Nov. 9, 1954 L. J. LECHTENBERG 2,693,791

BREATHER FOR AIR-COOLED INTERNAL-COMBUSTION ENGINES

Original Filed May 11, 1954 4 Sheets-Sheet 1

Fig. 1.

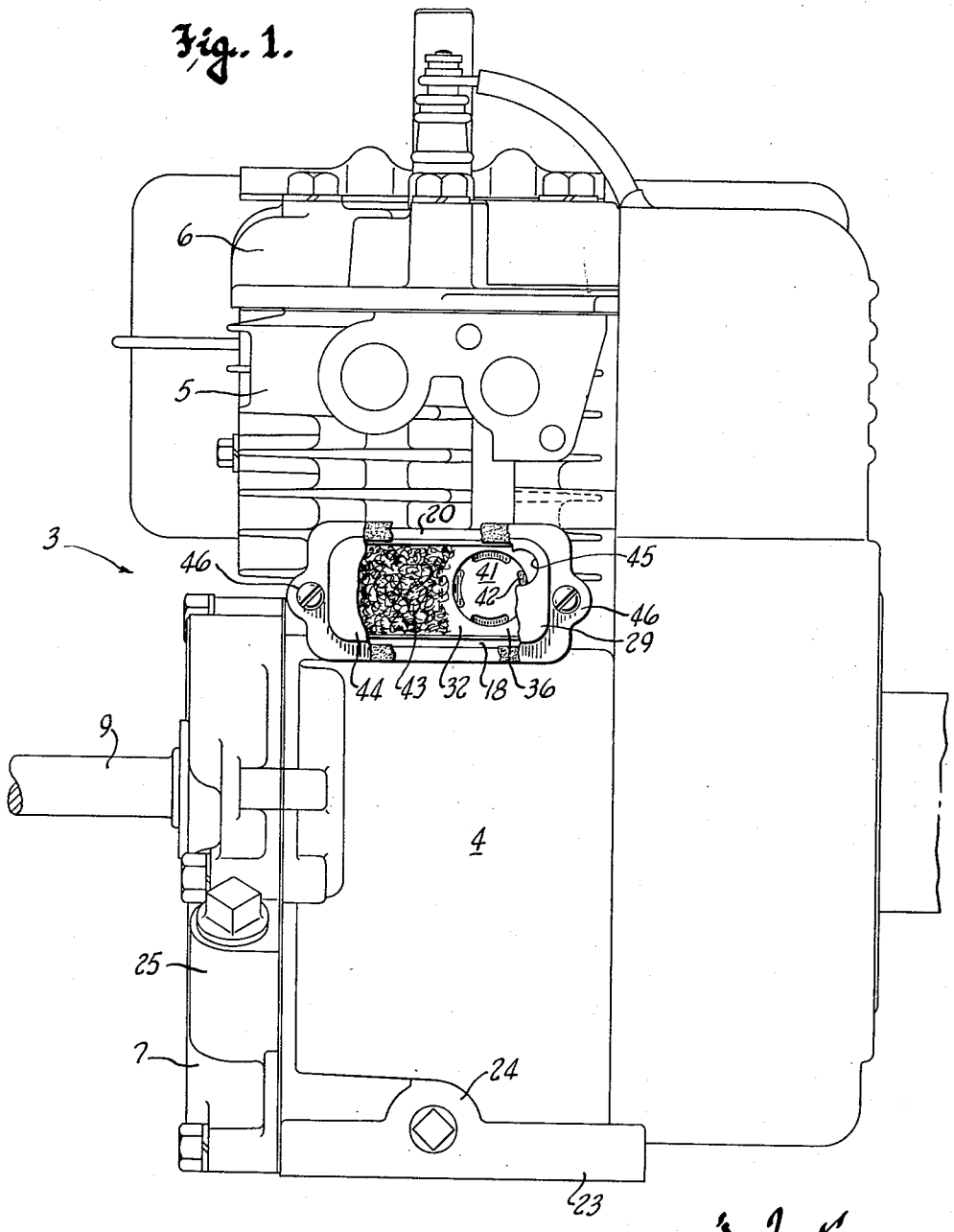

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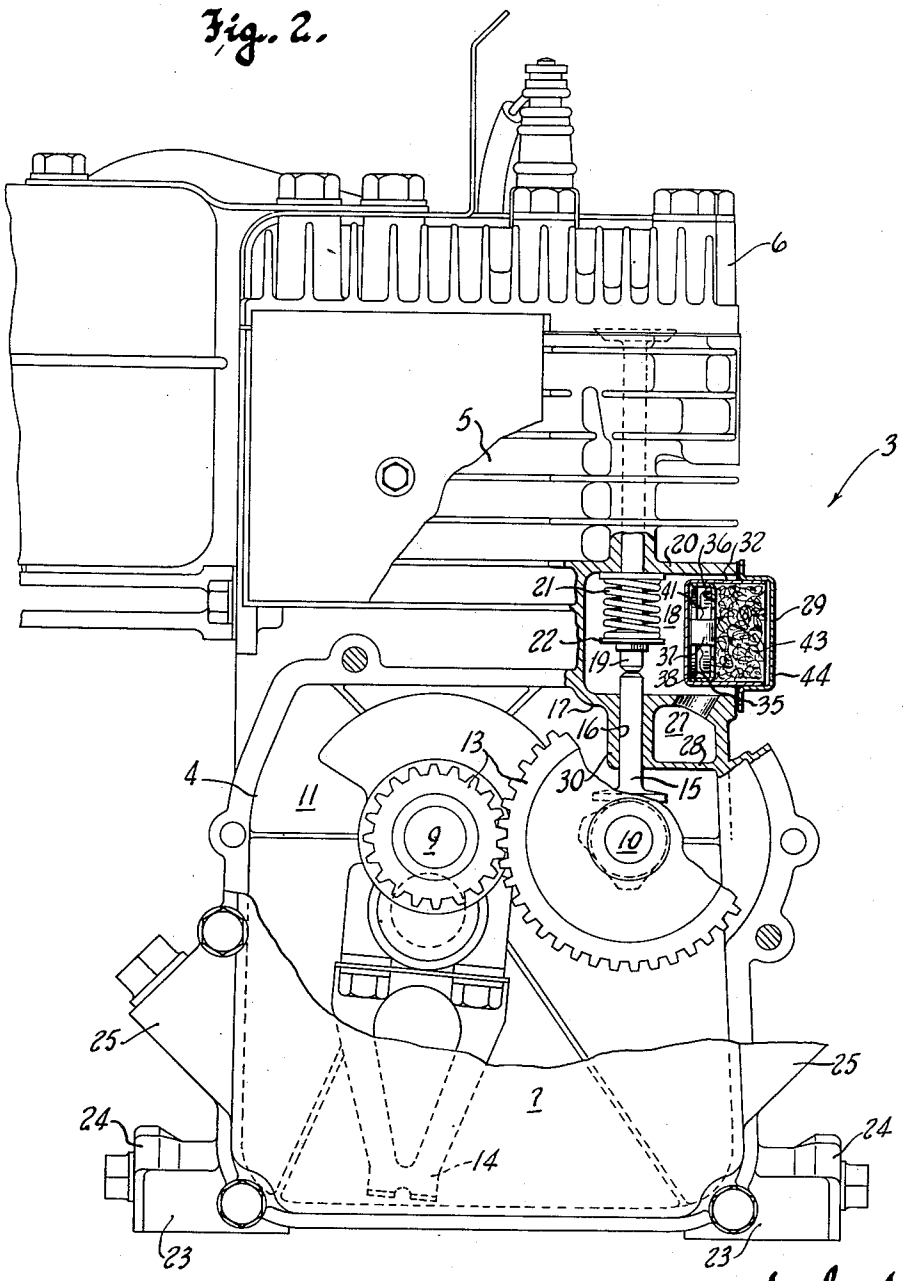
Fig. 2.



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BREATHER FOR AIR-COOLED INTERNAL-COMBUSTION ENGINES

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Fig. 3.

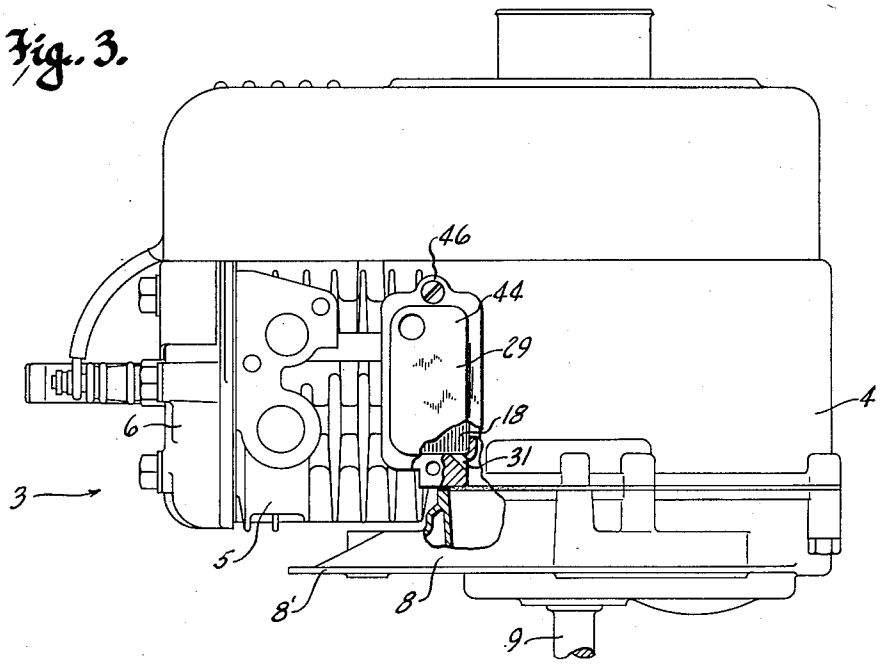


Fig. 4.

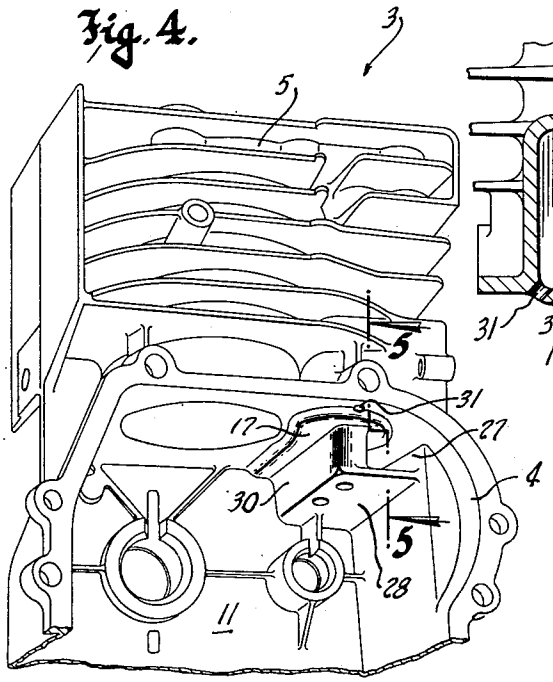
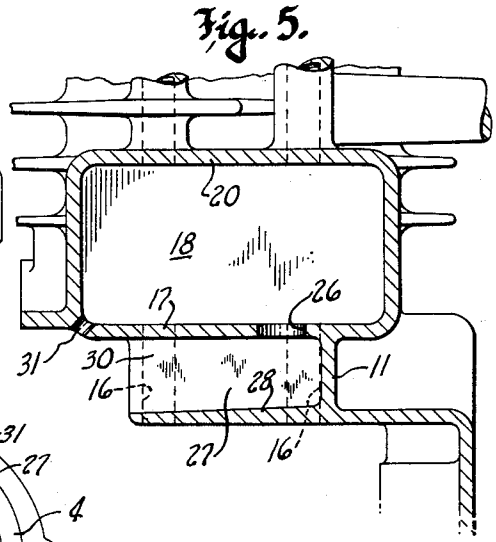


Fig. 5.



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BREATHER FOR AIR-COOLED INTERNAL-COMBUSTION ENGINES

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Fig. 6.

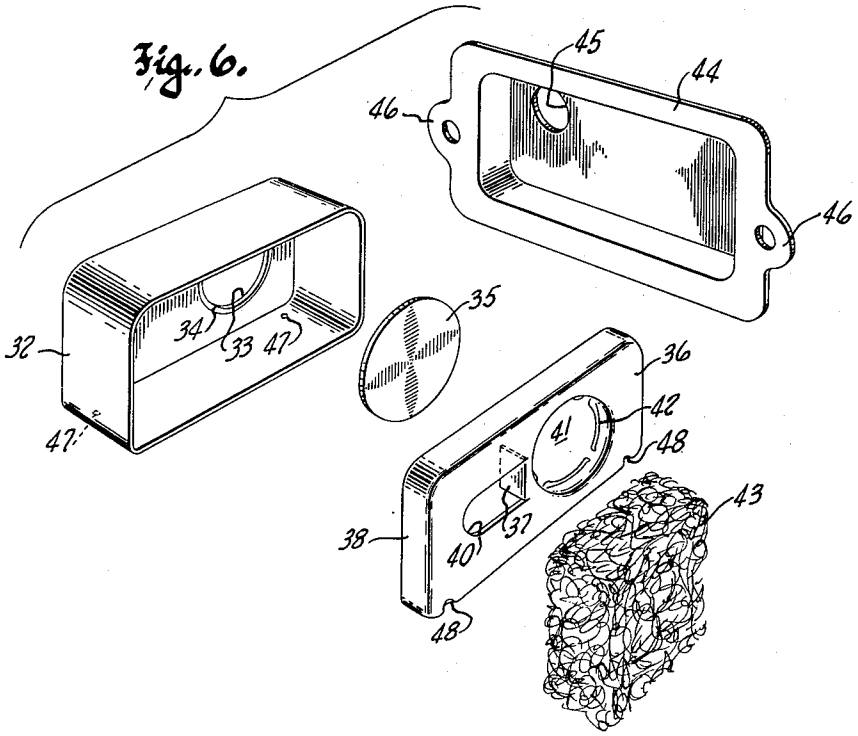
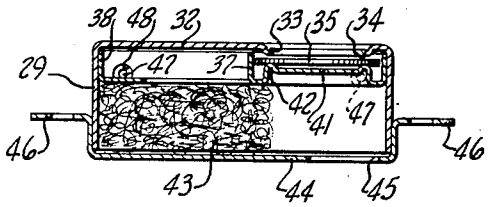


Fig. 7.



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BREATHER FOR AIR-COOLED INTERNAL-COMBUSTION ENGINES

Leo J. Lechtenberg, Milwaukee, Wis., assignor to Briggs & Stratton Corporation, Milwaukee, Wis., a corporation of Delaware

Application August 9, 1954, Serial No. 448,406

5 Claims. (Cl. 121—194)

This invention relates to internal combustion engines and refers more particularly to single cylinder, air cooled, four-stroke cycle engines of the type now widely used on power lawn mowers and many other well-known appliances.

More specifically, this invention concerns the manner in which the crankcase of the engine forming the subject matter of the pending application Serial No. 354,056, is vented; this application being a division of said application.

One of the objects of this invention is to provide assurance against oil leakage from the crankcase through the necessary breather opening by the simple expedient of a properly placed baffle cast integral with the crankcase.

With a view toward improving the air breather for the crankcase it is another object of this invention to vent the crankcase through a pocket or compartment in which the valve springs are located and with which the tappet openings communicate, and to control the flow of air to and from this valve spring pocket or compartment by means of a novel breather valve assembly formed as a cover for the valve spring compartment.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of the engine of this invention with a part of the cover for the valve spring compartment broken away, and with the carburetor removed for clarity;

Figure 2 is a view of the power take-off end of the engine, with a substantial part of the crankcase cover broken away and parts of the cylinder-crankcase casting broken away and shown in section;

Figure 3 is a side view of the engine adapted for horizontal operation, that is, with its cylinder horizontal and showing the same equipped with a crankcase cover especially designed to adapt the engine for use as the power unit of a rotary type lawn mower, parts of said view being broken away and shown in section to illustrate how oil which may enter the valve spring compartment is drained therefrom when the engine is adapted for horizontal operation;

Figure 4 is a perspective view of a portion of the cylinder-crankcase casting looking into the interior of the crankcase and illustrating especially the baffle arrangement by which the splashing of oil through the breather opening is prevented;

Figure 5 is a detail sectional view through Figure 4 on the plane of the line 5—5;

Figure 6 is an exploded perspective view of the air breather assembly which controls the venting of the crankcase interior, and

Figure 7 is a longitudinal sectional view through the air breather assembly.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 3 designates generally the crankcase-cylinder casting of the engine, consisting of a crankcase portion 4 and a cylinder 5. This main casting together with a cylinder head 6 and a crankcase cover casting 7 or 8 (depending upon the intended use of the engine) comprises the entire body of the engine. For ordinary general utility where an upright disposition of the engine is desirable, the crankcase cover 7 is used, but where the engine is intended to operate with its cylinder axis horizontal as in the driving units of rotary type lawnmowers, and as shown for instance in Figure 3, the cover 8 is used.

The bearings for the engine crankshaft 9 and its cam shaft 10 are mounted in the cover casting and the end wall 11 of the crankcase-cylinder casting opposite the cover, and to enable adapting the engine to any one of a wide variety of uses without need for changing the crankcase-cylinder casting the flywheel 12 is mounted upon the end of the crankshaft which protrudes from the casting wall 11 and the opposite power take-off end of the crankshaft protrudes from the cover casting regardless of which of the two types of covers is employed.

The crankcase-cylinder casting 3, the cylinder head 6 and the crankcase cover 7–8 are cast of aluminum alloy, preferably as die castings, and the crankshaft and cam shaft run directly in bearings bored in the cover casting and the opposite wall of the crankcase-cylinder casting. In other words, the bearings are not bushed, but can be bored out to receive bushings (not shown) after the engine has been in service long enough to cause serious bearing wear.

The cam shaft 10, which is of conventional construction is driven from the crankshaft by the usual set of timing gears 13 which are located adjacent to the crankcase cover, and when the engine is intended for general utility, the connecting rod has an oil splashing dipper 14 secured thereto to effectively splash the oil contained in the crankcase up into all parts of the crankcase interior and into the cylinder.

Valve tappets 15 operated by the cam shaft are slidably received in relatively long holes 16 drilled through a wall 17 of the crankcase-cylinder casting and a boss 30 depending therefrom. The outer ends of these holes open to a valve spring pocket or compartment 18 in which the tappets abut the valve stems 19 to lift the valves in the customary manner. The valve stems enter the compartment 18 through its top wall 20 and the valve springs 21 are confined between this top wall 20 and spring seats 22 on the lower ends of the valve stems.

The valve spring pocket or compartment 18 not only affords a convenient enclosure for the valve springs but, as will be hereinafter more fully described, forms part of the means by which the crankcase interior is ventilated.

If the engine is intended for operation with its cylinder vertical the crankcase-cylinder casting 3 is provided with integral mounting feet 23 and bosses 24 at opposite sides of the casting, either one of which may be drilled and tapped to provide an oil drain port. But when the engine is intended for operation with its cylinder axis horizontal, the feet and drain port are not needed and hence those portions of the die or mold in which the feet and bosses are formed would be blocked off. Also, when the engine is intended for general utility and the cover 7 is employed the oil filler port may be located at either side of the engine, and to provide for such alternate location the cover casting 7 has a pair of bosses 25 either of which may be drilled and tapped to provide the oil inlet port.

If the engine is intended for operation with its cylinder horizontal and the other cover casting 8 is used both the oil inlet port and the oil drain port are in the cover casting which has a relatively deep dish-shaped formation and thus provides an oil sump for the engine. The gasket face formed by the outer edges of the side walls of the cover 8 has the same shape as the gasket face formed by the outer edges of the side walls of the cover casting 7 so as to interchangeably fit the open side of the crankcase.

If the engine is intended for use as the power unit

of a rotary type lawn mower the cover casting **8** has a mounting flange **8'** cast integrally therewith. This flange seats upon and is secured to the deck of the lawn mower (not shown) to firmly mount the engine with the power take-off end of its crankshaft extending down below the deck.

Crankcase ventilation, as hereinbefore suggested, is accomplished with a minimum loss of oil from the crank case. The need for ventilating the crankcase arises from the fact that as the piston descends it tends to compress the air in the crankcase, and as it rises on its compression stroke there is a certain amount of "blow-by" past the piston rings from the combustion chamber. Thus unless the crankcase is vented the pressure therein builds up and causes undue leakage of oil past the oil seals and gasket joints. The means provided by this invention for ventilating the crankcase not only eliminates such undesirable pressure but in fact actually produces a partial vacuum in the crankcase. To achieve this result without loss of oil from the crankcase the air is led from the crankcase by a very tortuous passage which includes the valve spring compartment **18** and comprises a hole or port **26** in the bottom wall **17** of this compartment, a pocket **27** formed by a baffle **28** in coaction with adjacent walls of the crankcase and a novel air breather assembly **29** which forms a cover for the valve spring compartment.

As best shown in Figure 5 the port **26** is located between the plane of connecting rod motion and the end wall **11** of the crankcase. The baffle **28** is formed as an integral part of the crankcase-cylinder casting and projects from its end wall **11** across the mouth of the port, being preferably a continuation of the bottom of the depending boss **30** through which the valve tappets pass. Since the baffle **28** extends from the casting wall **11** almost to the open side of the casting it coacts with the adjacent walls of the casting to define the pocket **27** which forms a tortuous path of communication between the port **26** and a "quiet" relatively oil-free zone of the crankcase interior. Hence, very little oil is carried from the crankcase through the port **26**. That which does leave the crankcase through this port is trapped in the valve spring compartment **18** by the breather assembly **29**, to be returned to the crankcase when the engine is in its vertical position by simply flowing back through the port **26** into the pocket **27** and from there over the edge of the baffle **28**, and when the engine is in its horizontal position, by flowing through a drain port **31** which leads from the compartment **18** to the crankcase interior.

The breather assembly **29** as best shown in the exploded perspective view Figure 6, comprises a stamped oblong box **32** having a hole **33** in its bottom wall, the edge of which projects slightly from the bottom wall to provide a valve seat **34**. A lighter flutter valve **35** stamped from fiber or other suitable material coacts with the seat **34** and is loosely held in position by a partition wall **36** and a tongue **37** extending down from the partition wall toward the bottom of the box **32**. The partition wall is spaced a fixed distance from the bottom wall of the box by downturned edges **38**, and the tongue **39** being formed from the partition wall leaves a hole **40** through which air may freely pass from one side of the partition wall to the other.

A protrusion **41** in the partition wall **36** provided with circumferentially spaced projections **42** holds the flutter valve **35** off the partition wall and the projections keep the valve disc from sticking in its open position. The valve disc is thus always free to float to and from engagement with the valve seat **34** as the pressure in the crankcase alternates between negative and positive. This arrangement permits free expulsion of air from the crankcase and restricts influx of air to the slight amount which can pass through the hole **33** during the interval the valve disc moves from its "open" position to its "closed" position on the seat **34**. However, any dirt or foreign matter entrained in the air thus entering the crankcase is trapped by a mass of keratin fiber or other filtering material **43** confined between the partition and a cover **44**.

The cover **44** fits over the box **32** and has an air inlet port **45** in its end remote from the hole **40** in the partition wall to thus assure that any air flowing through the device either inward or outward must pass through the filter.

Mounting ears **46** on opposite ends of the cover provide for fastening the entire assembly in position across the mouth of the valve spring pocket or compartment with the box **32** projecting a substantial distance into the compartment as best shown in Figure 2. Any oil which is carried into the box **32** drains back into the valve spring compartment through drain holes **47** and **48** in the box and its partition wall, and these holes are so located that at least one set thereof is always effective regardless of whether the engine is operating with its cylinder vertical, inclined from the vertical, or horizontal.

The air breather assembly of this invention thus performs five important functions.

(1) It baffles out the oil remaining in the air expelled from the crankcase.

(2) It drains this oil back to the crankcase.

(3) Its flutter valve enables the maintenance of a partial vacuum in the crankcase.

(4) Its filter traps dirt which might otherwise be carried into the crankcase.

(5) It provides a cover for the valve spring compartment.

What is claimed as my invention is:

1. In an internal combustion engine of the character described having a cylinder and a crankcase cast as one unit with the cylinder extending from one wall of the crankcase, said wall of the crankcase having an air breather hole therein near the junction of said wall with an adjacent side wall of the crankcase for communicating the interior of the crankcase with the atmosphere; and a baffle inside the crankcase cast integrally therewith and extending across the corner at the junction of said two walls and across the mouth of said air breather hole to coact with said two walls to define a tortuous passage leading from the mouth of said air breather hole to a relatively oil free zone of the crankcase interior to thereby minimize loss of lubricant from the crankcase through said air breather hole.

2. In an internal combustion engine of the character described having a cylinder and a crankcase cast as one unit with the cylinder extending from one wall of the crankcase and with the crankcase having an end wall substantially parallel with the plane of the connecting rod motion, the first designated wall of the crankcase from which the cylinder extends having an air breather hole therein near the junction of said first designated wall with an adjacent side wall of the crankcase and between the plane of connecting rod motion and said end wall of the crankcase for communicating the interior of the crankcase with the atmosphere; and a baffle inside the cranckcase cast integrally therewith and extending across the corner at the junction of said first designated wall and said side wall and across the mouth of said air breather hole and projecting from the end wall of the crankcase a substantial distance beyond the plane of connecting rod motion to coact with said two corner defining walls to form a tortuous passage leading from the mouth of said air breather hole to a relatively oil free zone of the crankcase interior to thereby minimize loss of lubricant from the crankcase through said air breather hole.

3. An air breather unit for internal combustion engines, comprising: a stamped sheet metal plate adapted to be secured as a cover over an opening in a wall of the engine; a box-like stamping having a hole in its bottom, the edge of said hole being raised a slight distance above the inner surface of said bottom wall to provide a valve seat; means connecting the box-like stamping with said cover plate, said cover plate having a hole therethrough; a light valve disc within the box-like stamping; means loosely confining said disc to a zone over the valve seat so that said disc may be moved off and onto the seat; a partition wall inside the box-like enclosure between its bottom wall and the cover plate and positioned to block direct passage through said holes and provide a tortuous passage from one hole to the other; and a filter between the partition wall and the cover plate through which all air flowing through the unit must pass.

4. In an internal combustion engine of the character described, having a cylinder and crankcase cast as one integral unit with the cylinder extending outwardly from one wall of the crankcase: a boss extending inwardly from said wall of the crankcase between its junction with the cylinder and the junction of said wall and an adjacent side wall of the crankcase; said boss having holes therethrough to accommodate the valve actuating tappets of

the engine; the portion of said first designated crankcase wall which lies between the cylinder and said boss having an air breather hole therethrough for communicating the interior of the crankcase with the atmosphere; and a baffle inside the crankcase cast integrally therewith and extending from said boss towards the designated side wall of the crankcase across the corner formed by its junction with the first designated crankcase wall and across the mouth of the air breather hole to coact with said two walls and the boss to define a tortuous passage leading from the mouth of the air breather hole to a relatively oil free zone of the crankcase interior to thereby minimize loss of lubricant from the crankcase through said air breather hole.

5. The engine defined in claim 4 further characterized by the fact that the crankcase has an end wall substantially parallel with the engine's connecting rod motion and joining said two designated walls of the crankcase;

by the fact that the boss and the baffle also join said end wall and project substantially perpendicularly therefrom for a substantial distance beyond the plane of connecting rod motion; and by the fact that the air breather hole is located between the plane of connecting rod motion and said end wall of the crankcase.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,352,022	Pajalic	Sept. 7, 1920
2,029,216	Barker	Jan. 28, 1936
2,187,265	Carlson	Jan. 16, 1940
2,305,186	Muenk	Dec. 15, 1942
2,361,061	Roos	Oct. 24, 1944
2,607,332	Bosma	Aug. 19, 1952