May 13, 1958 E. RAWSON 2,834,425

EXHAUST MUFFLER

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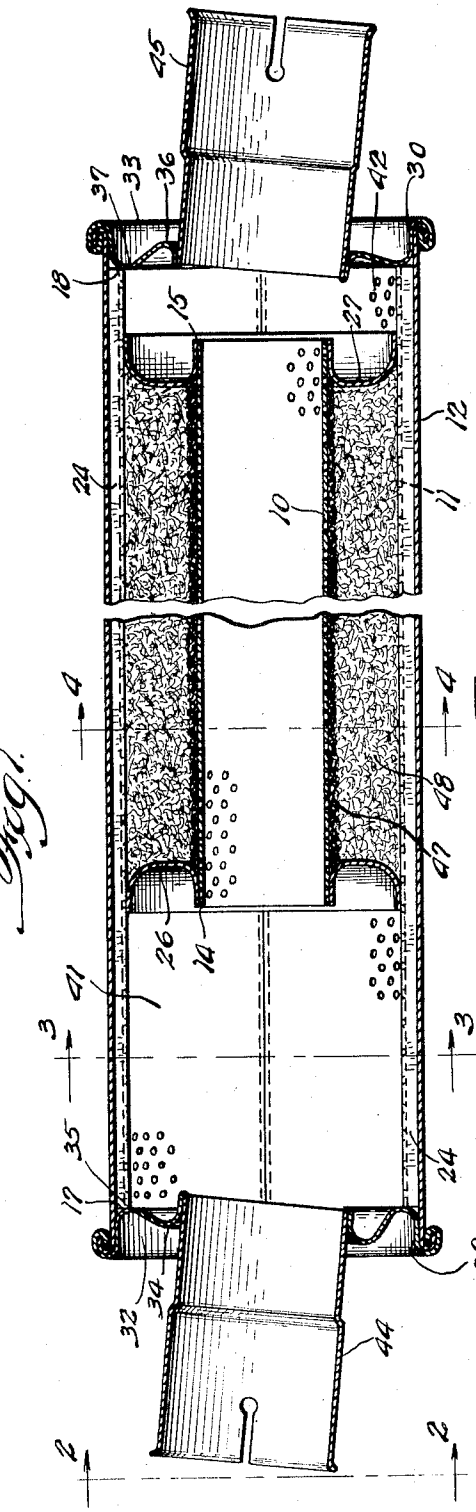


Fig. 1.

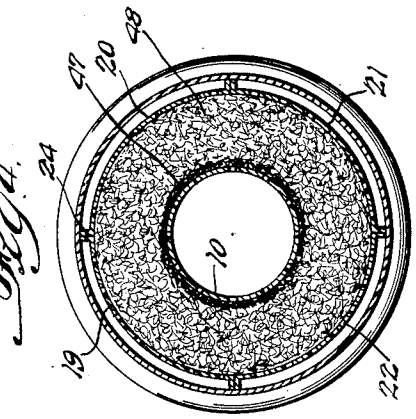


Fig. 4.

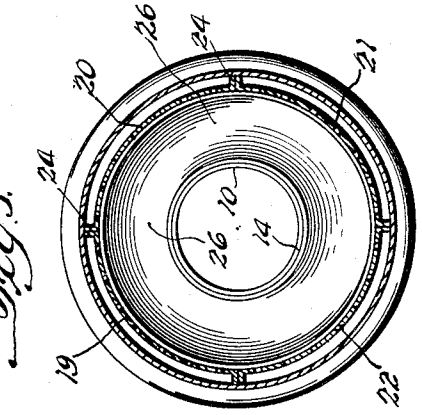


Fig. 3.

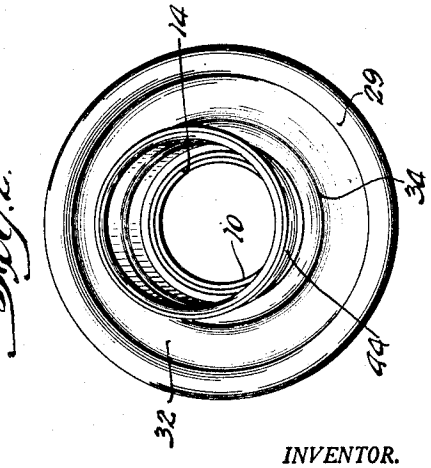


Fig. 2.

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# EXHAUST MUFFLER

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7 Claims. (Cl. 181—42)

This invention relates to an exhaust muffler for use on automobiles, trucks and other automotive vehicles or for use in stationary gasoline internal combustion engines.

The muffler forming the subject matter of the present invention is of the type having an elongated passage through which exhaust gases are directed, said elongated passage being defined by perforated metal. The perforations in the metal lead to sound absorbing fibrous material such as glass fiber or mineral wool or the like. In mufflers of this type, it has been found that the inert fibrous material such as glass fiber is most effective acoustically when the material is in finely divided form. Thus for example in the case of glass fiber, the fine glass fiber is most effective. This fine fiber is also the most widely used and is least costly.

It has been found, however, that this fine glass fiber deteriorates in the vicinity of the perforated sleeve through which exhaust gases pass. Whether the heat or the acoustic shock or the combination of the two is responsible is difficult to tell. However, the fine glass fiber is pulverized, seeps through the metal perforations and is blown out of the exhaust. In the course of time, all of the glass fiber filling the space around the perforated sleeve disintegrates, disappears and renders the muffler inoperative as far as reducing noise is concerned.

I have found that this deleterious action may be eliminated by using a layer of coarse glass fiber or other inert material in the region immediately surrounding the perforated sleeve where the inert filler is exposed to acoustic shock and concussion, as well as heat. In the case of coarse glass fiber, this material comes as a coarse mat and is more expensive than the fine glass fiber and is acoustically not as satisfactory. Therefore, a relatively thin layer of such glass fiber mat is used to surround the perforated sleeve through which the exhaust gases pass. Disposed around the coarse glass fiber mat is the conventional filling of fine glass fiber.

The coarse glass fiber mat has more body than the fine glass fiber and resembles a felted material in having strands crossing each other at all angles. The fine glass is conventional glass wool and resembles soft cotton batting.

Instead of coarse glass fiber, it is possible to use other inert material which can withstand the acoustic shock and heat of the exhaust. Such other material may, for example, be asbestos, magnesia, or other fibrous material capable of withstanding the intense heat and strong enough or soft enough to withstand the acoustic shock.

In order that the invention may be understood, it will now be explained in connection with the drawings wherein an exemplary embodiment is shown, it being understood that variations are possible without departing from the scope of the invention except as defined by the appended claims.

Referring to the drawing,

Figure 1 is a longitudinal sectional view of an exhaust muffler embodying the present invention.

Figure 2 is an end view along line 2—2 of Figure 1.

Figure 3 is a section along line 3—3 of Figure 1.



Figure 4 is a section along line 4—4 of Figure 1.

The exhaust muffler embodying the present invention comprises three nested elongated tubular members **10**, **11** and **12**. Member **10**, which is the core, consists of a perforated metal pipe, the metal being of sheet iron or sheet steel as desired. As a rule, tubular member **10** may be formed in a manner generally resembling a stove pipe in having the meeting edges of a flat sheet curled or otherwise suitably attached to maintain the member in its round condition. It is understood that any of the three nested members may depart from a round shape. However the circular cross section as illustrated is generally preferred for simplicity. Tubular core **10** has ends **14** and **15**.

Surrounding core **10** is intermediate perforated tubular member **11** having ends **17** and **18** respectively. Intermediate tubular member **11** is also formed of perforated sheet iron or sheet steel and may conveniently be formed as illustrated in Figures 3 and 4 of four quadrant portions **19** to **22** inclusive. Each quadrant portion has the longitudinal edge bent outwardly so that adjacent edges form outwardly extending flanges **24**. The quadrant portions may be spot welded at the outwardly extending flanges to maintain the generally tubular character of intermediate member **11**. As an example, core **10** and intermediate tubular member **11** may be made of 22 gauge sheet iron, the material having $\frac{1}{16}$" holes with the centers of the holes spaced $\frac{1}{8}$" apart. The holes are staggered so that the sheet metal has substantial strength.

It will be noted that ends **14** and **15** of core member **10** stop short of ends **17** and **18** of intermediate tubular member **11**. Core member **10** is maintained in centered relation with respect to intermediate tubular member **11** by annular trough-shaped retainers **26** and **27**. These retainers may be spot welded to the outside and inside parts of tubular members **10** and **11** respectively.

Disposed around intermediate tubular member **11** is outer shell **12** consisting of solid sheet iron or sheet steel as desired. Outer shell **12** has ends **29** and **30** engaged by annular support members **32** and **33** respectively. Support members **32** and **33** are shaped to resemble a wave extending in a circular pattern, having crest **34** and trough **35** in support member **32** and crest **36** and trough **37** in support member **33**. Ends **29** and **30** of shell **12** and the perforated portions of annular support members **32** and **33** are crimped as shown to provide a sturdy construction.

The annular support members are so disposed that the troughs engage ends **17** and **18** of intermediate tubular member **11** to retain the same longitudinally within shell **12**. Outwardly extending flanges **24** formed in intermediate tubular member **11** are designed to fit within the inside of shell **12** and thus maintain the intermediate tubular member centered within the shell. It will be noted that annular space **39** between core **10** and intermediate tubular member **11** is both shorter axially of the muffler and greater radially of the muffler compared to the region between intermediate tubular member **11** and shell **12**.

Between annular support **32** and annular trough-shaped retainer **26** is open region **41**, this region being within intermediate tubular member **11**. Between annular support member **33** and annular trough-shaped retainer **27** is region **42**, also within intermediate member **11**. Region **41** is preferably substantially longer in extent than region **42**.

Annular support member **32** has an intake coupling sleeve **44** welded or suitably attached to the inner flange of the support. Similarly, annular support **33** has discharge coupling sleeve **45** attached to the inner flange part thereof. The two coupling sleeves may be slotted as shown and may be disposed out of line with the axis of

the muffler in accordance with conventional practice to facilitate installation.

Within the region defined by core **10** and intermediate perforated member **11** and by annular trough-shaped retainers **26** and **27**, is a mass of inert fibrous material for silencing purposes. In accordance with this invention, inner layer **47** of this mass of material consists of relatively coarse glass fiber mat. This forms a layer immediately around the outer surface of core **10**.

The thickness of layer **47** may vary depending upon the distance between the outer surface of inner core **10** and the inner surface of intermediate sleeve **11**. In general, however, the thickness of layer **47** may be of the order of about 1/16 of an inch. The actual thickness of layer **47** will depend in some measure upon how tightly the glass fibers are compressed into the space between the core and the sleeve. Another factor which will determine the thickness of fiber mat **47** will be the size available in the market.

In comparison to the thickness of coarse fiber mat **47**, the remainder of the space within intermediate sleeve **11**, filled by fine glass fibers **48**, will be large. As a rule, the coarse glass fiber mat comes in sheets having a number of layers packed together. The fine glass fiber comes in bats but has less body than the glass mat.

Thus as an example of a muffler, the space between core **10** and intermediate sleeve **11** has a dimension of about 1" with a sheet of coarse glass fiber mat disposed around the outside surface of inner core **10** and the remainder of the space being packed with glass wool or fine glass fiber. Inner core **10** in such a muffler may have a diameter of the order of about 1½" while intermediate member **11** may have a diameter of the order of about 3¼" with outer member **12** having a diameter of about 3½". The overall length of the muffler excluding the intake and outlet connections may range anywhere as from about 17" to about 30" depending upon the engine size and various other factors. These dimensions are merely exemplary and will vary depending upon the size of the engine and the desired exhausting effects.

The length of region **41** will generally be substantially greater than the length of region **42** but the respective lengths may vary within wide limits without departure from the scope of the present invention.

It will be noted that the inlet and outlet coupling sleeves have diameters at the annular supports somewhat larger than the diameter of core **10**.

Instead of glass wool forming portion **48** of the muffler packing, other inert wools such as asbestos or the like may be used. The coarse glass fiber mat forming layer **47**, however, is preferred above all other known materials and is highly effective.

What is claimed is:

1. A muffler for automobile engines comprising three nested elongated tubular metal members laterally spaced from each other along substantially all of their respective opposed surfaces, the two inner members thereof being perforated, means for maintaining said members in generally symmetrical relation with respect to each other, a layer of relatively coarse glass fiber mat disposed immediately around the outer surface of said innermost member and additional fibrous inert material disposed over the first named fiber mat, said additional material being substantially finer than the coarse glass fiber and normally being subject to rapid deterioration when used directly around said innermost member, the fiber mat being strong enough to resist deterioration due to exposure to the exhaust gases.

2. An automobile exhaust muffler comprising three nested elongated tubular metal members laterally spaced from each other along substantially all of their respective opposed surfaces, the two inner members being perforated, the innermost member stopping short of the remaining two members at both ends of said innermost member, means for maintaining said members in generally symmetrical relation with respect to each other, a layer of relatively coarse glass fiber disposed immediately around the outer surface of said innermost member and additional fibrous inert material disposed around said first named coarse glass fiber layer, said additional material being substantially finer than the coarse glass fiber and normally being subject to rapid deterioration when used directly around said innermost member, said two layers filling the space between the two perforated members.

3. An automobile exhaust muffler comprising three nested elongated tubular metal members laterally spaced from each other along substantially all of their respective opposed surfaces, the two outer members having substantially the same length while the innermost member is substantially shorter than the remaining two outer members, the two inner members being perforated, means for maintaining said members in generally symmetrical relation with respect to each other, the innermost member being disposed so that one end thereof is farther from the corresponding one end of the remaining two members than the other end of said innermost member is from the other end of the remaining two members, a thin layer of coarse glass fiber disposed immediately around the outer surface of said innermost member, additional fibrous inert material disposed around said first named layer and filling the space within said intermediate member, annular supports carried jointly by the two outer members at their respective ends and inlet and outlet coupling sleeves carried by said annular supports.

4. An automobile exhaust muffler comprising three nested elongated tubular metal members, the outermost member being of solid material and shaped to form a generally circular pipe, an intermediate member of perforated metal, said intermediate member having a length substantially the same as the outer member and having externally directed flanges for fitting against the inside surface of the outermost member so that the intermediate member may be maintained in predetermined relation within the outermost member, the innermost member being of perforated sheet metal and having a length substantially shorter than the remaining other members, said innermost member having a generally circular cross section, annular members at both ends of the innermost member for maintaining the innermost member in generally centered relation within the intermediate member, a layer of coarse glass fiber mat disposed around the outer surface of the innermost member, glass wool disposed around said first mentioned glass layer, all of said glass being disposed between the two perforated members and between the two annular retaining members.

5. The construction according to claim 4 wherein annular support members are provided at the two ends of the two outer members, said annular support members retaining the intermediate member in position, said annular support members being adapted to have connected thereto inlet and outlet members.

6. The construction according to claim 5 wherein said annular support members have inlet and outlet sleeves connected thereto.

7. The construction according to claim 4 wherein the innermost member is disposed substantially farther from one end of the two outer members than from the other end of the two outer members, said one end forming the inlet for the exhaust muffler.


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