

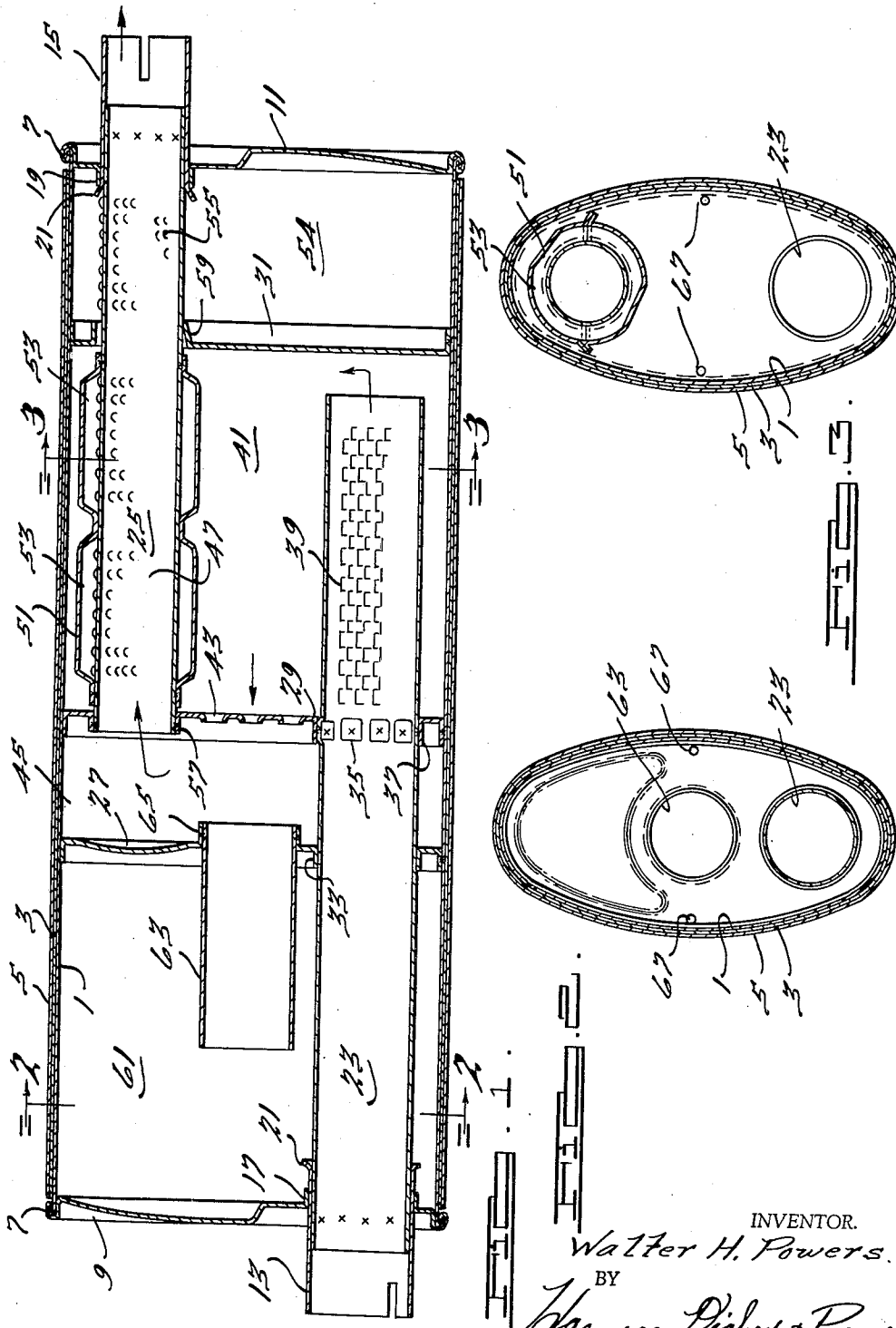
May 29, 1962

W. H. POWERS

3,036,655

MUFFLER

Filed Oct. 4, 1957



INVENTOR.
Walter H. Powers.
BY
Harnes, Dickey & Pura
ATTORNEYS.

1

3,036,655
MUFFLER

Walter H. Powers, Jackson, Mich., assignor, by mesne assignments, to Walker Manufacturing Company, Racine, Wis., a corporation of Delaware
Filed Oct. 4, 1957, Ser. No. 688,270
10 Claims. (Cl. 181-54)

My invention relates to mufflers and, in particular, to mufflers of the type used to silence the exhaust gases of automotive internal combustion engines.

It is an object of my invention to provide a muffler construction for present day automobiles which may be produced at a reduced cost of manufacture and which will effectively silence the exhaust gases.

In accordance with my invention, a multi-function chamber is provided in a tri-flow type muffler. This chamber serves to cause reversal of flow, provides a cross over connection, and serves as a spit chamber. It also incorporates features for breaking slugs of gases into small streams and for reducing pulsing of the gases. It also provides a volume in which small spit chambers may be disposed about one of the tubes.

These features are illustrated in the accompanying drawings in which:

FIGURE 1 is a longitudinal cross section through the improved muffler;

FIG. 2 is a section taken along the line 2-2 of FIG. 1; and

FIG. 3 is a section taken along the line 3-3 of FIG. 1.

The muffler shown in the drawings has a shell construction which consists of an inner shell 1, a layer of asbestos or the like 3 over the inner shell, and an outer shell 5. The shells are preferably oval in shape as can be seen best in FIGS. 2 and 3. The opposite ends of the inner shell 1 are interlocked in beads 7 with the inlet and outlet headers 9 and 11 respectively. Inlet and outlet bushings 13 and 15 respectively are inserted in inturned flanges 17 and 19 respectively on the inlet and outlet headers 9 and 11. The bushings 13 and 15 have flared ends 21 on the inside and they are spot welded to the flanges 17 and 19. An inlet tube 23 is spot welded to the inlet bushing 13 and extends into the muffler. An outlet tube 25 overlaps the inlet tube 23 and extends through the outlet bushing 15 and is spot welded to it.

There are three transverse partitions within the muffler shell 1 which are designated from left to right by the reference numerals 27, 29, and 31. Each of these has flanges formed around its periphery whereby the partitions can be spot welded to the inner shell 1. The flanges of the partitions 27 and 29 face the inlet header 9 while the flange of the partition 31 faces the outlet header 11. The partitions 29 and 31 along with the tubes 23 and 25 are formed as a subassembly which is inserted in the muffler shell. After such insertion the partitions 31 and 29 are spot welded in place. This can be done readily through the open ends of the shell since their flanges face, respectively, toward the inlet and outlet ends. After these parts have been inserted, the partition 27 is inserted from the inlet end and it has a slip fit over the tube 23. When it is in proper position it is spot welded to the shell 1. After this has been done, the inlet and outlet headers 9 and 11 are forced over the ends of the tubes 23 and 25 and their bushings spot welded to the tubes 23 and 25. Either before or after this has been done, the beads 7 can be rolled to interlock the headers 9 and 11 with the ends of the shell.

The inlet tube 23, as already indicated, extends with a tight fit through a flanged opening 33 in the partition 27. It has embossments 35 formed on it which fit in a flanged opening 37 in the partition 29 and provide means for spot welding the tube 23 to the partition as a subassembly

2

prior to insertion in the muffler. The inner end of the inlet tube 23 is provided with a series of louvers 39 within the chamber 41 that is located between the partitions 29 and 31. The open end of the inlet tube 23 is spaced a slight distance toward the inlet end from the partition 31 so that gas entering the muffler through the inlet tube will flow out of the end of the tube and transversely in the chamber 41, slugs of gas impinging upon the partition 31 and being partially broken up. Gas leaves the chamber 41 through a series of flanged openings 43 that are formed in the partition 29. These have necks or flanges which extend toward the inlet end, i.e., downstream, the openings preferably being about 1/2 inch in size and 16 in number. Thus, they provide little resistance to the flow of gas but are effective in breaking the gas slugs up into smaller streams and thus reducing pulsation.

The gas leaving the chamber 41 enters a cross over chamber 45 which is provided between the partitions 27 and 29. From this chamber the gas can flow into the inner end of the outlet tube 25 and down the length of the outlet tube through the bushing 15 to the tail pipe. The outlet tube 25 is provided with two series of louvers 47 and around them is a split shell type spit chamber forming construction 51 which provides two spit chambers 53. The space between the partition 31 and the outlet header 11 constitutes a large volume spit chamber 54 into which gas can communicate through the louvers 55 in the outlet tube. The outlet tube 25 is supported in a flanged opening 57 in the partition 29 and also in a flanged opening 59 in the partition 31, being spot welded to both these partitions at a subassembly prior to insertion in the muffler as already indicated.

Low frequency sounds are removed by a resonator chamber 61 which is provided between the inlet header 9 and the partition 27. A tuning neck 63 aligned with openings 43 is mounted in the flanged opening 65 of the partition 27 and spot welded to it at subassembly and constitutes the only inlet and outlet to chamber 61.

In order to minimize corrosion and provide for the removal of liquid condensate within the muffler, the top and bottom sides of each of the partitions 27, 29, and 31 are provided with 1/4 inch openings 67 that are located as close to the shell 1 as possible. With this arrangement the water within the muffler can slosh back and forth from one chamber to another and when it is in the warmest chamber, i.e., the chamber 41, it will be vaporized and removed by passage out through the outlet tube 25.

It will be noted that the chamber 41 serves to perform several functions. It provides a cross over chamber through which the gases leaving the tube 23 can flow in order to reach the outlet tube 25. It also provides a return flow chamber so that gases can reach the cross over chamber 45 and the tuning tube 63. It also serves as a spit chamber to act on gases or sound waves passing through the louvers 39 in the inlet tube 23. It also provides space to house the pancake spit chamber construction 51 around the outlet tube 25. Thus, the present muffler arrangement provides a simplified, economical construction which embodies three different size spit chambers, a resonator chamber, a tri-flow pattern, and two means for breaking up slugs of gas.

I claim:

1. In a muffler construction, a shell providing an elongated chamber, a pair of transverse partitions next to each other in said chamber, a pair of gas overlapping conveying tubes in said chamber, one of said tubes extending through both of said partitions, the other of said tubes extending through one of said partitions and terminating in spaced relationship from the other partition to empty in the space between said partitions, said two tubes comprising the only gas conveying tubes in the space between said partitions, the space between said

3

partitions constituting a cross over chamber and a return flow chamber and providing the only path for the passage of gas from one tube to the other, and a substantial number of small but nonrestrictive outlet openings in said one of the partitions permitting gas to flow from said space to the other of said tubes.

2. The invention set forth in claim 1 including louvers formed in that portion of one of the tubes within the space between the partitions and a shell means around said louvers in said tube located within the space between the partitions.

3. The invention set forth in claim 2 including a third partition, and a tuning tube supported in the third partition and located in alignment with said openings in said partition.

4. In a muffler construction, a shell, inlet and outlet headers closing the ends of the shell, a pair of transverse partitions next to each other in the shell, an inlet tube extending through one of the partitions and terminating short of the other partition and projecting as a cantilever into the space between said partitions, an outlet tube overlapping the inlet tube and extending through both of the partitions and through the outlet header, louvers formed in that portion of the inlet tube within the space between the two partitions, and openings in one of the partitions to provide for flow of the gases from the inlet tube through the space between the partitions to the outlet tube, the entire cross-section of the shell between said partitions comprising a return flow path for gas leaving the inlet tube.

5. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the outlet header, said tubes being transversely spaced from each other and extending longitudinally of the shell and overlapping each other so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, a first transverse partition in the shell between the outlet header and the outlet end of said inlet tube, a second transverse partition in the shell at the inlet end of the outlet tube, said tubes overlapping in the space between said partitions and said inlet tube projecting as a cantilever into said space, each of said tubes having openings formed in the side walls thereof in said space, a shell in said space around the openings in one of the tubes, said second partition having a multiplicity of downstream flanged nonrestrictive openings whereby gas can flow in said space from the inlet tube back toward the inlet header and through said flanged openings, said space comprising the only path for gas to flow from the inlet to be outlet tube, a third partition in said shell between said second partition and said inlet header and defining with said inlet header a resonator chamber, a tuning tube supported on said third partition and aligned with said flanged openings and providing the sole inlet and outlet to said resonator chamber, said transverse partitions having peripheral flanges spot welded to said shell, the flanges of the second and third partitions facing said inlet header and the flange of the first partition facing the outlet header, said inlet tube extending through an opening in the third partition and being spot welded to a flanged neck in the second partition, said outlet tube being spot welded to flanged necks in said first and second partitions, the space between said first partition and outlet header comprising a spit chamber, said outlet tube having openings in that portion thereof extending through said spit chamber.

6. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the outlet header, said tubes being transversely spaced from each other and extending longitudinally of the shell and

4

overlapping each other so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, a first transverse partition in the shell between the outlet header and the outlet end of said inlet tube, a second transverse partition next to the first partition in the shell at the inlet end of the outlet tube, said tubes overlapping in the space between said partitions, each of said tubes having openings formed in the side walls thereof in said space, a shell in said space around the openings in one of the tubes, said second partition having a multiplicity of downstream flanged nonrestrictive openings whereby gas can flow in said space from the inlet tube back toward the inlet header and through said flanged openings, said space comprising the only path for gas to flow from the outlet end of the inlet tube to the inlet end of the outlet tube, said transverse partitions having peripheral flanges spot welded to said shell, the flanges of the second partition facing said inlet header and the flange of the first partition facing the outlet header, said inlet tube being spot welded to a flanged neck in the second partition, said outlet tube being spot welded to flanged necks in said first and second partitions, the space between said first partition and outlet header comprising a sound attenuating chamber, and means for connecting said chamber to gas flowing through the muffler.

7. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the outlet header, said tubes being transversely spaced from each other and extending longitudinally of the shell and overlapping each other so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, a first transverse partition in the shell between the outlet header and the outlet end of said inlet tube, a second transverse partition in the shell at the inlet end of the outlet tube and next to the first partition, said tubes overlapping in the space between said partitions, at least one of said tubes having openings formed in the side walls thereof in said space, said second partition having a multiplicity of downstream flanged nonrestrictive openings whereby gas can flow in said space from the inlet tube back toward the inlet header and through said flanged openings, said space comprising the only path for gas to flow from the inlet to the outlet tube, said transverse partitions having peripheral flanges spot welded to said shell, the flanges of the second partition facing said inlet header and the flange of the first partition facing the outlet header, said inlet tube being spot welded into a flanged neck in the second partition, said outlet tube being spot welded to flanged necks in said first and second partitions.

8. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the outlet header, said tubes being transversely spaced from each other and extending longitudinally of the shell and overlapping each other so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, the path for gas flow from said inlet tube toward said outlet tube consisting of the entire cross-section of said shell, and a partition having a multiplicity of downstream flanged nonrestrictive openings in the only path for gas flowing between the tubes, said openings being about 1/2 inch in diameter and having flanged necks extending downstream, there being about 16 of said openings.

9. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the

5

outlet header, means including a transverse partition providing a chamber across the entire cross section of the shell, said tubes being transversely spaced from each other and extending longitudinally of the shell and overlapping each other in said chamber so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, said chamber forming the only path for gas leaving the inlet tube to flow to the outlet tube, said partition having a multiplicity of flanged nonrestrictive openings in the path of gas flowing through said chamber from the inlet tube to the outlet tube, a second partition in said shell located in line with said flanged openings and defining with one of said headers a resonator chamber, and a tuning tube supported on said second partition and aligned with said flanged openings and providing the sole inlet and outlet to said resonator chamber.

10. In a muffler, an elongated shell having inlet and outlet ends, inlet and outlet headers attached to the shell and closing said ends, said headers each having an opening therein, an inlet tube extending in the opening in the inlet header, an outlet tube extending in the opening in the outlet header, said tubes being transversely spaced from each other and extending longitudinally of the shell and overlapping each other so the outlet end of the inlet tube is closer to the outlet header than is the inlet end of the outlet tube, a first transverse partition in the shell between the outlet header and the outlet end of said inlet tube, a second transverse partition in the shell at the inlet end of the outlet tube and next to the first partition, said tubes overlapping in the space between said partitions,

6

said second partition having a multiplicity of downstream flanged nonrestrictive openings whereby gas can flow in said space from the inlet tube back toward the inlet header and through said flanged openings, a third partition in said shell between said second partition and said inlet header and defining with said inlet header a resonator chamber, a tuning tube supported on said third partition and providing the sole inlet and outlet to said resonator chamber, said transverse partitions having peripheral flanges spot welded to said shell, the flanges of the second and third partitions facing said inlet header and the flange of the first partition facing the outlet header, said inlet tube extending through an opening in the third partition and being spot welded to a flanged neck in the second partition, said outlet tube being spot welded to flanged necks in said first and second partitions, the space between said first partition and outlet header comprising a spit chamber, said outlet tube having openings in that portion thereof extending through said spit chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

25	1,541,275	Powell	June 9, 1925
	2,193,791	Hollerith et al.	Mar. 19, 1940
	2,337,300	Noblitt	Dec. 21, 1943
	2,618,354	Hedrick	Nov. 18, 1952
	2,652,128	Cary	Sept. 15, 1953
30	2,800,973	Cary et al.	July 30, 1957
	2,899,007	Morrish et al.	Aug. 11, 1959