

May 6, 1958

W. W. LOWTHER

2,833,368

MUFFLER

Filed May 17, 1956

3 Sheets-Sheet 1

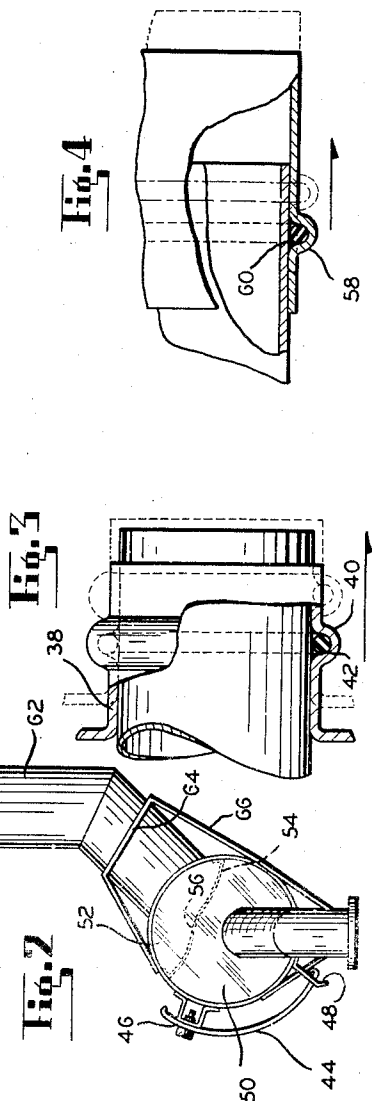
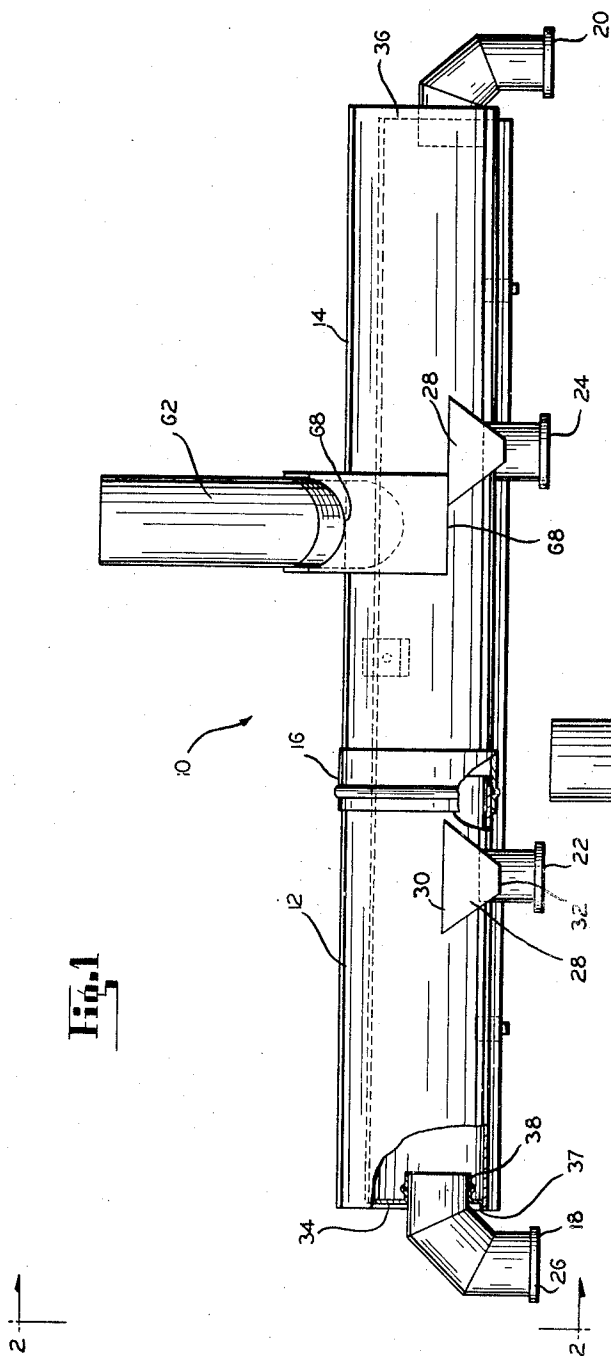


Fig. 4

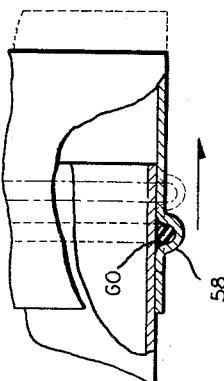
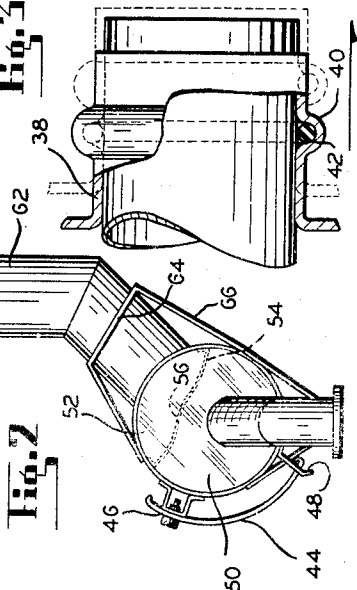


Fig. 3



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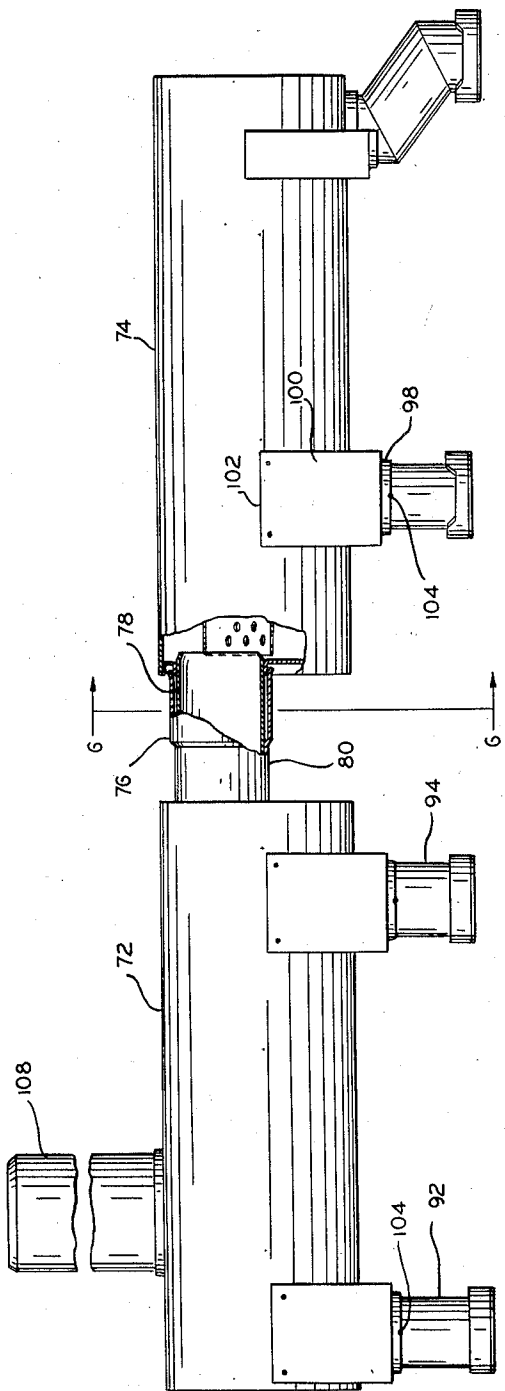
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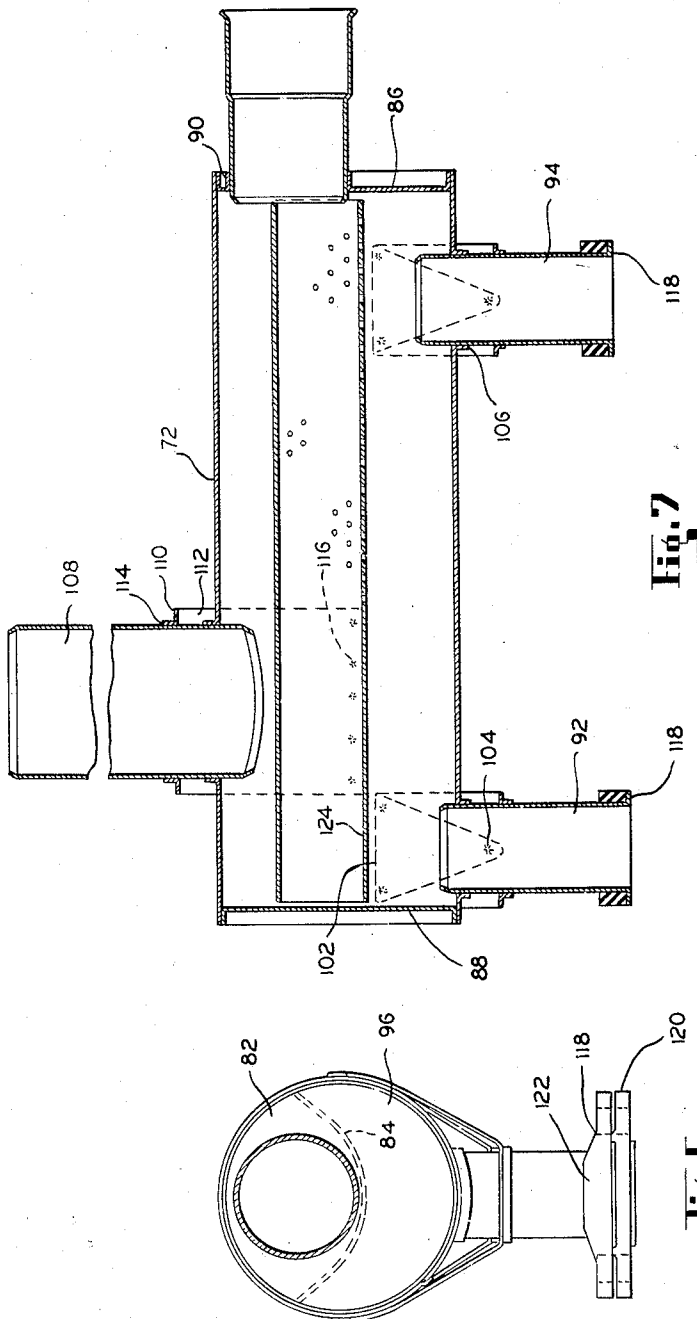
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3 Sheets-Sheet 3



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3 Claims. (Cl. 181—40)

My invention is in the field of mufflers for internal combustion engines primarily designed for use with diesel engines, for example, under the hood of a tractor or the like, although it is not necessarily restricted thereto.

A primary object of my invention is an exhaust muffler for use with an engine, constructed to compensate automatically for thermal expansion and contraction.

Another object of my invention is a rigid muffler structure for under hood use, for example, on a tractor.

Another object of my invention is an integral and rigidly braced muffler structure.

Another object of my invention is a rigid sheet metal muffler constructed for a minimum of leakage.

Another object of my invention is an exhaust muffler with a plurality of inlet pipes or nozzles adapted to be connected to the exhaust outlets on the engine with a rigid bracing structure.

Other objects will appear from time to time in the ensuing specifications and drawings in which;

Figure 1 is a side view, with parts broken away, of one form of my muffler;

Figure 2 is an end view of Figure 1;

Figure 3 is an enlarged view of an end expansion connection on an enlarged scale;

Figure 4 is an enlarged view of the intermediate expansion connection;

Figure 5 is a side view of a modified form;

Figure 6 is a section along line 6—6 of Figure 5; and,

Figure 7 is a longitudinal section, on an enlarged scale, of one housing section.

In Figure 1, a muffler is indicated generally at 10 and includes two housing sections 12 and 14. These sections are shown generally cylindrical or they could be otherwise shaped. The sections are connected by an expansion joint 16 which will be explained in detail later.

The muffler has four inlet pipes, generally aligned two at the ends 18 and 20 and two within the body or between the ends 22 and 24. Each pipe is adapted to be connected to the hot gas exhaust of an engine by a suitable flange or the like 26. The pipes project into the housing sections so that the gases will be exhausted into a common manifold. The two center nozzles or pipes 22 and 24 project directly through the wall of the respective housings and are rigidly connected on the side by struts or straps 28, one being disposed on each side, each being welded along its wider edge 30 to the side of the housing and along its narrow edge 32 to the pipe. The two straps or struts for each nozzle may be formed as an integral piece perforated in the center to accept the nozzle, and a spot welding may be applied so that a V-shaped strap or strut effect is acquired. The open end of the V, along the line 30, is seam, spot or otherwise welded to the side of the housing, the strap or strut being brought in tangent to the side of the housing. The point of the V, generally at the line 32, is welded to the nozzle, and the

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opening through the side of the housing accepting the nozzle may be spot or seam welded.

Thus, each inner nozzle is rigidly braced on each side with a V-shaped strap to prevent flexing and a brittle connection formed by the weld around the opening in the housing with the pipe can neither rotate nor flex.

The two ends, pipes 18 and 20, are formed in three sections to effect a 90 degree turn with each section being welded or otherwise secured to the other sections. The end walls 34 and 36 of the housing are sheet metal discs which are oversized and force fitted into the opening, the turned edge of the disc being spot welded at 37 to prevent the disc from working free. But the seal to prevent leakage and escape of gas is effected by the force fit, not by the weld. An inwardly directed sleeve 38 is stamped or otherwise formed on the end wall to accept the end of the nozzles, and a bead is rolled in it at 40 to accept an O ring seal 42 or the like which surrounds the end of the nozzles. I have only shown the details of the nozzle at the left end of the muffler in Figure 1 but the right exhaust pipe could be the same.

The end exhaust pipes 18 and 20 could be formed other than as shown, however, I find it convenient and desirable to provide an expansion connection so that the housing sections can move back and forward on the inlet pipe, as shown in Figure 3, due to thermal expansion and contraction using the inner rigid pipes 22 and 24 as fixed points.

On the engine side, I position a deflector or shield 44 of arcuate formation or otherwise with a rigid upper mounting 46 of any suitable type and a slideable lower mounting 48 to take care of expansion and contraction.

Each housing section is divided into two chambers 50 and 52 by an intermediate perforate plate 54 extending longitudinally and connected on each side by welding or otherwise. The plate is arched, flexed or bent in a suitable manner at 56 so that it may move back and forth if the housing is heated or cooled.

Between the two housing sections, the expansion joint 16 includes a bead cavity 58 rolled in one section which telescopes over the other to provide a sliding fit and an O ring or the like 60 is used for a seal. Sufficient overlap is provided in the telescopic joint to take care of the expansion and contraction of the material between the fixed nozzles 22 and 24.

An outlet pipe or duct 62 projects through a suitable opening into the housing and communicates with the chamber 52 on the opposite side of the perforate plate from the exhaust inlets. The pipe is connected by a U-shaped bracket 64 which spans the pipe and has projecting legs 66 which are tangentially connected by weldings along a line 68 on each side of the housings. The straps or legs 66 may be welded at the single localized area 68 to the exhaust pipe to effect the V-shaped strut or brace similar to the inlet pipes. It should be realized that the inlet pipes may have an integral U-shaped bracket instead of two separate legs, if desired.

The four inlet pipes are generally equally spaced and the expansion and contraction is generally equally distributed between the three joints. The exhaust pipe could be either straight or bent as shown. The perforate intermediate plate 54 may be arched or bent as desired.

I show a modified form in Figure 5, which includes a pair of housing sections 72 and 74, generally circular in cross section, spaced from each other and connected by an expansion joint 76 which includes a pair of telescopically disposed pipes 78 and 80 of a substantially smaller diameter than the housing sections. These pipes open in the housing sections into the upper chambers 82 de-

finned by the intermediate perforate plate 84 which is arched or otherwise disposed in the housing to compensate for expansion and contraction. Each housing section has end walls or plates 86 and 88 which are press fitted into position and suitably spot welded. The seal is again effected by the press fit and the spot weld is only used to hold the plate. The pipes of the telescopic expansion joint project through and are welded or otherwise secured with a press fit to a short flange or sleeve 90.

Each housing has two exhaust pipes or nozzles 92 and 94 adapted to be connected at their open ends to the exhaust passages on the engine and project into the housing at their upper end. Both open into the lower chamber 96 which is defined by the perforate intermediate plate so as to be separated from the telescopic expansion joint. Each nozzle is connected to the housing by a strap 98 which surrounds the nozzles and has a pair of projecting legs 100 which engage the side of the housing on a tangent and are welded along the line 102 to the housing and at the localized point 104 to the side of the nozzle, although the weld may be further extended around the peripheral engagement between the strap and the nozzle, as desired. In any case, a connection is effected on each side of the nozzle at the straps and a V-shaped brace is attached to the side of the housing in a tangential direction to prevent the nozzle from working loose or rocking. Furthermore, the nozzle may be welded at the point 106 where it penetrates the housing.

The exhaust pipe 108 rising from the upper chamber has a similar strap 110 with a pair of legs or struts 112, one on each side, welded to the nozzle at a localized point 114 and along an extended line 116 to the side of the housing at the point of tangency.

Each inlet pipe or nozzle is outwardly flanged at 118 on its outer end and surrounded by a mounting bracket 118 which has suitable ears 120 with openings to accept bolts or the like and an intermediate beefed up portion 122 around each side. Thus, when the mounting bracket is disposed laterally as shown in Figure 6 with bolts secured in place, all lateral sway will be prohibited by the enlarged portions 122.

One of the exhaust nozzles may be formed as a dog leg, however, this is not necessary.

The use, operation and functions of my invention are as follows:

I have shown two species and it should be noted that in each species the outlet duct of the manifold is offset relative to and is not aligned with any of the inlet nozzles to prevent direct pulse communication. In each case the intermediate perforate plate is flexed or arched so that thermal contraction and expansion will not crack the connecting welds.

The inlet nozzles are braced by what I term V-shaped straps, one on each side, either separate as in Figure 1 or in one piece as in Figure 6. All parts, as far as possible, are of sheet metal, either rolled into the desired shapes and welded or suitably flanged, formed or cut to the desired forms. The muffler is inexpensive, light and easy to manufacture. The nozzles, housing sections, straps, exhaust outlet, expansion joints and perforate plate can all be made of sheet metal. Only the mounting bracket is a heavy piece. All connections are made by welds except the main bolts connecting the nozzles to the engine, and I wish to emphasize that prior to my invention, welding exhaust manifolds has not been recommended.

In the species of Figure 1, the two inner nozzles are reference or bench marks or points, and expansion and contraction is taken care of in the joints or at the outer nozzles. The joint between the bench marks or fixed nozzles provide a three way compensation.

In the species of Figure 5, sufficient play is allowed between the mounting of each nozzle and the engine so that no separate joint is needed between the two nozzles

for each housing section. But I provide a telescopic expansion joint between the two housing sections to take care of the over-all expansion and contraction between the two units as a whole. This has the distinct advantage that the telescopic section can be much smaller in cross section than the housing sections and there will be less opportunity for leakage. As a matter of fact, I can do away with the O ring seal previously required. Additionally, each housing section functions separately to muffle or suppress the exhaust noises and the gases can pass through the expansion tubes in the upper chamber to the exhaust pipe.

Each housing section is merely a sheet of metal rolled into the cylindrical form shown and welded at the overlap. The two sections can be made identical, and two such sections joined by the telescopic seal. Either of the two sections could be provided with the exhaust pipe 108.

In both forms the end plates are pressed or forced into position and a suitable weld holds them in place. The built up sides of the mounting bracket on the nozzles prevent lateral sway when the unit is vibrated by the engines.

Whereas I have shown and described the preferred form and one variation of my invention, it should be understood that numerous modifications, substitutions, alterations and additions can be made which do not depart from the invention's fundamental theme. For example, an appropriate shield could be used on the Figure 5 species. The Figure 1 species could have the mounting bracket to hold the nozzles rigidly on the engine as shown in Figure 5 to prevent lateral sway. I might also make the intermediate plate solid or imperforate in a localized area 124 opposite the nozzle 92 to prevent a direct pulse or direct communication between the nozzle and the outlet 108. At the same time, this will substantially suppress excess noise and provide a quieter muffler. The perforations could begin at a suitable point beyond the exhaust pipe 108 toward the nozzle 94 in Figure 7. I might also add that the various joints are tight enough so that the unit can function as a water-tight muffler to prevent the leakage in of water in military installations and at the same time to prevent the leakage out of exhaust fumes. The majority, if not all, of the joints are made by press fits and thereafter spot welded merely to retain the parts in place, the actual seal being acquired by the press fit.

With these and other modifications in mind, I wish that my invention be unrestricted, except as by the appended claims.

I claim:

1. In a muffler structure for under hood use on a tractor or the like, a pair of generally aligned housing sections disposed in spaced relation, each section having a longitudinally disposed laterally arranged perforate plate connected across it dividing the housing section generally into two chambers, a plurality of nozzles each adapted to be connected to the exhaust port on an engine and leading into one of the chambers of each section to convey exhaust gases to the said one chamber on each housing section, a single exhaust pipe connected to the other chamber of only one housing section, and an expansion conduit between the said other chamber of the housing sections so that only the said other chambers of the housing sections are in direct communication.

2. The structure of claim 1 in which the housing sections are generally cylindrical and approximately the same size.

3. The structure of claim 1 in which the expansion conduit between the housing sections includes a pair of telescoped pipes materially smaller in cross section than the housing sections.

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