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LUBRICATOR FOR PNEUMATICALLY OPERATED TOOLS

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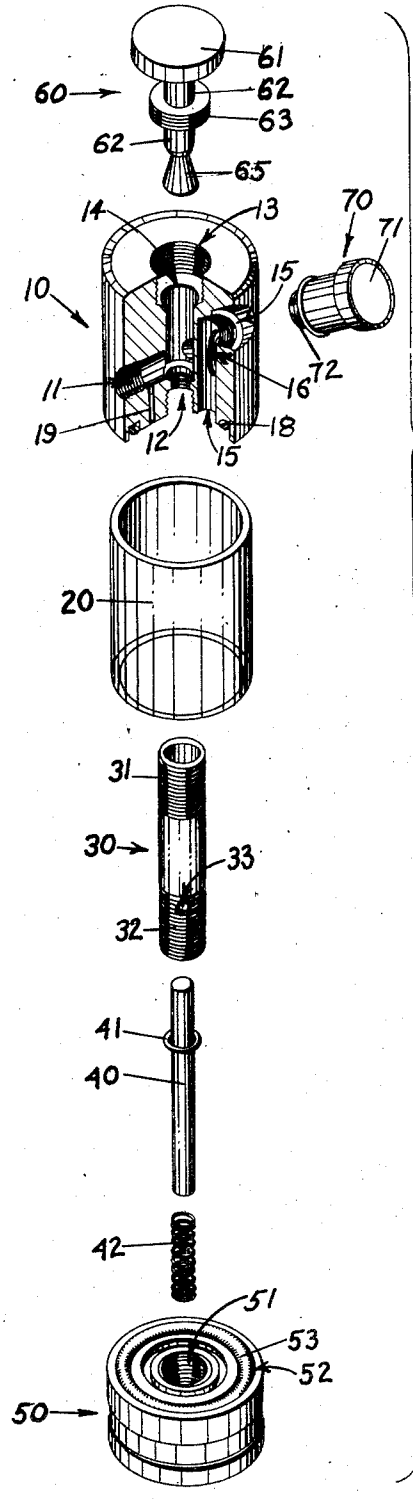

Fig. 1

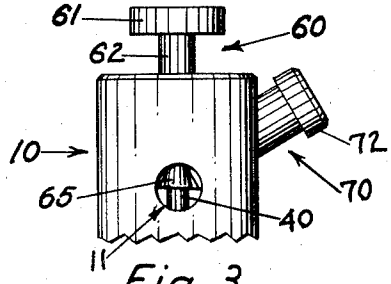

Fig. 3

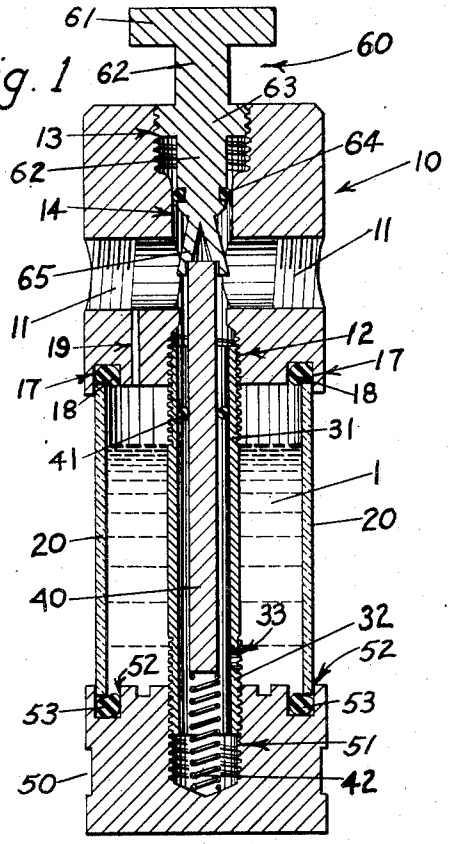

Fig. 2

INVENTOR.
JOSEPH J. SHADA
BY
Lloyd A. Hemmeld
ATTORNEY

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LUBRICATOR FOR PNEUMATICALLY OPERATED TOOLS

Joseph J. Shada, Grand Rapids, Mich., assignor to Nu Jett Products Corporation, Grand Rapids, Mich., a corporation of Michigan

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This invention relates to lubricators for pneumatic tools designed to introduce the lubricant into the air stream for the tool. More particularly, this invention relates to such a lubricator designed to regulate the quantity of lubricant introduced into the air stream.

Lubricators for pneumatic tools, both of the aspirating and of the wick type, are well known to the industry. However, present day lubricators are lacking in certain essential features. One of the disadvantages of these lubricators is the necessity for disassembling the entire unit to permit adjustment or regulation of the quantity of lubricant introduced into the air stream. Another disadvantage has been the necessity for restricting the diameter of the air passageway near the wick in order to reduce the pressure at the top of the wick. These lubricators have also been lacking in any suitable means for regulating the pressure in the vicinity of the top of the wick except by varying the position of the wick itself. The object of this lubricator is to eliminate these deficiencies.

The primary object of this invention is to provide a lubricator having a positive means to adjust the quantity of oil introduced into the air stream.

Another object of this invention is to provide an exterior adjustment means for adjusting the quantity of lubricant introduced into the air flowing through the air passageway for a pneumatic tool.

Still another object of this invention is to provide a means for adjusting the extent of the wick in the air passageway and at the same time adjusting the pressure near the top of the wick in order to regulate the quantity of lubricant introduced into the air stream.

A further object of this invention is to provide an exterior means for adjusting the length of the wick exposed to the tool's air stream.

Another object is to provide an exterior means for adjusting the pressure in the air stream near the top of the wick.

These and other objects and purposes of this invention will be readily seen by one acquainted with the design and construction of pneumatic tools upon reading the following specification in conjunction with the accompanying drawings wherein:

Fig. 1 is an exploded oblique view of the lubricator.

Fig. 2 is a central sectional elevational view of the lubricator.

Fig. 3 is a fragmentary, side elevational view of the top portion of the lubricator.

Briefly, this invention is concerned with a lubricator for pneumatic tools wherein the lubricant is introduced into the air supply stream in a form of a fine spray of mist. The lubricator of this invention includes a lubricant chamber which communicates with the lower end of a wick. The top end of the wick extends into the air passageway for the pneumatic tool. The wick is biased in one direction and a stop member is provided for adjusting the length of the wick projecting into the air

passageway. This is preferably accomplished by biasing the wick upwardly into the air passageway and providing an adjustable stop member extending downwardly and contacting the top end of the wick. Regulating the position of the stop member adjusts the extent of the wick into the air passageway. Preferably, the stop member is shaped so that it provides a means for causing the air flowing past it to have a greater velocity so as to create a lower pressure in the immediate vicinity of the top of the wick. This eliminates the need for providing a restricted air passageway near the wick. More specifically this invention includes a tube extending downwardly into the lubricant chamber. The wick is mounted for axial adjustment in the tube and a ring seal is provided between the interior of the tube and the wick. This ring seal normally prevents the lubricant from passing around the wick except when the wick is plugged up in which case the lubricant is allowed to flow past the seal and into the air stream.

In describing this invention the words "upper," "lower," "top" and "bottom" are used. The terms "upper" and "top" shall be taken to mean toward the top of the apparatus as shown in Figs. 1 or 2. By the same token, "lower" and "bottom" means toward the bottom of the apparatus. The "extent" of the wick in the passageway means the amount extending or projecting into such passageway.

Referring specifically to the drawings, Figs. 1 and 2 show the lubricator having a lubricant chamber or reservoir **1** (Fig. 2) formed by the head **10**, the cylindrical bowl **20**, and the base **50**. The head or cover **10** has a circular recess **17** in its bottom surface in which the O-ring **18** is nested. The base **50** has a similar shaped recess **52** in which the O-ring **53** is nested. The tubular bowl **20** fits into the recesses **17** and **52** and bears against the O-rings. The bowl **20** is held in place by the tube **30** secured to the head **10** and the base **50**. When secured firmly against the head **10** and the base **50** the bowl **20** is sealed thereto permitting the lubricant chamber **1** to retain a lubricant without leaking.

Extending horizontally through the head or cover **10** is an air passageway **11**. The passageway **11** is threaded on both ends to receive fittings which are part of the supply line for the tool with which the lubricator is used.

Extending vertically and axially through the center of the head **10** are the aligned lower bore **12** and upper bore **13**, both of which extend to and thus communicate with the air passageway **11**. The upper bore **13** is threaded at the top portion and has a reduced diameter at its lower portion **14**. The lower bore **12** is threaded at its lower portion and has a reduced diameter at its upper portion. The head **10** also has a lubricant filler opening **15** which is threaded at the top to receive the cap **70**. A breather port **16** (Fig. 1) extends from the bottom of the head (not shown) to the filler opening **15**. An aperture **19** is provided between the passageway **11** and the lubricant chamber **1**. This aperture communicates with the air passageway **11** at a stop remote from the wick **40**. Thus, it creates a greater pressure in the chamber **1** than is normally present in the vicinity of the wick **40** which extends into the air passageway **11**.

The tubular bowl **20** is fabricated from some type of plastic material or any other transparent material which will permit a visual indication of the quantity of lubricant in chamber **1**. The bowl must be sufficiently rigid to withstand the forces necessary to seal the joints between the bowl and the base **50** and head **10**.

The tube **30** has an upper threaded end **31** and a lower threaded end **32**. The top end is adapted to be secured in the bore **12** and the lower end in hole **51**. Thus, the interior of the tube **30** communicates with the air pas-

sageway **11**. Located in the tube **30** is the wick **40** which extends through the tube upwardly into the air passageway **11**. It is biased upwardly into the air passageway **11** by the spring **42** which is seated in the hole **51**. The wick may be fabricated of any suitable material so long as it will provide capillary action for the lubricant and at the same time is sufficiently rigid and hard to withstand the abrasive action of the air stream. Suitable wick materials include sintered glass or metal. Fibrous type wicks in some cases may work satisfactorily.

The tube **30** has an opening **33** permitting the lubricant to flow into the interior of the tube. The lubricant is prevented from passing around the wick **40** by the O-shaped sealing ring **41**. The ring **41** has a circular cross section and is preferably made of rubber or any other type of resilient material. This ring serves to center the wick in the tube **30** while at the same time normally preventing the oil from passing around the ring to the air passageway **11**. The exact function of the ring will be described in more detail in Operation.

Threadedly secured in the bore **13** of the head **10** is an adjustable stop element **60**. The element **60** includes a knob **61** attached to a stem **62**. Located intermediate the stem is the enlarged threaded portion **63** which engages the threads of the bore **13** and provides the means for axially adjusting the element **60**. At the lower end of the stem **62** there is attached or made integral therewith a cone shaped member **65** which is adapted to contact the top end of the wick **40**. The exact function of the cone shaped member **65** will be described in more detail in Operation.

The cap **70** having the knob **71** and the threaded end **72** is adapted to be screwed into the filler hole **15** to prevent lubricant from splashing or spilling out of chamber **1**.

Assembling of the lubricator

The assembling of the lubricator is very simple. The tube **30** is first threaded into the threaded hole **51** of the base **50**. Then the spring **42** is dropped into the hole through the tube **30** and the wick with the ring seal **41** thereon is inserted into the tube **30**. The cylindrical bowl **20** is then placed in the recess **52** directly on the O-ring **53**. The top threaded end **31** of the tube **30** is then threaded into the bore **12** until a tight joint is established between the top of the bowl **20** and the ring **18** and the bottom edge of the bowl **20** and the O-ring **53**. The adjustable stop member is then threaded into the upper bore **13** of the head **11**. The lubricant is poured into the filler hole **15** until the chamber **1** is substantially full. The cap **70** is then screwed into the opening **51** to prevent the lubricant from splashing or spilling out. The entire lubricator is then affixed in the supply line of the pneumatic tool with which the lubricator is to be used. The adjustable stop member is then adjusted to regulate the quantity of lubricant desired.

When the lubricator is entirely assembled, the opening **33** in the tube **30** is below the level of the lubricant. Thus the lubricant is permitted to pass into the inside of the tube and through the wick. Normally the ring seal **41** prevents the lubricant from passing about the wick. At the top of the unit the ring seal **64** on the adjustable stop member provides a seal between the reduced lower portion **14** of the bore **13** and the stem **62**. This prevent the air, flowing through the air passage **11**, from passing upwardly through the bore **13**. The O-rings **18** and **53** provide a liquid tight seal at the upper and lower ends of the bowl **20**.

The spring **41** biases the wick upwardly causing it to extend into the air passageway **11**. Cone shaped member **65** of the adjustable stop member **60** determines the position or the extent of the wick **42** into the air passageway **11**. Air from the passageway **11** is admitted to the chamber **1** by the aperture **19** in the bottom of the head **10**.

Operation

The lubricator of this invention operates primarily by capillary action caused by the pressure differential between the vicinity of the top of the wick and the air space in chamber **1**. The quantity of lubricant introduced into the air flowing through passageway **11** is determined by the difference in pressure at these two points and also the extent of the wick **40** in the passageway **11**.

When the adjustable stop member is screwed entirely down, the bottom edge of the cone shaped member **65** bears against the wall of the passageway **11** closing the top entrance to the bore **12**. In this position no lubricant is picked up by the air as it flows through the passageway **11**. Upon screwing the adjustable stop member upwardly, the spring **42** biases the wick **41** into the passageway **11**. This permits the lubricant passing through opening **33** and rising to the top of the wick to be introduced into the air as it flows through the passageway **11**.

The flow of the lubricant up the wick is caused by the difference between the pressure in the space surrounding the wick and the pressure on the top of the lubricant. The increase in the velocity of the air flowing by the cone shaped member **65** and the wick itself is increased because of the restricted cross-sectional area through which the air flows. This creates a lower pressure in the immediate vicinity of the top of the wick. Since the air space above the lubricant is in communication with the air passageway **11** at a spot remotely located from the top of the wick, the pressure on the top of the lubricant in the chamber **1** is greater than the pressure at the wick. Thus the lubricant is forced up the wick and into the air stream.

Fig. 3 shows a side elevational view of the air passageway. It illustrates the restricted portion of the passageway made possible by the adjustable stop member. This restriction in the passageway causes the air to flow at a greater velocity past the wick **40** resulting in a decrease in pressure. It should be obvious that upon adjusting the member **60** by turning the knob **61** the restriction and thus the velocity of the air passing through the passageway in the vicinity of the wick **40** can be varied. As a result, the quantity of oil evaporated into the air stream can be regulated by this means as well as by adjusting the amount of the wick exposed to the air stream.

The shape of the cone shaped member can be varied in accordance with the different requirements for pneumatic tools. The shape can be varied so that a greater restriction to the air flowing through the passageway **11** results when a small portion of the wick is exposed to the air. In such a case, a greater difference in pressure will result and there will be a greater pull on the lubricant resulting in a greater quantity of lubricant per unit area of exposed wick passing into the air stream. On the other hand, it may be desirable to shape the member **65** in such a manner that the greatest velocity is obtained when the wick is fully extended into the air passageway. This could be accomplished by extending the member **65** over and around the side of the wick leaving enough room for the air to pass therethrough. In the form shown the cone-shaped member **65** is tapered to compensate for the porosity of the wick and thus maintain the velocity and pressure in the passageway constant regardless of its position. It should be obvious that many different configurations of the member **65** can be made depending upon the requirements and the conditions for which the lubricator is to be used. In its broader aspect this invention applies to any and all such configurations wherein the restricted portion of the aperture **11** is created by a member other than the wick extending into the passageway, thereby avoiding the necessity of reducing the diameter of a portion of the air passageway.

It will be seen that this arrangement not only provides an exterior means for adjusting the differential

pressure but it also provides an exterior means for adjusting the position of the wick **40**. Heretofore, a satisfactory solution has not been found for making such exterior adjustments. With this lubricator, the adjustment is very simple. In this respect it should be noted that several equivalent structures could be used. For example, the adjustable stop member, if it is not to serve as a means for adjusting the velocity of the air through the passage, could be located in the base and the spring could be located in the head. In such a case, the spring would bias the wick out of the air passageway and this biasing means would be opposed by the adjustable stop member located in the base **50**. The biasing means in either arrangement could be located in different positions.

It should be understood that the exact arrangement is not necessary for practicing the broadest aspect of this invention. For example, the bores **13** and **12** need not be aligned. Conceivably, an adjustable member could be adjustably inserted through the side of the head at a 90° angle, or any other angle, to the bore **12**. Then the adjustable member would act as a cam to adjust the position of the wick. The arrangement shown, however, is the preferred arrangement and works most satisfactorily. It has many advantages over other conceivable types of adjustment means which fall within the broadest aspect of this invention.

Ring seal **41** serves several important functions. It centers the wick in the center of the tube **30**, thus permitting the lubricant to enter the wick from all sides and to pass evenly up to the top of the wick where it will be distributed evenly in the air stream. For this purpose any type spacer could be used. For example, a split ring serves the purpose very well. One difficulty experienced in the split ring is that in most type wicks the exterior diameter of the wick is very uneven, thus the seal between the ring and the wick is not as good. However, such type rings will work and serve the purpose of centering the wick in order to establish an even distribution of oil throughout the entire wick.

The ring **41** also provides a seal against the wick and the interior wall of the tube. This is another advantage of the type sealing ring shown which has a circular cross section and is made of resilient material such as rubber. This type ring, when the wick is adjusted, usually does not slide within the tube but rolls on the wick thus normally maintaining the seal between the members at all times. This rolling action eliminates friction between the seal and the tube **30** and the seal and wick **40**, thus permitting easier adjustment of the wick.

Although the ring does provide a seal under normal conditions, it has another advantage in allowing the lubricant to flow past it when the wick is plugged due to paraffin deposits or otherwise. When the wick becomes plugged the pressure is much greater above the lubricant than the pressure in the vicinity of the end of the wick. Thus, the lubricant will be pushed past the ring because of the resiliency of the ring and also the looseness of the fit. This result can be obtained with other type rings previously discussed. It should be noted, however, that the preferred ring shown works more effectively in normally preventing the escape of liquid past the seal.

Having described my invention it should be understood that several modifications can be made and other embodiments constructed without departing from the scope of the invention. Several details have been described which are not a necessary part of this invention. The scope and the spirit of this invention should only be interpreted and determined in accordance with the following claims. Any limitations of details described herein shall not be considered limiting unless expressly set forth in the appended claims.

I claim:

1. In a lubricator for pneumatically operated tools, the combination comprising: a lubricant supply chamber; a housing secured to said chamber; an air passageway in said housing; a first bore between said passageway and said chamber; a tube secured in said bore and extending into said chamber below the level of the lubricant; the interior of said tube communicating with said chamber; a wick adjustably mounted in said tube and extending into said passageway; biasing means urging said wick into said passageway; a second bore in said housing extending from the exterior thereof to said passageway; an exteriorly adjustable member mounted in said bore for opposing said biasing means whereby the extent of said wick in said passageway can be varied; and a movable sealing ring located between the interior wall of said tube and said wick facilitating the easy movement of said wick by said biasing means in said tube and permitting by-pass of lubricant when said wick is plugged.

2. The lubricator defined in claim 1 in which the sealing ring has a circular cross section.

3. In a lubricator for pneumatically operated tools, the combination comprising: a lubricant supply chamber; a housing secured to said chamber; an air passageway in said housing; a first bore between said passageway and said chamber; a tube secured in said bore and extending into said chamber below the level of the lubricant; the interior of said tube communicating with said chamber; a rigid wick adjustably mounted in said tube and extending into said passageway; biasing means urging said wick into said passageway; a second bore in said housing opposite to and aligned with said first bore; an exteriorly axially adjustable member in said bore for opposing said biasing means whereby the extent of said wick in said passageway can be varied; and a movable sealing ring located between the interior wall of said tube and said wick facilitating the easy movement of said wick by said biasing means in said tube and permitting by-pass of lubricant when said wick is plugged.

4. The lubricator defined in claim 3 in which the sealing ring has a circular cross section.

5. In a lubricator for pneumatically operated tools, the combination comprising: a lubricant supply chamber; a housing secured to said chamber; an air passageway in said housing; a bore between said passageway and said chamber; a tube secured in said bore and extending into said chamber below the level of the lubricant; the interior of said tube communicating with said chamber; a rigid wick adjustably mounted in said tube and extending into said passageway; a sealing ring located between the interior wall of said tube and said wick and movable with said wick when adjusted, facilitating the easy movement of said wick in said tube and permitting by-pass of lubricant when said wick is plugged; and exteriorly adjustable means for regulating the extent of said wick in said passageway.

6. The lubricator defined in claim 5 in which the sealing ring has a circular cross section thereby being capable of rolling on said wick.

7. In a lubricator for pneumatically operated tools, the combination comprising: a lubricant supply chamber; a housing secured to said chamber; an air passageway in said housing; a first bore between said passageway and said chamber; a tube secured in said bore and extending into said chamber below the level of the lubricant; the interior of said tube communicating with said chamber; a rigid wick adjustably mounted in said tube and extending into said passageway; a second bore in said housing opposite to and aligned with said first bore; and a cone-shaped member axially adjustable in said second bore and engaging said wick for adjusting the extent of said wick in said passageway; said cone-shaped member being tapered in a direction away from the top end of said wick to compensate for the porosity of the wick so that velocity of the air passing through said passageway is maintained substantially constant.

8. In a lubricator for pneumatically operated tools, the combination comprising: a lubricant supply chamber; a housing secured to said chamber; an air passageway in

said housing; a first bore between said passageway and said chamber; a tube secured in said bore and extending into said chamber below the level of the lubricant; the interior of said tube communicating with said chamber; a rigid wick adjustably mounted in said tube and extending into said passageway; biasing means urging said wick into said passageway; a second bore in said housing extending from the exterior thereof to said passageway; a cone-shaped member axially adjustable in said second bore and engaging said wick for adjusting the extent of said wick in said passageway; said cone-shaped member being tapered in a direction away from the top end of said wick to compensate for the porosity of the wick so that velocity of the air passing through said passageway is maintained substantially constant; and a movable sealing ring located between the interior wall of said tube and said wick.

References Cited in the file of this patent

UNITED STATES PATENTS

41,174	Bollinger	Jan. 5, 1864
1,504,341	Hansen	Aug. 12, 1924
2,439,910	Snyder	Apr. 20, 1948
2,680,496	Johnson	June 8, 1954
2,735,512	Faust	Feb. 21, 1956
2,767,807	Booth	Oct. 23, 1956