July 26, 1966 O. F. BORGESON 3,262,516

MULTI-PASSAGE MUFFLER INSERT FOR EXHAUST PIPE

Filed March 9, 1964

Fig. 3

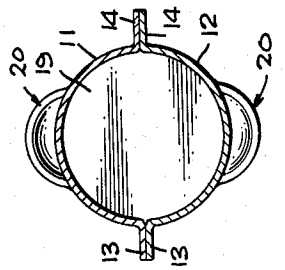


Fig. 5

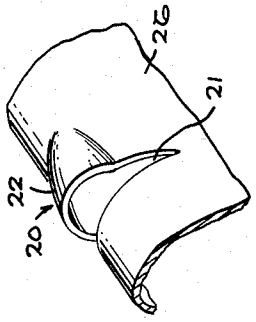


Fig. 1

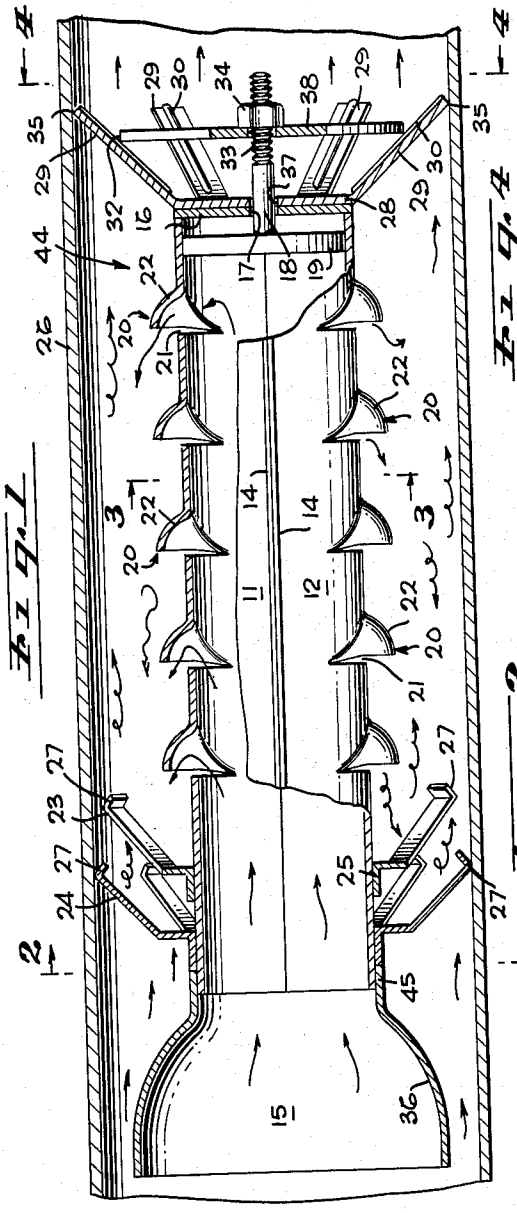


Fig. 4

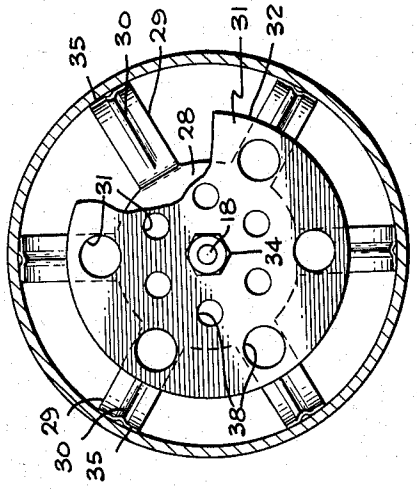
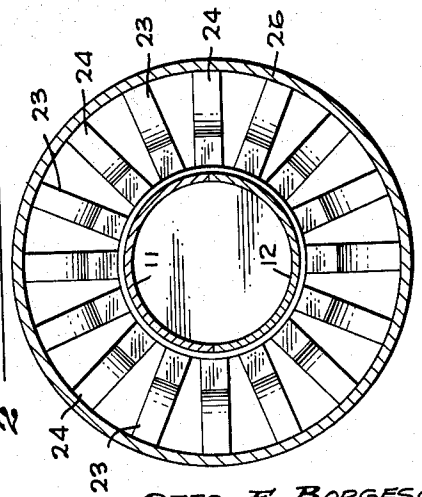


Fig. 2



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MULTI-PASSAGE MUFFLER INSERT FOR EXHAUST PIPE

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The invention herein described pertains to mufflers for internal combustion engines, and more particularly to mufflers for internal combustion engines installed in boats.

Mufflers are conventionally installed somewhere between the exhaust ports of the engine and the exhaust pipe that releases the exhaust gases into the surrounding atmosphere. When such mufflers are replaced, it is consequently necessary to disconnect the exhaust pipe, interpose a new muffler in the exhaust system and then attach the exhaust pipe to the new muffler. One of the objects of the present invention is to simplify such replacements as well as the original installations of mufflers by providing a muffling device that may be mounted within the exhaust pipe itself. This is particularly feasible in boats where the exhaust pipes are frequently three or four inches in diameter.

Another object is to provide a muffler of the type described that may be positioned coaxially within the exhaust pipe by means of mounting members of such design that individual adjustments may be made to permit a relatively few sizes of mufflers to be adapted to a wide range of exhaust pipe sizes.

An additional object is to provide an efficient muffler for motor boats that will be inexpensive to build.

Still another object is to provide a design for mufflers of the type described that will make it possible to construct the mufflers entirely from stampings, thus materially reducing their cost.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of an embodiment of the invention. For this purpose, such an embodiment is shown in the drawings accompanying and forming a part of the present specification. This embodiment will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawings:

FIGURE 1 is a longitudinal section through a portion of an exhaust pipe with the muffler coaxially mounted therein, the section extending through the muffler itself;

FIG. 2 is a cross-section taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is a section taken on line 3—3 of FIG. 1;

FIG. 4 is a section taken on line 4—4 of FIG. 1; and

FIG. 5 is a cut-away view of a portion of the muffler showing one of the vents that is formed in its surface.

In the presently preferred embodiment of the invention, the body or shell of the muffler **44** is formed of two identical complementary parts **11** and **12**, each having a pair of oppositely extending peripheral flanges **13** and **14** whereby the complementary halves of the shell are connected together in any suitable manner, as by rivets or spot welding. One end of the shell portion is provided with a funnel, or bell-shaped, inlet **15** that may be formed in any appropriate way as by means of casting, spinning or stamping, but preferably the latter. The inlet **15** is mounted coaxially on one end of the shell in such a manner that little obstruction will be offered to the gases entering the funnel-like inlet and proceeding into the shell proper.

The end of the shell opposite from the inlet **15** is provided with a closure **16**. This closure has a central aperture **17** therein through which, in the presently preferred embodiment of the invention, a bolt **18** extends, the internal end of this bolt being suitably secured to a disc **19**, the purpose of which will hereinafter become apparent.

The periphery of the shell has a plurality of louvers **20** formed therein. In the illustrated embodiment of the invention, there are two series or groups of individual louvers in axial alignment, each of the two groups being disposed 180° from the opposite group.

The louvers **20** may be stamped by a cutting and forming operation in the wall of the shell in order to give the louvers the configuration best seen in FIG. 5. To fabricate the illustrated louvers, the metal is sheared as shown at **21** in FIGS. 1 and 5, and the adjoining portion of the shell on the side of the cut nearest the end of the shell that is to receive the closure is then flared out as shown at **22** so that gases entering the inlet **15** and bouncing back from the disc **17** or plate **19** will be directed by the ear-shaped portions **22** of the louvers toward the convex outer surface of the inlet **15**.

A plurality of lugs or fins **23** are spaced, preferably equally, around the periphery of the muffler. These may be individual parts appropriately secured to the shell, or they may be radial extensions of a ring **25** surrounding the shell, or of two complementary halves of such a ring. The fins **24** may be formed integrally with the small end **45** of the funnel-like gas inlet **15**. This reduced portion **45** may be slipped or pressed over and around the end of the shell that is opposite from its closed end. The various lugs **23** and **24** are provided with bent-over portions **27** to facilitate the insertion of the muffler with its projecting fins and lugs into the exhaust pipe **26** from the right end toward the left end, the left end of the portion of the exhaust pipe **26** shown in FIG. 1 being the end that is closest to the engine. The fins or lugs **23** and **24** may be adjusted to adapt the muffler to different sized exhaust pipes by bending them outwardly until they engage the inside of the walls of the exhaust pipe. The lugs **24** in FIG. 1 are shown bent out to such adjusted position. The lugs **23** in FIG. 1 are also in adjusted position but are disposed on radii that places their bent-over ends further back from the plane on which the longitudinal section is taken. The bending of these fins or lugs is done as the muffler is inserted into the exhaust pipe at the time of installation.

A disc **28** having radially extending projections **29** is secured as by welding to the closure member **16** of the end of the muffler opposite from the inlet bell **15**. The projections **29** are provided with beads **30** extending radially thereof in order to strengthen the projections. These projections are so formed on the central portion **28** of the disc that they form an obtuse angle with respect thereto. This structure thus resembles the palm of the hand with the fingers cupped. The fingered disc **28** encircles the bolt **18** and is secured to the closure **16** by spot welding or other appropriate means. Another disc **31**, having an uninterrupted circular periphery, is provided with a central aperture **33** so that the disc may be slipped over the bolt **18** and received within the cupped region circumscribed by the projections **29** of the inner disc **28**.

In the assembly of te muffler, a nut **34** is threaded over the outer end of the bolt **18**. This nut bears against the disc **31** whose periphery **32** may be tightened against the fingers **29** to spread them outwardly so that their relatively sharp outer ends **35** will dig into the inner wall of the exhaust pipe in order to hold the muffler tightly in position. The force of the gases against the concave walls **36** of the inlet bell and against the disc **19** adjacent the closure **16** urges the entire muffler structure toward

the right, thus causing the ends **35** of the fingers to bite into the inner walls of the exhaust pipe.

The beads or ribs **30** not only serve to strengthen and stiffen the fingers **29**, but also supply a curved surface against which the periphery **32** of the disc **31** may bear and slide as the nut **34** is tightened firmly against the disc **31** for spreading the fingers.

It is not absolutely essential that the disc **28** be riveted or welded to the closure member **16**, as the member **28** is quite securely held in place mechanically. Its central aperture **37** which surrounds bolt **18** positions the disc, and the firm pressure of the periphery **32** of the disc **31** against the fingers **29** clamps the entire end assembly together.

The exhaust gases move through the exhaust pipe from left to right when the parts are positioned as shown in FIG. 1. The greater portion of these gases enters the funnel-shaped inlet **15**, and the remainder passes around it. When the gases that have entered the shell reach the disc **19** at the end of the chamber opposite from the inlet, they are deflected and escape out of the shell through the louvers **22** where they encounter the gases that have passed around the muffler and which are traveling from left to right through the exhaust tube. The gases that are escaping through the louvers **22** thus create turbulence with the gases surrounding the shell; and turbulence, of course, breaks up sound waves and muffles the sound.

Turbulence is also created within the shell itself between the gases that are approaching the right end of the enclosure and those that are being deflected back therefrom toward the louvers. The turbulence in these various areas is indicated by the wavy or looped arrows in the regions where the turbulence takes place.

The radial projections **23** and **24** that extend out from the peripheral portions of the shell between the louvers and the bell-shaped inlet **15** are staggered as indicated in FIG. 2 so that the gases will encounter temporary obstructions all around the shell. A portion of the gases that has passed between the lugs **24** in the forward ring strikes the lugs **23** in the next ring. This mechanical interference with the fast moving gases also produces helpful turbulence. Still additional turbulence is produced by the fingers **29** around the closed end of the shell.

The various holes **38** in the disc **31** that spreads the fingers **29** serve the double function of lightening the disc and causing another region of turbulence.

In motor boats, part of the water that cools the engine is released into the exhaust system for further cooling purposes. Some of this water flows under the bell-shaped inlet **15** and beneath the shell, and some of it enters the shell itself through the inlet. The fast moving gases force some of the water into the louvers on the lower side of the shell. The churning water and gases produce a most effective muffling effect.

Although the illustrated embodiment of the described invention is one that may be readily made from stampings, the invention may of course be embodied in similar structures that may be assembled from parts which may be cast or formed in any other appropriate manner. Many modifications may of course be made from the embodiment shown, and other elements may be substituted for those described; and these may be rearranged, reversed and repositioned—all without departing from the broad spirit of the invention as succinctly set forth in the appended claims.

The inventor claims:

1. A muffler comprising: an elongated shell adapted to be positioned lengthwise within an exhaust pipe of an internal combustion engine, said shell flared outward at one end to form a funnel-like structure whose maximum diameter is greater than that of the main body of the shell but less than the internal diameter of said pipe; a plurality of louvers in the wall of said shell having their external diverging portions directed toward the exterior of said funnel-like structure; said shell closed at the end opposite from said structure; a plurality of first lugs carried by said shell and spaced therearound adjacent said opposite end; a plurality of second lugs carried by said shell and spaced therearound intermediate said louvers and said funnel-like structure; said first and second lugs acting to position said shell coaxially of said pipe; and said louvers acting to permit the gases received within said shell through said funnel-like structure to escape to the exterior of the shell against the gases moving through said pipe toward said first lugs from the region around said funnel-like structure, thereby creating turbulence in the gases around the shell to break up the sound waves in said gases.

2. A muffler comprising: an elongated shell adapted to be positioned lengthwise within an exhaust pipe of an internal combustion engine, said shell closed at one end and flared outward at the other end to form a funnel-like gas inlet whose maximum diameter is greater than that of the main body of the shell but less than the internal diameter of said pipe; a plurality of first lugs carried by said shell and spaced therearound adjacent said other end; a plurality of second lugs carried by said shell and spaced therearound intermediate said first lugs and said funnel-like gas inlet, said first lugs angularly staggered with respect to said second lugs for intercepting portions of the exhaust gas stream that have passed between the second lugs; said first and second lugs engaging the inner wall of said exhaust pipe and acting to position said shell coaxially of said pipe; a plurality of louvers in the wall of said shell for directing gas from within said shell outwardly thereof against the gases moving through said pipe in an opposite direction from the region around said funnel-like structure, thereby creating turbulence in the gases around the shell to break up sound waves.

3. A muffler comprising: an elongated shell adapted to be positioned lengthwise within an exhaust pipe of an internal combustion engine, said shell closed at one end and flared outward at the opposite end to form a funnel-like gas inlet whose maximum diameter is greater than that of the main body of the shell but less than the internal diameter of said pipe; skeletal means for positioning said shell coaxially of said pipe, said means including (a) a plurality of lugs spaced around the closed end of the shell and so inclined at an obtuse angle with respect to the shell's periphery that the fingers diverge from each other, (b) a threaded rod protruding from the center of the closed end, (c) a centrally apertured disc mounted on said rod, and (d) a nut threaded on said rod against the exterior surface of said disc for urging it toward said closed end and against said lugs for spreading them outwardly against the inner wall of the exhaust pipe; and a plurality of louvers in the wall of said shell for directing gas from within said shell outwardly thereof against the gases moving through said pipe in an opposite direction from the region around said funnel-liike structure, thereby creating turbulence in the gases around the shell.

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