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EXHAUST GAS BURNER AND MUFFLER

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Fig. 1

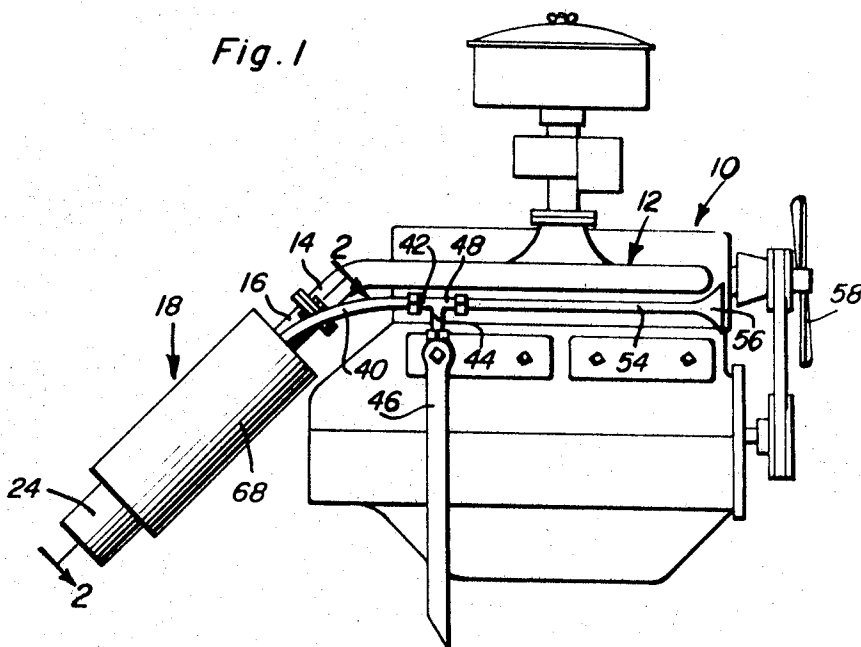


Fig. 2

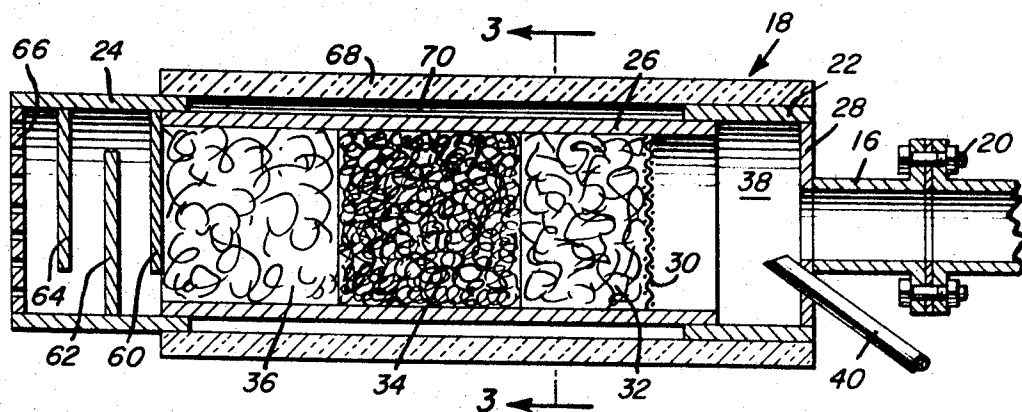
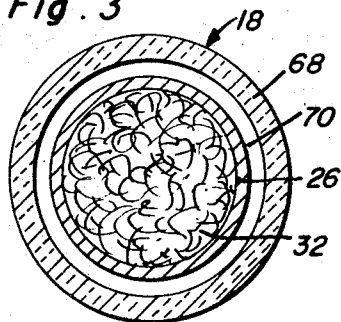


Fig. 3



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EXHAUST GAS BURNER AND MUFFLER

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3 Claims

ABSTRACT OF THE DISCLOSURE

A tubular exhaust afterburner and muffler for an internal combustion engine having, in flow series, an exhaust inlet, an air inlet, a bed of bulk material to be heated to incandescence, a tortuous path defined by staggered baffles, and an outlet. The bulk material is retained within a central tubular member and may include zones of differing density. The inlets and outlets are formed in end caps telescoped onto the central member and an outer insulative wrapping is placed around the end caps and spaced from the central member.

The exhaust gas burner and muffler includes at least a partial filling of internal sound deadening bulk material which may be heated to incandescent temperatures by hot exhaust gases passing through them muffler and which serves, in conjunction with the combustion chamber in the muffler, for ensuring a more complete burning of unburned fuel normally exhausted from an internal combustion engine.

The exhaust gas burner and muffler is provided with means for admitting air into the combustion chamber of the muffler disposed at the inlet end of the muffler in order to more fully support the combustion of unburned fuel particles in the combustion chamber.

Also, the exhaust gas burner and muffler of the instant invention has been specifically designed to be positioned closely adjacent the point of discharge of exhaust gases from an internal combustion engine whereby minimum heat loss of the exhaust gases is realized before they pass through the muffler. In this manner, the temperature of the entire internal structure of the muffler is maintained at a higher temperature and therefore further ensures the burning of unburned fuel particles passing through the muffler. Also, a substantial portion of the muffler is wrapped in a coating of sound deadening and heat insulative material whereby heat transfer from the external surfaces of the muffler to the ambient atmosphere will be maintained at a minimum.

The main object of this invention is to provide an exhaust gas burner and muffler which will be adequate to function as a sound muffling apparatus for the exhaust gases of an internal combustion engine and which will further serve to substantially completely burn all unburned particles of fuel exhausted from the associated combustion engine which are discharged into the muffler.

Another object of this invention, in accordance with the immediately preceding object, is to provide means whereby crankcase vapors from the associated combustion engine may be vented into the combustion chamber of the muffler in a manner such that the crankcase vapors will have the hydrocarbon contaminants therein substantially completely burned and the oxygen in the crankcase vapors will enhance the burning of unburned hydrocarbons in the combustion chamber of the muffler.

Yet another object of this invention is to provide a means whereby ram air from a fan portion of an associated internal combustion engine may also be ducted into the combustion chamber of the muffler to further enhance the burning of unburned hydrocarbons discharged into the combustion chamber of the muffler.

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A final object of this invention to be specifically enumerated herein is to provide an exhaust gas burner and muffler in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble-free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of a conventional form of internal combustion engine with the exhaust gas burner and muffler of the instant invention operatively associated with the exhaust gas system of the internal combustion engine;

FIGURE 2 is an enlarged sectional view taken substantially upon the plane indicated by the section line 2—2 of FIGURE 1; and

FIGURE 3 is a transverse sectional view taken substantially upon the plane indicated by the section line 3—3 of FIGURE 2.

Referring now more specifically to the drawings, the numeral 10 generally designates a conventional form of internal combustion engine including an exhaust manifold generally referred to by the reference numeral 12 into which exhaust gases from the internal combustion engine 10 are discharged. The exhaust manifold 12 includes a flanged outlet 14 to which the flanged inlet neck 16 of the exhaust gas burner and muffler generally referred to by the reference numeral 18 is secured by means of suitable fasteners 20. The exhaust gas burner and muffler defines an elongated tubular body including large diameter heavy gauge opposite end sections 22 and 24 and a smaller diameter intermediate section 26 over whose opposite ends the adjacent ends of the end sections 22 and 24 are telescoped and secured. The inlet end section 22 includes a centrally apertured inlet end wall 28 to which the outlet end of the inlet neck 16 is secured in any convenient manner and a screen-type diaphragm or baffle 30 is secured in the intermediate section 26 a spaced distance from the inlet end of the intermediate section 26.

Behind the diaphragm or baffle 30 is disposed a first quantity of any suitable sound deadening bulk material such as coarse lathe cuttings 32. Similar material in the form of finer lathe cuttings 34 is disposed behind the cuttings 32 and a third quantity of coarse lathe cuttings 36 is disposed behind the fine lathe cuttings 34.

The volume of the interior of the elongated tubular body defined by the sections 22, 24 and 26 and disposed between the end wall 28 and the partition 30 defines a combustion chamber 38 into which the discharge end of an injection tube 40 opens. The inlet end of the injection tube 40 is connected to the outlet of a T-fitting 42 having one inlet 44 communicated with the interior of the conventional draft tube 46 of the combustion engine 10 and its second inlet 48 communicated with the discharge end of a ram air tube 50 whose inlet end is flared as at 56 and disposed behind the fan 58 of the combustion engine 10 to receive ram air from the fan 58. In this manner, ram air from the fan 58 as well as crankcase vapors are injected into the combustion chamber 38 through the injection tube 40. However, it has been found that the exhaust gas burner and muffler 18, when associated with some types of internal combustion engines does not need to have fresh ram air injected into the combustion chamber 38. In these instances, the ram air tube 54 may be eliminated. Further, in other instances it is not necessary or required to convey crankcase vapors from the crank-

case of the associated internal combustion engine into the combustion chamber 38.

The end section 24 includes a plurality of transversely extending baffle plates 60, 62 and 64 extending transversely thereof which define a tortuous passage for the exhaust gas passing through the end section 24 and the outlet end of the end section 24 is closed by means of an aperture end plate 66. Further, the tubular body consisting of the sections 22, 24 and 26 is completely encircled by a wrapping 68 of sound deadening and heat insulative material throughout substantially its entire length which defines a dead air space 70 between the outer surface portions of the intermediate section 26 and the inner surfaces of the wrapping 68. Of course, the wrapping 68 reduces the transfer of heat from the exhaust gases passing through the muffler 18 to the ambient atmosphere and thus the sound deadening material 32, 34 and 36 as well as all internal surfaces of the muffler 18 are maintained at high temperatures by the exhaust gases passing through the muffler 18. In fact, the lathe cuttings 32, 34 and 36 are maintained at a temperature rendering the cuttings at least somewhat incandescent and therefore any unburned fuel particles passing through the lathe cuttings 32, 34 and 36 tend to be ignited. Of course, the injection of fresh ram air through the injection tube 40 as well as crankcase vapors into the combustion chamber 38 greatly enhances the support of combustion of unburned particles of fuel as well as the unburned hydrocarbons contained in the crankcase vapors.

What is claimed as new is as follows:

1. An exhaust gas burner and muffler adapted to be interposed in the exhaust gas passage means of a combustion engine and to receive exhaust gases substantially directly from the exhaust manifold of said engine, said burner and muffler including heavy gauge front and rear large diameter axially spaced tubular sections, and a heavy gauge center section of smaller diameter whose opposite ends are sealingly telescoped into the rear and front end portions of said front and rear sections, internal sound deadening bulk material disposed in said center section and capable of being heated to incandescent temperatures by hot exhaust gases passing through said center section, the forward end of said front section including

partial front wall means and exhaust gas inlet means of smaller cross-sectional area than the inside diameter of said front section opening inwardly through said partial front wall means, whereby the interior of said front section defines an exhaust gas expansion chamber, air injection inlet passage means including an outlet end opening into the interior of said expansion chamber, the rear end of said rear section including exhaust gas outlet means for discharging exhaust gases from said burner and muffler, and a tubular wrapping of heat insulative and sound deadening material disposed snugly about, enclosing and extending between the outer surface portions of said front and rear tubular sections, the inside diameter of said wrapping being larger than the outside diameter of said center section with a closed trapped sound deadening air space defined between said center section and said wrapping.

2. The combination of claim 1 wherein the rear end section includes longitudinally spaced baffle means defining a tortuous path of flow for exhaust gases passing through said rear end section.

3. The combination of claim 1 wherein said bulk material is disposed in said center section with zones thereof of different density spaced longitudinally of said center section.

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