

[54] FOLDED SHELL MUFFLER

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[58] Field of Search **181/35 C, 53, 54, 61, 57; 29/157 R, 455; 113/116 R**

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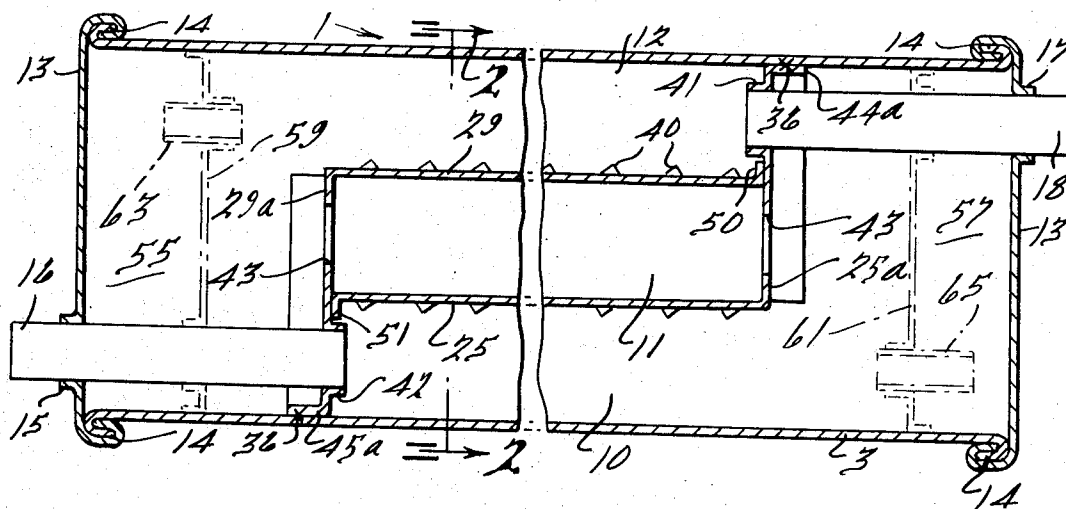
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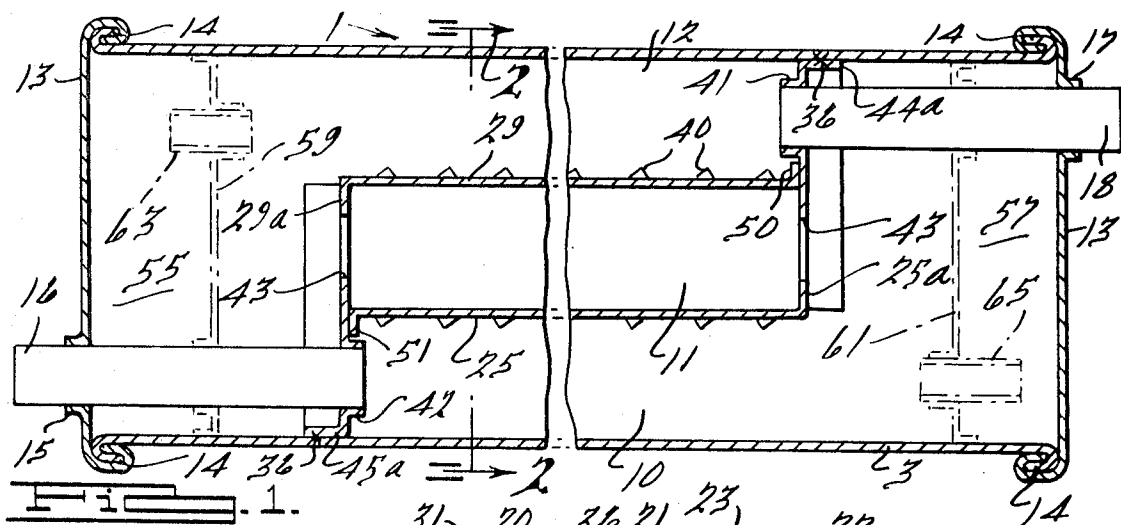
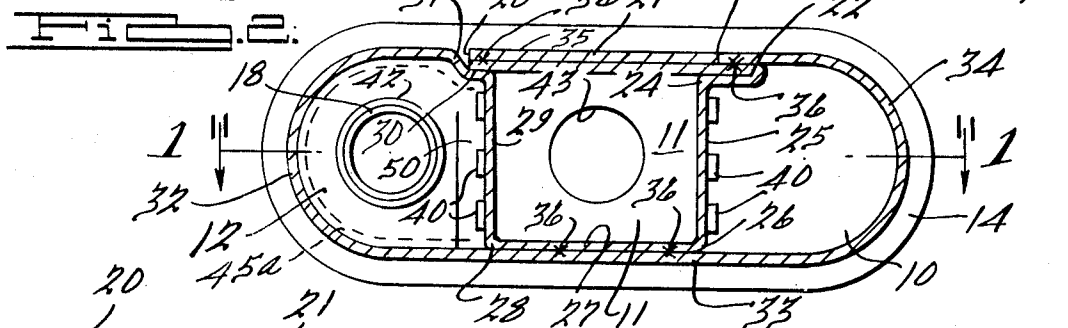
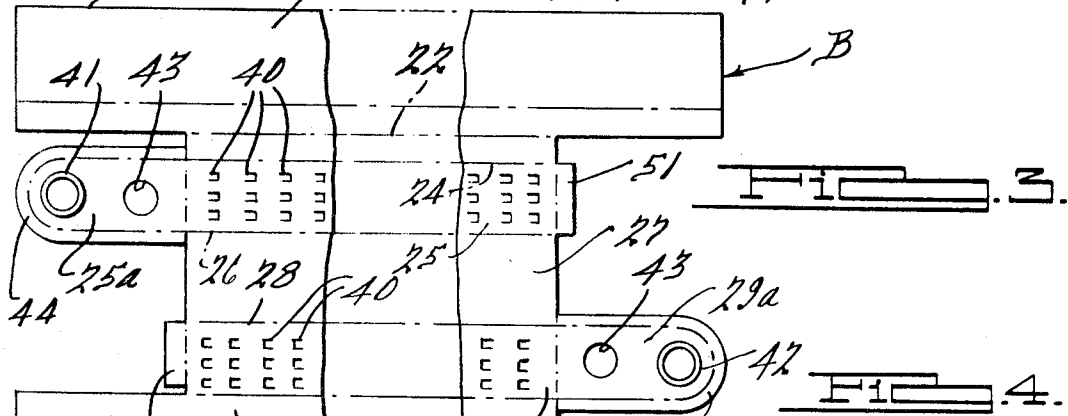
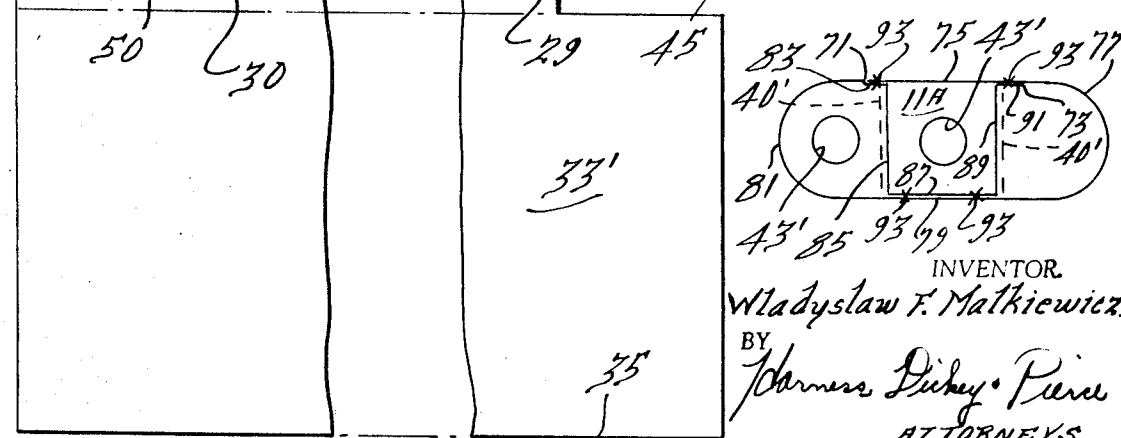
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[57] ABSTRACT

A gas silencing muffler has an external shell and inner gas passages formed from a single piece of sheet metal that is bent, folded, and welded to form a pair of exterior walls that define the shell and a pair of internal walls that define the gas passages.

6 Claims, 4 Drawing Figures





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FOLDED SHELL MUFFLER

BRIEF SUMMARY OF THE INVENTION

This invention relates to mufflers and, more particularly, to a muffler formed from a continuous wrapped sheet of metal.

More especially, this invention relates to a multi-chambered muffler in which a continuous sheet of metal is folded and wrapped or bent to form three chambers, all of which are integral with one another and in which the contacting parts are secured together by welds or the like to maintain the chamber-like formation of the folded sheet. This invention is shown in connection with a tri-flow muffler unit in which the muffler is provided with three passages, to wit: an outer inlet passage, an intermediate passage, and another outer passage constituting an outlet passage.

It is therefore a principal object of this invention to provide a substantially one-piece muffler in which a plurality of gas passages are formed from a single sheet of metal that is bent, folded, and united into an integrated structure by welds or the like at the points of contact of the folded and bent sheet.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view through a muffler constructed in accordance with this invention taken substantially on the plane indicated by line 1—1 in FIG. 2;

FIG. 2 is an enlarged cross sectional view taken substantially on the plane indicated by line 2—2 of FIG. 1;

FIG. 3 is a plan view on a smaller scale of the blank from which the muffler is formed; and

FIG. 4 is a line schematic drawing similar to FIG. 2 showing a modified construction.

DESCRIPTION OF THE INVENTION

The automotive exhaust gas muffler 1 illustrated is formed essentially from a blank sheet of metal B, such as shown in FIG. 3 of the drawings. The muffler comprises an outer shell 3 containing an inlet chamber or passageway 10, an intermediate or return passage or chamber 11, and an exhaust passage or chamber 12. The ends of the shell 3, as shown in FIG. 1, are closed by separate headers 13 which are secured to the muffler body by suitable means such as folded seams 14. The header 13 at the inlet end of the muffler is flanged as at 15 to support a tubular inlet bushing 16. The header 13 at the outlet end of the muffler is flanged as at 17 to support a tubular outlet bushing 18.

The sheet metal blank B which is shaped and apertured by a suitable press operation is folded and wrapped or bent to form the three passageways or chambers 10, 11 and 12. The manner in which this is accomplished can best be understood by reference to FIGS. 2 and 3.

The reference character 20 in FIG. 2 indicates both edges of the blank B adjacent the top 21 of the muffler. The portion of the blank adjacent the lower edge forms a layer 23 which at 22 is folded back upon itself and then bent or folded as at 24 to form the right side wall 25 of the return passageway 11. The sheet is then bent at 26 at substantially right angles to form the bottom wall 27 of the return passage 11. The blank is further bent at right angles as at 28 to form the left side wall 29 of the return passage 11.

The wall 29 is then bent to form a ledge 30 providing a shoulder 31 to receive the end 20 of the blank. The blank section 33' is then shaped to form a rounded side portion 32 which forms the outlet passage or chamber 12 of the muffler. The blank section 33' is then bent to form a straight extended bottom portion 33 which is then bent to form a rounded side portion 34 which constitutes the inlet passage or chamber 10. The end section 35 of the blank rests on the ledge at 22 and is extended over layer 23 to terminate above ledge 30 to give a two layer top structure 21.

As shown in FIG. 2, the blank is spot welded to itself, as indicated at the spot welds 36, to integrate the structure and to maintain the sheet in its folded and bent condition. The walls 25 and 29 of the intermediate or return passage are provided with louvered openings 40.

As shown in FIG. 3, the walls 25 and 29 are formed with tab-like portions 25a and 29a on the blank. The tab 25a is provided with a flanged opening 41 to support the inner end of the outlet bushing 18, and the tab 29a is formed with a flanged opening 42 to support the inner end of the inlet bushing 16. Each of the tabs 25a and 29a are preferably provided with an opening 43 to permit the passage of the exhaust gases therethrough. However openings 43 may be optionally located in place of a patch of louvers 40 in walls 25 and/or 29.

The tab portion 25a is provided with a marginal portion 44 adapted to be bent at right angles to form a flange 44a and for welding to an adjacent portion of the wall 33 of the muffler. The tab 29a is provided with a similar portion 45 to form a flange 46a adapted to be welded to an adjacent portion of the adjacent wall. The welds are indicated at 36. This supports the intermediate or return passage 11 centrally of the muffler.

The wall portion 25 of the blank at one end thereof is provided with a flange 51 adapted to be bent at right angles to engage the end wall 29a. The wall portion 29 of the blank at one end thereof is provided with a flange 50 adapted to be bent at right angles to engage the end wall 25a. These wall portions may be alternately fitted with twist tabs which can be fastened through slots in 25a and 29a to rigidize the structure.

In operation, the exhaust gases enter through the inlet bushing 16 into chamber 10 from which some may cross bleed through the louvered openings 40 while the main body flows through the righthand opening 43 into the intermediate or return passage 11. The gases flow rearwardly through this passage 11 and out through opening 43 at the left or forward end of the passage, some gas being able to cross bleed into passage 12 through the louvers 40. The gas in passageway 12 flows out through the outlet bushing 18. The retrovert passage, the louvers, and the changes in volume all attenuate sound in the gas as it flows through the unit.

From the foregoing, it will be evident that there is provided a substantially one-piece muffler in which the three passages or chambers of a tri-flow muffler are formed from a single sheet of metal or the like, bent and folded so as to provide the three passages in superposed relation, and united into an integrated structure by welds or the like at the points of contact of the folded and bent sheet. It can be seen from FIG. 2 that a tube within a tube (square passage 11 inside an oval shell) is formed from a single piece of metal properly blanked and folded.

It is to be noted that since the passage 11 is less than the length of the shell 3 relatively large spaces 55 and 57 are formed, respectively, at the inlet and outlet ends of the muffler. These may be utilized as Helmholtz tuning chambers and tuned to attenuate desired lower frequencies by providing transverse partitions 59 and 61 to close off the spaces 55 and 57 except for the tuning tubes 63 and 65 that are mounted on the partitions. By selecting the proper volume of each chamber and length and area of tuning tube for each chamber, the frequency to be attenuated thereby can be predetermined.

FIG. 4 illustrates a modified fold arrangement for a one-piece structure wherein one longitudinal edge of the blank is shown at 71 and the other at 73. Starting with the edge 71 there is a top section 75 and then the curved right side section 77 which blends into the bottom section 79. From the bottom, the blank is curved through the side section 81 and then may be offset to provide the ledge 83 that supports the end 71. From ledge 83, the blank extends at right angles to form one side 85 of the intermediate passage 11A and then at right angles to form the bottom side 87 of the passage and then, again, at right angles to form the other side 89 of the passage. Finally, the blank at the top of side 89 extends at right angles to form a flange 91 that terminates in edge 73 and acts with ledge 83 to form a support and weld assembly with the top section 75, welds being indicated at 93. Louvers 40' and openings 43' are provided in the structure of FIG. 4 as well as the other appropriate details shown in FIGS. 1-3. Operation of the muffler of FIG. 4 is the same as that of FIGS. 1-3.

The actual folding sequence for the unit of FIG. 4 will be adjusted to suit available machinery and tooling. Presently it is preferred to start with edge 73 and allow sufficient length for flange 91 prior to bending sheet at right angles to form one side 89 of the intermediate passage 11A and then at right angles to form the bottom side 87 of the passage and then, again at right angles to form the other side 85 of the passage. There is then a bend at right angles to provide ledge 83, which offset may be included before forming curved section 81 which blends into bottom section 79. From there is formed the right side curved section 77 and top section 75 which terminates at 71. The weld assembly is formed by spot welds 93 as indicated.

Modifications may be made without departing from the spirit and scope of the invention.

I claim:

1. In the method of making an elongated oval shaped silencing muffler having a length and a major width and a minor width, said muffler including an outer tubular oval shell and at least one pair of parallel internal longitudinally extending flat walls of less length than said shell and extending across the minor width of the shell, the steps comprising first, forming a flat blank having a

first section with a length substantially equal to the length of the shell and a second section joined to the first and having a length substantially equal to the length of the walls, and second folding said blank into oval form with said first section on the outside to form at least part of said shell and said second section in the shape of a rectangular internal tube on the inside of the shell, and securing the rectangular tube on opposite minor width sides to the outer shell.

2. A method as set forth in claim 1 wherein said first step includes forming a third section in said blank which is attached to said second section and which is substantially the same length as the first section and the combined widths of the first and third sections is at least equal to the perimeter of the shell and said second step includes the substeps of forming a part of a shell with said first section and folding said second section to form said internal tube with the first section and then folding the third section onto said shell around the internal tube.

3. A method as set forth in claim 2 wherein said first step includes forming said second section so that it has a width substantially equal to the height of two of said walls plus the distance between said walls and forming louvers in at least one of said wall portions.

4. A method as set forth in claim 3 wherein said first step includes forming extensions on said second section in alignment with the two wall portions and said second step includes bending said extensions at angles to the wall so that said extensions form transverse partitions extending from the wall to the shell.

5. In a muffler for silencing gases having an oval shaped outer shell and inner gas passages, a one-piece monolithic sheet member having first and second parallel longitudinally extending coextensive end edges, said sheet member including a pair of parallel external wall sections defining the top and bottom of the outer shell and curved side sections joining the wall sections, said sheet further including a pair of parallel internal flat wall sections forming longitudinal partitions extending transversely to the first wall sections and across the minor width of the oval shell and a flat connecting wall section joining the internal wall sections and extending at substantially right angles thereto and parallel to the exterior wall sections, said internal wall sections being engaged opposite sides with opposite sides of the shell across the minor width of the shell and furnishing transverse support for said oval shell, said internal wall sections being shorter than the external wall sections and defining said inner gas passages.

6. A muffler as set forth in claim 5 wherein each of said flat internal wall sections includes as a part of said sheet an extension extending at right angles to the wall section and forming a transverse partition in said shell, said shell having end headers closing opposite ends, and inlet and outlet gas flow bushings supported in said headers and extensions.

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