Aug. 25, 1964 J. P. MARX 3,145,800

MUFFLERS

Filed Jan. 23, 1961 2 Sheets-Sheet 1

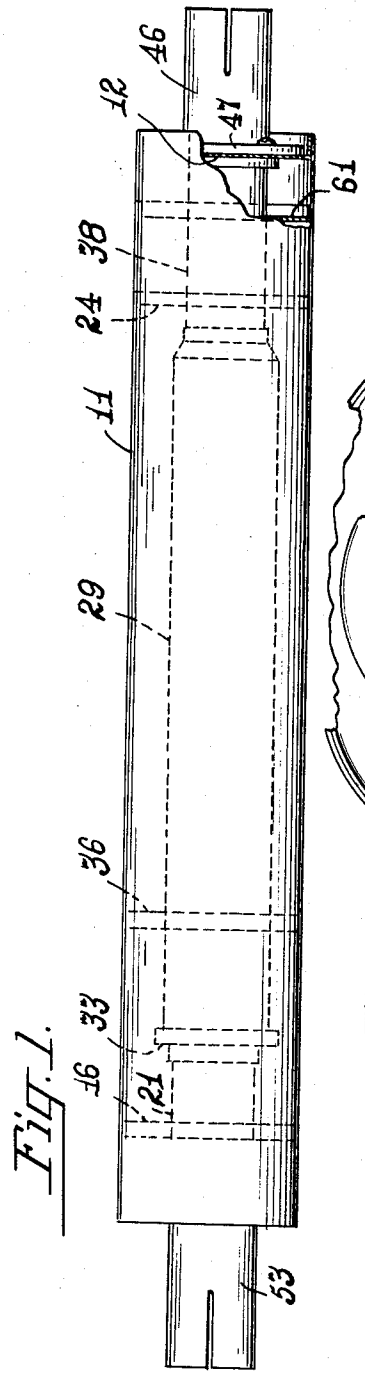

Fig. 1.

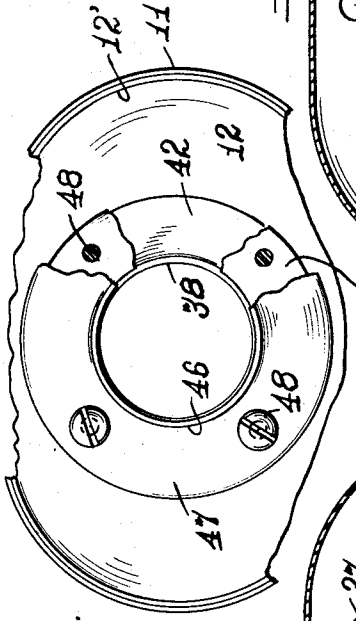

Fig. 2.

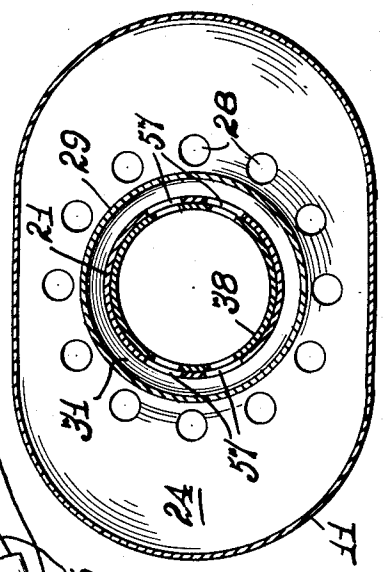

Fig. 6.

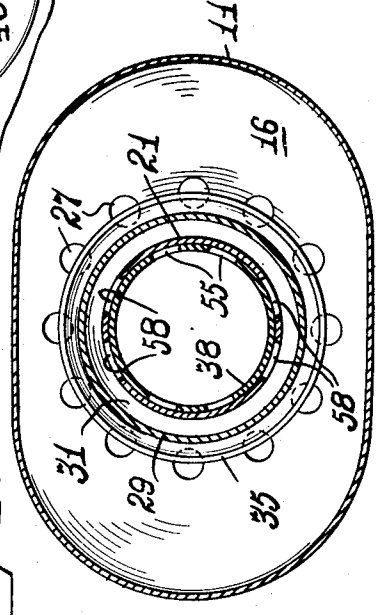

Fig. 5.

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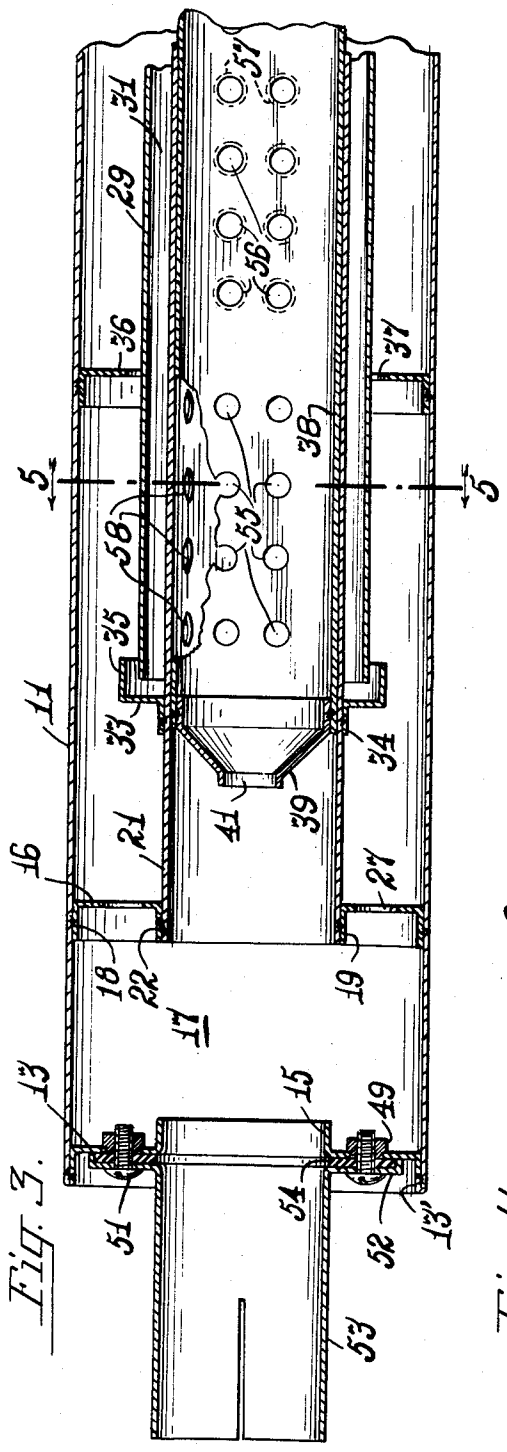

Fig. 3.

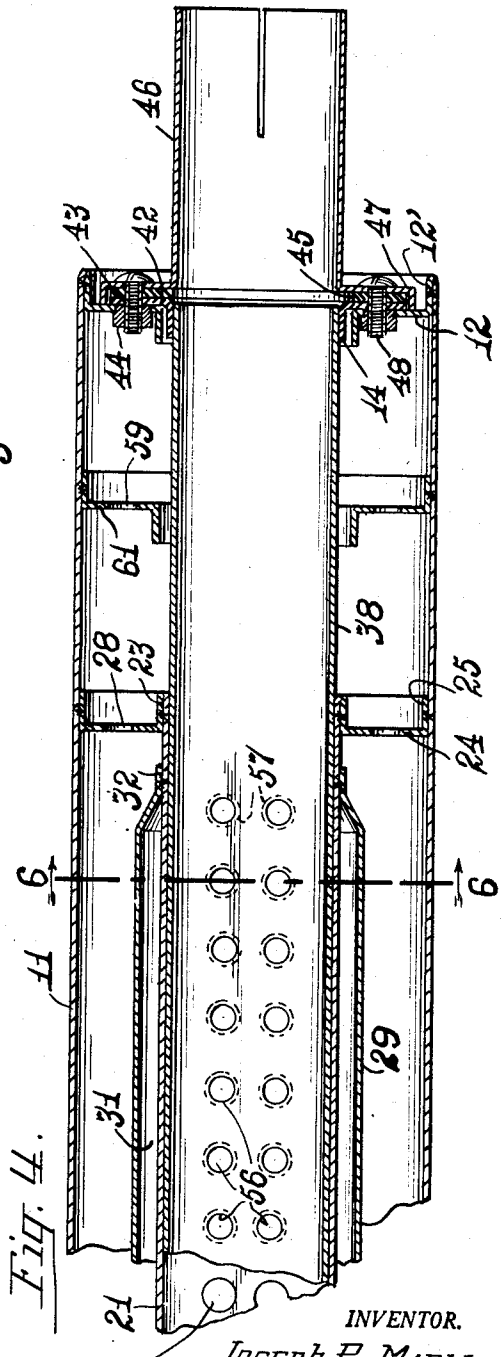

Fig. 4.

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United States Patent Office 3,145,800
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Filed Jan. 23, 1961, Ser. No. 84,125
2 Claims. (Cl. 181—45)

The invention relates to improvements in silencers and is more particularly concerned with the novel construction and assembly of a muffler of the replacement type embodying novel tone control means.

In view of the numerous makes of vehicles, the annual change in models and the wide range of variants in maximum back-pressure permissible and tone requisites, it is impractical for a service station to carry a replacement muffler embodying each of these requirements.

The improved muffler herein disclosed in an exemplary form embodies structural features adapting various parts thereof to be adjustably positioned relative to each other at the time of installation so as to alter the muffling or tone characteristics of the muffler and, further, to facilitate adjustment of the back pressure characteristics of the muffler and the interchange of head and tail fittings thereof to adapt it for use in association with exhaust and tail pipes of different diameters.

It is therefore an object of the invention to provide a muffler structure having the foregoing advantages.

Another object is to provide a muffler structure which may be readily and efficiently assembled to meet specific installation requirements.

Another object is to provide a muffler construction embodying novel means to facilitate ready adjustment of the muffling or tone characteristics.

Another object is to provide a muffler assembly comprised of interchangeable parts adapting the assembly to meet specific back pressure characteristics of a given vehicle in which it is to be installed.

Another object is to provide a rugged muffler assembly that is not expensive to construct, is easy to assemble, is capable of efficient sound control, provides maximum efficiency in silencing unwanted sound and is readily adaptable for installation in various types of vehicles.

Other and more detailed advantages and objects of the invention will appear more fully as the description proceeds, reference being made to the accompanying drawings wherein a preferred form of the invention is shown. It should be understood however that the drawings and description are illustrative only and should not be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

FIG. 1 is an elevational view of an exemplary muffler embodying the invention, showing a portion of the shell broken away.

FIG. 2 is an enlarged elevational view of the inlet end of the muffler, showing the inlet fitting flange and outer shell broken away in part.

FIG. 3 is an enlarged longitudinal sectional view of the exhaust end portion of the muffler.

FIG. 4 is an enlarged longitudinal sectional view of the inlet end portion of the muffler.

FIG. 5 is a transverse sectional view taken on line 5—5 of FIG. 3.

FIG. 6 is a transverse sectional view taken on line 6—6 of FIG. 4.

Generally considered, the construction contemplates the assembly of mufflers in a manner to vary the muffling characteristics and back pressure capacities and to adopt them for connection with exhaust and tail pipes of different diameters. The structure, when adjusted and assembled, constitutes an integral assembly. In the exemplary embodiment herein illustrated, the exhaust and inlet fittings are detachably connected to the muffler shell to facilitate the selection of fittings having diameters responding to the diameters of the usual exhaust and tail pipes of a given vehicle. Control of tone characteristics is obtained by the provision of a pair of novel telescoped conduits arranged within the muffler shell and which may be pre-adjusted to vary the number of by-pass flow openings for exhaust gases and sound waves and consequently vary the tone characteristics of the muffler. Also, the effective back pressure required in a specific installation can be pre-determined by selection of a conduit element having as an integral part thereof a venturi opening of the requisite size. Because all of the elements involved in the determination of back pressure, fitting size and tone characteristics are detachably connected for quick adjustment and assembly, the assembly adapts itself to use on vehicles of various types and models.

Referring now to the exemplary disclosure in the accompanying drawings, the muffler consists of an outer shell **11**, which preferably is oval in section but may be of any other functional shape, having end walls or headers **12**, **13**, one at each end thereof which preferably are flanged on their outer perimeters, as at **12'** and **13'** respectively, to permit the headers to be welded to the shell as shown. Each end wall is formed with an aligned axially located internally flanged opening **14**, **15**, respectively.

Referring now particularly to FIG. 3, a partition or baffle **16** is spaced inwardly from end wall **13**, within shell **11**, to provide a collection chamber **17**, and it has an external flange **18** secured, as by welding, to said shell.

This partition has an axially aligned flanged opening **19** through which one end of an outer tubular member **21** extends and to which said end is secured as by welding **22**. The tubular member **21** extends axially through substantially the length of shell **11** but terminates short of end wall **12**, it having its end telescoped in and secured, as by welding, within an axially aligned flanged opening **23** (FIG. 4) in a partition or baffle **24** that has its peripheral flange **25** welded or otherwise secured firmly to shell **11**. For purposes to be explained, presently, the baffles **16** and **24** are each provided with circumferentially spaced apertures **27**, **28** respectively.

A cylindrical hood **29** is arranged around tubular member **21** and is spaced therefrom to provide a cylindrical chamber **31** which opens at one end adjacent to baffle **16** and is closed at its other end by a reduced diameter **32** that is welded to tubular member **21**, inwardly of partition **24**. A deflector flange **33** (FIG. 3) is arranged closely adjacent to the open end of hood **29**, and has an inner peripheral flange **34** welded to tubular member **21** and an outer peripheral flange **35** that overlies but is spaced from the open end of hood **29**, all for a purpose to be explained presently. Also spaced substantially midway between partitions **16** and **24** is a reinforcing ring **36** that is welded to the shell and has an axial opening **37** larger than the external diameter of hood **29** so as to provide a circular passage surrounding said hood.

An inner tubular member **38** is extended through the flanged axial opening **14** in end wall **12** (FIG. 4) and is telescoped endwise snugly into the outer tubular member **21** and terminates substantially in the region of deflector flange **33** (FIG. 3), to define, with outer tubular member **21**, a continuous conduit for the passage of exhaust gases and sound waves from the inlet end of the muffler to the collection chamber **17**. A venturi element **39** is welded or otherwise secured to the open end of inner tubular member **38**, the opening **41** therein being of any predetermined size required of the specific muffler installation.

As best shown in FIGS. 2 and 4, the mounted end of inner tubular member **38** has an external flange **42** that is seated against the outside face of end wall **12**. This flange is provided with circumferentially arranged mutually spaced holes **43** which are adapted to align with threaded apertures in a like number of stake-nuts **44** carried by end wall **12**. A similarly apertured washer **45** is placed over said flange and a tubular inlet fitting **46** is then positioned thereover with its similarly apertured external flange **47** overlying the washer. The assembly is secured by screws **48** that are threaded into the stake-nuts.

The end wall **13** also is provided with circumferentially arranged mutually spaced stake-nuts **49** to receive holding screws **51** that are passed through aligned apertures in a flange **52** of a tail pipe fitting **53** and an interposed washer **54**.

The inlet and tail pipe fittings and the assembly just described are such that said fittings can be easily and quickly removed and fittings of other diameters can be attached to adapt the muffler assembly to receive exhaust and tail pipes of different diameters, which are, of course, secured thereto by any conventional clamp devices. The common detachable mounting of inlet fitting **46** and inner tubular member **38** serves the additional purpose of permitting easy and quick placement of an inner tubular member having a venturi element of any required size and, more important, affords means to facilitate circumferential adjustment of the inner tubular member with respect to the outer tubular member **21** for a purpose now to be described.

As best shown in FIGS. 3 and 5, inner tubular member **38** has circumferentially spaced longitudinally extending rows of mutually spaced holes **55**, inwardly of the venturi end of said member. A second set of circumferentially spaced longitudinal rows of mutually spaced holes **56** also is provided in the inner tubular member (FIGS. 4 and 6), said rows preferably being in longitudinal alignment with the rows of holes **55**, but spaced therefrom a short distance. In the present disclosure, there are four holes in each row of holes **55** and ten holes in each row of holes **56**, but it should be understood that the number of holes in each of said rows and the number of rows of each may vary from the within description without detracting from the features of the invention.

When the inner tubular member **38** is in the position best illustrated in FIGS. 3, 4 and 6, the second set of holes **56** are in register with a like number of holes **57** in outer tubular member **21**, while the first set of holes **55** are out of register with a complemental number of holes **58** in said outer tubular member. When the parts are in this relationship, the flow of exhaust gases and sound waves entering through inlet fitting **46** and flowing through conduit **21–38** is diverted in part through the registering openings **56, 57** and escapes into the circular chamber **31** defined by hood **29**. The expanded gases and sound waves leaving chamber **31** flow around deflector flange **33** and are further expanded and turbulated as they enter the circular space between hood **29** and shell **11**. The apertures **27, 28** in partitions **16, 24** respectively and apertures **59** in an auxiliary partition **61** arranged inwardly of end wall **12**, permit free circulation and maximum turbulation of the escaped exhaust gases and sound

waves throughout the interior of shell **11** in a manner to diffuse the sound waves and muffle the exhaust noises.

The escaped turbulated gases and dampened sound waves entering the collection chamber **17** commingle with the direct exhaust flow through the conduit and pass out of the tail pipe fitting **53** and through the usual tail pipe (not shown) connected therewith. The flow of exhaust gases and sound waves through the large number of openings **56, 57** results in a larger proportion of the exhaust gases and sound waves escaping into shell **11** as compared with the volume flowing directly through the conduit with the result that the tone of exhaust is more subdued or softer.

In the event less muffling is desired, the inner tubular member **38** is rotated, in this instance, approximately 90° so as to carry holes **55** in said inner tubular member into register with a like number of holes **58** in the outer tubular member. This effects full closing of holes **56, 57** and since the holes **55, 58** are fewer in number, the amount of exhaust gases and sound waves escaping into the interior of the shell is considerably lessened and a greater proportion of such gases and sound waves will flow straight through the conduit and into the tail pipe fitting with consequent increase in exhaust sound.

It should be understood that the number and size of the holes in the inner and outer tubular members is optional and that they can be increased or decreased in number and size to suit various installation requirements. It is preferred however, that the holes **57, 58** be larger than holes **55, 56** so as to avoid the necessity of absolute precision in their relative locations.

The present arrangement and disposition of the two sets of holes in the tubular members is preferable because it permits selective hole alignment by rotation of the inner tubular member 90° to effect a change in tone characteristics. Accordingly, there preferably are four equally spaced stake-nuts and registering holes at the mounting of the inner tubular member and end wall **12** so that upon removal of the screws, the inner tubular member can be rotated 90° and secured in its required position without requiring the drilling of new holes for the screws and without close examination of the muffler interior to ascertain the degree of circumferential adjustment attained. Of course, the stake-nuts can be dispensed with and conventional nuts used or the end walls may be tapped in the usual manner should such structures be preferred.

From the foregoing description it is believed that the nature of my invention and the manner in which it is to be carried out will be readily apparent to those skilled in this art.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A silencer having a conduit confined within an outer shell having end walls and forming a central passageway for exhaust gases and sound waves that extends from one end wall to adjacent the other end wall, an inlet in said one end wall in direct communication with one end of the conduit, a partition wall supporting the other end of said conduit and through which said conduit extends, said partition wall dividing the interior of the shell outside said conduit into an elongated expansion chamber and into a collection chamber, an exhaust fitting on said other end wall through which gases and sound waves entering the collection chamber are exhausted, said conduit comprising relatively adjustable parts telescoped one into the other endwise and each having apertures in their telescoped portions adapted to be selectively aligned to provide a pre-selected number of passages in the conduit wall and through which a portion of the gases and sound waves may escape, a cylindrical hood within the expansion chamber surrounding at least the apertured area of said conduit, said hood opening at one end into the expansion chamber and defining an annular chamber into and through which said escaped gases and sound waves flow, and deflector means adjacent to the open end of said

hood to reverse the direction of flow of said escaped gases and sound waves leaving the annular chamber and entering the expansion chamber, said partition being apertured to permit the gases and sound waves in the expansion chamber to flow into the collection chamber.

2. The silencer recited in claim 1, in which baffles are arranged in the expansion chamber to cause turbulation of the gases and sound waves in said chamber.

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