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AIR CLEANER WATER EXTRACTION DEVICE

Filed Aug. 27, 1965

FIG. 1

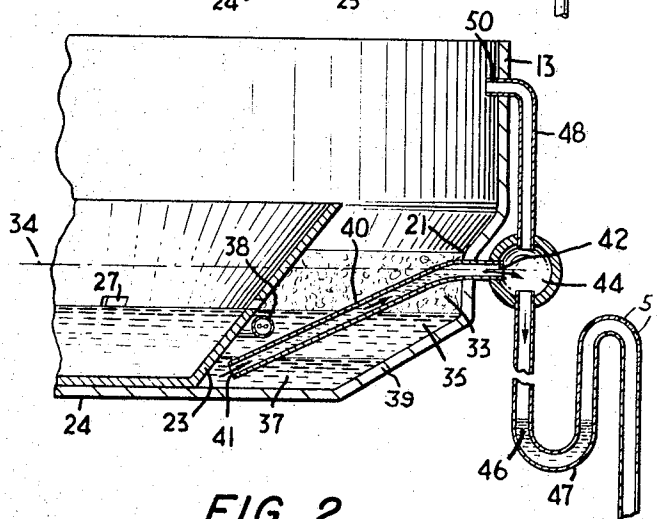
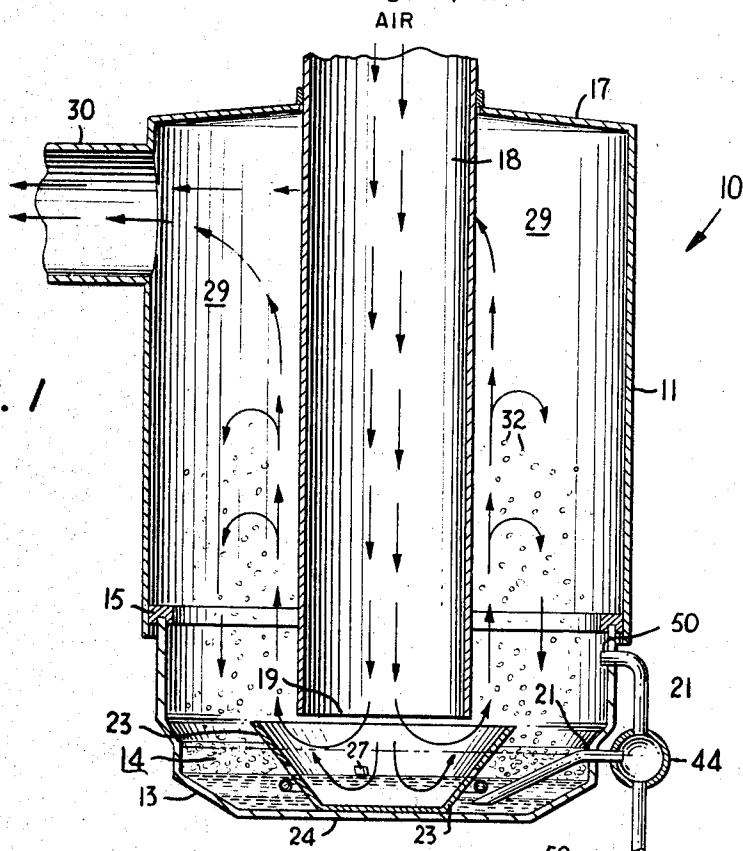


FIG. 2

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AIR CLEANER WATER EXTRACTION DEVICE
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4 Claims. (Cl. 252—362)

ABSTRACT OF THE DISCLOSURE

This is an improvement in air cleaners for internal combustion engines of the type having an oil bath for removing dirt and the like in the bottom of a casing and having an air inlet conduit extending downwardly in the casing and having an open lower end spaced above the oil level, an air outlet passage in the casing for supplying air to the internal combustion engine and a tube extending down into the bottom of the casing for draining off any water which accumulates below the level of the oil in the casing and extending upwardly above the level of the oil and then downwardly through a header by means of which siphoning action can be broken to prevent siphoning of oil as well as water from the casing and for equalizing the pressure in the drain tube, the portion of the casing containing the oil bath in the preferred form of the invention being provided with a heating element for melting ice which may accumulate in the air cleaner.

This invention relates to air cleaners for internal combustion engines, compressors, and other air consuming devices, and more particularly, to air cleaners of the variety employing an oil bath.

Air cleaners with an oil bath prevent foreign particles, such as dust, from being drawn into the air consuming device itself. When employed with internal combustion engines, it has been found that engine performance and efficiency may be reduced in inclement weather when rain, snow, or hail is drawn into the air cleaner. Under such conditions, water may collect in the oil bath thereby raising its level until the oil or an emulsion of oil and water may be drawn up into the engine together with the abrasive road dust, grease, and grit contained therein. Another related problem with oil bath air cleaners is that under freezing conditions ice may collect or form in the air cleaner in a sufficient amount to clog the air intake tube and stall the engine or prevent starting after previous normal operation, requiring the cleaner to be removed and dismantled to clean the ice from it.

In accordance with the present invention, an oil bath type air cleaner has an oil bath, suitable air intake, discharge conduits leading to and from the bath, and means for separating and removing ice, snow, and water from the oil in the bath.

More particularly, air cleaners embodying the invention have a heating element disposed within an oil bath reservoir in the air cleaner, adapted to heat and break any emulsion of oil and water, melt ice or snow collecting in the reservoir and cause the water to separate from the oil and collect in the bottom of the reservoir from which it can be discharged through a water dip or drain tube. The dip tube is arranged so that when the water collects in the bottom of the reservoir and raises the water-oil level in the reservoir sufficiently, the resulting hydraulic pressure causes the water to be discharged from the bottom of the reservoir into a header.

The header may include a waste or discharge tube located at its bottom end which has an S-shaped section or trap and another tube member connecting the header to the air cleaner at some convenient point above the top level of the reservoir. The last-mentioned tube prevents

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reduced pressure within the air cleaner from interfering with the hydraulic pressure head acting upon the water within the dip tube. Means is also provided for preventing reverse air flow through the dip tube which would interfere with its action in discharging excess water from the bottom of the reservoir.

The following are among the desirable features which may be obtained by employment of the invention: (a) engine operating efficiency is maintained in inclement weather, (b) engine maintenance and wear are reduced, (c) replenishment of the air cleaner oil is reduced, and (d) maintenance of the air cleaner is considerably reduced.

For a better understanding of the present invention, reference may be made to the accompanying drawings, in which:

FIGURE 1 is a side elevational view in section showing a preferred form of the invention incorporated in an oil bath air cleaner; and

FIGURE 2 is a large sectional view, with some parts broken away, of the bottom section shown in FIGURE 1.

The air cleaner 10 illustrated in FIGURES 1 and 2 includes a vertically disposed, generally cylindrical casing 11 that is closed at its top by a cover 17, secured to the cylindrical casing 11, and at its bottom by a downwardly detachable cup-shaped bottom section 13, which provides a reservoir 14 for a body of liquid, usually engine oil. The section 13 is telescopically mounted within the lower end of the cylindrical casing 11 and is embedded within a resilient gasket element 15 which in turn is fixed to the casing 11. It will be understood that any suitable anchoring means may be employed for detachably securing the section 13 in its shown operative position.

Leading axially downwardly through the cover 17 of the casing 11 is a tubular air intake conduit member 18, which has its lower discharge end 19, disposed within an area defined by the section 13, but spaced above the top level 20 of the reservoir which arbitrarily may be considered to be defined by the bend 21 in the bottom section 13. The discharge end 19 of the intake conduit 18 is centrally located within the air cleaner 10 and disposed above an inner oil cup member 23, which is rigidly fixed by, for example, welding to the bottom surface 24 of the section 13. The inner cup member 23 is provided with holes or ports 27 which permit the oil to pass from the area defined within the inner cup 23 to the other portions of the reservoir 14.

Air from the intake conduit 18 is drawn downwardly against the surface of the oil bath in the reservoir 14 and then upwardly through the annular passage 29, defined between the intake conduit 18 and the cylindrical casing 11, to an exit conduit 30 fixed within the top portion of the casing 11 just below the cover 17, and which is adapted to be connected to an air consuming device, for example, an internal combustion engine. During dry weather conditions, any oil droplets 32 drawn upwardly along with the air from the conduit 18 generally, as shown, fall or drain back down through the annular passage 29 to the reservoir 14 and do not pass into the exit conduit 30. Baffle elements may be provided, as will be understood to those skilled in the art, to aid in the removal of oil from an upwardly moving air stream to the exit conduit. Moreover, various screening devices may also be used to intercept the oil carried with the upwardly moving air stream and cause the oil to separate from the air and drain downwardly back to the reservoir 14.

As thus far disclosed, the structure of the present air cleaner 10 is of a standard configuration. The improvement is shown most clearly in FIGURE 2. As illustrated, during inclement weather conditions, water, snow, and the like may collect in the reservoir forming an emulsion 33

of oil and water on the top of the oil. In any event, the water, ice, or snow in the reservoir raises the level of liquid in the reservoir above the initial level 34 of the water-free oil.

Disposed about the inner oil cup 23 and secured thereto by any appropriate means is an electric heating coil 38 for melting ice and snow and breaking the emulsion 33 to separate water and oil. The heavier water 37 collects in the bottom of the reservoir 14.

A dip tube 40 has a free end 41, disposed adjacent the bottom 24 of the bottom section 13, between the member 23 and the side wall 39 of the bottom section 13. The tube 40 extends upwardly and outwardly through the bottom section 13 so that its top end 42 is at a level about coincident with the normal oil level 34 in the reservoir. A header member 44 is connected to the top end 42 of the tube 40. The header member 44 is a hollow shell of any suitable shape such as cylindrical or spherical, as illustrated. A waste tube member 46 is connected to the bottom of the header 44 for draining water delivered from the dip tube 40 to the header 44. An S-shaped trap 47 is formed in the tube 46 and liquid normally retained therein prevents the engine vacuum from siphoning or drawing any dirt or grit into the air cleaner 10.

A pressure equalizing tube 48 extends upwardly from the header 44 and has its upper end 50 extending through the wall of the bottom section 13 connected to the annular passage 29 above the reservoir 14. The tube 48 aids in preventing the intake pressure differential from interfering with the action of the hydraulic pressure head of the oil and water in the reservoir 14, from discharging the water through the tube 40 into the header 44.

One or more small apertures 51 in the upper bend of the trap 47 prevents all of the liquid from being drained from the trap by siphon action. The liquid retained in the lower bend of the trap prevents air from being drawn through the trap and interfering with the action of the dip tube 40.

In operation, the heater coil 38 causes the emulsion 33 of oil and water to be broken and ice and snow, if present, to melt and drain to the bottom of the reservoir 14. When the level of oil and water raises above the top 42 of the tube 40, the water 37 at the bottom of the reservoir 14 will overflow into the header 44 through the waste tube 40 until the liquid level drops below the level of the top 42 of the tube 40. The pressure equalizing tube 48 prevents siphoning liquid (water or oil) after the liquid level falls to the level of the tube 40 while the apertures 51 prevent total discharge of the liquid from the trap 47.

The above described embodiment of the invention is merely exemplary, and those skilled in the art will be able to make any modification or variation of it without departing from the spirit and scope of the invention. All such modifications and variations are intended to be included within the scope of the invention as defined in the appended claims.

I claim:

1. In an air cleaner having a casing and a bottom section forming a reservoir for liquid, an air intake conduit extending downwardly through said casing terminating with a free end disposed above the bottom of said bottom

section, and an air outlet passage located in said casing, the improvement comprising a tube extending from adjacent the bottom of said reservoir upwardly and outwardly through said casing, a header member connected to said tube, a waste tube extending downwardly from said header, a pressure equalizing tube extending from said header upwardly and inwardly into said casing adjacent the top of said bottom section and an oil cup member fixed within said bottom section and a heating element disposed about said oil cup within said reservoir.

2. The structure of claim 1 wherein said waste tube has an S-shaped trap therein and means in said trap for preventing siphoning of liquid from said trap.

3. An oil bath air cleaner comprising an outer casing and a bottom section detachably secured to said casing and defining an oil reservoir, an air intake conduit extending downwardly through said casing and having a free end disposed above the bottom of said bottom section, an air outlet in said casing, a cup shaped member in said bottom section in alignment with said conduit, a heating element in said bottom section adjacent to said cup member, a first tube having a free end disposed within said reservoir between said cup member and a side of said bottom section, said first tube extending upwardly and outwardly through said bottom section and having an outer end, a header communicating with said outer end of said tube and a second tube extending from said header upwardly and inwardly into said bottom section above said reservoir.

4. In an oil bath cleaner having a casing including a bottom section defining an oil reservoir, an air intake conduit having a lower end adjacent to and for directing air against the surface of said oil in said reservoir to remove dirt and water from said air and an air exit conduit, the improvement comprising a header member, a water dip tube extending from adjacent the bottom said said reservoir upwardly and out of said casing between the surface of said oil and the lower end of said conduit and having an outer end connected with said header to enable water to overflow from adjacent the bottom of said reservoir into the header, a heater disposed within said reservoir for breaking water-oil emulsions and melting ice in said reservoir, a pressure equalizing tube extending from within said cleaner above said reservoir into said header for preventing siphoning of water and oil from said reservoir and a waste tube extending downwardly from said header and including a trap for discharging water from said header and preventing flow of air into said header through said waste tube.

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R. R. WEAVER, *Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,350,322

October 31, 1967

Clarence Waterhouse

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, lines 14 and 15, for "concident" read -- coincident --; line 42, for "raises" read -- rises --; column 4, line 36, for "said", first occurrence, read -- of --.

Signed and sealed this 26th day of November 1968.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents