Nov. 23, 1937. R. J. MacKENZIE ET AL 2,099,858

MUFFLER CONSTRUCTION

Filed Dec. 8, 1934 2 Sheets-Sheet 1

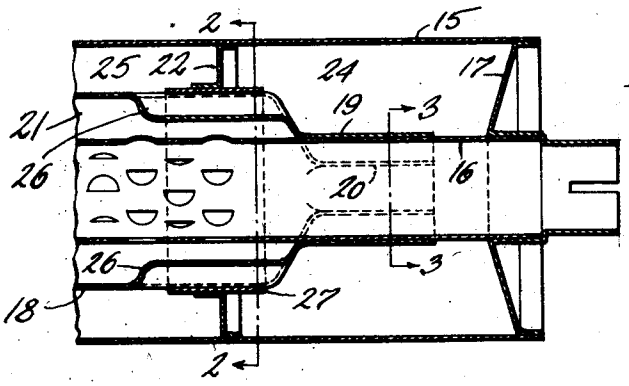


Fig. 1.

Fig. 2.

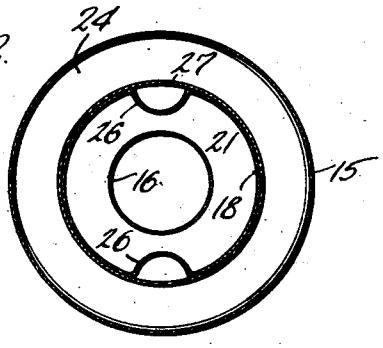


Fig. 3.

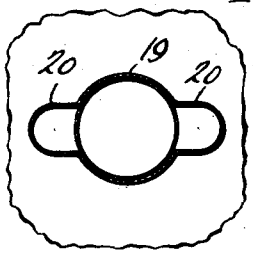
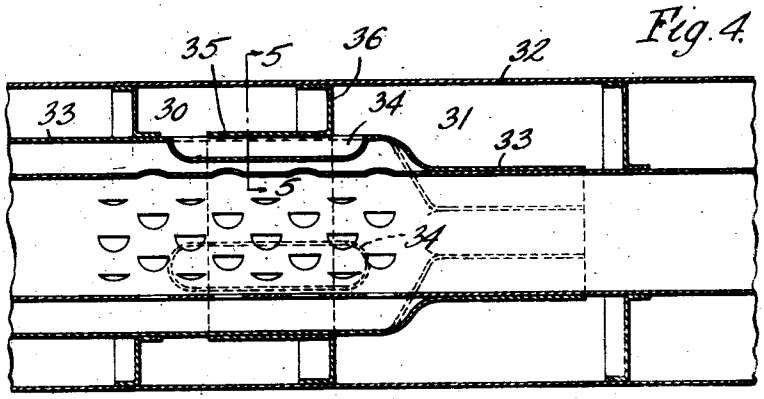


Fig. 4.



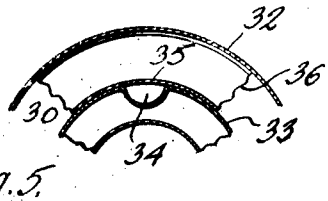


Fig. 5.

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Fig. 6.

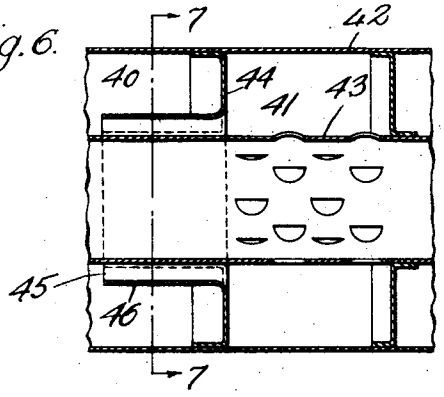


Fig. 7.

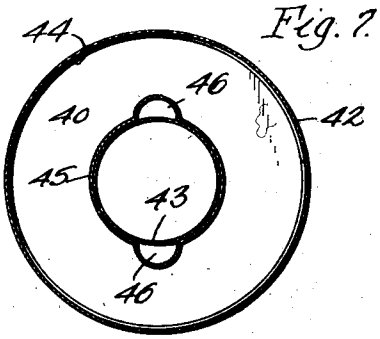


Fig. 8.

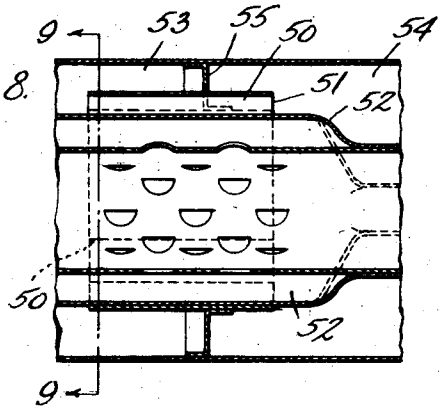


Fig. 9.

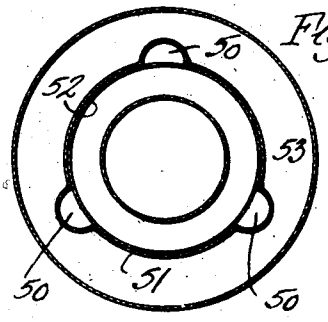


Fig. 10.

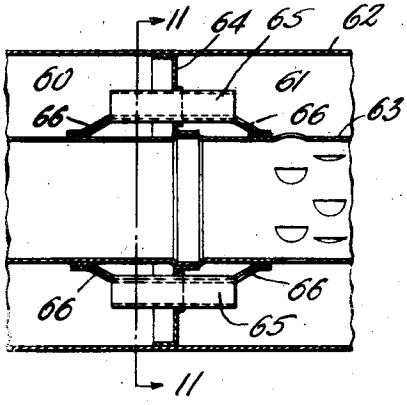
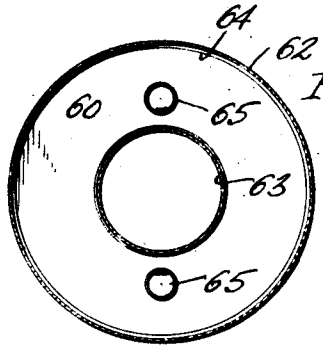


Fig. 11.



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MUFFLER CONSTRUCTION

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Application December 8, 1934, Serial No. 756,638

14 Claims. (Cl. 181—48)

This invention relates to improvements in mufflers or silencers of the kind which may be used for silencing noises resulting from the flow of gases, such, for example, as occur at the exhaust or intake of an internal combustion engine.

It has been found in mufflers of this kind that certain sounds or noises can best be eliminated by connecting two chambers by means of a sound conducting passage or tuning tube of materially smaller cross sectional area than that of the chambers and materially greater length than its diameter. In constructions heretofore used, these tuning tubes were generally made of tubing welded to a baffle connecting two adjacent chambers, and this construction consequently involved considerable expense.

The objects of this invention are to provide mufflers with sound conducting passages or tuning tubes of improved and inexpensive construction; also to provide a muffler with passages or tubes made entirely of sheet metal and secured to the muffler by inexpensive means; also to improve the construction of mufflers by providing the same with sound conducting passages which are formed by two adjacent portions of the muffler; also to improve the construction of mufflers in other respects hereinafter specified.

The improvements herein described may be applied to mufflers of any suitable or desired construction having more than one sound deadening or silencing chamber, and the portions of the mufflers shown in the accompanying drawings are for purposes only of illustrating the application of the sound conducting passages or tubes of this invention to mufflers, and it is understood that the invention is not limited to the particular muffler constructions shown.

In the accompanying drawings:

Fig. 1 is a fragmentary longitudinal central sectional view of a muffler provided with sound conducting passages embodying this invention.

Figs. 2 and 3 are transverse sectional views thereof respectively on lines 2—2 and 3—3, Fig. 1.

Fig. 4 is a fragmentary longitudinal central sectional view of a muffler showing sound conducting passages of another construction.

Fig. 5 is a fragmentary transverse sectional elevation thereof, on line 5—5, Fig. 4.

Fig. 6 is a fragmentary longitudinal central sectional view of the muffler provided with sound conducting passages of still another construction.

Fig. 7 is a transverse sectional view thereof, on line 7—7, Fig. 6.

Fig. 8 is a fragmentary longitudinal central sectional view of still another modified construction.

Fig. 9 is a transverse sectional view thereof, on line 9—9, Fig. 8.

Fig. 10 is a fragmentary longitudinal central sectional view of a muffler showing still another form of sound conducting passage.

Fig. 11 is a transverse sectional view thereof on line 11—11, Fig. 10.

Referring to Figs. 1 to 3, 15 represents the outer shell and 16 the inner shell of a muffler, and 17 a head at one end of the muffler. An intermediate shell 18 is arranged between the inner and outer shells and has its end provided with inwardly pressed or contracted portions 19 contacting with the inner shell 16. Other portions of the intermediate shell are bowed outwardly as indicated at 20, to form channels between the inner and intermediate shells through which sound waves or gas impulses may pass from a chamber 21 formed between the inner and intermediate shells. 22 represents a baffle, which is spaced between the outer and intermediate shells and separates the space between these two shells into resonance chambers 24 and 25.

In the embodiment of the invention illustrated in Figs. 1 and 2, sound conducting passages or tuning tubes are provided to connect the chambers 24 and 25, and for this purpose, the intermediate shell is provided with one or more inwardly pressed longitudinally extending grooves or channels 26, two of these channels being shown in the construction illustrated. A tubular member or sleeve 27 is arranged around the portion of the intermediate shell which is provided with the channels or grooves 26. It will be noted that the grooves or channels are of greater length than the sleeve 27, so that the ends of the channels may terminate in openings in the chambers 24 and 25 beyond the ends of the sleeve. The sleeve contacts through the greater portion of its inner surface with the intermediate shell 18 and other portions of this sleeve close the outer or open sides of the channels 26, thus forming sound conducting passages or tuning tubes through which sound waves or impulses may travel from one of the connecting chambers to the other. The length of the passages or tubes can, of course, be easily varied by changing the length of the channels 26 and sleeve 27.

In the particular construction illustrated in Figs. 4 and 5, it is desired to connect two chambers 30 and 31 by means of one or more tuning tubes or sound conducting passages, the cham-

bers 30 and 31 being formed between the outer and intermediate shells 32 and 33. In this case, grooves or channels 34 are formed in the intermediate shell 33, and the open sides of these grooves or channels are closed by a tubular member or sleeve 35, which, in the particular construction illustrated, is in the form of an annular flange formed integral with the baffle member 36.

In the construction illustrated in Figs. 6 and 7, two chambers 40 and 41 arranged between two shells 42 and 43 are connected by means of sound conducting passages or tuning tubes formed by providing the transverse baffle member 44 with an elongated inner flange, forming a tubular member or sleeve 45 and which is provided with outwardly projecting beads or channels 46, which extend lengthwise of the sleeve and form with the shell 43 sound conducting passages or tubes connecting the chambers 40 and 41.

In Figs. 8 and 9 is shown a construction, quite similar to that illustrated in Figs. 1 to 3 inclusive, except that in Figs. 8 and 9, the sound conducting passages are formed by providing channels 50 in a sleeve 51, instead of in the intermediate shell. The intermediate shell 52 closes the inner open faces of the channels, so that sound conducting passages are formed connecting the chambers 53 and 54 at opposite sides of the baffle 55.

It will be noted in all of these constructions that to provide these sound conducting passages or tuning tubes, it is merely necessary to supply the muffler with one additional tubular member, namely, a sleeve which may be either a portion of the transverse baffle or formed separately therefrom, and this sleeve may cooperate with a shell of the muffler to form with the shell sound conducting passages between the two chambers. The shell and sleeve may be readily fastened together by welding or in any other convenient manner, and the provision of separate pieces of tubing and the welding of the same to a baffle are entirely eliminated, together with the expense which this prior construction involved.

We claim as our invention:

1. A muffler including inner, outer and intermediate shells, a head connecting the outer and inner shell, said intermediate shell terminating at a distance from said head, a baffle dividing said intermediate and outer shells into separate sound deadening chambers, said inner shell forming a through passage for gases and sound waves and having perforations in portions thereof surrounded by said intermediate shell, said end of said intermediate shell having portions thereof pressed inwardly into contact with said inner shell and other longitudinal portions spaced from said inner shell to form a restricted passage connecting the space between said inner and intermediate shells with one of said chambers, and a tuning passage of much greater length than width connecting said chambers and terminating at opposite sides of said baffle, a portion of the wall of said passage being formed by one of the shells connected with said baffle.

2. A muffler having a main passage therethrough for gases and sound waves, and shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, and a sleeve snugly fitting one of said shells and contacting therewith throughout a substantial part of a surface of said sleeve and spaced from said shell at a longitudinal portion thereof to form a channel, one end of which terminates in said resonance chamber and the other end of which receives sound waves from said passage, the length and cross sectional area of said channel being predetermined to cooperate with said resonance chamber to reduce certain sounds in said passage by destructive interference, one of said baffles forming a wall of said resonance chamber and also connecting with said sleeve.

3. A muffler having a main passage therethrough for gases and sound waves, shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, and a sleeve interposed between the inner periphery of one of said baffles and one of said shells and fitting snugly about and contacting with said shell throughout a substantial part of the inner surface of said sleeve and spaced from said shell at a longitudinal portion thereof to form a channel which terminates at one end in said resonance chamber at one side of said baffle and at its other end at the opposite side of said baffle, the other end of said channel being open to receive sound waves from said passage, the length and cross sectional area of said channel being predetermined with relation to said resonance chamber to form a bottle neck resonance chamber tuned to certain sounds occurring in said passage.

4. A muffler having a main passage therethrough for gases and sound waves, shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, and a sleeve at the inner periphery of one of said baffles and fitting snugly about one of said shells and contacting therewith throughout the greater part of the inner surface of said sleeve, said shell being provided with a longitudinally extending depression, the opposite ends of which extend beyond the ends of said sleeve to form a channel, one end of which terminates in said resonance chamber at one side of said baffle and the other end of which terminates at the other side of said baffle in a position to receive sound waves from said passage, said channel being of a length and cross section to cooperate with said resonance chamber to form a bottle neck resonator tuned with respect to certain sound waves occurring in said passage.

5. A muffler having a main passage therethrough for gases and sound waves, shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, and a sleeve arranged at the inner periphery of one of said baffles and snugly fitting about one of said shells and contacting therewith throughout a substantial part of the inner surface of said sleeve, said sleeve being provided with portions formed to extend away from the surface of said shell to form a channel, one end of which terminates at one side of said baffle in said resonance chamber, and the other end which terminates at the other side of said baffle in a position to receive sound waves from said passage, the cross sectional area and length of said channel being so proportioned with reference to said resonance chamber

as to silence certain sounds in said passage by destructive interference.

6. A muffler having a main passage therethrough for gases and sound waves, shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, and a sleeve telescopically arranged within one of said baffles and fitting snugly about one of said shells and contacting therewith throughout a substantial part of the inner surface of said sleeve and spaced from said shell at a longitudinal portion thereof to form a channel which terminates beyond the ends of said sleeve, one end of said channel terminating in said resonance chamber at one side of said baffle and the other end of which terminates at the other side of said baffle in a position to receive sound waves from said passage, said channel forming a neck for said resonator chamber, and the length and cross sectional area of said channel being so formed with relation to said resonance chamber as to deaden certain sound waves in said passage by destructive interference.

7. A muffler having a main passage therethrough for gases and sound waves, shells extending about said main passage, and arranged one within another, a baffle extending across the space between adjacent shells to form a resonance chamber about said main passage and into which sound waves from said main passage may pass, one of said baffles being provided with an integrally formed tubular extension fitting snugly about one of said shells and contacting therewith throughout a substantial part of the inner surface of said tubular extension and spaced from said shell at longitudinal portions thereof to form a channel, one end of which terminates in said resonance chamber, and the other end of which receives sound waves from said passage, the length and cross sectional area of said channel being predetermined to cooperate with said resonance chamber to reduce certain sounds in said passage by destructive interference, said baffle also forming a wall of said resonance chamber.

8. A muffler having nested inner, intermediate and outer shells, said inner shell forming a substantially straight uninterrupted passage from end to end thereof and being apertured in a portion thereof surrounded by said intermediate shell, said intermediate shell terminating at one end at a distance from the adjacent end of the inner shell and having longitudinal portions of its end pressed inwardly into contact with said inner shell and having another portion between said inwardly pressed portions spaced from said inner shell to form a channel terminating at one end in a space between said intermediate shell and an apertured part of said inner shell and at its other end in a space between said inner and outer shells extending beyond the end of said intermediate shell, a sleeve surrounding a portion of said intermediate shell at a distance from the end thereof and contacting throughout a substantial portion thereof with an intermediate shell, another portion of said intermediate shell and said sleeve being spaced apart to form a channel terminating at opposite ends of said sleeve, a transverse annular baffle, the inner periphery of which terminates at said sleeve, said channel connecting at one end with a resonance chamber, one wall of which is formed by said baffle, and at its other end in said chamber between said inner and outer shells.

9. In a muffler of the type which silences sound waves by a destructive interference, the combination of a pair of shells arranged one within the other, a sleeve arranged in the space between said two shells snugly fitting one of said shells and having the greater part of one surface thereof in contact with said shell, and a baffle extending from said sleeve to the other of said shells, said sleeve and said first mentioned shell being spaced apart at portions thereof to form between them a channel extending from end to end of said sleeve and communicating at one end with said resonance chamber and at the other end with said main passage.

10. In a muffler, the combination of a pair of shells secured one within another, a baffle forming a connection between said shells and dividing the space between said shells into separate chambers, means for admitting sound waves to one of said chambers, a sleeve having portions thereof contacting with one of said shells and having other portions thereof spaced from said shell from end to end of said sleeve and terminating at opposite sides of said baffle to form tuning tubes connecting said chambers.

11. In a muffler, the combination of a plurality of longitudinally extending tubular members secured one within another, a transverse baffle forming a connection between two adjacent tubular members and dividing the space between said members into separate chambers, a short tubular member arranged with a substantial portion thereof in contact with one of said first mentioned tubular members, at least one of said two last mentioned tubular members being provided with a longitudinal channel formed therein and of greater length than said short tubular member to form between said last mentioned tubular members a tuning passage connecting said chambers, said transverse baffle being arranged with its inner periphery terminating at said sleeve.

12. In a muffler, the combination of a pair of shells secured one within another, a baffle forming a connection between said shells and dividing the space between said shells into separate chambers, means for admitting sound waves to one of said chambers, a sleeve having portions thereof contacting with one of said shells, said sleeve having a channel formed therein extending from end to end of said sleeve and forming with said last mentioned shell a sound conducting passage connecting said chambers, and means connecting said sleeve with another shell located adjacent thereto to force sound waves to pass through said channel.

13. In a muffler, the combination of a pair of shells secured one within another, a baffle forming a connection between said shells and dividing the space between said shells into separate chambers, means for admitting sound waves to one of said chambers, a sleeve having portions thereof contacting with one of said shells, said shell contacted by said sleeve having a longitudinal channel formed therein of greater length than said sleeve and terminating at opposite ends beyond said sleeve and forming with said sleeve a sound conducting passage connecting two of said chambers at opposite sides of said baffle, the inner periphery of said baffle contacting with said sleeve.

14. In a muffler, the combination of a pair of shells secured one within another, a baffle forming a connection between said shells and dividing

the space between said shells into separate chambers, means for admitting sound waves to one of said chambers, a sleeve having portions thereof contacting with one of said shells and having a longitudinal channel formed therein and extending throughout the length thereof and forming with said shells a sound conducting passage connecting chambers at opposite sides of said baffle, and means connecting said sleeve with another shell located adjacent thereto to force sound waves to pass through said channel.

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