Jan. 7, 1936. S. OLDBERG 2,026,795

SILENCER

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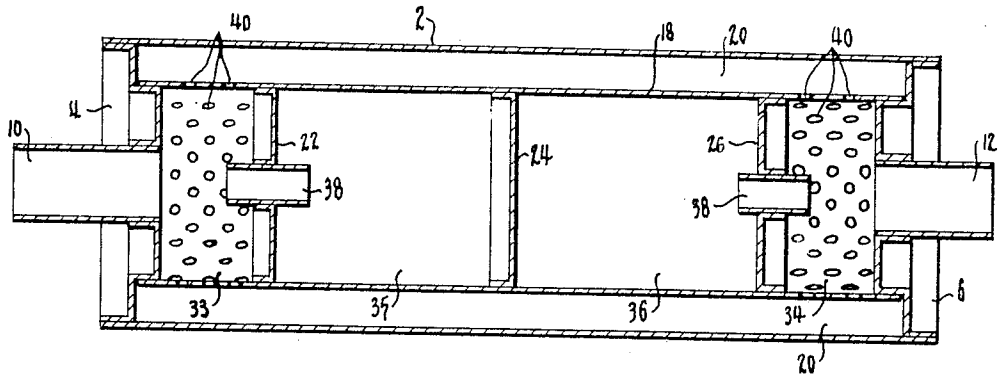


Fig. 1

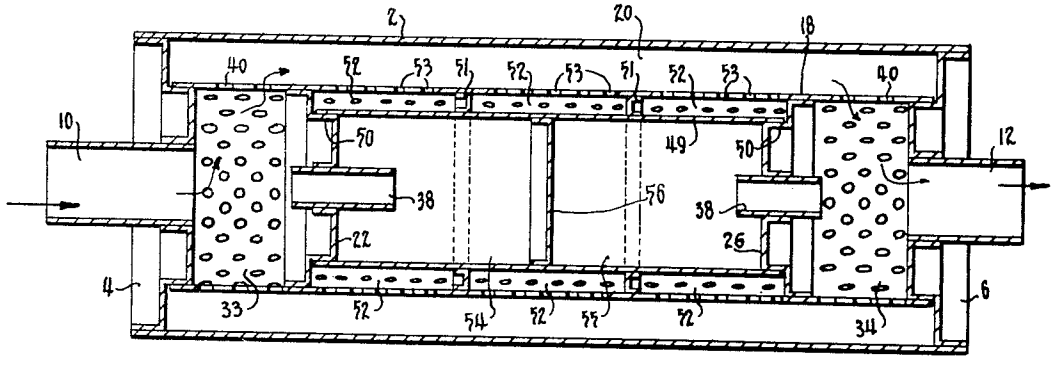


Fig. 2

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SILENCER

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5 Claims. (Cl. 137—160)

This invention relates to silencers and more particularly to silencers used in connection with gases exhausted from internal combustion engines.

An object of the invention is to provide a rigid and strong silencer which is efficient, though cheap and economical to manufacture.

Other objects and features of the present invention will be readily apparent to those skilled in the art upon reference to the following detailed description of embodiments of the same, reference being had to the appended drawing.

In the drawing,

Figures 1 and 2 are longitudinal elevational section views of embodiments of the invention.

Referring to the drawing, it will be seen that the silencer of Figure 1 is preferably constructed from a cylindrical shell 2 having its ends closed by inserted end headers 4 and 6. Centrally located in the inlet and outlet end headers are positioned the inlet and outlet tubes 10—12. Annular shoulders formed on the headers 4 and 6 form abutments upon which is positioned an inner shell 18, the latter preferably being concentrically nested within the outer shell 2. It is apparent that this structure forms an annular space or volume 20 between the outer and inner shells which is utilized to form a passageway for the gases which course therethrough from the inlet tube to the outlet tube.

The inner shell 18 is divided by means of diaphragms 22—24—26 into four volumes, two of which (33—34) are immediately adjacent the inlet and outlet tubes and form end expansion chambers for the coursing gases. Between these are positioned two closed spaces 35 and 36 which form the resonator chambers for the silencer. The mouths of the resonating chambers are formed by perforating the diaphragms 22—26 and placing therein the tubes 38, these being of any desired length.

The gas expansion chambers 33—34 are in communication with the annular space 20 through holes 40 in the inner shell 18. Thus the gases entering the silencer by the inlet tube 10 are directed through the holes 40 into the annular space 20, from whence they are led to the expansion space 34, adjacent the outlet, through holes 40, flowing out therefrom through the outlet tube 12.

It will be seen that original impulses of sound accompanying the gases through the inlet 10 are deadened by the resonator chamber 35 whose mouth or inlet 38 is practically concentric with the tube 10. Hence the sound waves traveling forward with the gases immediately enter the resonating chamber 35 and those sound waves of the frequencies to which the resonator is responsive become tuned out. The double wall construction with the annular space between the two shells 2 and 18 tends to cushion or muffle the sounds formed in the resonator and make the action of the silencer quiet. The action of the resonator 36 on the outlet end has practically the same virtues, tending to further reduce the sound waves accompanying the exhaust gases.

The concentric construction of the two shells 2 and 18 with their headers 4 and 6 make a very rigid structure which is at the same time very economical to manufacture. The construction here shown is superior to known constructions because of the fact that the resonators are in the center, because it provides sharper tuning, because the damping factor is not very high, and because the gases are more easily cooled, being conducted around the cool resonators to the outside of the silencer.

Referring to Figure 2 of the drawing, there is shown a second embodiment of the invention. This has an outer shell 2, the end flanges 4 and 6, and the inlet and outlet tubes 10 and 12, practically the same as in the embodiment just described. This embodiment also employs a shell 18, and diaphragms 22 and 26, providing expansion chambers 33 and 34 adjacent the inlet and outlet tubes. It differs from the one shown in Figure 1 in that a third, concentrically positioned, shell 49 is added to the structure to form an annular space inside the shell 18, the shell 49 being held in position by annular shoulders 50 on the diaphragms 22—26. The shell 49 is rigidly positioned between these two diaphragms, and is further supported by annular rings 51 positioned in the annular volume between the two shells 18 and 49, the annular rings 51 having a further function in that they divide the annular volume between the two shells 18 and 49 into sections 52 which form absorption chambers for the noises accompanying the gases coursing through volume 20, which chambers are in communication with the coursing volume 20 through holes 53 in the wall of the shell 18. In this embodiment the central chamber within the shell 19 forms two resonators 54—55, separated by a diaphragm 56.

Under certain circumstances, it may be desired to dispense with the dual resonator construction. In this case, the diaphragm 56 is dispensed with and the header 26 within the shell 18 is closed completely, eliminating the resonator tube 38 on

the outlet end. This construction will give one resonator chamber, which extends the whole length of the shell 49, having its mouth provided at the inlet end by the resonator tube 38 positioned there.

In the embodiment shown, the coursing gases enter the silencer through the tube 10 and enter the expansion chamber 33, the resonator 54 within the shell 49 tuning out the greatest portion of the accompanying sound waves. The gases then flow through the holes 40 in the wall of the shell 18 into the annular volume 20, where they flow past the holes 53 of the absorption chambers 52. At this point the sound waves, still accompanying the coursing gases, are further reduced by absorption in the chambers 52. The coursing gases then flow through the holes 40 in the wall of the shell 18 on the outlet end into the expansion chamber 34. When the gases are in the expansion chamber 34, the noises may be reduced still further through the action of the resonator chamber 55. The gases then flow smoothly through the outlet tube 12 to the atmosphere.

Where the shell 49 encloses only one resonating chamber, it is clear that no further diminution of noises will be accomplished at the outlet end, and the coursing gases will flow from the expansion chamber 34 into the atmosphere through outlet tube 12, without their sound waves being tuned out at the outlet.

The construction shown in Figure 2 will be more rigid than the one shown in Figure 1, and yet be economical in manufacture.

Now having described preferred embodiments of the invention, reference will be had to the following claims for a determination of the scope of the invention.

What I claim is:

1. In a silencer, two nested casings, an inlet of less diameter than the innermost casing opening directly thereinto, an apertured diaphragm in the innermost casing remote from said inlet dividing the innermost casing longitudinally into an expansion chamber into which the inlet opens, and a resonance chamber in communication with the expansion chamber but otherwise closed, there being a communication from said expansion chamber into the volume between the casings, and an outlet for said volume remote from the aforesaid communication.

2. In a silencer, means providing an expansion chamber into which opens the gas flow inlet, a resonance chamber in communication with said expansion chamber, and an annular gas flow volume around said chambers, the expansion chamber being in communication with said volume.

3. In a silencer, two nested casings, with the innermost one having three diaphragms dividing it longitudinally into two end chambers between which are two intermediate chambers, each end chamber being in communication with the adjacent intermediate chamber through a hole in their separating diaphragm, the intermediate chambers being otherwise closed, an inlet for one end chamber, and an outlet for the other end chamber, there being a communication between each end chamber and the volume between the pair of casings.

4. In a silencer, two nested casings, an inlet of less diameter than the innermost casing opening directly thereinto, an apertured diaphragm in the innermost casing remote from said inlet dividing the innermost casing longitudinally into an expansion chamber into which the inlet opens, and a resonance chamber in communication with the expansion chamber but otherwise closed, there being a communication from said expansion chamber into the volume between the casings and an outlet for said volume remote from the aforesaid communication, the innermost casing being double walled to provide an annular sound wave absorption space communicating with the annular space between the casings through apertures in the outer wall of the innermost casing.

5. In a silencer, two nested casings, with the innermost one having three diaphragms dividing it longitudinally into two end chambers between which are two intermediate chambers, each end chamber being in communication with the adjacent intermediate chamber through a hole in their separating diaphragm, the intermediate chambers being otherwise closed, an inlet for one end chamber, and an outlet for the other end chamber, there being a communication between each end chamber and the volume between the pair of casings, the innermost casing being double walled to provide an annular sound wave absorption space communicating with the annular space between the casings through apertures in the outer wall of the innermost casing.

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