July 21, 1970 F. B. LEFFLER 3,521,429

MUFFLER

Filed Oct. 4, 1968

FIG. 1.

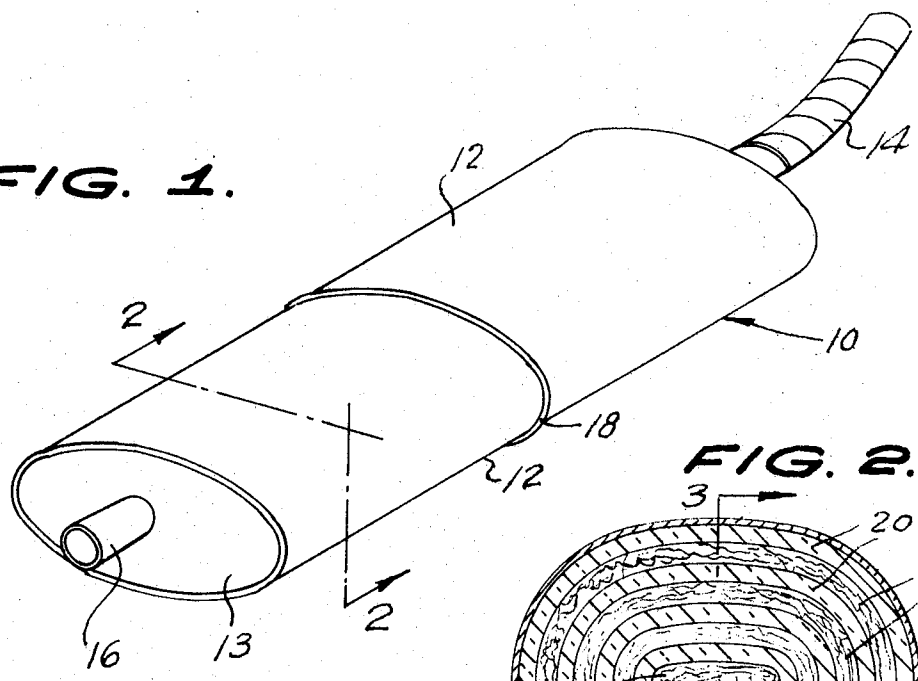


FIG. 2.

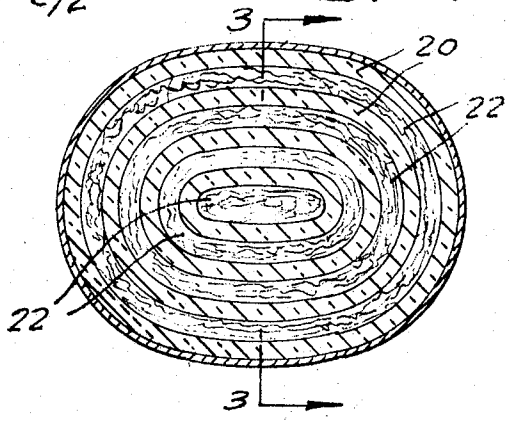
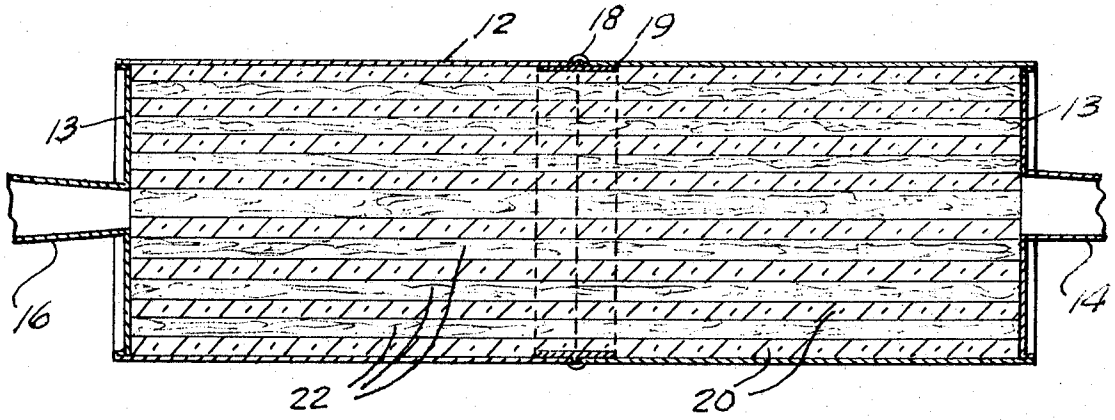


FIG. 3.



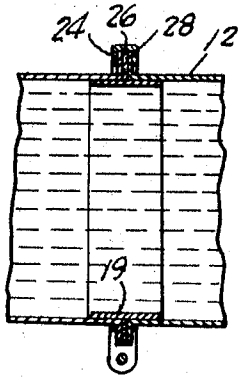


FIG. 4.

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U.S. Cl. 55—276 4 Claims

ABSTRACT OF THE DISCLOSURE

An improved exhaust muffler packed with fibrous material in roll form of fibrous glass and metal layers impregnated with a silicone oil capable of withstanding exhaust gas temperature.

This invention relates to a new and improved muffler to be used in the combustion exhaust systems commonly found in automobile engines, truck Diesel engines, or the like.

It is a primary object of this invention to provide a muffler which is economical in construction, inexpensive in use, and effective in reducing the noise level of combustion exhaust gases.

Another object of this invention is to provide a high capacity effective filtering means for removal of solid particulate matter from exhaust gas.

Another object of this invention is to provide means for converting gaseous pollutants to harmless products prior to their ejection into the surrounding atmosphere.

Another object of this invention is to provide a muffler of long life wherein the internal packing is replaceable thereby restoring performance of said muffler to its initial high value.

Another object of this invention is to provide muffler packing material of a fibrous nature, said material having improved noise attenuation, particulate filtering and gaseous conversion properties wherein said fibrous material is coated with an oil-like substance.

Other objects and advantages of this invention will be made readily apparent from the disclosure in the attached specification and from the accompanying drawing, wherein:

FIG. 1 is a perspective view of a specific embodiment of the muffler comprising the subject matter of the instant invention;

FIG. 2 is a sectional transverse view taken substantially along the line 2—2 of FIG. 1, and illustrates a particular arrangement of packing materials wherein such materials are alternately spaced in a flattened cylindrical type arrangement.

FIG. 3 is a vertical sectional view taken along the longitudinal axis of line 3—3 of FIG. 2, and illustrates the muffler volume with a substantially filled packing material contained therein, and

FIG. 4 is a fragmentary sectional view and illustrates a clamping arrangement for detachably securing a split muffler housing.

Referring now to the drawing, wherein like numerals indicate like elements throughout the several views, the specific embodiment of said improved muffler is generally indicated by the numeral **10**. The muffler **10** comprises an imperforate tube housing **12**, a pair of end plates **13**, each of which is suitably secured at one end of said tube **12** thereby enclosing said tube **12** from the external atmosphere, an inlet conduit **14** secured to one end plate, and outlet conduit **16** secured to the other end plate **13** thereby providing means for attachment into the automobile exhaust system.

Imperforate tube **12**, as shown in FIG. 1, is constructed of conventional materials capable of resisting the corroding effects of water condensate and other corrosive agents present in exhaust gases. Galvanized steel, aluminized steel, aluminum, ceramic or glass-lined metal tubes, are examples of such materials, which may be used. The shape of said tube **12** may be cylindrical, flattened cylindrical having an elliptical type cross-section, or any other suitable shape.

A porous packing material preferably of fibrous glass **20** and steel wool **22** is contained within said tube **12** substantially filling the entire internal volume thereof. Suitably confining screens, not shown, may be provided at the inlet **14** and outlet **16** to prevent loss of said packing materials **20, 22** into the exhaust system. A preferred packing arrangement is shown in FIGS. 2 and 3 and consists of filling the internal volume with alternate layers of glass fiber and steel wool mats, each layer being approximately ¾-inch thick, and the layers being tubular sleeves concentrically arranged about the longitudinal axis of tube **12** extending the length thereof. Alternatively, other methods of layering may be used, as for example, flat sheets laid one upon the other, or spiraled coincident with the axis of said tube **12**.

As can readily be appreciated, approximately equal volumes of glass fibers **20** and steel fibers **22** are thereby provided. The packing materials are commercially available in a variety of forms such as belts, mats, wool, or the like. Irregularly-shaped metallic chips may also be used in place of the matted fiber structure. Other combinations of materials may be used including fibrous asbestos, quartz, alumina, copper, aluminum, stainless steel, or the like.

Filling the entire muffler sleeve **12** with porous packing material offers high capacity for particulate filtration, low back pressure, and reduced noise, as well as improvement of engine efficiency and reduced air pollution.

In addition to the particular arrangement of said packing material, as described hereinabove, a preferred treatment of said material includes applying a synthetic oil-like fluid to the packing material surfaces, thereby coating the surfaces as by impregnation, spraying, or dipping.

Impregnating fluids for use in this invention must be of low volatility and capable of withstanding temperatures of up to 600° F. in the presence of oxygen for prolonged periods of time without decomposition. Commercially available synthetic lubricants are obtainable for such use. A variety of silicone fluids having the necessary high temperature properties are suitable. In particular, dimethyl and methylphenyl polysiloxane fluids available from Dow Corning Corporation and designated as 210 and 710 series, respectively, have been used. Preferred fluids are designated as 210, 210H, 710G and 710R.

Ordinary hydrocarbon oils have been found to be unsuitable due to a break-down of their molecular structure resulting in carbon formation which clogs the internal muffler passages.

By coating the fibrous packing material with the lubricant described above unexpected results are obtained. Lower back pressures are achieved by reducing the friction of the moving gases passing through, and internal corrosion is also reduced. Particulate matter is more easily retained on the packing material surfaces.

In using the muffler constructed and assembled as described hereinabove, the muffler inlet conduit **14** may be of a flexible type with gradually increasing diameter away from the muffler such that it is easily connectible to the engine exhaust pipe, located upstream of said muffler. Exhaust gases emanating from the internal combustion engine are conducted through conduit **14** into muffler **10** where expansion occurs and where said gases intimately and uniformly contact and pass through the porous packing at a reduced velocity and emerge via conduit **16** into

an exhaust tailpipe and are subsequently discharged into the atmosphere. Pollutants normally found in the exhaust gases are thereby filtered and/or converted to harmless products.

The variety of pollutants normally found in the exhaust gas may result from such factors as improper air-fuel mixtures, engine wear, combustion inefficiencies, or any combination thereof. Therefore, it is common to find within such exhaust gas undesirable gaseous pollutants such as carbon monoxide, nitrous oxide and unreactive hydrocarbons, and solid particulate pollutants such as carbon particles, in addition to water vapor, nitrogen, carbon dioxide and oxygen.

As stated earlier, removal of the solid particles is by physical entrapment. Removal of the undesirable gaseous pollutants is by conversion of said pollutants to a chemical state considered to be non-contributing to atmospheric pollution, probably by a combination of temperature, and catalytic reaction.

It is believed that the combination of packing materials herein described having extensive surface areas promotes the ready removal and conversion of such pollutants.

In time, however, a build-up of particulate matter on the packing will lead to increased back pressure. Replacement of the packing material may be desirable, in which case it may be accomplished by cutting open the tube **12**, removing its contents and substituting new material. As shown in FIG. 3, the tube **12** is constructed of two halves joined, after the packing material has been inserted, by a light weld or soldered seam **18**. A reinforcing ring **19** may be internally welded or tacked on the inner surface of one of said tube halves, thereby providing reinforcement and guiding means for joining both halves.

Alternatively, tube **12** may be constructed in such manner as depicted in FIG. 4 wherein each half of tube **12** is provided with continuous flange members **24** adjacently separated by sealing gasket **26** and held firmly in place by a circumferential removable clamp device **28**. This construction facilitates removal and replacement of packing materials **20** and **22**.

While a specific embodiment of the instant invention has been disclosed in the foregoing description, it will be understood that various modifications within the spirit

of the invention may occur to those skilled in the art.

What is claimed is:

1. An exhaust muffler and filter comprising, an imperforate tube, end plates secured to said tube having inlet and outlet means disposed axially of the tube for directing the passage of high temperature exhaust gases therethrough, and a porous packing and filtering material substantially filling the internal volume of said tube between said end plates and across the tube, said packing and filtering material including a plurality of flat layers of fibrous glass and metallic fibers of substantially equal volume laid alternately on one another and rolled about an axis coincident with the axis of said tube to define coaxial tubular sleeves parallel to the direction of flow of the exhaust gases, each of said layers being completely impregnated with a silicone oil capable of withstanding normal muffler exhaust gas temperatures.

2. An exhaust muffler and filter according to claim **1**, wherein said tube and the enclosed packing and filtering material layers have flattened, ovoid cross-sections.

3. The device of claim **2**, wherein said inlet and outlet means each provides an opening of much smaller cross-section than that of said imperforate tube.

4. The device of claim **3**, wherein said tube is formed in two equal, longitudinally aligned parts and joined by clamping means.

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