

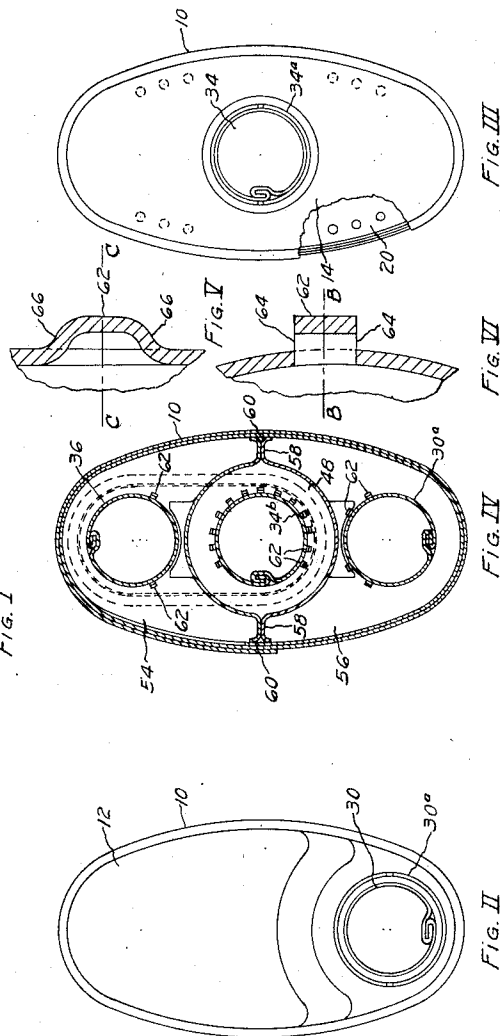
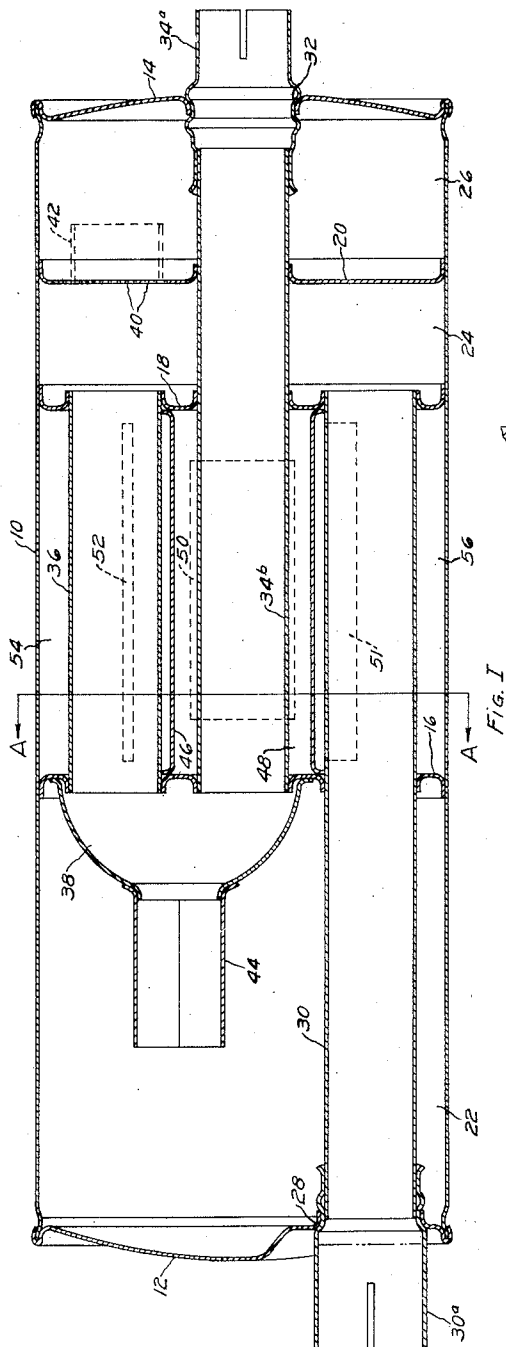
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RETROVERTED PASSAGE TYPE MUFFLER WITH RESONATOR CHAMBERS

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RETROVERTED PASSAGE TYPE MUFFLER
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This invention relates to retroverted passage type mufflers and more particularly to such as are used in connection with internal combustion engines for attenuating the sound of the exhaust.

An object of the invention is to provide an improved construction of retroverted type of muffler which is of simplified yet efficient construction and gives desirable sound damping or attenuating possibilities for a wide range of operating conditions.

Another object of the invention is to provide an acoustically tuned muffler which incorporates a tortuous gas conduit and associated wave filter and compounded resonator chambers in a novel and efficient assembly.

Further objects and advantages, residing in the construction, arrangement and combination of features and structural parts of the muffler will become apparent and clear from a consideration of the following detailed description with reference to the accompanying drawings in which—

Fig. I is a longitudinal section of a muffler construction in accordance with the invention,

Fig. II is an end view of Fig. I, looking on the left end thereof,

Fig. III is an end view looking on the right end of Fig. I,

Fig. IV is a transverse section on the line A—A of Fig. I,

Fig. V is an enlarged fragmentary cross section on the line B—B of Fig. VI and showing a preferred construction of the louvres provided on the gas conduits, and

Fig. VI is a section on the line C—C of Fig. V.

Referring to the drawings, the muffler comprises an outer and main casing 10, which is conveniently of oval shape in cross-section, as seen in Figs. II—IV, and has end header plates 12 and 14 and intermediate axially spaced partition plates 16, 18 and 20, these plates defining resonator chambers 22, 24 and 26.

The end header plate 12 has an opening 28 in which a straight conduit section 30 is supported with its end extension 30a, while the other end header plate 14 has an opening 32 in which another straight conduit section 34 is supported with its end extension 34a.

The end extension 30a can be employed to constitute the inlet end of the muffler, with the latter so hooked-up to the engine exhaust system and with the end extension 34a constituting the outlet end of the muffler. It is possible, however, to reverse this connection and so employ the end extension 34a as inlet and the end extension 30a as outlet.

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The two conduit sections 30 and 34 extend in axial and parallel relationship into the casing interior and are supported therein by passage through suitable openings in the partition plates 16, 18 and 20, as is clearly seen in Fig. I, where the inner end portions of these conduit sections are shown in overlapped relationship and as extending in opposite directions between the partition plates 16 and 18, while the latter are also shown as supporting between them a third straight conduit section 36.

At one end, the two conduit sections 34 and 36 are interconnected by an elbow section 38, whereas the opposite end of the conduit section 36 and also the corresponding end of the conduit section 30, open into the resonator chamber 24. The latter is placed in compounding relationship with respect to the adjacent resonator chamber 26, as by the partition plate 20 being provided with a series of perforations 40, or alternatively with a tube section 42, while the elbow connection 38 is also placed in communication with the resonator chamber 22 by the tube section 44.

That portion 34b of the tube section 34 which extends between the partition plates 16 and 18 is enclosed within an encircling imperforate tube 46 secured at its ends, as by welding, to the said partition plates and defining an enclosed annular acoustic wave filter chamber 48 into which gases conveyed along the tube portion 34b can pass through the louvre portion of this tube portion and indicated generally at 50 in Fig. I.

The tube section 36 and also the portion 30a of the tube section 30 are provided with louvre portions indicated generally at 51 and 52 in Fig. I, and through which louvre portions these tube are able to discharge into a pair of wave filter chambers 54 and 56 defined about the tubes section 36, and the tube portions 30a and 34b as seen in Fig. IV. Such chambers 54 and 56 are of substantially semi-annular shape and are conveniently defined by elongated web portions 58 bent radially outwards from opposite sides of the imperforate tube 46 in the formation of the latter from half sections of sheet metal and weld connected, for instance, at 60, to the inside of the outer casing 10, all as clearly shown in Fig. IV.

The said louvre portions are preferably formed by piercing the corresponding tube surfaces along short parallel lines and deflecting the thus defined tube portion 62 outwardly to define an arch, as is clearly seen in Figs. IV, V and VI, with side openings 64 between the curved sections anchored ends 66 of the portion 62, which ends 66 merge into the

general contour of the corresponding tube surface. Such louvre construction is preferable to mere perforations since it does not create objectionable high frequency sounds and enables the acoustic wave attenuating characteristics to be varied simply by regulating the height of the arches defined by the outwardly bent tube portions 62.

The length and diameter of the tube section 44 can be varied to alter the acoustic characteristic of the resonator chamber 22, while a similar adjustment is possible with respect to the size and number of the perforations 40 in the common partition plate 20 of the compounded resonator assembly 24 and 26, or with respect to the length and diameter of the tube section 42, if employed.

In operation, and assuming that the muffler is connected in the exhaust gas circuit of an internal combustion engine with the inlet end 30a, the gas flow will take place along the tube section 30 and discharge into the resonator chamber 24, with an attendant filtering action through the louvre portion 51 into the chamber 50. In the resonator chamber 24 the gases can surge back and forth into the resonator chamber 26 via the perforations 40, or the tube 42, and enter the tube section 36, from which the gases can filter through the louvre portion 52 into the chamber 54. From the tube section 36 the gases flow into the elbow 38, wherein there is a surging possibility through the tube 44 into the resonator chamber 22, and from this elbow connection the gases flow into the tube portion 34b for delivery along the tube section 34 to the outlet connection 34a. While in the tube portion 34b the gases are permitted to filter through the louvre 50 into the enclosed air space constituted by the chamber 48.

It will be appreciated therefore that the invention provides a very compact and relatively simplified muffler construction which can be readily manufactured and assembled and which provides a number of acoustic tuning or adjustment possibilities, while at the same time making maximum use of the available casing space in the provision of a retroverted conduit and associated filter and resonator chambers. The retroverted conduit is of substantially the same general cross sectional area throughout its length and the entire gas conducting assembly is such as provides for unrestricted flow and the elimination of any undue back pressure.

The proportions of the acoustic wave attenuating structure will, of course, vary, depending upon particular requirements and practical considerations. In general, with the acoustic range of the exhaust system determined by a wave frequency analyzer, the filter chambers 54, 56 and 48 are proportioned to attenuate the higher frequency wave ranges or bands and the resonator chambers 22, 24 and 26 are proportioned and tuned to attenuate the lower frequency ranges or bands. The compounding of the resonator chambers 24 and 26 materially increases the attenuating characteristics of the muffler and leads to increased efficiency and compactness of construction.

Having thus described the invention, what it is desired to protect by Letters Patent and claim is:

1. An acoustically tuned muffler construction comprising in combination, an outer elongated hollow casing, end header plates at opposite ends of said casing, each said header plate having an opening therein, a first partition plate within the casing in axially spaced adjacent relationship to

one said header plate and defining with the latter an end resonator chamber, a second partition plate within the casing in axially spaced relationship both to the other header plate and to said first partition plate and defining with the latter the opposite end walls of a compounded resonator chamber assembly, an intermediate partition plate in said compounded resonator chamber assembly and defining adjacent resonator chambers at the end of the casing remote from the end containing said first mentioned resonator chamber, means placing said adjacent resonator chambers in gas flow compounding relationship, a first tube section extending within the casing interior from one end thereof and mounted in the header plate at such end and in said first and second partition plates, a second tube section extending within the casing from its opposite end and mounted in the header plate at such end as well as in said first and second partition plates, said conduit sections having laterally spaced end portions extending in opposite directions between said first and second partition plates, one said conduit being in communication with said compounded resonator chamber assembly, a third conduit section extending between and mounted on said first and second partition plates in laterally spaced relationship to said first and second conduit sections, means connecting said second and third conduit sections in gas flow communication at the first said partition plate to define a retroverted conduit, said third conduit section being in open communication with the compounded resonator chamber assembly at the end thereof adjacent said second partition plate, a tube enclosing the portion of said second conduit section extending between said first and second partition plates, means connecting said tube with opposite sides of the casing interior to define separate acoustic wave attenuating chamber portions embracing said third conduit section and the portion of the first said conduit section which extends between said partition plates.

2. An acoustically tuned muffler construction comprising an elongated hollow casing, a gas flow conduit mounted in said casing with axial extending portions in retroverted arrangement within the latter, transverse interior partition plates in said casing defining an intermediate space surrounding portions of said conduit, axially extending acoustic wave attenuating structure embracing said conduit portions, and axially extending baffle means disposed between the sides of said casing and constituting a partition between certain of said conduit portions for dividing said intermediate space into two separate compartments.

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