ABSTRACT OF THE DISCLOSURE

An automobile exhaust treating device which includes a burning unit comprised of a plurality of tungsten vanes in the path of the exhaust gas for burning the exhaust gas, a cooling chamber surrounding the burning unit, an exit filter and mixing chamber, and a pre-mixing chamber for mixing air and exhaust gases prior to burning is disclosed.

BACKGROUND OF THE INVENTION

This invention comprises a continuation-in-part of our copending patent application, Ser. No. 641,049 filed May 24, 1967 now abandoned and which is entitled "Exhaust Treating Device." The instant invention relates to vehicle exhaust treatment devices and, more specifically, to devices for burning carbon monoxide to form carbon dioxide and to thereby render exhaust gases harmless. The teachings of this invention are extended herein to include devices for burning carbon monoxide derived as chimney exhaust gases to convert the same to poisonless carbon dioxide. The major aim of this invention is to provide means for ridding air of one of the major air pollutants, carbon monoxide, by treating automobile and chimney exhaust gases substantially at their point of origin.

Description of the prior art

It is known in the prior art to use catalytic devices, filters, and similar units to filter out or to treat automobile exhaust. It is also known to heat automobile exhaust for the purpose of reacting it catalytically or otherwise. The present invention is directed to an improved device for treating automobile exhaust in which the carbon monoxide is burned to form innocuous carbon dioxide.

SUMMARY

The invention contemplates in one exemplary form, a bracket for securing the device to the exit end of an automobile exhaust pipe, a generally tubular burning unit which includes an annular electrical insulating unit which carries conductor rings and a multiplicity of tungsten vanes at the exit end of the burning device, said burning device being surrounded by a cooling chamber and terminating in a mixing chamber. In a preferred form, an activated charcoal filter is also provided. In yet a further improved and preferred embodiment, a pre-mixing chamber is disposed between the exhaust pipe and the burning unit for mixing the exhaust gases under pressure with air from the atmosphere to increase the efficiency of the burning process.

In a second highly effective embodiment, the device is constructed for connection with an automobile exhaust pipe directly and eliminates the need for the cooling and mixing chamber referred to supra. In this embodiment, the burning device is formed of a woven electrical grid constructed of a heat resistant electrical resisting wire material, specifically, Nichrome, and the same embodiment is extended to the treatment of chimney exhaust gases.

Accordingly, the objects of the present invention include:

1. The provision of an improved automobile exhaust treating device including a specially designed heating unit.
2. An improved automobile exhaust treating device including a specially designed pre-mixing chamber.
3. An improved automobile exhaust treating device in which the burning unit is surrounded by a cooling chamber.
4. The provision of an improved automobile exhaust treating device in which the carbon monoxide in the exhaust is actually burned to form carbon dioxide.
5. An improved automobile exhaust treating device including a mixing chamber and filter after the burning unit.
6. An improved chimney gas treating device.
7. The specific constructional details and features of the invention, as shown in the drawings, and described in the specification, also comprise objects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevational view of the exhaust treatment apparatus according to one embodiment of this invention showing the major exterior components thereof;

FIGURE 2 is an enlarged detail medial longitudinal cross-sectional view, FIGURE 2 being taken substantially on the horizontal plane of line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is an enlarged detail end view of the burning device of this embodiment of the invention, FIGURE 3 being taken substantially on the vertical plane of line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is a side elevational view, partly broken away, of a second embodiment of this invention in which a pre-mixing chamber is illustrated;

FIGURE 5 is an enlarged detail medial longitudinal cross-sectional view of a third embodiment of this invention.

FIGURE 6 is an enlarged detail cross-sectional view illustrating certain assembly details;

FIGURE 7 is an exploded perspective view of the component elements of the burner device;

FIGURE 8 illustrates still another embodiment of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGURE 1, the exhaust treating device 10 of this invention is designed to connect to the exit end of an exhaust pipe 12. As shown in FIGURE 2, means 14 for connecting the treating device to the exhaust pipe 12 are provided. The treating device also includes a burning unit 16 which is surrounded by a cooling chamber 18 and an exit mixing chamber 20.

The means for connecting the device to an automobile exhaust pipe includes a sleeve 22 which includes a plurality of tapped apertures therethrough for receiving a plurality of threaded bolts 24, 26, 28 and 29. The sleeve terminates in a threaded portion 30 which threadably receives the threaded end 32 of an elongate tubular member 34 which comprises a part of the burning unit 16. As is shown by the arrow, the exhaust gases flow from the exhaust pipe 12 into the tubular unit 34.

The burning unit 16 includes, in addition to the tubular unit 34, an annular member 36 which is made of a heat resistant electrical resisting material such as ceramic material, fused silica, or the like. The insulating annular member 36 is secured by means of bolts 38 and 40 in the distal end, the exit end, of the tubular member 34. Bolt 40 also secures a grounding strap 42 for a heater 44.

The heater 44 is shown in greater detail in FIGURE 3 to which reference is now made. Heater 44 comprises upper and lower generally semimembranous conductors 46 and 48 which are held in spaced relation by insulating spacers
3,482,395

50 and 52 which include openings therein for receiving bosses such as are shown at 54 and 56. The semiannular members 46 and 48 and the spacers 50 and 52 form an annular support for a multiplicity of vanes 58 which are preferably composed of a heat resistant electrical resisting material such as Nichrome or, preferably, tungsten. Conductors 46 and 48 are secured in the end of the insulating member 36 by means of terminal bolts 60, which is secured by means of nut 62, and 64 which is secured by means of nut 66. An electric conductor such as a wire 68 is also secured to the terminal bolt 64 to provide electric energy to the heater as will be described in greater detail hereinafter.

The cooling chamber 18 comprises a generally cylindrical portion 20 which is provided with a plurality of apertures disposed in parallel rings through the walls thereof shown at 72 and 74. A generally conical rear section 76 terminates in an interiorly threaded portion 78 which is secured to the threaded end 94 of the tubular member 34. An aperture 80 is provided through the conical member 76 and a grommet 82, which is of a heat resistant electrically resisting material such as ceramic or silicone rubber, is provided for passing conductor 68 therethrough. At the other end of the cylindrical portion 78 there is provided an interiorly threaded sleeve portion which threadably receives the end 86 of a second cylindrical portion 88 of the cooling chamber 16. The member which includes cylindrical portion 88 terminates in a conical mixing chamber shown at 20. The mixing chamber 20 is separated from the cooling chamber by a filter 90 which preferably is made of activated charcoal. The filter is held in place by a plurality of spring clips shown at 92 and 94 which are, in turn, secured to the cylindrical portion 88 by rivets 96 and 98. The charcoal in the filter is, preferably, secured in place by means of foraminous members 100 and 102 on the respective sides thereof.

In operation, the exhaust gases enter the device from the exhaust pipe 12 and flow down the tubular member 34 and through the burning unit 44. As the exhaust gases pass through the vanes 58 they are burned since the vanes are simultaneously in contact with the exhaust gases and with air in the cooling chamber. Energy for maintaining the heating element which comprises burner 44 is supplied from a battery or generator or a desired source through the conductor 68 and through the ground strap 42. One side of the energy source is, of course, grounded. The burned exhaust gases, which comprise carbon dioxide, are cooled by intermixing with the air in the cooling chamber and are passed through the activated charcoal filter 90 and are mixed with the air entering the cooling chamber prior to expulsion of the mixture from the device.

With reference now to FIGURE 4, in a preferred embodiment, the exhaust gases are mixed with air prior to the burning thereof to increase the efficiency of the burning. This is done by means of a pre-mixing chamber 104 which includes a generally cylindrical portion 106, a rear conical portion 108 which is secured, as at 110, to the attaching bracket 14a, which is similar to bracket 14.

The other end of the chamber is provided with a conical portion 112 which is connected, by threads or otherwise, to the cooling chamber 88.

A housing 114 is provided on the surface of the cylindrical portion 106 and communicates through a port 116 with the interior of the pre-mixing chamber 104 and includes a fan or impeller 118 which draws air through an opening 120 inwardly and compresses the air in the pre-mixing chamber 112. Any desired means for compressing the air may be used.

In operation, in this embodiment, the mixture of air and exhaust gases pass through the burning unit 16a which includes a heater 44a, which are substantially identical to the burning unit and heater previously described. The mixing chamber 20a is also similar to the previously described mixing chamber. It has been found that more complete combustion and greater efficiency is achieved by the latter embodiment than is achieved by the embodiment of FIGURE 2.

It is important to note that by means of the present device, all or substantially all of the carbon monoxide in the exhaust, as well as many other exhaust components such as incomplete combustion hydrocarbons, etc., are burned to form carbon dioxide, primarily, and other innocuous materials. The burning takes place because of the position of the heating device and the construction thereof.

FIGURES 5 to 7, inclusive, illustrate another of the preferred embodiments of this invention. In this embodiment, the exhaust gas treating device bears the general reference numeral 110. As before, the device 110 is adapted for rigid connection with an automobile exhaust gas pipe 112.

The exhaust gas treating device 210 is seen to comprise a first substantially hollow cylindrical shell 214 which terminates, at one of its ends, in a first substantially hollow frusto-conical side wall 216. The side wall 216 is provided with an integrally connected inwardly extending annular flange 218 against the inner side of which abuts an outwardly turned laterally extending circumferential flange 220 integrally formed with the exhaust gas pipe 212. Any conventional means (not shown) may be used in effecting a fixed connection between the flanges 218, 220. An exhaust gas burning unit constructed according to this embodiment of the invention is here denoted by the general reference numeral 222. The unit 222 comprises an elongated substantially hollow cylindrical side wall 224 across one end of which extends a substantially cylindrical end wall 226. The opposed end 228 of the side wall 224 is open. The side wall 224, to serve a function to be described infra is further provided with pairs of diametrically opposed tapped openings 130 and 132, respectively. The end wall 226 is integrally formed with a coaxially extending and outwardly projecting hollow cylindrical throat 134 which is disposed substantially in congruent relationship with respect thereto. As is seen in FIGURE 5 of the drawings, the inner end of the throat 134 opens into the cylindrical end wall 226. The outer end of the throat 134 is threaded as at 136.

The gas burning assembly 138 comprises the general reference numeral 138 and is compound in construction. As such, the assembly 138 comprises a substantially hollow cylindrical sleeve 140 internally threaded as at 142 (see FIGURE 6). The sleeve 140 is further formed, at one of its respective ends, with an end closure wall 144 (see FIGURES 6 and 7) through which transversely extends a centrally located elongated and substantially rectangular opening 146. Bolt openings 148, 149 also extend transversely through the end wall 144 in diametrically opposed relationship relative to one another and are disposed adjacent the opposed ends of the opening 146.

The assembly 138 further includes a substantially cylindrical asbestos washer 150 in which is formed an elongated substantially rectangular opening 152 and transversely extending bolt openings 154. The bolt openings 154 are diametrically opposed with respect to one another and are located adjacent the opposed ends, respectively, of the opening 152. In the gas burning assembly 138, the washer 150 is adapted to be superimposed against the inner side of the end closure wall 144 with the diametrically opposed pairs of bolt openings 148, 149 and corresponding openings 154 being coaxially aligned, and with the rectangular openings 146, 152 disposed in concentricity with respect, respectively, to one another. The openings 146 and 152 are, preferably, of the same peripheral dimensions.

The assembly 138 further comprises a heating element 156 which includes an elongated substantially rectangular woven wire grid 158 preferably formed of a heat resistant electrical resisting wire material such as, for example,
Nichrome. The elongated substantially rectangular wire grid 158, at its opposed ends, is clamped between the opposed arms 160, 162 of a pair of identically constructed metal brackets 164 which pass through the frusto-conical side wall 121, the shell 214, the unit 222, the shell 176 and its associated side wall 178, the hydrocarbons thereof react with the aluminum dioxide to form carbon dioxide which is exhausted through the annular flange 180, and the hydrocarbon gases under exhaust pressure are also forced through the Nichrome grid 138 to become heated and to convert the carbon monoxide molecules thereof into the harmless carbon dioxide gas.

FIGURE 8 of the drawings illustrates still another application of the instant invention wherein the same is shown in association with the chimney of a building or other edifice. Here the gas burning assembly is identified by the reference numeral 138' and is shown as being mounted on the upper end of the chimney 300 of a building or other edifice (not shown). In this case, the assembly 138' is connected via wires 188', 194' to a suitable source of electrical energy (not shown).

What is claimed is:

1. An automobile exhaust treating device for burning carbon monoxide to form carbon dioxide which, in combination, comprises:

   a. means for attaching the device to an automobile exhaust pipe;

   b. a heating unit which includes a heating element for connection in communication with said exhaust pipe;

   c. a mixing chamber for mixing air and the burned exhaust gases prior to expelling said gases into the atmosphere; and

   wherein said mixing chamber comprises:

   a. a generally cylindrical chamber for mixing air and said exhaust gases;

   b. a plurality of heating vanes composed of resistance material extending substantially parallel between said conductors; and

   means for connecting the conductors to a source of electric energy for heating said vanes.

2. The invention of claim 1 wherein the cooling chamber comprises:

   a. a generally cylindrical chamber having a plurality of apertures therethrough for permitting entry of air, said chamber terminating in a generally conical chamber which comprises said mixing chamber.

3. The invention of claim 2 further comprising:

   a. a filter member separating the cooling chamber and the mixing chamber for filtering the burned exhaust gases and air passing therethrough.

4. The invention of claim 3 wherein the filter member comprises:

   a. a thickness of activated charcoal; and

   means for supporting said charcoal.

5. The invention of claim 1 further comprising:

   a. a pre-mixing chamber disposed between the burning unit and the means for attaching the device to said exhaust pipe for mixing said exhaust gases with air prior to the passage of said exhaust gases through said burning unit.

6. The invention of claim 5 wherein the pre-mixing chamber comprises:

   a. a generally cylindrical chamber for mixing air and said exhaust gases;
3,482,395

7

a housing secured on the exterior surface of said chamber, said housing communicating with said chamber and with the atmosphere; and
means in the housing for forcing air into the chamber from the atmosphere.

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