Nov. 20, 1962 W. H. POWERS ET AL 3,064,336

METHOD OF MAKING MUFFLERS

Original Filed Dec. 5, 1955 2 Sheets-Sheet 1

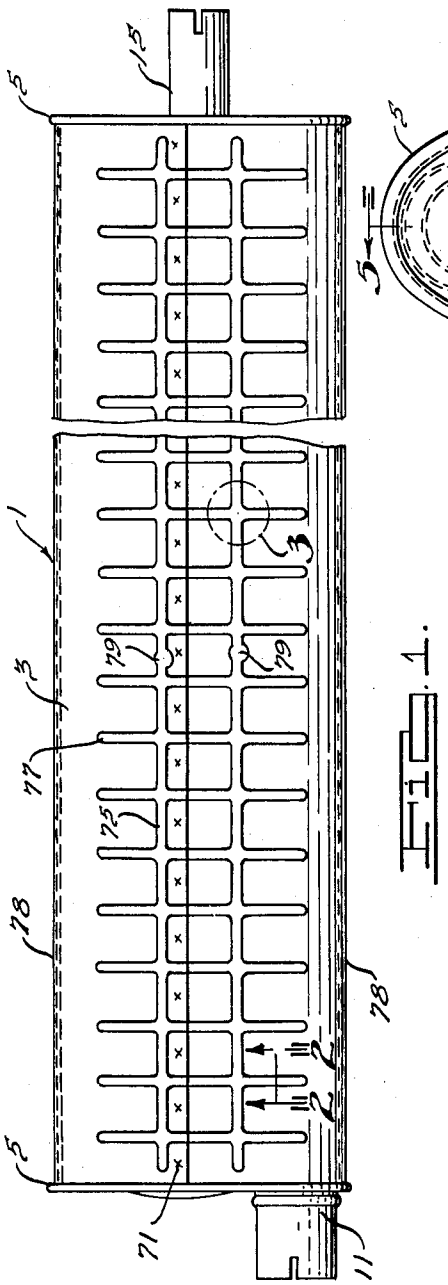


FIG. 1.

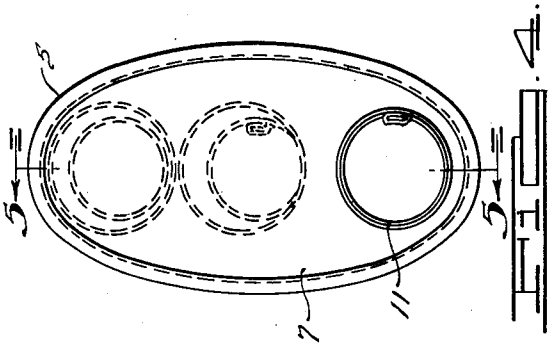


FIG. 4.

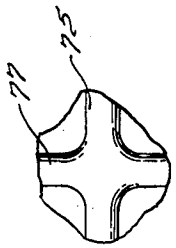


FIG. 3.



FIG. 2.

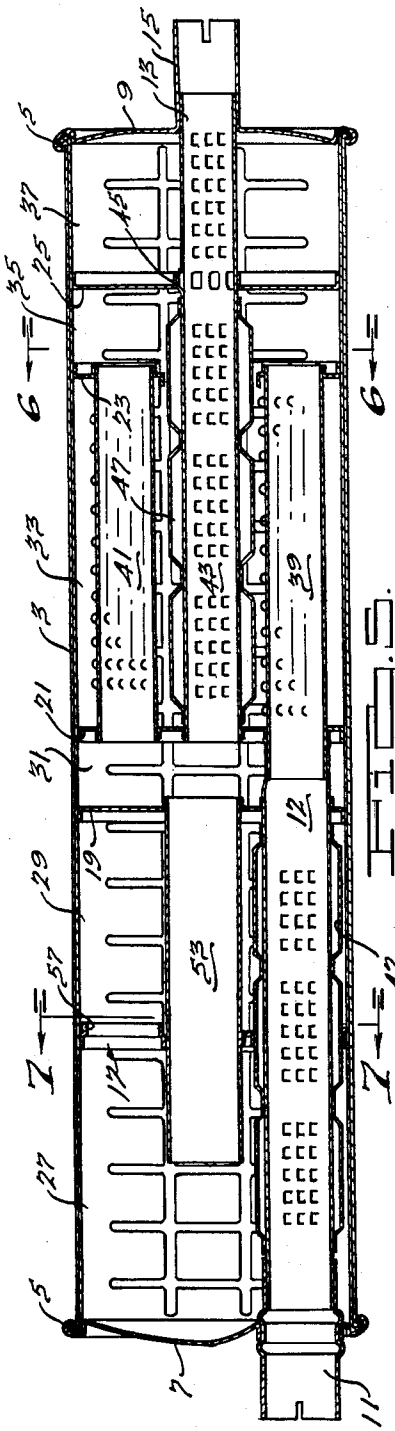
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METHOD OF MAKING MUFFLERS

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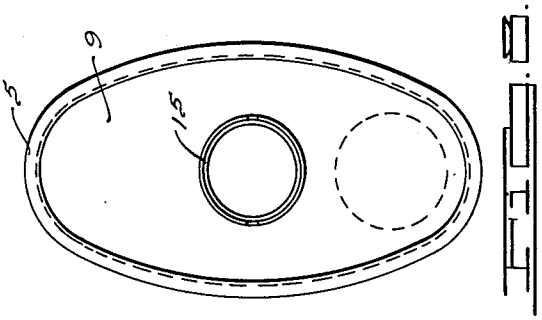


FIG. 8.

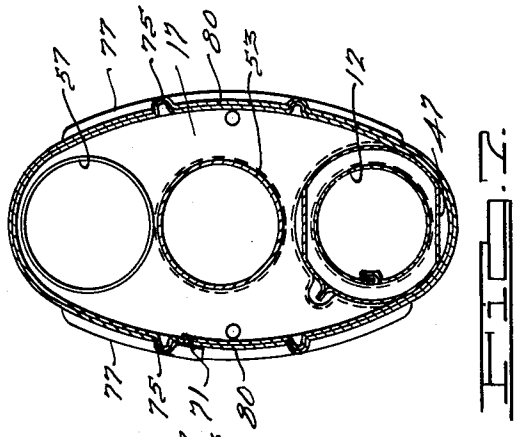


FIG. 7.

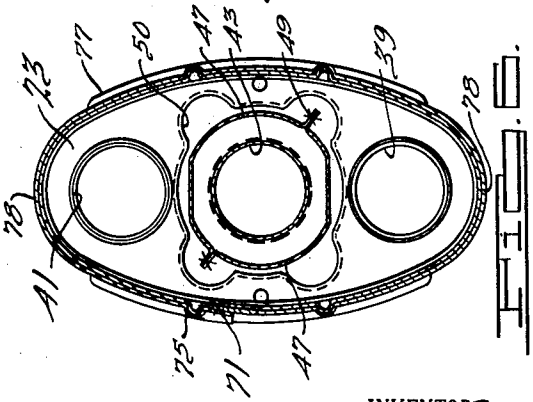


FIG. 6.

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METHOD OF MAKING MUFFLERS

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Original application Dec. 5, 1955, Ser. No. 551,043. Divided and this application Sept. 16, 1959, Ser. No. 846,223

2 Claims. (Cl. 29—157)

This application is a division of application Serial No. 551,043, filed December 5, 1955, now abandoned.

This invention relates to a method of making mufflers and, in particular, to casings for mufflers of the type ordinarily used in exhaust systems for automobiles and trucks.

One object of this invention is a method of stiffening the casing of mufflers by means of ribs which are readily formed therein in the manufacturing process. The ribs tend to stiffen the casing and make it possible to reduce the amount of metal used to obtain proper strength and they also tend to reduce vibrations of the muffler shell itself.

We accomplish this and other objects by means of ribs that are arranged at angles to each other, preferably transversely and longitudinally of the muffler. The ribs are formed in such a way that they can be easily added to the shell or casing in the course of manufacture of the muffler.

A preferred construction embodying the principles of our invention is shown in the accompanying drawings in which:

FIGURE 1 is a side elevation of a muffler embodying the invention;

FIG. 2 is an enlarged cross section taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged view of an intersection of the transverse, longitudinal ribs as taken within the circle 3 of FIGURE 1;

FIG. 4 is an end elevation taken from the left of FIG. 1;

FIG. 5 is a cross section through the muffler taken along the line 5—5 of FIG. 4;

FIG. 6 is a cross section taken along the line 6—6 of FIG. 5;

FIG. 7 is a cross section taken along the line 7—7 of FIG. 5; and

FIG. 8 is an end elevation taken from the right of FIG. 5.

As shown in FIGURE 1, the muffler 1 includes a casing 3 which is interlocked at 5 with the end headers 7 and 9 to form a closed interior. Within the casing 3 is silencing structure of a suitable design including an inlet bushing 11 and an outlet bushing 15 formed in the outlet header 9. A series of partitions 17, 19, 21, 23, and 25 divide the space within the casing 3 into a series of chambers 27, 29, 31, 33, 35, and 37. The inlet bushing 11 supports an end of the perforated inlet tube 12 and the other end of the tube is supported in a flanged opening in the partition 19. The end of the tube 12 also has a slide fit with a perforated continuation tube 39, the other end of which tube is supported in a flanged opening in the partition 23. Supported in the partitions 21 and 23, in flanged openings therein, is a perforated return tube 41. A perforated outlet tube 43 is supported at its inner end in a flanged opening in partition 21 and by means of circumferentially spaced embossments on its outer surface in a flanged opening in the partition 25, as shown at 45. The tubes 12 and 43 have a series of louvers or openings formed therein and located around these openings is a pancake construction consisting of split shells 47, the halves of which have flanges that are secured together as shown at 49. These

surround the openings in the tube and define high frequency spit chambers to attenuate sounds in the exhaust gases. The tubes 39 and 41 also have suitable openings or louvers formed therein which open into the chamber 33. The chamber 33 and the chamber 35 are connected by the flanged opening 50 in partition 23 around pancake section 47 (FIG. 6). The tube 13 has openings 51 formed therein opening into a chamber 37, these openings being the only outlet to said chamber so that it acts as a resonator chamber. Mounted in the partitions 17 and 19 is an imperforate tube 53 which connects chamber 31 with chamber 27. Chamber 27 is connected with chamber 29 by means of openings 57 in the partition 17 so it will be seen that chambers 27 and 29 form a compound resonator construction receiving gas from the chamber 31.

Gas will enter the inlet bushing 11 and flow through the tube 12 into the tube 39 and thence through the cross-over chamber 35 into the tube 41. From the tube 41 they will enter cross-over chamber 31 and then tube 43 and pass out of the muffler through the bushing 15. The pancake assemblies 47 around tube 12 and tube 43 will remove high frequency sounds. Other frequencies in gas passing through tubes 39 and 41 will be removed in chamber 33, and the opening 50 between chambers 33 and 35 will suppress further noise. Lower frequencies will be removed in compound resonator chambers 27 and 29 which reached through tuning tube 53 and still other low frequencies can be removed in resonator chamber 37.

Turning now to the construction of the casing 3, it will be seen that it preferably comprises an oval-shaped, double wrapped layer of originally flat metal which is wrapped around twice and then interlocked by spot welding in a three-layer joint shown at 71. The muffler therefor comprises an oval-shaped piece of material that is wrapped around itself into two layers and then spot welded in an overlapped joint consisting of three layers. This is done, of course, prior to the insertion of the various silencing elements and prior to attachment of the end heads 7 and 9. While it is in this oval open-ended condition, and the sides thereof are plain or blank, the longitudinal ribs 75 and the transverse ribs 77 are formed in both layers of metal as clearly seen in FIGS. 2, 6, and 7. These ribs extend outwardly, that is they constitute raised surfaces on the outside of the casing 3 and the transverse ribs 77 terminate inwardly of the sides 78 of the casing. This arrangement has peculiar advantages insofar as practical manufacture of the casing is concerned. They are formed by passing about one-half the length of the casing 3 over a male die which is thus on the inside and which contains ridges or ribs on its outer surface corresponding to the ribs 75 and 77. The inner die is enough smaller than the minor width or diameter of the casing 3 to permit spring back of the metal to substantially lift the casing off the die and the ribs thereon. A female outer die is then brought into engagement with the outer surface of the casing 3 so as to press it down over the ribs against the inner die member. It would normally be expected that difficulty would be encountered in removing the inner die member after the formation of such ribs. However, we have found that the spring back of the metal in combination with the shortened length of transverse ribs 77 is enough to enable the casing 3 to be readily removed from the inner die. We contemplate forming the ribs in only about half of the length of the casing at a time and in order to insure alignment when the casing is turned end for end to form ribs in the other half, we preferably provide the circular enlargements 79 at the inner ends of at least one of the longitudinal ribs 75. When the ribs are then formed in the other end, it is a simple matter to align the ends of the ribs 75 with the circular portion 79 and thus secure proper alignment.

It will be noted that the ribs 77 do not extend over

the full width of the muffler. Thus there are no ribs on the die near the sides 78 and spring back of the flatter and relatively flexible central portions 80 of the casing will lift the casing off the die so that it can be removed from the die after ribs 75 and 77 are formed in it. The longitudinal ribs 75 preferably terminate inwardly of the ends of the casing so as not to provide stiffness in that section of the end of the casing which will be turned around and interlocked in the joint 5 with the end headers 7 and 9. The intersection of the ribs 75 and 77 is provided with suitable radii as shown in FIGURE 3.

It will now be seen that we have provided an improved muffler and that changes can be made in the specific structure shown herein without departing from the spirit and scope of the invention.

We claim:

1. The method of making a muffler which comprises forming a metal shell open at both ends, placing said shell over an inner die having outwardly projecting and intersecting ribs, the width of said inner die at said ribs being relatively less than the width of the shell opposite the ribs and the ribs extending laterally of said inner die relatively less than the width of said shell generally normal

to said first mentioned shell width thereby to condition said shell for removal from said inner die due to spring back of said shell, compressing said shell against said inner die to form ribs in the shell, removing said shell from the die upon spring back of the shell, inserting gas silencing structure in the shell, and attaching end headers to both ends of the shell.

2. The invention set forth in claim 1 wherein said ribs are formed in two operations each from a different end of the shell and said ribs are aligned by forming an enlargement at the end of a rib formed in the first operation.

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