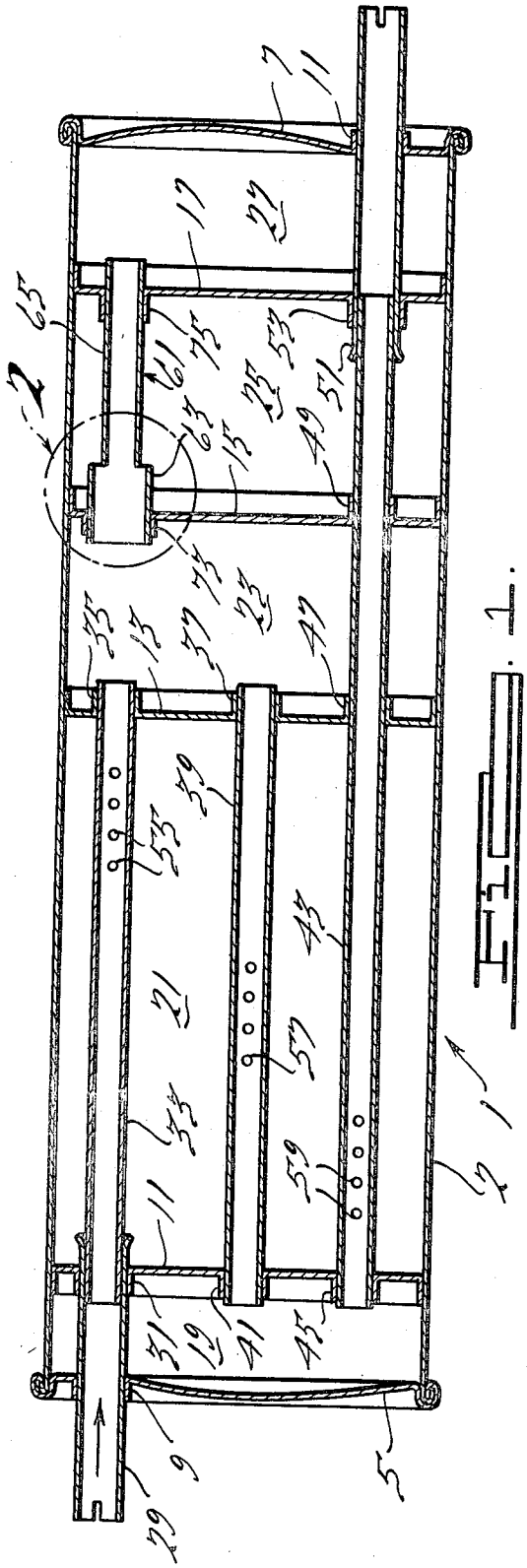
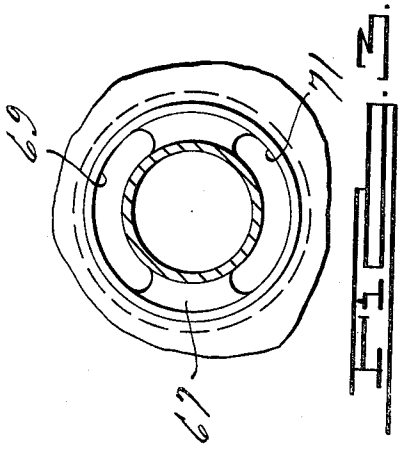
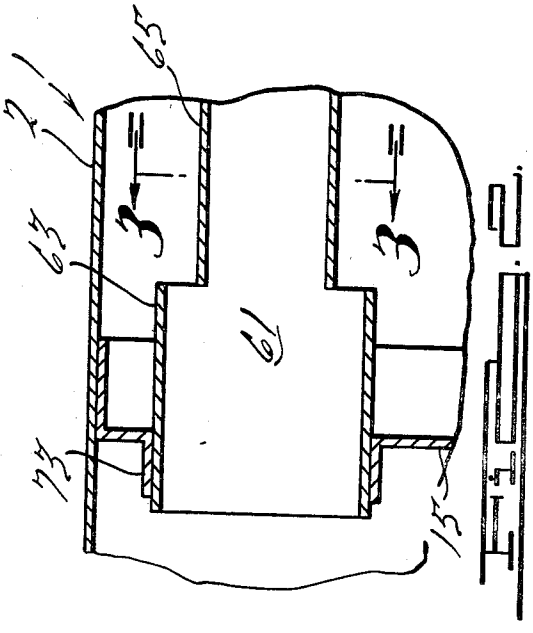
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CO-AXIAL TUNING TUBES FOR MUFFLER

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CO-AXIAL TUNING TUBES FOR MUFFLER

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ABSTRACT OF THE DISCLOSURE

A tuning tube for an internal combustion engine exhaust muffler or the like is formed of a one-piece tubular member that is reduced in diameter and has an opening at the plane of diameter reduction so that this opening along with the openings at each end of the tube enable it to be used in conjunction with two different volumes or chambers to attenuate two different predetermined frequencies.

SUMMARY OF THE INVENTION

It is the purpose of the invention to simplify the structure used to form two resonator chambers of the type used in mufflers for attenuating sound in flowing gases. The invention achieves this by means of a one-piece tube which is formed with different diameters and has an opening at the change of diameter section.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross section, partly schematic, of a typical internal combustion engine system exhaust muffler embodying the invention;

FIG. 2 is an enlarged view of the structure within the circle 2 of FIG. 1; and

FIG. 3 is a section along the line 3—3.

DESCRIPTION OF THE INVENTION

The muffler 1 has an oval shell 3 which is closed at its inlet end by an inlet header 5 and its outlet end by header 7, the headers having flanged openings 9 and 11. Within the shell 3 are a series of longitudinally separated partitions 11, 13, 15, and 17 which have outer annular flanges that are spotwelded to the shell. The partitions act with the end headers to define a series of axially adjacent chambers 19, 21, 23, 25, and 27.

An inlet bushing 29 is supported in the inlet header opening 9 and in a suitable annular flange 31 in the partition 11. Supported in the downstream end of the bushing 29 is an inlet tube 33 which has its downstream end supported in an annular flange 35 in the partition 13. The partition 13 also supports by means of its annular flange 37 one end of a reverse flow tube 39, the other end of the tube being supported in an annular flange 41 in the partition 11. An outlet tube 43 has its inlet end supported in an annular flange 45 in the partition 11 and extends through annular flanges 47 and 49 in the partitions 13 and 15. Its downstream end is supported in an outlet bushing 51 which in turn is supported in an annular flange 53 of the partition 17 and extends out through the flanged opening 11. The tubes 33, 39 and 43 may have louver patches or openings 55, 57, and 59 in them to connect with chamber 21, as illustrated.

In accordance with this invention the chamber 23 is connected to the chambers 25 and 27 by a one-piece tuning tube member 61 having a large diameter section 63 and a small diameter section 65. The two sections are

preferably coaxial. The shape of each is preferably circular, but one or the other or both may be of different shapes, such as oval or square. Preferably, the reduced diameter section 65 is formed by a swaging operation on a tube that is originally of the diameter of section 65. In reducing the diameter a wall 67 is formed which extends radially with respect to the axis of the member 61 and it is provided with a pair of openings 69 and 71 as best seen in FIG. 3. The tube 61 is supported in annular flanges 73 and 75 in the partitions 15 and 17 so that the openings 69 and 71 communicate with chamber 25.

As is well known, the tuned frequency of a Helmholtz resonator is a function of the volume of the tuning chamber (chambers 25 and 27) and the conductivity of the tuning or feed tube (tube 69) for the chamber. For the chamber 25 the conductivity is a function of the area and equivalent radius of feed openings 69 and 71, the length of tube section 63, and the diameter of section 63. For chamber 27, the conductivity is a function of the lengths and diameters of both sections 63 and 65. These conductivities can be calculated and since the volumes of the two chambers is known it is apaprent that they can be tuned to attenuate two different predetermined frequencies.

The rest of the muffler functions in a known manner so that gas entering inlet bushing 29 flows to the cross-over chamber 23 where it reverses its direction and passes by way of tube 39 to the chamber 19 where reversal again occurs and the gas flows out of the muffler through tube 43 and the outlet bushing 51. Silencing occurs because of the flow pattern and the expansion and contraction of the gas as well as by means of the acoustic action of the hole groups 55, 57, and 59 with the chamber 21. Other silencing means may also be used, as desired, with the arrangement of tube 61 and chambers 25 and 27.

What is claimed is:

1. In a muffler for attenuating sound in flowing fluid, a housing including partition means defining three aligned but separate chambers, a one-piece tube having both ends open and supported in said partition means, one end of the tube opening in a first of said chambers and the other end of the tube opening into a second of said chambers, the third of said chambers being located between the first and second, said tube having a first diameter portion and a second diameter portion smaller than the first and a radial wall portion interconnecting the two portions, said radial wall portion being located in said third chamber and being partially open to connect the first and third chambers through the first diameter portion of the tube.

2. A muffler as set forth in claim 1 wherein the lengths and sizes of the two tube portions and the volumes of the second and third chambers are interrelated so that they are tuned to attenuate predetermined sound frequencies.

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