

June 28, 1949.

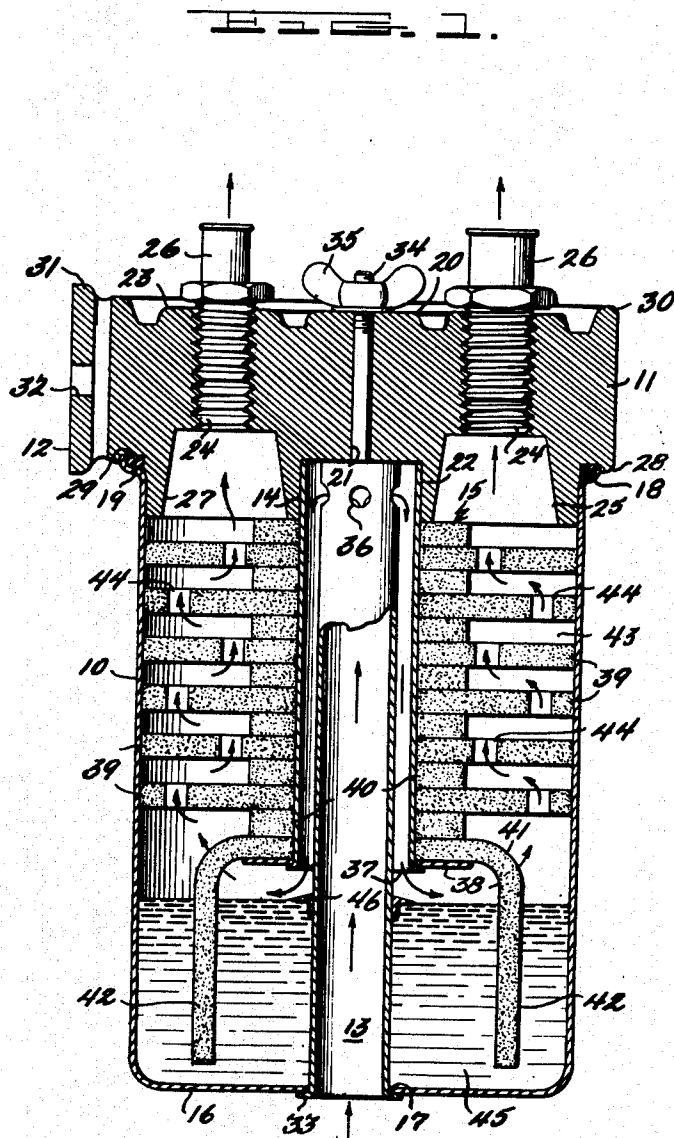
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2,474,746

AIR CLEANER

Filed May 18, 1948

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2.

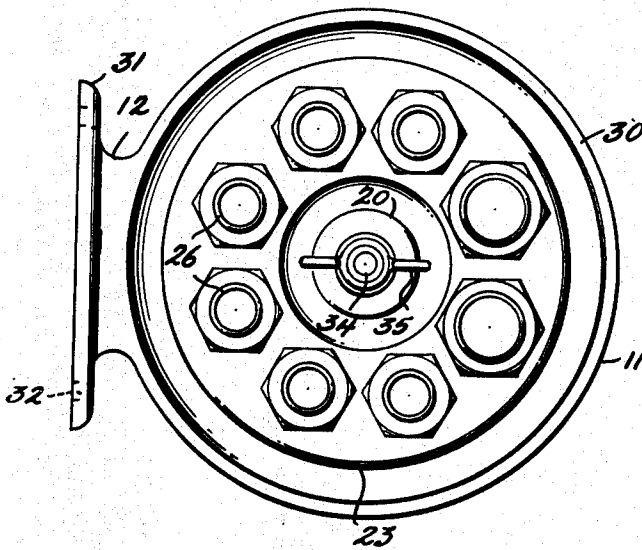
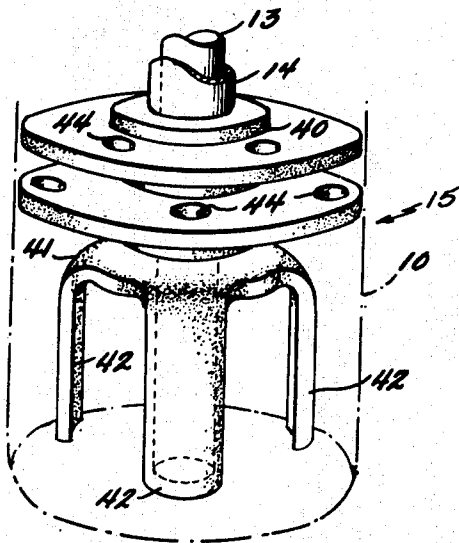


FIG. 3.



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AIR CLEANER

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5 Claims. (Cl. 261-99)

1

This invention relates to air cleaners and has more particular reference to air cleaners intended for use with air driven instruments, such as gyroscopic instruments or the like.

One object of the invention is to provide an improved air cleaner adapted to be connected to the air intake of one or more air driven instruments to remove dust and other foreign matter from the air consumed by the instruments and to lubricate the internal parts of the instruments by means of oil vapor carried by the cleaned air into the interior of the instruments.

Another object of the invention is to provide an air cleaner, as above characterized, including a container adapted to hold lubricating oil in its bottom and provided with an air inlet; a baffle assembly provided with a plurality of tortuous air passages therethrough removably mounted in the container, and a manifold cover for the container provided with a plurality of air outlets each adapted to be connected to the air intake of an air driven instrument.

Another object of the invention is to provide an air cleaner, as above characterized, in which the baffle assembly comprises a plurality of superimposed apertured members capable of being saturated by capillary attraction and wick means depending from the baffle assembly and adapted to extend into the oil in the bottom of the container to keep the baffle members saturated with oil by capillary attraction.

Another object of the invention is to provide an air cleaner, as above characterized, in which marker means are provided to indicate the proper oil level and in which the air is discharged into the container at a point below the baffle assembly but above the oil level marker, so that the air will not have to pass through the oil, thereby insuring uniform and unrestricted flow of air through the air cleaner.

A further object of the invention is to provide an air cleaner, as above characterized, which is simple in construction, easy to install, repair and maintain, and efficient and durable in operation.

Other objects and advantages of the invention will be apparent from the following specification when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of a multiple connection air cleaner constructed in accordance with the present invention;

Fig. 2 is a plan view of the air filter shown in Fig. 1; and

Fig. 3 is a fragmentary perspective view of the

2

baffle assembly, showing how the felt baffles are mounted to stagger the openings therethrough.

Referring now to the drawings, there is shown a preferred embodiment of an air cleaner constructed in accordance with the present invention and comprising a cylindrical shell container 10, a manifold cover plate 11 provided with a plurality of air outlet ports and carrying an attaching bracket 12; an air intake tube 13 extending upwardly into the interior of the shell from the bottom thereof; an air guiding tube 14, which acts to guide the incoming air downwardly; and a baffle assembly 15 composed of a plurality of superimposed and apertured discs mounted on the air guiding tube 14.

The shell container 10 is preferably made of sheet steel and has a flat bottom wall 16 having a central opening 17 therein, through which the air intake tube 13 projects. The upper peripheral edge of the container is bent outwardly and upwardly to form an annular groove 18 in which is received an annular gasket member 19, preferably made of neoprene.

The cover plate 11 and the attaching bracket 12 are preferably made of aluminum and cast as an integral member. The cover plate is disc-shaped and has flat top and bottom surfaces. Formed on the top of the plate is a centrally located boss 20 having a bore 21 extending through the plate and communicating with a circular recess 22 formed on the bottom of the plate. A plurality of bosses 23 are formed on the top of the plate and arranged in a concentric circle with respect to the boss 20. The bosses 23 are provided with threaded bores 24 which extend through the plate and communicate with an annular recess 25 formed on the bottom of the plate and positioned concentrically with respect to the circular recess 22. Threaded into the bores 24 are nipples 26 which are adapted to have the air intake hoses from the various instruments connected thereto. A portion of the peripheral side wall of the cover plate is cut away adjacent the bottom edge to provide a cylindrical portion 27 having a diameter slightly less than the internal diameter of the container shell 10 and an overhanging upper edge or annular shoulder 28 which is provided with an annular groove 29 to receive the gasket 19 when the cover member is secured onto the container shell. A peripheral flange 30 is formed on the upper surface of the plate.

The attaching bracket 12 projects from one end of the plate 10, is generally rectangular in outline and is provided with a peripheral flange

31 which carries the usual opening 32 for the reception of securing screws or the like.

The air intake tube 13 extends upwardly into the container 10 through the hole 17 formed in the bottom of the container. The bottom end of the tube 13 is flared outwardly into engagement with the bottom surface of the container, as indicated at 33, and secured thereto, as by welding, to form a gas-tight joint. The top end of the tube 13 is closed and engages the bottom surface of the circular recess 22. A rod 34 is fixedly attached to the top of the tube 13 and projects through the bore 21 of the boss 20. The projecting end of the rod is threaded for the reception of a butterfly nut 35. The construction being such that when the butterfly nut 35 is tightened on the rod 34, the cover plate, air intake tube 13, and the container are securely held together, with the gasket 19 forming an airtight joint between the container and cover plate. A plurality of apertures 36 are formed in the tube 13 adjacent its upper end to permit the egress of air therethrough.

The air guiding tube 14 is open-ended and its upper end is press-fitted into the circular recess 22 formed in the bottom of the cover plate. The guide tube 14 extends downwardly over the air intake tube 13 in concentric relation thereto, with the space between the inner wall of the outer tube and the inner tube forming an air passage-way. Preferably, the guide tube 14 extends downwardly into the container for about two-thirds of the height thereof and has its bottom peripheral edge flared outwardly, as indicated at 37, to support an annular washer 38 for a purpose to be hereinafter described.

The air baffle assembly 15 comprises a plurality of baffle discs 39; separator discs 40; and a wick disc 41, all mounted in tight fitting engagement in superimposed relation on the air guide tube 14, with the wick disc 41 resting on and supported by the washer 38. The wick disc 41 has a plurality of depending wick portions 42 which extend downwardly to a point adjacent the bottom of the container shell 10. The baffle discs 39 are positioned above the wick disc 41 and are spaced from it and from each other by the separator discs 40. The diameters of the baffle discs 39 are of such size as to insure that they maintain tight engagement with the inner wall of the container 10. The diameters of the separator discs and the wick discs are less than the diameter of the baffle discs to provide air spaces 43 between adjacent baffle discs.

Each of the baffle discs 39 is provided with a plurality of apertures 44 so arranged with respect to each other and to the apertures on the adjacent baffle discs as to provide a tortuous air passage through the baffle assembly, zig-zagging from one aperture to another, as indicated by the arrows in Fig. 1. In the particular embodiment shown, the apertures on each disc are evenly and circumferentially arranged to form a concentric circle, and the radius of the concentric circle of one disc is of a different length from the radius of the circle on the adjacent upper and lower discs; and the discs are mounted in such fashion that the apertures of one disc are laterally and equidistantly staggered with respect to the apertures of the adjacent upper and lower discs (see Fig. 1). The baffle discs 39, separator discs 40, and the wick disc 41, may be made of any suitable flexible woven or felted fibrous material having sufficient stiffness to prevent sagging or drooping when saturated with oil, and being capable of being

wetted by capillary action, as, for example, textile material, or cellulose material. Preferably, these discs are made of white felt having the required stiffness. S. A. E. No. F-1 white felt, for example, has been found suitable.

The container 10 is filled with oil, as indicated at 45, up to a level below the bottom of the air guide tube 14. A marker 46, in the form of a flanged sleeve, is secured on the inner air intake tube 13 to indicate the proper oil level. The particular oil used is a very light lubricating oil such as is used to lubricate the internal parts of the instruments which are to be connected to the cleaner. In assembling the air cleaner, the container 10 is filled with a suitable lubricating oil up to the marker 46.

The operating principles of the cleaner are basic and simple. Dust laden air is best cleaned by placing damp barriers or baffles in the path of the air flow. When the dust laden air blows against the damp baffles, the dust permanently adheres to them and is removed from further circulation. The felt baffle discs 39, which, prior to the installation of the cleaner unit in service, are initially saturated by immersion in oil, during service, are maintained saturated by the wick portions 42 of the felt wick disc 41 dipping into the oil reservoir in the bottom of the shell 10, oil working up by capillary attraction. The oil with which the baffle assembly discs are initially saturated, being the same type as the oil in the container, which is a lubricating oil suitable to lubricate the bearings of the instruments which are to be connected to the filter. The fuzzy surface of the baffle discs 39 offers a most suitable and effective trap for the dust and other airborne particles.

The air is sucked up the air intake tube 13 and flows through the apertures 36 at the top of the tube into the enveloping outer guide tube 14, which guides the air downwardly and causes it to blow against the surface of the oil in the reservoir bottom of the container 10 and be deflected up towards the baffle assembly composed of the various felt baffle discs 39. By virtue of the staggered openings in the felt baffle discs 39, the air must follow a tortuous passage through the baffle assembly, zig-zagging from one opening into the next one before it is able to pass into the annular recess or collecting chamber 25 in the cover plate, from which it flows into and out of the various bores or outlet ports 24 and the nipples therein, towards the consuming air operated instruments connected to the nipples by tubing, not shown.

In the process of passing through the various felt baffles 39, the air is being constantly freed of any dust it may have borne, the momentum of the dust particles causing them to be trapped by and to stick permanently to the felt baffles.

In addition to the removal of dust, the cleaner unit produces an oil vapor which is carried by the air into the interior of the casings of the instruments connected to it, where it condenses or precipitates in almost imperceptible, thin films on vital parts, such as pivots, bearings, etc., and keeps them from running dry and becoming vulnerable to rust or corrosion. The oil vapors, however, at no time condense inside the instruments to the extent of collecting and requiring drainage.

The production of the oil vapors is made possible by the fact that the oil used in the filter is very light and vaporizes readily, more so when aided by the constantly circulating air. The

5

constantly circulating air currents produced by the inrushing air help the vaporization process so that air emerging from the cleaner unit is well impregnated with oil vapors. Yet the vapors are such that they do not even cause the glasses of the instruments to fog or cloud up. The lubricating function of the cleaner is of paramount significance and of incalculable value to the successful operation of the air driven instruments connected thereto.

The proper level of the oil supply, as indicated by the marker 46, is an important consideration. The oil supply is such that its volume is not sufficient to run into and flood the collecting chamber 25 when the cleaner is tilted, as by the rolling or pitching of an airplane. The oil, therefore, cannot find its way into the air outlets of the cover plate of the cleaner unless the unit is completely inverted. Another reason for the requirement that the oil level be not exceeded is that the incoming air must not be compelled to bubble through the oil, as this would cause excessive foaming of the oil, with the resultant effect of the suspension of excessive oil in the air flowing to the instruments.

From the foregoing, it readily will be seen that there has been provided an air cleaner particularly adapted for cleaning the air supply for operating air driven instruments and, at the same time, helping keep the internal parts of the instruments properly lubricated. The cleaner of the invention is simple in construction, easily assembled, connected, and disconnected, has long life as there are no moving parts, and is extremely efficient in operation.

While the cleaner has been illustrated and described as a multiple type cleaner, i. e., one adapted to have several instruments connected thereto, obviously, without departing from the invention, it may be constructed as an adjunct to a single air operated instrument.

What is claimed is:

1. An air cleaner of the type described, comprising a manifold having a plurality of air outlets extending therethrough and adapted to be connected to the air intakes of air operated instruments; a container depending from and detachably connected to said manifold with said outlets communicating with the interior of the container, the bottom of said container being adapted to hold a pool of lubricating oil; a hollow member depending from and detachably connected to said manifold and having its lower end open and spaced above the bottom wall of the container; a plurality of spaced baffle members mounted on said hollow member and having their outer peripheral edges engaging the inner peripheral side walls of the container, said baffle members having staggered openings therein to provide a plurality of continuous tortuous courses for air through the container; and an air inlet conduit having one end communicating with the upper end of said hollow member and its other end communicating with the exterior of the cleaner whereby when the instruments connected to the manifold outlets are operated, the air consumed in their operation will pass through the air cleaner and the dust particles carried by the air will be ensnared and removed by the baffle members and the air as it passes through the container will be impregnated with oil vapor for lubricating the instruments as the air passes therethrough.

2. An air cleaner as set forth in claim 1, wherein the container is in the form of a cylinder hav-

6

ing a closed bottom and wherein the baffle members are disc-shaped and are spaced from each other by separator discs of lesser diameter and are superimposed upon a disc having depending wick portions adapted to extend into the pool of oil in the bottom of the container, all of said discs being made of a material capable of being saturated with oil by capillary attraction.

3. An air cleaner as set forth in claim 1 wherein the air inlet conduit communicating with the upper end of the hollow member comprises a second hollow member extending upwardly through an opening in the bottom of the container and having its upper end portion concentrically received within the first named hollow member, said second named hollow member having its bottom open end rigidly secured to the outer bottom wall of the container and its closed upper end provided with a plurality of circumferential apertures and having a projection rigidly secured thereto and adapted to be received in and project through an opening formed in the manifold and securing means adapted to engage the projecting end of said projection to detachably secure the manifold and container together.

4. An air cleaner of the type described, comprising a container adapted to hold a pool of lubricating oil in its bottom; a transversely extending baffle mounted in said container and positioned to provide an air space thereabove and therebelow, said baffle being made of material capable of being saturated with lubricating oil by capillary attraction and being provided with a plurality of tortuous air passageways there-through, a wick engaging said baffle and having a depending portion extending into the bottom of the container in position to dip into the oil therein and maintain the baffle saturated with oil; a conduit communicating with the interior of said container and having its exit end positioned to discharge air at a point spaced above the oil in the bottom of the container and below said baffle; and a cover member detachably mounted on said container, said cover member having at least one air outlet communicating with the interior of said container above said baffle and adapted to be connected to the air intake of an air operated instrument, whereby, as the air consumed in operating the instrument passes through the cleaner it will become impregnated with the vapor of the lubricating oil therein and the dust particles in the air will become attached to the baffle and removed from the air and the oil vapor carried into the instrument will lubricate it as it passes therethrough.

5. An air cleaner of the type described, comprising a container adapted to hold a pool of lubricating oil in its bottom; a baffle assembly mounted in said container, said assembly including a plurality of spaced baffle members made of material capable of being saturated with oil by capillary attraction and extending transversely of said container with their outer peripheral edges engaging the inner side walls of the container, said baffle members having staggered openings therein arranged to provide a plurality of tortuous air passages through the container and being provided with wick means which extend into the bottom of the container in position to dip into the oil therein and maintain the baffle members saturated with oil; a conduit communicating with the interior of said container and having its exit end positioned to discharge air at a point below said baffle members and above

said pool of oil; and a cover member detachably mounted on said container, said cover member having at least one air outlet communicating with the interior of said container above said baffle members and adapted to be connected to the air intake of an air operated instrument, whereby, as the air consumed in operating the instrument passes through the cleaner it will become impregnated with the vapor of the lubricating oil therein and the dust particles in the air will become attached to the baffle members and removed from the air and the oil vapor carried into the instrument will lubricate it as it passes therethrough.

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