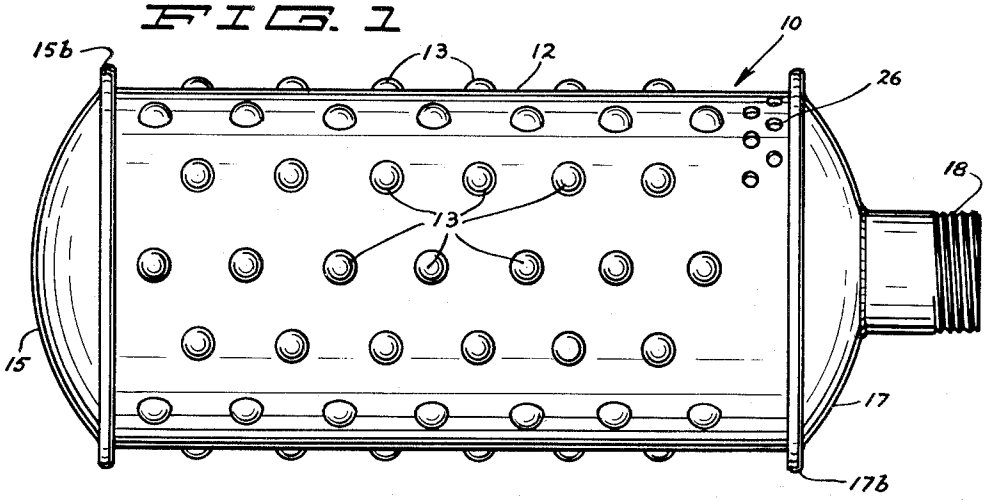
Nov. 21, 1961 C. T. COCKLIN 3,009,530

EXHAUST DEVICE

Filed Jan. 21, 1960 2 Sheets-Sheet 1

FIG. 1



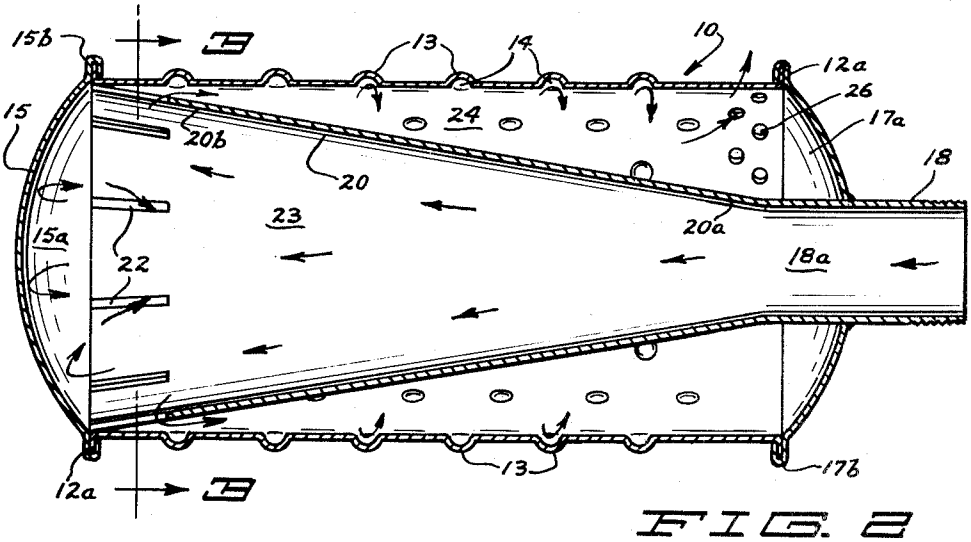


FIG. 2

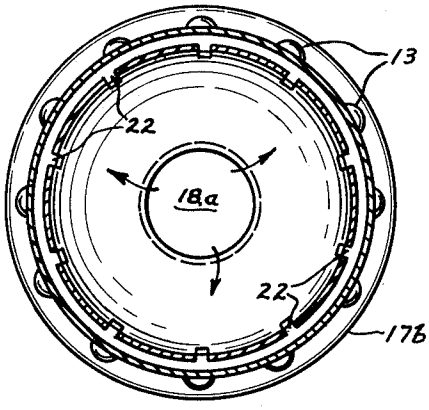


FIG. 3

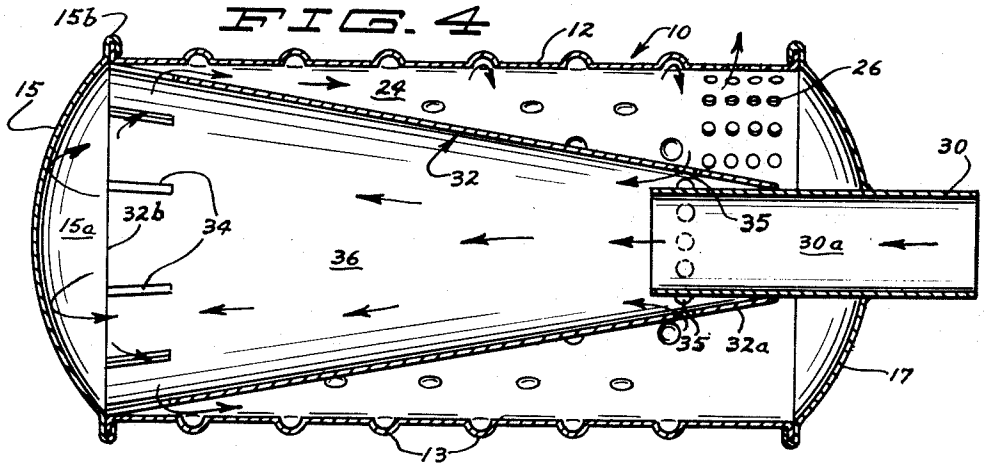
INVENTOR.
CLINTON T. COCKLIN
BY Reifand Gregory
ATTORNEYS

Nov. 21, 1961 C. T. COCKLIN 3,009,530

EXHAUST DEVICE

Filed Jan. 21, 1960 2 Sheets-Sheet 2

FIG. 4



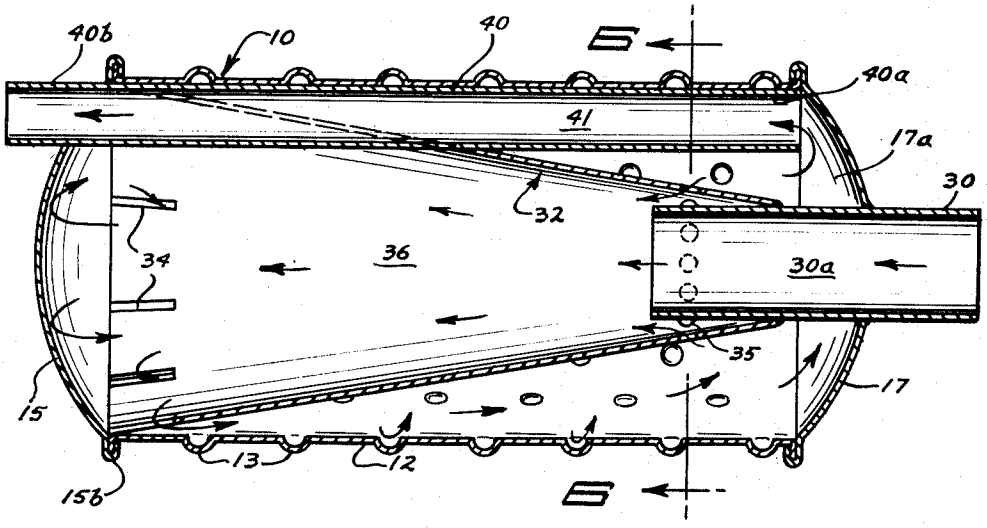


FIG. 5

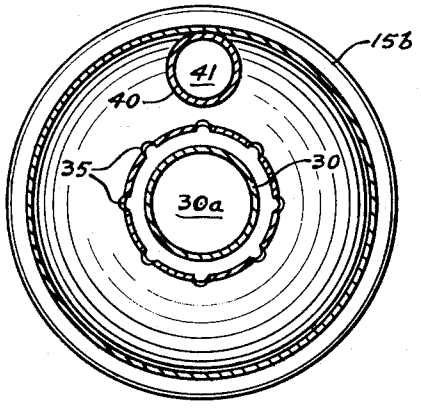


FIG. 6

INVENTOR.
CLINTON T. COCKLIN
BY Reif and Gregory
ATTORNEYS

United States Patent Office 3,009,530 Patented Nov. 21, 1961

3,009,530

EXHAUST DEVICE

Clinton T. Cocklin, Griswold, Iowa, assignor to Laco Oil Burner Co., Inc., Griswold, Iowa, a corporation of Iowa

Filed Jan. 21, 1960, Ser. No. 3,866
9 Claims. (Cl. 181—53)

This invention relates to an improvement in an exhausting device and more specifically of a type commonly referred to as a muffler for use with a combustion type engine, and particularly the type of engine such as may be used in connection with riding mowers, golf carts, sweepers, and similar types of equipment requiring an engine for a self-propelling means.

There are specific areas in which there is substantial room for improvement in the construction of mufflers. Among others these have to do with reduction of exhaust noise, reduction of back pressure in the muffler and reduction of heat. Back pressure here directly adversely affects the operation of the engine. The applicant's novel construction of an exhausting device represents a substantial improvement in the reduction of exhausting noise, exhaust heat, and in providing for reduction in the amount of back pressure created therein.

It is an object of this invention therefore to provide an exhausting device to be used in connection with a combustion type of engine whereby the exhausting fumes or gases are drawn into an expanding chamber with said chamber having in connection therewith a cushioning means from which said exhaust fumes are diverted into a second expanding chamber and are then exhausted to the atmosphere.

It is another object of this invention to provide an exhaust means for a combustion type engine whereby the exhausting gases are drawn therein through an inlet leading into an expanding chamber in which some of the force of said gas is spent without causing back pressure and a cushioning means at the far end of said chamber for diverting said gases into a second chamber, said second chamber having a plurality of air pockets formed in the inner wall surface thereof for providing both a retarding means to assist the gas in spending its force and in providing a cushioning effect to deaden the noise caused by exhausting gases providing a substantial acoustical effect with means for exhausting said gases from said second chamber to the atmosphere.

It is also an object of this invention to provide an exhausting device for a combustion type of engine adapted to receive exhaust gases therein by providing an expanding chamber into which said gases initially enter, and means provided adjacent the inlet of said gases whereby communication is had with the atmosphere so that said gases in entering said inlet draw inwardly also a supply of air to act as a coolant, and a cushioning means in connection with said expanding chamber to provide an acoustical effect in diverting said gases into a second expanding chamber from which said gases are exhausted to the atmosphere.

It is also another object of this invention to provide an exhausting device comprising a substantially cylindrical housing having an inlet for the passage of said gases thereinto, said inlet communicating with an expanding chamber within said housing, a cushioning means at the remote end of said expanding chamber for diverting said gases into a second expanding chamber, means in connection with said first expanding chamber for said gases to draw inwardly therewith a supply of air to act as a coolant, said second expanding chamber being formed within said outer housing, and an outlet means in said second chamber for the passage of said gases to the atmosphere.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

FIG. 1 shows a plan view of applicant's device;

FIG. 2 is a view in central vertical section of applicant's device;

FIG. 3 is a view in vertical cross section taken on line 3—3 of FIG. 2 as indicated by the arrows;

FIG. 4 is a view similar to that shown in FIG. 2 showing a modification of applicant's device;

FIG. 5 is a view similar to FIG. 4 showing another modification of applicant's device; and

FIG. 6 is a view taken on line 6—6 of FIG. 5 in vertical cross section as indicated by the arrows.

With reference to FIG. 1, applicant's exhausting device which will be referred to hereinafter as a muffler is shown in the embodiment here disclosed comprising a housing **10** substantially cylindrical in form having a central body portion **12** and enclosed end portions **15** and **17**. Within said end portion **15** there is formed a chamber **15***a* which forms an air pocket. Within said end portion **17** there is a similar chamber **17***a* forming an air pocket. Said end portions may be variously formed but are here shown respectively to be substantially convex in form with said end portion **17** having a tubular inlet member **18** in connection therewith and extending inwardly thereof for some distance as indicated in FIG. 2, and having a passage **18***a* therethrough.

Said central body portion **12** is here shown having a multiplicity of outwardly extending indentations **13** therein forming dimples. As indicated in FIG. 2, said dimples **13** in extending or protruding outwardly of said body portion **12** form pockets **14** on the inner side of said body portion.

Said end portions **15** and **17** will be joined to said central body portion **12** in a suitable manner and are here shown having reversely bent edge portions **15***b* and **17***b* respectively crimped over outwardly extending flange portions **12***a* of said central body portion.

Positioned on the inner side of said housing **10** is an inner housing **20** here shown to be frusto-conical in form to provide an expanding chamber having its smaller end portion **20***a* integral with the inner end of the inlet **18** and having its larger end portion **20***b* secured to the inner surface of the central body portion **12** adjacent the end **15** and substantially about the inner side of the flange **12***a* adjacent thereto. Circumferentially about the larger or inner end of said inner housing **20** is a plurality of apertures **22** which may be variously formed and are here shown to be slot-like in form extending substantially longitudinally of said housing **10**. Thus there is formed within said inner housing **20** a chamber **23** and a second chamber **24** is formed about said inner housing **20** and within said housing **10**.

Adjacent the end portion **17** there is a plurality of apertures **26** formed in the central body portion **12** for communication between said chamber **24** and the atmosphere.

In operation, the inlet **18** will be connected in any suitable manner to the exhaust pipe of a combustion type engine whereby exhaust gases from said engine will enter through the inlet passage **18***a* into the expanding chamber **23**. The gases in rushing into said expanding chamber will immediately become considerably spent and thus will lose a great deal of velocity whereby the effect of creating back pressure is avoided. Said gases in passing to the inner end of said chamber **23** are cushioned by the air pocket **15***a* therein with said air being under some degree of pressure caused by the entrance of said gases. Said pocket **15***a* provides an acoustical effect to absorb a substantial amount of the exhaust noise caused by the exhausting gases.

Said exhausting gases will be diverted from the pocket 15*a* through the apertures 22 into the outer chamber 24, which outer chamber forms an expanding chamber from the point of the apertures 22 in the direction of the reverse end of said housing 10. Said exhausting gases in passing through said chamber 24 will contact the air pockets 14. Said air pockets 14 serve a dual purpose. They serve to absorb an additional amount of exhaust noise and provide a retarding effect on the passage of gases thereby whereby more of the velocity of said exhausting gas is spent and has become considerably spent upon reaching the apertures 26 through which said gases are exhausted to the atmosphere.

Provided at the enlarged end of said chamber 24 is the air pocket 17*a* which provides additional cushioning effect for absorbing sound and retarding velocity prior to the exhausting of the gases through said apertures 26.

With reference to FIG. 4, a modification of applicant's device is shown in which all parts identical with those previously described bear the same characters and in which a change of structure is shown with reference to the inlet member 30 and the inner housing 32. Said member 30 has a chamber 30*a* therein.

Said inlet member 30 extends inwardly of the outer housing 10 for some distance further than does the inlet member 18. Said inner housing 32 is identical in construction with said inner housing 20 having its larger end 32*b* secured to the inner side of the central body portion 12 in the same manner as said housing 20 and having spaced about at its larger end a plurality of slot-like apertures 34. Said inlet member 30 extends inwardly of the smaller end 32*a* of said inner housing 32 with the smaller end of said inner housing being secured about said inlet member 30 some distance back of its inner end portion, as indicated in FIG. 4. Spaced about the smaller end portion of said inner housing 32 is a plurality of apertures 35 somewhat to the rear of the inner open end of said inlet member 30. Formed within said inner housing 32 is a chamber 36.

In operation, applicant's modification shown in FIG. 4 will operate in the same manner as the device previously described with the addition that as the exhaust gases pass through the inlet member 30 into the inner chamber 36 of the inner housing 32 a low pressure area will be created about the inner end portion of said inlet member whereby air will be drawn inwardly through the apertures 35. The air drawn in will be considerably cooler than the exhausting gases and said air will act as a coolant in providing for a more rapid reduction in the heat of the gases than would otherwise be possible. Said gases will pass through the chamber 36 and will be diverted by the pocket 15*a* to pass through the apertures 34 into the outer chamber 24 and will be exhausted to the atmosphere through the outlet apertures 26. It has been found in actual operation that said apertures 35 also have an effect on reducing the noise level of the exhaust gases.

With reference to FIGS. 5 and 6, another modification of applicant's device is shown in which parts identical with those previously described bear the same characters, with this structure being substantially the same as that shown in FIG. 4 with the exception that the apertures 26 serving as an outlet to the atmosphere have substituted in their stead an exhaust tube 40 substantially cylindrical in form having a passage 41 therethrough and being secured to an inner side wall portion of said central body portion 10, as by welding, and having an open inner end 40*a* adjacent the inner end portion 17*a*, and having its outer end 40*b* extending outwardly of the end portion 15 for a short distance. Said inner housing 32 will have a wall portion apertured so that said tube 40 may be disposed therethrough.

In operation, applicant's device as shown in FIGS. 5 and 6 will operate in the same manner to exhaust gases as the structure shown in FIG. 4, with the exception that in passing from the outer chamber 24 to the atmosphere instead of passing through outlet apertures in the central

body portion 10 said gases will pass through said tube 40 to the atmosphere. With the use of the tube 40 the point of exhaust of the gases passing therethrough may be more specifically localized than through the use of said apertures 26 and under some conditions it will be more desirable to use applicant's device as equipped with the exhaust tube rather than with the exhaust apertured. Passing through said tube 40 will reduce substantially the velocity with which said gases will be exhausted.

Thus there has been provided a very simply constructed and efficient exhausting device providing expanding chambers through which exhaust gases may pass, thus spending their energy without creating noticeable back pressure, and acoustical air cushions are provided to effect a substantial reduction in the noise caused by the exhaust of the gases. Applicant's device is in commercial use and has proved to be very successful in operation.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which, generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An exhausting device to be used in connection with a combustion type engine having in combination, a substantially cylindrical outer housing, a convex end portion at one end of said outer housing, a second housing substantially frusto-conical in form disposed within said outer housing and having its larger end adjacent the convex end portion of said outer housing, a plurality of apertures disposed about the larger end of said inner housing, a substantially cylindrical inlet tube extending inwardly of the other end of said outer housing and extending inwardly for some distance of the smaller end of said inner housing, a plurality of apertures circumferentially about the smaller end of said inner housing spaced between the inner end of said inlet tube and the smaller end of said inner housing, and a plurality of apertures in said outer housing for communication with the atmosphere adjacent the end thereof remote from the larger end of said inner housing.

2. An exhausting device to be used in connection with a combustion type engine having in combination, a substantially convex end portion at one end of said outer housing, an inner housing substantially frusto-conical in form disposed within said outer housing and having its larger end portion adjacent said convex end portion of said outer housing, an inlet tube extending within the other end of said outer housing and extending for some distance within the smaller end portion of said inner housing, a plurality of apertures disposed about the smaller end portion of said inner housing spaced between the points of intersection thereof by an extension of the planes respectively of the inner end of said inlet tube and the smaller end of said inner housing, and a substantially cylindrical exhaust tube within said outer housing extending from a point therein adjacent said other end thereof to extend outwardly of said convex end portion thereof to exhaust to the atmosphere.

3. An exhausting device to be used in connection with a combustion type engine having in combination, an enclosed outer housing, an outwardly curved end portion at one end of said housing comprising an air chamber forming an air cushion within said housing, an inner housing disposed within said outer housing increasing in transverse dimension in the direction of said convex end portion of said outer housing and communicating with said air cushion, said inner housing having an unobstructed chamber therein, the smaller end portion of said inner housing forming an inlet tube and being disposed to extend through the other end of said outer housing, a plurality of apertures disposed about the larger end of said inner housing adjacent said air chamber, and a plurality of

apertures in said outer housing adjacent said other end thereof for direct communication with the atmosphere.

4. The structure set forth in claim 3, an outwardly curved end portion formed at the other end of said outer housing whereby said outwardly curved end portions at either end of said outer housing form air pockets to provide an acoustical cushion at either end thereof.

5. An exhausting device to be used in connection with a combustion type engine having in combination, an elongated enclosed outer housing having a chamber therein, a substantially convex end portion at one end of said outer housing comprising an air chamber having an air cushion, an inner housing disposed within said outer housing extending substantially the full length thereof and increasing in transverse dimension in the direction of said convex end portion, an unobstructed chamber extending the full length within said inner housing, the larger end of said inner housing being secured to the inner surface of said outer housing adjacent said convex end portion and communicating with said air pocket and the air cushion therein, a plurality of apertures spaced about the enlarged end of said inner housing for communication between said first and second mentioned chambers, an inlet tube having a passage therethrough in communication with said second chamber, said inlet tube being integral with the smaller end of said inner housing and extending outwardly of the other end of said outer housing, and a plurality of apertures in said outer housing adjacent said other end thereof for direct communication between said first mentioned chamber and the atmosphere.

6. An exhausting device to be used in connection with a combustion engine having in combination, an elongated enclosed outer housing having a substantially convex end portion at one end thereof and having a chamber therein, an inner housing within said outer housing extending substantially the full length thereof and increasing in transverse dimension in the direction of said convex end portion and having its enlarged end portion secured to said outer housing adjacent said convex end portion, a chamber within said inner housing, a plurality of apertures about the larger end portion of said inner housing for communication between said first and second mentioned chambers, an inlet tube at the other end of said outer housing integral with the smaller end of said inner housing and extending for some distance within said inner housing, a plurality of apertures about the smaller end of said inner housing between the inner end of said inlet tube and the adjacent end of said outer housing for communication between said first and second mentioned chambers, and means providing communication between the chamber of said first mentioned housing and the atmosphere.

7. The structure set forth in claim 6, an elongated tube having a passage therethrough being disposed within said outer housing extending substantially the full length thereof and extending outwardly at one end thereof having apertures therein remote from said outwardly extending portion thereof for communication between said first mentioned chamber and the atmosphere.

8. An exhausting device to be used in connection with a combustion type engine having in combination, a substantially cylindrical outer housing having a chamber therein, a convex end portion at one end of said housing having an air cushion therein, a substantially frusto conical housing disposed within said outer housing having the larger end thereof adjacent said convex end portion of said outer housing and having the smaller end thereof extend through the other end of said outer housing to form an inlet tube, an unobstructed chamber in said inner housing, a plurality of apertures disposed about the larger end portion of said inner housing adjacent said convex end portion of said outer housing, and a plurality of apertures in said outer housing adjacent said other end thereof for communication with the atmosphere.

9. An exhausting device to be used in connection with a combustion type engine having in combination, an elongated enclosed outer housing having a chamber therein, a substantially convex end portion at one end of said outer housing comprising an air chamber having an air cushion therein, an inner housing disposed within said outer housing extending substantially the full length thereof and increasing in transverse dimension in the direction of said convex end portion, an unobstructed chamber extending the full length within said inner housing, the larger end of said inner housing being secured to the inner surface of said outer housing adjacent said convex end portion and communicating with said air chamber and the air cushion therein, a plurality of apertures spaced about the enlarged end of said inner housing for communication between said first and second mentioned chambers, an inlet tube having a passage therethrough in communication with said second chamber, said inlet tube being integral with the smaller end of said inner housing and extending outwardly of the other end of said outer housing, said inlet tube having an inner end portion extending inwardly of said second chamber, a plurality of apertures spaced about the smaller end of said inner housing at a point between the inner end of said inlet tube and the adjacent end of said outer housing, and a plurality of apertures in said outer housing adjacent said other end thereof for direct communication between said first mentioned chamber and the atmosphere.

References Cited in the file of this patent

UNITED STATES PATENTS

1,150,898	Spiegel	Aug. 24, 1915
1,302,300	Brinkman	Apr. 29, 1919
1,848,990	Boyd et al.	Mar. 8, 1932
2,151,084	Deremer	Mar. 21, 1939
2,401,570	Koehler	June 4, 1946
2,928,491	Crouch	Mar. 15, 1950