

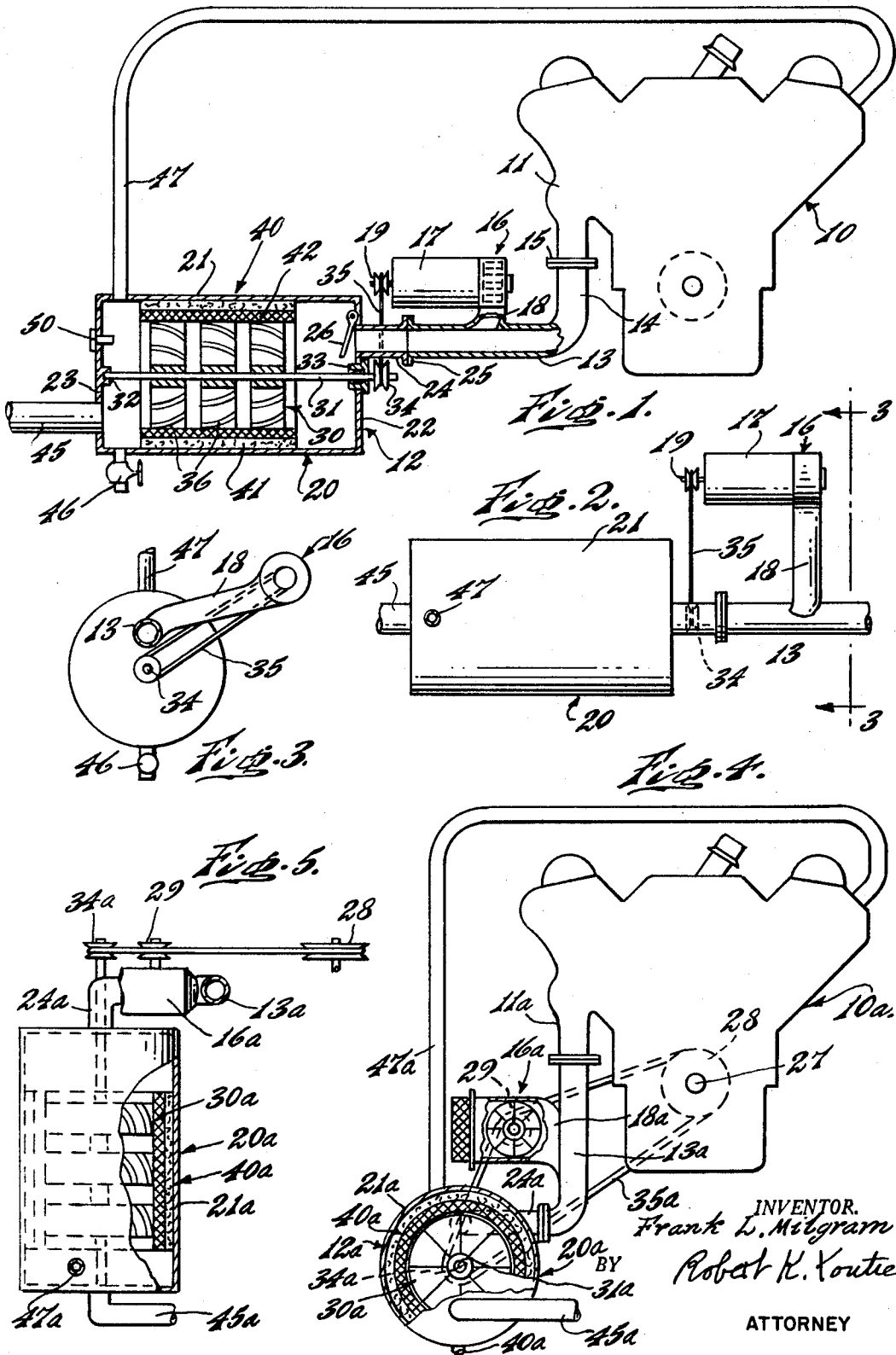
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ENGINE-EXHAUST-TREATMENT SYSTEM

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ENGINE-EXHAUST-TREATMENT SYSTEM

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This invention relates generally to internal-combustion engines, and is especially concerned with purifiers for the exhaust fumes of such engines.

As is well known to those versed in the art, a wide variety of proposed exhaust-fume purifiers have been attempted, with only a modicum of success. Prior devices have required relatively complex structures of considerable size and involving substantial expense, all without the achievement of satisfactory exhaust-fume purification.

Accordingly, it is an important object of the present invention to provide a relatively simple system for the treatment of internal-combustion-engine exhaust fumes, which is highly effective in its purifying effect, entirely automatic in operation, and durable and reliable throughout a long useful life.

It is a further object of the present invention to provide an exhaust-fume purifier for internal-combustion engines having the advantageous characteristics mentioned in the preceding paragraph, which is readily adaptable for use in automotive vehicles, either as original or accessory equipment, with a minimum of expense.

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.

In the drawings:

FIGURE 1 is an elevational view, partly in section, illustrating an exhaust-fume purifier of the present invention and diagrammatically representing an internal-combustion engine in operative association with the treatment system;

FIGURE 2 is a partial top plan view of the exhaust-treatment system of FIGURE 1, with the engine omitted;

FIGURE 3 is a sectional elevational view taken generally along the line 3—3 of FIGURE 2;

FIGURE 4 is an elevational view, partly in section, showing a slightly modified embodiment of exhaust-treatment system of the present invention in association with an internal-combustion engine; and

FIGURE 5 is a partial top view partly broken away.

Referring now more particularly to the drawings, and particularly to FIGURES 1—3 thereof, an internal-combustion engine is there generally designated 10, and may, of itself, be generally conventional, including at least one exhaust manifold 11.

An exhaust-treatment system is generally designated 12, and includes a generally horizontal pipe or conduit 13 having one end 14 extending upwardly for connection to the exhaust manifold, as by a flange coupling 15. An air blower 16 may be driven by an electric motor 17 and includes an air-outlet or discharge duct 18 connected to the receiver conduit 13 intermediate the ends of the latter. The blower 16 may have its inlet open to the atmosphere for receiving fresh air to be discharged into the receiver conduit. A drive pulley 19, or other suitable drive mechanism, may be carried by the shaft

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of electric motor 17, for a purpose appearing presently.

A treatment chamber is generally designated 20, and may include a generally horizontally disposed, substantially cylindrical casing 21 having generally parallel end walls 22 and 23. The end wall 22 may be provided with a nipple or duct 24 projecting longitudinally outward from the end wall eccentrically thereof and coupled, as at 25 to the adjacent end of receiver conduit 13. Thus, the receiver conduit communicates in fluid communication through the nipple 24 with the interior of treatment chamber 20. A one-way valve 26, say a flap valve, may be provided interiorly on the casing end wall 22 over the adjacent end of nipple 24 to permit fluid passage-way through the nipple into the casing and prevent fluid passageway in the reverse direction.

An impeller, generally designated 30 is mounted axially within the casing 21 of treatment chamber 20, including a shaft 31 extending coaxially through and having its opposite ends journaled within the end walls of the casing. That is, the shaft 31 is journaled in the end wall 23 by a bearing 32, and is journaled in the end wall 22 by a bearing 33; and, the shaft extends outward through the bearing 33 to carry on its projecting end a pulley 34. A drive member or belt 35 may be trained about the pulleys 19 and 34, whereby the motor 17 effects rotation of shaft 31 simultaneously with operation of the blower 16.

The impeller 37 further includes one or more sets of blades 36 carried by the shaft 31 for rotation therewith concentrically within the casing 21. The blades are configured in accordance with the direction of shaft rotation to effect fluid movement longitudinally within the casing 21 in the direction from casing end wall 22 to casing end wall 23. Advantageously the sets of blades 36 are each of a diameter less than the internal diameter of the casing 21, so as to be spaced concentrically within the casing. Concentrically surrounding the impeller blades 36 is a catalyst bed, generally designated 40. The bed 40 is generally of open-ended cylindrical configuration, including an outer shell 41, say of Fiberglas mat, and an inner liner 42, say of an openwork structure, such as copper wire. The mat 41 and wire 42 may be impregnated with catalyst, such as cuprous chloride, or other, if desired. Also, either one or the other of the mat 41 and screen 42 may be impregnated with catalyst. Obviously while the impeller 30 is of a generally axial type, centrifugal force is imparted to the fluid acted upon by the impeller, so that effective surface contact of fluid with catalyst bed is assured.

The bed 40 and impeller 30 are located in an intermediate region between opposite casing walls 22 and 23, being spaced therebetween.

Connected in fluid communication with the interior of the chamber 20, through the casing end wall 23, is a discharge conduit 45, which may be connected to a muffler and exhaust pipe of a vehicle. Adjacent to the casing end wall 23, in the space between the latter and the impeller 30, at a lower region of the casing 21, there may be provided a drain cock 46, affording convenient automatic gravity removal of condensate. Connected to an upper region of the casing 21 adjacent to end wall 23 is a blow-by conduit 47, which communicates from the treatment chamber 20 to the fuel-supply system of the engine 10, say just ahead of the carburetor, for recovering any remaining combustibles.

There is also provided interiorly of the treatment chamber 20 an igniter 50, which may be employed to ignite remaining combustibles, if desired. The igniter may be a glow or spark plug, if desired, and serves to insure effectively total combustion prior to final discharge.

While operation is believed apparent from the fore-

going description, it is only necessary to energize the motor 17 to effect operation of the blower 16 and impeller 30. Air is delivered by the blower 16 to the products of combustion from the engine 10, the mixture of air and products of combustion being impelled through the treatment chamber 20 by the impeller 30, while subjected to catalytic action of the bed 40. Also, additional ignition may be employed by the igniter 50, there now being sufficient air in the mixture introduced by the blower 16; and, more volatile vapors may be returned from the upper region of the treatment chamber through the blow-by conduit 47 to the engine-fuel-supply system.

Referring now to the embodiment of FIGURES 4 and 5, an internal-combustion engine is there generally designated 10a, including an exhaust manifold 11a. The engine crankshaft 27 is provided on one end with a drive member or pulley 28.

The exhaust-treatment system is generally designated 20a, including a receiver conduit 13a having one end connected to the exhaust manifold 11a, and having its other end connected by a nipple 24a to a treatment chamber 20a.

An air blower 16a may be essentially similar to the air blower 16 of the first-described embodiment, including a discharge conduit 18a connected to the receiver conduit intermediate the ends of the latter, and having its inlet open to the atmosphere. The shaft of the impeller 16a is provided with an external pulley or other suitable drive member, as at 29, for a purpose appearing presently.

The treatment chamber 20a may be essentially similar to the treatment chamber 20, including a generally cylindrical, substantially horizontally disposed casing 21a, the nipple 24a communicating through one end wall of the casing at its elevation above the casing axis. The other end wall of the casing 21a may be provided with a discharge conduit 45a communicating through the casing end wall at a location below the casing axis. Interiorly of the casing 21 may be provided an axial fluid impeller, generally designated 30a carrying a shaft 31a journaled axially of the casing and projecting through one casing end wall. The shaft 31a is provided on its projecting end with a drive member or pulley 34a.

Surrounding the impeller 30a may be a catalyst bed 40a of the same general construction as described hereinbefore in connection with FIGURES 1-3. Also, the remaining elements, including a one-way inlet valve to the casing 21a, and an igniter corresponding to the igniter 50, may be provided in the casing 21a. A condensate drain 46a may be carried by the casing 21a at a lower downstream region of the casing, while a blow-by conduit 47a may be connected between an upper downstream region of the casing and the engine-fuel-supply system.

In the embodiment of FIGURES 4 and 5, driving power for the air blower 16a and impeller 30a is provided by a transmission member or belt 35a trained about the engine-crankshaft pulley 28, blower pulley 29, and impeller pulley 31a, so that operation of the exhaust-treatment system is automatic upon operation of the internal-combustion engine.

From the foregoing, it is seen that the present invention provides an exhaust-treatment system for internal-combustion engines which fully accomplishes its intended ob-

jects 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 exhaust manifold, an exhaust-treatment system comprising a receiver conduit connected to said exhaust manifold for receiving exhaust products, an air blower having its discharge connected to an intermediate region of said receiver conduit, the intake of said blower communicating with the atmosphere, a treatment chamber connected in fluid communication with said receiver conduit downstream of said blower for receiving a mixture of exhaust products and air, a discharge conduit connected to said chamber in fluid communication therewith remote from said receiver conduit, an impeller in said chamber for moving said mixture from said receiver conduit toward said discharge conduit, a bed of catalyst in said chamber for contact with said mixture, ignition means in said chamber for igniting combustibles in said mixture, and a one-way valve between said receiver conduit and chamber to prevent fluid return to said receiver conduit.

2. The combination according to claim 1, in combination with drive means operatively connected to said blower and impeller.

3. The combination according to claim 2, said drive means comprising an electric motor.

4. The combination according to claim 2, said drive means comprising said engine.

5. The combination according to claim 1, in combination with a blow-by conduit connected between an upper region of said chamber and the fuel-mixture supply of said engine.

6. The combination according to claim 1, said chamber being generally cylindrical and connected at respective ends to said receiver and discharge conduits, and said impeller having an axis of rotation coaxial with said chamber for effecting axial flow through said chamber.

7. The combination according to claim 6, said catalyst bed surrounding said impeller for effective contact without back pressure.

8. The combination according to claim 7, said catalyst bed comprising an openwork structure impregnated with cuprous chloride.

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