United States Patent [19]

Perrine

[11] **3,786,895**

[45] **Jan. 22, 1974**

[54] **SILENCER FOR GAS DISCHARGING DEVICES**

[76] Inventor: **Walter E. Perrine**, P.O. Box 66, Navajo, Ariz. 86509

[22] Filed: **Jan. 18, 1973**

[21] Appl. No.: **324,850**

[52] **U.S. Cl.**..... **181/49**, 181/41, 181/47 R, 181/47 B, 181/59, 181/58, 181/66, 181/70, 181/36 A, 89/14 D

[51] **Int. Cl.**..... **F01n 1/08**

[58] **Field of Search**..... 181/41, 46, 47, 49, 57, 58, 181/66, 70; 89/14 D

[56] **References Cited**

UNITED STATES PATENTS

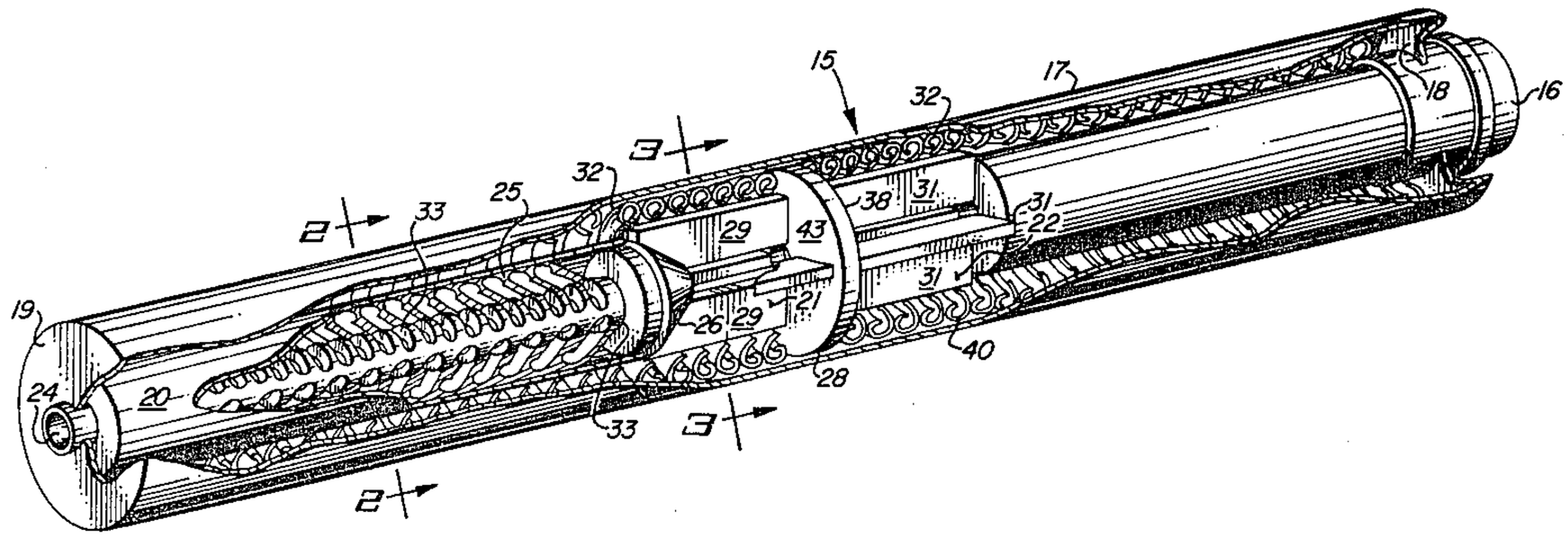
3,399,597	9/1968	Perrine	181/58
1,066,898	7/1913	Gray	181/47 R
958,935	5/1910	Maxim	89/14 D
958,934	5/1910	Maxim	89/14 D
916,885	3/1909	Maxim	89/14 D

Primary Examiner—Stephen J. Tomsky
Assistant Examiner—Vit W. Miska
Attorney, Agent, or Firm—Warren F. B. Lindsley

[57] **ABSTRACT**

A silencer for muffling of noises in a fluid pressure exhaust system such as the exhaust systems for air operated power cylinders, tools and the like, firearms such as hand weapons, as well as internal combustion engines of the two- and four-cycle type by the utilization of guiding surfaces for directing the gases under pressure into chambers where the gases acquire a rotary or whirling movement about a stationary axis within the silencer and are expelled after such rotary action has dissipated their energy.

20 Claims, 12 Drawing Figures



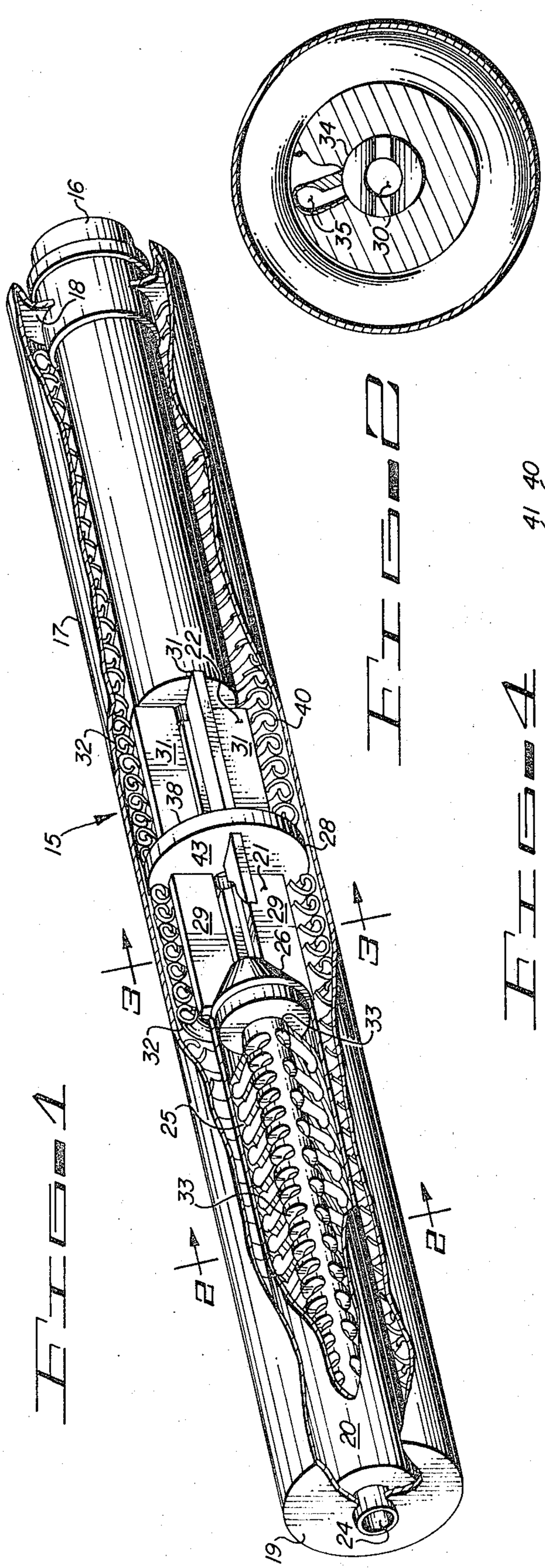


FIG. 1

FIG. 2

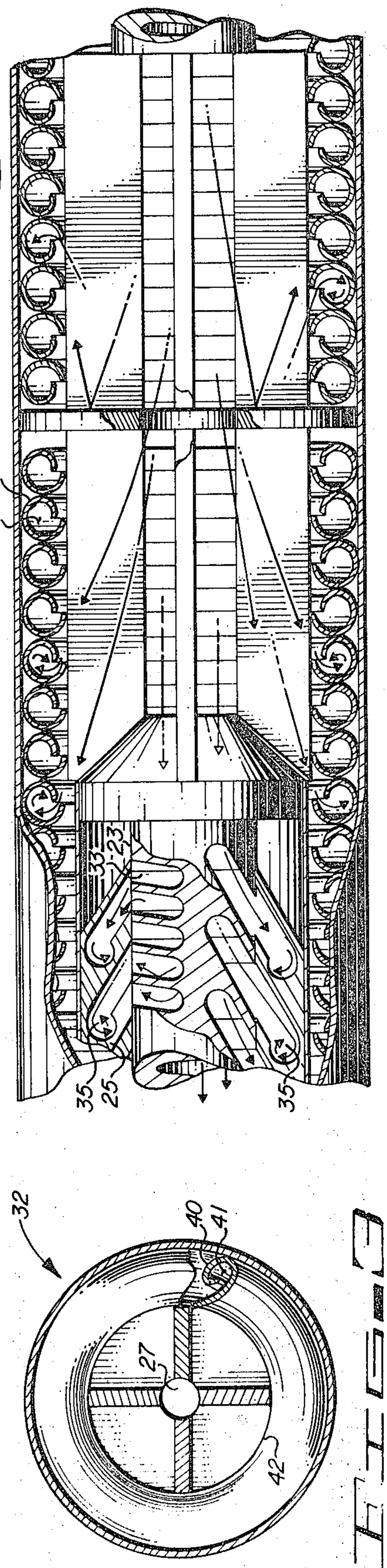


FIG. 4

FIG. 3

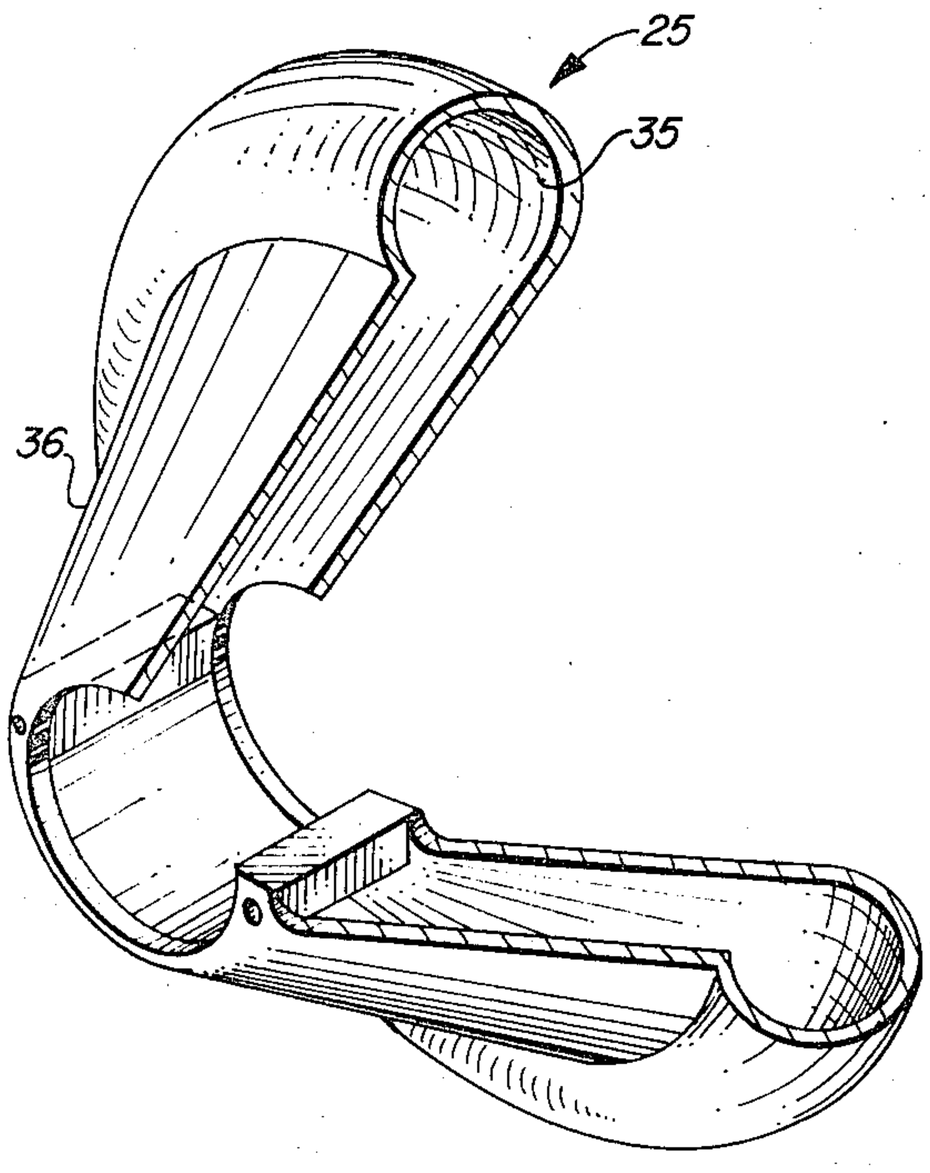


Fig. 5

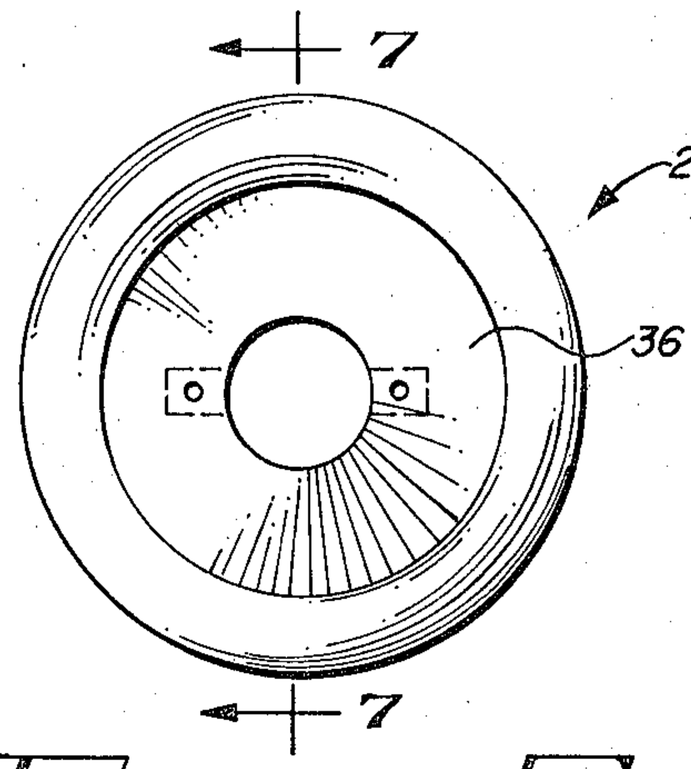


Fig. 6

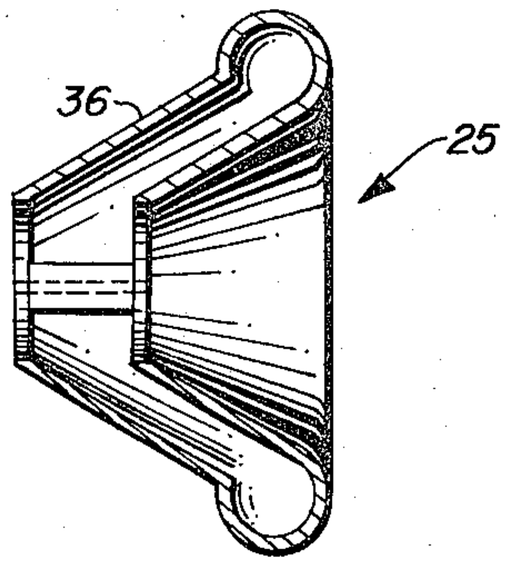


Fig. 7

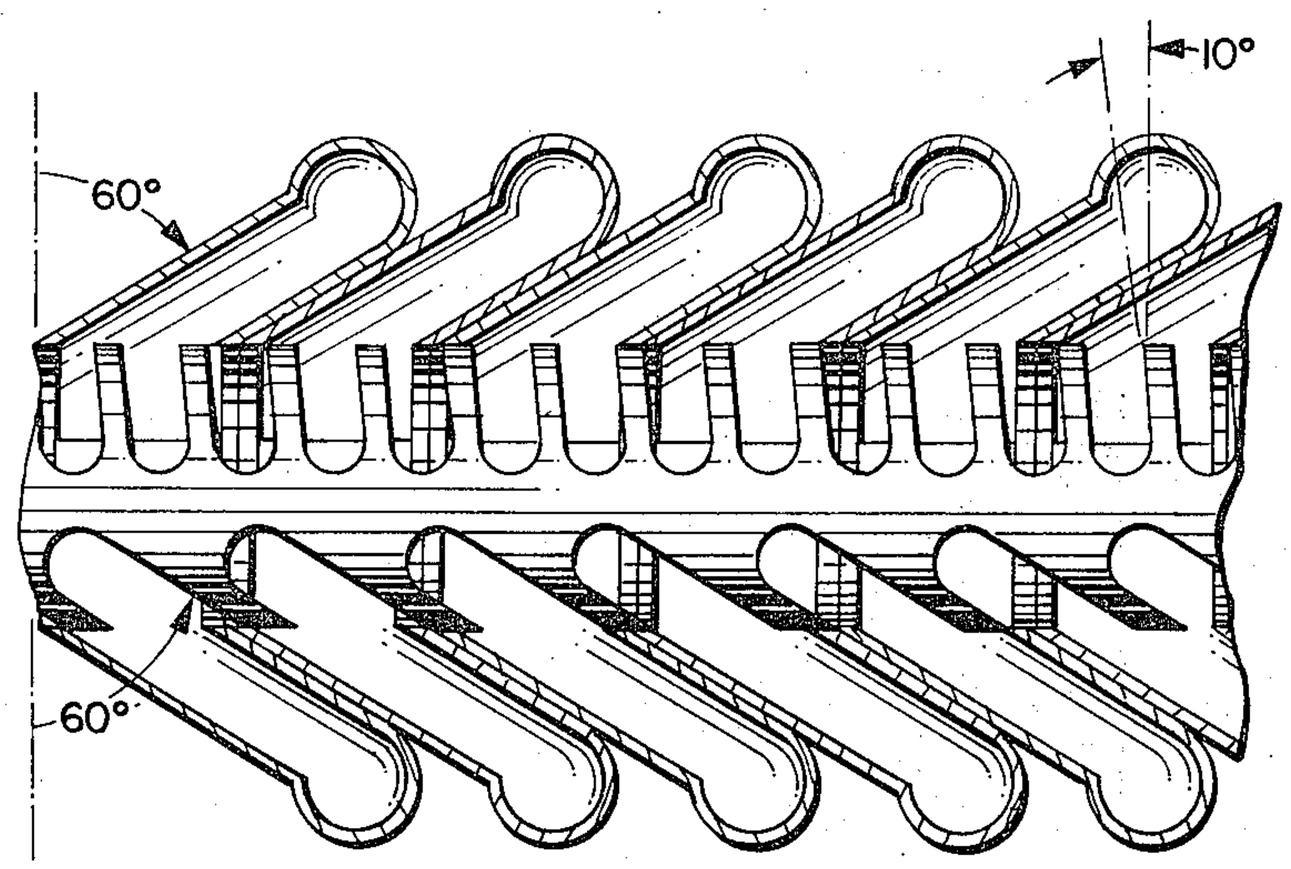


Fig. 8

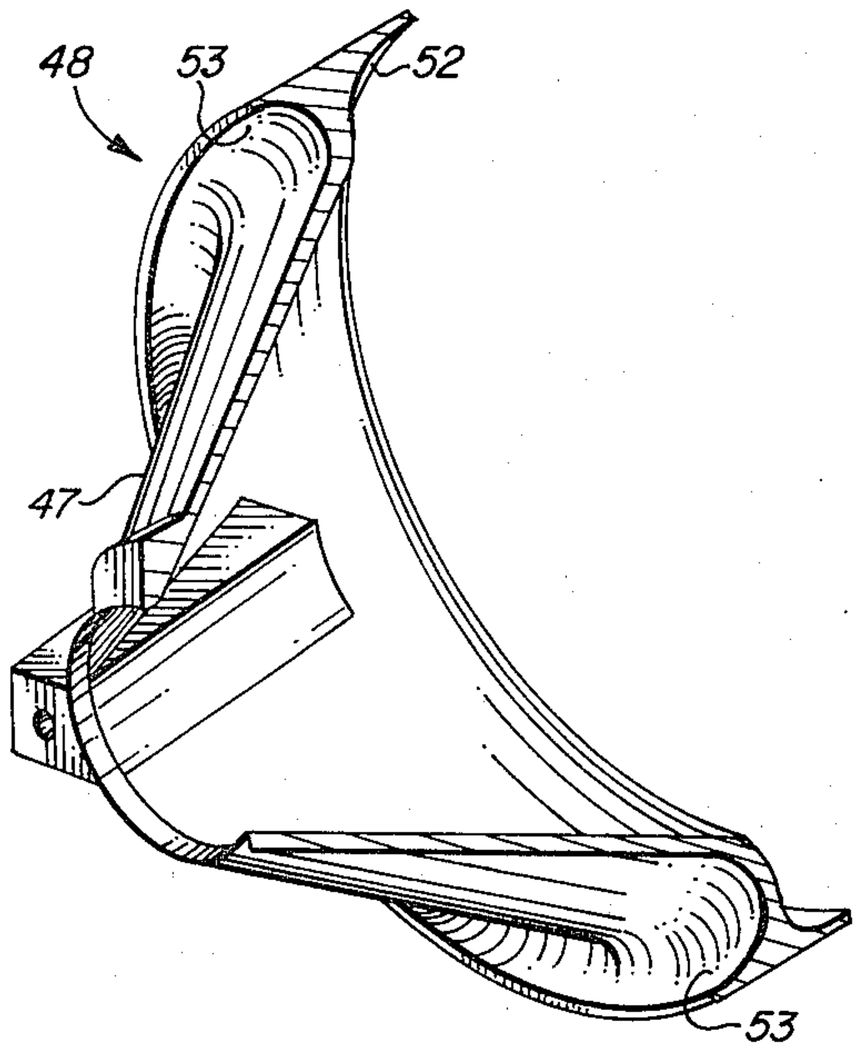


FIG-9

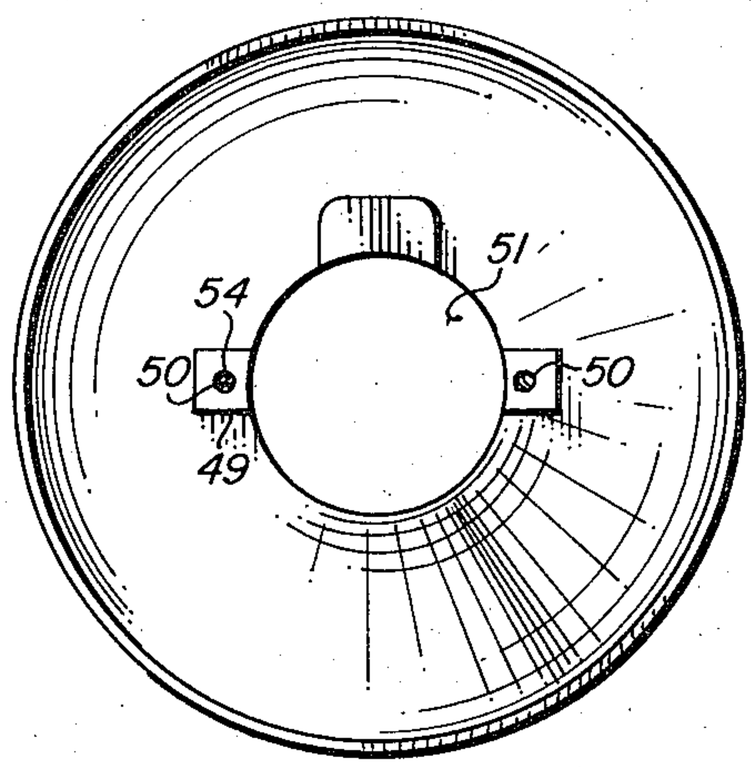


FIG-10

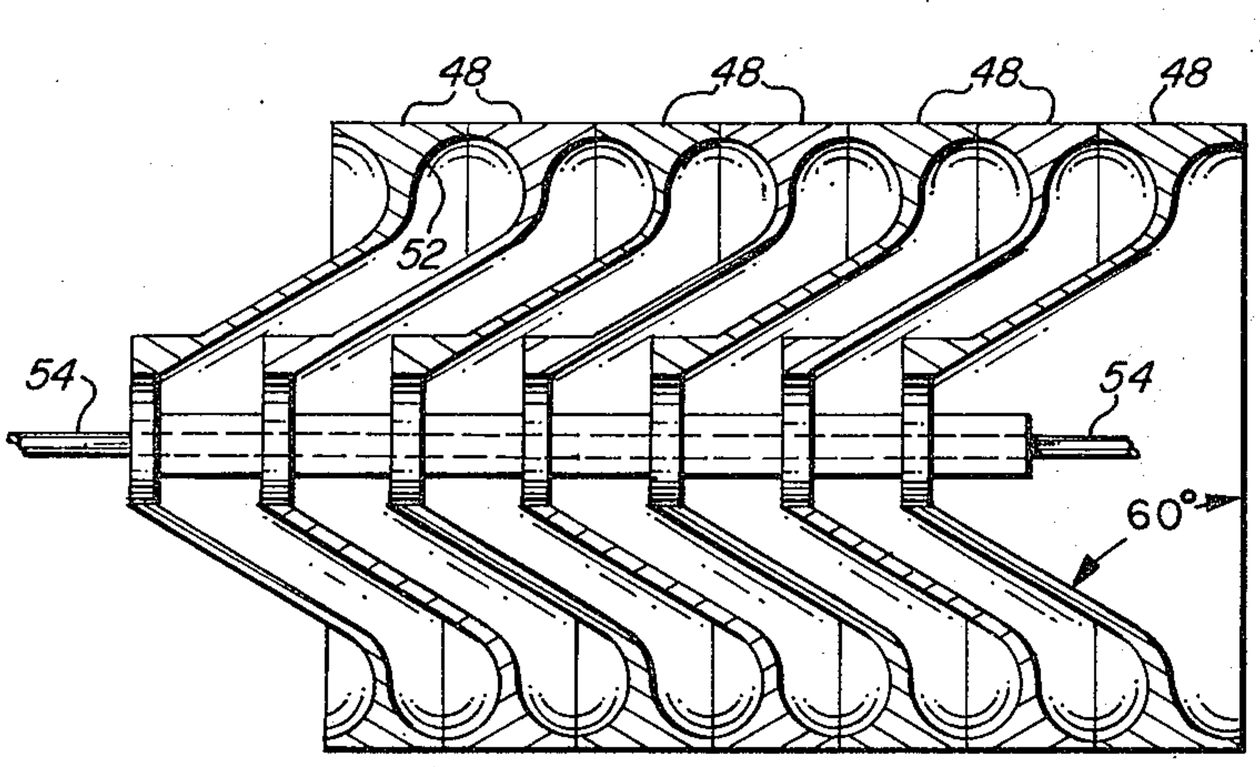


FIG-11

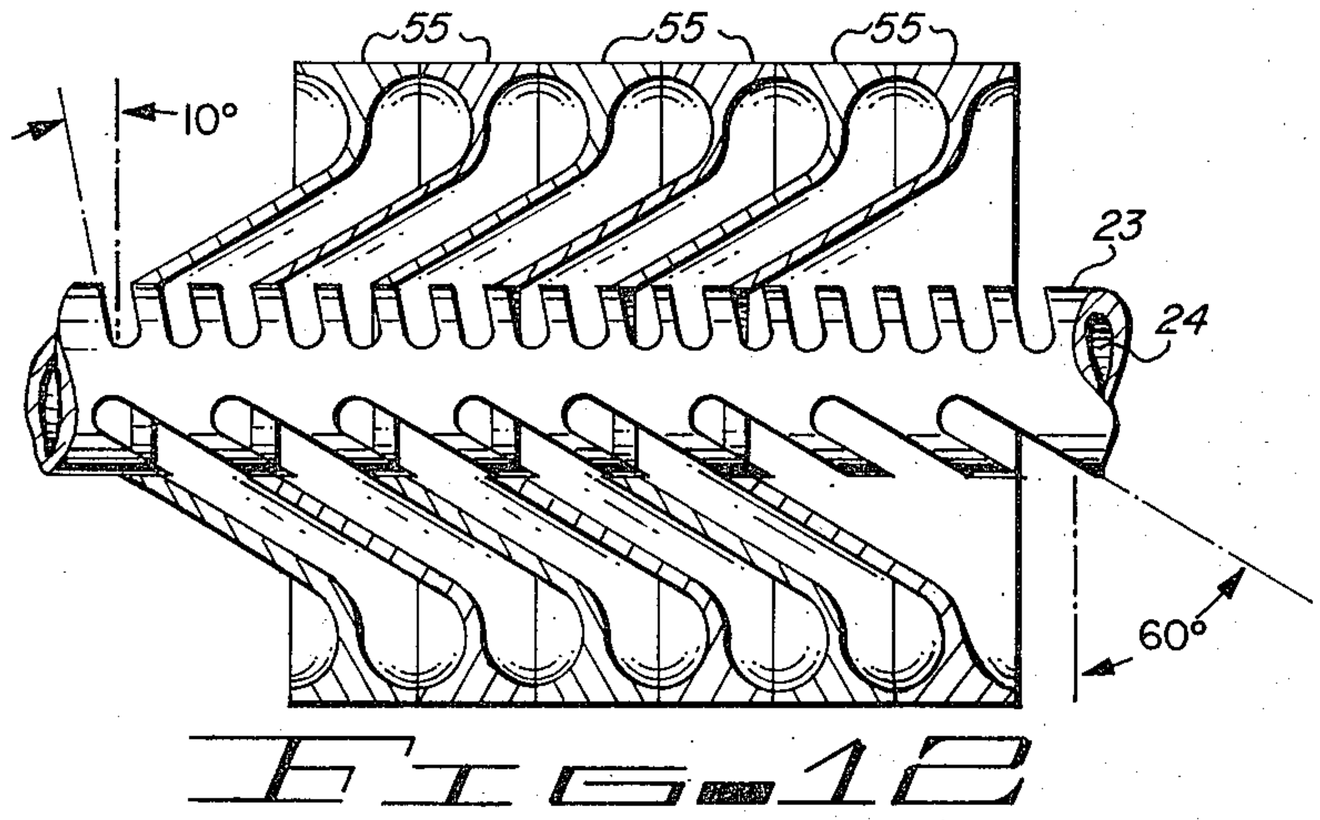


FIG-12

SILENCER FOR GAS DISCHARGING DEVICES

BACKGROUND OF THE INVENTION

This invention relates to devices for muffling and silencing of noises in pressure fluid exhausts such as the exhausts from compressed air operated power cylinders, tools or the like, firearms such as hand weapons, as well as internal combustion engines of the two- and four-cycle type.

FIELD OF THE INVENTION

This invention is particularly directed to novel and improved muffling devices for silencing exhaust noises by directing exhaust gases under pressure into a chamber where they acquire a rotary or whirling movement about a stationary axis within the chamber and escape therefrom after their energy is dissipated in such rotary or whirling movement.

DESCRIPTION OF THE PRIOR ART

Heretofore mufflers have been used for the dissipation of exhaust noises wherein the exhaust stream of gases is diverted by fins or ribs of a spider means within the muffler. Other mufflers have dissipated exhaust noises of an exhaust system in a silencing chamber by the utilization of porous walls through which the exhaust fluid is diffused. These porous walls have been formed of cellulose fibre sheet material impregnated with a phenolic resin.

Various attempts have been made to render noiseless the discharge of firearms by preventing the sudden release of the powder gases at the muzzle of the firearm.

In firearms, attempts were made to dissipate the energy of the powder gases by giving them a rotary or whirling movement in a suitable chamber with the gases gradually escaping from the chamber to atmosphere.

In all cases, the muffling was only partially effective and the muffler devices were not effective when used with a constant source of exhaust gases, since their exhaust to atmosphere after dissipation of their energy was too slow and applied a back pressure to the power generating device such as the power cylinder and internal combustion engine which reduced its efficiency. Therefore, a need exists for a new and improved muffler or silencer which may operate on a continuous stream of exhaust gases to effectively muffle or silence its exhaust gases without destroying the efficiency of the associated power generating device.

SUMMARY OF THE INVENTION

In accordance with the invention claimed, a new and improved muffler or silencer is provided for an intermittent or continuous source of exhaust gases under pressure which dissipates the energy of the exhaust gases by rotary and whirling movement about a plurality of stationary axes progressively positioned in a chamber before the gases are expelled to atmosphere.

It is, therefore, one object of this invention to provide a new and improved muffler or silencer.

Another object of this invention is to provide an improved muffler for silencing the noises of exhaust fluids by giving them a rotary or whirling movement in a suitable chamber in a new manner.

A further object of this invention is to provide an improved muffler for silencing the noises of exhaust fluids by giving them a series of rotary or whirling movements about a series of stationary axes as they pass through a suitable chamber.

A still further object of this invention is to provide an improved muffler for silencing the noises of exhaust gases by dissipating their energy by giving them a rotary or whirling movement in a suitable chamber about axes coincident with the axis of the dissipated gases being exhausted to atmosphere.

A still further object of this invention is to provide a muffler or silencer for exhaust gases under pressure which utilizes a gas deflecting means which provides the gases with a rotary or whirling motion which is assembled with a minimum number of interchangeable parts.

A still further object of this invention is to provide a muffler or silencer useable on firearms which deflects the gases of explosion as they pass through the muffler to destroy its pencil-like stream configuration.

A still further object of this invention is to provide a muffler or silencer for firearms which provides a guiding surface through the muffler for the projectile.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be more readily described by reference to the accompanying drawings, in which:

FIG. **1** is a perspective view partially broken away showing a muffler embodying the present invention;

FIG. **2** is a cross-sectional view of FIG. **1** taken along the line **2—2**;

FIG. **3** is a cross-sectional view of FIG. **1** taken along the line **3—3**;

FIG. **4** is an enlarged partial view of the guiding surfaces for the moving and expanding exhaust gases;

FIG. **5** is an enlarged partial perspective view of one of the gas guiding means or baffles shown in FIGS. **1–4**;

FIG. **6** is a front or end view of the complete guiding means shown in FIG. **5**;

FIG. **7** is a cross-sectional view of FIG. **5**;

FIG. **8** is an alternate embodiment of the baffle arrangement shown in FIGS. **1–7**;

FIG. **9** is a modification of the baffles shown in FIGS. **1–7**;

FIG. **10** is an end view of FIG. **9**;

FIG. **11** is a cross-sectional view of an assembly of the baffles shown in FIG. **9** mounted on a pin; and

FIG. **12** is a modification of the assembly of the baffles shown in FIG. **11** mounted without the aid of a pin

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring more particularly to the drawing by characters of reference, FIGS. **1–7** disclose an improved muffler **15** for fluid discharge devices such as guns, internal combustion engines, air motors and the like. As shown in FIG. **1**, for purposes of illustration only, muffler **15** is mounted in the end of a gun barrel **16**.

Muffler 15 comprises a hollow cylindrical housing 17 having a pair of ends 18 and 19. A core member 20 fixedly attached to cylindrical housing 17 at end 19 and comprises a first, second and third annular chambers 20, 21 and 22 arranged along its length. Chamber 20 comprises a slotted cylindrical wall 23 defining a passageway 24 therethrough which is axially aligned with the gun barrel 16 extending into the opposite end of the muffler, and a plurality of deflection devices 25 coaxially arranged around its cylindrical wall 23.

Annular chamber 21 is defined by a funnel-shaped flange 26 fastened to the inboard end of the cylindrical wall 23 with a passage 27 extending therethrough, as shown in FIG. 3, of the same diameter as the diameter of passageway 24 in the annular chamber 20 and in axial alignment therewith. The opposite end of chamber 21 is defined by a flange 28 which is of substantially the same diameter as the inside diameter of housing 17. Extending between the funnel-shaped flange 26 and flange 28 and affixed thereto are four fins 29 which are positioned at substantially 90° to each other but spaced at their inner edges far enough to define between them a passageway 30, shown in FIG. 2, of the same diameter as passageway 24 of annular chamber 20 and in alignment therewith.

Annular chamber 22 comprises similar aligned fins 31 spaced in the same manner as fins 29 to define between their inner edges an extension of passageway 30. It should be noted that an aperture is provided in flange 28 of the same diameter as the diameter of passageway 30 so that it provides in combination with passageways 24 and 30 a common unified bore through the muffler which is in axial alignment with the rifled bore of barrel 16 of a gun to which this muffler is attached.

Loosely arranged within housing 17 of muffler 15 between end 19 and flange 28 and between flange 28 and end 18 thereof are a plurality of deflection devices 32. As noted from FIG. 1, all of the deflection devices 32 around annular chambers 20 and 21 are arranged in one direction with regard to the gas under pressure moving through the muffler, and all of the deflection devices around annular chamber 22 and around the outside periphery of barrel 16 in the muffler extend in the opposite direction with regard to the flow of gas under pressure through the muffler.

The muffler comprising the annular chambers 20, 21 and 22 together with the particular arrangement of baffles and deflection devices such as, inter alia, deflection devices 25 and 32, provide a gas disseminator between the ends 18 and 19 of the muffler, which annular chambers and the other parts of the disseminator operate individually and sequentially upon the exhaust fluid or gases discharged by a noise producing device such as a firearm, air or internal combustion engine and the like.

The muffler 15 defines a hollow cavity in its end 18 which may be used to receive and secure the extremity of a gun barrel 16, as shown in FIG. 1, or the exhaust conduit of an engine or other noise producing device in any suitable manner, such as a friction fit, screw threads, welding, etc., not shown, since such connecting means are well known in the art.

It is the intent of this disclosure to disclose a method and means for controlling the gases which escape from the barrel of a gun, the exhaust conduit of an engine such as an internal combustion engine or an air expansion engine, and to compel these gases to acquire

within successive cells or chambers formed in the muffler a continuous, expanding rotary or whirling movement about the axis of the muffler. As the gases under pressure from the noise producing device are provided with a rotary or whirling movement they expand and lose or dissipate their energy.

Usually the blast of a gas under pressure from an internal combustion or gas expansion type of engine passes out of the noise producing device in a pencil-like form or core of gas under pressure. In the case of a gun, this core of gas follows the projectile. This core of gas, which until this point of expansion has not been made to dissipate its energy in a rotary or whirling movement in a silencing device, therefore occasions some noise of explosion. In the device and method claimed herein, this noise of explosion or expansion of the explosive gases under pressure are controlled or substantially eliminated.

In the devices disclosed, the gases of explosion or expansion are deflected or turned out of a straight line in a sequence of operations to eliminate or substantially reduce the noise of gas expansion.

Although the method and devices disclosed and claimed herein utilize some principles heretofore known, the claimed configuration is an improvement over the teachings in the following U. S. patents and others that may appear in the art: U.S. Pat. Nos. 916,885 — Maxim; 951,770 — Miller; 958,934 — Maxim; 958,935 — Maxim; 1,066,898 — Gray; 1,554,051 — Walker; 2,600,236 — Gibel; 2,815,088 — Gibel; 3,399,597 — Perrine.

As shown in FIG. 1, the cylindrical wall 23 forming within it passageway 24 is slotted along its length to provide vent openings for the gas under pressure passing through passageway 24. These slots 33 are arcuate in configuration and extend less than 180 degrees around the circumference of the cylindrical wall 23. Two of the slots 33 on opposite sides of the circumference of wall 23 may extend in the same cross-sectional plane or they may be a continuation of a spiral moving longitudinally along the axis of the cylindrical wall 23. One requirement of the slots 33 is that they open into the entrance to the deflection devices 25 arranged axially along and around the cylindrical wall 23, as will hereinafter be explained in more detail.

Each deflective device 25, as shown in FIGS. 1, 2 and 4, may be formed or molded separately and then assembled around cylindrical wall 23 to form a part of the annular chamber 20. Each deflection device 25 is formed with a hole or aperture 34 and when a plurality of them are assembled axially in like direction around the cylindrical wall 23 they provide a plurality of passages or pockets 35 in which the gases expanding out of slots 33 may expand to dissipate their energy.

FIGS. 5, 6 and 7 illustrate enlarged views of deflection device 25 and show that it comprises a funnel-shaped surface 36 which tapers outwardly to a conical opening, passage or pocket 35. The housing 37 forming the pocket 35 lies in planes lateral to the axis of the deflection device 25 so that a plurality of the devices may be axially aligned, one fitting into the next as shown in FIGS. 1 and 4.

The gases as they expand out of slots 33 in the cylindrical wall 25 pass into pockets 35 of deflection devices 25 where they expand or diverge and are directed by the guiding surfaces forming pockets 35 to assume a whirling or rotary movement about a substantially cir-

cular or annular line or axis in each pocket, whereby under the centrifugal action developed by such rotary movement of the gases and the expansion thereof during such action, the gases are caused to dissipate their energy in friction against the inner walls of these deflection devices forming pockets **35.**

The total silencing effect of this type of action, which was accomplished only to a limited extent by Maxim in his patents above identified, however, is not enough to silence the exhaust gases of modern weapons and particularly internal combustion and gas expansion engines. Therefore, further deflection and expansion of the expanding gases of these noise producing devices must be effected in a new, improved and controlled manner.

As disclosed herein, the expanding gases are first expanded and deflected in a controlled manner before they are transmitted to annular chamber **20,** where they are deflected and expanded by deflection devices **25.**

As the core or pencil of gas under pressure leave the noise producing device such as, for example, barrel **16** of a gun, a part of these gases expands between the fins **31** in the annular chamber **22** and strikes sides **38** of flange **28** as these gases move through the muffler, where they are deflected backwardly and outwardly into the openings in deflection devices **32,** which are axially aligned in a loose-fitting arrangement with the outer edges of fins **31** and the outer periphery of barrel **16.**

Deflection devices **32,** as shown in FIGS. **1, 3** and **4,** comprise an annular disc having a turned-over, scroll-type outer edge **40** forming a pocket **31** within it for whirling the gases directed into it. A plurality of these deflection devices are mounted in alignment around the outer edges of fins **31** and the outer periphery of barrel **16** between flange **28** and end **18** of the muffler, with their scroll opening facing side **38** of flange **28** to receive the gases deflected off of it. It should be recognized that the opening **42** formed in each deflection device **32,** as shown, is slightly larger than the diameter of the fins **31** and the outer periphery of barrel **16** so that the expanding and deflected gases being controlled may readily pass rearwardly along the muffler toward end **18** thereof and readily pass into the openings leading into the pockets **41** of these deflection devices. The clearance between the apertures or openings **42** in the deflection devices and the outer edges and surfaces of fins **31** and barrel **16** need only be enough to permit the passage of gas under pressure, which might be as little as one-sixteenth inch or so. The pockets in the deflection plates cause the gases entering each pocket to assume a whirling or rotary movement about a substantially circular or annular line or axis, whereby under the centrifugal action developed by such rotary movement the gases of expansion are caused to dissipate their energy in friction against the inner walls of these deflection devices forming the pockets **41.**

As shown in the annular chamber **21,** the same deflection devices **32** are arranged around the outer edges of fins **29** between the funnel-shaped flange **26** and the side **43** of flange **28,** as shown. The only difference in this assembly of deflection devices **32** and those in annular chamber **22** is that the scrolls open in the opposite direction to those in annular chamber **22.**

Gases expanding out of passageway **27** are deflected off of the surfaces of funnel-shaped flange **26** against side **43** of flange **28** and into the openings of the scrolls of deflection devices **32,** wherein they dissipate their energy as heretofore explained. Since these deflection devices fit loosely around fins **29** and the outside circumference of deflection devices **25** between end **19** of muffler **15** and the forward or downstream end of funnel-shaped flange **26,** many pockets are available for the dissipation of the energy of the expanding gases.

Thus, as the gases of expansion or explosion of a noise producing device are directed into muffler **10,** the core of gases first partially expands and is directed in a whirling motion in annular chamber **22** to lose part of its energy of the resulting expansion-generated noise. Next, the core of gas and its trailing portion partly expanded in annular chamber **22** moves into annular chamber **21,** where it further expands, and is directed in a whirling motion to reduce further its energy. Thirdly, the gas and its trailing expanded portion moves into annular chamber **20,** where it is again expanded and directed to lose or dissipate more of its energy, after which it moves out of end **19** of the muffler through passageway **24,** substantially reduced in pressure and substantially noiseless.

FIG. **8** is an alternate arrangement of the slot **33** and associated openings in the deflection devices **25** as assembled in FIGS. **1** and **4.** In FIG. **8** the slots **33** are formed in the slotted cylindrical wall **23** such that edge **45** of slots **33** is inclined at an angle of 10° with a line extending perpendicularly to the longitudinal axis of the cylindrical wall **23.** As shown also in FIG. **8,** the slope of funnel-shaped configurations of deflection devices **25** loosely mounted around the cylindrical wall **23** are substantially 60° to a line extending perpendicularly to the longitudinal axis of the cylindrical wall **23.** This particular arrangement of cooperating passages aids in direction of the expanding gases into pockets **35** of the deflection devices for dissipating of the energy of these gases and the resulting noises of gas expansion.

FIGS. **9** and **10** illustrate a modification of the deflection devices **25** wherein the funnel-shaped flange **47** forming the deflection device **48** is provided with shoulders **49** on opposite sides, each of which are provided with apertures **50** extending therethrough longitudinally of aperture **51** formed along the device's longitudinal axis. As noted from FIG. **9,** the deflection device opens into an arcuate-shaped, flared end **52.** The other side **53** of the flared end **52** is also of an arcuate configuration, curving outwardly in a direction substantially opposite to the flared surface of end **52.** When two similarly shaped deflection devices **48** are axially aligned and held together by rods **54,** only one of which is shown in FIG. **11,** they form an assembly as shown in FIG. **11.** This assembly can then be assembled around cylindrical wall **23** to serve as a gas disseminator in the manner of deflection devices **25** shown in FIG. **1.**

FIG. **12** shows deflection devices **55** of the same general type shown in FIG. **11** without the shoulder and rod or pin arrangement for holding them together. Each of the deflection devices is axially aligned along and around the cylindrical wall **23,** as shown.

Although but a few embodiments of the present invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. A muffler for receiving gas under pressure from a source comprising:
a housing adapted to communicate with said source,
said housing having a gas discharge opening extending axially therethrough for the passage of gas under pressure,
a pair of annular chambers axially aligned in said housing, each defining sequentially a part of said opening,
each of said chambers comprising a plurality of baffles extending longitudinally of said housing positioned to define by their adjacent edges a part of the periphery of said opening in said first and second chambers,
a first flange having an aperture therethrough forming a part of said opening at the downstream end of said first chamber and extending laterally of said housing for separating said chambers,
said first flange deflecting gas under pressure expanding outwardly of said opening in said first chamber,
a second flange having an aperture therethrough forming a part of said opening at the downstream end of said second chamber and extending laterally of said housing,
said second flange deflecting upstream against the downstream side of said first flange gas under pressure expanding outwardly of said opening in said second chamber, and
a plurality of deflecting means loosely mounted around the outer edges of and in coaxial alignment with the baffles in said first and second chambers,
said deflecting means each comprising a pocket for receiving the deflected gases in the chamber aound which they extend for causing them to acquire a rotary and whirling movement about an annular axis,
the pockets in said deflection means surrounding said first chamber opening in the upstream direction of movement of gas under pressure through said opening and the pockets in said deflection means surrounding said second chamber opening in the downstream direction of movement of gas under pressure through said opening.

2. The muffler set forth in claim 1 wherein:
said first flange dividing said housing into two separate chambers with the only gas communication therebetween being said gas discharge opening.

3. The muffler set forth in claim 1 wherein:
said first and second flanges divide said housing into two separate chambers wherein the only gas communication through said first and second chambers is through said gas discharge opening.

4. The muffler set forth in claim 1 wherein:
said baffles in each of said chambers are arranged on the quadrants of a circle.

5. The muffler set forth in claim 4 wherein:
said housing comprises a hollow cylindrical configuration,
said first and second flanges comprise discs extending substantially perpendicular to the longitudinal axis of said opening, and
said baffles comprise planar members extending longitudinally of said first and second chambers having a width less than the radius of said housing.

6. The muffler set forth in claim 5 wherein:
said deflection means loosely fitting around the outer edges of said baffles define a secondary passageway for deflected gas under pressure along said housing in each of said first and second chambers.

7. The muffler set forth in claim 6 wherein:
said housing defines an annular opening at one end for receiving a discharge nozzle of a gas generating device,
said annular opening opening into one end of said first chamber.

8. The muffler set forth in claim 7 wherein:
said deflection means in said first chamber extend longitudinally of said housing around said annular opening.

9. The muffler set forth in claim 8 wherein:
said annular opening is adapted to receive the barrel of a gun.

10. The muffler set forth in claim 8 wherein:
said annular opening is adapted to receive the tail pipe of an engine.

11. The muffler set forth in claim 1 wherein:
said deflection means each comprise a circular, doughnut-shaped configuration having a turned-over edge forming a scroll-like, arcuate configuration along its outer periphery for forming said pocket.

12. A muffler for a device discharging gas under pressure comprising:
a housing adapted to communicate with the bore of the gas discharging device,
said housing having an opening extending axially therethrough for the passage of gas under pressure from the gas discharging device,
three annular chambers axially aligned in said housing, each defining sequentially a part of said opening,
the first and second of said chambers each comprising a plurality of baffles arranged to extend longitudinally of said housing and arranged to define with their adjacent edges a part of the periphery of said opening,
a first flange at the downstream end of said first chamber extending laterally of said housing for deflecting gas under pressure expanding outwardly of said opening,
a second flange at the downstream end of said second chamber extending laterally of said housing for deflecting downstream in said housing against said first flange gas under pressure, said gas under pressure then deflected upstream and outwardly away from said opening,
a plurality of first deflection means loosely mounted around the outer edges of said baffles in said first and second chambers in axial alignment for receiving the outwardly deflected gases off of said first and second flanges,
said first deflection means each comprising a pocket for receiving the deflected gases and causing them to acquire a rotary and whirling movement about an annular axis,
the pockets in said first deflection means surrounding said first chamber opening in the upstream direction of movement of gas under pressure through

said opening and the pockets in said deflection means surrounding said second chamber opening in the downstream direction of movement of gas under pressure through said opening,

the third of said chambers arranged for receiving the discharge gas under pressure from second chamber and comprising a cylindrical housing surrounding and defining the periphery of a portion of said opening in said muffler,

said cylindrical member provided with a plurality of slots spacially arranged along the longitudinal axis of said cylindrical housing,

a plurality of second deflection means axially arranged along said cylindrical member and each defining a pocket in communication with at least one of said slots,

each of said pockets of said second deflection means causing said gas deflected through said slots and into them acquiring a rotary and whirling movement about an annular axis to dissipate their energy,

said gases in said muffler after dissipation of a substantial amount of their energy in said first and second deflection means being expelled through said opening to atmosphere.

13. The muffler set forth in claim **12** wherein:

said second deflection means comprises funnel-shaped devices with one resting within the other when assembled.

14. The muffler set forth in claim **13** wherein:

each of said second deflection means defines an opening axially thereof of a slightly larger diameter than said cylindrical member for slidably fitting thereover.

15. The muffler set forth in claim **14** wherein:

said housing defines an annular opening at one end for receiving a discharge nozzle of a gas generating device,

said annular opening opening into one end of said first chamber.

16. The muffler set forth in claim **15** wherein:

said first deflection means in said first chamber extend longitudinally of said housing around said annular opening and said first deflecting means in said second chamber extend longitudinally of said housing around said second deflection means.

17. The muffler set forth in claim **16** wherein:

said second deflection means isolate the gas under pressure passing through said muffler from gases in said first and second chambers.

18. A muffler for mounting on the barrel of a gun comprising:

a housing adapted to communicate with the barrel of the gun,

said housing having a gas discharge opening extending axially therethrough for the guidance of a projectile of the gun and the passage of a pencil-like gas stream following it,

an annular chamber axially aligned in said housing defining a part of said opening,

said chamber comprising a plurality of baffles extending longitudinally of said housing positioned to define by their adjacent edges a part of the periphery of said opening in said chamber,

the adjacent edges of each of said baffles of said chamber defining an extension of the bore of the gun for physically keeping a projectile of the gun axially aligned with the axis of said housing when passing therethrough,

a flange having an aperture therethrough forming a part of said opening at the downstream end of said chamber and extending laterally of said housing,

said flange deflecting gas under pressure expanding outwardly of said opening in said chamber to break up the pencil-like stream of gas following the projectile, and

a plurality of deflecting means loosely mounted around the outer edges of and in coaxial alignment with said baffles in said chamber,

said deflecting means each comprising a pocket for receiving the deflected gases in the chamber around which they extend for causing them to acquire a rotary and whirling movement about an annular axis,

the pockets in said deflection means surrounding said chamber opening in the upstream direction of movement of gas under pressure through said opening.

19. A muffler for mounting on the barrel of a gun comprising:

a housing adapted to communicate with the barrel of the gun,

said housing having a gas discharge opening extending axially therethrough for the guidance of a projectile of the gun and the passage of a pencil-like gas stream following it,

a pair of annular chambers axially aligned in said housing, each defining sequentially a part of said opening,

each of said chambers comprising a plurality of baffles extending longitudinally of said housing positioned to define by their adjacent edges a part of the periphery of said opening in said first and second chambers,

the adjacent edges of each of said baffles of each of said chambers defining an extension of the bore of the gun for physically keeping a projectile of the gun axially aligned with the axis of said housing when passing therethrough,

a first flange having an aperture therethrough forming a part of said opening at the downstream end of said first chamber and extending laterally of said housing for separating said chambers,

said first flange deflecting gas under pressure expanding outwardly of said opening in said first chamber to break up the pencil-like stream of gas following the projectile,

a second flange having an aperture therethrough forming a part of said opening at the downstream end of said second chamber and extending laterally of said housing,

said second flange deflecting upstream against the downstream side of said first flange gas under pressure expanding outwardly of said opening in said second chamber.

20. The muffler set forth in claim **19** in further combination with:

a plurality of deflecting means loosely mounted around the outer edges of and in coaxial alignment with said baffles in said first and second chambers,

said deflecting means each comprising a pocket for receiving the deflected gases in the chamber around which they extend for causing them to ac-

quire a rotary and whirling movement about an annular axis,

the pockets in said deflection means surrounding said first chamber opening in the upstream direction of movement of gas under pressure through said opening and the pockets in said deflection means surrounding said second chamber opening in the downstream direction of movement of gas under pressure through said opening.

* * * * *