April 28, 1942. B. W. WESTCOTT 2,281,124

INTERNAL COMBUSTION ENGINE

Filed Feb. 7, 1940

Fig. 1

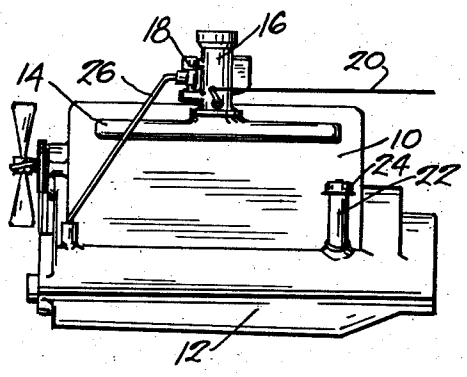
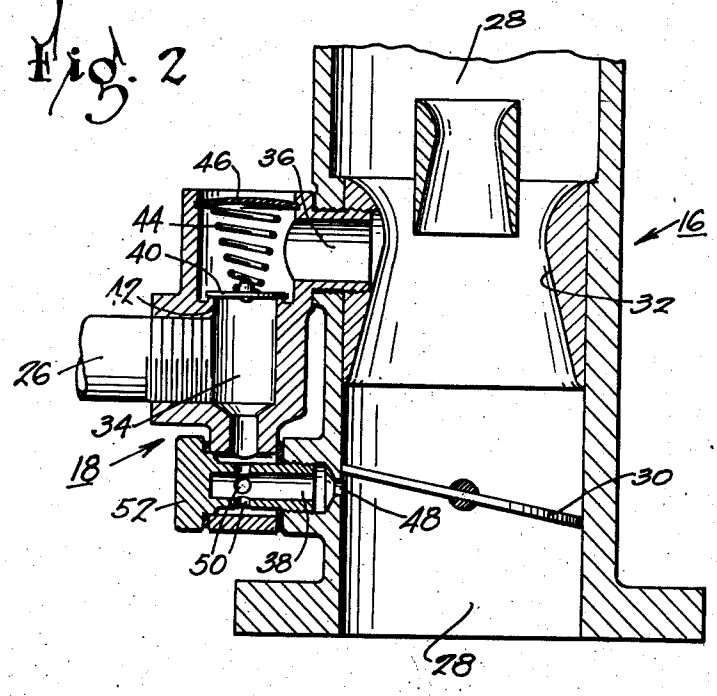


Fig. 2



INVENTOR.
BRAYTON W. WESTCOTT
BY
A. R. McCrady
ATTORNEY.

Patented Apr. 28, 1942

2,281,124

UNITED STATES PATENT OFFICE

2,281,124

INTERNAL COMBUSTION ENGINE

Brayton W. Westcott, Detroit, Mich., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

Application February 7, 1940, Serial No. 317,634

14 Claims. (Cl. 123—119)

This invention relates to internal combustion engines and more particularly to crankcase ventilators therefor.

During operation of an internal combustion engine some of the combustion gases are blown past the piston in the cylinder into the engine crankcase from whence they escape to atmosphere through the oil filter cap or other crankcase vent. These gases and other crankcase fumes, particularly in marine installations, if permitted to escape to atmosphere are both a fire hazard and a disturbing factor to personal comfort. Many devices have heretofore been proposed to draw these fumes into the engine with the incoming charge. The particular disadvantage with the majority of such devices is that the quantity of crankcase ventilation is insufficient under certain operating conditions to adequately draw off the fumes and so great at other conditions as to interfere with engine operation.

It is an object of this invention to provide an improved crankcase ventilator.

It is a further object to provide a crankcase ventilator in which the quantity of ventilation is jointly dependent upon the engine manifold vacuum and the quantity of air flowing to the engine.

It is a further object to provide a crankcase ventilator creating a positive but limited ventilation during idling and an increase in ventilation with increase in the power output of the engine.

Still another object is to secure a variable amount of crankcase ventilation by automatic means during all stages of engine operation.

The invention may best be understood when described in connection with the accompanying drawing in which:

Figure 1 is a side elevation of an internal combustion engine; and

Figure 2 is a vertical section through the carburetor and attached ventilator control unit.

With particular reference to Figure 1, there is shown an internal combustion engine comprising a cylinder block 10, crankcase 12, intake manifold 14, and a carburetor 16 having a ventilator control unit 18 attached thereto. The operation of the engine may be controlled by the driver or operator through the carburetor throttle control link 20 in the known manner. A combination oil filler and breather tube 22 is preferably provided at one end of the engine which is equipped with a customary type breather cap 24 having an air filtering element and providing constant communication between the enclosed crankcase space and the atmosphere. A tube 26 connects the crankcase at its opposite end with the ventilator control unit 18. Suction created in the carburetor during periods of operation and applied, as will be described hereinafter, to the tube 26, draws fumes from the crankcase and in addition creates a ventilating current of air from atmosphere, through tube 22, across the crankcase 12, and through tube 26 to the carburetor where it enters the induction passage with the incoming fresh charge.

The carburetor 16 may be of any known type having, as shown in Figure 2, an induction passage 28 controlled by a throttle 30 positioned posterior to a venturi 32. The tube 26 leads to a chamber 34 of the ventilator control unit 18 which communicates through passageway 36 with the venturi 32 and through passageway 38 with the induction passage 28 posterior to the throttle 30. A disc valve 40 urged onto a seat 42 by a compression spring 44 acting between the disc valve and a closure plug 46 controls the passage 36 and is arranged to close the passage at low Venturi suctions and open the passage an increasing amount as the Venturi suction increases.

The passage 38 is restricted in effective cross sectional area either by the size of opening 48 into the induction passage or by the size of the orifices 50 in the plug 52, the latter arrangement being preferred so that the effective area may be readily varied to produce the maximum amount of ventilation without interfering with the engine smoothness at idling conditions.

During operation, assuming the engine is idling, the throttle valve is closed and a high suction obtains posterior to the throttle and a negligible suction in the venturi 32. Under these conditions the valve 40 is closed preventing flow in either direction through passageway 36. The high vacuum at 48 draws fumes from the crankcase through tube 26 and passageway 38. Since the quantity of blow-by is very low at idle, the limited flow creating capacity of restricted passageway 38 will adequately take care of the crankcase fumes and in addition create a small flow of air across the crankcase. The valve 40 prevents any back flow of air from the venturi 32 through the passage 36 to the passage 38 which might otherwise decrease the ventilating capacity of passageway 38.

As the speed and power output of the engine is increased by opening the throttle valve, the increased air flow through venturi 32 creates a suction at the Venturi throat and on the upper side of valve 40. Since the tube 26 is relatively

large, the pressure within chamber 34 remains substantially atmospheric and as a consequence valve 40 will open a variable amount depending upon the differential pressure on opposite sides thereof. Under these conditions crankcase fumes and ventilating air are drawn into the induction passage both through passageway 36 and passageway 38.

It is true that as the engine speed and power increase the vacuum posterior to the throttle and consequently the flow through passageway 38 will decrease. However, the increase in flow through passageway 36 is relatively great and much more than sufficient to compensate for the loss of flow through passageway 38. In this connection it should be noted that an increase in Venturi suction accompanying an increase in engine power output has a double effect on the flow capacity of passageway 36, both of which tend to increase the flow therethrough; first, the mere increase in Venturi suction acting on a given opening of valve 40 will increase the flow in approximate proportion to the increase in air flow through the venturi, and second, the increased suction produces an increased valve opening thus providing a greater available area for flow. An automatic control of the amount of crankcase ventilation is thus provided.

Although the invention has been described with particular reference to but one modification it should not be inferred that the scope of the invention is limited thereto nor otherwise except in accordance with the appended claims.

I claim:

1. In an internal combustion engine, an induction passage leading to the engine, a crankcase, a venting conduit leading from the crankcase and having two branches connected to the induction passage at spaced points, and a pressure operated valve controlling at least one of said branches.

2. In an internal combustion engine, an induction passage leading to the engine, a venturi and a throttle in said passage, a crankcase having an atmospheric inlet, a venting conduit leading from the crankcase and having a pair of branches respectively connected to the venturi and to the induction passage posterior to the throttle, and means for varying the relative effective areas of said branches.

3. In an internal combustion engine having a crankcase and an induction passage including a venturi and a throttle, a conduit leading from the crankcase to the venturi, a conduit leading from the crankcase to the induction passage, and means responsive to Venturi suction for controlling at least one of said conduits.

4. In an internal combustion engine, an induction passage having a throttle valve therein, a venturi in said passage anterior to the throttle, a crankcase having an air inlet, venting conduits connecting the crankcase respectively to the venturi and to the induction passage posterior to the throttle, and a valve operated by Venturi suction controlling one of said conduits.

5. In an internal combustion engine, an induction passage having a throttle valve therein, a crankcase having an air inlet, venting conduits communicating said crankcase with the induction passage on opposite sides of the throttle, and means for varying the relative effective areas of said conduits.

6. A control unit for an internal combustion engine having a throttle controlled induction passage comprising a chamber, an inlet to said chamber adapted to be connected to the engine crankcase, a pair of outlets from said chamber adapted to be respectively connected to the induction passage on opposite sides of the throttle, and a pressure operated valve for varying the effective area of one of said outlets.

7. In an internal combustion engine having an air supply conduit and a crank case, a venturi in said conduit, a venting duct leading from the crankcase to the venturi, and a valve responsive to Venturi pressure controlling said duct.

8. In an internal combustion engine having an air supply passage and a crankcase, a venturi in said passage, and a conduit connecting the crankcase with the venturi adjacent the smallest portion thereof.

9. A control device for an internal combustion engine having a throttle controlled induction passage, said device having an inlet adapted to be connected to the engine crankcase, an outlet adapted to be connected to the induction passage on one side of the throttle, a branch outlet adapted to be connected to said passage on the opposite side of the throttle, and suction responsive means for varying the effective area of the outlets relative to each other.

10. In an internal combustion engine, an induction passage, a throttle in said passage, a crankcase, and a venting conduit leading from the crankcase and having two branches connected to the induction passage on opposite sides of the throttle.

11. In an internal combustion engine, an induction passage having a throttle therein, a crankcase having an atmospheric inlet, and passages connecting the crankcase with the induction passage anterior and posterior to the throttle valve.

12. A crankcase ventilator for an internal combustion engine having a throttle controlled induction passage comprising a venting duct having an inlet adapted to be connected to the crankcase of the engine, and a pair of outlets adapted to be connected to the induction passage on opposite sides of the throttle.

13. In a crankcase ventilation system for an internal combustion engine having an induction passage including a venturi and a throttle valve posterior thereto, a control unit comprising a chamber, an inlet to said chamber adapted to be connected to the engine crankcase, a duct leading from the chamber to the venturi, and a second duct leading from the chamber to the induction passage posterior to the throttle valve.

14. In a crankcase ventilation system for an internal combustion engine having an induction passage including a venturi and a throttle valve posterior thereto, a control unit comprising a chamber, an inlet to said chamber adapted to be connected to the engine crankcase, a duct leading from the chamber to the venturi, a second duct leading from the chamber to the induction passage posterior to the throttle valve, and a spring pressed valve controlling said first named duct and adapted to open in response to Venturi suction.

BRAYTON W. WESTCOTT.