

Aug. 4, 1942.

H. McCURDY

2,292,340

CUSP-SECTION MUFFLER

Filed Dec. 9, 1940

2 Sheets-Sheet 1

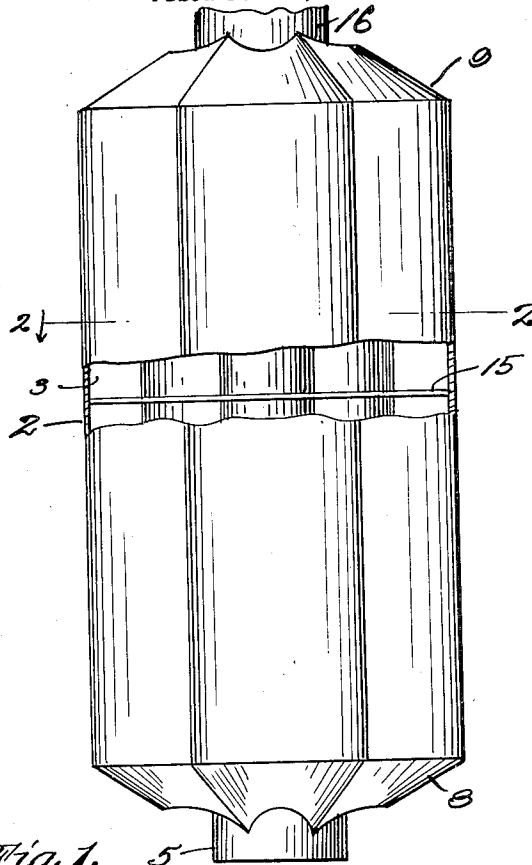


Fig. 1.

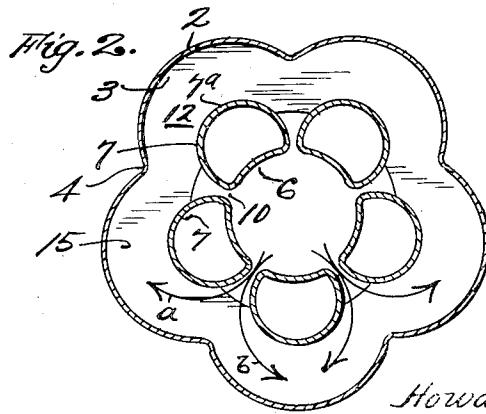


Fig. 2.

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2 Sheets-Sheet 2

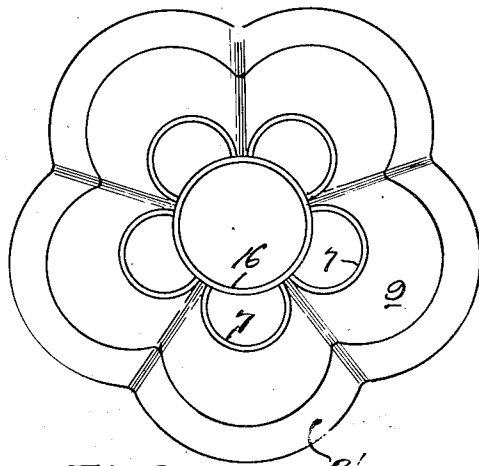


Fig. 3.

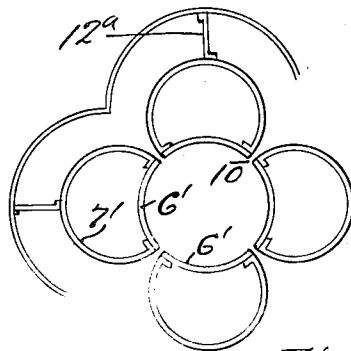


Fig. 5.

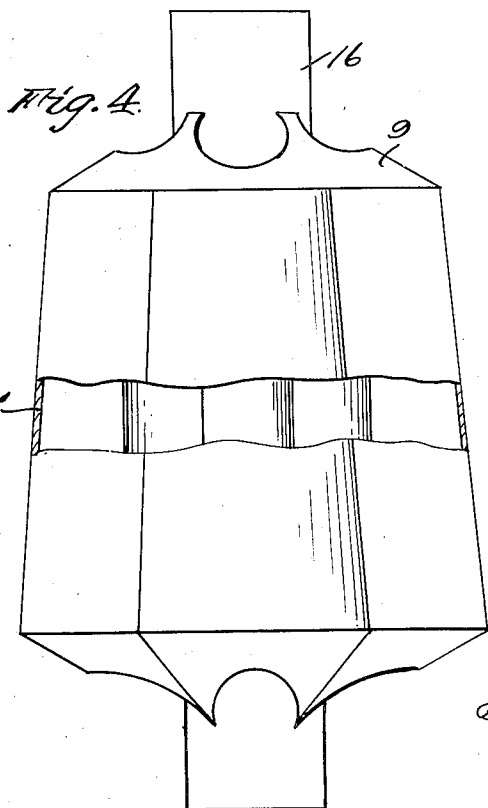


Fig. 4.

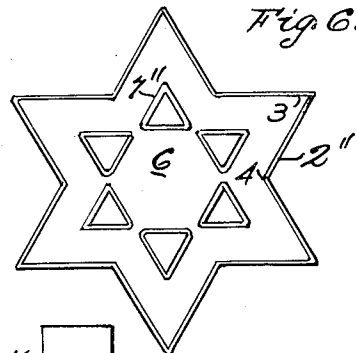


Fig. 6.

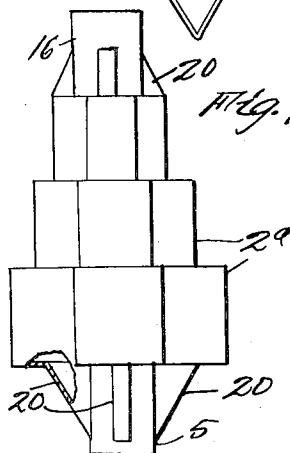


Fig. 7.

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UNITED STATES PATENT OFFICE

2,292,340

CUSP-SECTION MUFFLER

Howard McCurdy, Walnut Park, Calif.

Application December 9, 1940, Serial No. 369,184

6 Claims. (Cl. 181—48)

This invention is a fluid expanding and noise reducing muffler.

It is an object here to provide a muffler of this class which is of utmost simplicity, of low cost of construction and of high efficiency.

Another object is to provide a muffler in which the wave head of an exhausting fluid, for instance, passes into a straight-line wall bore which is axially unobstructed and has narrow, longitudinal expansion flow vents for the radial dissipation of radial-longitudinal plane sheets of the passing fluid.

A purpose is to provide means which not only form the bore wall of the muffler and create, by peculiar arrangement, the narrow expansion vents, but, further, constitute a number of spaced, longitudinally extending air tunnels wholly sealed from the expansion chamber of the muffler whereby to facilitate in the radiation of heat that may be present in the passing fluid; as gases from a hot engine.

An additional object of the invention is to provide a structure, in mufflers, which is preferably quite free from plane surface walls and thereby defeat undesired panel oscillations.

Further a feature of the invention is the provision of a structure whereby the longitudinal sheets of expanding gas are longitudinally split by a wedge shaped means and the split sheets are so diverted and controlled, by wall structure of the muffler, that they collide along longitudinal lines and their energy is absorbed by mutual reaction.

Also, a purpose is to provide a chamber structure which affords a constantly widened space for the expansion of the sheets of gas projected radially through the several, longitudinal vents.

The invention consists of certain advancements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose constructions, combinations, and detail of means and the manner of operation will be made manifest in the following description of the herewith illustrative apparatus; it being understood that modifications, variations and adaptations may be resorted to within the spirit, scope and principle of the invention as it is more particularly claimed presently.

Figure 1 is a broken away elevation of a parallel wall embodiment of the muffler shell, and Figure 2 is a cross-section on line 2—2, Fig. 1.

Figure 3 is a top plan and Figure 4 is a broken-away side elevation of a frusto-conical form of the shell.

Figure 5 is an end view of a system of cooling-air tunnels of cylindric sections, and

Figure 6 is an end view of a tube and tunnel, and shell structure in common center arrangement.

Figure 7 shows a stepped form of shell, in elevation.

A distinguishing feature of this invention is the embodiment of an external shell 2 whose inner surface is of such form as to provide a system of longitudinal, right-line valleys 3 separated one from the other by longitudinal ridges, and preferably the shell 2 is made of internally and externally corrugated form and is therefore herein referred to as of "cusp" cross-section. Its cross-section is crenate in outline. The corrugated shell has the advantage that it affords a uniform wall thickness throughout, in preference to a shell which is cylindric externally and cusped only internally, though this latter shape is in the scope of the invention.

The shell 2 has at one end an inlet pipe 5 from any desired source from which a fluid is to be expanded in and discharged from this muffler. From this pipe 5 the fluid, hereinafter called as "gas," passes into a straight, axial passageway 6, here called a tube, which is concentric with the shell 2.

In the several embodiments here illustrated this tube is peculiarly constructed in that it consists of longitudinal wall parts shown in Figs. 1 and 2 as the innermost sides of a system of longitudinally extending tubular elements 7 disposed in a circle concentric to the shell center and these elements are tunnels opening at each end through ends heads 8 and 9 closing the ends of the shell 2.

In order to provide for the expansion of the passing gas in the passageway or tube 6 the tunnels are annularly slightly spaced for their full lengths to form vents 10 through which sheets of gas may radially burst for the full length of the tunnels to be expanded in the chamber in the shell 2, whose inner surface is longitudinally troughed by reason of the internal cusp cross-section of the shell. The tunnels 7 of Fig. 2 are of one piece, each, of cylinder shape but their inner most sides forming wall parts 6 of the bore passageway are preferably of arched section outwardly and concentric to the axis of the shell not only to give a cylindric shape to the bore tube structure but also to eliminate plane wall form which would tend to set up undue vibration.

The curvature of the air tunnel walls is not

concentric to the arches of the cusp section shell and the tunnels are arranged radially inward from the cusp arches in such a manner that the expansion vents 10 are radially inwardly opposite the horns or ridges 4 along the shell face. Therefore, sheets of gas expanding through the vents move directly toward the ridges 4 and these react to split the sheet (note arrows *a* and *b*) Fig. 2 and the divisions of the sheet from each vent 10 move outwardly toward the deepest parts of the valleys 3. Thus halves of divided sheets are moving toward each other over the crests of the intervening tunnel whose sides go to make up the vents 10 from which the full sheets originated, and the consequence is that the long fronts of the divided sheets meet in head-on collision at the ridge of the contiguous tunnel and their energy is mutually absorbed.

It will be seen that the crests 1a of the tunnels 7 are not concentric with their radially opposite shell valleys 3 and that the radial width of the expansion space 12 about the tunnels 7 gradually increases from the ridges 4 toward the valley bottoms. Therefore, the expanding waves from the vents continue an expanding moment as they pass the ridges.

The several vents 10 are freely open from end to end of the shell chamber. In some cases of use it may be desirable to divide the shell chamber into separated compartments as by the installation of a suitable number of transverse walls 15; one being here shown.

The expanded gases robbed of material energy are ultimately released at an outlet pipe 16.

Figs. 3 and 4 show a muffler of the same general structure, but the shell 2' is frusto-conoidal.

Instead of the use of deformed, cylindric tube tunnels as in Fig. 2 there is shown in Fig. 5 a longitudinally slotted tube presenting sections of an annulus, 6' and to these are attached tunnel segments 7'; these units being spaced to provide the restricted vents 10.

Fig. 6 illustrates the conception of a shell 2'' of star cross-section giving internal ridges 4 and deep valleys 3 into which project the ridges or crests of tunnels 7'' of triangular cross-section with bases spaced to form vents 10.

Fig. 4 shows shell 2' as converging from its intake end and another form of gradually converged shell 2a is shown in Fig. 7 as of stepped cone embodiment. At the ends of the shell 2a there are a suitable number of hollow gussets 20 converging from the shell chamber to its end inlet and outlet tubular parts 5 and 16.

In some adaptations of the muffler there may be provided radial partitions 12a, Fig. 5, from the crests of the tunnels to the bottoms of the valleys 3.

What is claimed is:

1. A muffler characterized as having an outer shell of side to side outturned channels of arched contour in cross-section, and having a concentric bore tube provided with longitudinal vents opposite the meeting sides of the channels of the shell chamber.

2. A muffler characterized as having a concentric bore tube provided with longitudinally arranged vents, and an outer shell of side to side channels of arched cross-section; said vents leading to the shell chamber in radial opposition to the junctions at the sides of the shell wall channels.

3. A muffler whose inner surface is of cusp section and has longitudinal ridges, and tubular bore flow means in the shell chamber with longitudinal vents opposite the ridges for directing fluid sheets radially toward the ridges of the cusps to effect longitudinal division of the individual sheets and diversion of the divisions of each sheet impinging a ridge in opposite directions at the ridges whereby to effect a collision of diverted divisions of the sheets as they meet in valleys between the ridges.

4. The muffler of claim 2, and said means being concentric to the axis of the shell.

5. The muffler of claim 2, and air tunnel means between the said tubular means and the shell.

6. The muffler of claim 1, and the bore tube consisting of an annular series of pipes each forming a free air flow passageway from end to end of the shell chamber and not in communication therewith.

HOWARD McCURDY.

CERTIFICATE OF CORRECTION.

Patent No. 2,292,340.

August 4, 1942.

HOWARD McCURDY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, lines 37 and 39, claims 4 and 5, for "claim 2" read --claim 3--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of November, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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