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PURIFIER AND OIL SEPARATING APPARATUS

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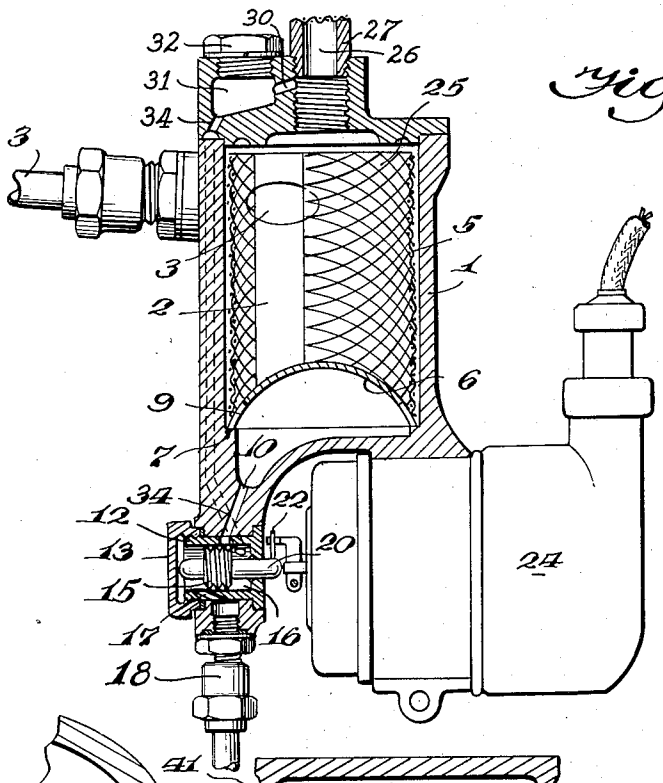


Fig. 1

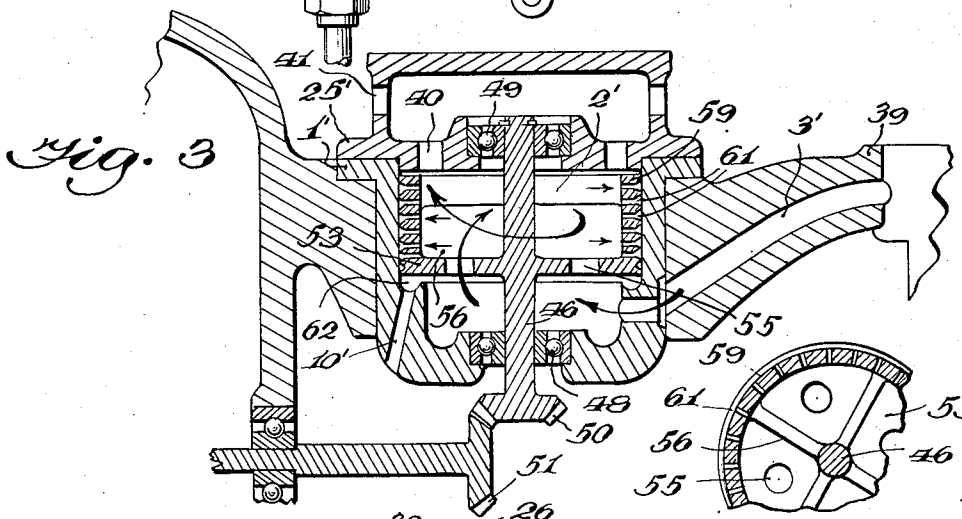


Fig. 3

Fig. 4

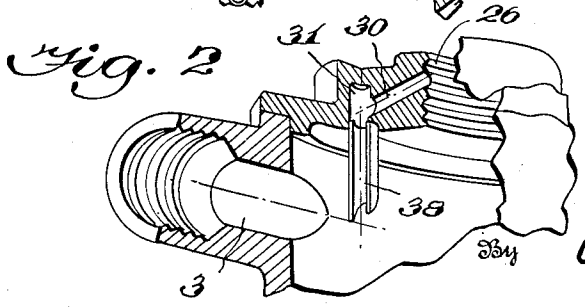


Fig. 2

Inventor
C. R. Waseige,
By Albert Coleombe
Attorney

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PURIFIER AND OIL SEPARATING APPARATUS

Charles Raymond Waseige, Rueil, France; vested in the Alien Property Custodian

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3 Claims. (Cl. 183—63)

This invention relates to a purifier and oil separating apparatus arranged to be inserted in a gas circuit with the object of separating therefrom the liquid particles of oil or the like carried thereby.

Said invention more particularly relates to a purifier of the kind comprising a cylindrical chamber in which the air or other gas to be purified is imparted a whirling motion so that the oil particles settle on the walls of said chamber, flow down said walls and are then discharged by means of a channel connected with the lower part of said chamber, while the air escapes through an outlet provided at the upper part of said chamber.

In apparatus of this kind as hitherto in use, the oil discharge channel connects directly, eventually through a valve, with the inner chamber of the purifier. This arrangement, though not impairing the operation when the pressure in this discharge channel is substantially lower than that obtaining in said chamber, is however disadvantageous when the oil is to be discharged into a sump or reservoir the pressure in which is practically the same as or even greater than that obtaining in the purifier. In this case, the discharge of oil will not be properly effected, and the back-pressure in the discharge channel impairs the operation of the apparatus as a whole and impedes the flow of the oil.

One object of this invention is to provide a purifying and oil separating apparatus of the aforementioned type, which is able to operate properly even when the oil is to be discharged into a sump or reservoir the pressure in which is equal to or higher than that of the gas to be purified. Another object is to provide a purifier more particularly though not solely adapted to be used in plants on board of aircraft in which the separated oil is to be returned to the crank case of the engine or to a sump or reservoir connected with said crank case; a still further object is to provide a purifier of the aforesaid kind which may conveniently form the connection between the crank case of an engine and the open air so as to act as a breather.

In accordance with an important feature of the invention, the connection between the inner chamber of the purifier and the oil discharge channel is effected through a separating device or extractor. In a preferred embodiment, this extractor is in the form of a cylindrical body the outer side wall of which is provided with a spiral groove and is fitted to turn in a cylinder.

This extractor acts as a pump and effects the positive discharge of the separated oil by forcibly driving the same into the discharge channel, even when acting against a substantial back-pressure.

In another embodiment, the said cylindrical body is hollow and its side wall is provided with ducts opening into said groove, the oil to be discharged being delivered into said body. The oil is thus centrifugally driven through said ducts. This centrifugal separator or extractor may also serve as a purifier if, according to another feature of the invention, the gases to be purified are so delivered into said cylindrical body that they circulate therethrough, the oil particles in suspension thus being centrifugally separated in the cylindrical body itself and thrown upon its peripherical wall from which they are discharged by said ducts.

The purifier according to this embodiment may be constructed as an independent assembly driven by a prime mover—electric or otherwise—or the aforesaid rotor in accordance to a preferred embodiment may be arranged in the crank case of a combustion engine and driven by a driving connection from the engine shaft.

Another object of the invention is to remove as completely as possible the oil particles that may settle upon the walls of the outlet of the purifier, which outlet may be conveniently provided with an inner screw thread the pitch of which is in the opposite direction to that of the whirl formed by the air in the purifier.

In view of this object, in accordance with an important feature of this invention, also usable independently of the features above described, the wall of the aforesaid outlet is provided with a tangential passage turned in the same direction as the whirling motion and opening into a small chamber from which the oil is discharged by a conduit connected with a suction means.

In a convenient embodiment the discharge conduit of the aforesaid small chamber is connected to the oil extractor already mentioned.

The oil contained in the small chamber is thus sucked by the aforesaid extractor acting as a pump or the like and is discharged together with the oil that has been separated in the body of the purifier.

Other objects and features of the invention will be apparent from the following description given with reference to the annexed drawing and more particularly pointed out in the claims.

In the drawing are shown only by way of examples:

Fig. 1, a sectional elevation of a purifier according to an embodiment of this invention;

Fig. 2, a fragmentary perspective view of a modification;

Fig. 3, a sectional elevation of a purifier according to another embodiment, acting as breather for a combustion engine;

Fig. 4, a fragmentary plan view of the rotor of the purifier shown in Fig. 3.

According to the embodiment shown in Fig. 1, the purifier comprises a vertically arranged hollow body 1 having inside a cylindrical chamber 2 into which tangentially opens an inlet passage 3 for the air or other gas to be purified, said passage slightly slanting downwards. The inner wall of chamber 2 is faced with a wire gauze or sieve 5 carried by a dome 6 which rests upon an upwardly facing shoulder 7 carried by the lower part of said chamber, said dome 6 being provided with peripherical gaps 9. Below the shoulder 7 the chamber 2 is funnel-like and leads to a discharging duct 10. The latter opens into a cylindrical sleeve 12 carried by the body 1 and closed by a cap 13. The sleeve 12 serves as a casing for a worm 15, a space 16 being provided between the end of the threaded part of said worm and the bottom of said casing. The duct 10 and a passage 17 leading to a drain-off conduit 18 respectively open into the casing on opposite sides of said threaded part. The worm 15 is mounted on a spindle 20 mounted in a bearing and projecting outwardly. Said spindle 20 is provided with a catch pin 22 for coupling same with the shaft of an electric motor 24 so that said spindle may be rotatingly driven thereby. Thus the cylinder 12 and the worm 15 rotating therein forms a positive extractor for the oil, since the oil is forced by the worm 15 into the drain conduit 18.

The chamber 2 is closed at its upper part by a cover 25 having centrally a cylindrical outlet 26 through which the purified air is to be discharged, said outlet being surmounted by a cap 27 provided with a wire gauze. The outlet 26 is provided with an inner screw-thread the pitch of which is in an opposite direction to the whirling motion imparted to the air entering through the passage 3. A slanting duct 30, opening tangentially into the outlet 26, connects the latter with a chamber 31 formed in the cover 25, said chamber being closed by a plug 32. The bottom of this chamber 31 inclines towards an outlet passage 34 leading to the aforesaid space 16 at the right end of worm 15 (as shown in Fig. 1) in casing 12.

The air or the like entering into the chamber 2 through the passage 3 causes a downward whirling flow along the cylindrical wall of said chamber, and the particles of oil carried in suspension are retained by the wire gauze 5 and flow upon the dome 6, being then directed through the holes 9 and the passage 18 to the casing 12, from which they are removed by the worm 15 driven by the motor 24, so that they are forcibly driven into the conduit 18 even if a back pressure obtains in said conduit, as is the case, for example, when said conduit leads to the crank case of a combustion engine to the breather tube of which the passage 3 may be connected,

The purified air escapes through the outlet 26. The oil particles which may still be carried in suspension therein settle on the wall of said outlet and return to the chamber 2 by flowing along the thread of said outlet. The last particles flow through the duct 30 into the small chamber 31 from which they are drawn off, by the relative vacuum or suction caused by the extracting pump consisting of the worm 15 and the casing 12, through the passage 34, into said casing, to be directed therefrom by conduit 18.

In the modification shown in Fig. 2, the channel 30 opens into a small chamber 31. A Pitot tube 38 arranged vertically and opening opposite to the gas inlet 3 assures the discharge from said chamber 31 and produces therein a slight suction.

Figs. 3 and 4 relate to a purifier the body 1' of which is secured in the crank case 39 of a combustion engine and has a cylindrical chamber 2' closed by a cover 25' provided with holes 40—41. This body contains an oil extractor in the form of a rotor integrally connected with a spindle 46 mounted in ball bearings 48, 49 carried respectively by the body 1' and the cover 25'. The lower end of said spindle is integrally connected with a pinion gear 50 engaging with a pinion gear 51 driven from the engine shaft. The rotor is in the shape of a cup. The bottom 53 thereof is provided with holes 55 and webs 56 are provided between the spindle 46 and the annular wall 59 of said rotor. The latter is provided with radial holes extending throughout its annular wall 59 and its outer surface is provided with a spiral rib 61 substantially engaging with the cylindrical inner wall of the chamber 2' of the purifier. The rib 61 is a screw-thread the pitch of which is such that the rotation of the rotor forces oil downwardly. Opposite to the peripherical rim of the bottom 53 is an annular groove 62 connecting through a channel 10' with the inside of the crank case. A channel 3' opens into the lower part of the chamber 2' and delivers air charged with oil particles. This air is admitted by the holes 55 in the rotor, by which it is centrifugally separated. The oil particles flow through the holes of the wall 59 into the spaces between the rib portions and is driven by the web portions into the groove 62, from which it falls back into the crank case through the channel 10'. The purified air is discharged through the holes 40, 41.

The invention obviously is in nowise limited to the embodiments shown and described by way of examples. Thus particularly the purifier according to Figs. 3 and 4 may be constructed in the form of an independent assembly and driven by an electrical or other motor.

What I claim is:

1. A purifier and oil separating device for compressed air and other gases including a cylinder, a hollow cylindrical body having radial perforations on its side walls and provided with a spiral groove in the external face of its wall and rotatably fitted within said cylinder, oil discharge means from said cylinder, said hollow body having a perforated bottom, means for supplying the gas to be purified into said hollow body through said perforated bottom, and means for rotating said hollow body.

2. A purifier of the type described including a reservoir, a cylindrical chamber, an inlet conduit for the material to be treated, outlet conduits and a discharge conduit into the reservoir, a rotatable cup shaped member having inlet orifices in the bottom and perforations in the side walls thereof journaled within the chamber, the material to be treated entering said member through the orifices in the bottom thereof and through centrifugal action being separated therein, the separated material passing through the perforations in the side walls, and an exter-

nal spiral rib on the cup shaped member having a downward pitch for forcing the separated material through the discharge conduit and into the reservoir.

3. A purifier and oil separating device for gases comprising a cylindrical separation chamber, an inlet thereto, a discharge conduit therefrom, a rotary cylinder with a foraminous side wall arranged for rotation within said chamber and a spiral rib on the outside of the cylinder adapted to advance the oil passing through the cylinder toward the discharge conduit.

CHARLES RAYMOND WASEIGE.