Aug. 23, 1955 F. D. HOPPERT 2,715,858

REGULATOR MEANS FOR A FIREARM GAS PISTON

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Fig. 1.

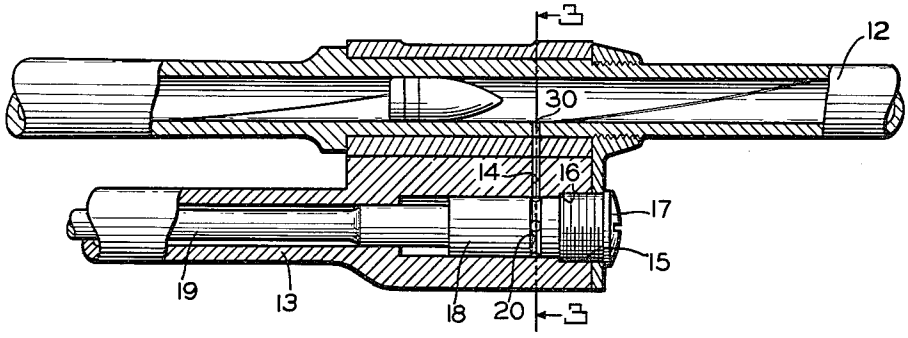


Fig. 2.

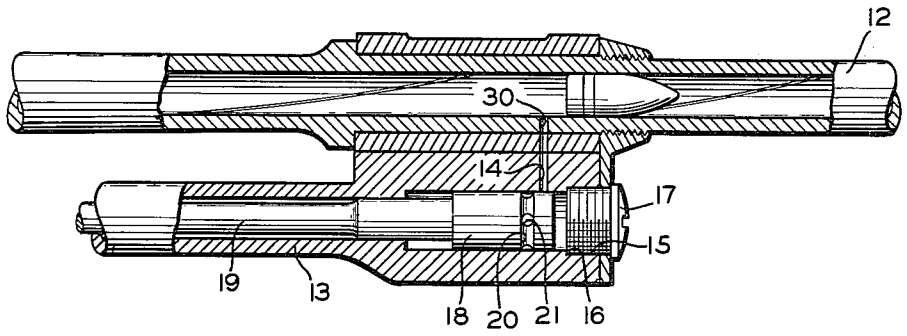


Fig. 3.

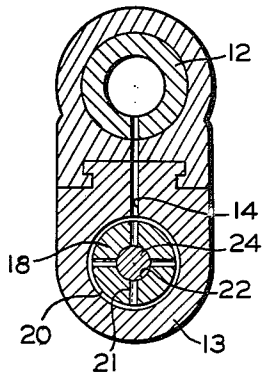
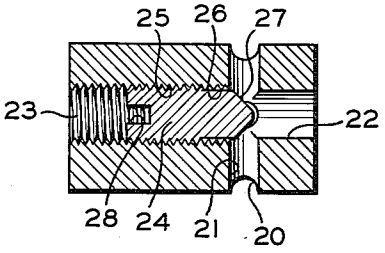


Fig. 4.



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REGULATOR MEANS FOR A FIREARM GAS PISTON

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3 Claims. (Cl. 89—193)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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

This invention relates to automatic firearms of the type wherein gases are bled from the barrel to act against a movable piston and is particularly directed to the piston in which there is provided herewith a novel means for regulating the pressure of the gases acting thereagainst and in which there is also provided means for cutting off the initial impingement of the gases.

In gas-operated firearms it is desirable that means be provided whereby the pressure of the gases may be regulated to compensate for those conditions which vary the pressure of the gases received by the gas system and which affect the power requirements of the weapon. For example, it is well known that the explosive force of ammunition varies, with consequent fluctuation of gas pressure. In addition, the atmospheric temperature in which the firearm is operated varies the pressure of the gases received by the gas system since a cold gas system diminishes the pressure of the gases received therein. Then too, the mechanical conditions of the firearms as reflected in the efficiency of the gas system and in the facility of operation affect power requirements.

Further, it is desirable in firearms of automatic types that means be provided for regulating the rate of fire. In gas-operated firearms, this can be accomplished by regulating the pressure of the actuating gases. However, in the past difficulty has been experienced in providing gas regulator means which do not become inoperable because of the adhesive residues from the gases.

Also, in gas-operated firearms with high powered ammunition, it is desirable that means be provided for reducing the initial impingement of the gases received by the gas system so as to reduce undesirable violence to the gas system and the firing mechanism.

Accordingly, it is an object of this invention to provide a novel means of regulating the actuating gases in gas-operated firearms.

It is a further object of this invention to provide an improved means of reducing the initial impingement of the actuating gases.

It is another object of this invention to provide a gas regulating means which is simple in construction, is not readily affected by the adhesive residues produced during fire, and therefore, is easily adjusted.

It is the specific object of this invention to provide an operating piston having an incorporated gas regulator and a gas impingement cut-off means.

The specific nature of this invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 is a longitudinal cross-sectional view of the front end of a firearm provided with the improvements of this invention and shows the piston in full forward position;

Fig. 2 is a view similar to Fig. 1 but showing the position of the piston at the moment when a bullet fired in the barrel of the firearm has passed the gas port therein;

Fig. 3 is an enlarged cross-sectional view taken along line 3—3 of Fig. 1; and

Fig. 4 is an enlarged, longitudinal cross-sectional view of the piston.

Shown in the figures is a firearm barrel 12 with a gas port 30 leading therefrom and an attached gas cylinder 13 with a gas aperture 14 in registry with gas port 30. The forward portion of gas cylinder 13 is counterbored, as shown by 15, and thereby forms a shoulder 16 forwardly of gas aperture 14. Threadedly mounted in counterbore 15 is an enclosure member 17 the rear end of which contacts shoulder 16 when fully installed and thereby forms a gas seal to prevent the gases received in gas cylinder 13 from acting upon the threaded mounting portions.

Slidably mounted in gas cylinder 13 is a cylindrical piston member 18 the forward end of which is contactable with enclosure member 17 and the rear end is contactable with a longitudinally reciprocating operating rod 19. When in battery position, operating rod 19 maintains piston 18 in contact with the rear end of enclosure member 17.

Provided around piston 18 is an annular groove 20 arranged to align with gas port 14 when piston 18 is in contact with enclosure member 17. Extending radially from groove 20 are a multiplicity of ducts 21 which communicate with a cylindrical bore 22 provided axially through piston 18.

That portion of bore 22 which extends rearwardly from the junction of ducts 21 is threaded, as noted by 23. Mounted in threaded portion 23 is a device 24 having a threaded mounting portion 25 which mates with threaded portion 23, and a rod portion 26 which extends forwardly therefrom to terminate in a tapered portion 27. The diameter of rod portion 26 is approximately that of the minor diameter of thread portion 23 with which it engageably cooperates. In the rear end of device 24 there is provided a slot 28 for receiving a suitable turning means.

A firearm provided with the gas system of this invention operates as follows:

When the firing mechanism is in battery position, operating rod 19 maintains piston 18 against enclosure member 17 to assure alignment of annular groove 20 with gas aperture 14 as has already been explained. Thus, when the firearm is fired, the gases from the explosion pass through gas port 30 and gas aperture 14 when the bullet has passed thereby, as shown by Fig. 2, circle annular groove 20, and pass through ducts 21 and the forward end of bore 22 into gas cylinder 13 to urge piston 18 and operating rod 19 rearwardly. The amount of gases entering gas cylinder 13, and consequently the force by which piston 18 is driven rearwardly, is regulated by turning device 24 to progressively block off ducts 21 from bore 22.

As piston 18 is accelerated rearwardly under the impact of the actuating gases, annular groove 20 moves out of registry with gas aperture 14 which, at the same time, is blocked off by the forward portion of piston 18. By the time piston 18 has moved past gas aperture 14, the greatest force of the gases has been dissipated. Thereafter, gases of moderate pressure enter gas aperture 14 to act on the forward end of piston 18. During counter-recoil, operating rod 19 moves piston 18 forwardly to drive the gases remaining in gas cylinder 13 out of gas aperture 14.

When the pressure of the gases received by gas cylinder 13 needs to be regulated, enclosure member 17 is removed, permitting piston 18 to slide forwardly out of gas cylinder 13. The adjustment is made by inserting a suitable

turning means in slot **28** and rotating device **24** which, as has already been explained, controls the amount of the initial gases passing from gas aperture **14** into gas cylinder **13**. Tapered portion **27** enables a finer adjustment. Because mounting portion **25** of device **24** is removed from the path of the gases by several turns of the threads in threaded portion **23** and because the threads snugly accommodate cylindrical portion **26**, there is little likelihood that enough gases will reach mounting portion **25** to adversely affect rotation of device **24**. Then, too, when device **24** is turned rearwardly in piston member **18**, to increase the pressure of the gases, the threads in threaded portion **23** act as scrapers to remove any gas residue accumulation on cylinder portion **26** which might impede the rotation of device **24**. It is obvious, that if necessary, piston **18** may be quickly and easily replaced.

Thus, there is seen that there is here provided a simple, rugged, and novel means of regulating the gas pressure and rate of fire in gas-operated weapons and for reducing the initial impingement of the actuating gases.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. In an automatic firearm having a barrel with a gas port leading therefrom, the improvement comprising a gas tube secured to the barrel and having a radially disposed gas aperture aligned with the gas port in the barrel, an enclosure member threadably secured to one end of said gas tube, a reciprocating operating rod disposed within said gas tube, a cylindrical piston slidably arranged in said gas tube between said enclosure member and said operating rod, a circumferential annular groove concentric to and spaced apart from the front end of said piston and arranged for registry with said gas aperture when said piston is in contact with said enclosure member, a multiplicity of ducts extending radially from said groove to an axial bore through said piston, a device threadably mounted in said bore rearwardly of the junction of said ducts and arranged to adjustably block off said ducts from said bore, and a portion forwardly of said groove arranged to restrict said gas aperture when moved into contiguous relationship therewith.

2. In an automatic firearm having a barrel with a gas port leading therefrom, the improvement comprising a gas tube secured to the barrel and having a radially disposed gas aperture aligned with the gas port in the barrel, a counterbore in the front end of said gas tube arranged to form an annular shoulder forwardly of said gas aperture, an enclosure member threadably mounted in said

counterbore and arranged to abut said shoulder, a cylindrical piston slidably disposed in said gas tube, an operating rod reciprocably mounted in said gas tube for movement between a recoil and a battery position and arranged to maintain said piston in contact with said enclosure member when in battery position, a circumferential annular groove concentric to and spaced apart from the front end of said piston and arranged for registry with said gas aperture when said piston is in contact with said enclosure member, a multiplicity of ducts extending radially from said groove to an axial bore through said piston, a device threadably mounted in said bore rearwardly of said ducts and provided with a forwardly extending rod portion terminating in a taper portion, said rod portion being of approximately the same diameter as the minimum diameter of said bore, a slot provided in the rear end of said device whereby said device may be rotated to advance said taper portion to progressively block said ducts, and a portion forwardly of said groove arranged to restrict said gas aperture when moved into contiguous relationship therewith.

3. In an automatic firearm having a barrel and a gas tube with respective connecting gas ports, the combination of a plug threadably secured in the front end of the gas tube forwardly of the gas port therein, a piston slidably mounted in the gas tube for reciprocal movement into and out of abutment with the rear face of said plug, said piston having an axial bore therethrough and an annular groove in the exterior periphery thereof, said piston having a plurality of radially disposed gas passages providing communication between said annular groove and said axial bore, a gas regulating member adjustably mounted in said axial bore rearwardly of said radial gas passages, said annular groove being located rearwardly of the front face of said piston in registry with the gas port in the gas tube only prior to the rearward movement of said piston whereby the subsequent entry of gases into said axial bore is initially blocked until said piston has moved sufficiently rearward to uncover the gas port in the gas tube, and means for adjusting said gas regulating member to intersect the junction of said radial gas passages with said axial bore and thereby provide a gas expansion system for accelerating said piston during the blocking of the gas port in the gas tube.

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