ABSTRACT OF THE DISCLOSURE

A firearms silencer comprising a tubular casing with a plurality of partition means therein to define a number of chambers with a passage therethrough for the projectile and a tubular sleeve. The partitions further dividing the second chamber from the muzzle end of the casing for the passage of the projectile. There are openings in the partition between the first and second chambers with the openings tapering inwardly toward the second chamber.

The present invention relates to a small arms silencer of the type comprising a tubular casing which can be detachably mounted on the muzzle of the weapon, more particularly, to such a silencer having a plurality of chambers therein with the second chamber from the muzzle end of the silencer having a sleeve for the passage of the projectile therethrough and tapered openings in the partition between the first and second chambers to admit discharged gases into the second chamber.

Numerous forms of construction have been incorporated in silencers for small arms in an attempt to achieve effective silencing of the report when the firearm is discharged. One form of silencer includes a tubular sleeve as a large chamber with the end of the sleeve mounted on the muzzle and a plurality of smaller chambers in the other side of the sleeve. The particular silencer structure produces some silencing of the report, the report is still audible to such an extent that this type of silencer cannot be considered to be successful. Another form of silencer includes a number of conical partitions which divide the interior of the silencer sleeve into individual chambers with these chambers being surrounded by a large annular chamber. Here again, a certain attenuation of the report from the muzzle of the firearm is achieved, but the performance is not satisfactory.

It is therefore the principal object of the present invention to provide a novel and improved silencer for small arms.

It is another object of the present invention to provide a silencer which can be detachably mounted on the muzzle of a firearm and which effectively silences the discharge report from the muzzle.

The objects of the present invention are attained by the silencer disclosed herein which essentially comprises a tubular casing having partitions therein to divide the casing into three or more chambers. The end walls and partitions of the casing have aligned apertures therein for the passage of the projectile through the silencer. Connecting the apertures in the partitions defining the second chamber from the muzzle end of the silencer is a tubular sleeve. Tapered openings are provided in the partition between the first and second chambers for the passage of the discharge gases into the second chamber. These openings are tapered inwardly in the direction from the first to the second chambers.

In the third chamber from the muzzle end of the silencer there are provided a number of conical partitions to divide this chamber into smaller individual chambers. The apices of these conical partitions are directed toward the muzzle end of the silencer and are provided with apertures for the passage of the projectile therethrough. One or both of the conical surfaces may be provided with a series of annular shoulders in order to achieve a more favorable dispersion of the sound waves.

When the firearm to which the silencer is fitted is discharged, the first chamber within the casing is initially filled by the discharge gases which have propelled the projectile from the muzzle of the firearm. The gases expand within the first chamber to the extent permitted by the volume of this chamber. As the projectile passes through the tube within the second chamber, the gases within the first chamber expand through the tapered openings into the second chamber. Only after the projectile has passed through the tubular member in the second chamber and is in the third or successive chambers can the discharge gases from the first chamber enter into the third and successive chambers for expansion. Further, these gases enter the third and successive chambers only through the tubular member. Because of the tapered openings in the partition between the first and second chambers the discharge gases from the second chamber can flow back into the first chamber only after a large portion of the movement and energy of the gases has been dissipated. These gases with much of their energy being absorbed, can then flow through the tubular member to follow the path of the projectile. The second chamber thus acts as an absorbing chamber for a part of the discharge gases. The magnitude of the energy which is absorbed depends largely upon the quantity and pressure of the discharged gases within the silencer.

Other objects and advantages of the present invention will be apparent from the accompanying description when taken in conjunction with the following drawings, wherein;

FIGURE 1 is a longitudinal sectional view of the silencer according to the present invention showing schematically the silencer structure;

FIGURE 2 is a longitudinal sectional view through the silencer of FIGURE 1 constructed in line with the present invention, and showing construction details;

FIGURE 3 is a plan view of the partition member between the first and second chambers of the silencer of FIGURE 1 and;

FIGURE 4 is a longitudinal sectional view of an insert which can be placed in the third chamber of the silencer according to the present invention for further dividing this chamber into sub-chambers.

Referring now to the drawings wherein like reference symbols indicate the same parts throughout the various views, a specific embodiment of the present invention will be described in detail. With particular reference to FIGURE 1, the silencer of the present invention is generally indicated at 10 and comprises a tubular sleeve or casing 11, having a rear wall 12, with an aperture 13 therein which is adapted for being mounted upon the muzzle of a barrel 14 of a firearm.

Within the casing 11 there is a partition 15 which, with end wall 12, defines a first chamber 16, with this chamber directly communicating with the muzzle of the firearm. On the other side of the partition 15 is a second chamber 17 which is further limited by an additional partition 18.

On the other side of the partition 18 is a third chamber 19.

The partition 15 which is between the first and second chambers, has a plurality of openings 20 therein which taper inwardly in the direction from the first to the second chambers.

The entire length of the second chamber 17 is spanned by a tube 21 which, as can be seen in FIGURE 1, extends between partitions 15 and 18. The tube 21 provides a pas-
sage for the projectile and is the sole passage for gases from the first to the third chambers of the silencer.

The first and third chambers are further divided by a number of conical partitions 22 into sub-chambers 19a, 19b, and 19c. The apices of the conical partitions 22 are apertured and are directed toward the muzzle end of the silencer and are provided with short tubular sections 23 extending in the direction of the casing rear wall. These tubular sections 23 are for the passage of the projectile and the discharge gases.

The third chamber 19 is closed by the front end wall 24 in which there is an opening 25 for the exit of the projectile and the discharge gases. A tube 26 having outwardly flaring ends is inserted into the exit opening 25.

The openings 20 in the partition 15 between the first and second casing chambers are preferably arranged at an angle with respect to the central longitudinal axis of the casing along which the projectile travels. By so inclining the tapered openings 20, the gases entering the second chamber from the first chamber are induced into a state of rotary movement so as to obtain a further turbulence which in turn aids in the dissipation or destruction of the energy within the discharged gases.

One form of the openings, but not necessarily the only ones shown, is illustrated in FIGURE 3. The openings in the partition of FIGURE 3 consist of radially extending slots 31 in a plate 32 which are inclined with respect to the central axis of the plate 32. The tubular member passing through the second chamber is indicated in FIGURE 3 as 31. It will be apparent that the inclination of the slots 31 is obtained by the walls of each slot being inclined at different angles. Thus, the gases flowing through the slots 31 into the second chamber 17 have a certain degree of rotation imparted to them by the slots 31.

The silencer as illustrated and described above in FIGURE 3 is largely schematic. The fabrication of such a silencer according to the present invention is illustrated in detail in FIGURE 2. Such a silencer can be fabricated with an outer tubular casing 41 into the rear end of which a disc 42 having a substantial thickness is inserted as a seal. The rear wall 42 thus formed has a threaded opening 43 therethrough to enable the silencer to be screwed onto threads 44 on the front end of a barrel 45 of a firearm.

The second chamber 48 of the silencer is formed by a tubular insert 46 which comprises a tube 49 having a disc 50 affixed to one end thereof and a second disc 51 positioned over the other end of the tube. The disc 51 is positioned against one end of a reinforcing sleeve 54 and thus defines the first chamber 47.

The disc 51 comprises a plurality of slots 52 such as illustrated in FIGURE 3.

This disc 50 is held in position by a reinforcing seam 53 formed in the wall of the tubular casing 41. Thus, the entire second chamber as formed by the discs 50, 51 and tube 49 is positioned by the reinforcing sleeve 54 and the seam 53.

In front of the disc 50 there is defined a third chamber 55 of the silencer. A plurality of identical inserts 56 are positioned into this chamber from the front of the sleeve 41 with the rear-most insert positioned against a reinforcing seam 57 in the sleeve 41. Each insert 56 comprises a short tubular section 58 positioned against the inner surface of the tubular sleeve 41. At the end of each tubular section 58 directed toward the muzzle 45 there is attached a conical wall section 59 with its apertured apex directed to the muzzle 45. The conical wall has a plurality of annular shoulders formed therein. Each apex aperture of the conical partition 59 is provided with a short tubular section 60 which is aligned with the tubular member 49 of the second chamber to provide a passage for the projectile.

As may be seen in FIGURE 2, the inserts 56 are axially fixed in position since their tubular portions 58 abut against each other.

The leading insert 56 is held in position by a front disc or plate 61 which is inserted into the front end of the tubular casing 41. The front plate 61 has a central opening 62 with its ends outwardly flaring. The rear flared end has a plurality of annular shoulders therein as indicated at 63.

As can be seen from FIGURE 2 the inserts 56 may be readily punched and stamped from thin walled material. However, it is also possible to fabricate an insert from a block of material by turning such as shown at 71 in FIGURE 4.

Insert 71 which is structurally the same as the insert 56 in FIGURE 2, has a conical wall 73 with its inner face 72 being graduated in successive steps formed by turning a plurality of annular shoulders. It has been found that this step construction on the conical surface provides greatly improved impaction of the sound waves and materially assists in breaking down and dissipating the gases before they are finally discharged into the atmosphere.

The exterior surface 74 of the conical wall 73 may be smooth as illustrated or may also have a plurality of annular shoulders similar to those at 72.

These inserts such as 56 and 71 can also be fabricated of a conically wound spring wire material.

Under certain conditions, particularly if the silencer is to be employed with automatic weapons, it is advantageous to incorporate pressure equalization holes in the sleeve of FIGURE 3, and the openings in the partition of the first chamber. The gases escaping through these pressure equalization holes do not intensify the sound of the muzzle report because of the large quantity of gases retained within the silencer due to the rapid succession of shots.

It is therefore apparent that the silencer of the present invention effectively reduces the sound of the muzzle report since the major portion of the discharged gases emitted from the muzzle of the gun enter the second chamber of the silencer. The energy of these gases is largely dissipated within this chamber because of the turbulence imparted to these gases by the inclined openings in the partition between the first and second chambers. Only after the projectile has passed through the tubular member within the second chamber can the discharged gases escape through this tubular member and the third chamber to the atmosphere. However, by this time the energy of the discharged gases has been largely dissipated and effective silencing of the muzzle report has occurred. Thus, by providing a tubular member for the passage of the projectile from the second chamber, the projectile within this tubular member blocks the discharge of the gases and forces a major portion of the discharge gases to be diverted to the second chamber through the tapered partition openings for dissipation of energy.

The silencer according to the present invention not only is effective in operation but simple in construction and can be readily fabricated by ordinary manufacturing processes.

It will be understood that this invention is subject to modification in order to adapt it to different uses and conditions and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. A silencer for the muzzle end of a firearm, comprising a tubular casing with front and rear ends and having an apertured end wall at its rear end adapted for being mounted on the muzzle of a firearm, the front end of said tubular casing having an apertured end wall with an opening therein for the exit of the projectile and discharged gases, apertured partition means within said tubular casing and having apertures for the passage of the projectile therethrough for dividing the interior of said tubular casing into at least three chambers, a tube spaced from the inner face of said casing connecting the apertures of the partition means forming the second chamber from the rear end of the casing to define a passage for the projectile, the partition means between the first and second
chambers from the rear end of the casing having openings therein for the passage of the discharged gases, said openings being between the inner face of said casing and said connecting tube with each opening tapering inwardly from said first to said second chambers.

2. A silencer as claimed in claim 1, and further comprising a plurality of conical partitions with apertures at the apices thereof for the passage of the projectile disposed in the casing chambers of other than said first and second chambers.

3. A silencer as claimed in claim 2 wherein the apices of said conical partitions are directed toward the rear end of said casing, and tubular members extending from said conical partition apertures toward said casing rear end for the passage of the projectile therethrough.

4. A silencer as claimed in claim 2 wherein the apices of said conical partitions are directed toward the rear end of said casing, and a plurality of annular shoulders on the conical partition surfaces directed toward the front end of the casing.

5. A silencer as claimed in claim 4 and further comprising annular shoulders on the conical partition surfaces directed toward the rear end of the casing.

6. A silencer as claimed in claim 1 wherein said openings in said partition means between said first and second chambers are at angles to the apertures for the passage of the projectile to impart a rotary movement to the discharged gases entering the second chamber from the said first chamber.

7. A silencer as claimed in claim 1 and further comprising a tubular member having outwardly flaring ends in the aperture of said casing front end wall.

8. A silencer as claimed in claim 7, wherein the inner surface of the flared end of said tubular member directed to the casing rear end has a plurality of annular shoulders thereon.

References Cited

<table>
<thead>
<tr>
<th>UNITED STATES PATENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,017,003 2/1912 Kenney 89—14 X</td>
</tr>
<tr>
<td>1,111,202 9/1914 Westfall 89—14</td>
</tr>
<tr>
<td>1,401,667 12/1921 Brown 89—14 X</td>
</tr>
<tr>
<td>1,874,326 8/1932 Mason.</td>
</tr>
<tr>
<td>2,098,617 11/1937 Cuits.</td>
</tr>
<tr>
<td>2,212,685 8/1940 Hughes 89—14</td>
</tr>
<tr>
<td>2,348,114 5/1944 Dow 89—14</td>
</tr>
<tr>
<td>2,499,428 3/1950 Tiffany 89—14</td>
</tr>
<tr>
<td>2,872,848 2/1959 Schuessler 89—14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOREIGN PATENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>825,016 2/1938 France.</td>
</tr>
<tr>
<td>30,240 1909 Great Britain.</td>
</tr>
</tbody>
</table>

BENJAMIN A. BORCHELT, Primary Examiner.

S. C. BENTLEY, Assistant Examiner.