Jan. 4, 1949. A. BAUER 2,457,802

SILENCER AND RECOIL REDUCER FOR FIREARMS

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Fig. 1

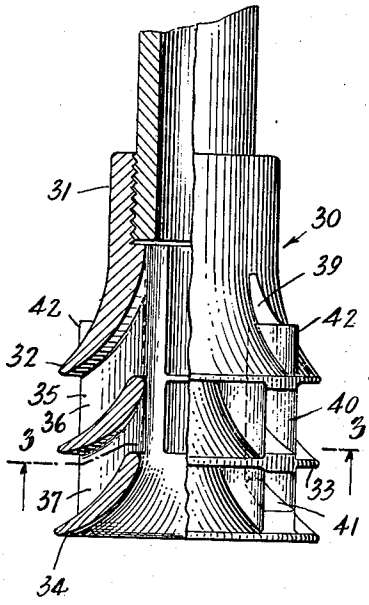


Fig. 4

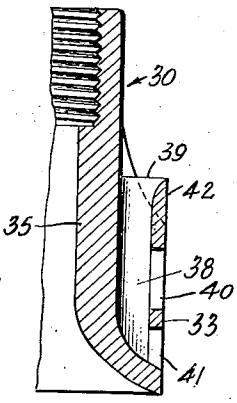
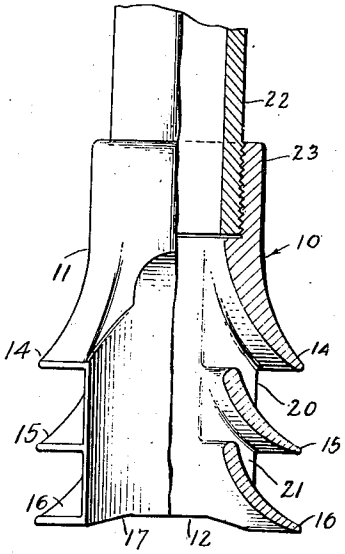


Fig. 2



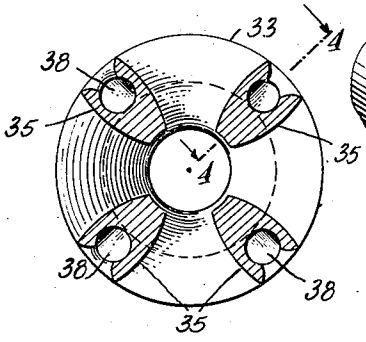
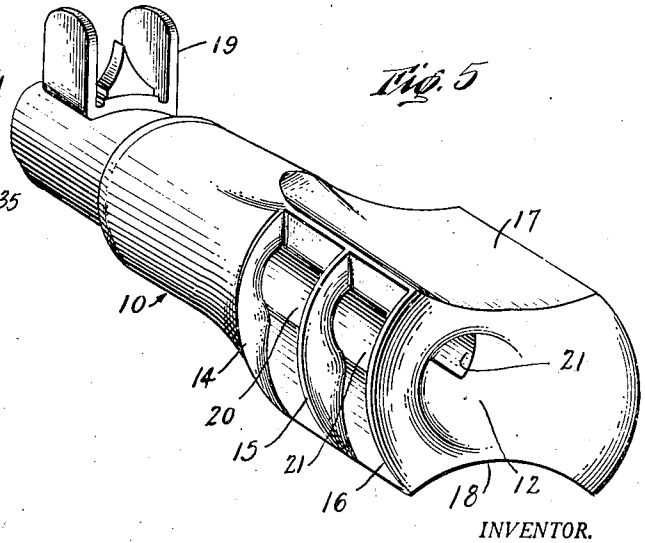


Fig. 3

Fig. 5



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SILENCER AND RECOIL REDUCER FOR FIREARMS

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1 Claim. (Cl. 89—14)

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This invention relates to an improved means for reducing the recoil, and the noise, of discharging firearms.

In particular, the invention relates to means to be positioned at the discharge end of the barrel of a firearm, to disperse the gaseous discharge thereof in such manner as to reduce the recoil, and to lessen the noise of discharge.

It is an object of the invention to provide an improved means for reducing the recoil of a discharging firearm by causing the escaping gases to separate and to take oppositely directed paths which are substantially radial of the axis of the barrel of the firearm, rather than axially thereof.

It is another object of the invention to provide a device for use on firearms, which by suitably diverting the gaseous discharge in directions radially of the barrel will reduce recoil and compensate the firearm against the usual tendency of the barrel of the arm to jump in a vertical direction upon firing.

It is yet another object of the invention to provide a recoil reducer which is of rugged, inexpensive construction, capable of manufacture by casting, forging, or welding, according to the size and strength requirements of the firearm or ordnance piece with which the invention is to be used.

It is another object of the invention to provide a silencer and recoil reducer which is inherently self-cooling.

It is a further object of the invention to provide a silencer for a firearm which does not require multitudinous baffles and complex countercurrent flow of gases, thereby minimizing back pressure.

Experimentation establishes that the recoil, commonly known as "kick," of a firearm is the result of the gases escaping from the muzzle of the firearm after the projectile has been discharged. There is no reaction during the instant in which the gases are acting upon the projectile in forcing it through the barrel, since the forward and backward pressures created by the gases expanding within the barrel are equal and opposite. It is only after the projectile has been discharged from the barrel that the gases, escaping in the line of the axis of the barrel, exert a rearward force on the firearm. A rocket, during the stage when the reaction of the escaping gases is propelling the rocket, is analogous to a firearm after the projectile has been discharged and the gases are continuing to flow from the barrel.

The present invention provides means whereby the escaping gases are divided and are caused

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to flow substantially radially with respect to the barrel of the firearm. Such angular discharge of gases may be over approximately the full circumference of a circle or over any smaller proportion thereof. Fins or guide walls define gas-flow passages which establish a pattern of gas discharge such that the reactive forces of the gases act in opposite directions and therefore tend to neutralize each other.

The dispersion of discharging gases by means of the present invention is effective, additionally to materially reducing the recoil, to quiet the discharge, because the vacuum zone normally concentrated immediately behind axially discharging gases is distributed over a wide area, with resulting less concentration of air disturbance and correspondingly less noise resulting therefrom.

An important advantage of my invention resides in the fact that whereas conventional silencers are characterized by substantial length and multiplicity of baffles to cause a staggered gas flow, the invention herein disclosed effectively reduces recoil and noise by means of a device which employs no countercurrent flow and therefore no complex arrangement of baffle walls.

A further advantage of the present invention is that it may be applied to rifles, pistols, or other arms having conventional front and rear sights, without concealing such sights or conflicting with usual sighting or "aiming" practices.

With the foregoing and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a quarter-sectional view of one practical embodiment of the invention, as applied to a gun barrel or an adapter for attachment to a gun barrel;

Fig. 2 is a quarter-sectional view of a second embodiment of the invention, as applied similarly to the Fig. 1 embodiment;

Fig. 3 is an end elevation of the structure of Fig. 1, taken on lines 3—3 thereof;

Fig. 4 is a side sectional elevation of the embodiment of Fig. 1, taken on lines 4—4 or Fig. 3; and

Fig. 5 is a perspective of the embodiment of the invention disclosed in Fig. 2, as applied to the end of a rifle.

Referring to the drawings, and initially to Fig. 2, 10 represents an embodiment of the device particularly suited for use with a rifle, pistol, or other arm having a front sight. The structure includes a body portion 11 having a bore 12 therethrough, and a plurality, illustratively three,

guide walls 14, 15, 16. In the embodiments of Figs. 2 and 5, the walls are interrupted by upper and lower walls 17, 18, which are concave to be lower than the front sight 19 of the arm. The walls define gas-flow passages 20, 21 which communicate with and are on diametrically opposite sides of the bore 12.

Each of the passages comprehends one quarter of the total circumference, more or less, and serves to direct the flow of the discharging gases in a generally sideward direction.

Fig. 2 shows one method of attaching the invention to muzzle of a rifle, or to an adapter by means of which the device may be attached to the muzzle. Assuming, for purpose of illustration, that 22 represents such rifle-barrel or adapter member, the said member is screw threaded for cooperation with a threaded socket 23 at the rear of the body of the device 10.

As clearly appears in Fig. 2, the walls 15, 16, desirably have an "airfoil" shape, with the inner edges, adjacent the bore 12, thickened to correspond generally to the leading edge of an airplane wing. The discharge ends of the passages may be of larger area than the inlet ends, to accommodate the gaseous expansion. As also appears in Fig. 2, the spacing between the inner ends of the diametrically opposite walls 16 is greater than the spacing between the inner ends of the diametrically opposite walls 15. The spacing between the inner end of each wall 16 and the adjacent surface of each wall 15 is less than the spacing between the inner end of each wall 15 and the adjacent surface of each wall 14. The airfoil cross section and curved shape of the walls minimize friction and increase the efficiency of gaseous expulsion.

Fig. 1 typifies an embodiment of the invention, designated 30, which is particularly applicable to larger-caliber ordnance, which are sighted by means of apparatus not disposed on or in close relationship with the barrel. In such application it is not necessary to provide concave surfaces to clear the sights, and hence the structure may be of full circular cross section, as indicated in Fig. 3.

According to the showing of Fig. 1, the silencer 30 has a socket portion 31, screw threaded for attachment to the barrel or to an adapter, as aforesaid. A succession of concentric substantially funnel-like walls 32, 33, 34, interconnected by ribs 35, define gas-flow passages 36, 37, which, except for the intervening ribs 35, occupy the full circular periphery. The spacing between the inner end of the respective baffles 34 and the adjacent surfaces of baffles 33 is less than the spacing between the inner ends of baffles 33 and the adjacent surface of baffles 32.

The said ribs 35 may be generally U-shaped, as shown, to provide air passages 38; the baffles 33, 32 are apertured to afford a continuous air passage from a point of entry 39 to exits 40 between walls 32 and 33, and 41, adjacent the mouth of the device, as shown in Fig. 4. If desired the entry 39 may be hooded, as by the substantially semi-circular wall 42.

For relatively small caliber arms, the device either in the Fig. 1 or Fig. 2 embodiments, may be constructed of aluminum alloys, bronze, or other suitable material. The device may be cast en bloc, or formed in sections to be welded together. For larger caliber pieces, the relatively greater stresses incident to the discharge thereof may require the structures to be cast or forged from steel or other high-strength material.

In the embodiments shown, the walls act as heat radiators, and the structures are inherently self-cooling. However, and in the application of the device to large caliber ordnance, the additional cooling afforded by the air passages 38 may prove advantageous.

The operation of the devices of Figs. 1 and 2 is substantially the same. Taking Fig. 1 as an example, the escaping gases following the projectile have a tendency to expand, while being carried in a direction axially of the bore by the inertia effect of the velocity of expulsion from the bore. In ordnance fitted with the present invention, the expanding gases are diverted, by means of the walls 32 and 33, through the outwardly directed passages 36, 37 and in very great measure are directed radially of the barrel. The reaction of the thus-separated and directed gases is toward the bore of the recoil reducer, and hence the reactive forces are substantially mutually opposing. Rather than an axial thrust in a direction opposite to the escaping gases, the gaseous thrust is radial and mutually cancelling, with a net reactive force which is relatively small in a rearward direction. It will be understood that because it is impracticable to obtain radial outflow of gases in a plane which is truly perpendicular to the axis of the barrel, there will be some net reactive effect in the direction of the barrel; but such reactive effect will be small in proportion to the total potential reactive effect of gases discharging solely axially of the barrel.

Expressed differently, it may be said that the reactive effect of the outwardly directed gases is directed toward a common center, with small force component axially of the barrel.

In the Fig. 1 embodiment, and as clearly shown in Fig. 3, the supporting ribs 35 are so shaped in cross section that the gas passages therebetween have a Venturi-like section which very materially reduces the friction of the gases against the passage defining walls, and creates an aspirator effect pursuant to which the vacuum condition immediately above the open-topped ribs 35 serves to draw air through the entrance 39 of the respective airports for discharge through the openings 40, 41.

The discharge of gases about substantially the full periphery of the barrel may be utilized to balance the forces in directions vertical to the axis of the barrel and therefore minimize the tendency of the piece to jump in one or another direction during the firing thereof, with resultant increased accuracy of fire.

For example if the muzzle of the piece tends to jump upwardly during discharge, the area of the vertically directed passages may be increased and that of the lower passages decreased, so that the reactive effect of the upwardly discharging gases will be the greater and will oppose the upward movement of the barrel of the piece, thereby restraining such movement.

The noise of a discharging firearm is due largely to a concentrated air disturbance created by a relatively high-vacuum area immediately following the expelled gases. The dispersion or diffusion of such gases by the baffles of the present invention dissipate the vacuum area and cause an air disturbance which is not concentrated and hence less effective to create pressure waves capable of transformation into intense sound.

It will be understood that the herein described embodiments of the invention are capable of modification without departure from the spirit

of the invention. The number of gas-flow passages may be reduced to one, with satisfactory results in low-caliber firearms, or may be increased to such number as may be necessary or desirable. In general, it has been found that the illustrated embodiments operate satisfactorily over a relatively wide range of types and caliber firearms.

I claim:

Recoil reducing means for firearms, comprising a structure having at one end means for securement to the muzzle of the firearm to form an axial extension thereof, said structure having spaced upper and lower imperforate walls defining an axial bore for the passage of a bullet; and a succession of mutually spaced pairs of vanes of airfoil cross section connecting said upper and lower walls at diametrically opposite sides of said structure to define a plurality of side openings therefor, said vanes curving forwardly and outwardly of the bore of the structure; the mutual spacing between successive pairs of vanes decreasing toward the discharge end of the structure, and the spacing between the inner ends of each pair of vanes, measured transversely across the bore, increasing successively from the muzzle end to the discharge end of the structure.

AUGUST BAUER.

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