ABSTRACT: An exhaust muffler for external side mounting on sports cars comprises an elongated tubular housing having internal partitions which carry two pairs of overlapping perforated gas flow tubes separated by a central expansion chamber to provide a series arranged, double triflow pattern for gas flow and sound silencing.
BRIEF SUMMARY OF THE INVENTION

It is the purpose of this invention to provide a muffler construction that will fit neatly along the side contours of various American-made sports cars and will meet the legally specified sound level requirements at a minimum back pressure.

The invention accomplishes this by means of a relatively long tubular housing of relatively small cross section which has two sets of overlapping perforated tubes arranged in series and separated by a central chamber. This arrangement provides two flow attenuation systems, which in conjunction with the central chamber and other chambers, provide a high degree of sound attenuation of frequencies in the high and medium range with minimum horsepower loss due to back pressure of the muffler.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic side elevation of a single exhaust system containing a muffler in accordance with this invention, it being recognized that in most sports car applications two of the mufflers will be used externally, one along each side of the automobile;

FIG. 2 is an enlarged, long cross section of the muffler shown in FIG. 1;

FIG. 3 is a section along the line 3-3 of FIG. 2; and

FIG. 4 is a broken-away cross section showing a different housing construction that may be used at opposite ends of the muffler.

DETAILED DESCRIPTION OF THE INVENTION

An internal combustion engine 1 has an exhaust manifold 3 which discharges gases into an exhaust system 5 that includes an exhaust pipe 7 which delivers gases to a muffler 9, constructed in accordance with this invention, which in turn discharges gases to a tailpipe or tailpipe spout 11 that empties into atmosphere.

The muffler 9 has a long, small tubular housing 13 which may be formed from tubular stock that is flattened on opposite sides as indicated at 15 in FIG. 3 to enable it to fit neatly along the outside of an automobile. In the modification of FIG. 2, the opposite ends of the housing 13 are closed by an inlet header 17 and outlet header 19 which are in the form of transverse partitions having flanges spotwelded to the housing 13. Inside of the housing 13 are a series of transverse partitions 21, 23, 25, 27, 29, and 31 which subdivide the housing into adjacent, but separate internal chambers 33, 35, 37, 39, 41, 43, and 49. The headers 17 and 19 as well as the partitions 21 and 31 have aligned collars 51 and 53 which support an inlet bushing 55 so that it is concentric with the centerline and longitudinal axis of the housing 13. The outlet header 19 and the partition 31 have aligned collars 59 and 61 which support an outlet bushing 65 so that it is coaxial with the inlet bushing 55. The inlet bushing 55 and the outlet bushing 63 are spotwelded respectively to the collars 51 and 53 and 59 and 61 and since the headers and the partitions are spotwelded to the shell 13, a high degree of structural strength for the bushings is achieved.

The exhaust pipe 7 fits in the inlet bushing 55 and is secured to it by a clamp 57. The outlet bushing 63 receives the inlet end of the tailpipe 11 and is clamped to it by a suitable clamp 65.

Two substantially identical sets 67 and 69 of overlapping flow tubes are mounted within the housing 13 to provide two separate triflow chambers. The set 67 comprises an inlet conduit 71 and an outlet conduit 73 while the set 69 comprises an inlet conduit 75 and an outlet conduit 77. The conduits in each set preferably have a substantial length of mutual engagement and are spotwelded to each other as indicated at 79 so that each set acts as an integral structure to eliminate the need for a central supporting partition. The inlet end of the inlet conduit 71 is mounted in a collar 81 in the other wise imperforate partition 23 and the outlet end of the outlet conduit 73 is mounted in a collar 83 in the otherwise imperforate partition 25. In the set 69 the inlet end of the conduit 75 is mounted in a collar 85 of the otherwise imperforate partition 87 and the outlet end of the conduit 77 is mounted in a collar 89 in the otherwise imperforate partition 91. The inlet conduit 71 terminates a substantial distance upstream from the partition 25 and the inlet conduit 79 terminates a substantial distance upstream from the partition 29. The outlet conduit 73 has its inlet end spaced a substantial distance downstream from the partition 23 and the outlet conduit 77 has its inlet end spaced a substantial distance downstream from the partition 27. Each of the tubes 71, 73, 75, and 77 has a substantial part of its length, preferably in the area which overlaps the other tube of the set, perforated and the perforations are preferably in the form of lower patches 89.

In the modification of FIG. 4 the internal construction of the muffler is substantially the same as that of FIG. 2 but the housing 13' is reduced in diameter by swaging or otherwise, as seen at 101, and the outlet (and inlet) bushing 63' is formed as a monolithic or integral part of the housing thereby eliminating the need for the end headers 17 or 19 and the adjacent support partitions 21 and 23.

In operation, gas from the exhaust pipe 7 enters the muffler through the inlet bushing 55 and passes into the enlarged area and volume of the inlet chamber 35. From the chamber 35 the gas enters the reduced area of the inlet pipe 71 until it is discharged into the enlarged area formed by the volume of chamber 37 adjacent the partition 25. The gas then reverses its direction of flow and heads back through chamber 37 toward the inlet of the muffler until its direction of flow is reversed by partition 23 to cause it to enter the smaller outlet tube 73. It is discharged from tube 73 into the central expansion chamber 39 from which it enters the smaller inlet conduit 75 of the triflow set 69 to follow a similar pattern of double reversal, i.e., three paths of flow in chamber 41, and discharge by outlet conduit 77 into the enlarged chamber 43. From chamber 43 the gas flows from the outlet bushing 63 into the tailpipe 11 and then to atmosphere.

In the case of the muffler embodying the modification of FIG. 4, the outlet chamber 43 (and inlet chamber) would be shaped as indicated in FIG. 4.

The various changes in cross section of the flow path which the gas must follow as it travels through chambers to conduits remove a substantial amount of acoustic energy from the pulsating gas. The central expansion chamber 39 is of a relatively large size and provides for rather broad-based note control or tuning as do, to a lesser degree, the expansion inlet and outlet chambers 35 and 43. The optimum volume of expansion of the central expansion chamber 39 is determined by the size of the engine being silenced. Its placement between the triflow sections 67 and 69 minimizes turbulence and back pressure and improves attenuation. The lower patches 89 in the conduits in conjunction with the crossflow chambers 37 and 41 attenuate high frequencies and roughness and provide some crossflow to keep back pressure as low as possible. The total construction is very effective in removing high and medium frequencies but is deliberately designed to be only partially effective on the lower frequencies so that the deep tone sound of generated horsepower is audible.

The relatively simple construction of muffler 9 therefore provides low back pressure, high performance sound-attenuating means in a long, slim housing which is shaped for external mounting on the outside of an automobile to provide the "show and the go" desired in sports cars. Either end of the structure shown may be the inlet and the same unit may be used with different models and different makes of automobiles of substantially the same engine displacement. As indicated above, the muffler 9 is normally used in pairs, one on each side of the vehicle.

I claim: 1. A muffler comprising a long, slim housing having an inlet means at one end and an outlet means at the other end, transverse partition means in the housing providing a housing-wide expansion chamber located substantially at the longitudinal...
midsection of the housing, first gas conduit means mounted in the housing providing a first triflow gas path receiving gas from said inlet and discharging it into said expansion chamber, and second gas conduit means mounted in the housing providing a second triflow gas path receiving gas from said expansion chamber and discharging it into said outlet means.

2. A muffler as set forth in claim 1 wherein said inlet and outlet means each include a bushing extending externally of the housing and a housing-wide expansion chamber forming a part of the gas flow path through the muffler.

3. A muffler as set forth in claim 1 wherein said first and second gas conduit means each include a pair of overlapping perforated gas flow tubes and a housing-wide chamber containing said tubes.

4. A muffler as set forth in claim 3 wherein said inlet and outlet means each include a bushing extending externally of the housing and a housing-wide expansion chamber forming a part of the gas flow path through the muffler.

5. A muffler as set forth in claim 4 wherein said first and second conduit means are substantially identical in construction and said inlet and outlet means are substantially identical in construction.

6. A muffler as set forth in claim 5 wherein opposite longitudinal sides of the muffler are substantially symmetrical with respect to said expansion chamber and the inlet and outlet means are interchangeable.