Sept. 3, 1968 W. E. PERRINE 3,399,597

SILENT FIREARM

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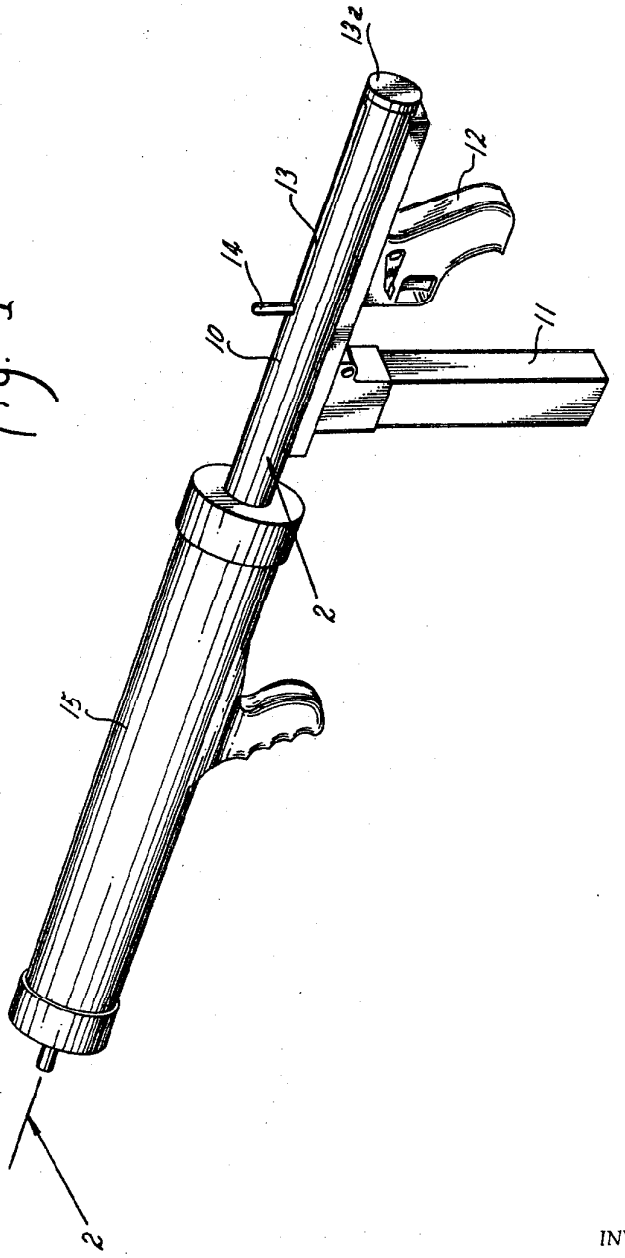


fig. 1

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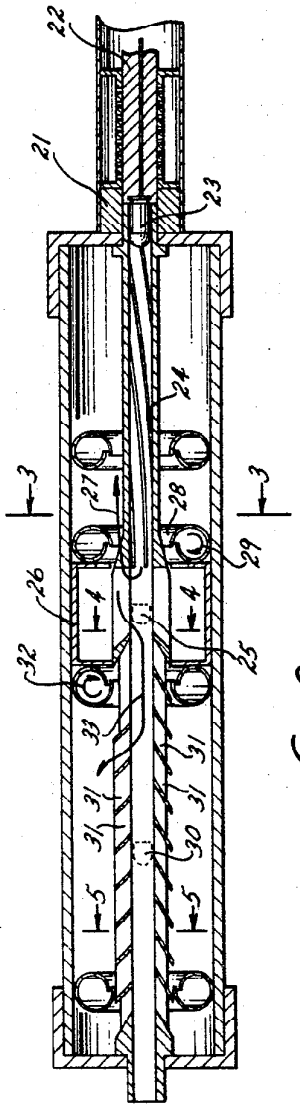



fig. 2

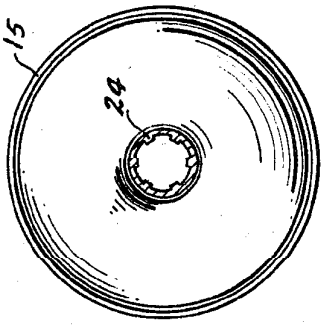



fig. 3

fig. 4

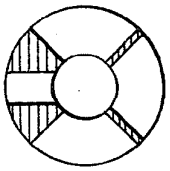
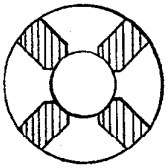


fig. 5



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# SILENT FIREARM

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## ABSTRACT OF THE DISCLOSURE

A silent firearm having a pair of chambers surrounding successive lengths of the barrel. The barrel is ported to allow gases to expand into the surrounding chambers. Each chamber is provided with a plurality of volute-shaped annular baffles which absorb kinetic and thermal energy from the gases. The baffles are positioned to impart spin to the gases in the opposite rotational direction. The chambers are proportioned to allow gas initially entering the first chamber to expand back into the barrel and into the second chamber after passage of the projectile.

This invention relates to firearms. More particularly, the invention concerns improvements whereby firearms may be rendered substantially silent and recoilless. In a further aspect, the invention relates to improvements especially adapted to the silencing and elimination of recoil in automatic weapons.

For many years, the workers in the firearm art have sought effective means for reducing the recoil of firearms as well as attempting to provide means for reducing the noise resulting from the firing of such weapons. These features, namely, recoilless and substantially silent operation, are particularly sought in the automatic weapons art. Recoil affects not only the stability and, therefore, the accuracy of a firearm, but also affects the comfort of the operator and the size and complexity of gun mounts and the like which must be provided in order to compensate for the instability caused by recoil.

Additionally, the silencing of firearm devices is particularly desirable, for obvious reasons, in weapons employed in military, police, or espionage operations and the like.

Accordingly, it is an object of the present invention to provide improvements for obtaining substantially recoilless operation of a firearm.

Another chief object of the invention is the provision of improvements whereby a firearm can be rendered substantially silent.

Another object of the invention is the provision of improvements for rendering a firearm both recoilless and substantially silent.

Yet another object of the invention is the provision of improvements of the type aforementioned which are especially adapted for use in connection with automatic weapons.

Still another object of the invention is the provision of means for rendering a firearm recoilless and substantially silent which can be employed in conjunction with known and developed firearms without extensive redesign of the action and receiver mechanism thereof.

Other objects and advantages of the invention will become apparent to those skilled in the art from a consideration of the following detailed description of the invention taken in conjunction with the drawings, wherein an embodiment of the invention, chosen for purposes of illustration, is shown and described.

In the drawings:

FIG. 1 is a perspective view of an automatic weapon embodying the present invention showing the general arrangement of the parts thereof;



FIG. 2 is a sectional view of a portion of the weapon illustrated in FIG. 1, said sectional view being taken along section line 2—2 of FIG. 1;

FIG. 3 is a sectional view of the portion of the weapon illustrated in FIG. 2, FIG. 3 being a cross section taken along section line 3—3 of FIG. 2;

FIG. 4 is a sectional view of a portion of the barrel of the device illustrated in FIGS. 1 and 2, FIG. 4 being a cross-sectional view taken along section line 4—4 of FIG. 2;

FIG. 5 is another cross-sectional view of a portion of the barrel of the weapon illustrated in FIGS. 1 and 2, FIG. 5 being a cross section taken along section line 5—5 of FIG. 2.

The objectives and advantages of the invention are achieved by providing improvements in combination with a typical firearm. The typical firearm may comprise an action mechanism, which includes a trigger assembly, bolt assembly, cartridge firing chamber and means for feeding cartridges to the firing chamber and ejecting the fired cartridges therefrom. The typical firearm will also include a receiver casing which encloses and positions the elements of the action mechanism in operative relationship. The improvements contemplated by the present invention, whereby the firearm is adapted to substantially completely silent and recoiless operation, comprise in combination with the firearm a barrel extending forwardly from the firing chamber. The barrel is provided with, proceeding successively from the firing chamber, an imperforate length, a first ported length, a second ported length, and terminates in a muzzle portion at the extreme forward end of the barrel. The ported lengths comprise portions of the barrel provided with circumferentially spaced slots or holes communicating between the exterior of the barrel and the bore thereof. The barrel is provided with means, typically a cylindrical member concentrically enclosing the barrel, defining a pair of expansion chambers which communicate with the interior or bore of the barrel by means of the ports or slots aforementioned. The first ported length of the barrel communicates with a first expansion chamber, and the second ported length of the barrel communicates with the second expansion chamber. The chambers enclose a volume which includes a plurality of volute-shaped annular baffles. These baffles are coaxially disposed within each of the expansion chambers. Each baffle has a lip adapted to direct a portion of the propellant gases produced when a cartridge is fired, the gases being directed into the interior of the volute to dissipate at least a portion of the thermal and kinetic energy of the gas within the volute. The volute-shaped baffles disposed within the first expansion chamber are positioned in opposed relation to the baffles disposed within the second expansion chamber. In this manner, the spin imparted to the gases entering the baffles in the first chamber is rotationally directionally opposite to the spin imparted to the gases entering the baffles in the second expansion chamber. By this means, the recoil normally produced by the reaction of the propellant gases upon parts of the weapon or upon exit from the muzzle of the weapon is effectively canceled. The volume and the number of baffles disposed in the first expansion chamber is adjusted such that after the projectile is fired and passes through the first ported length of the barrel and on into the second ported length, those portions of gas which were initially directed into the first expansion chamber and into the volute-shaped baffles therein may re-expand back into the first ported length of the barrel, into the second ported length and, finally, into the second expansion chamber. In this way, the kinetic and thermal energy of the propellant gases is effectively dissipated without discharging the same to the exterior of the weapon

as by discharge from the muzzle. This provides substantially silent operation of the weapon. While the silencing of a single shot or semiautomatic weapon by means of artificially dissipating the energies of the propellant gas prior to their discharge from the muzzle is a rather difficult problem, the problem is magnified considerably when the same techniques are attempted to be applied to the silencing of automatic weapons. Manifestly, the volumes of gasses and the energy, particularly thermal energy, which must be dissipated over relatively very short periods of time between firing of rounds in an automatic weapon are very much greater than would be encountered in weapons adapted for only single-shot or semi-automatic operation. The improvements of the invention, therefore, find their most advantageous employment in connection with the silencing and reduction in recoil of automatic weapons.

Turning now to the drawings for a more detailed description of the features and structure of the embodiment chosen for purposes of illustration, FIG. 1 is an external perspective view of an automatic weapon embodying the present invention. The weapon illustrated in FIG. 1 employs the action mechanism and receiver casing, ammunition magazine, etc. of the so-called "eagle" type which is commonly called the "grease gun." This is a very simple action mechanism of the blowback-type wherein the bolt is not locked to the face of the firing chamber when the round is fired. FIG. 1 shows generally the receiver casing **10**, ammunition magazine **11**, trigger assembly **12**, and bolt assembly generally indicated by reference numeral **13** which identifies the slot in the receiver casing **10** within which the bolt handle **14** operates during firing of the weapon. As is well known to those skilled in the art, the cartridge feeding and ejecting apparatus of the eagle action is integrally contained within the bolt assembly. Therefore, it is considered that the details thereof need not be shown since such matters are well known to those skilled in the art.

Continuing with reference to FIG. 1, the improvements of the invention are generally contained within the housing denoted by reference numeral **15** which forms the outer walls of the expansion chambers, mentioned hereabove, and contains the various imperforate and ported barrel lengths, also mentioned hereabove.

FIG. 2 is a cross-sectional view of the forward portion **21** of the receiver group **10** of FIG. 1, taken along section line **2—2** of FIG. 1. The forward neck of the bolt **22** is shown in firing position with the cartridge **23** seated in the firing chamber. Upon firing, the projectile passes through the imperforate length **24** of the barrel and into the first ported length **25**. The ports of the first ported length are shown in cross section in FIG. 4 and take the form of elongate slots opening into a spool piece **26** which forms a portion of the first expansion chamber. Gases passing through the slots in the first ported section pass first into the volume defined by the spool piece **26** and thence rearwardly along the periphery of the imperforate length **24** as shown by the arrow **27**. Portions of these gases are diverted by the lip **28** of the volute-shaped baffles (only one shown), thus imparting a spin to the gases in the general rotational direction of the arrow **29**.

Thereafter, as the projectile passes from the first ported length **25** into the second ported length **30**, the propulsion gases which have not been diverted into the first expansion chamber pass through the ports **31** of the second ported length of the barrel and into one of the volute-shaped baffle elements (only one shown), thereby imparting a spin in the rotational direction shown by the arrow **32**.

Meanwhile, gases which were initially diverted into the first expansion chamber may now re-expand as shown by the arrow **33** back into the bore of the barrel and into the second expansion chamber for final dissipation of the thermal and kinetic energy thereof. The ports of the second ported length of the barrel are shown in cross section in FIG. 5.

FIG. 3 is a cross section taken along section line **3—3** of FIG. 2, showing the outer casing **15** forming the wall of the first expansion chamber and the rifled imperforate length of the barrel **24**. The outer casing material **15** may be fabricated of lightweight, durable material such as a metal, e.g., aluminum, or plastic such as a suitable epoxy material. Pressures encountered in the expansion chambers during operation of the weapon are nominal and the parts forming the improvement can be fabricated of suitable lightweight material to save weight.

If desired, the weapon may be further provided with a common muzzle device to reduce the sound caused by the exit of the projectile from the muzzle of the weapon. However, this may be optionally omitted without seriously affecting the silent characteristics of the weapon since the gases which are recognized as the cause of the predominant portion of noise associated with the firing of a weapon have been effectively dissipated in the expansion chambers of the device.

A serious disadvantage which has been encountered in several prior art devices employing ported barrels is the reduction in muzzle velocity and, consequently, kinetic energy of the projectile. However, according to penetration tests performed with the weapon shown and described herein, the muzzle velocity is actually slightly higher than that obtained with an unported barrel of the length of the imperforate section or slightly longer. In operation, the device of the invention makes no more noise during full automatic operation than that made by a typical office typewriter. This noise emanates principally from the mechanical operation of the action mechanism rather than from the expulsion of the projectile or propellant gases.

The weapon illustrated in the drawings has been test fired under full automatic operation with 45 caliber ammunition with the butt-end (**13***a* of FIG. 1) of the receiver resting on the operator's nose to demonstrate the substantially complete lack of any recoil.

Having fully described by invention and the presently preferred embodiments thereof, I claim:

**1.** In a firearm comprising

an action mechanism including trigger assembly, bolt assembly, cartridge firing chamber and means for feeding cartridges to said firing chamber and ejecting fired cartridges therefrom, and

a receiver casing enclosing and positioning the elements of said action mechanism in operative relationship,

the improvements whereby said firearm is adapted to substantially completely silent, recoilless operation, said improvements comprising in combination with said firearm:

(a) a barrel extending forwardly from said firing chamber and having, successively,

(1) an imperforate length,

(2) a first ported length,

(3) a second ported length,

and terminating in a muzzle portion at its extreme forward end;

(b) means defining a first expansion chamber communicating with the interior of the first ported length of said barrel through the ports therein;

(c) means defining a second expansion chamber communicating with the interior of the second ported length of said barrel through the ports therein;

(d) a plurality of volute-shaped annular baffles coaxially disposed within each of said first and second expansion chambers, each baffle having a lip adapted to direct a portion of the propellant gases produced by firing said cartridges into the interior of the volute to dissipate a portion of the thermal and kinetic energy of said gas therewithin;

the volute-shaped baffles in said first and second expansion chambers being positioned in opposed

relation such that the spin imparted to the gases entering the baffles in said first chamber is rotationally opposite the spin imparted to the gases entering the baffles in said second chamber, and

the volume of said first expansion chamber being such that after the projectile from a fired cartridge passes through said first ported length of the barrel and into the second ported length, the gases initially entering said first expansion chamber may further expand back into said first ported length, into said second ported length and into said second expansion chamber.

2. The improved firearm of claim 1 wherein the action mechanism is adapted to full automatic firing.



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