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CRANKCASE VENTILATION SYSTEM AND APPARATUS

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2 Sheets-Sheet 1

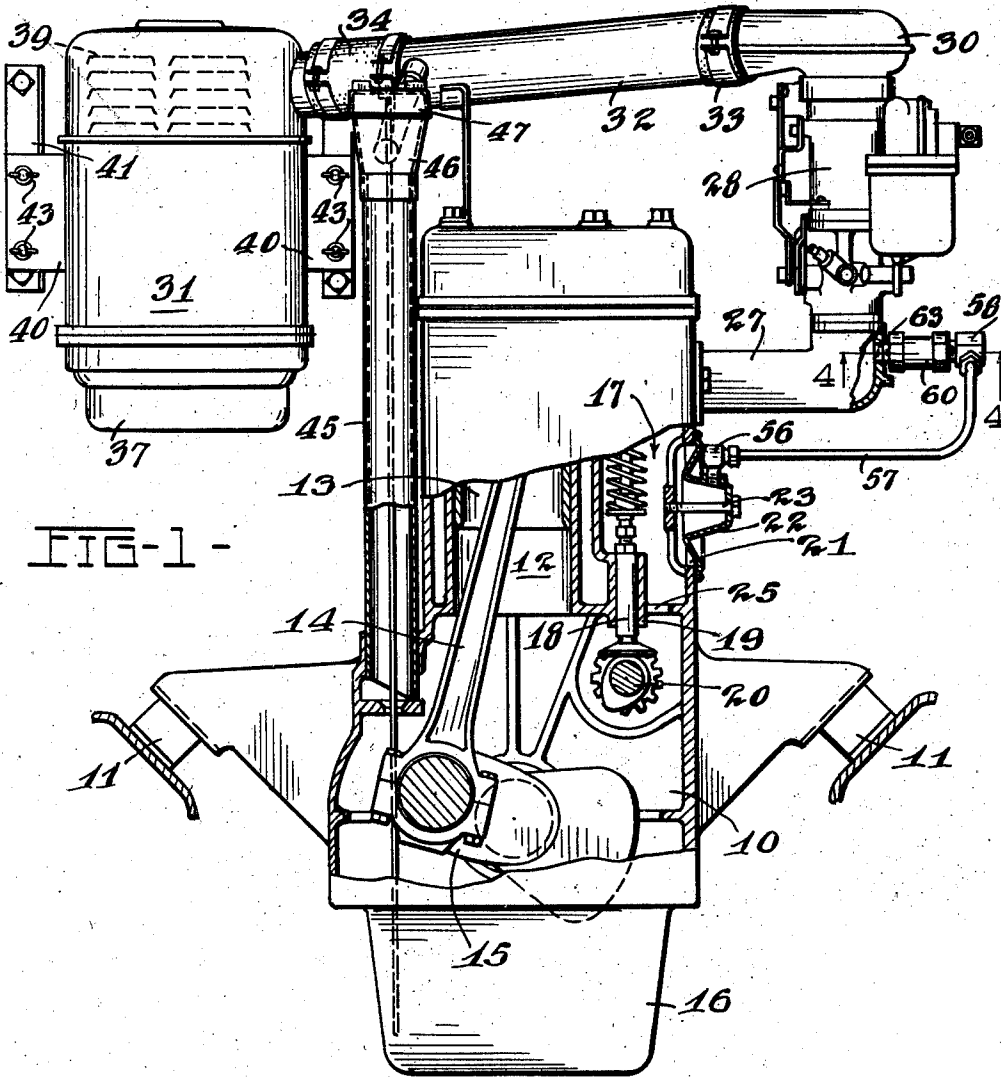


FIG-1-

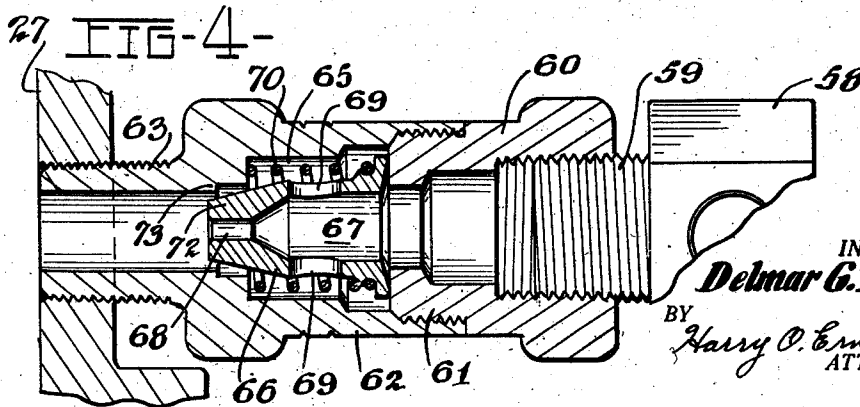


FIG-4-

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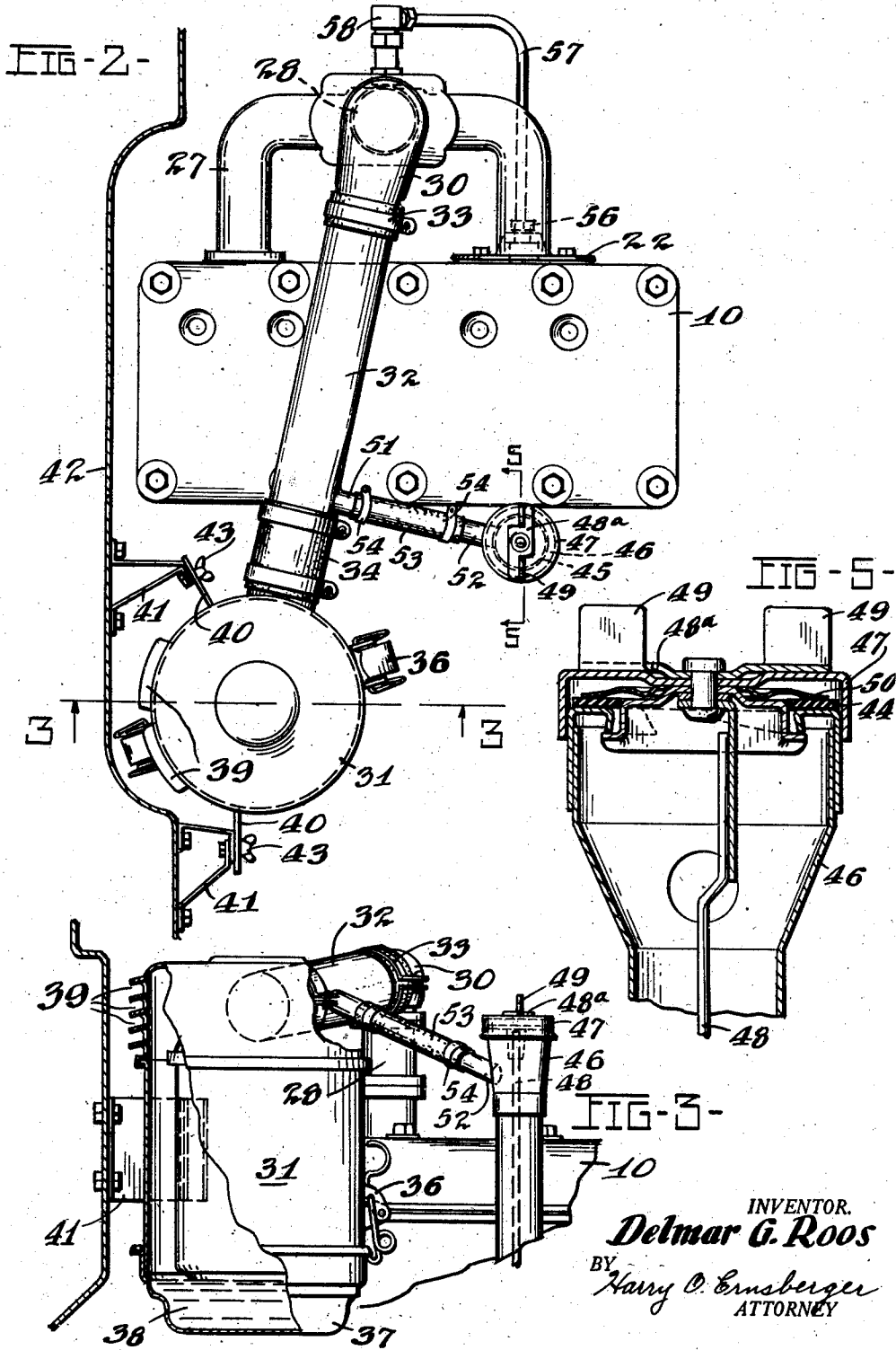
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## CRANKCASE VENTILATION SYSTEM AND APPARATUS

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3 Claims. (Cl. 123—119)

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This invention relates to a system and apparatus for circulating a current of air through a crankcase of an internal combustion engine especially for the purpose of removing vapors and gases from the crankcase and valve mechanism chamber of the engine.

The invention comprehends a system and apparatus for continuously removing vapors from the crankcase during engine operation whereby oil contamination by dilution as well as by sludge formation due to oxidation is materially reduced.

One of the principal objects of the invention is the provision of means intercalated with the air cleaner and conduit for conveying air to the carburetor as to divert a portion of the air from the air cleaner through the crankcase and valve push rod chamber, so that clean air flows through the crankcase and valve push rod chamber.

Another object of the invention resides in the provision of a system and apparatus for circulating a current of clean air through the crankcase and whereby the air passing through the crankcase and valve push rod compartment is discharged into the intake manifold of the internal combustion engine.

Another object of the invention is the provision of a crankcase ventilating system whereby a portion of the clean air which would otherwise normally pass through the carburetor is diverted through the engine crankcase and incorporating means for varying the rate of flow of air through the crankcase dependent upon the speed of the engine.

Another object of the invention is the provision of means for circulating a current of clean air through the crankcase of an internal combustion engine which arrangement may be adapted to existing engine types without the necessity of material alterations being made in the engine structure.

Still a further object of the invention is the provision of a system of circulating air through a crankcase whereby the circulating air and entrained vapors are discharged into the intake manifold of the engine.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawings of a form of the invention, which may be preferred, in which:

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Figure 1 is an end elevational view of an internal combustion engine, parts being shown in section illustrating the system and apparatus of my invention;

Figure 2 is a top plan view of the engine and associated apparatus shown in Figure 1;

Figure 3 is a view taken substantially on the line 3—3 of Figure 2 with the air cleaning arrangement shown partially in section;

Figure 4 is an enlarged detailed sectional view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a detailed sectional view taken substantially on the line 5—5 of Figure 2.

While I have illustrated a form of my invention as incorporated in a multi cylinder engine of a character usable in an automotive vehicle, it is to be understood that I contemplate the utilization of my invention with any type of engine wherein the same may be found to have utility.

Referring to the drawings in detail, I have illustrated a conventional type of internal combustion engine inclusive of a crankcase 10 mounted upon suitable support 11 one or more cylinders 12, each cylinder accommodating a reciprocating piston 13 connected by means of a connecting rod 14 to a crankshaft 15, the latter being journaled for rotation in suitable bearings carried by the crankcase 10. The lower portion of the crankcase is closed by means of an oil pan or reservoir 16. The upper portion of the crankcase is formed with a valve push rod chamber 17, the valve push rods 18 being arranged in bearings 19 and are actuated by suitable camshaft 20. The chamber 17 is provided in its side wall with opening 21 which is covered by means of a closure or fitting 22 held in place by a bolt 23. The valve push rod chamber 17 is in communication with the crankcase by means of a passageway 25.

Secured to the engine block is an intake manifold 27 which is connected to a fuel and air mixing device or carburetor 28 for supplying a combustible mixture to the engine, the latter being provided with a conventional exhaust manifold (not shown). Connected to the carburetor 28 is an air horn 30 which communicates with an air cleaner 31 by means of a duct or conduit 32 secured to the air horn by means of a clamp 33, the other end of the tube 32 being connected to the air cleaner by means of a flexible conduit or tube 34. The air cleaner 31 is inclusive of a substantially cylindrical chamber which is closed at its lower end by means of a cup-like member 37 which is adapted to contain a small quantity of liquid 38 as for example, oil or the like, to trap

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particles removed from the air entering the cleaner. The member 37 is retained in position by clamping means 36. The upper portion of the cleaner is provided with a series of louvered inlets 39 to facilitate the ingress of air into the interior of the cleaner. The air cleaner structure is provided with projections 40 which engage brackets 41 secured to the dash board 42 or other suitable portion of the vehicle, the projections 40 being secured to brackets 41 by means of wing nuts 43 or other suitable retaining means.

Vertically arranged with respect to the engine block and projecting into the crankcase 10 is an oil filler tube 45 preferably fabricated of sheet metal tubing. The upper portion of the tube 45 is provided with a fitting 46 of flared or frusto-conical configuration to facilitate the introduction of lubricant or oil into the engine crankcase. The fitting 46 is tightly closed by means of a cap 47 through the medium of a sealing gasket 44 urged into sealing position under the influence of a spring 50, as particularly shown in Figure 5. Secured to the cap 47 is a rod 48 which extends downwardly through the tube 45 into the oil pan 16 and provides a means for measuring or determining the oil level in the oil pan 16. The cap 47 is provided exteriorly with a member 48a having upturned ear portions 49 affording a manipulating means for removing the oil filler cap 47, when it becomes necessary to introduce lubricant into the filler tube. It is desirable that the entrance to the filler tube be tightly closed in order that all air taken into the crankcase for ventilation purposes be admitted through the air cleaner 31.

The conduit 32 is provided with a branch passageway 51 and the flared fitting 46 of the oil filler system is provided with a laterally extending tube or passageway 52 which are joined together by means of a flexible tube 53 held in place by clamps 54. The tubes or passageways 51, 52 and 53 form an air passage or duct from the conduit 32 to the oil filler tube 45 thus providing a means for diverting a portion of the air taken in through the air cleaner 31 into the oil filler tube 45 thence into the crankcase 10.

The fitting 22 closing the opening 20 in the wall of the valve push rod chamber is provided with an L-shaped fitting 56 to which is connected a tube 57 leading to another L-shaped fitting 58 which has a threaded tenon portion 59 engaging in a threaded opening in a member 60. The member 60 is formed with a tenon 61 which engages in an interior threaded portion in a sleeve 62, the latter having a portion 63 engaging in a threaded opening in a wall of the intake manifold 27. The sleeve 62 is formed interiorly with valve chamber 65 in which is positioned a reciprocable valve or air flow regulating member 66. The valve member 66 is provided with a chamber 67 which communicates with the intake manifold through a passageway or metered opening 68. The walls of the chamber 67 are formed with transversely arranged passageways 69 which open into the chamber 65. The valve member 66 is normally urged into engagement with the end of the tenon 61 under the influence of an expansive coil spring 70. The valve member 66 is formed with a frusto-conical wall portion 72 which is adapted to seat against a shoulder or abutment 73 formed in the interior passageway in the tenon portion 63 of sleeve 62. When the valve member 66 moves in a left-hand direction as viewed in Figure 4, the tapered seat 72 engages the abutment 73 so that thereafter air may only circulate through the metered passageway 68.

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The operation of the arrangement of my invention is as follows: During operation of the internal combustion engine, air is admitted through the air cleaner 31, conduit 32, air horn 30 into the carburetor 28 where the air is mixed with combustible fuel, the mixture passing through the intake manifold 27 into the engine cylinders. Under the influence of sub-atmospheric or reduced pressure existing in the intake manifold during engine operation, a portion of the air entering the cleaner 31 is diverted through the branch passageway or duct formed by tubes 51, 52 and 53 into the oil filler tube 45, the air passing into the crankcase 10 through passageway 25, valve push rod compartment 17, thence through fitting 56, tube 57, fitting 58, member 60 and sleeve 62 into the intake manifold of the engine and below the carburetor 28. When the engine is operating at comparatively slow speed, that is, when the sub-atmospheric pressure in the intake manifold is only slightly less than atmospheric pressure, the valve member 66 is in the position shown in Figure 4, the air circulating through the crankcase passing from chamber 67 through the openings 69 and past the valve seat 72 into the intake manifold as well as through the metered passageway 68. When the engine speed increases, the pressure in the intake manifold is further reduced creating a higher vacuum therein. The air pressure in the crankcase and valve chamber 65 being substantially greater than the pressure in the intake manifold, overcomes the pressure of the spring 70 and causes the valve 66 to move in a left hand direction until the tapered seat 72 engages the abutment 73, so that the only air passageway through the valve is by means of the metered opening or passage 68. With the valve in closed position, the rate of flow of air through the passage 68 may be comparatively high with increased engine speed, but the amount of air circulating through the crankcase will remain within practical limits, although variable, as it is dependent upon the engine speed and the position of the valve member 66. In this manner the circulation of air through the crankcase is controlled or regulated so that at high engine speeds the circulation of air is not increased to a point which would carry out oil from the crankcase. It should also be noted that all of the air circulating through the crankcase together with the fumes and other vapors entrained by the air, are discharged into the intake manifold and into the engine, being subsequently discharged through the engine exhaust system.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than is herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

What I claim is:

1. In combination, an arrangement for ventilating the crankcase of an internal combustion engine having an intake manifold and a plurality of cylinders in line and an adjacent valve chamber, a carburetor, an oil filler tube extending into said crankcase substantially below the lower end and opposite the valve chamber and projecting above the engine; an air cleaner, an air conduit connected to said carburetor, means connecting said air cleaner and said air conduit, a closure for sealing the upper end of said filler tube, means establishing communication between the upper portion of said filler tube and said air conduit, and means including a connection be-

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tween the valve chamber and the intake manifold whereby the reduced pressure in said intake manifold sets up a flow of filtered air from said air cleaner through said filler tube and crankcase in a transverse direction.

2. In combination, an arrangement for ventilating the crankcase of an internal combustion engine having an intake manifold and a plurality of cylinders in line and an adjacent valve chamber, a carburetor, an oil filler tube extending into said crankcase, substantially below the lower end and opposite the valve chamber and projecting above the engine; an air cleaner, an air conduit connected to said carburetor, means connecting said air cleaner and said air conduit, 10 a closure for sealing the upper end of said filler tube, means establishing communication between the upper portion of said filler tube and said air conduit, means including a connection between the valve chamber and the intake manifold 20 whereby the reduced pressure in said intake manifold sets up a flow of filtered air from said air cleaner through said filler tube and crankcase, and spring loaded valve means positioned exteriorly of the engine in the connection between 25

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the valve chamber and intake manifold, said valve means being dependent for actuation upon the amplitude of subatmospheric pressure in the intake manifold for regulating the amount of air flowing through the crankcase.

3. In combination, an internal combustion engine having a series of vertical cylinders arranged in a line, and a crank case below the cylinders, a valve chamber laterally disposed to the cylinders, a carburetor having an intake and an outlet, an oil filler tube projecting from above the engine and extending into the crankcase below the valve chamber and on the opposite side of the cylinders from the said chamber, an air cleaner on the same side of the engine as the filler tube, means connecting the carburetor's intake with said air cleaner, an air conduit connected to said filler tube, means connecting the air cleaner and said air conduit, a closure for sealing the upper end of the filler tube, an intake manifold connected to the carburetor's outlet, and valve means connecting the valve chamber and the intake manifold.

DELMAR G. ROOS.