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CRANKCASE BREATHER CONSTRUCTION

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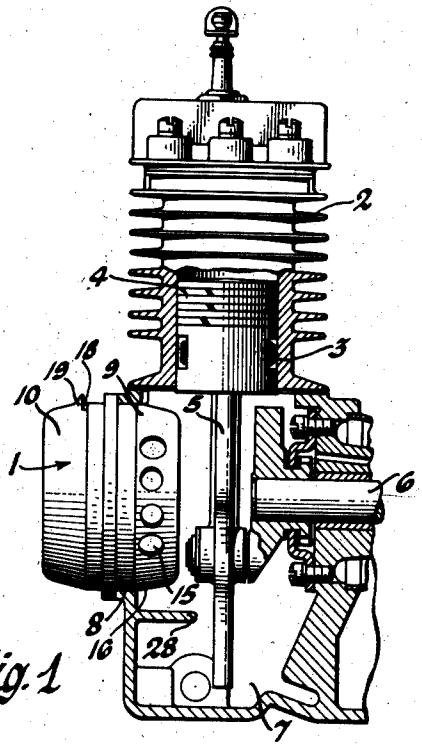

Fig. 1

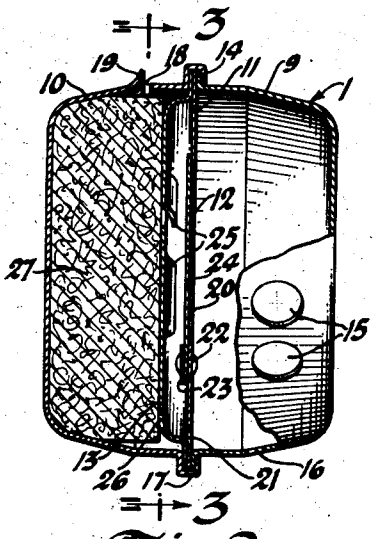

Fig. 2

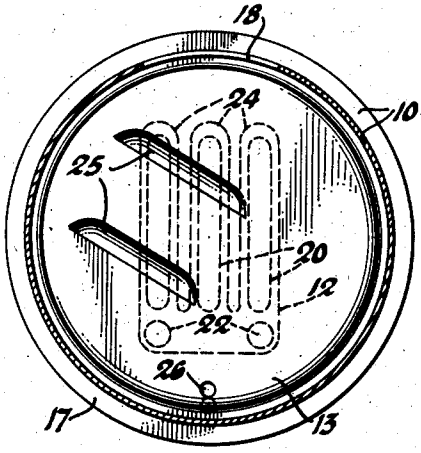

Fig. 3

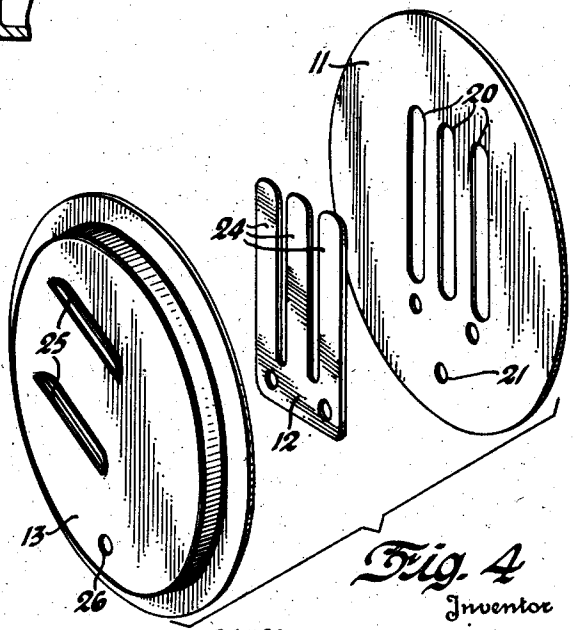

Fig. 4

Inventor

Wilbur L. Carlson

By Blackmore, Spencer & Flint

Attorneys

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CRANKCASE BREATHER CONSTRUCTION

Wilbur L. Carlson, Rochester, N. Y., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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8 Claims. (Cl. 121—194)

This invention relates to a new and improved crankcase breather construction for internal combustion engines which is adapted to relieve the compression in the crankcase.

It is one of the objects of the invention to provide a breather construction with a valve which will permit the escape of gases and vapors from the crankcase to the atmosphere whenever the pressure in the crankcase exceeds some predetermined degree.

A further object is to provide a breather construction which will separate any oil from the crankcase gases and vapors passing through the breather and return this oil to the crankcase.

It is a still further object to provide a breather construction which is exceedingly simple and inexpensive to manufacture.

Other objects and advantages of this invention will appear from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a fragmental vertical section of an internal combustion engine with the breather of the present invention.

Figure 2 is a vertical, longitudinal section of the breather assembly with a portion of the breather casing in elevation.

Figure 3 is a transverse section of the breather assembly taken substantially on line 3—3 of Figure 2.

Figure 4 is a perspective view of certain elements of the breather assembly shown in spaced relation.

Referring first to Figure 1, the breather unit, indicated generally at 1, is shown in connection with an air cooled engine 2 of the general type used in small electric generating plants, although it will be understood that this breather unit may be used with any standard internal combustion engine. In the present showing, the engine 2 includes the usual cylinder 3, piston 4, connecting rod 5, crankshaft 6, and crankcase 7, and the crankcase is provided with an opening 8 to receive the breather unit 1 which is the subject of the present invention.

With the exception of a filter element, the entire breather unit is made up of sheet metal parts which may be cheaply and readily formed and assembled with the filter element in a self-contained unit as is shown in Figure 2. These metal parts consist of the two casing members 9 and 10, the plate member 11, the valve member 12, and the filter retaining member 13.

The casing member 9, which as shown in Figure 1 is adapted to extend into the crankcase 7 when the breather unit is associated with the engine, as of generally cup-shaped form with an outwardly extending flange 14 at its open end, and is provided with a series of openings 15 in its peripheral wall and also with a relatively small hole 16 for a function to be hereafter described.

The casing member 10, which is located outside of the crankcase when the breather unit is associated with the engine, is also of generally cup-shaped form with an offset flange 17 at its open end which is crimped or spun over the flange 14 of the casing member 9 as shown in Figure 2 during assembly of the breather unit. This casing member 10 is provided with a peripheral slot 18 which is formed with the outwardly curved wall portion 19 in the nature of a louver.

The plate member 11 is a flat circular plate having a diameter substantially equal to the outside diameter of the flange 14 on the open end of the casing member 9 and this plate is provided with a plurality of slots 20 and with a relatively small hole 21 adjacent its edge for a purpose to be later set forth.

The valve member 12 which is of relatively thin sheet metal, such as spring steel, is formed with a base portion which may be secured as by rivets 22 to the plate member 11 with a metal washer 23 interposed between each rivet head and the member 12, and with a plurality of upstanding ears 24 which are in the nature of spring reeds and which are slightly larger than the slots 20 in the plate member 11 and biased to normally close such slots.

The filter retaining member 13 is a dished circular plate having a diameter equal to that of the plate member 11. The dished, central portion of this member 13 is provided with the inclined louvers 25 and with a relatively small hole 26 adjacent its offset peripheral edge. The filter element which may consist of a mass of copper mesh or other suitable pervious material 27, is adapted to be located within the casing member 10.

To assemble the breather unit, the circular edge of the member 13 is placed within the offset flange 17 on the casing member 10 with the dished, central portion of this member 13 extending towards and engaging the filter material 27, the plate member 11 is then placed against the member 13 with its circular edge also within the offset flange 17 on the casing member 10 and with its attached valve member 12 on the side towards the member 13, and the flange 14 of the casing member 9 is then placed against the plate

member 11 and the parts secured together, as shown in Figure 2, by crimping or spinning the edge of the flange 17 over this flange 14. Before describing the operation of the breather it should be noted that the parts are so positioned during assembly that when the unit is mounted in the opening 8 in the engine crankcase with the slot 18 at the upper side of the unit, the small holes 16, 21 and 26 will be located at the bottom of the unit.

In the present application of the invention, the crank pin bearing and crankshaft bearing are adapted to be lubricated by a splash system and the hollow connecting rod 5 is provided with an extension to splash the oil in the crankcase and also feed some of this oil through the connecting rod to the piston pin bearing (not shown), and it is preferable to provide a horizontal baffle plate or wall 28 in the crank case below the opening 8 therein for the breather unit to prevent the direct splashing of oil into the openings 15 in the breather casing member 9 which extends into the crankcase.

With the above described construction it will now be apparent that the crankcase gases and vapors may first enter the casing member 9 of the breather unit through the openings 15 and whenever the pressure thereof deflects the spring reeds 24, pass through the slots in the plate member 11 into the space between this member and the filter retaining member 13. From here the gases and vapors may escape to the atmosphere by passing through the louvers 25 in the member 13 which functions as a baffle member and through the filter material 27 to the outlet slot 18 in the casing member 10.

During this movement of the crankcase gases and vapors to the atmosphere it will also be apparent that the relatively small amount of oil which may be present in these vapors will either condense on some of the interior surfaces or be separated from the vapors by the filter material 27, and may be returned to the crankcase through the small holes adjacent the bottom of members 9, 11 and 13. For instance, any oil which collects in the bottom of the casing member 10 may pass through the hole 26 in member 13, and together with any oil which collects in the bottom of the space between member 13 and member 11, then pass through the hole 21 in member 11 into the casing member 9 and together with any oil which has collected therein, be returned to the crankcase through the drain hole 16.

It will also be apparent that whereas the valve member 12 opens only outwardly to provide a relatively large passage to relieve excess pressure in the crankcase, the slot 18, oil drain holes 16 and 21, and louvers 25 provide a relatively restricted open passage from the crankcase to the atmosphere so that on the upward movement of the engine piston and the consequent reduction of the pressure in the crankcase, air will be drawn into the crankcase through this passage together with any crankcase gases and vapors and condensed oil in the breather unit.

As has been noted above, the louvers 25 in the filter retaining member 13 are inclined or diagonally arranged with reference to the horizontal axis of this member, and this member not only prevents the filter material 27 from contacting the valve member 12 but also functions as a baffle member and condenses some of the oil particles in the crankcase vapors. Such oil particles as are condensed on the surface of the filter retaining member 13 will drain downwardly thereon to be returned to the crankcase through the openings 21 and 16. The inclined arrangement of the louvers 25 provides for the downward draining of the condensed oil and reduces the collection of oil particles on the bottom edge of the louvers. If the louvers were horizontally arranged there would be a tendency for the oil to collect on the bottom edges of the louvers and pass through the louvers into the filter chamber. It will therefore be apparent that the filter retaining member 13 and the diagonal arrangement of the louvers 25 serve to reduce the amount of oil which passes to the filter material to be separated thereby from the gases and vapors which escape to the atmosphere through the outlet slot 18.

As shown in Figures 2 and 3, the outlet slot 18 is considerably smaller in area than either the louvers 25, valve slots 20, or openings 15, so that this outlet slot 18 provides more restriction to the escape of crankcase gases and vapors than such other openings. This restriction of the outlet slot 18 has been determined to be an essential feature of the construction since it functions to prevent condensed oil from being forced out to the atmosphere on violent surges such as are caused by the movement of the piston 4. Unless the outlet slot 18 is materially smaller in size than the other passages in the breather unit for the crankcase gases and vapors, it has been found that some oil particles will be expelled through this slot.

Only a single specific embodiment of the invention has been herein shown and described, but it will be understood that the invention is not to be strictly limited thereto and various changes and modifications may be made within the scope of the invention as set forth in the appended claims.

I claim:

1. In a crankcase breather, a casing adapted to communicate with a crankcase adjacent one end of said casing and with the atmosphere adjacent the other end of said casing, a wall intermediate the ends of said casing provided with a one-way pressure operated valve for the passage of crankcase vapors from the crankcase to the atmosphere, filter material in said casing between said valve and the outlet to the atmosphere to remove oil from said vapors, and means interposed between said wall and said filter material to space said material from said valve.

2. In a crankcase breather, a casing adapted to communicate with a crankcase adjacent one end of said casing and with the atmosphere adjacent the other end of said casing, a wall intermediate the ends of said casing provided with a one-way pressure operated valve for the passage of crankcase vapors from the crankcase to the atmosphere, filter material in said casing between said valve and the outlet to the atmosphere to remove oil from said vapors, and a filter retaining plate interposed between said wall and said filter material and louvres in said plate to provide for the passage of crankcase vapors therethrough.

3. In a crankcase breather, a casing adapted to communicate with a crankcase adjacent one end of said casing and with the atmosphere adjacent the other end of said casing, a wall intermediate the ends of said casing provided with a one-way pressure operated valve for the passage of crankcase vapors from the crankcase to the atmosphere, filter material in said casing between said valve and the outlet to the atmosphere to remove oil from said vapors, said wall being provided with an opening adjacent the bottom thereof and said

casing being provided with a drain hole to permit the return of oil from said filter material to the crankcase.

4. In a crankcase breather, a casing adapted to communicate with a crankcase adjacent one end of said casing and with the atmosphere adjacent the other end of said casing, a wall intermediate the ends of said casing provided with a one-way pressure operated valve for the passage of crankcase vapors from the crankcase to the atmosphere, filter material in said casing between said valve and the outlet to the atmosphere to remove oil from said vapors, a filter retaining plate interposed between said wall and said filter material, and relatively small openings in said wall and plate adjacent the bottom thereof with a drain hole in said casing adjacent the end thereof which communicates with the crankcase to permit the return of oil to the crankcase.

5. In a crankcase breather, a casing constituted by two substantially cup-shaped parts to provide a substantially cylindrical casing with closed end walls, peripheral openings in said casing adjacent opposite ends thereof adapted to communicate respectively with a crankcase and the atmosphere, a wall intermediate the ends of said casing and clamped between the two parts thereof, and an opening in said wall with a spring reed secured to said wall and normally closing said opening.

6. In a crankcase breather, a casing constituted by two substantially cup-shaped parts to provide a substantially cylindrical casing with closed end walls, peripheral openings in said casing adjacent opposite ends thereof adapted to communicate respectively with a crankcase and the atmosphere, a wall intermediate the ends of said casing and provided with an opening with a spring reed secured to said wall and normally closing said opening, filter material in said casing between said wall and the outlet to the atmosphere, and a filter retaining member interposed between said wall and said filter material and provided with louvres, said wall and said filter retaining member being clamped between the two parts of the casing.

7. The elements set forth in claim 6, with relatively small openings in said wall and filter retaining member adjacent the bottom thereof and a bottom drain hole in said casing to permit the return of oil from said filter material to the crankcase.

8. In a crankcase breather, a casing adapted to communicate with a crankcase adjacent one end of said casing and with the atmosphere adjacent the other end of said casing, a wall intermediate the ends of said casing provided with a one-way pressure operated valve for the passage of crankcase vapors from the crankcase to the atmosphere, filter material in said casing between said valve and the outlet to the atmosphere, a filter retaining plate interposed between said wall and said filter material and louvers in said plate, said louvers being diagonally arranged with reference to the horizontal axis of said plate.

WILBUR L. CARLSON.