ABSTRACT OF THE DISCLOSURE

A method is disclosed for making a one-piece body muzzle brake threaded on the outer end of a gun barrel containing a plurality of spaced discrete tapered holes allowing gases to escape outwardly to impinge on a baffle surface to reduce the recoil, and a further deflector surface receiving gases deflected by said baffle surface, the deflector surface sloping forwardly to deflect sound wave forwardly of the muzzle brake to reduce the sound reaching the user's ears.

This application is a division of my copending application 537,191, filed Mar. 24, 1966 now Patent No. 3,368,452.

The present invention relates to a new and novel muzzle brake and method of making same, and more particularly to a muzzle brake which substantially reduces the ear-blast to the shooter of the associated gun.

The muzzle brake of the present invention is adapted to be mounted at the outer end of the muzzle of a gun such as a rifle and the like, and as is the case with typical devices of this type, it is specifically designed to perform a recoil absorbing function so as to substantially reduce the recoil of an associated gun. In addition, the muzzle brake of the present invention also serves to perform the function of dispersing and reducing the flash when a shot is fired.

A particular advantage of the present invention is the fact that it not only provides the advantageous results as discussed above, but in addition, means is provided for substantially reducing the ear-blast to the shooter or anyone else on the firing line. In the past, devices which adequately reduced the recoil and disperse and reduce the flash have not successfully reduced the ear-blast, and accordingly, these devices have not proved to be successful in actual practice on the firing line.

In the present invention, a very simple and relatively inexpensive construction is provided, and yet at the same time the apparatus efficiently accomplishes all of the above discussed desired end results.

The body means of the present invention is of a one-piece construction so as to enable ready manufacture thereof, a threaded portion being provided at the rear end thereof for mounting the body means on the muzzle of a gun. The forward end of the body means is provided with an outlet passage through which a projectile fired by the gun is adapted to pass. An expansion chamber is provided between the threaded rear end portion and the outlet passage at the forward portion of the apparatus.

A unique feature of the present invention is the provision of a plurality of holes disposed peripherally about the entrance to the outlet passage, each of these holes tapering to a smaller dimension in a direction forwardly of the apparatus. The tapered configuration of these holes forms individual jets of gas which issue therethrough with greater force than would be the case if the holes were of uniform diameter throughout their length.

The gas issuing from the outer ends of the holes then impinges upon a baffle surface which is oriented in a special manner with respect to the holes. Each of the holes is formed symmetrically about longitudinal axes which form an acute angle with the longitudinal axis of the overall body means so that the holes taper forwardly and outwardly from the expansion chamber, and the baffle surface is disposed such that it is substantially perpendicular to each of the axes of the various holes. Accordingly, the baffle surface is generally frusto-conical in configuration, and slopes rearwardly in an outward direction of the apparatus. This particular orientation of the baffle surface is important since the gases discharged from the outer ends of the holes impinge upon the baffle surface at a right angle and there is no shear-off of the pressure.

The over-all effect is to substantially reduce the ear-blast while providing maximum efficiency in reducing the recoil as well as dispersing the flash and sound waves. A further feature of the present invention is the provision of a novel method of making the muzzle brake of the present invention wherein the relatively complex finished shape of the muzzle brake may be formed on relatively conventional machines with a minimum number of steps required so as to provide an article which may be economically manufactured.

An object of the present invention is to provide a new and novel muzzle brake which substantially reduces the recoil of an associated gun.

Another object of the present invention is the provision of a muzzle brake which also disperses and reduces the flash.

Still another object of the invention is to additionally reduce the noise to the shooter.

Yet another object of the invention is to provide a muzzle brake which is relatively simple and inexpensive and yet which at the same time is quite efficient and reliable in use.

A still further object of the invention is to provide a new and novel method of making a muzzle brake whereby the article can be economically manufactured.

Other objects and many attendant advantages will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a top perspective view of the muzzle brake of the present invention in operative position on the muzzle of an associated gun;

FIG. 2 is a sectional view taken substantially along line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a sectional view taken substantially along line 3—3 of FIG. 2 looking in the direction of the arrows;

FIGS. 4 through 15 illustrate various steps in the method of making the muzzle brake of the present invention.

Referring now to the drawing wherein like reference numerals designate corresponding parts throughout the several views, the barrel of a gun is indicated by reference numeral 10, this barrel having a rifled bore 12 formed therethrough, and the muzzle of the barrel is provided with a thread 14 provided on the outer surface for receiving the muzzle brake of the present invention.

The invention device is indicated generally by reference numeral 20, and includes a generally cylinrical portion 22 having internal threads formed therein which are complementary to the threads 14 on the muzzle so that the muzzle brake may be readily mounted on or removed from the gun as desired.

The muzzle brake is of a one-piece construction and may be formed of steel or a similar rigid substance.
A surface 26 flares forwardly from the threaded cylindrical portion 22 and defines an expansion chamber within the muzzle brake. The body means includes a forwardly extending generally cylindrical portion 28 having an outlet passage 30 formed therethrough. Outlet passage 30 is aligned with the bore 12 of the barrel 10 and may be of slightly greater diameter so as to permit a bullet or the like to readily pass through the outlet passage 30.

A plurality of holes 34 are provided in the body means of each of these holes 34 being substantially symmetrical about the axis x-x disposed at an acute angle to the longitudinal axis of the body means, and which in a typical example may define an angle of approximately 20° therewith. As seen in FIG. 3, ten of these holes are provided, although the number may be varied as desired. Each of the holes tapers throughout its length to a smaller dimension in a direction longitudinally and outwardly of the brake. It will also be noted as seen in FIG. 2 that these holes are disposed peripherally about the entrance to the outlet passage 30. The rear ends of holes 34 are disposed at the forward end of the expansion chamber, while the outer ends of holes 34 are formed through the outer surface 36 on the body means, this outer surface being generally frusto-conical in configuration.

An annular portion 38 formed integral with portion 28 previously described extends outwardly therefrom and defines a rearward facing surface 40 which comprises a baffle surface which is spaced from and generally parallel with the surface 36 on the body means. It will be noted that this baffle surface is also generally frusto-conical and is spaced from the discharge portion of holes 34. The baffle surface 40 is also so positioned that it is substantially perpendicular to each of the axes x-x of the individual holes 34.

It will be noted that surface 40 slopes rearwardly in an outwardly extending direction as seen in FIG. 2, and extends outwardly of the holes 34. It is accordingly apparent that the jets of gas issuing from the various holes 34 will impinge upon the baffle surface at substantially right angles thereto.

The body means includes an outwardly extending portion 50 which defines a deflector surface 52. This deflector surface is generally arcuate in cross-sectional configuration as seen in FIG. 2, and joins with surface 40. It will be noted that the deflector surface 52 slopes forwardly and outwardly of the brake and is disposed rearwardly of the baffle surface partly outwardly thereof as well as outwardly of the outer ends of the holes 34. With this arrangement, the deflector surface 52 will serve to receive gases that are delivered to the gas deflector surface 40 by the baffle surface 40, the deflector surface in turn deflecting the gases forwardly and outwardly away from the muzzle and accordingly directing sound waves away from the shooter so as to substantially reduce the ear-blast.

Referring now to FIGS. 4-15 of the drawings, the method of making the muzzle brake of the present invention is illustrated. As seen in FIG. 4, a blank 60 formed of steel or similar suitable material is provided, this blank being preferably generally cylindrical in cross-sectional configuration, and the blank may either be sawed or otherwise removed from a larger piece of material, or it may be cast if so desired.

Referring now to FIG. 5, the blank is provided with an end portion 62 of reduced diameter. This reduced diameter portion may be made by turning the blank on a lathe or the like.

Referring now to FIG. 6, the opposite end portion of the blank is then provided with an outer surface 64 of reduced diameter, the diameter of this end portion being slightly less than the diameter of the end portion 62 and the surface 64 is cut at a slight angle to a plane extending perpendicular to the longitudinal axis of the brake. It will be noted that by forming the two reduced end portions 62 and 64, an annular flange portion 68 is provided at an intermediate point along the muzzle brake.

A bore 70 is formed longitudinally throughout the length of the brake. The operations illustrated as being carried out in FIG. 6 may be carried out on a turret lathe, screw machine, lathe and the like. Referring now to FIG. 7, a tapered surface 74 is formed on the outer right-hand portion of the brake as seen in this figure, and a cylindrical outer surface portion 76 is formed adjacent to surface 74. Here again, these operations may be carried out by a screw machine, turret lathe and the like. It should also be understood that the steps illustrated in FIGS. 6 and 7 need not necessarily be carried out in the sequence shown, but the sequence of these steps may be varied if so desired.

Referring now to FIG. 8, the right-hand end portion of the longitudinally extending bore 70 is enlarged by forming the cylindrical surface 80 within this end portion of the blank, surface 80 being joined with surface 70 by a connecting generally frusto-conical surface 82. The enlarged bore may be formed by drilling and turning the blank on a turret lathe or other production machinery.

Referring now to FIG. 9, a flow of gas will be illustrated through the enlarged bore portion 80 by an inside forming operation or a bore of a screw machine to develop the surface 84 which flares outwardly toward the central portion of the blank, the frusto-conical surface 82 being extended outwardly to intersect with the surface 84.

Referring now to FIG. 10, the cylindrical bore portion 80 is provided with threads 90, the tapping being done by a turret lathe, automatic machinery, or a screw machine and the like.

Referring now to FIG. 11, an annular groove 94 is formed in the flange, this groove sloping inwardly and to the left as seen in FIG. 11 away from the thread end portion of the blank. A plunge cut by a turret lathe, screw machine or other special machinery is employed for forming groove 94, the groove serving to divide the flange into two separated portions 68' and 64'.

Referring now to FIG. 12, the flange portion 68' is removed by a turret lathe, hand pressed and special fixture, the flange portion 68' remaining in the same relative position as shown in FIG. 11.

Referring now to FIG. 13, a plurality of tapered and straight holes 100 are formed between the expansion chamber defined within surface 84 of the blank and the groove 94. These holes 100 are produced by a special fixture and jig on a drill press or the like. Each of holes 100 is formed substantially symmetrically about an associated axis y-y which, as seen in FIG. 13 defines with the longitudinal axis z-z of the blank. Any suitable number of holes 100 may be provided, and as described in connection with FIG. 3, ten of such holes may be formed.

It will be noted that the holes 100 as seen in FIG. 13 are not tapered for the full length thereof as are the holes 34 of FIG. 2. As seen in FIG. 13, the holes may be tapered for about two-thirds of their length and then are cylindrical for the remaining portion of the length thereof. If the muzzle brake is to be employed with a regular load in any given caliber, the holes will be formed so as to be tapered throughout their length. On the other hand, if the muzzle brake is to be used with a magneto load, the holes will be tapered throughout only a portion of their length as illustrated in FIG. 13.

Referring now to FIG. 14, the flange portion 68' is rolled over toward that end portion of the blank opposite to the end portion which is threaded to provide the arcuate deflector surface hereinbefore described. This flange portion is rolled by a special set-up on a turret, engine lathe, and punch press by the use of a form die. As an alternative arrangement, this deflector flange portion 68' may be made as a separate part attached to the remaining portion of the blank by threads, by soldering or by a press fit and the like.
Referring now to FIG. 15, the outer surface of the left-hand end portion of the blank is then cut away along a line 104 to form the arcuately shaped cutout in this end of the blank so as to reduce the size and weight of the muzzle brake, and yet at the same time to retain sufficient structural integrity to withstand the forces applied thereto. It should be understood that no specific dimensions are provided in the present description since the size of the parts will depend upon the muzzle velocity, caliber of the associated gun and the like. The relative sizes and relationships of the various parts will remain the same regardless of size.

It is apparent from the foregoing that there is provided according to the present invention a new and novel muzzle brake which may be readily attached to the muzzle of a gun, and which does not reduce the efficiency of the operation of the gun itself. The muzzle brake substantially reduces the recoil of the associated gun, and also disperses and reduces the flash. Additionally, the brake substantially reduces the ear-blast of the shooter so that the noise level is greatly reduced. The device is relatively simple and inexpensive in construction, since various portions of the device may be cold-rolled and cut on a screw machine, thereby enabling ready manufacture of the finished device. The device is also quite efficient and reliable in use. The present invention also provides a new and novel method of making a muzzle brake whereby the device may be produced in a most economical manner.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. The method of making a muzzle brake comprising providing a blank of rigid material, forming a laterally extending flange at an intermediate portion of said blank, forming a bore longitudinally through the central portion of said blank, enlarging one end of said bore and forming a flare in said enlarged end portion toward the central portion of said blank, forming threads on the internal surface of the enlarged end of said bore adjacent to the flared portion thereof, forming an annular groove in said flange with the annular groove sloping inwardly and away from the threaded end portion of the bore, cutting off said flange at one side of said groove, forming a plurality of tapered and straight holes from said enlarged bore portion into an inner portion of said groove, and rolling over the remaining portion of the flange so as to slope outwardly and away from the threaded end portion of the muzzle brake.

2. The method as defined in claim 1 wherein said annular flange is formed on said blank by providing a first end portion of reduced diameter and a second end portion of reduced diameter with the annular flange being defined between said reduced end portions.

3. The method as defined in claim 1 including the additional step of forming a taper on the outer surface of said blank immediately outwardly of the flared enlarged bore portion.

4. The method as defined in claim 1 including the additional step of removing material from the outer surface of said blank at the end opposite to the threaded end of the blank.

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