March 24, 1959 R. D. WILEY 2,878,895

AIR LINE LUBRICATOR

Filed April 12, 1957

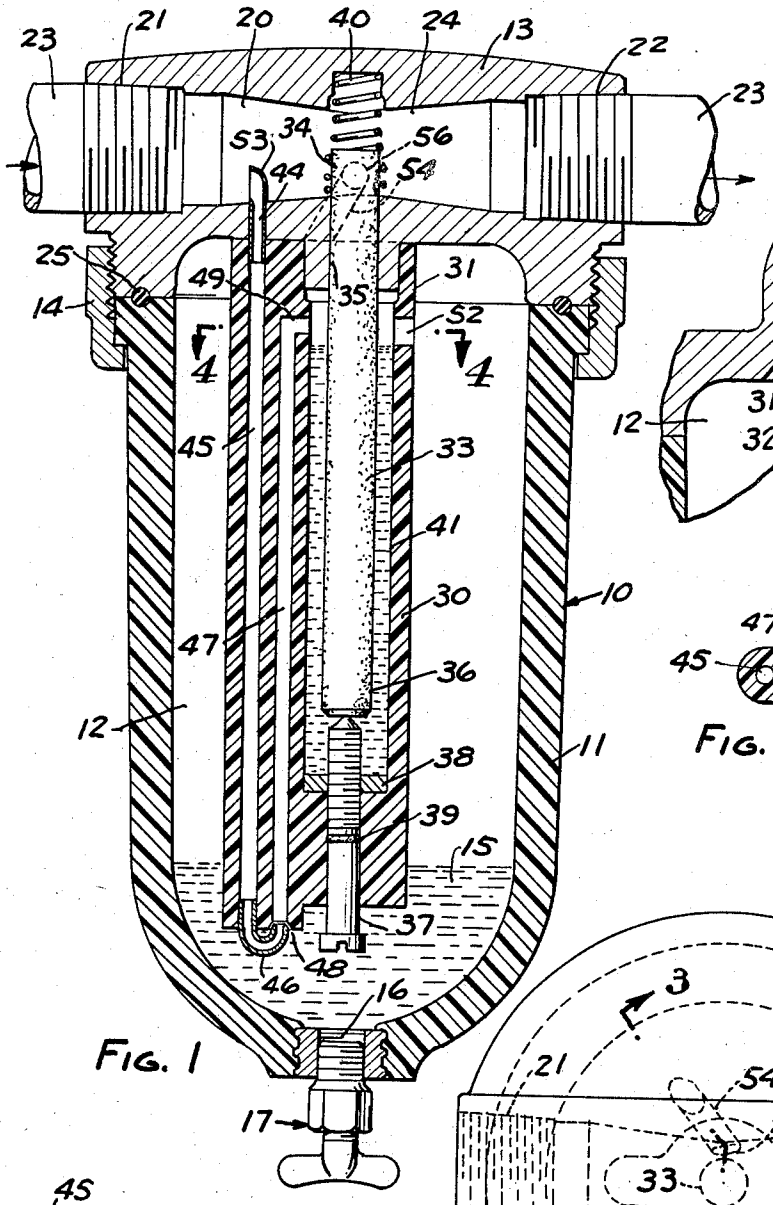


FIG. 1

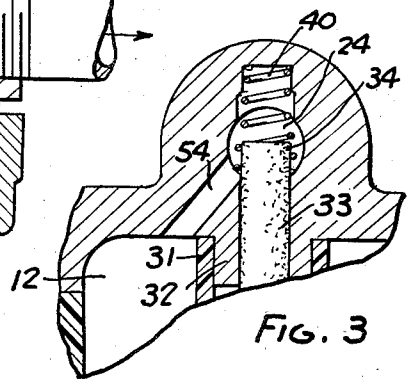


FIG. 3

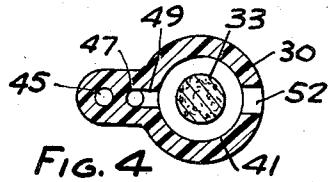


FIG. 4

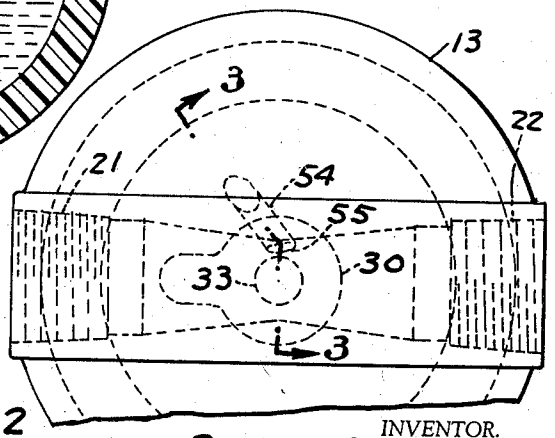


FIG. 2

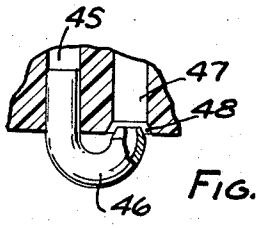


FIG. 5

INVENTOR.

ROBERT D. WILEY

BY

Barnes Kisselle Raughlin & Price

ATTORNEYS.

United States Patent Office 2,878,895 Patented Mar. 24, 1959

2,878,895

AIR LINE LUBRICATOR

Robert D. Wiley, Detroit, Mich., assignor to Master Pneumatic, Inc., Detroit, Mich., a corporation of Michigan

Application April 12, 1957, Serial No. 652,486

3 Claims. (Cl. 184—55)

This invention can be used wherever it is desired to deliver a liquid in the form of relatively small particles to a stream of gas passing through a conduit. A typical application of the invention is in delivering lubricating oil to a stream of air in a conduit which supplies air under pressure to pneumatically operated equipment which requires lubrication.

Heretofore, some air line lubricators have used wicks dipped into a reservoir of oil and projecting into the air stream, the air stream carrying oil in the form of a spray or mist from the wick to the device to be operated and lubricated. One objection to such a structure is that the rate of capillary flow of the oil through the wick diminishes as the level of oil in the reservoir goes down and the effective height of the wick increases so that the rate of delivery of oil to the air stream varies undesirably.

Other air line lubricators have heretofore used pressure for forcing the oil from a reservoir into the air stream. One objection to such structures is that the oil must usually be forced through a small orifice or a wick like element presenting a relatively small filtering surface and in either case the structure is subject to being clogged by foreign matter.

An object of the present invention is to provide a simple inexpensive improved air line lubricator which will remain free of clogging and in which the rate of delivery of oil to the air stream will remain uniform.

The invention is carried out generally by mounting a wick within a container separate from the oil reservoir and providing an aspirator for delivering oil from the reservoir to the container at a rate faster than it is removed by the wick. The container is provided with an overflow opening so that the level of oil in the container remains uniform and the rate of capillary flow of oil from the container to the portion of the wick within the air stream remains uniform. The wick is dimensioned to provide a large filtering surface so that it may be used indefinitely without clogging. One form of the invention is shown in the accompanying drawings:

Fig. 1 is a generally sectional view of an air line lubricator according to this invention.

Fig. 2 is a top plan view of the lubricator with parts shown in phantom to illustrate structure.

Fig. 3 is a fragmentary sectional view on line 3—3 of Fig. 2.

Fig. 4 is a sectional view on line 4—4 of Fig. 1.

Fig. 5 is an enlarged fragmentary sectional view illustrating structure at the aspiration port.

Shown in Fig. 1 is a lubricator **10** having a body formed by a cup **11** defining a chamber **12** which is closed by a cap **13** detachably secured to the cup by such means as a threaded retainer ring **14**. Chamber **12** provides a reservoir for lubricating oil **15**. Cup **11** is preferably provided at its bottom with a drain opening **16** having a drain cock **17** threaded therein. Cap **13** has a passageway **20** with an inlet **21** and an outlet **22** threaded for connection to portions of a conduit **23** for carrying air under pressure. Passageway **20** has an intermediate constricted portion **24** providing a venturi construction. Cup **11** and cap **13** may be formed of suitable form retaining materials, such as metal or plastic. A sealing ring **25** may be provided between the cap and cup.

A separate container **30** for lubricating oil is provided within chamber **12**. This container may be formed of a suitable form retaining material such as plastic. Container **30** is shown as having an upper portion **31** press fitted around a downwardly projecting lug **32** on cap **13** for suspending the container in chamber **12**. A wick member **33** is mounted within container **30** and has and upper portion **34** which projects through an opening **35** in cap **13** into the constricted portion **24** of passageway **20**. The wick is preferably formed of a generally rigid material such as a sintered metal and is supported at its lower end **36** by a screw **37** having a threaded connection to an element **38** press fitted into the bottom portion of container **30** as shown. An O ring **39** provides a seal between the shank of screw **37** and adjacent portions of the container bottom. Wick **33** fits nicely but slidably in cap opening **35** so that the height of the wick portion exposed within passageway **20** can be adjusted by turning screw **37**. A spring **40** seats on the upper end of the wick and reacts against cap **13** for urging the wick against supporting screw **37**. Wick **33** extends a considerable distance into container **30** and the side walls **41** of the container are spaced from the sides of the wick by an appreciable distance as shown.

An aspirator structure is provided for transferring oil from the main reservoir formed by chamber **12** into container **30** for contact with wick **33**. This aspirator generally speaking comprises a shunt passageway extending from a portion of passageway **20** upstream of constriction **24**, through an interior portion of container **30**, and then to constriction **24**; an aspiration port is provided in the shunt below the normal level range of oil in the main reservoir. In the illustrated form of the invention cap **13** is provided with a port **44** opening into main passageway **20** upstream of constriction **24** and registering with an end of a passageway **45** formed in a wall of container **30**. A fitting **46** connects the downstream end of passageway **45** with another passageway **47** formed in the container wall. Fitting **46** and the upstream end of passageway **47** cooperate to define a relatively small aspiration port **48** disposed below the normal level of oil in the main reservoir. The cooperating portions of fitting **46** and passageway **47** are shown as being tapered so that the aspiration port has generally annular conical form. The downstream end of passageway **47** opens into the upper portion of container **30** as at **49**.

Container **30** has a port **52** adjacent its upper end which opens into chamber **12**. Cap **13** has a vent passageway **54** extending from the upper portion of chamber **12** to constricted portion **24** of main passageway **20**. This completes the shunt system which provides the aspirator for transferring oil from the main reservoir to container **30**. Shunt passageway **54** opens into chamber **12** at an angle to the depth dimension of chamber **12** for a purpose to be described. An air scoop **53** may be provided as shown at port **44** to assist entry of air into the aspirator system.

In use, it may be assumed that the inlet **21** and outlet **22** of main passageway **20** have been connected into air conduit **23** and that lubricating oil has been placed in the reservoir formed by chamber **12**. It may also be assumed that wick **33** has been primed or dampened with oil and that container **30** has been filled. The height of wick **33** has been adjusted to expose a desired portion of the wick to the interior of passageway **20**. When air under pressure is passed through conduit **23** in the direction indicated by the arrows (Fig. 1) it passes through constricted portion **24** at a relatively high velocity and relatively low pressure according to well known principles and picks up

oil in small particles in the form of a spray or mist and delivers the oil to the equipment to be operated and lubricated.

The pressure at port 44 is greater than the pressure at the downstream end at 56 of vent 54 which is disposed at constriction 24. Accordingly, an air stream flows through port 44, passageway 45, fitting 46 and past aspiration port 48 into passage 47. From there the stream flows through outlet 49 into the upper interior portion of container 30, out of the container through port 52, and into the upper portion of chamber 12. From there the stream passes out of chamber 12 through vent 54 and returns to passageway 20 at constriction 24.

As the stream passes aspiration port 48 it picks up oil in particulate or spray or mist form and carries it to the interior of container 30. The container interior has a greater sectional area than that of passageway 47 so that the velocity of the oil bearing air diminishes as it enters the container and oil is deposited in the container. This depositing of the oil is assisted by diversion of the air stream around wick 33. The shunt passageway system and aspiration port 48 are arranged so that oil is thus transferred from the main reservoir into container 30 at a rate at least as great as it is removed from container 30 by wick 33. Port 52 provides an overflow for any excess oil which may be delivered to container 30, the overflowing oil returning to the main reservoir as will be apparent from Fig. 1. The level of oil in container 30 is maintained uniform at the level of the overflow as illustrated. Accordingly, there is a uniform capillary flow through wick 33 to its portion 34 exposed to the air stream in main passageway 20. The rate of this capillary flow remains uninfluenced by the level of oil in cup 11. As a result, oil is fed to the main air stream at a uniform rate regardless of the oil level in cup 11.

The portion of wick 33 contacted by oil in container 30 is relatively long and the surface of contact is relatively great so that the pores of the wick will not be readily clogged by foreign matter in the oil because of the filtering effect of the wick. Accordingly, the lubricator may be used over a long period of time without stoppage due to clogging.

The velocity of the air diminishes further as it enters chamber 12 through port 52 so that any excess of oil which it still carries will for the most part be deposited in the chamber. The angled direction of vent 54 results in a relatively smooth flow of air from port 52 through chamber 12 and minimizes turbulence within the chamber and increases the efficiency of the aspirator system.

When the flow of air through passageway 20 ceases, the oil level in container 30 will remain substantially at overflow port 52 and the exposed end portion 34 of the wick will remain fully dampened and ready for immediate resumption of its lubricating function when air again passes through the passageway. Thus, cup 11 may be drained, such as for cleaning purposes, by opening cock 17, or cup 11 may even be removed from cap 13 for cleaning or maintenance purposes without substantially affecting the condition of the wick.

When the air flow in passageway 20 is interrupted, liquid may rise in passageways 45 and 47 through port 48 toward the level of oil in cup 11. However when the air flow is resumed, the oil in these passageways is discharged and there is no appreciable delay in functioning of the aspirator system.

The volume of lubricant delivered to the air stream in conduit 23 may be varied as desired by adjusting the height of exposed portion 34 of the wick in constriction 24. This is done by turning screw 37 to raise or lower the wick. Spring 40 insures downward movement of the wick with screw 37 when the screw is retracted.

The present invention makes it possible to provide adequate lubrication fluid to a high volume of air over a relatively long period of time at a uniform rate and without malfunctioning.

I claim:

1. In an air line lubricator having a passageway adapted to be connected to a conduit for air under pressure, a cup for containing lubricant and an elongate wick extending into said cup and into said passageway, means providing a bath of lubricant of uniform depth around said wick comprising, an envelope surrounding substantially the entire length of the portion of said wick extending into said cup, said envelope having a closed bottom below the lower end of said wick and forming a container which is separate from said cup, said container having an open portion adjacent the uppermost region of the portion of the wick extending into said cup, flow diverting means operative to divert a flow of air from said passageway, means operable by said flow of air to transfer lubricant in said cup to said open portion of said container at a rate exceeding the rate at which said wick delivers lubricant to said passageway, whereby to maintain a bath of lubricant around said wick having a generally uniform depth equal to the depth of said container from its bottom to said open portion, the portion of said wick adjacent said open portion being exposed to the pressure of air within said cup above the lubricant level, said flow diverting means including a vent for exhausting said flow of air to said passageway at a location predetermined to provide a relatively small differential between the air pressure on the latter said portion of said wick and the air pressure on the portion thereof extending into said passageway, so that said wick feeds lubricant to said passageway by capillarity at a rate substantially unaffected by the pressure of the air in said cup.

2. In an air line lubricator having a passageway adapted to be connected to a conduit for air under pressure, a cup for containing lubricant and an elongate wick extending into said cup and into said passageway, means providing a bath of lubricant of uniform depth around said wick comprising, an envelope surrounding substantially the entire length of the portion of said wick extending into said cup, said envelope having a closed bottom below the lower end of said wick and forming a container which is separate from said cup, said container having an open portion adjacent the uppermost region of the portion of the wick extending into said cup, flow diverting means operative to divert a flow of air from said passageway, means operable by said flow of air to transfer lubricant in said cup to said open portion of said container at a rate exceeding the rate at which said wick delivers lubricant to said passageway, whereby to maintain a bath of lubricant around said wick having a generally uniform depth equal to the depth of said container from its bottom to said open portion, the portion of said wick adjacent said open portion being exposed to the pressure of air within said cup above the lubricant level, said flow diverting means including a vent for exhausting said flow of air to said passageway, said vent being open to said cup and opening into said passageway at a location closely adjacent the portion of said wick which extends into said passageway to provide a relatively small differential between the air pressure on the latter said portion of said wick and the air pressure on the portion thereof adjacent said open portion of said container, so that said wick feeds lubricant to said passageway by capillarity at a rate substantially unaffected by the pressure of the air in said cup.

3. In an air line lubricator having a passageway adapted to be connected to a conduit for air under pressure, said passageway having a constricted portion, a cup for containing lubricant, and an elongate wick extending into said cup and into said constricted portion of said passageway, means providing a bath of lubricant of uniform depth around said wick comprising, an envelope surrounding substantially the entire length of the portion of said wick extending into said cup, said envelope having a closed bottom below the lower end of said wick and forming a container which is separate from said cup, said

container having an open portion adjacent the uppermost region of the portion of the wick extending into said cup, flow diverting means operative to divert a flow of air from said passageway, means operable by said flow of air to transfer lubricant in said cup to said open portion of said container at a rate exceeding the rate at which said wick delivers lubricant to said passageway, whereby to maintain a bath of lubricant around said wick having a generally uniform depth equal to the depth of said container from its bottom to said open portion, the portion of said wick adjacent said open portion being exposed to the pressure of air within said cup above the lubricant level, said flow diverting means including a vent which is open to said cup and which opens into said passageway at

said constricted portion thereof to provide a relatively small differential between the air pressure on the latter said portion of said wick and the air pressure on the portion thereof extending into said constricted portion of said passageway, so that said wick feeds lubricant to said passageway by capillarity at a rate substantially unaffected by the pressure of the air in said cup.

References Cited in the file of this patent

UNITED STATES PATENTS

1,504,341	Hansen	Aug. 12, 1924
2,718,934	Norgren et al.	Sept. 27, 1955
2,767,807	Booth	Oct. 23, 1956