby defining an obtuse angle between the wall of the chamber 28 and the wall of the interface 30. A sleeve 34 is slidably mounted in the receiver 4 for movement to a forward seated position shown in FIGURE 2. In its forward seated position, the sleeve 34 extends into the chamber 28. It is noted that the front face 36 of the sleeve 34 is tapered at an obtuse angle with respect to the outer surface of the sleeve, the obtuse angle on the sleeve being slightly larger than the obtuse angle on the interface 30 so as to provide a tight frictional engagement between the sleeve

34 and the interface 30 when the sleeve is in its forward seated position. A plurality of gas grooves 37 are cut into the external surface of the sleeve 34 to provide a gas tight seal between the sleeve 34 and the chamber 28. The sleeve 34 further includes a bore 38 defining a firing chamber, the forward end of which is slightly inwardly tapered, as at 39, to provide for engagement between the bore wall and a projectile seated therein, as is more clearly shown in FIGURE 4. It is noted that the smallest diameter of the tapered portion 39 is slightly larger than the diameter of the barrel bore 32 to furnish a shot start surface for a projectile fired from the gun.

A bolt 40 is slidably mounted in the receiver 4 rearward of the sleeve 34. The bolt 40 includes a central passage 42 in which a firing pin 44 is movably mounted. A compressible spring 46 is housed in the bolt 40 to bias the pin 44 in a direction away from the sleeve 34 so that the front end of the pin 44 is normally recessed from the front end of the bolt 40, as shown in FIGURE 2. The bolt 40 is movable between a rearward retired position shown in FIGURE 2, wherein the front face of the bolt 40 is to the rear of the rear face of the rising block 24, and a forward battery position shown in FIGURE 4 wherein the front face of the bolt is immediately adjacent to the rear face of a cartridge seated in the firing chamber 38. A plurality of gas grooves 48 are cut into the exterior surface of the bolt 40 to provide a sealing engagement between the wall of the chamber 38 and the bolt 40 when the latter is in its battery position.

An ejection port 50 is formed in the side wall of the receiver 4 and provides means whereby a previously loaded cartridge can be removed from the receiver should the operator decide not to fire the gun, as hereinafter described in greater detail.

The rising block 24 is mounted on the receiver 4 for vertical reciprocating movement therein through an aperture 52 in the bottom of the receiver. The rising block 24 includes a transverse passage 54 for the reception of a projectile 56 from the magazine 22 and a propellant pellet 58 from the magazine 20. It is noted that each propellant pellet 58 includes a depression 60 in the rear face thereof in which a layer of primer material 62 is deposited. The rising block 24 also includes a slot 64 cut into the bottom wall thereof and opening into the passage 54. A divider plate 66 is disposed in the slot 64 and extends into the passage 54 when the rising block 24 is in its cartridge-receiving position, which is shown in FIGURE 2. The plate 66 serves to subdivide the passage 54 when the rising block 24 is in its cartridge-receiving position so as to maintain proper alignment of the projectile 56 and the propellant pellet 58 within the passage 54. The plate 66 is connected to a support arm 68 which in turn is mounted on the magazine 22, as shown in FIGURE 1. It is noted that the rising block 24 comes to rest upon the support arm 68 when the block is in its cartridge-receiving position and that the spacing between the arm 68 and the magazine 22 is such as to automatically bring the passage 54 into registry with the bores of each magazine 20 and 22.

Each magazine 20 and 22 contains a follower 70 and 72 respectively biased by compressible springs 74 and 76 to urge the propellant pellets 58 and the projectiles 56 toward the rising block 24. As shown in FIGURE 2, the rising block 24 is in its cartridge-receiving position with a projectile 56 and a propellant pellet 58 being seated in the passage 54, the bolt 40 is in its retired position, and the sleeve 34 is in its forwardmost seated position.

FIGURE 3 shows the rising block 24 lifted into its cartridge-feeding position wherein the passage 54 is aligned with the bolt 40 on one side and the firing chamber 38 on the other side. It is noted that in the cartridge-feeding position, the passage 54 has been moved upwardly

and clear from the divider plate 66. The cartridge, composed of the propellant pellet 58 and the projectile 56, is now ready to be moved into the firing chamber 38. It is also noted that the ejection port 50 is closed off by the rising block 24 when the latter is in the cartridge-feeding position.

To seat the cartridge in the firing chamber 38, the bolt 40 is moved ahead through the rising block passage 54 and into the firing chamber 38 to its battery position, carrying therewith the pellet 58 and the projectile 56, as is shown in FIGURE 4. In this position, the projectile 56 is seated against the tapered portion 39 of the wall of the firing chamber 38, and against the shot start surface of the tapered interface 30. It is noted that when the cartridge is seated in the firing chamber, the rising block 24 is locked into its cartridge-feeding position by engagement with the bolt 40, thus ensuring that the ejection port 50 will be closed off when the gun is fired. Furthermore, the lower portion of the rising block 24 overlies the open ends of the magazines 20 and 22 to prevent accidental discharge of pellets or projectiles therefrom. As shown in FIGURE 4, the gun is now ready to fire. To fire the gun, the trigger is pulled and the hammer is driven against the rear face of the firing pin 44 in a conventional manner, driving the latter against the action of the spring 46 to impact the forward end of the pin 44 against the primer 62. Combustion of the pellet 58 is thus incurred producing high pressure gases in the sealed chamber which gases drive the projectile through the barrel bore 32.

The firearm of this invention can be unloaded in the following manner should one decide not to fire the gun for any reason. To unload the gun, the bolt 40 is first moved to its retired position, as shown in FIGURE 5, and the rising block 24 then falls to its cartridge-receiving position, uncovering the ejection port 50. The handle 14 on the sleeve 34 is then grasped and the sleeve 34 is moved to the rear to a cartridge-ejecting position shown in FIGURE 5. In the cartridge-ejecting position, the bolt 40 substantially fills the chamber 38. As the sleeve 34 is moved to the rear, the tapered portion 39 on the wall of the chamber 38 engages the projectile 56 sufficiently to carry the projectile 56 and the pellet 58 to the rear with the sleeve. This engagement between the projectile 56 and the taper 39 is not sufficient, however, to prevent the bolt 40 from moving through the chamber 38. Thus the bolt 40 forces the pellet 58 and projectile 56 out through the front of the sleeve 34. The ejection is accomplished while holding the gun with the port 50 facing downward, thus the projectile 56 and pellet 58 fall through the port 50 after they are pushed out of the sleeve 34 by the advancing bolt 40, as is clearly shown in FIGURE 5.

This invention thus provides for a device utilizing caseless cartridges wherein the cartridges are automatically fed into a firing chamber, and wherein unspent cartridges can be easily and safely removed from the firing chamber after they have been loaded therein. Furthermore, this invention provides for the automatic feeding of binary caseless cartridges wherein the propellant pellet and the projectile are separate, unconnected bodies.

What is claimed is:

1. In a firearm of the type utilizing caseless cartridges, which caseless cartridges comprise a projectile portion and a separate, unconnected propellant portion, the combination of elements comprising:

- (a) a receiver having an ejection port;
- (b) a barrel connected to said receiver and having a bore opening into said receiver;
- (c) sleeve means slidably mounted in said receiver and normally disposed in a forward seated position in engagement with said barrel, said sleeve means having a bore defining a firing chamber opening into said barrel bore;

5

- (d) a bolt mounted in said receiver for reciprocating movement between a retired position and a battery position, said bolt being substantially coaxial with said firing chamber;
- (e) a first tubular magazine connected to said barrel;
- (f) a second tubular magazine connected to said receiver, said second tubular magazine being substantially coaxial with said first tubular magazine;
- (g) vertically reciprocating means mounted on said receiver and operable to receive and transfer a projectile and a propellant pellet in alignment from said first and second magazines respectively to a cartridge-feeding position between said bolt, when the latter is in said retired position, and said firing chamber, whereby movement of said bolt from said retired position to said battery position is operative to transfer said projectile and propellant pellet into said firing chamber thereby loading said firearm; and
- (h) said sleeve means being slidable to a rearward cartridge-ejecting position when said bolt is in said retired position, wherein said bolt substantially fills said firing chamber to displace said propellant pellet and projectile therefrom.
2. The device of claim 1, wherein a forwardmost portion of said firing chamber is inwardly tapered to engage said projectile when the latter has been loaded into said firing chamber.
3. The device of claim 1, wherein said ejection port is closed off by said vertically reciprocating means when the latter is in the cartridge-feeding position.
4. In a firearm of the type utilizing caseless cartridges, the combination of elements comprising:
- (a) a receiver;
- (b) a barrel connected to said receiver and having a bore opening into said receiver;
- (c) sleeve means slidably mounted in said receiver and movable therein between a forward seated position in engagement with said barrel, and a rearward cartridge-ejecting position, said sleeve means having a bore defining a firing chamber opening into said barrel bore; and
- (d) a bolt mounted in said receiver for reciprocating movement between a retired position and a battery position, said bolt being substantially coaxial with said firing chamber whereby movement of said sleeve means to its cartridge-ejecting position when said bolt is in its retired position causes said bolt to

6

- substantially fill said firing chamber and dislodge a loaded caseless cartridge from said firing chamber.
5. The device of claim 4, wherein a forwardmost portion of said firing chamber is inwardly tapered to engage a caseless cartridge when the latter has been loaded into said firing chamber.
6. In a firearm of the type utilizing caseless cartridges, which caseless cartridges comprise a projectile portion and a separate, unconnected propellant portion, the combination of elements comprising:
- (a) a receiver;
- (b) a barrel connected to said receiver and having a bore opening into said receiver;
- (c) sleeve means mounted in said receiver in a forward seated position in engagement with said barrel, said sleeve means having a bore defining a firing chamber opening into said barrel bore;
- (d) a bolt mounted in said receiver for reciprocating movement between a retired position and a battery position, said bolt being substantially coaxial with said firing chamber;
- (e) a first tubular magazine connected to said barrel;
- (f) a second tubular magazine connected to said receiver, said second tubular magazine being substantially coaxial with said first tubular magazine; and
- (g) vertically reciprocating means mounted on said receiver and operable to receive and transfer a projectile and a propellant pellet in alignment from said first and second magazines respectively to a cartridge-feeding position between said bolt, when the latter is in said retired position, and said firing chamber, whereby movement of said bolt from said retired position to said battery position operates to transfer said projectile and propellant pellet into said firing chamber to load said firearm.

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U.S. Cl. X.R.

42—15, 39.5