

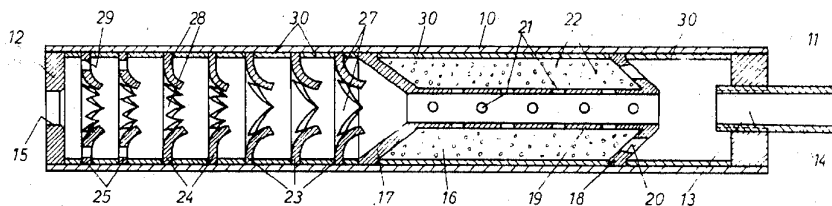
- [54] **SILENCER FOR FIRE ARMS**  
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- [56] **References Cited**  
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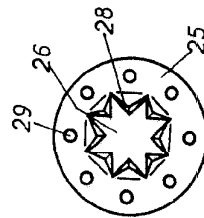
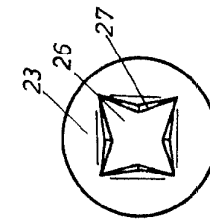
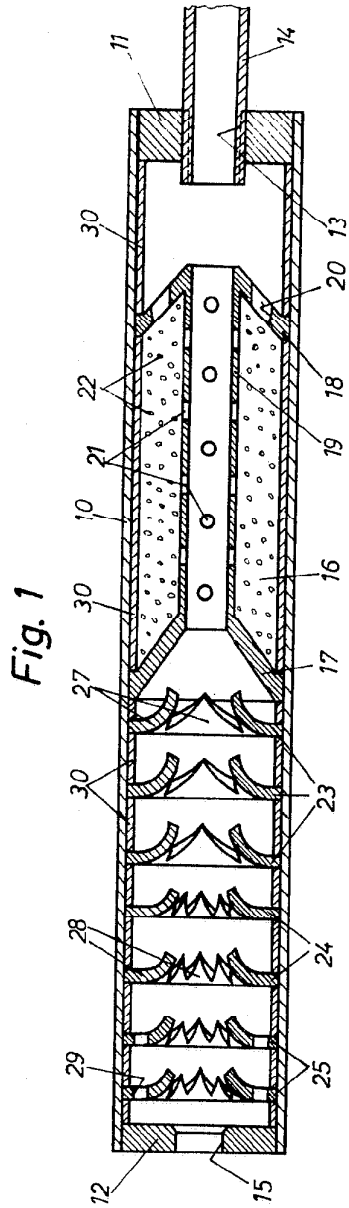
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[57] **ABSTRACT**

A silencer comprises a hollow cylindrical casing closed by front and rear end walls having aligned openings to define a passage therethrough for a bullet and propellant gases emerging from the muzzle opening of a fire-arm. A plurality of partitions within the casing define chambers with at least one chamber being constructed as a return-flow chamber. The partitions have openings therein for the passage of the bullet with the edges of the openings being serrated and bent toward the rear end wall of the casing. A tubular element with openings therein defines a passage through the return-flow chamber for the bullet and gases.

**7 Claims, 3 Drawing Figures**





## SILENCER FOR FIRE ARMS

The present invention relates to silencers for hand firearms, more particularly, to the structure of a plurality of partitions within the silencer forwardly of a return-flow chamber.

Up to the present time, known silencers for hand firearms can be generally classified into two groups. In one group, the discharge and propellant gases that follow the bullet into the silencer are stored for a short period of time in a plurality of successive chambers which are closed to the outside. This produces a throttle expansion of the propellant gases through the bullet exit opening in the front end wall of the silencer. In a second group, at least a portion of the propellant gases are diverted to the exterior through a plurality of lateral openings in the silencer. The silencers of the first group have gained particularly wide acceptance because of better efficiency. The silencers of the second group have been employed, as a practical matter, only in those cases where it is desired to avoid the propagation of propellant gases at supersonic velocities and the velocities of the gases are to be lowered into the subsonic range prior to discharge of the bullet from the barrel.

Silencers have also been proposed in which there is provided a return-flow chamber positioned immediately adjacent to the silencer rear wall opening through which the bullet and gases enter the silencer. Such a chamber is provided with a central tubular element to define a passage for the bullet and gases and is capable of receiving a large portion of the propellant gases following the projectile. Such silencers equipped with return-flow chambers have been found to be quite effective.

In order to achieve a more effective storage of a large portion of the propellant gases in a return-flow chamber silencer as well as in other chambers formed by successive partitions, it has been proposed to provide funnel-shaped structures axially positioned on the partitions so as to force the propellant gases following the projectile to expand and thus remove a large portion of such gases from moving along the direction of the bullet. It has also been proposed to provide lateral interruptions in such funnel-shaped walls in order to improve the flow of the propellant gases to these walls. It has further been proposed to establish a turbulence in the propellant gases by various arrangements of guiding fins. Inducing these turbulent movements in the gases results in an effective filling of the various chambers of the silencer.

However, it is a general rule that the silencing effect achieved in such silencers becomes greater as the manufacturing cost of the silencer increases. In addition, the return-flow chamber type of silencer does not permit any further reduction of the noise of discharge below a certain sound level. This results from the fact that the forcing of the propellant gases to the desired degree of expansion and, accordingly, the possibility of a short period storage in the chambers cannot be effectively obtained with known silencers.

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

It is another object of the present invention to provide a more efficient silencer of the type having a return-flow chamber and a plurality of successive chambers formed by a series of partitions.

It is a further object of the present invention to provide a silencer having structural features therein which effectively divert a large portion of the discharge gases following closely upon and in close contact with the projectile.

It is still another object of the present invention to provide a silencer having effective structural elements for diverting gas flow adjacent and following a projectile which is effective in operation and inexpensive to manufacture.

The objects of the present invention are achieved and the disadvantages of the prior art as described above are eliminated by the silencer of the present invention which essentially comprises a hollow cylindrical casing having front and rear end walls with aligned openings therein to define a passage for the bullet and discharge gases. A return-flow chamber is provided in the rearward portion of the silencer and has conical-shaped forward and rear walls. A tubular element extends between the end walls of the return-flow chamber and is aligned with the passage for the bullet. A plurality of partitions are positioned forwardly of the return-flow chamber with the partitions having passage openings therein. Each passage opening has a serrated edge with the serrations being bent rearwardly to define a funnel which diverts effectively the gases flowing directly in front of, beside and behind the bullet. The conical end walls of the return-flow chamber prevent an excessively uniform or smooth gas thrust and facilitate the flow of discharge gases through openings provided in the rear wall of the return-flow chamber. Gases entering the tubular element of the return-flow chamber behind the projectile are drawn off into the return-flow chamber through a plurality of lateral openings in the tubular element. The pressure waves thus formed by the discharge gases are partially extinguished by striking pressure waves reflected in the return-flow chamber.

On the basis of tests and measurements conducted on a silencer constructed in accordance with the present invention, there was obtained a much more effective silencing effect of the noise produced by the discharge of a firearm than of other known silencers.

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

FIG. 1 is a longitudinal sectional view through a silencer of the present invention;

FIG. 2 is a front elevational view of one of the rear partitions in the silencer of FIG. 1; and

FIG. 3 is a front elevational view of one of the forward partitions of the silencer of FIG. 1.

Proceeding next 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.

As may be seen in FIG. 1, the silencer comprises a hollow cylindrical casing 10 closed by a rear end wall 11 and a front end wall 12. The rear end wall 11 is provided with an entrance bore 13 through which projects a muzzle 14 of a hand firearm. The muzzle 14 projects into the silencer and the silencer is attached to the muzzle by a threaded connection.

The front end wall 12 is provided with a bullet exit opening 15. The exit opening 15 is the only opening in the silencer through which discharge gases can escape.

The interior of the silencer is divided into a plurality of individual chambers by means of a plurality of partitions. Immediately subsequent to the entrance opening 13 of the silencer there is provided a return-flow chamber 16 formed by a conical front end wall 17 and a conical rear end wall 18. A tubular element 19 passes through the chamber 16 between the end walls 17 and 18 and forms a passage for a bullet and discharge gases. The outer face of the return-flow chamber 16 is formed by the silencer casing 10. A plurality of openings 20 are provided in the conical end wall 18 and openings 21 are provided in the tubular element 19 to provide passages for lateral flow of the discharge gases into the chamber 16. The rear wall openings 20 are conical in shape which provides a throttling of the gases flowing outwardly from the return-flow chamber 16.

The two end walls 17 and 18 of the return-flow chamber are conical and taper toward the rear end wall 11 of the silencer. The conical shape of rear end wall 18 avoids an excessive initial thrust exerted by the gases as they enter the silencer through opening 13. In addition, the gases expanding in the chamber defined by the rear end wall 11 and the conical wall 18 of the chamber flow through openings 20 into the interior of the return-flow chamber 16.

The conical shape of the front end wall 17 forces an expansion of the propellant gases discharged from the tubular element 19 in a forward direction.

The gases immediately following the bullet passing through the tubular element 19 are drawn through the lateral openings 21 into the interior of the return-flow chamber. This will continue until the pressure is equalized between the interior of the tube 19 and the interior of the return-flow chamber 16. In addition, the air displaced by the bullet passing through the tube 19 is drawn through openings 21 into the return-flow chamber. In order not to decrease the effectiveness of the subsequent chambers, provisions are made to avoid or at least diminish the effect of the pressure wave pushed in front of the bullet. This is achieved by positioning a very coarse wire screen 22 in the interior of the return-flow chamber 16. The wires of the screen have a diameter or thickness of at least 0.5 to 1.0 mm. and preferably the wires have a rectangular cross-section. The pressure waves expanding within the return-flow chamber 16 and basically originating from the propellant gases flowing in through openings 20 of the rear wall 18 of the return flow chamber and partially overtaking the movement of the bullet are broken up and partially reflected by the wire screen 22. The pressure waves reflected by the wire screen 22 and the front end wall 17 of the return-flow chamber thus partially extinguish subsequent pressure waves and, in effect, bring about a phase shift of 180° in the pressure waves. The wire screen is thus not employed for the purpose of absorbing the energy of propellant gases as in the case of known wire screens but for bringing about a maximum reflection of the pressure waves within the return flow chamber.

Additional chambers are formed subsequently to the return-flow chamber 16 by a plurality of partitions 23, 24, 25 and the inner face of the cylindrical casing 10. These partitions are provided with passage openings 26 arranged concentrically with respect to the casing 10 and are aligned with the tubular element 19 so as to define a passage through the silencer for the bullet and discharge gases.

The partitions 23, 24 and 25 are in the form of discs. The edges of the passage openings 26 are notched or serrated with these serrations being bent rearwardly toward the casing rear end wall 11. The rearward partitions 23 or those furthest away from the front wall of the silencer have prongs or serrations 27 which are larger than the prongs or serrations 28 of the forward partitions 24 and 25. As can be seen in FIG. 1, the passage openings 26 as defined by the prongs 27 and 28 are funnel-shaped which divert or expand the propellant gases passing through the passages 26 as known in the art.

In addition to the passage openings 26, the foremost partitions 25 are provided with additional openings 29 that facilitate the equalization of the overpressure prevailing in the silencer after a shot to the atmosphere pressure outside of the silencer.

The rearwardly bent serrations or prongs 27 and 28 in the partitions subsequent to the return-flow chamber 16 function to break up the waves produced by the bullet passing through the silencer. They produce an effective turbulence in the cylindrical column of discharge gases following the bullet and also in the gases flowing directly beside the bullet or drawn along by the bullet. Thus, the gases are progressively diverted into the chambers formed by the partitions 23, 24 and 25. It is preferable that the extent of bending of the prongs or serrations, and thus their lengths, increases from the front toward the rear of the silencer. This structure enables the funnel-shaped bent edges of the passages 26 to bring about an expansion of the discharge gases that are rendered turbulent.

The partitions 23, 24 and 25 having the prongs 27 and 28 can be manufactured and mounted in the cylindrical casing 10 in a simple operation. The partitions can be formed of duraluminum discs and the passages 26 formed by punching cross slots at the centers of the discs and by bending the resulting prongs or serrations by a suitable punch. In the front partitions 24 and 25 the hole 26 is bored initially so that the lengths of the prongs 28 are relatively small. Tubular sleeves 30 are positioned within the casing 10 between discs 23, 24, 25, end walls 17 and 18 of the return-flow chamber 16 and outer end walls 11 and 12 of the silencer for axially spacing the components within the silencer and for positioning the components therein.

Thus it can be seen that the present invention has disclosed an improved silencer comprising a return-flow chamber and a plurality of partitions defining successive chambers therein. The edges of the passages in the partitions are funnel-shaped and notched to improve the diversion and expansion of the gases and to enhance the turbulence of the gases diverted into the individual chambers. The components of the silencer are simple in structure and can be assembled with a minimum of labor so that the result is a simple but effective silencer which is relatively inexpensive in cost.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages 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 a firearm comprising a hollow cylindrical casing having a front end wall and a rear end wall, said rear end wall having an entrance opening through which a bullet and discharge gases pass from

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the muzzle opening of a firearm said front end wall having an exit opening aligned with said entrance opening to define a passage for a bullet and gases through the casing, a plurality of partitions each having a passage opening therein within said casing to define a plurality of chambers, means within one of said chambers for defining a return-flow chamber having conical front end and rear end walls, a tubular element between the end walls of said return-flow chamber aligned with said passage, there being openings in the wall of said tubular element, the edges of the partition passage openings forwardly of said return-flow chamber being serrated and bent toward the casing rear end wall.

2. A silencer as claimed in claim 1 and comprising a coarse wire screen within said return-flow chamber.

3. A silencer as claimed in claim 2 wherein the wires

of said screen have a thickness of at least 0.5 to 1.0 mm.

4. A silencer as claimed in claim 3 wherein said wires have a rectangular cross section.

5. A silencer as claimed in claim 1 wherein the bent serrated edges of said partition openings are funnel-shaped and the lengths of the serrations increase from the front end wall toward the rear end wall.

6. A silencer as claimed in claim 1 wherein at least one partition adjacent said front end wall has additional openings therein.

7. A silencer as claimed in claim 1 wherein the conical end walls of said return-flow chamber taper toward the casing rear end wall.

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