

[54] **AFTERBURNER FOR INTERNAL COMBUSTION ENGINE**
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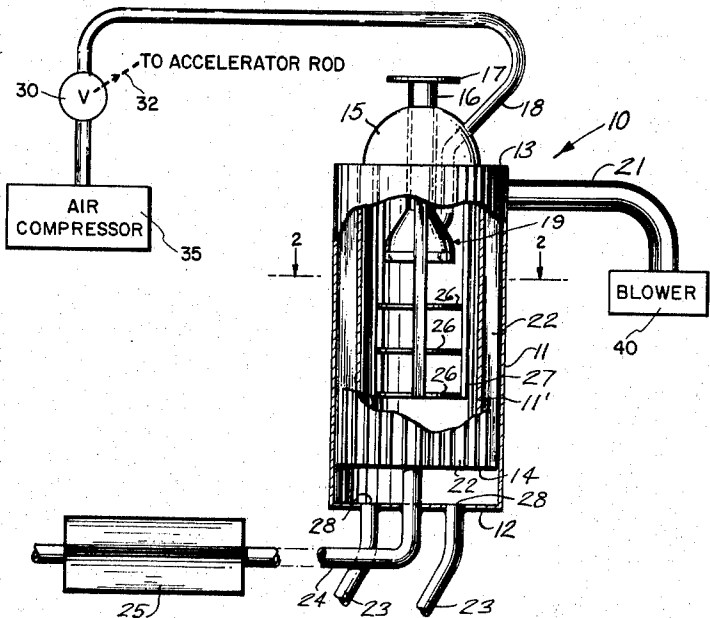
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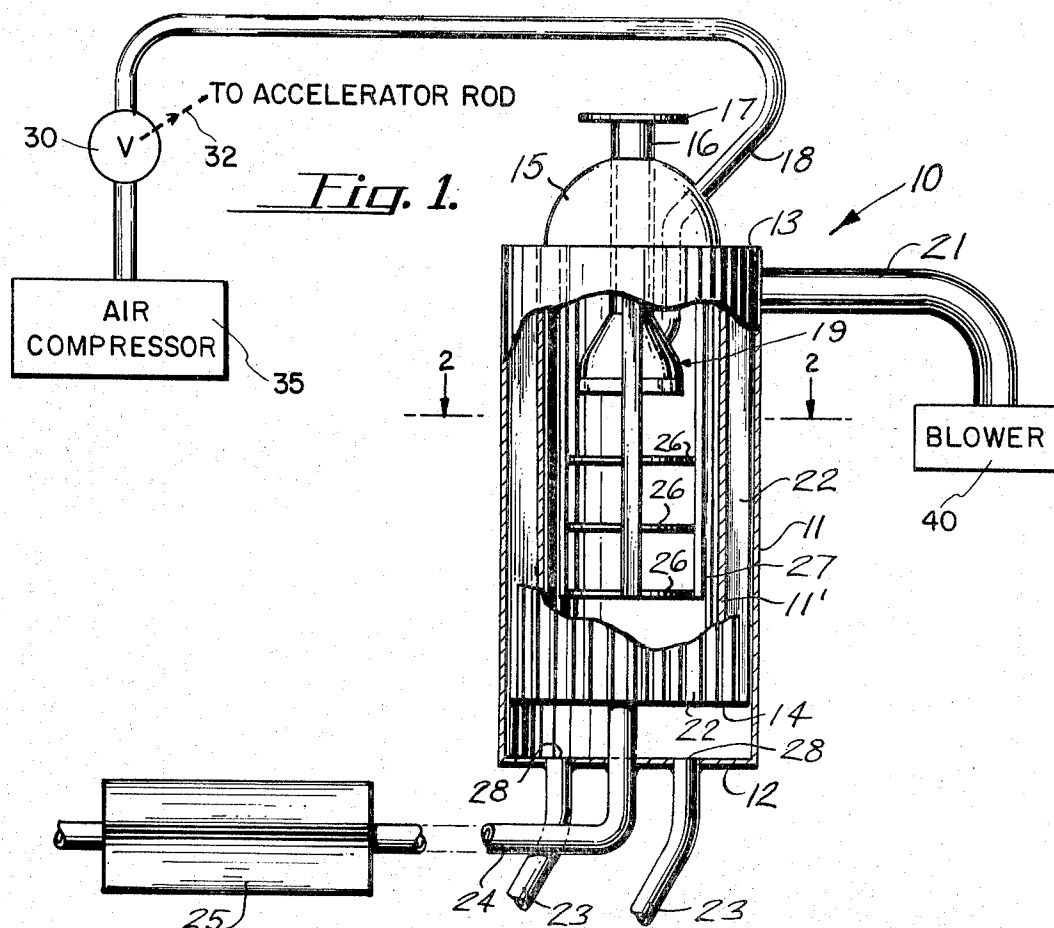
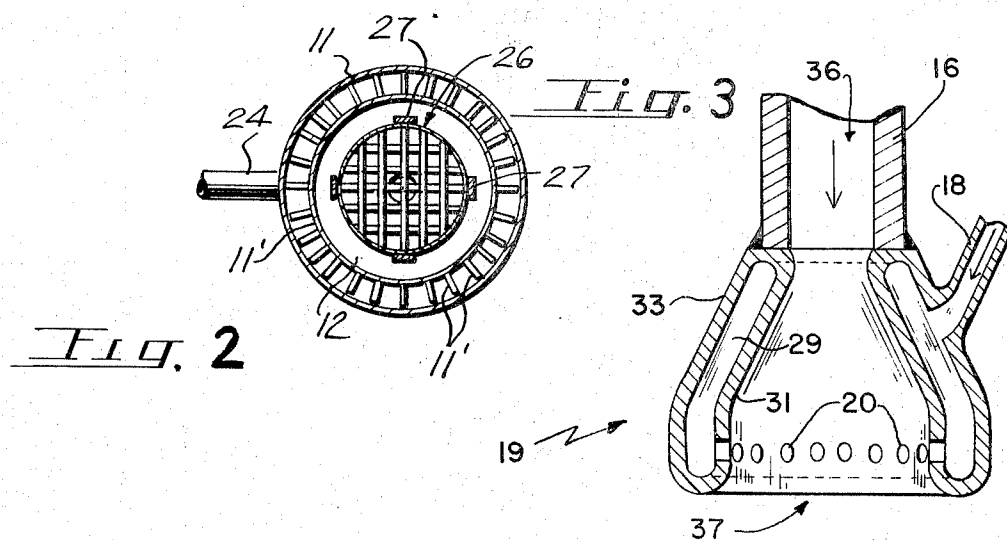
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ABSTRACT

An afterburner for internal combustion engines mixes exhaust gases from an exhaust manifold of an engine with a stream of compressed air to ignite the unburned gases which then pass over heating grids. As the remaining unburned gases pass through the heated grids, they ignite and burn. The device includes means within an outer sleeve for cooling the afterburner.

5 Claims, 3 Drawing Figures





AFTERBURNER FOR INTERNAL COMBUSTION ENGINE

This application is a continuation-in-part of application Ser. No. 91,823, filed Nov. 23, 1970.

This invention relates to air pollution reducing devices, and more particularly to an afterburner for internal combustion engines.

It is an object of the present invention to provide an afterburner having an outer sleeve which contains an inner sleeve in which pressurized air is mixed with exhaust gases causing the resulting engine exhaust flame to heat spaced apart grids red hot. Remaining unburned exhaust gases pass through the heated grids, ignite, and burn.

Another object of this invention is to provide an afterburner device which can be connected between an engine and a muffler, by installing the device to the engine exhaust manifold.

A further object of this invention is to provide an afterburner which introduces pressurized air into a mixing chamber to self-ignite hot exhaust gases which are then employed to heat a grid structure to cause the remaining unburned exhaust gases to more completely burn.

Yet another object of this invention is to provide an afterburner device which employs a valve coupled to the accelerator rod on the carburetor to control the flow of air into the afterburner as needed for different engine speeds.

Other objects of this invention are to provide an afterburner for internal combustion engines which is simple in design, inexpensive to manufacture, rugged in construction, easy to use, and efficient in operation.

These and other objects will become readily apparent upon a study of the following specification together with the accompanying drawings in which:

FIG. 1 is a side elevational view in partial cutaway form of the present invention;

FIG. 2 is a sectional view taken along the section lines 2-2 of FIG. 1; and

FIG. 3 is an enlarged side elevational view in cross section of the mixing chamber employed with the afterburner of the present invention.

According to this invention, an afterburner 10 includes a cylindrical outer sleeve 11 having a first end wall 12 and a second end wall 13. An inner sleeve 11' is concentrically mounted within sleeve 11 as shown in FIG. 2. Inner sleeve 11' has a heavy end wall 14 at one end and a dome-shaped end 15 at the other end to promote the flow of gases downwardly (in FIG. 1). A neck 16 extends from the domed end 15 and is provided with a flange 17 for attaching the afterburner 10 to the exhaust manifold or other coupling of an internal combustion engine (not shown). A tube 18 extends through the domed end 15 and is connected to an air compressor 35 (shown in block diagram form) by means of a control valve 30. Valve 30 is mechanically coupled to an accelerator control rod (not shown) by suitable mechanical coupling means illustrated by the dashed lines 32 in FIG. 1. As explained below, the flow of air from compressor 35 to the afterburner 10 can be controlled thereby in accordance with the position of the engine's accelerator to supply sufficient oxygen to provide self-ignition of the hot exhaust gases from the engine.

The lower extremity of tube 18 extends out of a bell-shaped venti-duct 19 which is provided with a plurality

of spaced apart openings 20. The venti-duct 19 is shown in detail in FIG. 3 and comprises an outer wall 33 and an inner wall 31 forming an annular chamber 29 therebetween. Tube 18 extends through wall 33 thereby providing pressurized air to the chamber 29. As seen in FIG. 3, openings 20 are formed in the inner wall 31 at the bottom of the venti-duct near a central opening 37 and communicate with chamber 29. As exhaust gases enter the top opening 36 of the venti-duct 19 through neck 16, they flow in a downward direction indicated by arrow A in FIG. 3. The gases mix in the bell-shaped interior of venti-duct or mixing chamber 19 with pressurized air entering at right angles to the exhaust gas stream from openings 20. The pressurized air supplies sufficient oxygen to cause self-ignition of the hot unburned exhaust gases which then exit the venti-duct through the bottom opening 37 which is substantially larger than opening 36. Thus, the venti-duct 19 provides a mixing chamber for efficiently mixing pressurized air from tube 18 with the exhaust gases from the engine.

A plurality of open grids 26 are spaced apart and secured to bracket rods 27 in order to suspend them within inner sleeve 11' below the venti-duct as seen in FIGS. 1 and 2. The burning exhaust gases from the venti-duct pass over these grids to heat them to a red hot condition which causes the burning of any remaining unburned gases as they pass through the afterburner and exit through pipe 24 extending through end wall 14. A conventional muffler connects to exhaust pipe 24.

Also attached to afterburner 10 is a cooling air pipe 21 which connects to an air blower 40 for forcing air between sleeves 11 and 11'. A plurality of radially spaced apart fins 22 are positioned on the outer periphery of inner sleeve 11' and serve as a means for transferring heat from the interior of the afterburner to the cooling air stream. Extending from the first end wall 12 of sleeve 11 and coupled to outlet openings 28 are a pair of coolant air exhaust tubes 23 which can be vented to the atmosphere or used for supplying heat to the vehicle on which the afterburner is mounted.

In operation, the engine exhaust gases from the engine manifold enter the afterburner 10 through the neck 16. The compressed air introduced into the venti-duct 19 mixes with the gases which are sufficiently hot to ignite in the presence of the added oxygen. The flaming gases emanating from the venti-duct 19 heat the open grids 26 to a red hot condition. As the remaining unburned exhaust gases pass through the grids 26, they ignite and burn up such that the resulting gases passing through muffler 25 will contain a very small quantity of air pollutants. The fins 22 of afterburner 10 serve to transfer the heat to the forced air which is introduced through the pipe 21. As the engine speed is varied by moving the accelerator rod coupled to the carburetor, valve 30 varies the flow of pressurized or compressed air and thus the air-exhaust gas mixture in the mixing chamber 19 to insure combustion. With greater engine speeds and therefore more exhaust gas volume, valve 30 is opened to supply a greater flow of compressed air and therefore more oxygen to the venti-duct.

The compressor can be a suitable electrically operated or belt driven compressor for providing pressurized air in the order of 20 p.s.i. or greater to the afterburner. Valve 30 can be a conventional mechanically operated air valve. Blower 40 can be a conventional

electrically operated device for supplying the forced cooling air. The afterburner can be employed with automobiles, trucks, buses or other vehicles employing internal combustion engines to significantly reduce air pollutants which normally are emitted therefrom without impairing the efficiency of the engine operation.

It will be apparent to those skilled in the art that various modifications to the present invention can be made without departing from the spirit or scope of the present invention as defined in the appended claims.

What is claimed is:

1. An afterburner for burning unburned exhaust gases remaining in the exhaust from an internal combustion engine comprising:

- an outer cylindrical sleeve having first and second end walls,
- an inner cylindrical sleeve mounted within said outer sleeve and including a neck extending from said inner sleeve through one end of said inner sleeve,

means for coupling said neck to an exhaust coupling of an engine to receive exhaust gases therefrom, a mixing chamber having bell-shaped inner and outer walls defining an annular chamber therebetween and a top opening coupled to an end of said neck within said inner sleeve and remote from said coupling means, said mixing chamber including a plurality of openings in said inner wall at an end remote from said neck and spaced around the periphery thereof, said mixing chamber further including a central opening for allowing mixed gases and air to exit therefrom,

a tube having one end coupled through said outer wall of said mixing chamber and communicant with said annular chamber, and a remote end extending from said afterburner adapted to couple said tube to a source of compressed air to provide a pressurized stream of air from said plurality of openings in said mixing chamber thereby mixing sufficient air with exhaust gases to cause self-ignition of the mixture within said inner sleeve,

a plurality of grids mounted within said inner sleeve in spaced relationship between said mixing cham-

ber and an end of said sleeve remote from said neck and heated in response to the presence of the ignited air-gas mixture to a temperature sufficient to sustain combustion in said inner sleeve between said grids to burn remaining unburned gases, an exhaust pipe coupled to an end of said inner sleeve remote from said neck to provide an exhaust passage for exhaust gases from said engine, an air intake pipe having one end coupled through said outer sleeve and communicant with the space between said inner and outer sleeves and having a remote end adapted to be coupled to an air blower for providing a stream of cooling air between said inner and outer sleeves, a plurality of cooling fins positioned along an outer surface of said inner sleeve and spaced around the periphery thereof for transferring heat from said inner sleeve to said stream of cooling air, and air outlet means in said second end wall of said outer sleeve for providing an outlet for said cooling air.

2. The apparatus as defined in claim 1 wherein a control valve is coupled to said tube communicant with said annular chamber of said mixing chamber between said mixing chamber and said remote end of said tube, and adapted to be coupled to an accelerator rod associated with an engine to control the flow of pressurized air from said openings in said inner wall of said mixing chamber thereby providing a mixture of air and exhaust gases sufficient to self-ignite within said inner sleeve for varying engine speeds.

3. The apparatus as defined in claim 2 wherein said inner sleeve is concentrically mounted within said outer sleeve.

4. The apparatus as defined in claim 3 wherein said openings in said mixing chamber direct said stream of pressurized air at approximately right angles to the flow of exhaust gases entering said mixing chamber through said top opening thereof.

5. The apparatus as defined in claim 4 wherein said one end of said inner sleeve is dome-shaped.

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