Jan. 13, 1959 W. J. JARRETT 2,868,078

NOISE REDUCER FOR GUN

Filed Jan. 11, 1956

Fig. 1.

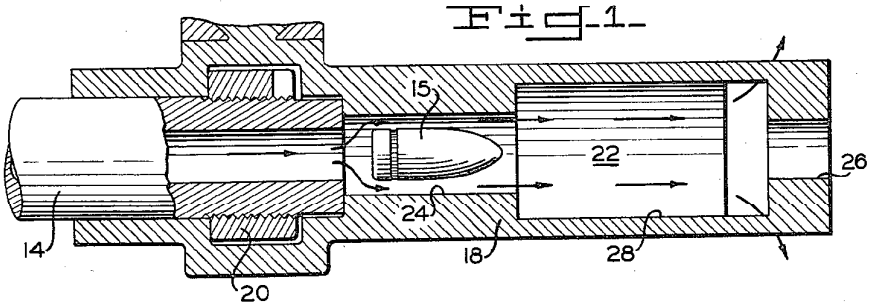


Fig. 2.

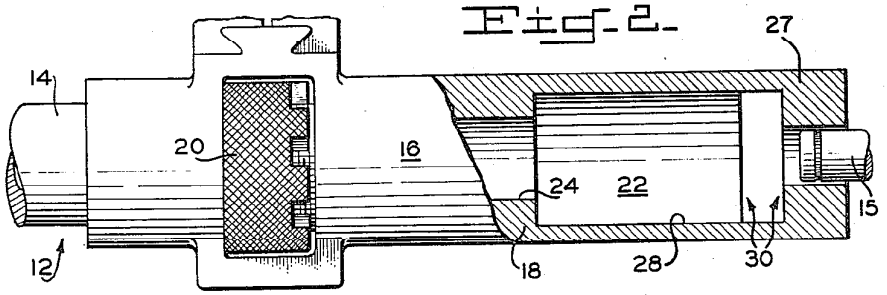


Fig. 3.

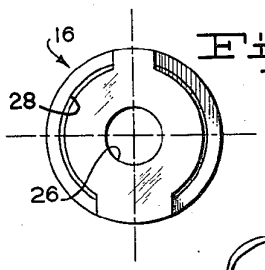
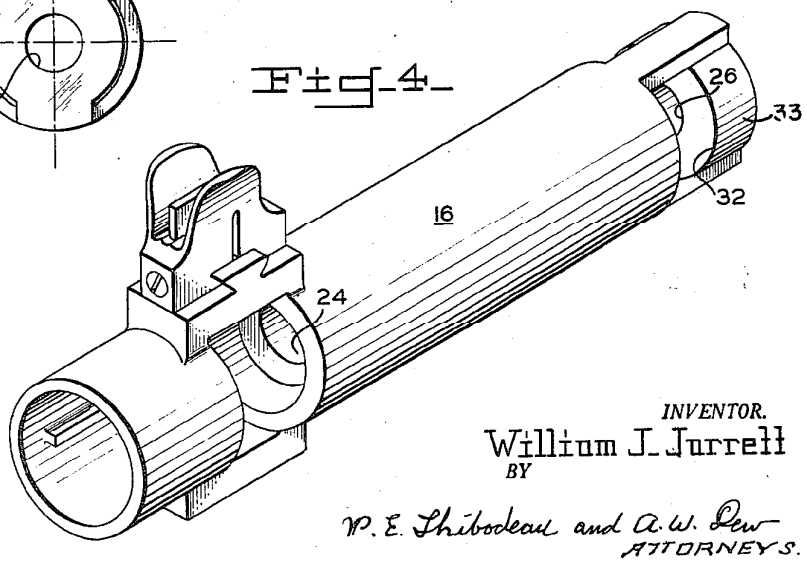


Fig. 4.



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NOISE REDUCER FOR GUN

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1 Claim. (Cl. 89—14)

(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.

My invention relates to guns and more particularly to a device therefor for reducing the audible noise of discharge of the guns.

The velocity of sound from the discharge of a cartridge is represented by the equation:

$$V=(gKRT)^{1/2}$$

where V=the velocity of sonic propagation in propellant gas in feet per second, g=the gravitational constant 32.2 foot pounds per second per second, R=the universal gas constant (119), and T=the temperature in degree centigrade.

If the process is assumed to be adiabatic with K=1.246, the value of V is expressed by

$$V=(32.2\times1.246\times119\times1547)^{1/2}$$
$$V=2700 \text{ F. P. S.}$$

The barrel of a gun is a tube or pipe with a closed end having the source of vibration disposed at the open end since the vibrations are set up as the gases leave the barrel. The equation of the fundamental frequency of resonance of the tube is f, in cycles per second.

$$f=\frac{4\cdot l}{(2n+1)}$$

$$f=\frac{(2n+1)\cdot V}{4\cdot l}$$

The barrels of usual firearms vary from two inches for a pistol to 36 inches for a rifle, therefore,

$$f=\frac{3\times2700}{4\times\frac{2}{12}}$$

$$=12{,}080 \text{ C. P. S. for 2'' barrel}$$

$$f=\frac{3\times2700}{4\times\frac{36}{12}}$$

$$=675 \text{ C. P. S. for 36'' barrel}$$

The fundamental frequency, therefore, varies roughly between frequencies of 675 and 12,080 cycles per second which are within the sonic range.

Since the whole amount of discharged gas escapes from the gun to the atmosphere, the volume of sound thus created often causes distress to people confined in a closed space with a gun being fired, and in the open, permits the discharge of the gun to be heard at great distances to disclose the location of the gun.

Silencers for guns have been developed but the silencers now existing are heavy, cumbersome attachments for the barrels with chambers and labyrinths or the like for reducing the pressure of the discharged gases from the guns, and ports to increase the area of discharge of the gases from the barrels.

It is an object of my invention to produce a light compact device to reduce the audible noise of discharge of a machine operated by a gas having a high acoustic velocity.

Another object of my invention is to provide a noise reducer to limit the audible noise of discharge of a gun.

A further object of my invention is to provide a noise reducer to limit the sonic vibrations in the gas emitted from a gun.

A still further object of my invention is to provide a gun with a device including a discharge gas chamber and ports therein for escape of gases from the gun at supersonic frequencies of vibration.

Yet a further object of my invention is to provide a gun with a barrel extension including an entry chamber for leakage of discharge gases around a projectile, an exit chamber having substantially the bore of the gun and an intermediate chamber having a bore greater than the bores of the entry and exit chambers, and gas exhaust ports.

Other aims and objects of my invention will appear from the following explanation thereof.

In carrying out my invention a barrel extension for attachment to a gun includes an aperture with a plurality of chambers including an entry chamber with a bore substantially larger than the diameter of a projectile for leakage of gases therearound, an intermediate chamber having ports with sharp edges for escape of discharge gases therefrom, and an exit chamber with a bore substantially equal to the bore of the gun barrel. The intermediate chamber is provided with a bore greater than the bores of the entry and exit chambers and a length required to resonate supersonic vibrations.

For a more complete understanding of my invention, reference is directed to the following description and the accompanying drawing in which:

Fig. 1 is an elevation, partly in section of a portion of a gun incorporating an embodiment of my invention, with the projectile about to enter the intermediate chamber;

Fig. 2 is a view similar to Fig. 1 with the projectile leaving the gun;

Fig. 3 is a muzzle end view of the barrel extension; and

Fig. 4 is a perspective view of the barrel extension.

Accordingly, a gun **12** having a barrel **14** for discharge of projectiles **15** therethrough is provided with a barrel extension **16** having a body **18** secured to gun **12** by a nut **20**.

Body **18** is provided with a first chamber **24** and a second chamber **28** of larger diameter extending forwardly therefrom. The front end of second chamber **28** is terminated by an annular flange **27** through which there is provided an axial aperture **26**.

Front chamber **24** is disposed immediately forward of the muzzle end of barrel **14** and has a diameter slightly larger than that of the projectiles **15** so that some of the gases propelling the projectiles forwardly may escape thereby into second chamber **28** before the entry of the projectiles thereinto. Second chamber **28** has a predetermined length and extending laterally from the front end thereof is a pair of diametrically opposed mouth portions **30**. The outside of body **18**, immediately forward of the mouth portions **30**, is cut away to form arcuate surfaces **33** concentric to body **18** with such surfaces having a radius slightly smaller than that of second chamber **28**. The junctions of the annular surfaces **33** with the inside face of flange **27** form a right angular edge **32** which lies in the path of the gases expelled forwardly from second chamber **28** to cause the discharge gases to vibrate in the same manner as the passage thereof through a whistle. The frequencies of the vibrations are determined by the length of second chamber **28** and, therefore, the length of such chamber is predetermined as .8

inch. Whereby, as hereinafter explained, the frequency at which the discharge gases vibrate is above the limit of human audibility. Aperture **26** has a diameter approximately the same as that of projectiles **15** so that when such projectiles are passing therethrough the discharge gases are directed entirely out through the mouth **30**.

The value of f, the frequency of vibration in the gas discharged from a closed pipe is expressed by

$$f=\frac{V}{4.1}$$

where f=cycles per second, V=the velocity of sonic propagation in air in feet per second, and l=the length of the pipe in feet.

The frequency of sound in the gases escaping from ports **30** in cycles per second with a chamber length of .8 inch, therefore, is

$$f=\frac{nV}{2\cdot l}$$

$$=\frac{2700}{2\times\frac{0.8}{12}}$$

$$=20{,}000+\text{C. P. S.}$$

This frequency is supersonic since the upper limit of human audibility is conceded to be 20,000 cycles per second.

A portion of the gas traversing the exit chamber behind the projectile of course, still vibrates in the sonic range but, in a model tested in an inclosed range the noise of the gun was considerably reduced.

The gases are attenuated by leakage around the projectiles in entry chamber **24** to reduce the diameter of intermediate chamber **28** required for escape of the gases and to reduce the intensity of noise in the gases traversing chamber **26**. The diameter and length of

entry chamber **24** determines the degree of the attenuation.

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 claim is intended to include such variations.

I claim:

An attachment for the muzzle end of a firearm barrel to reduce the noise produced by the discharge of gases therefrom, said attachment including the combination of a body provided with a chamber having a diameter larger than that of the bore of the barrel, an annular flange provided with a rear face and disposed at the front end of said chamber, said flange having an aperture therethrough in axial alignment with the barrel, a pair of mouth portions extending radially outward from said chamber rearwardly of said flange for the discharge of the gases, cutout portions extending forwardly in said body from said mouth portions, arcuate surfaces formed on said flange by said cutout portions, arcuate edges formed at the junctions of said arcuate surfaces with said rear face, said arcuate surfaces having a radius smaller than that of said chamber to locate said edges in the forward path of the gases to set up vibrations therein when discharged through said mouth portions, and said chamber having a predetermined length for producing the vibrations at a frequency higher than that of audible sound.

References Cited in the file of this patent

UNITED STATES PATENTS

1,143,814	De Vries	June 22, 1915

FOREIGN PATENTS

314,842	Germany	Nov. 29, 1917
270,629	Italy	Jan. 15, 1930