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D. F. GERMAN

3,411,609

AIRLINE OILER

Filed Oct. 29, 1965

FIG. 1

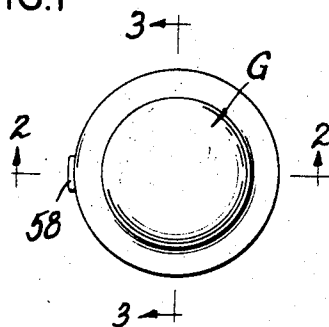


FIG. 4

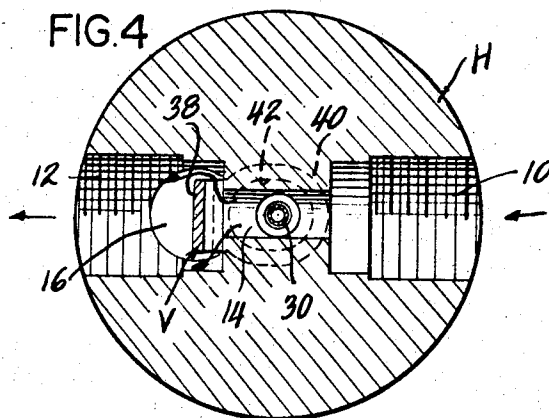


FIG. 2

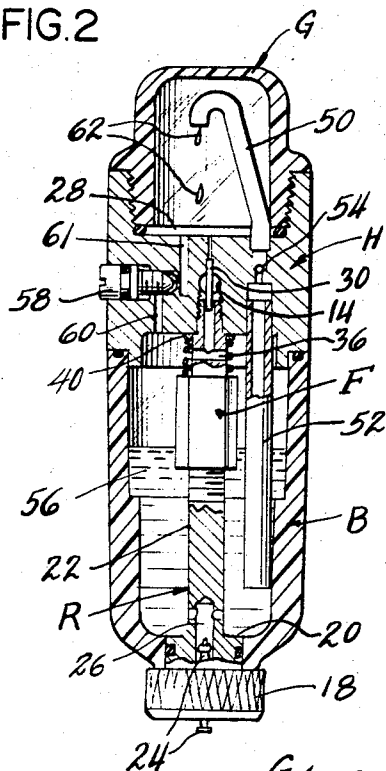


FIG. 3

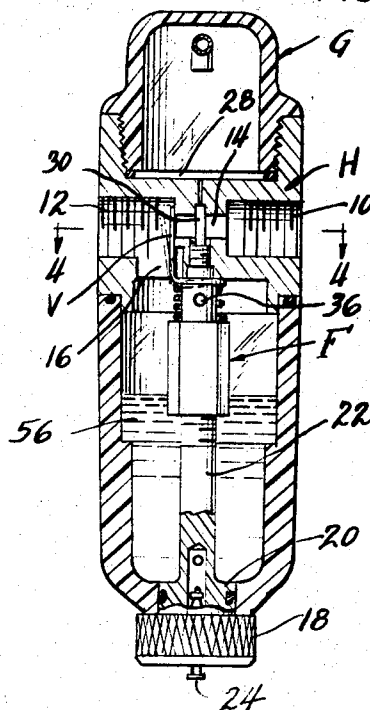


FIG. 5

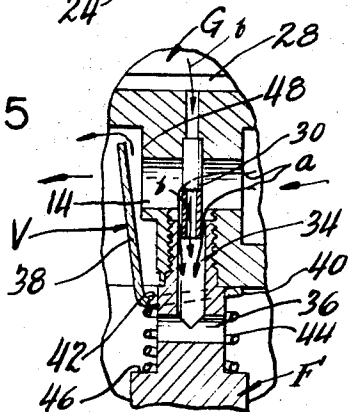
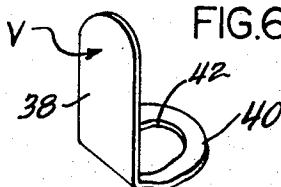


FIG. 6



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AIRLINE OILER

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1 Claim. (Cl. 184—55)

ABSTRACT OF THE DISCLOSURE

Airline oiler employing Venturi action for charging a stream of air through the oiler with oil fog. An automatic regulator for oil in proportion to air is provided in the form of a wall between the inlet and outlet of the oiler through which there is an air passageway normally closed by a valve plate engaged against the downstream surface of the wall by spring means.

This invention relates to an airline oiler of comparatively simple and inexpensive construction.

One object of the invention is to provide an airline oiler which has a novel Venturi action for injecting oil into the air stream and at the same time atomizing it so that the oiler is charged with oil fog or mist which enters the air stream flowing through the oiler and thereupon flows to a pneumatic tool receiving compressed air through the oiler. Simultaneous operation and lubrication of the tool is thereby effected.

Another object is to provide a simplified version of the airline oiler disclosed in the copending application of myself and Wilbert G. Kautz, Ser. No. 337,233, filed Jan. 13, 1964, now Patent No. 3,244,257.

Still another object is to provide novel means in an airline oiler for effecting the dripping of oil from a nozzle into an oil pocket that feeds a Venturi mechanism so that the drops of oil through a sight gauge can be counted in a unit of time, and the speed of operation of the oiler thereby determined.

A further object is to provide a regulating valve for the sight gauge so that the rate of oil fogging can be adjusted to suit various sizes of tools or other lubrication requirements of pneumatic tools or the like.

An additional object is to provide an arrangement of Venturi mechanism and compensating valve which cooperate with each other in such manner as to provide substantially the same rate of oil fogging regardless of variations in the air flow through the oiler.

Another additional object is to provide an airline oiler in which an air passageway from an inlet to an outlet is provided, the outlet communicating with an oil bowl to receive air and oil fog therefrom and the means to produce such oil fog comprising a sight gauge on the head of the oiler, a drip nozzle therein, oil passageway means from the oil bowl below the level of oil therein to the drip nozzle, an oil pocket for receiving oil from the drip nozzle and Venturi means to effect operation of the drip nozzle together with a movable compensating valve in the first air passageway operable to variably obstruct the flow of air through the Venturi throat and thereby automatically produce an oil fog proportionate to air flow resulting from the action of the compensating valve.

A further additional object is to provide the compensating valve in the form of a valve plate transversely across the first air passageway and pivotally mounted adjacent one side thereof, a coil spring being provided to bias the valve plate to closed position and the coil spring surrounding a fitting that has the Venturi throat in it, the valve plate having a tail piece provided with a slot through which the Venturi fitting loosely extends, the tail piece engaging one end of the coil spring, the Venturi fitting having a shoulder engaged by the other end of the coil spring.

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Still a further object is to provide retaining means for the oil bowl of the airline oiler connected with the Venturi fitting having the Venturi throat therein.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my airline oiler, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my claim and illustrated in detail on the accompanying drawing, wherein:

FIG. 1 is a plan view of an airline oiler embodying my invention;

FIG. 2 is a vertical sectional view thereof on the line 2—2 of FIG. 1;

FIG. 3 is a vertical sectional view thereof on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged horizontal sectional view on the line 4—4 of FIG. 3;

FIG. 5 is an enlargement of a portion of FIG. 3, and

FIG. 6 is a perspective view of a compensating valve plate used in my airline oiler.

On the accompanying drawing I have used the reference character H to indicate an oiler head, B and oil bowl and G a sight gauge constituting, in general, the body of the airline oiler. The body B is suspended from the head H by a Venturi fitting F and a retainer R, the details of which will hereinafter be described.

The head H has an air inlet 10 and an air outlet 12 between which is a central connecting passageway 14. An oil fog passageway 16 is also provided in the head H and communicates the interior of the oil bowl B with the outlet 12.

The retainer R comprises a knob 18 knurled for convenience in rotating the retainer during assembly and disassembly of the oil bowl to the head H, a shouldered portion 20 which is O-ring sealed relative to the bowl B and a stem 22 threaded on its upper end. A sediment discharge valve 24 (which may be an ordinary tire valve insert) is provided in the knob 18 and communicates with the interior of the bowl B by means of a sediment discharge passageway 26.

The upper end of the bowl B is O-ring sealed relative to the head H and the sight gauge G is likewise sealed relative to the head, the sight gauge being threaded into the upper end of the head as shown in FIGS. 2 and 3. The bowl B and the sight gauge G are formed of transparent plastic material.

The socket in the top of the head H forms an oil pocket 28 from which a passageway 32 leads downwardly to a Venturi nozzle 30. The lower end of the nozzle 30 is located in a tubular extension 34 from the upper end of the fitting F which is threaded into the head H and has a bore slightly larger than the outside diameter of the nozzle 30 as shown in FIGS. 4 and 5. The extension 34 thus forms a Venturi throat which discharges into the bowl B through a cross passageway 36 at the lower end of the bore of the tubular extension.

A compensating valve V is provided comprising a valve plate 38 and a tail piece 40 which is perforated as indicated at 42 to loosely receive the tubular extension 34. A spring 44 is mounted on the tubular extension with its upper end bearing against the tail piece 40 and its lower end bearing against a shoulder 46 of the fitting F. The valve plate 38 in its normal position engages the inner surface 48 of the air outlet 12 as shown by solid lines in FIG. 3 but can be actuated to the solid line position shown in FIGS. 4 and 5 by air flow as will hereinafter appear.

A drip nozzle 50 is located in the sight gauge G and oil is supplied thereto from an oil tube 52, the lower end of which is below the level of oil 56 in the bowl B. A check ball 54 is located in the head H between the oil

tube 52 and the drip nozzle 50 to prevent retrograde oil movement.

In order to effect flow of oil upwardly through the oil tube 52 and the drip nozzle 50, the interior of the sight gauge G requires a drop in pressure. This is effected by the Venturi action in the Venturi throat 34. The relationship of the Venturi nozzle 30 and the interior of the Venturi throat 34 is shown in FIGS. 4 and 5, the air flow being indicated by arrows *a* which produce a suction as indicated by the arrow *b* because of the increase in velocity of the air as it passes through the Venturi throat 34.

The Venturi action would produce more drops of oil per minute than required and it is desirable to have a means to regulate the number of drops. This is effected by a sight gauge control valve 58 in the form of a needle valve in a passageway 60-61 leading from the space in the bowl B below the head H to the oil pocket 28. This passageway acts as a bleed to reduce the effectiveness of the Venturi action. The head of the valve 58 may be engaged by a screwdriver and the valve adjusted as required.

There is a statistical relationship between droplet sizes in the oil fog, some being small enough that they can be air-borne while others precipitate back into the oil bowl. This relationship in actual practice is approximately one in twenty. Therefore, with a given constant air consumption of a pneumatic tool (in CFM), by observing the number of drops 62 (FIG. 2) falling through the sight gauge G in one minute and dividing by twenty the result is the number of drops per minute actually delivered from the air outlet 12 in the form of fog. Thus, if a pneumatic tool requires 30 CFM for its operation and one and one-half drops of oil per minute for its lubrication, the valve 58 may be adjusted until one and one-half drops per minute is consumed, which in the sight gauge G amounts to 30 drops per minute. The Venturi action illustrated in FIG. 5, of course, breaks the oil coming from the nozzle 30 into fine particles thereby filling the bowl B with fogged oil above the level of the oil therein. The air indicated by the arrows *a* and the air passing through the air passageway 14 both flow out of the outlet 12 during the operation of the pneumatic tool. The air that flows through the Venturi throat 34 into the bowl takes along with it some of the fogged oil as it flows upwardly through the passageway 16 into the outlet 12. The heaviest particles of oil fall out of the air in the bowl and return to the oil 56 therein and this entire cycle of operation provides the 20:1 ratio above mentioned.

Since the air entering the head H is obstructed by the valve plate 38 of the compensating valve V, the valve effects flow of air as indicated by the arrows *a* in FIG. 5 to produce the Venturi action. The function of this valve is to automatically control the amount of air passing the upper end of the Venturi throat 44 as compared to the amount of air that flows through the Venturi throat and out of the cross passageway 36. Pressure reduction, due to the Venturi, changes with the square of the air velocity. Therefore, if the air flow of an ordinary oiler increases, a flooding condition of the oil results and likewise starvation of oil will result when the air flow decreases. This condition of flooding and starvation of oil is compensated for in my oiler by use of the compensating valve V which opens wider whenever the air flow is increased and thereby decreases the Venturi action.

The parts are so designed and the tension of the spring 44 is such that the proper balance is attained to supply the correct amount of oil fog for the tool being operated regardless of whether it is operated at high speed by increasing the air flow or low speed by decreasing it. I have found the disclosed arrangement very effective to provide the desired uniformity of oiling action for a pneumatic tool fed with compressed air from my oiler.

From the foregoing specification it will be obvious that I have provided a comparatively simple oiler construction having means to produce oil fog and to regulate the degree of oil fog by means of a sight gauge in which the rate of oil drops may be observed. Automatic compensation for air flow variation is had and the device is readily adjustable to secure the desired degree of lubricating action for a pneumatic tool or the like.

Some changes may be made in the construction and arrangement of the parts of my airline oiler without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents which may reasonably be included within its scope.

I claim as my invention:

1. An airline oiler comprising a head, an oil bowl depending therefrom, said head having an air inlet and an air outlet, a wall between said inlet and said outlet, an air passageway through said wall from said inlet to said outlet, said outlet communicating with said oil bowl to receive air and oil fog therefrom, and means to produce such oil fog comprising a sight gauge on said head, a drip nozzle therein, oil passageway means from said oil bowl below the level of oil therein to said drip nozzle, an oil pocket for receiving oil from said drip nozzle, Venturi means to effect operation of said drip nozzle comprising a Venturi nozzle communicating with said oil pocket and a fitting having a Venturi throat communicating with said inlet, and a compensating valve operable to variably obstruct the flow of air through said air passageway of said wall, said compensating valve opening wider with increased air flow whereby a portion of the air flows through said Venturi throat in proportion to air flow through said first air passageway, said compensating valve comprising a valve plate transversely across said air passageway, pivotally mounted adjacent one side thereof and engaging the downstream surface of said wall, and a coil spring to bias said valve plate to wall-engaging position, said coil spring surrounding said fitting and said valve plate having a tail piece provided with a slot through which said fitting loosely extends, said tail piece engaging one end of said coil spring, said fitting having a shoulder engaged by the other end of said coil spring.

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