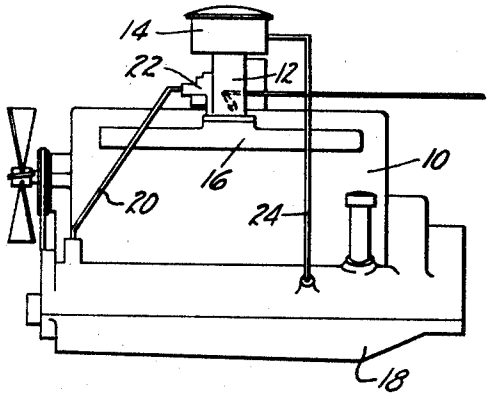
Nov. 22, 1949 A. H. WINKLER 2,489,230

INTERNAL-COMBUSTION ENGINE

Filed Sept. 20, 1946

FIG. 1



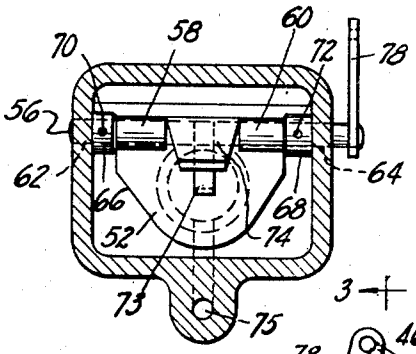


FIG. 3

FIG. 2

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Patented Nov. 22, 1949

2,489,230

UNITED STATES PATENT OFFICE

2,489,230

INTERNAL-COMBUSTION ENGINE

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Application September 20, 1946, Serial No. 698,117

14 Claims. (Cl. 123—119)

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The present invention relates to an internal combustion engine and more particularly to a crank case ventilating system therefor.

In the operation of internal combustion engines, small amounts of combustion gases seep from the cylinder into the crank case and escape therefrom through the oil filter cap into the atmosphere. Occasionally, some of the gases find their way into the passenger compartment of the vehicle, causing unpleasant odors and discomfort for the occupants of the car. In cold weather, the moisture and unburned vaporous fuel in the combustion gases condense in the crank case if not readily removed and mix with the oil, causing dilution of the oil and formation of sludge in the crank case. These undesirable conditions can be minimized by providing a suitable crank case ventilating system which withdraws the combustion gases from the crank case and replaces these gases with clean air from a suitable source; however, the majority of the systems now available either do not fully meet requirements, interfere with engine operation or are too intricate and difficult to regulate to provide dependable satisfactory performance. It is, therefore, a principal object of the present invention to provide an improved simplified crank case ventilating system which will minimize or entirely eliminate the aforementioned undesirable conditions resulting from improperly vented crank cases.

Another object of the present invention is to provide in a crank case ventilating system of an internal combustion engine a simple, dependable control mechanism which does not interfere with engine operation and which provides a continual flow of air of substantial volume throughout the normal engine operating range.

Another object of the invention is to provide a ventilating system for a crank case in which engine suction and air flow in the induction passage are utilized to provide a continual flow of air of a substantial volume through the crank case.

Still another object is to provide a control mechanism for a crank case ventilating system of the aforesaid type in which there is a substantial flow of air over the entire range of operating engine speed and throttle position.

Another object of the invention is to provide a crank case ventilating system wherein the air admitted into the crank case has been filtered to prevent contamination of the oil contained in the crank case.

The crank case ventilating system hereinafter more fully described is not limited to the particular embodiment disclosed in the specification and shown in the drawing, but is understood to be available in any case wherein an induction passage leading to the engine is controlled by a throttle valve. It is our intention to utilize any or all variations that fall within the scope of the appended claims.

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Figure 1 is a side elevation of a conventional internal combustion engine showing several parts thereof diagrammatically.

Figure 2 is a cross section through the carburetor of Figure 1 showing the relationship of the crank case ventilator to various parts of the carburetor.

Figure 3 is a cross section taken on line 3—3 of Figure 2.

The present crank case ventilating system includes in combination a device for filtering the air entering the crank case, a passageway leading from the air filtering device to the crank case and another therefrom to the induction passage terminating preferably adjacent the throttle valve, and a control mechanism having a valve responsive to engine suction and throttle position for maintaining a continual flow of clean air through the crank case. The present invention may be readily understood by referring to the drawings in which Figure 1 illustrates a conventional internal combustion engine for an automobile wherein numeral 10 designates a cylinder block, 12 a conventional carburetor, 14 an air filter, 16 an intake manifold on which the carburetor is mounted, and 18 a crank case connected through a conduit 20 with a crank case ventilating control mechanism shown generally at 22. A conduit 24 is shown connecting crank case 18 with air filter 14 mounted on carburetor 12. In Figure 2, the carburetor 12 on which the control mechanism for the crank case ventilating system is mounted consists of an induction passage 26 having therein a large venturi 28, a boost venturi 30, and a conventional throttle valve 32 on shaft 33 for controlling the flow of air or fuel-air mixture through said induction passage to the engine. The carburetor 12 is mounted on intake manifold 16 and secured thereto by cap screw 34 inserted in holes of flange 36 of the carburetor and flange 38 of the manifold, the joint between said flanges being sealed by a suitable gasket 40. While the carburetor shown in the drawings is of the downdraft type, it is to be understood that any other type carburetor having a throttle valve therein may be used in combination with the present control mechanism for the crank case ventilating system.

Conduit 20, through which the contaminated air and combustion gases from the crank case are drawn, terminates in chamber 42 of control valve casing 44, said casing being mounted to the side of carburetor 12 adjacent throttle valve 32 and secured thereto by machine screws 46 in flange 48. Chamber 42 is vented by aperture 50 to the induction passage of the carburetor anterior to the throttle valve and, as shown in the drawings, this aperture is located between the throttle valve and the venturi; however, said aperture may be located at any place along the induction passage on the air intake side of the throttle valve. The bottom side of chamber 42 slopes gradually toward sperture 50 to permit the vapors condensing in said chamber to drain into the induction passage.

The flow of gases through conduit 20 into chamber 42 is controlled by a plate valve 52 which is adapted to seat over the open end 54 of conduit 20 and, when seated, to prevent air from chamber 42 from entering conduit 20. Plate valve 52 is mounted on shaft 56 and rotatably secured thereto by rolled portions 58 and 60 formed in the upper margin of the plate. The shaft 56 is journaled at either end in opposite side walls of casing 44, as shown at 62 and 64 in Figure 3, and secured against axial movement by collars 66 and 68 mounted on said shaft between the side walls of the casing and the ends of plate valve 52, said collars being secured to the shaft by set screws 70 and 72. These collars also prevent lateral movement of the plate valve on shaft 56. The shaft is so positioned in relation to end 54 of conduit 20 that when the valve is seated on said end, it is a few degrees off vertical position to permit said valve to open slightly by its own weight when no independent force is urging it to its closed position. The off vertical position shown in the drawings tends to prevent fluttering of the valve under certain engine operating conditions and facilitates opening of said valve by the suction in the induction passage. A pick-up pin 73 which is shown as an L-shaped member is secured to shaft 56 and is adapted to engage and close plate valve 52 and by contacting projections 74 of plate valve 52 to kick said plate valve open.

Conduit 20 on the anterior side of plate valve 52 is connected with the induction passage on the engine side of the throttle valve 32 by an auxiliary passageway 75 which, as may readily be seen, is continuously subjected to engine suction during the operation of the engine and is provided to remove the combustion gases and contaminated air from the crank case when the throttle is in the closed or substantially closed position. A replaceable restriction 76 may be provided in said passageway in order that the effective size of the passageway can be adjusted to the desired capacity by merely changing the restriction, said restriction preferably being disposed adjacent the induction passage end of said passageway to facilitate its removal and replacement.

Plate valve 52 is controlled by a yieldable mechanical linkage which urges said valve to its closed position when the throttle valve is closed or opened not more than a certain predetermined position and which limits the opening movement of said plate valve to an amount proportional to the degree of throttle opening above said predetermined position. The linkage includes a lever 78 rigidly mounted on one end of shaft 56 and adapted to rotate therewith, another lever 80 pivoted on the throttle valve shaft 33, a rod 82 connecting said levers, and a spring 84 reacting between lever 80 and a bracket 86 to urge the linkage in the direction to close plate valve 52. Lever 80 is so mounted on shaft 33 that it rotates freely thereon independently of the throttle valve lever 88. Throttle valve lever 88 which is mounted on the end of the throttle valve shaft adjacent lever 80 is provided with an arm 90 having a lateral projecting lug 92 adapted to engage lever 80 when the throttle valve has been opened to the aforementioned predetermined position, which is shown in the drawing as approximately 30°. Further opening movement of the throttle valve forces levers 80 and 78 to the left and rotates pick-up pin 73 away from the plate valve 52, permitting said plate valve to swing freely between the end of conduit 20 and the new position of said pick-up pin. When the throttle valve approaches full open position, pick-up pin 73 engages projection or lever 74 of plate valve 52 and will force open said valve in the event it has become stuck to the end of conduit 20.

In the operation of the internal combustion engine in which the present crank case ventilating system is used, the suction in the induction passage posterior to the throttle valve causes air from the air filter at the entrance of the induction passage to flow through conduit 24 into crank case 18, then through conduit 20 and passageway 75 into the induction passage below the throttle valve. It is apparent that as the throttle valve is opened, the suction posterior thereto gradually becomes less so that the flow of air through the crank case will become less if no provisions are made to compensate for the decrease in suction.

When the throttle valve 32 has been opened to a predetermined position, lug 92 on throttle arm 90 engages lever 80 and moves said lever and lever 78 to the left as shown in Figure 2 of the drawings, thus withdrawing pick-up pin 73 from plate valve 52 permitting said valve to move away from the end of conduit 20 either by its own weight or by the suction of the induction passage transmitted through port 50 into chamber 42. Plate valve 52 will be maintained against the end of conduit 20, so long as the suction below throttle valve 32 is greater than the suction created by the air flow in the induction passage past port 50. When the two suctions become substantially equal, the weight of plate valve 52 will cause said valve to open. Should plate valve 52 adhere to the end of conduit 20, opening of the throttle valve to the point where pick-up pin 73 engages lever 74 would force plate valve 52 away from the end of conduit 20. Thereafter, engine suction and the suction in the induction passage created by the air flow past port 50 will control the opening and closing movement of plate valve 52 so long as throttle valve 32 remains open beyond the point at which lug 92 engages lever 80. It is apparent that when the throttle valve 32 is opened and the suction in the induction passage posterior to said valve 32 decreases, the suction in chamber 42 created by air flow past port 50 increases, so that the suction in conduit 20 is always maintained at a substantial value, thus providing an adequate flow of air through the crank case throughout the entire normal operating range of the engine.

It is contemplated that other arrangements of the elements comprising the present invention than that shown in the accompanying drawings may be provided without departing from the scope of the present invention; for example, a conventional combination oil filter and breather

tube may be used to provide the air intake for the crank case in preference to the air filter 14 and conduit 24 connecting the crank case 18 with said filter. Furthermore, a coil spring mounted on throttle shaft 33 may be substituted for spring 84 for urging plate valve 52 to its closed position. These various modifications and the means for accomplishing them will be apparent to those skilled in the internal combustion engine art; therefore, detailed discussion of these modifications is unnecessary. Although only one specific embodiment of the present invention has been given herein, it is to be understood that other variations than those mentioned may be made without departing from the scope of the invention.

I claim:

1. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to suction in said induction passage; a yieldable means adapted to urge said valve to its closed position; and a means adapted to render said yieldable means incapable of completely closing said valve.

2. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; a yieldable means adapted to urge said valve to its closed position when said throttle is in closed position; and a means adapted to render said yieldable means incapable of completely closing said valve when the throttle is in partially or fully opened position.

3. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to suction in said induction passage; a yieldable means adapted to urge said valve to its closed position when said throttle is in closed position; and a means adapted to render said yieldable means incapable of completely closing said valve at a predetermined point in the opening movement of the throttle.

4. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; a yieldable means adapted to urge said valve to its closed position; a means adapted to render said yieldable means incapable of completely closing said valve; an air filter; and a conduit connecting said air filter with said crank case.

5. In an internal combustion engine having a crank case and an induction passage with a throttle therein; a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; a yieldable means adapted to urge said valve to its closed position when said throttle is in closed position; a means adapted to render said yieldable means incapable of completely closing said valve at a predetermined point in the opening movement of the throttle; an air filter; and a conduit connecting said air filter with said crank case.

6. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; a yieldable means adapted to urge said valve to its closed position; a means adapted to render said yieldable means incapable of completely closing said valve; and a means adapted to force said valve open when the throttle approaches wide open position.

7. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; a yieldable means adapted to urge said valve to its closed position when said throttle is in closed position; a means adapted to render said yieldable means incapable of completely closing said valve at a predetermined point in the opening movement of the throttle; and a means adapted to force said valve open when the throttle approaches wide open position.

8. In an internal combustion engine having a crank case and an induction passage with a throttle therein: a passageway connecting said crank case with said induction passage anterior and posterior to said throttle; a valve for controlling the flow of air through said passageway to the anterior side of said throttle, said valve being responsive to engine suction and air flow in said induction passage; and a means adapted to positively open said valve when the throttle approaches wide open position.

9. A crank case ventilating system for an internal combustion engine having an induction passage with a throttle therein comprising: a venting conduit leading from the crank case and having a branch communicating with the induction passage anterior to the throttle and another branch posterior thereto; a valve in said first mentioned branch for controlling the flow of gases therethrough; a linkage between said control valve and a throttle actuating lever; a one-way connection between said linkage and said control valve; a resilient member urging said linkage in the direction to close said control valve; and a lost motion connection between said throttle lever and said linkage whereby said resilient member is rendered incapable of completely closing said control valve at a predetermined point in the opening movement of said throttle.

10. A crank case ventilating system for an internal combustion engine having an induction passage with a throttle therein comprising: a venting conduit leading from the crank case and having a branch communicating with the induc-

tion passage anterior to the throttle and another branch posterior thereto; a valve in said first mentioned branch for controlling the flow of gases therethrough; a linkage between said control valve and a throttle actuating lever; a one-way connection between said linkage and said control valve; a resilient member urging said linkage in the direction to close said control valve; a lost motion connection between said throttle lever and said linkage whereby said resilient member is rendered incapable of completely closing said control valve at a predetermined point in the opening movement of said throttle; and a member adapted to be engaged by said linkage when the throttle is substantially wide open to force open said control valve.

11. A crank case ventilating system for an internal combustion engine having an induction passage with a throttle therein comprising: a venting conduit leading from the crank case and having a branch communicating with the induction passage anterior to the throttle and another branch posterior thereto; a valve in said first mentioned branch for controlling the flow of gases therethrough; a linkage between said control valve and a throttle actuating lever; a one-way connection between said linkage and said control valve; a resilient member urging said linkage in the direction to close said control valve; a lost motion connection between said throttle lever and said linkage whereby said resilient member is rendered incapable of completely closing said control valve at a predetermined point in the opening movement of said throttle; a member adapted to be engaged by said linkage when the throttle is substantially wide open to force open said control valve; and an air inlet passageway for said crank case having an air filter therein.

12. The combination of a carburetor for an internal combustion engine having an induction passage with a throttle therein and a control mechanism for a crank case ventilating system comprising a chamber communicating with said induction passage on the air inlet side of said throttle; an inlet port for said chamber adapted to be connected by a conduit to the crank case; a control valve in said chamber for controlling the flow of gases through said port; a passageway by-passing said valve and chamber adapted to connect said conduit with said induction passage on the engine side of the throttle; a linkage between said control valve and a throttle actuating lever; a one-way connection between said linkage and said control valve; a resilient member urging said linkage in a direction to close said control valve; and a lost motion connection between said throttle lever and said linkage whereby said resilient member is rendered incapable of completely closing said control valve at a predetermined point in the opening movement of said throttle.

13. A control mechanism for a crank case ventilating system adapted for use in conjunction with a carburetor for an internal combustion engine having an induction passage with a throttle therein, comprising a chamber adapted to communicate with said induction passage on the air inlet side of the throttle; an inlet port for said chamber adapted to be connected by a conduit to the crank case; a control valve in said chamber for controlling the flow of gases through said port; a passageway by-passing said valve and chamber adapted to connect said conduit with said induction passage on the engine side of the throttle; and a manually actuated means adapted to regulate said control valve through a portion of the engine operating range.

14. A control mechanism for a crank case ventilating system adapted for use in conjunction with a carburetor for an internal combustion engine having an induction passage with a throttle therein, comprising a chamber adapted to communicate with said induction passage on the air inlet side of said throttle; an inlet port for said chamber adapted to be connected by a conduit to the crank case; a control valve in said chamber for controlling the flow of gases through said port; a passageway by-passing said valve and chamber adapted to connect the first mentioned conduit with said induction passage on the engine side of the throttle; a linkage adapted to connect said control valve with a throttle lever; a one-way connection between said linkage and said control valve; a resilient member adapted to urge said linkage in a direction to close said control valve; and a means adapted to be engaged by a lost motion connection actuated by said throttle lever for rendering said resilient member incapable of completely closing said control valve at a predetermined point in the opening movement of said throttle.

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