

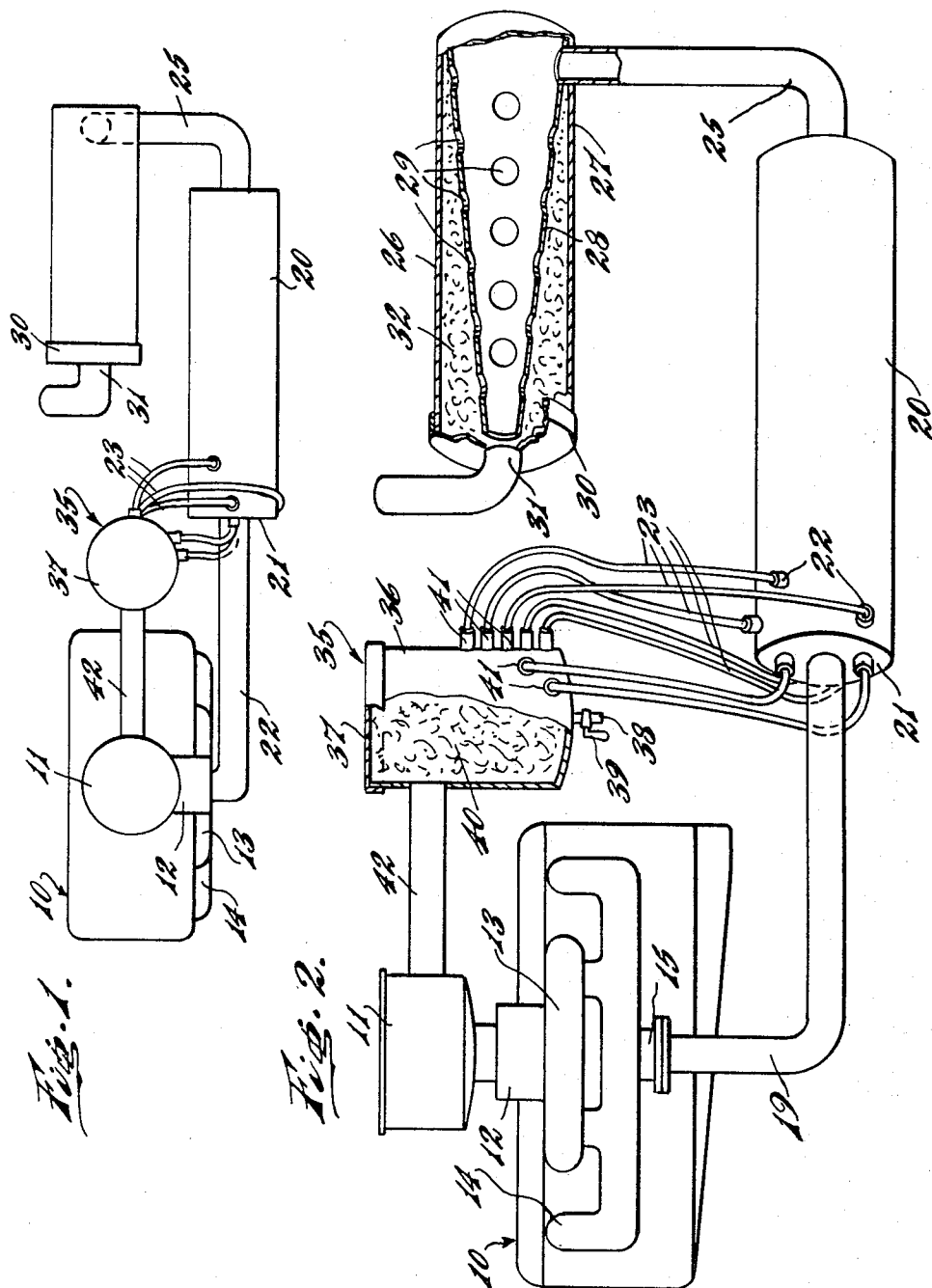
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EXHAUST-TREATMENT SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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**EXHAUST-TREATMENT SYSTEM FOR
INTERNAL-COMBUSTION ENGINES**
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ABSTRACT OF THE DISCLOSURE

The instant invention discloses a unique combination and arrangement of structure for use with an internal-combustion engine wherein the engine exhaust communicates with a pair of series-connected mufflers, and a condensation chamber communicates between the air intake of the engine and an upstream region of the upstream muffler.

BACKGROUND OF THE INVENTION

It is well known that internal-combustion engines are responsible for the production of impurities in the atmosphere, and further that internal combustions are relatively inefficient in their combustion process. While there have been proposed many exhaust-treatment systems for internal-combustion engines, these systems have been either ineffectual, or relatively complex and extremely expensive to manufacture, install and maintain.

SUMMARY OF INVENTION

Accordingly, it is an important object of the present invention to provide a highly improved exhaust-treatment system for internal-combustion engines which effects substantially complete elimination of harmful exhaust fumes, and which produces substantially increased combustion efficiency in the engine.

It is still a further object of the present invention to provide an internal-combustion engine exhaust-treatment system having the advantage characteristics mentioned in the preceding paragraph, which is extremely simple in construction and operation, capable of manufacture, installation and maintenance at a reasonable cost, and which can be readily installed as original equipment or as accessory equipment to existing internal-combustion engines in vehicles and otherwise.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a top plan view of a vehicle (partly in phantom) employing the system of the present invention; and

FIGURE 2 is an enlarged representation of the system apart from the vehicle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, it will there be seen that a conventional internal-combustion engine is generally designated 10, and includes an air inlet 11, which may be connected through a carburetor 12 to an intake manifold 13. An exhaust manifold is designated 14, and includes an exhaust outlet 15, all of which may be conventional.

The exhaust-treatment system of the present invention

includes a muffler 20, which may be of generally conventional design, having one end 21 connected by a suitable conduit 19 to the exhaust outlet 15. The muffler 20 is unique in the provision of a plurality of fittings 22 at an upstream region of the muffler for the connection of a plurality of conduits 23 each having one end in fluid communication with an upstream region of muffler 20. The plural conduits 23 may vary in number, seven having been found satisfactory in actual operation, and may be fabricated, at least in part, of copper tubing, as will appear more fully hereinafter.

A suitable conduit 25 is connected to the outlet or downstream end of the muffler 20, and extends for fluid communication with the interior of a second or downstream muffler 26. The latter muffler 26 is of unique construction, including a generally cylindrical outer shell or case 27 and having interiorly thereof a conical or tapering inner wall 28, of decreasing size in the direction from the inlet toward the outlet of the muffler 26. The tapering or conical wall 28 is of perforate or apertured construction, as by the thru holes 29. The downstream or outlet end of the downstream muffler 26 may be closed by a removable closure or cap 30 having an outlet opening 31, and a generally cylindrical body of filter material 32 is located interiorly of the casing 27 surrounding the tapering or conical tube 28. The filtering material may be fibreglas, hemp, or other suitable filtering media.

A condensation chamber is generally designated 35, and preferably located proximate to the air intake 11 of the engine 10. The condensation chamber 35 may include a generally cylindrical, normally upright casing or shell 36, preferably having its upper end open and provided therewith a removable closure 37. The lower end of the condensation-chamber casing 36 may be provided with a nipple 38 having a valve or drain cock 39. Interiorly of the condensation-chamber casing 36 there is provided a filter 40, substantially completely occupying the interior of the condensation chamber, which may be fabricated of suitable filter material, such as fibreglas, hemp fibers, or the like.

The plurality of conduits 23 extend from the upstream region of muffler 20 for connection at individual locations to the casing 36 and condensation chamber 35, as by fluid-connection fittings 41. Additional conduit means, such as copper or rubber tubing is connected in fluid communication at 42 between an upper region of the condensation chamber 35 and the engine air inlet 11. The connection fittings 41 of the plural conduits 23 are connected to and communicate with the interior of the casing 36 at a lower region thereof, below the level of communication of the conduit 42.

In operation, it will be appreciated that the exhaust fluid passing through the conduit 19 is partially directed through the plural conduits 23, the remainder passing entirely through muffler 20. The fluid moving through the plural conduits 23 is cooled by exposure of the conduits to the atmosphere, and reaches the condensation chamber in a partially cooled condition. The casing 36 of the condensation chamber is advantageously fabricated of metal, or other high-conductivity material, so as to be cooled by the atmosphere, and further cools the exhaust fluid reaching the interior of the condensation chamber. Substantial condensation of vapors present in the exhaust fluid takes place in the condensation chamber, which enhances the filtering action of the filter 40, to collect impurities as the gases remaining after condensation are drawn upward through the filter and out of the condensation chamber through conduit 42 for return to the air inlet 11. The drain cock 39 may be opened periodically to remove collected condensate.

The remaining exhaust-fluid effluent from the muffler

20 passes through conduit 25 to the second or downstream muffler 26. By the converging configuration of the inner muffler tube 28, the exhaust fluid passing there-through is effectively caused to move through the apertures 29, passing thence through the filter material 32 for exhaust through the outlet 31 to the atmosphere. However, effective purification and removal of impurities is accomplished in the muffler 26 prior to passage of the remaining exhaust fluid to the atmosphere. If desired the tube 28 may be of constant cross section, say cylindrical.

While maintenance is not required with much frequency, maximum efficiency of operation is maintained by periodic replacement of the filter 40, as by removal of the condensation-chamber cover 37, and replacement of the filter 32 by removal of the muffler closure 30.

It will be understood that back pressure of the mufflers 20 and 25 is effectively relieved by the by-passing of exhaust fluid through plural conduits 23 under the action of inlet vacuum, so that efficiency can be maintained or increased in this respect. Also, return of unburned products of combustion serves to increase the combustion efficiency of the engine.

From the foregoing, it is seen that the present invention provides an exhaust treatment for internal-combustion engine which fully accomplishes its intended objects and is well adapted to meet practical conditions of manufacture, installation, maintenance and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. In combination with an internal-combustion engine having an air inlet and an exhaust outlet, a first muffler connected at one end to said outlet for receiving exhaust fluid, a second muffler having one end connected to the other end of said first muffler for receiving efflu-

ent therefrom, the other end of said second muffler opening to the atmosphere, a condensation chamber in communication with said air inlet, and plural conduit means extending in parallel communication between an upstream region of said first muffler and said condenser, whereby exhaust fluid is partially withdrawn from said first muffler to said condensation chamber for condensation of vapor in said chamber.

2. The combination according to claim 1, said plural conduit means being exposed to ambient atmosphere for cooling.

3. The combination according to claim 2, in combination with filter means in said condensation chamber for collecting impurities, and a drain on said condensation chamber for removing condensate from the chamber.

4. The combination according to claim 3, said condensation chamber being fabricated of metal for thermal conductivity.

5. The combination according to claim 3, said condensation chamber communicating at an upper region thereof with said air inlet, and said plural conduit means communicating with said condensation chamber at a level below said upper region, for gravitational collection of heavier particles in said condensation chamber.

6. The combination according to claim 1, said second muffler comprising a casing, and a generally cylindrical body of filter material in said casing and having a central bore communicating through said casing, said bore tapering toward the downstream end of said casing for collecting impurities.

7. The combination according to claim 6, said second muffler including a removable closure for replacement of said filter material.

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