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(54) **FIREARM SILENCER**

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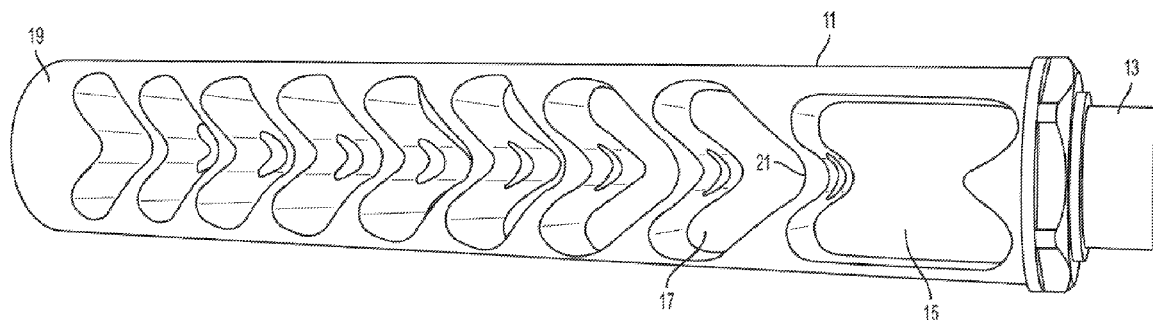
(57) **ABSTRACT**

(22) Filed: **Nov. 4, 2016**

A silencer includes a baffle stack with channels extending along its outer surface for the length thereof to a discharge end of the silencer. The channels are in communication with the baffle stack to allow gas resident in a firearm to which the silencer is attached to escape to minimize the results of a blast resulting by passing the gas through the channels and out from the silencer.

**Related U.S. Application Data**

(60) Provisional application No. 62/251,948, filed on Nov. 6, 2015.



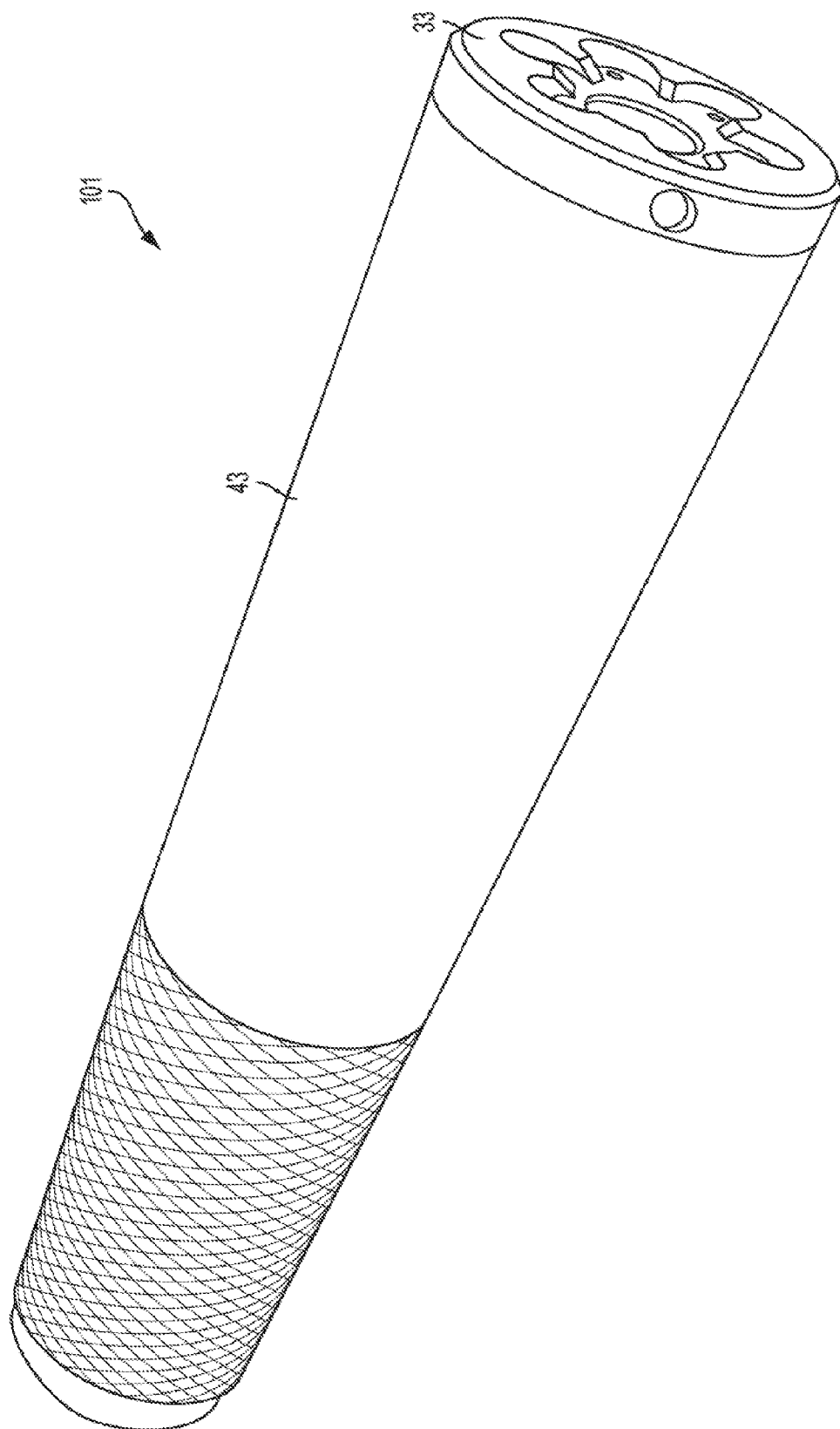


FIG. 1

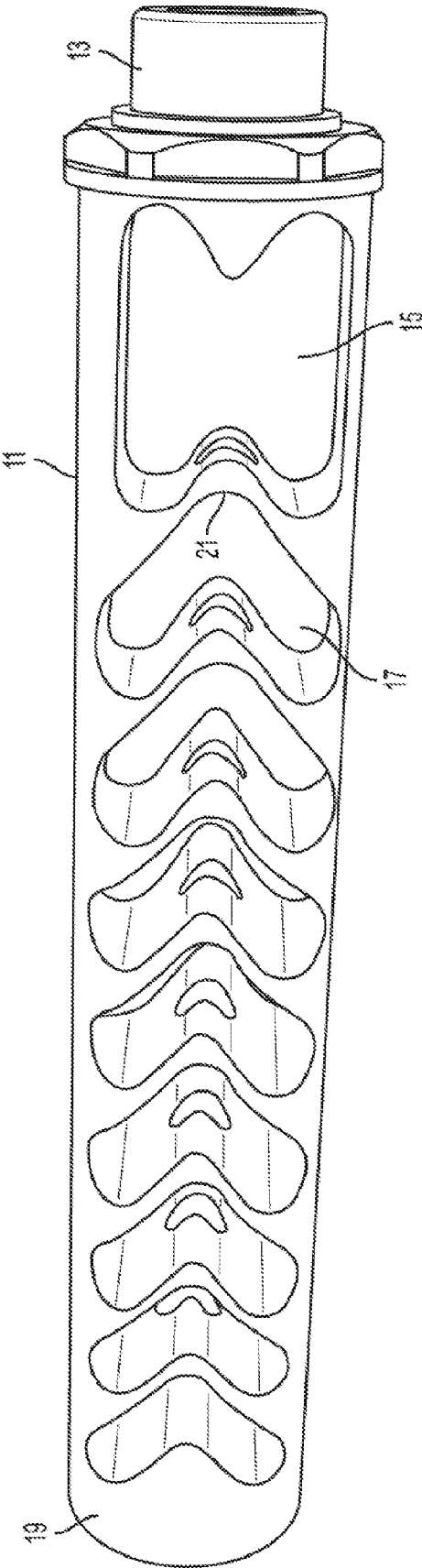


FIG. 2

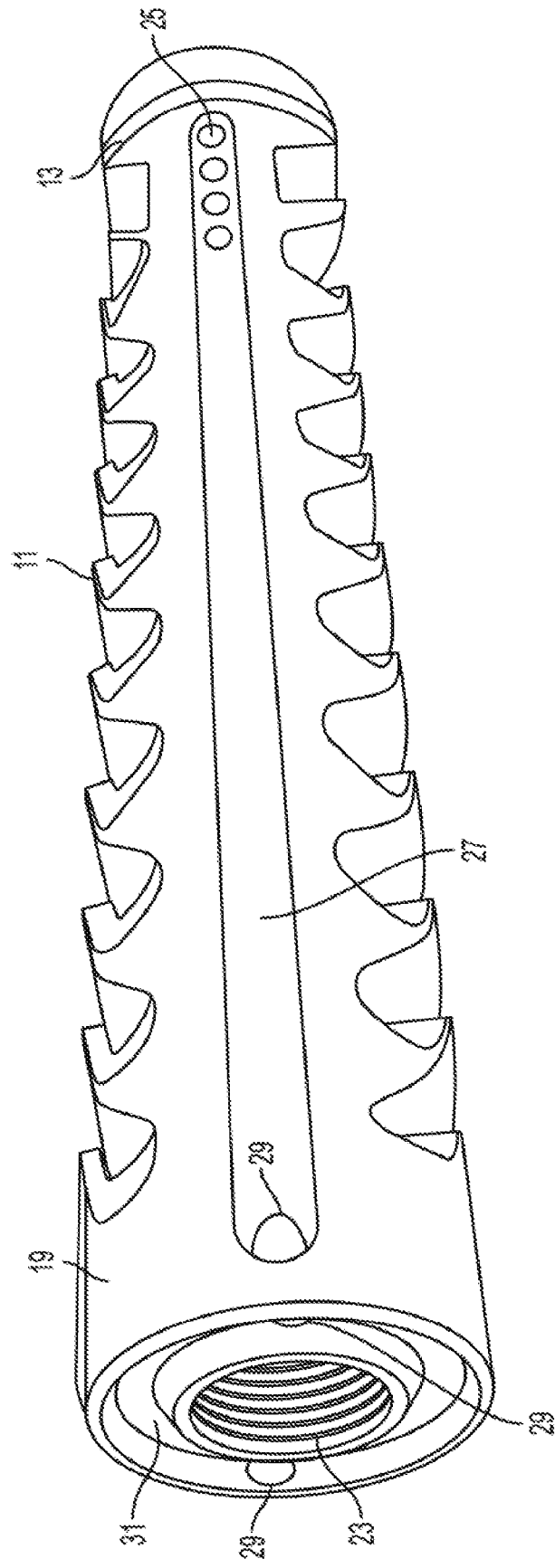


FIG. 3

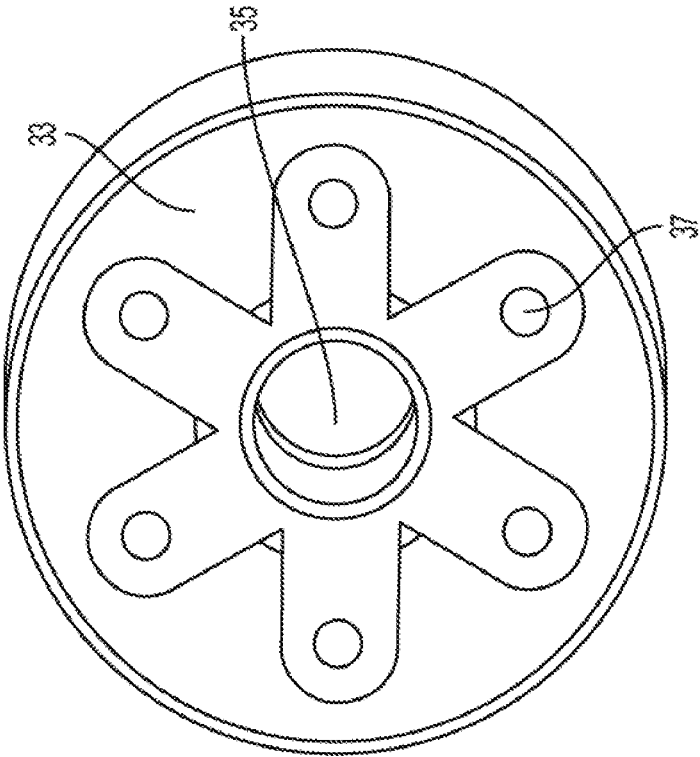


FIG. 4

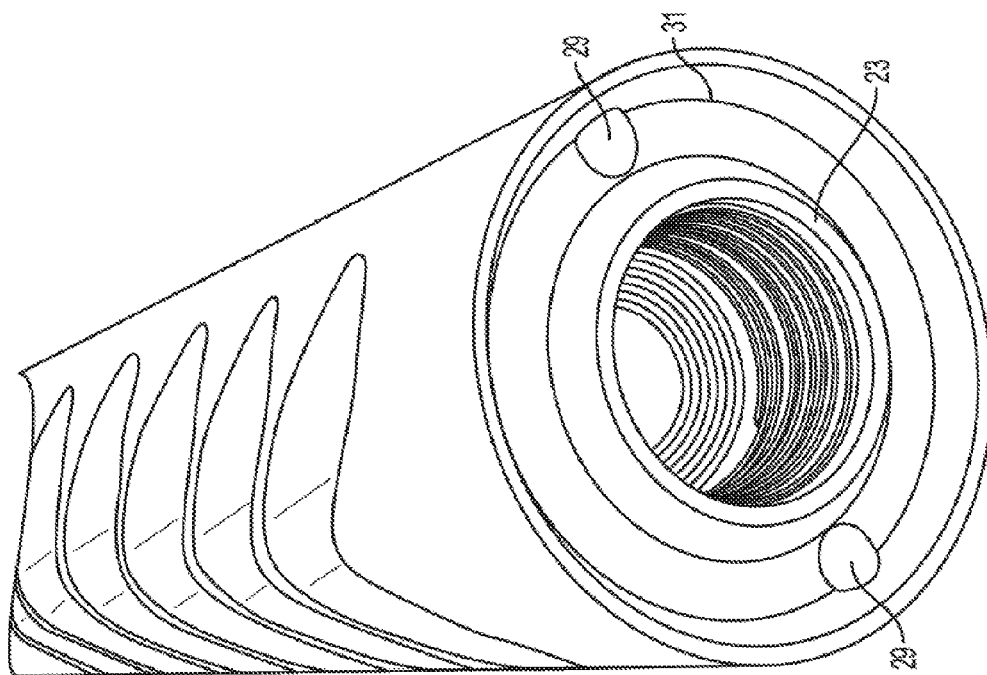


FIG. 5

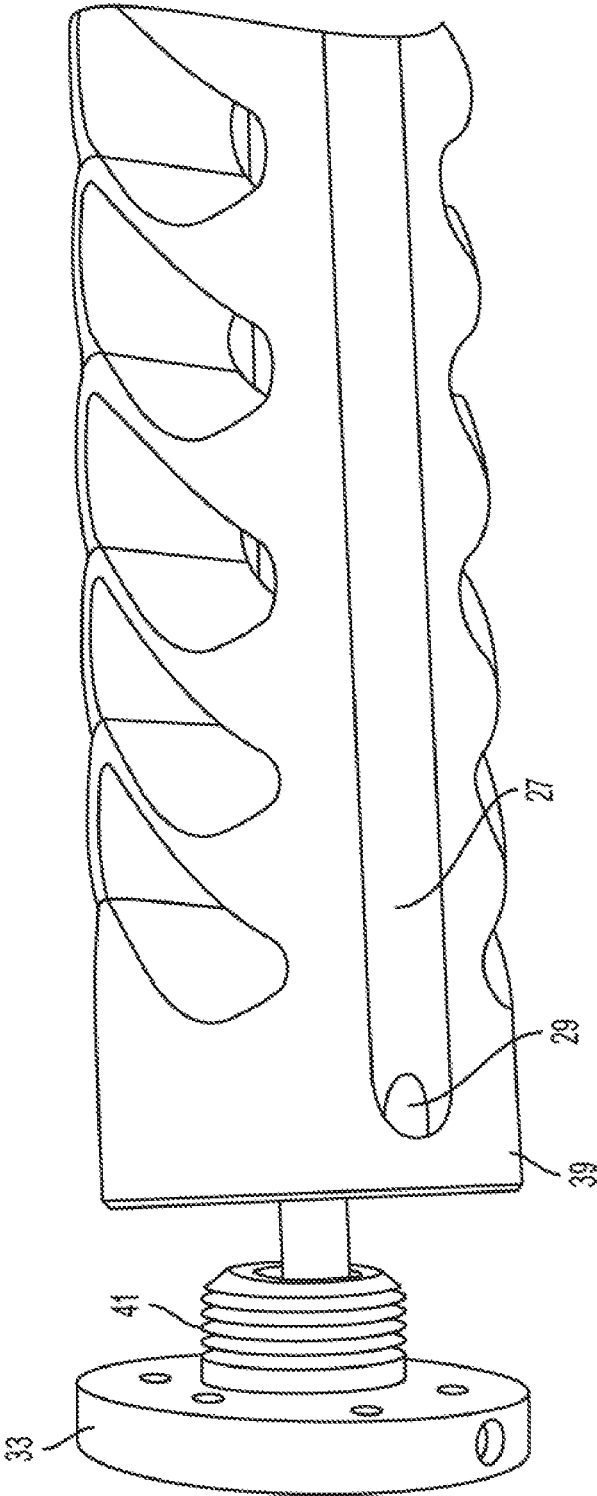


FIG. 6

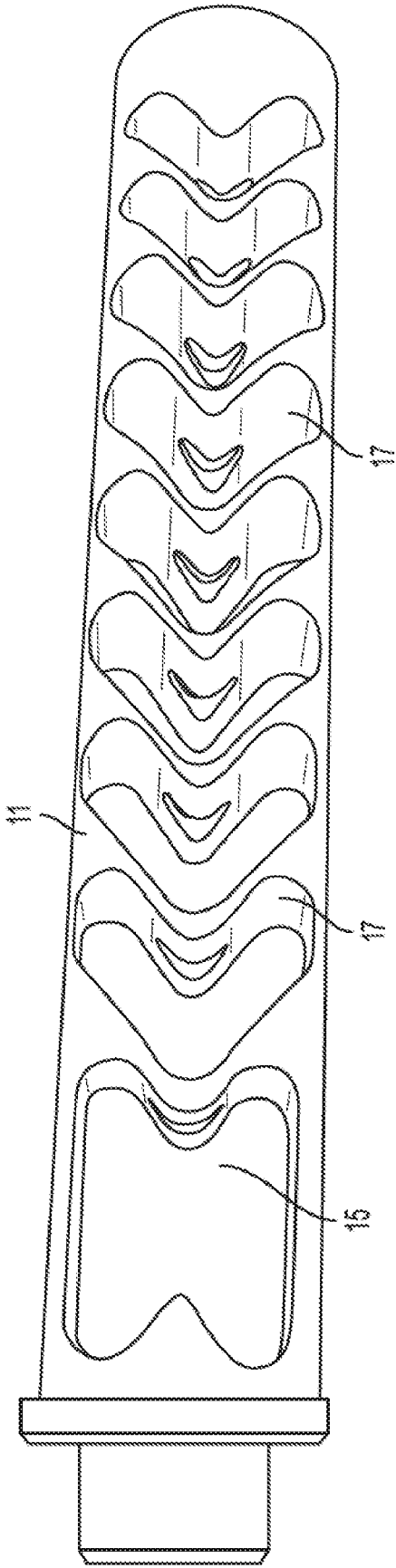


FIG. 7



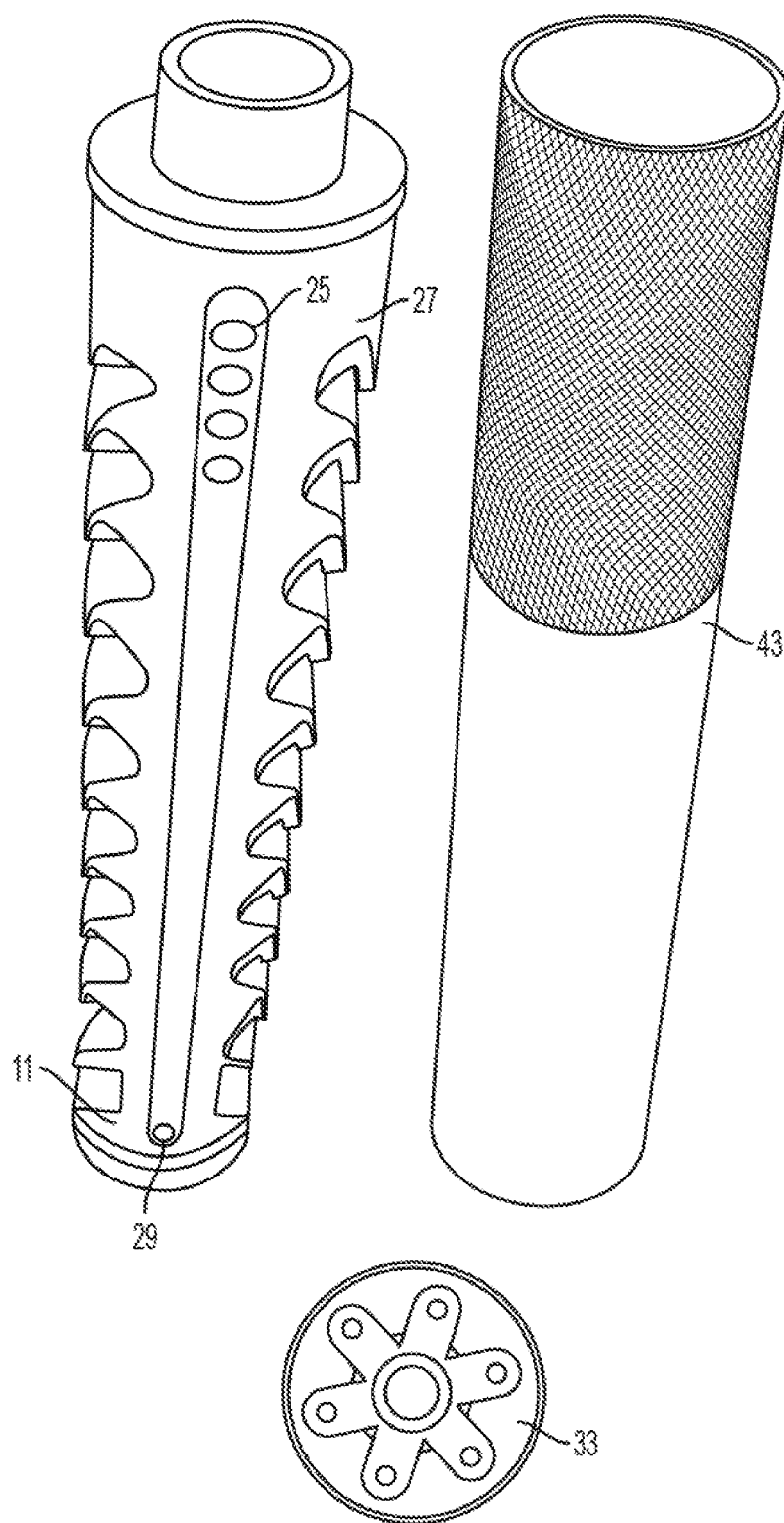


FIG. 8

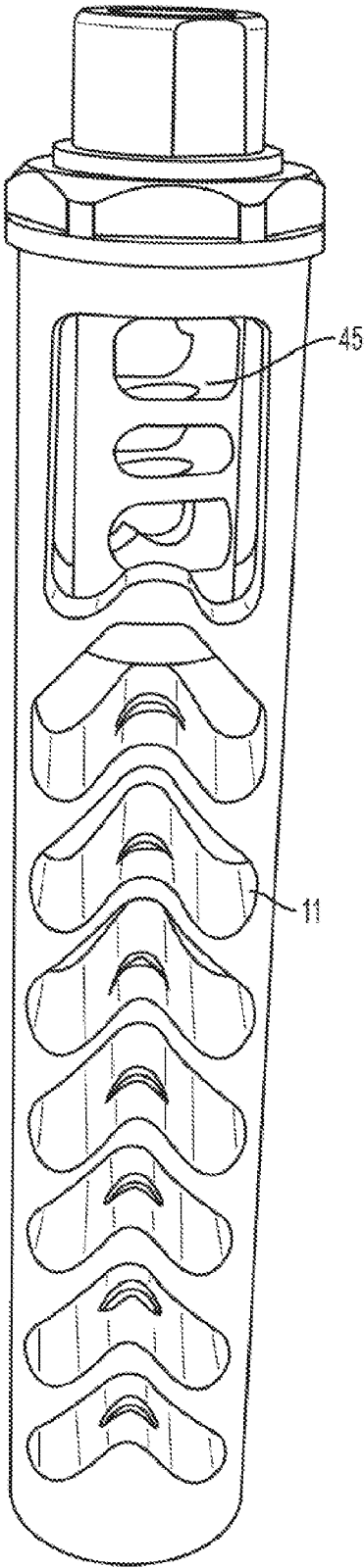


FIG. 9

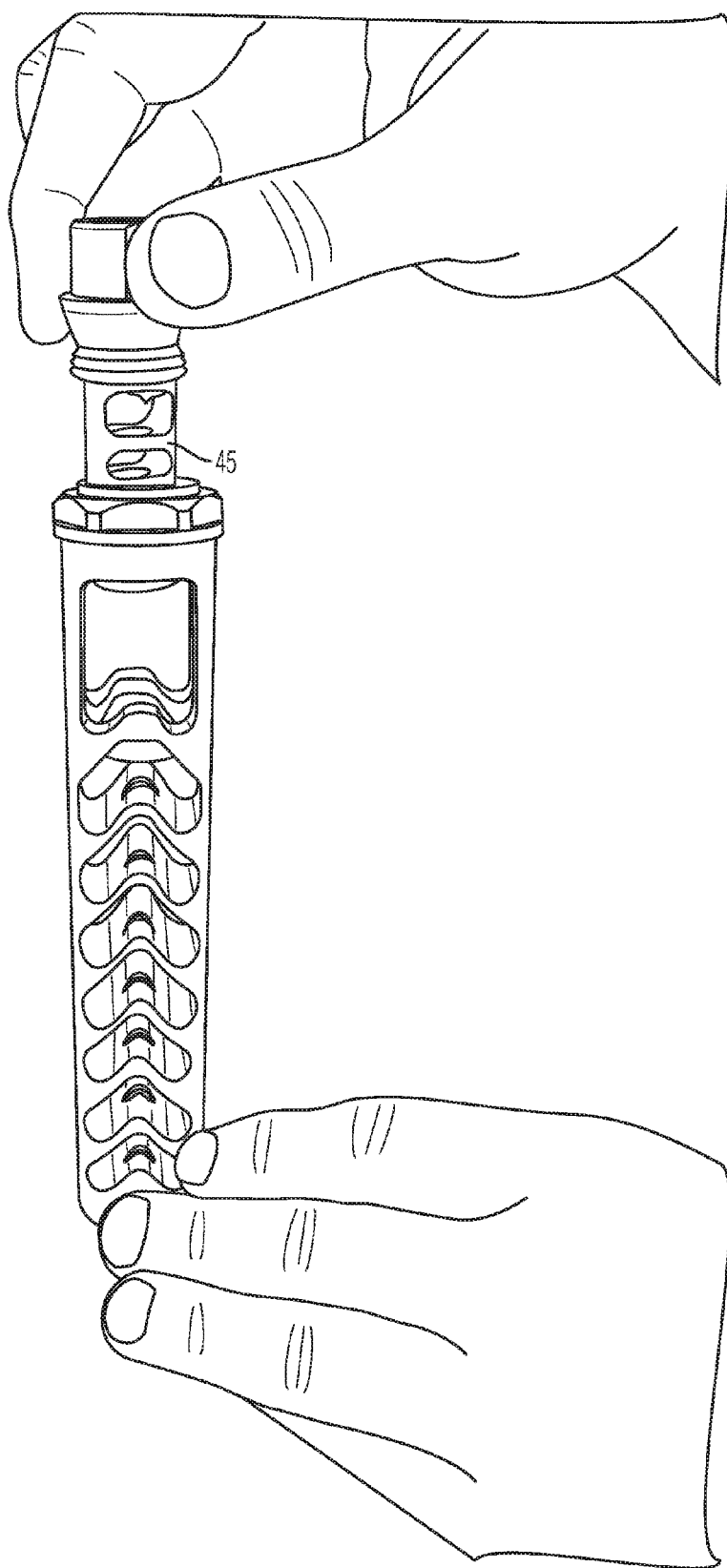


FIG. 10

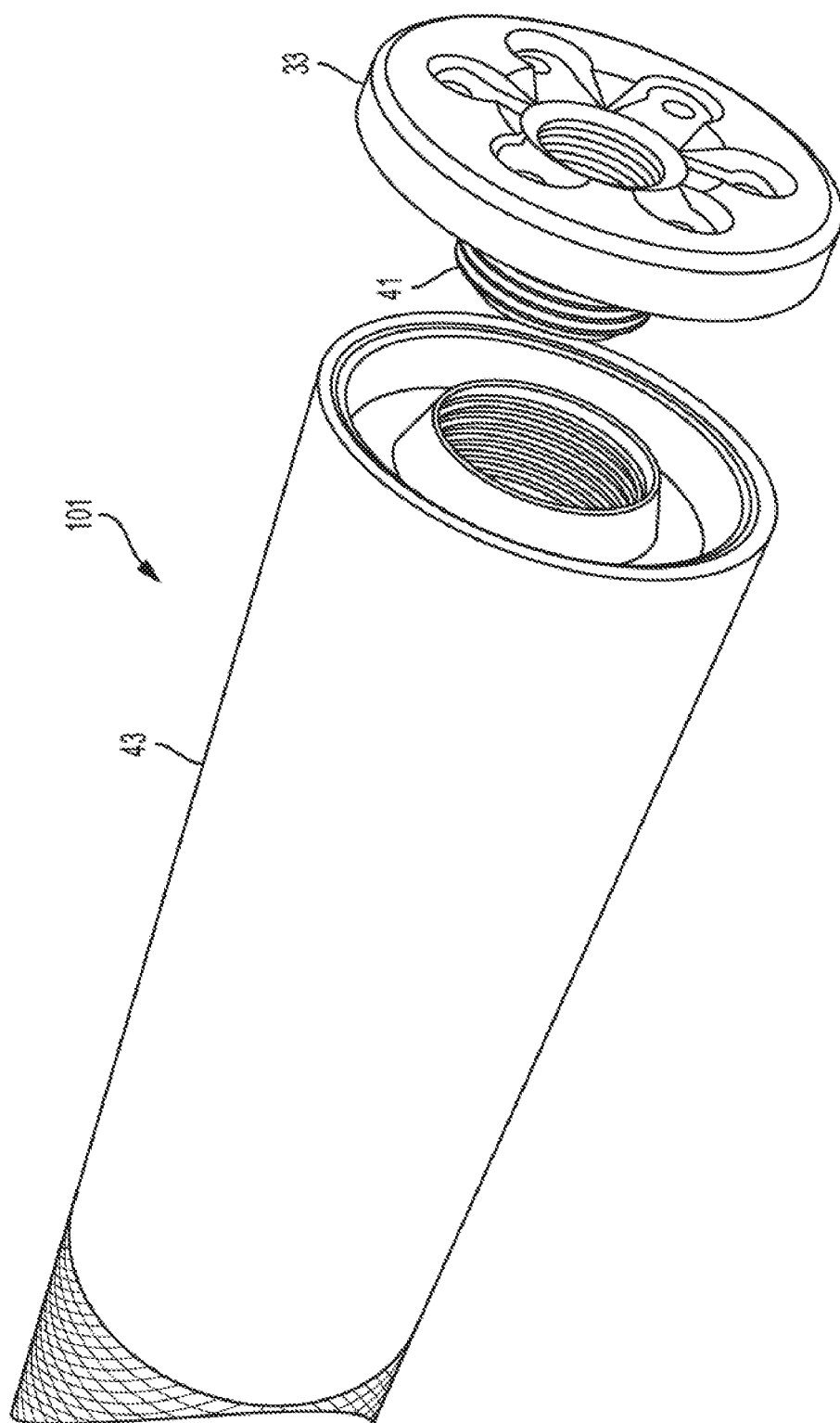


FIG. 11

## FIREARM SILENCER

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is related to and claims priority to provisional application Ser. No. 62/251,948 filed Nov. 6, 2015 of the same inventor herein entitled FIREARM SILENCER. The disclosure of Provisional Application Ser. No. 62/251,948 is expressly incorporated herein in its entirety by reference.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[0002] The invention relates to firearms in general and more particularly, to firearm accessories such as silencers or noise suppressors for firearms.

#### 2. Related Art

[0003] Firearms, such as pistols or rifles utilize expanding high pressure gases generated by burning propellant to expel a projectile from the weapon at a relatively high velocity. When the projectile exits the muzzle end of a weapon's barrel a high-pressure pulse of combustion gases and light from burning powder follows. The rapid pressurization and subsequent depressurization caused by the high-pressure pulse gives rise to a loud sound or report.

[0004] The use of firearm silencers, e.g., also referred to as noise suppressors, on firearms to reduce the amplitude of their muzzle blast is known. Silencers operate to reduce muzzle blast by reducing and controlling the energy level of propellant gases accompanying the projectile as it leaves the muzzle end of the weapon. These devices typically include an elongated tubular housing containing a series of baffles within a plurality of successive chambers. These chambers with baffles therein serve to control, delay, and divert the flow, expansion, and exiting of propellant gases, and also to reduce the temperature of the gases, so as to achieve a corresponding reduction in the noise and impulse produced by the propellant gases as they ultimately exit the device. The rear, or proximal end of a silencer typically includes a mechanism for removably attaching the device to a firearm, such as a threaded engagement mechanism allowing the silencer to be attached onto the end of the firearm's muzzle. At the front or distal end there is an opening to allow the projectile travelling through the path in the silencer, to exit when the firearm is discharged. The end is typically located sufficiently forward of the muzzle end of the firearm that it also can effectively function as a muzzle flash suppression device.

[0005] A problem with existing silencers is that they all fail to address certain aerodynamics involved when a projectile and accompanying propellant is discharged from a firearm.

[0006] Existing silencers do not address the aerodynamics involved with dealing with two different blasts a silencer experience. The first blast is from the stored energy of the air occupying the space between the space between the front of the projectile and the end of the silencer. The second blast is created from ignited propellant that travels behind the projectile. Existing silencers only work to mitigate the blast created by the propellant charge by slowing down or redirecting the gases present and ultimately out of the front of

the silencer through the channel the projectile follows. The current invention regulates and redirects both the first blast of gas as well as the muzzle blast created from propellant.

[0007] In accordance with the invention, the problems involved with current silencers which fail to address handling the two blasts of gases are avoided by the new and innovative design described herein.

[0008] It is noted that the terms "silencer" and "suppressor" are used interchangeably herein and refer generally to devices attached or attachable to the end of a barrel or muzzle of a firearm, for reducing the sound levels resulting from firing of the firearm.

### SUMMARY OF THE INVENTION

[0009] In accordance with the invention, two blasts occurring when a firearm is discharged are dealt with in an effective way that is not done with existing firearm silencers. More specifically, a first chamber of a baffle stack proximate to the discharge end of the firearm includes at least one, and preferably multiple, bypass sets of openings leading into respective channels machined into the outside surface of the baffle chamber stack of the silencer. The openings allow at least a first blast of gas, which is residual air within the firearm, to pass into the channel and bypass the baffle containing chambers in the baffle stack. An outer tube seals the baffle stack of the silencer so that the gas from the first blast passes through the openings in the first chamber, into the respective channels to be directed forwardly through the silencer, to the distal end thereof to be discharged through corresponding multiple openings connected to the channels at the distal end of the baffle stack. A portion of the gas from the first blast can also pass through the passage for the projectile and out the end of the silencer.

[0010] A second blast of air (i.e., propellant gases) resulting from firing the firearm is redirected within the baffle chamber stack, due to the physical shape of each baffle, in a transverse direction relative to the path of the projectile, by a multitude of baffle containing chambers to reduce the energy of the propellant gas flow, and to eliminate or reduce the sound blast that occurs when the firearm is discharged. Some of the gas from the second blast may also exit through the multiple channels which assists in bleeding off residual gas pressure in the firearm. Thus, the first blast passes into the openings of the first chamber and into the channels, and is bled out through openings at the distal end to more effectively deal with the dual blast of air and propellant gases which result from the discharge of a firearm. The propellant gas blast is generally initially contained within the baffle chambers and redirected, after which the gases pass to the atmosphere from the silencer thereby reducing any gas back pressure remaining in the barrel.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a perspective view of an assembled silencer/suppressor in accordance with the invention;

[0012] FIG. 2 is a side view of a baffle stack of a silencer in accordance with the invention;

[0013] FIG. 3 is a perspective view of the baffle stack of the invention;

[0014] FIG. 4 is a plan view of an end cap for the silencer;

[0015] FIG. 5 is a perspective view of the distal end of the baffle stack;

[0016] FIG. 6 is a disassembled view of the end cap and baffle stack showing how the end cap is assembled onto the silencer, but shown only in relation to the baffle stack without the outer tube shown;

[0017] FIG. 7 is another side-view of the baffle-stack of the silencer of the invention;

[0018] FIG. 8 is a disassembled view showing the baffle stack of the silencer, an end cap, and an outer tube used to complete the assembly of the silencer in accordance with the invention;

[0019] FIG. 9 is a perspective view showing an alternative embodiment of the silencer baffle stack of the invention, shown with a removable baffle insert for use with a first chamber located closest to the barrel for a firearm when assembled thereon;

[0020] FIG. 10 is a side view of two embodiments of the baffle stack of the silencer, showing the removable baffle insert being removed; and

[0021] FIG. 11 is a perspective view of a partially assembled silencer of the invention with the end cap removed showing how the end cap is screwed on to hold the outer tube on the baffle stack.

#### DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0022] FIG. 1 illustrates an assembled silencer/suppressor 101 in accordance with the invention with an outer tube 43 held thereon by end cap 33.

[0023] FIG. 2 is a side-view a baffle stack 11 of the silencer 101. The silencer 101, including the baffle stack 11, has a connector portion 13 for connecting to the end of the barrel of a firearm, for example, by threaded engagement. A distal end 19 is the discharge end of the silencer 101. A central passage 21 is provided connecting an opening at the connector portion 13 with an opening at the distal end 19 for allowing a projectile to pass through the silencer 101 from the firearm and out from the distal end 19. The central passage 21 passes through and is in connection or association with a series of baffle chambers 17 which follow in sequence from a first blast chamber 15 which is located proximate the connection point to the barrel of a firearm. While this embodiment shows progressively smaller baffle chambers 17 approaching the distal end 19, it will be appreciated that the baffle chambers 17 can remain the same size throughout the length of the baffle stack 11.

[0024] FIG. 3 is a perspective view of the baffle stack 11 of the silencer 101 of the invention. Outlet ports 25 are provided connecting to and outwardly from the first blast chamber 15 to allow gases which are, for example, air located within the firearm to pass therethrough as gases from the first blast are moved out of the silencer by passing through machined channels 27 on the exterior of the baffle stack 11 to terminate at a wall portion partially defining a recessed region 31 at the distal end 19 of the baffle stack 11 adjacent the end. These gases flow within channels 27 since they are sealed by the outer tube 43. Openings 29 at the partial wall 39 (FIG. 6) separating a generally recessed region 31 allow the gases which have been passed through openings 29 through channel 27 to exit the end of the baffle stack 11 through an end cap 33, shown in FIG. 4, as will be further explained hereafter. The end cap 33 can be attached through engagement with the threads 23 as will be discussed hereafter.

[0025] It will be appreciated that while only two channels 27 are shown, only one or a plurality of channels 27 can be implemented and also serve to pass gases resident in the firearm and silencer and from the propellant blast through the channels 27 as the gases from that blast are diverted back to blast chamber 15 by the baffles. Some of the gases also pass out the bore of the baffle stack 11 at the end thereof. What is important to appreciate is that the silencer 101 provides multiple paths for expansion and discharge of gas through the baffle chambers 17, ports 25, channels 27, recessed region 31, and multiple openings 37 of end cap 33.

[0026] FIG. 4 illustrates the end cap 33 for use with the silencer 101 of the invention. The end cap 33 includes a central opening 35 so that when the silencer 101 is assembled allows a projectile to be discharged from the silencer 101. Openings 37 open into recessed region 31 to allow rapid discharge of gases which were passed and allowed to expand and slow by being received in recessed region 31. The gases then pass through openings 29 from channels 27 to escape the silencer 101.

[0027] FIG. 5 is an end view of the baffle stack 11 shown without the end cap 33 attached, further illustrating the discharge openings 29 which connect to channels 27. Also shown is the recessed region 31 of the baffle stack 11 and silencer 101 of the invention which allows expansion and slowing of gases passing into the recessed region 31. Threads 23 shown thereon serve to secure the end cap 33 to the end of the baffle stack 11 by engaging the threaded section 23.

[0028] FIG. 6 illustrates how the end cap 33 is screwed onto the baffle stack 11 through threads 23 of the end cap 33. For ease of understanding, the outer tube 43 which seals the baffle stack 11 is not shown assembled thereon, but its assembly is readily apparent from this description: The channels 27 lead into openings 29 in a partial wall 39 to allow gases to pass out into recessed region 31.

[0029] FIG. 7 is another view illustrating the baffle stack 11 used in accordance with the invention and showing the increasingly smaller baffle chambers 17 in progression toward the distal end 19 of the baffle stack 11, with the large blast chamber 15 at the end proximate the barrel of the firearm.

[0030] FIG. 8 illustrates the silencer 101 of the invention in disassembled form. When assembled, outer tube 43 fits over the baffle stack 11 and seals the open baffle chambers 17, while at the same time allowing for gas to pass through outlet ports 25 in the baffle stack 11 at blast chamber 15 and into channels 27 to be discharged out the distal end 19 of the silencer 101. The assembly is held together by passing the outer tube 43 over the baffle stack 11. The outer tube 43 is held securely on the baffle stack 11 by end cap 33 which is threaded into the threaded opening 29 at distal end 19 of the baffle stack 11.

[0031] In a yet still further embodiment illustrated in FIGS. 9 and 10, a removable first baffle 45, can be threaded into the first blast chamber 15 to provide suppression of firearm kick when fired, and also serves to provide an attachment connection to the firearm. This allows the removable first baffle 45 to be replaced over time when it wears out without having to replace the entire silencer 101.

[0032] FIG. 11 illustrates how the end cap 33 holds the outer tube 43 on the baffle stack 11 by engagement through threaded section 41.

[0033] Having thus described the invention the same will become better understood from the appended claims wherein it is described in a non-limiting manner.

What is claimed is:

1. A silencer for a firearm, comprising:
  - a silencer body having a first proximate end connectable to an end of a barrel of a firearm, and a second distal end from which can exit a projectile from the firearm when the firearm is fired;
  - an opening at the proximate end of the silencer body leading into a passage through a baffle stack within the silencer body which extends to an opening at the second distal end to allow the projectile to enter a silencer at the proximate end to pass through the silencer body and be discharged through the opening at the distal end;
  - a baffle stack within the silencer body comprising a first chamber at the proximate end and comprising ports leading to at least one channel on an exterior surface extending the length of the baffle stack for allowing an initial blast of air from discharge of the firearm to pass through the ports into the channel and through the passage in the baffle stack to be discharged from the silencer;
  - a plurality of baffles containing chambers extending along the baffle stack toward the distal end, for causing a blast of gas from a propellant blast behind the projectile to be redirected in a direction toward the proximate end of the silencer and then discharged from the silencer through the passage and through the ports in the first chamber;
  - an outer tube received about the length of the baffle stack for sealing the baffle stack for containing the initial blast of air passing into the channel to be forced out the distal end of the silencer; and
  - an end cap attached to the distal end of the silencer to hold the outer tube securely on the baffle stack, and said end cap having a central opening to allow the projectile to pass therethrough and at least one gas discharge opening to allow gas to pass from the silencer.
2. The silencer of claim 1, wherein said plurality of baffle chambers extending from the proximal end to the distal end are each progressively smaller than the prior baffle chambers extending in the direction of the distal end.
3. The silencer of claim 1, wherein said at least one channel comprises two channels and said ports comprise two sets of ports, each set connecting to a respective channel
4. The silencer of claim 1, wherein a first baffle in a first chamber at the proximate end of the baffle stack is removable and replaceable.
5. The silencer of claim 3, wherein a first baffle in a first chamber at the proximate end of the baffle stack is removable and replaceable.
6. In a combination firearm and a silencer, comprising:
  - a firearm having a silencer connected thereto at the end of a barrel of the firearm;
  - the silencer comprising:
    - a silencer body having a first proximate end connectable to an end of a barrel of a firearm, and a second distal end from which can exit a projectile from the firearm when the firearm is fired;
    - an opening at the proximate end of the silencer body leading into a passage through a baffle stack within the silencer body which extends to an opening at the second distal end to allow the projectile to enter a silencer at the proximate end to pass through the silencer body and be discharged through the opening at the distal end;
    - a baffle stack within the silencer body comprising a first baffle chamber at the proximate end and comprising ports leading to at least one channel on an exterior surface extending the length of the baffle stack for allowing an initial blast of air from discharge of the firearm to pass through the ports into the channel and through the passage in the baffle stack to be discharged from the silencer;
    - a plurality of baffles containing chambers extending along the baffle stack toward the distal end, for causing a blast of gas a propellant blast behind the projectile to be redirected in a direction toward the proximate end of the silencer and then discharged from the silencer through the passage and through the ports in the first chamber;
    - an outer tube received about the length of the baffle stack for sealing the baffle stack for containing the initial blast of air passing into the channel to be forced out the distal end of the silencer; and
    - an end cap attached to the distal end of the silencer to hold the outer tube securely on the baffle stack, and said end cap having a central opening to allow the projectile to pass therethrough and at least one gas discharge opening to allow gas to pass from the silencer.
7. The combination firearm and silencer of claim 6, wherein said plurality of baffle chambers extending from the proximal end to the distal end are each progressively smaller than the prior baffle chamber extending in the direction of the distal end.
8. The combination firearm and silencer of claim 6, wherein said at least one channel comprises two channels and said ports comprise two sets of ports each set connecting to a respective channel
9. The combination firearm and silencer of claim 6, wherein a first baffle at the proximate end of the baffle stack is removable and replaceable.
10. The combination firearm and silencer of claim 8, wherein a first baffle in a first chamber at the proximate end of the baffle stack is removable and replaceable.

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