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(54) **MUFFLER WITH IMPROVED HEAT DISSIPATION**

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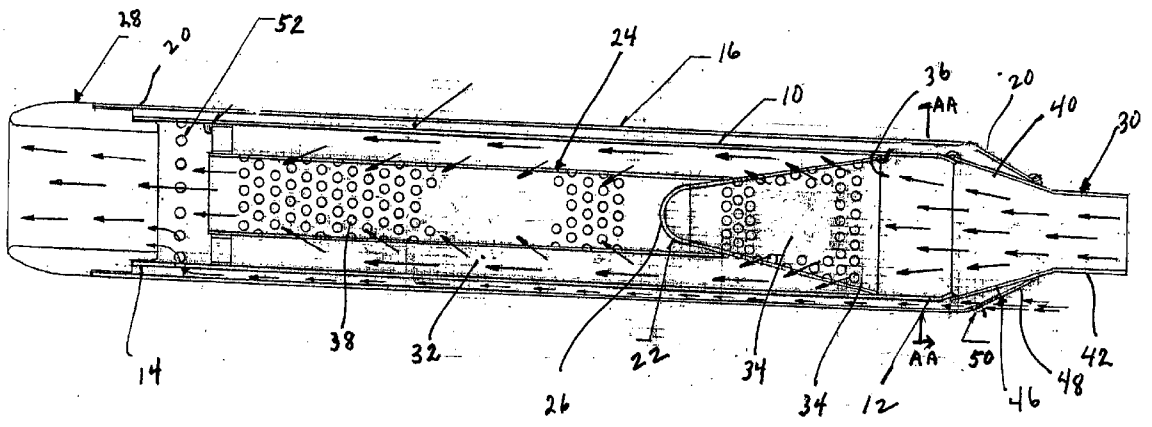
(57) **ABSTRACT**

A muffler has inner and outer elongated concentric and radially spaced generally cylindrical casings having inlet and outlet ends, and providing an annular chamber therebetween. The outer casing has an inlet opening into the annular chamber adjacent the inlet end of the outer casing so that air may flow to the outer end. The inner casing has an aperture adjacent the outlet end for the air to flow from the annular chamber into the inner casing for discharge with the exhaust. This air flow through the annular chamber reduces the temperature of the outer casing from that of the inner casing. Baffles are provided in the inner casing, and insulating material may also be provided in the inner casing.



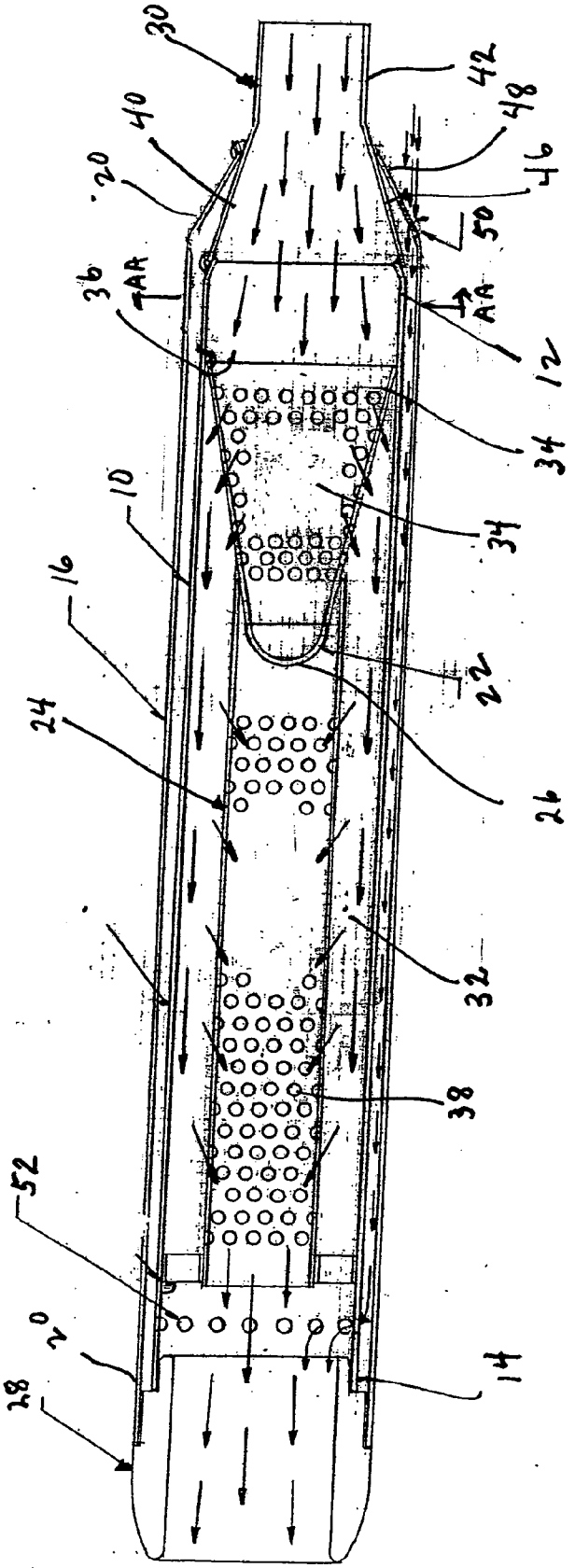


FIG. 1

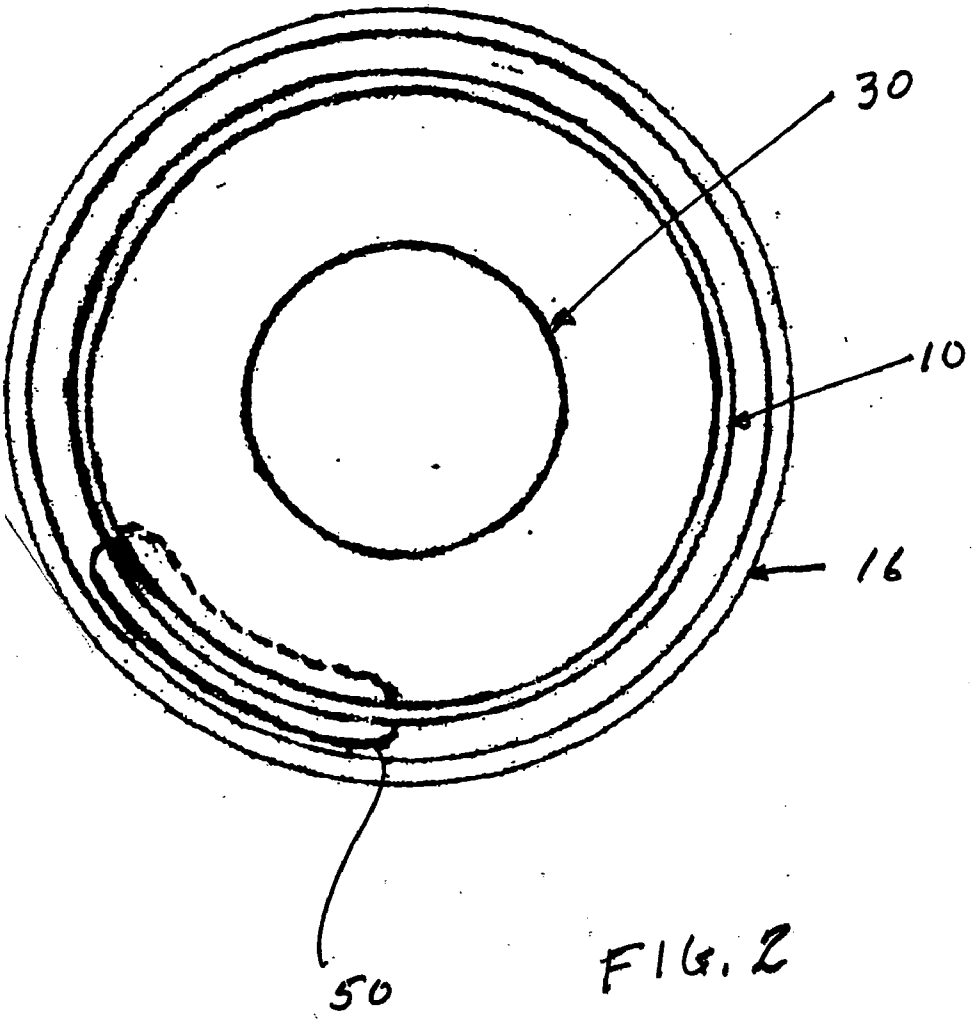


FIG. 2

MUFFLER WITH IMPROVED HEAT DISSIPATION

BACKGROUND OF THE INVENTION

[0001] This invention is related to exhaust systems, and, more particularly, to a muffler which will facilitate exhaust action and noise abatement of high velocity exhaust gas flow and which has an outer wall which has a reduced temperature.

[0002] Internal combustion engines and turbines produce exhaust combustion gases and the discharged exhaust is frequently accompanied by undesirable levels of noise. The problem of muffling and evacuating such exhaust gases is well known.

[0003] Moreover, the hot exhaust gas quickly heats the outer wall of the muffler to a temperature approaching that of the exhaust gas and prolonged high temperature can produce discoloration of the cosmetic finish on the outer wall.

[0004] In my U.S. Pat. No. 6,510,921 granted Jan. 8, 2003, I have described an improved muffler which contains a pair of baffle elements in a construction which reduces back pressure and facilitates extraction of the exhaust from the engine. However, the outer wall of the muffler reaches temperatures approaching that of the exhaust gas passing therethrough and discoloration of the cosmetic coating may occur.

[0005] It is an object of the present invention to provide a novel muffler which provides cooling of the outer wall to minimize or avoid discoloration of the cosmetic coating thereon.

[0006] It is also an object is to provide such a muffler with components which can be readily fabricated and assembled to provide a relatively long lived device.

[0007] Another object is to provide such a muffler which is relatively low cost, is relatively lightweight and is resistant to rust and corrosion.

SUMMARY OF THE INVENTION

[0008] It has now been found that the foregoing and related objects may be readily attained in a muffler and exhaust extractor comprising an inner elongated generally cylindrical casing having inlet and outlet ends and an outer elongated generally cylindrical casing having inlet and outlet ends. The diameter of the outer casing is greater than that of the inner casing to provide an annular chamber therebetween.

[0009] An exhaust inlet fitting is provided at the inlet end of the inner casing, and an air inlet is provided adjacent the inlet end of the outer casing to allow air to flow into the annular chamber. Vents in the inner casing adjacent the outlet end thereof permit air to flow from the annular chamber into the exhaust flowing through the inner casing. The inner and outer casings are spaced apart, and baffle elements are provided in the inner casing. Exhaust flows through the inner casing about the baffle elements, and ambient air flows through the annular chamber to provide a temperature at the outer casing which is lower than that of the inner casing.

[0010] The inlet end of the inlet fitting is of lesser diameter than the inner casing, and it has an outwardly sloping wall extending toward the inner casing. The outer casing has an inner end portion extending over a portion of the outwardly sloping wall of the inlet fitting, and the air inlet is provided in the inner end portion of the outer casing. Desirably, the end of the inner end portion of the outer casing is secured to the sloping wall of the inlet fitting.

[0011] The preferred baffle elements comprise a generally frustoconical baffle in the inner casing adjacent its inlet end, and the frustoconical baffle is elongated with the smaller diameter portion being spaced from the inlet end. The peripheral wall of the baffle has perforations therein closely spaced about the periphery and over the major portion of the axial length thereof. This baffle is spaced from the inner casing over the major portion of its axial length to provide an inlet end inner chamber thereabout.

[0012] The baffle elements also include a generally cylindrical baffle in the inner casing having one end extending over the smaller diameter portion of the frustoconical baffle. The cylindrical baffle has its peripheral wall spaced from the inner casing over substantially the entire length thereof to provide an elongated inner chamber thereabout communicating with the inlet end inner chamber about the frustoconical baffle. The peripheral wall of the cylindrical baffle has closely spaced perforations extending circumferentially thereabout and over the major portion of its length. As a result, a substantial portion of the volume of exhaust gases entering the inlet end of the frustoconical baffle exits through the perforations in the peripheral wall and thence moves generally axially in the chamber thereabout and into the chamber about the cylindrical baffle. The exhaust gases then pass into the cylindrical baffle through the apertures therein and move axially therethrough to the exit end of the casing.

[0013] Desirably, the end of the smaller diameter portion of the frustoconical baffle is open so that some of the exhaust gases pass axially therethrough into the interior of the cylindrical baffle. Preferably, the apertures in the peripheral wall of the cylindrical baffle are oriented in a spiral pattern.

[0014] The inlet end of the frustoconical baffle is supported by the inlet fitting which has an outwardly extending generally cylindrical portion for connection to an element of the exhaust system. The inlet end of the inner casing is secured to the outer surface of the end cap. The outlet end of the cylindrical baffle is supported by an end cap in the inner casing adjacent the outlet end thereof.

[0015] Desirably, there is included heat-resistant fibrous material in the elongated inner chamber to enhance sound reduction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] **FIG. 1** is a semi-diagrammatic longitudinal sectional view of an engine muffler/exhaust extractor embodying the present invention; and

[0017] **FIG. 2** is a sectional view along the line "AA" in **FIG. 1**.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

[0018] **FIG. 1** illustrates an engine muffler/exhaust extractor embodying the present invention which is generally

comprised of an inner tubular or cylindrical casing generally designated by the numeral **10** having an inlet end **12** and an outlet end **14**, and an outer tubular or cylindrical casing generally designated by the numeral **16** having an inlet end **18** and an outlet end **20**.

[**0019**] Seated within the inner casing **10** adjacent its inlet end **12** is a frustoconical baffle generally designated by the numeral **22**. Also seated within the casing **10** is a cylindrical baffle generally designated by the numeral **24** which extends over the small diameter end portion **26** of the frustoconical baffle **22** and is supported adjacent the discharge end by the support cap generally designated by the numeral **28**. At the inlet end of the casing **10** is an inlet fitting generally designated by the numeral **30**. The baffles **22** and **24** are dimensioned so that there is an annular space between them and the inner casing **10** providing a chamber **32** external to both baffles **22**, **24**. The numerous arrows diagrammatically illustrate the flow of the exhaust gases through the inlet fitting **30**, baffles **22**, **24** and chamber **32** to the outlet end **14**.

[**0020**] Turning now in detail to the frustoconical baffle **22**, the central section thereof is provided with closely spaced apertures **34** extending about the periphery thereof providing communication from its interior with the chamber **32**. The apertures **34** extend over the full length of the baffle **22**. The small diameter end portion **26** and the large diameter end portion **36** are both imperforate although the perforations **34** could be extended to both ends of the baffle **22** to facilitate use of fully perforated sheet material.

[**0021**] Turning next to the cylindrical baffle **24**, the two end portions are imperforate, but the entire center section is provided with helically oriented closely spaced apertures **38** over its entire length. The perforations **38** in the cylindrical baffle **24** are preferably oriented in a helical pattern and the metal is deformed thereabout to provide louver-like or scoop-shaped formations which have an open end disposed towards the outlet end **14** of the casing **10** for a purpose to be described more fully hereinafter.

[**0022**] The inlet fitting **30** has a circular cross section throughout its length. The larger diameter inner end portion **40** fits snugly over the end of the casing **10**, and the smaller diameter end portion **42** extends outwardly of the casing **10** for coupling to an adjacent component of the exhaust system (not shown).

[**0023**] The inlet fitting **30** has an expanded inner end **44** providing a frustoconical portion **46**.

[**0024**] The outer casing **16** has a frustoconical inlet end portion **48** which is welded to the frustoconical portion **46** and is supported at its outlet end **14** in the end cap **28**. The conical portion **46** of the outer casing **16** has an oval aperture **50** through which air flows into the elongated annular chamber **8** until it exits through vent apertures **52** in the inner casing **10**.

[**0025**] Ambient air passes through the inlet aperture **50** into the annular chamber **8** between the inner and outer casing **10**, **16** and flows therein to the vent apertures **52** where it exits into the exhaust gases flowing out the cap **48**.

[**0026**] Baffling material (not shown) when employed will normally fill the entire chamber about the cylindrical baffle **24**.

[**0027**] In a preferred structure, the casings **10**, **16** increase in diameter from the inlet ends to the outlet ends to facilitate flow of exhaust gases therethrough. An increase of one inch over a length of twenty-four inches has been found quite satisfactory.

[**0028**] As will be readily appreciated, the baffle components can be readily fabricated by first pre-punching sheet metal such as stainless steel and then forming the sheet material into the frustoconical and cylindrical baffles. The abutted ends of the sheet material can then be welded. The discharge end cap can be stamped from sheet metal, and the casing and inlet end cap can both be formed from tubing.

[**0029**] Although spacers may be provided between the inner and outer casings, the welding of the casings to the inlet fitting at the inlet end and the support provided by the cap at the outlet end is sufficient to maintain the desired spacing.

[**0030**] Although various metals and ceramics may be employed for the components, stainless steel is preferred for its resistance to corrosion. For the fibrous sound absorbing materials, fiberglass is preferred because of its low cost which allows the owner to replace it from time to time to maintain high efficiency of flow through the muffler.

[**0031**] As diagrammatically shown, the exhaust gases enter the frustoconical baffle and are partially vented through the apertures in its peripheral wall into the chamber thereabout. A substantial portion of the exhaust gases continues on a direct path through the reducing cross section of the baffle and is accelerated as it passes from the nozzle-like end into the cylindrical baffle. As the high velocity exhaust gas stream proceeds through the cylindrical baffle, the exhaust gas which has entered the chamber passes through the louvers and into the cylindrical baffle. The combination of the forward orientation of the openings in the scoop shaped louvers provides rapid flow of the exhaust gases therethrough and they are swept along with the exhaust gas which has passed directly into the cylindrical baffle.

[**0032**] With the current design of this muffler the air between the inner and outer casings flows from front to back when the engine of the vehicle is running because of the siphon effect of the exhaust passing by the exit vents at the exit end of the inner casing. The air is fed into the space between the inner and outer bodies by the oval cut-out near the inlet end or front of the muffler. This ambient (cool) air is at a lower temperature than that of the exhaust gases. The outer casing is not in direct contact with the exhaust gases or with the inner casing. This reduces heat transfer to the outer casing thereby reducing the possible discoloration of the chrome outer surface. This process is also enhanced when the vehicle is in motion by air flowing into the chamber through the slot at the inlet (front) of the muffler at a greater volume due to the speed of the vehicle. The cooling effect of this air flow on the outside of the casing will greatly reduce the temperature and substantially reduce the potential for discoloration of the cosmetic chrome finish on the outer casing.

[**0033**] Tests on mufflers embodying the present invention indicate that the high speed flow of ambient air into the annular chamber reduces the temperature of the outer casing and its cosmetic coating so that there is no discoloration.

[**0034**] Thus, it can be seen from the foregoing detailed specification and attached drawings that the novel muffler of

the present invention minimizes or eliminates the discoloration of the cosmetic coating on the muffler. The components are readily fabricated and relatively economical, and they can be readily assembled to provide a muffler which will exhibit relatively long life without discoloration.

Having thus described the invention, what is claimed is:

1. A muffler and exhaust extractor comprising:

(a) an inner elongated generally cylindrical casing having inlet and outlet ends;

(b) an outer elongated generally cylindrical casing having inlet and outlet ends, the diameter of said outer casing being greater than that of said inner casing to provide an annular chamber therebetween;

(c) an exhaust inlet fitting at the inlet end of said inner casing;

(d) an air inlet adjacent the inlet end of said outer casing to allow air to flow into said annular chamber;

(e) vents in said inner casing adjacent said outlet end thereof to permit air to flow from said annular chamber into the exhaust flowing through said inner casing; and

(f) baffle elements in said inner casing, whereby exhaust flows through said inner casing about said baffle elements and ambient air flows through said annular chamber to provide a temperature at said outer casing which is lower than that of said inner casing.

2. The muffler and exhaust extractor in accordance with claim 1 wherein the inlet end of said inlet fitting is of lesser diameter than said inner casing and has an outwardly sloping wall extending to said inner casing.

3. The muffler and exhaust extractor in accordance with claim 2 wherein said outer casing has an inner end portion extending over a portion of said outwardly sloping wall of said inlet fitting and said air inlet is provided in said inner end portion of said outer casing.

4. The muffler and exhaust extractor in accordance with claim 3 wherein the end of said inner end portion of said outer casing is secured to said sloping wall of said inlet fitting.

5. The muffler and exhaust extractor in accordance with claim 1 wherein there is included an end cap at the outlet-end of said casings and wherein said casings are supported thereon.

6. The muffler and exhaust extractor in accordance with claim 1 wherein said baffle elements comprise:

(a) a generally frustoconical baffle in said inner casing adjacent said inlet end, said frustoconical baffle being elongated with the smaller diameter portion being spaced from said inlet end, the peripheral wall of said baffle having perforations therein closely spaced about the periphery and over the major portion of the axial length thereof, said baffle being spaced from said inner casing over the major portion of its axial length to provide an inlet end inner chamber thereabout; and

(b) a generally cylindrical baffle in said inner casing having one end extending over the smaller diameter portion of said frustoconical baffle, said cylindrical baffle having its peripheral wall spaced from said inner casing over substantially the entire length thereof to provide an elongated inner chamber thereabout communicating with said inlet end inner chamber about said frustoconical baffle, said peripheral wall having closely spaced perforations extending circumferentially thereabout and over the major portion of its length, whereby a substantial portion of the volume of exhaust gases entering the inlet end of said frustoconical baffle exits through said perforations in said peripheral wall and thence moves generally axially in said chamber thereabout and into said chamber about said cylindrical baffle, the exhaust gases then passing into said cylindrical baffle through said apertures therein and moving axially therethrough to said exit end of said casing.

7. The muffler and exhaust extractor in accordance with claim 6 wherein the end of the smaller diameter portion of said frustoconical baffle is open so that some of the exhaust gases pass axially therethrough into the interior of said cylindrical baffle.

8. The muffler and exhaust extractor in accordance with claim 6 wherein the apertures in the peripheral wall of said cylindrical baffle are oriented in a spiral pattern.

9. The muffler and exhaust extractor in accordance with claim 6 wherein the inlet end of said frustoconical baffle is supported by said inlet fitting which has an outwardly extending generally cylindrical portion for connection to an element of the exhaust system.

10. The muffler and exhaust extractor in accordance with claim 9 wherein the inlet end of said inner casing is secured to the outer surface of said end cap.

11. The muffler and exhaust extractor in accordance with claim 6 wherein said outlet end of said cylindrical baffle is supported by an end cap in said inner casing adjacent said outlet end thereof.

12. The muffler and exhaust extractor in accordance with claim 6 wherein there is included heat-resistant fibrous material in said elongated inner chamber to enhance sound reduction.

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