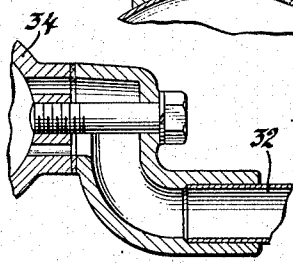
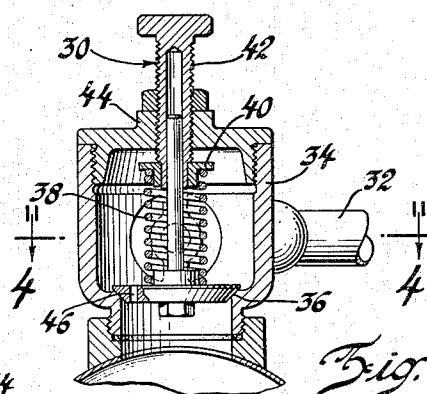
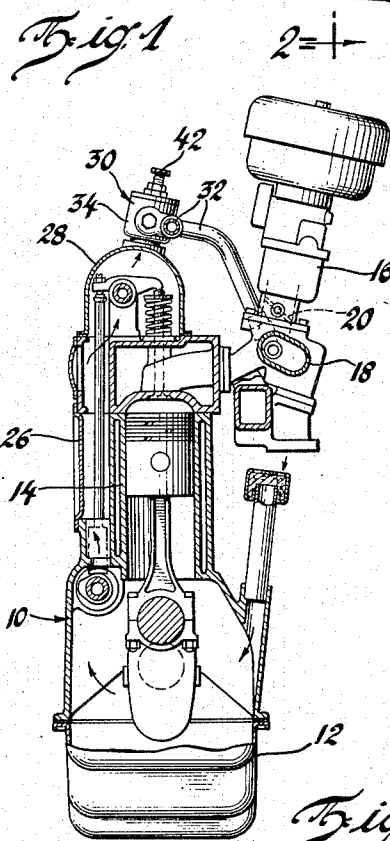
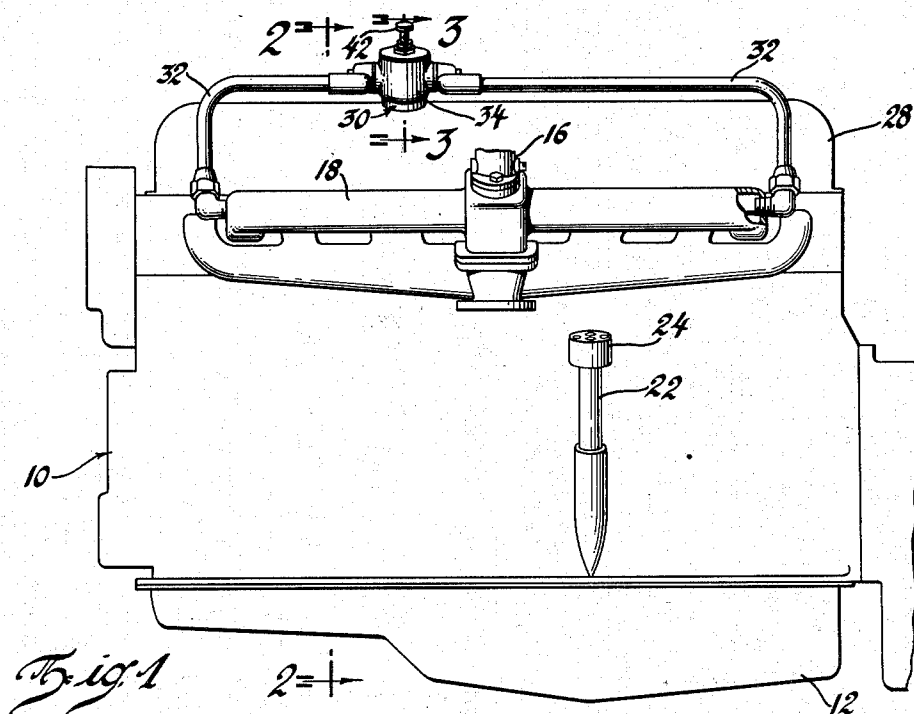


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G. F. RODDEWIG
CRANKCASE VENTILATION
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Inventor
Gil F. Roddewig
Blackman, Spencer & Flint
Attorneys

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CRANKCASE VENTILATION

Gilbert F. Roddewig, Pontiac, Mich., assignor to
Yellow Truck & Coach Manufacturing Com-
pany, Pontiac, Mich., a corporation of Maine

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4 Claims. (Cl. 123—119)

This invention has to do with internal combustion engines of the type in which the crankcase serves as a lubricant reservoir.

It is well-known that it is desirable to continually pass a stream of air through the crankcase during operation of the engine to remove diluents such as water and other combustion products as well as unburnt fuel, which leak past the piston rings. The amount of dilution is increased when the engine is operating under conditions unfavorable for combustion and this is especially the case when the car is rapidly decelerated and the engine operates as a brake. At such times the driver's foot is off the throttle and the throttle is practically closed so that the supply of fuel mixture is greatly cut down but the engine speed in the early stages of deceleration remains high so the vacuum in the manifold is considerably above normal. A fairly rich mixture is usually provided under such conditions to prevent stalling of the engine. Where the engine is operated for considerable periods under such conditions, as in the case of city bus service, the oil in the crankcase is rapidly diluted and some of the diluents accumulate in the form of a thick sludge in the crankcase which interferes with lubrication and makes it necessary to clean the crankcase at frequent intervals. The resulting poor lubrication also causes a substantial increase in engine wear especially on cylinder walls and pistons.

I have succeeded in devising a very simple system of crankcase ventilation which overcomes all of the above disadvantages and makes it possible to operate engines under the most severe conditions without objectionable dilution of the lubricating oil and without accumulation of sludge in the crankcase. Engines equipped with my system have been taken down and examined after as much as twenty thousand miles of severe service in which frequent stops have been made and the crankcases have been found to be clean and free from sludge and the combustion chambers have been found to be clean and substantially free from accumulations of the by-products of combustion. Furthermore, the oil has been found to be free from serious deterioration by dilution.

According to my invention the crankcase is provided with the usual air inlet, preferably provided with an air cleaner in accordance with the usual practice, and with an air outlet connected by a suitable conduit to the engine intake manifold. In the conduit is provided a spring-closed valve adjusted so that it will open when

the depression in the manifold is increased above normal by rapid deceleration as described, thereby admitting air, vapors and gases from the crankcase, diluting the mixture going to the cylinders and insuring substantially complete combustion. To provide for ventilation of the crankcase under normal operating conditions I have provided a by-pass which preferably takes the form of a small opening drilled through the valve permitting flow of a small stream of air through the crankcase into the manifold under all conditions.

The new system is very simple and inexpensive and may be readily installed on existing engines. Further details of the invention are disclosed in the following specification.

In the drawing:

Figure 1 is a side elevation of an internal combustion engine provided with my improved ventilating system.

Figure 2 is a vertical section through the engine on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1.

Figure 4 is a section on line 4—4 of Figure 3.

10 indicates an internal combustion engine having crankcase 12 and cylinders 14 supplied with combustible mixture from carburetor 16 through intake manifold 18. The supply of mixture to the manifold is controlled by the usual throttle valve 20 operated by the driver. The crankcase 12 is provided with air inlet 22 which may be equipped with air cleaner 24 as shown. Air admitted to the crankcase through the inlet 22 traverses the crankcase and passes upwardly along the valve push rods through passages indicated at 26, into the overhead valve chamber 28, and from there past ventilator control valve 30 through conduits 32 into the ends of the intake manifold, as shown in Figure 1.

The ventilator control valve 30 is housed in a casing 34 provided with a valve seat 36 to which the valve is yieldingly pressed by spring 38, the other end of which bears against collar 40 carried by adjusting screw 42 threaded in closure 44 of valve housing 34. The adjusting screw 42 is bored out to provide a guide in which the stem of ventilator control valve 30 is slidable. It will be apparent that by adjusting the screw 42 the spring 38 may be adjusted to exert the desired degree of seating pressure on the valve 30. Conduits 32 are secured in any suitable manner to the housing 34 beyond the valve 30 and its seat 36 and are connected in any suitable manner to the intake manifold beyond the throttle valve 20. Obviously, in some installations one conduit

32 may be sufficient. With the engine illustrated the two conduits connected to the ends of the manifold as shown have proven preferable because in this way ventilation is obtained with a minimum interference with the distribution of gaseous mixture from the manifold to the cylinders.

It is important to note the aperture 46 drilled in the head of ventilator control valve 30. In the case of the bus engine, here illustrated, the opening is about one-eighth of an inch in diameter.

The arrangement operates as follows:

During normal operation of the engine, ventilator control valve 30 is closed but the hole 46 serves as a by-pass to permit a small amount of air to flow through the crankcase into the intake manifold. A flow of from 1½ to 2 cubic feet per minute has been found to be sufficient in this particular engine to take care of gases blowing by the piston without interfering with idling of the engine. To insure against any such interferences under all conditions it will usually be found desirable to adjust the closed position of the throttle valve 20 to give sufficient mixture to insure a somewhat higher idling speed.

The ventilator control valve 30 remains closed under all ordinary operating conditions except when the driver takes his foot off the throttle and the engine operates as a brake to help bring the car to a stop. The amount of depression in the manifold is then high compared with that obtained under normal idling or running conditions and the tension of spring 38 is so adjusted that when this degree of depression exists in the manifold the ventilator control valve 30 opens and as long as this condition of abnormal vacuum continues a considerable stream of air passes through the crankcase and past the valve into the intake manifold. Thus with the engine illustrated, 12 cubic feet of crankcase air a minute is admitted to the manifold when coasting under the described conditions with the engine turning over at 2,000 R. P. M.

With this arrangement it has been found that after many thousands of miles of operation practically no sludge has accumulated in the crankcase even in the case of city busses which are subject to very frequent stops. Furthermore, owing to more complete combustion there is less accumulation of combustion products in the combustion chamber. The condition of the lubricating oil is also much improved since it is maintained substantially free of diluents as well as sludge so that the wear of the engine parts is

much less because of better lubrication. This reduction in wear especially on the cylinder walls is quite appreciable and results in material increase in the life of the engine.

I claim:

1. The combination of an internal combustion engine having a crankcase serving as a lubricant reservoir and an intake through which combustible mixture is supplied to the engine, a throttle valve controlling flow of mixture into said intake, an air inlet for said crankcase, an air outlet for said crankcase discharging into the intake, a valve in said outlet opening in the direction of air flow to the intake, means for yieldingly holding the valve on its seat, said means being so adjusted that the valve is closed under ordinary operating conditions and opens only when subjected to abnormally high suction obtaining when the throttle is rapidly closed to effect rapid deceleration.

2. In the combination as defined in claim 1, said valve having an aperture therein permitting a slight flow of air past the valve into the intake at all times.

3. The combination of an internal combustion engine having a crankcase serving as a lubricant reservoir and an intake through which combustible mixture is supplied to the engine, a throttle valve controlling flow of the mixture into said intake, an air inlet for said crankcase, an air outlet for said crankcase discharging into the intake, means substantially closing said outlet under normal operating conditions, and means for opening said closing means, said last-named means being effective only when the intake suction is at the abnormally high value produced by rapid closing of the throttle.

4. The combination of an internal combustion engine having a crankcase serving as a lubricant reservoir and an intake through which combustible mixture is supplied to the engine, a throttle valve controlling flow of the mixture into said intake, an air inlet for said crankcase, an air outlet for said crankcase discharging into the intake, means substantially closing said outlet under normal operating conditions, means for opening said closing means, said last-named means being effective only when the intake suction is at the abnormally high value produced by rapid closing of the throttle, and a bypass about said closing means to permit flow of a small amount of air from the crankcase to the intake at all times.

GIL F. RODDEWIG.