Jan. 16, 1934. R. L. JONES 1,943,765

CRANK CASE BREATHER

Filed March 22, 1930

FIG. 1.

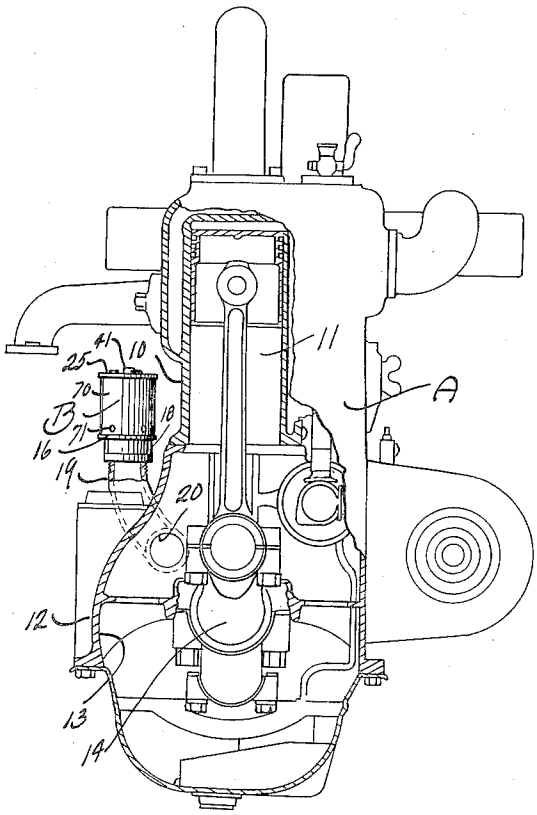


FIG. 2.

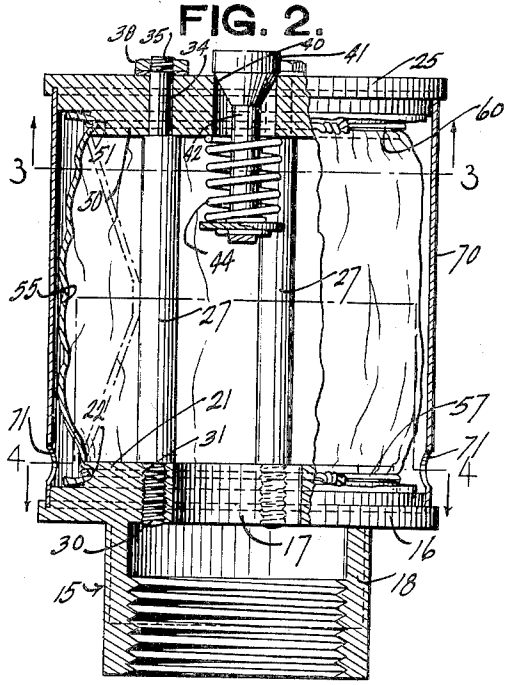


FIG. 3.

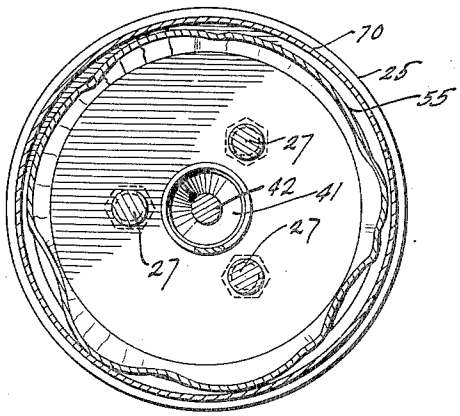
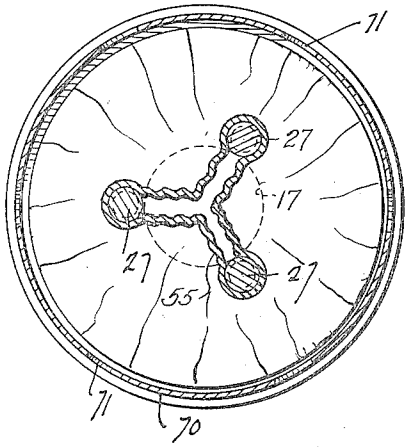


FIG. 4.



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Patented Jan. 16, 1934 1,943,765

UNITED STATES PATENT OFFICE

1,943,765

CRANK CASE BREATHER

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Application March 22, 1930. Serial No. 438,186

2 Claims. (Cl. 121—194)

This invention relates to improved means for permitting the free breather action in the crank case chamber of an internal combustion engine, as an incident of normal engine operation, and preventing the introduction of atmospheric air to the internal combustion engine and consequently preventing the introduction of foreign substances to the crank case chamber.

A further object of this invention is the provision of an improved device for use upon internal combustion engines which will permit a breather action to take place in the crank case chamber as an incident of normal engine operation without admitting any outside air; the improved device embodying means to prevent air pressures from building up in the crank case chamber and to prevent the formation of a vacuum therein.

A further object of this invention is the provision of an improved diaphragm device upon the crank case chambers of piston operated engines which has a compensatory action upon the volumetric air capacity of the crank case chamber which will permit the normal breather displacement without admitting any air from externally of the crank case chamber under normal operating conditions.

A further object of this invention is the provision of improved means for permitting pressures in the crank case chamber of an internal combustion engine to release therefrom without admission of air or foreign particles from externally of the engine.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawing, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views.

Figure 1 is a vertical sectional view taken through an internal combustion engine of a conventional type, showing the improved crank case breather device in associated relation therewith.

Figure 2 is an enlarged vertical sectional view taken through a preferred form of the invention.

Figures 3 and 4 are sectional views taken substantially on their respective lines in Figure 2 of the drawing. Figure 4 shows a diaphragm, forming part of the construction, drawn in against a plurality of supports.

In the drawing, wherein for the purpose of illustration is shown only a preferred embodiment of the invention, the letter A may generally designate an internal combustion engine, or any engine of the piston operated type wherein it is necessary to keep the crank case chamber free of foreign substances; the improved engine having the breather device B associated in an improved relation therewith.

The engine A may, of course, include the cylinders 10 having pistons 11 operating therein in the usual relation. A crank case 12 is provided having a chamber 13 wherein the usual supply of lubricant is disposed in a relation which will permit the same to pass in any approved relation to the bearings of a crank shaft 14 which is operatively connected in the usual or any approved relation with the pistons 11.

It is a matter of common knowledge that during engine operation there is a slight intake and exhaust of air with respect to the crank case chamber, occasioned by the volumetric displacement of air incident to piston operation. This displacement during piston operation may be said to be substantially constant, and for conventional engines the displacement is not very considerable, although it is necessary to provide some breather means to permit the displacement without building up pressures in the crank case chamber or creating a vacuum therein. In the usual engine the air intakes from the atmosphere freely, and of course dirt and other foreign materials enter the crank case chamber. In the case of industrial and agricultural engines, the introduction of foreign substances into the crank case chamber and bearings results in quick depreciation of the motor. Some attempts have been made to remedy the condition, and it is usual to place steel or bronze wool or some other air filtering material in the breather conduit or opening. Such expedients, however, actually restrict the breather action, resulting in the building up of partial vacuums in the crank case; the air entering usually around a crank shaft bearing, and very often drawing foreign substances into the bearings and resulting in their destruction or depreciation. I propose to prevent the intake of any air to the crank case during engine operation, therefore definitely eliminating the possibility of dirt entering the motor, and this without the building up of any pressures or partial vacuums in the engine crank case chamber. I do this by generally providing a substantially impervious flexible device in the nature of a diaphragm sealed across a suitable conduit, opening, or passageway to the crank

case chamber, which has a sufficient compensatory action to equal the maximum crank case chamber air volume breather displacement incident to normal engine operation. In combination with it I provide an improved check valve device upon the crank case to vent the pressures from the crank case chamber which are apt to build up therein as a result of loss of compression from the engine cylinders into the crank case chamber.

These devices are incorporated in a unitary structure, although this need not necessarily be true. The adapter for carrying both the diaphragm pouch and check venting valve preferably consists of a supporting frame 15 consisting of a metal rink-like disc 16 having a passageway 17 therethrough and extending from one face thereof having a concentric internally screw threaded neck 18 adapted to be threaded upon the externally screw threaded end of a breather conduit 19, as shown in Figure 1; the latter being provided with an opening 20 in the crank case chamber 13. The disc or support 16 is provided with a reduced extension 21 on the opposite side thereof from the connection 18, provided with an annular groove 22 thereabout.

The frame 15 also includes a top disc or support 25, supported in spaced parallel relation with the support 16 and connected with the latter by means of rods or standards 27, preferably three in number; the lower ends of which are provided with reduced screw threaded shanks 30 for detachable connection in suitable screw threaded openings 31 provided through the support 16. The rods 27 extend normal to the plane of the supporting disc 16, and at their upper ends are provided with reduced shanks 34 removably extending thru suitable openings in the upper disc or support 25; the extreme ends of the reduced shanks 34 being screw threaded at 35 and receiving nuts 38 to clamp the disc 25 in place upon the rods 27, as shown in Figure 2 of the drawing, in a relation that is quite apparent.

The supporting disc 25 is provided with a central opening 40 therethrough, wherein a check valve 41 operates; the same having a tapered head seating in the outer end of the passageway 40 and having a reduced stem 42 extending axially into the space between the supports 16 and 25, and supporting a spring 44 connected with the lower end of the stem 42, and held thereby in compression against the under surface of the supporting disc 25; said spring normally urging the valve 41 closed in the opening 40, as shown in Figure 2.

The upper supporting disc 25 is provided with a reduced portion 50 facing the disc 16, which is annularly grooved at 51.

A flexible diaphragm-like pouch 55, in the form of a flexible tube, is loosely connected at opposite ends upon the discs 16 and 25 to enclose the space therebetween. The tube-like diaphragm 55 is preferably seamless, and the lower end thereof is secured upon the reduced portion 21 of the lower disc 16 by means of an annular clamp 57, preferably a wire forcing the lower end of the tube 55 into the groove 22 and thus sealing the lower end of the diaphragm-like pouch 55. The upper end of the pouch 55 is similarly connected by a clamping wire or other similar clamp 60 in the groove 51 of the support 25. Thus, the upper and lower ends of the pouch 55 are suitably sealed and held in place upon the discs 16 and 25. The pouch 55 hangs loosely between the discs 16 and 25, and may freely inflate as shown in full lines in Figures 2 and 3 and deflate as shown in dot and dash lines in Figure 2 and full lines in Figure 4. It has a compensatory expansion which is equal to the maximum crank case chamber air volume breather displacement and alternately inflates and deflates as an incident of engine operation.

In the normal application the internally screw threaded neck 18 is of course applied upon the breather conduit 19. The latter may be either the breather conduit, as mentioned, or it may be the oil filler conduit; it being only necessary to remove the unit B to fill the crank case with lubricant. During normal engine operation the flexible diaphragm-like pouch 55 inflates and deflates to compensate for the air breather action in the crank case chamber, without actually admitting any air whatsoever from externally of the engine. The material of the diaphragm 55 is preferably substantially impervious to passage of air. In fact, for the purposes of this invention it is preferred that it be entirely impervious. However, for economical reasons I prefer to use chamois, rubber, composition fabric, or any other material having the necessary degree of flexibility, expansibility and the necessary imperviousness to permit of the inflation and deflation action. The device 55 does not act as an air filter during the breather action, but absolutely prevents the transmission of any atmospheric air from externally of the engine into the crank case, and without building up pressures or creating partial vacuums in the crank case, inasmuch as the pouch or diaphragm 55 has a displacement equal to the breather displacement. The action of the spring 44 in closing the check valve 41 is such that the so-called "blow-by" or loss of compression from the cylinders past the pistons into the crank case chamber is permitted to vent through the opening 40, without building any considerable pressures in the crank case chamber.

For practical reasons I deem it necessary to cooperatively associate the venting check valve and diaphragm device inasmuch as it is important in carrying out the objects of my invention to neither allow pressure to build up in the crank case nor allow a vacuum to exist therein, and this without admitting any atmospheric air or foreign materials from externally of the engine during operation of the latter.

As a reinforcing expedient for the improved unit B, and as a guard and stop for the diaphragm-like pouch 55, I propose to provide a relatively thin rigid cylindrical wall 70, secured at the upper and lower ends thereof in suitable annular sockets provided in facing relation in the supporting discs 16 and 25, as shown in Figure 2 of the drawing; the marginal ends of the wall 70 being seated in these sockets by the clamping action of the rods 27 in the position shown in Figure 2. This wall 70 encloses the pouch 55, but does not interfere with either its inflation or deflation in compensating for breather action, since it is provided with suitable ports 71 of any approved number and size which will quickly permit passage of air between the pouch and wall 70 without causing any restriction in the breather action of the engine. The wall 70 as well as the rods 27 provide stops to the movement of the pouch 55. The rods 27 prevent collapsing of the diaphragm to such an extent that the opposite walls thereof will touch and adhere

to one another as happens at times to oil soaked diaphragms. The wall 70 of course limits the inflation of the diaphragm and aids in causing the check valve to function, for the diaphragm cannot inflate to an extent which might cause non-action of the check valve when the latter should function. It is quite apparent that the parts may be quickly disassembled or assembled to remove or replace the pouch 55.

In using chamois for the diaphragm or pouch, while as above mentioned such material is not entirely impervious to passage of air, yet for the purposes of this invention it is really impervious inasmuch as the displacement of the flexible diaphragm is equivalent to the maximum breather displacement. Of course, the diaphragm when made of chamois becomes oil soaked and substantially impervious to passage of air.

Various changes in the shape, size and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. In a unit of the class described, a flexible hollow diaphragm structure, a frame including an upper support and a lower support, one of said supports having a passageway therethrough, means attaching an end of said diaphragm structure to the upper support and means attaching the opposite end of said diaphragm structure to the lower support, and means spacing apart said supports and limiting movement of the walls of said diaphragm toward and away from each other.

2. In a unit of the class described, a flexible hollow diaphragm structure, a frame including an upper support and a lower support, one of said supports having a passageway therethrough, means attaching an end of said diaphragm structure to the upper support, means attaching the opposite end of said diaphragm structure to the lower support, and means spacing apart said supports and limiting movement of the walls of said diaphragm structure toward each other.

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