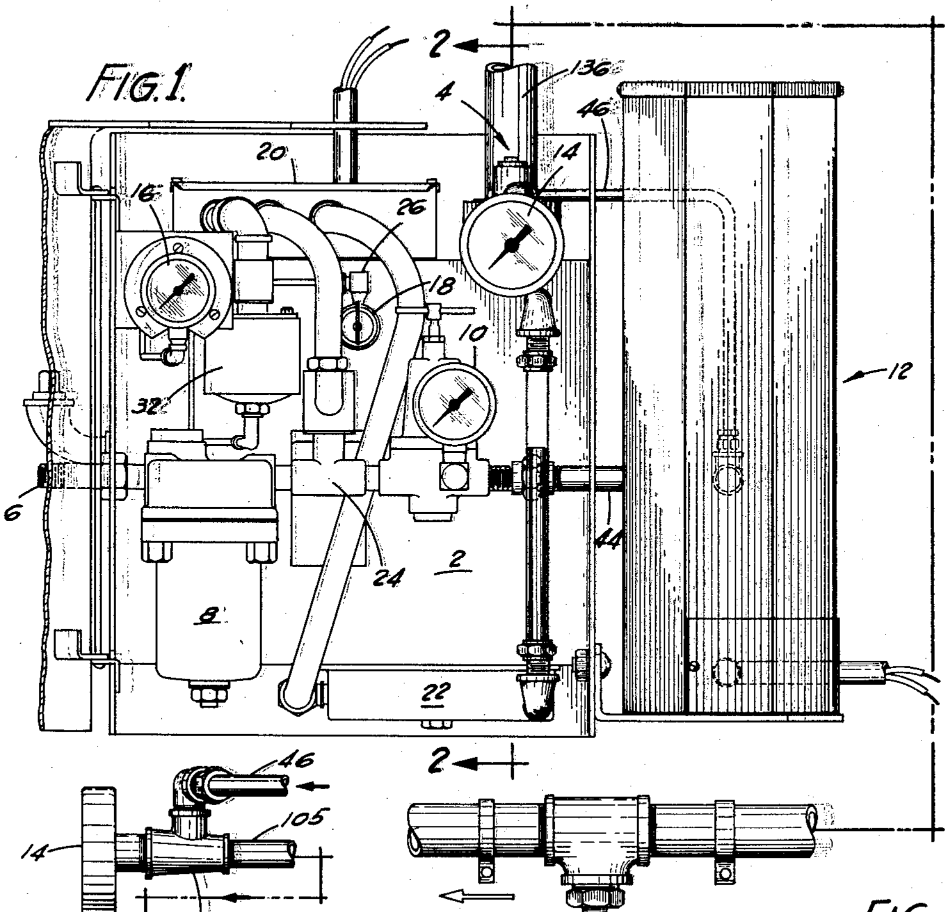
June 29, 1965 P. N. HAYWOOD 3,191,718

METHOD AND APPARATUS FOR GENERATING OIL MIST

Original Filed Oct. 21, 1960 2 Sheets-Sheet 1

FIG. 1.



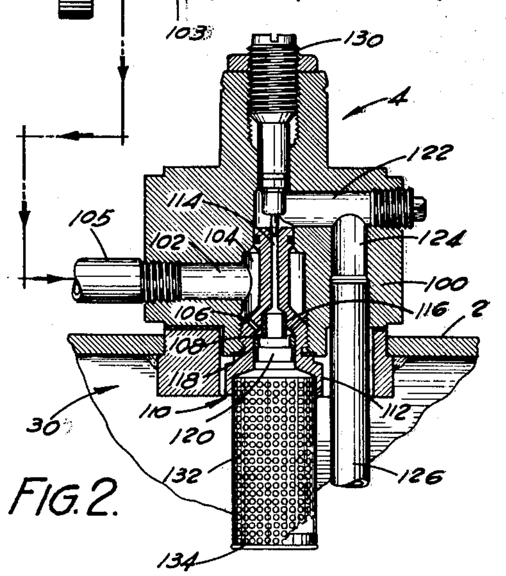
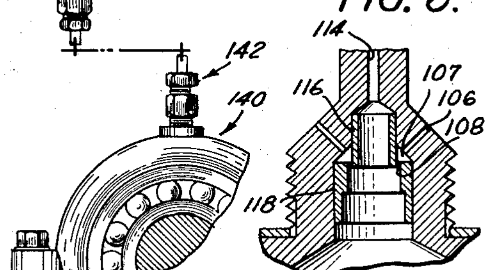


FIG. 2.

FIG. 6.



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METHOD AND APPARATUS FOR GENERATING OIL MIST

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FIG. 3.

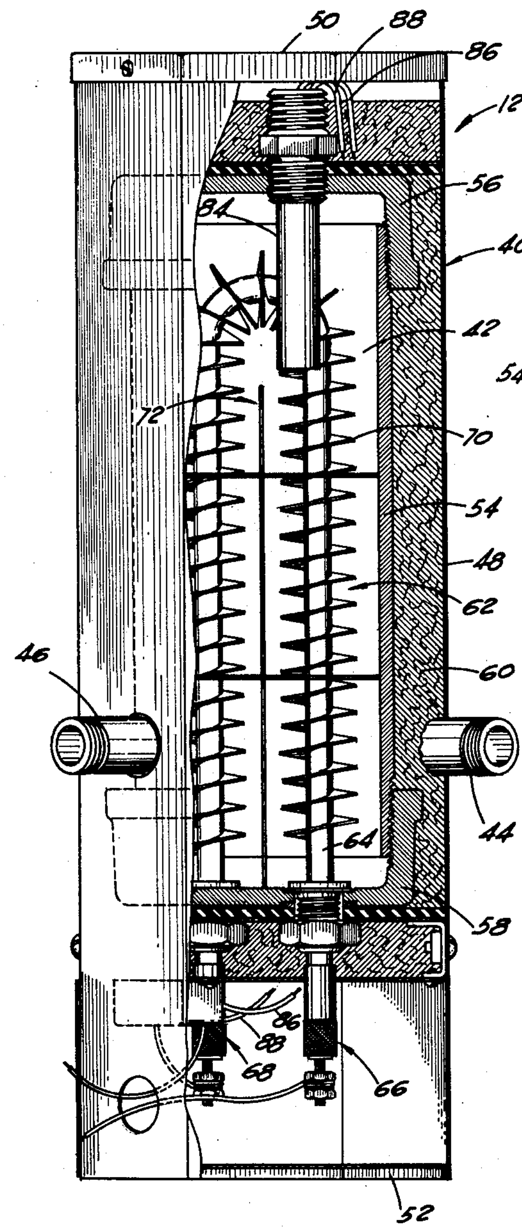


FIG. 4.

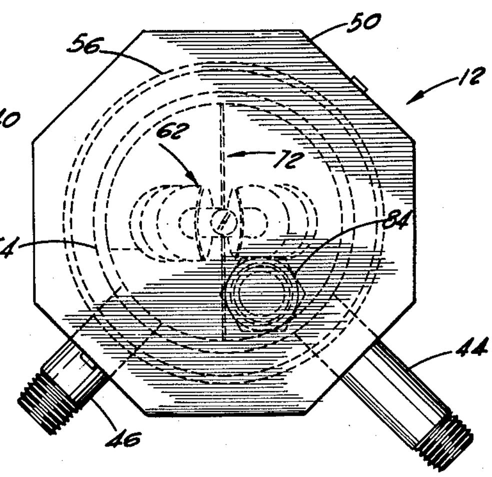
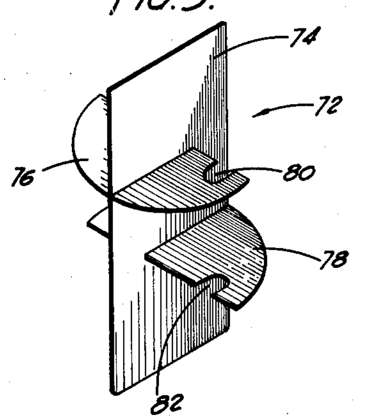


FIG. 5.



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METHOD AND APPARATUS FOR GENERATING OIL MIST

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Continuation of application Ser. No. 65,250, Oct. 21, 1960. This application July 8, 1963, Ser. No. 293,514
12 Claims. (Cl. 184—1)

This is a continuation of application Serial No. 65,250, filed October 21, 1960, now abandoned which was a continuation-in-part of application Serial No. 850,277, filed November 2, 1959, now abandoned, for Improved Method and Apparatus for Generating Oil Mist.

This invention relates to an improved method and means for generating substantially richer oil mist aerosols and for generating commercially practicable oil mist aerosols from highly viscous oils. The term oil as herein used in intended to include all mistable lubricant formulations.

So far as is known, no commercially acceptable method or apparatus to date has been capable of misting the highly viscous oils, for example those having viscosities in the order of 1000 S.U.S at 100° F. to viscosities in the order of 75000 S.U.S. at 100° F. or higher. For simplicity of description hereinafter, these viscosity values will be referred to as 1000 seconds, 75000 seconds, etc. Misting of 1000 second oils was not satisfactory since at best only small flow rates could be obtained. The practical upper limits for aerosol generation have been in the order of 600–700 second oils.

The method and apparatus of this invention are also capable of misting oils which are so viscous that they are difficult to be measured by the Saybolt Universal Viscosimeter test. Accordingly, these high viscosity limits are sometimes expressed as having a penetrometer reading equivalent to a N.L.G.I. (National Lubricating Grease Institute) consistency number. For example, the techniques hereinafter described are capable of misting oils whose penetration number as measured by ASTM D217–60T is 310 or higher. Such an oil would have a Saybolt viscosity reading ranging from about 250,000 to about 450,000 seconds at 100° F.

Although throughout this specification it is stated that the techniques herein described are suitable for misting oils, it should be clearly understood that this invention may satisfactorily mist any lubricant which would previously be misted by prior art techniques, excepting, however, the limits as to viscosity previously existing have been greatly extended.

In many widely varying industrial applications, the use of more viscous oils is either desirable or necessary. For example, large gears with diameters as high as 3′, 10′ and 15′, roller bearings supporting shafts with diameters as high as 30″, and large plain bearing surfaces are lubricated almost exclusively with the more viscous oils. These lubricants are often applied manually. In some instances the lubricants are heated to temperatures in the order of 90° F. to provide sufficient fluidity to permit the manual application of the lubricant to surfaces by brushing or the like. The situation has existed for many decades and is well recognized by industrial maintenance men and by the suppliers of lubricants.

Automatic centralized lubrication systems have made only slight inroads in the area of viscous oil use over the past 18 years. This is explained in detail in the October 1959, issue of Lubrication Engineering at page 398. Even the most recently introduced centralized system has found only limited use because of its complexity, its high cost and its tendency to be unreliable. Even in its limited

area of use, it has not been considered to be too desirable. This equipment requires highly skilled installation and maintenance with frequent inspections and complex timing adjustments. In addition, it must be remembered that any failure of the system may within a few minutes result in the destruction of a gear train of unusually high cost.

However, in spite of its many disadvantages, this automatic system has found limited use because of the inadequacies of the manual method of application. Perhaps the most serious disadvantages of the manual method is the high labor cost due to slowness of application and the requirement of frequent application. Manual application often requires shutting down of the equipment merely for the purpose of lubrication, thereby resulting in an obvious manufacturing inefficiency.

For several decades the use and advantages of oil mist lubricating systems in certain areas have been recognized. One of the chief advantages of a mist lubricating system is the ability to continuously apply lubricant to the required surfaces. This results in the ability to obtain at all times an optimum lubricant film which is more desirable than an insufficient film at all times, an excessive film at all times, or a periodic cycle of excessive and insufficient films. A second important advantage is the minimizing of operational costs as a result of the use of minimum amounts of lubricant and minimum maintenance.

So far as is known, no commercially successful oil mist system has ever been used for the misting of the highly viscous oils. An obvious approach would seem to be to heat the lubricant to a temperature higher than normal ambient temperatures in order to reduce the viscosity of the viscous oil and perhaps to thereby permit suitable misting. However, this approach has always resulted in failure and in abandoned experiments.

One obvious problem is the inability to heat the lubricant at will to any temperature because of the danger of the lubricant breakdown or deterioration. Not only must the average temperature of the entire mass of lubricant be maintained below temperatures at which its stability is endangered but also localized portions of the lubricant must be maintained below critical temperatures. Electrical heating elements appear to provide the only practical approach to lubricant heating. It is appreciated that these heating elements produce high temperatures at and adjacent to the heating element. In the prior art systems in which the less viscous oils are misted, electrical heating elements have been utilized with power inputs sufficient to heat the lubricant and to maintain average temperatures in the order of approximately 90° F. In these systems, it has been possible therefore to provide heat without endangering the stability of the lubricant.

However, similarly raising the temperatures of the more viscous oils to temperatures in the order of approximately 90° does not result in a commercially practicable system. Quantities of lubricant delivered are so small as to be negligible. It is in this regard that the second stumbling block has, so far as is known, always resulted in abandoment of experiments to satisfactorily mist the more viscous oils. This can be appreciated by reference to tests made with a typical viscous oil, Meropa No. 8, refined and sold by Texaco Inc. This oil has a viscosity of about 18000 seconds at 100° F. In a series of experiments which eventually terminated in abandonment, it was observed that raising the average temperature of the lubricant to values in the order of 210° F. resulted in oil consumption in the order of $\frac{1}{10}$ ounce per hour with a high capacity mist generator operating in 80° ambient environment.

A delivery such as this does not even begin to approach the requirements of a commercially practical system. The commercial apparatus used in the tests was designed for lubricant deliveries in the order of 6 ounces per hour.

Accordingly, it is a primary object of the present invention to provide an improved method and means for generating an aerosol with lubricant particles of a viscous oil. In one embodiment of the present invention, this object is achieved by heating air to a temperature in the order of 200° to 300° F. adjacent the air inlet to the aerosol generator. It has been found that heating the air to higher temperature of the order indicated above results in flow rates of Meropa No. 8 oil in the order of 2 ounces per hour to 7 ounces per hour. It is now possible to mist 5 ounces per hour of 75000 second oils such as Meropa No. 10 by heating the air and oil to temperatures in the order of 300° F.

It has been found that heating of the oil in the reservoir by separate heating means is not required except perhaps where a faster warm-up period is desired or where the system is operated in a very low temperature environment. Auxiliary heating of the oil merely shortens the time required to enable the oil to flow to the mist generator.

It is another object of the present invention to provide an improved method for misting less viscous oil. It has been found that by heating the air to high temperatures sufficiently below the critical temperatures at which the stability of the oil might be endangered, it has been possible to achieve lubricant delivery rates in a given mist generator in the order of 8 times its rated capacity. The phenomenal capabilities of this new method have for various reasons been overlooked by those experienced in the art.

It is another object of the present invention to improve the misting of oils having viscosities ranging up to 5600 S.U.S. at 100° F. As is hereinafter set forth, these less viscous oils are herein misted by heating the air applied to an oil mist generator to a temperature in the range of about 150° F. to the flash point of the oil to be misted. In the event a substantial increase in oil mist output is required, the upper temperature limit may be extended past the flash point to a temperature slightly less than the breakdown temperature of the oil at which chemical decomposition will occur which will have deleterious effects on the lubricant quality of the oil.

Another object of this invention is to mist extremely viscous oils and mistable lubricants having viscosities extending up to a penetrometer reading equivalent of an N.L.G.I. No. 1 grease or approximately 450,000 Saybolt seconds at 100° F. In the event the more viscous lubricants are to be misted the heated air supplied to an oil mist generator as hereinafter set forth must be increased to a minimum temperature of approximately 250° F. The maximum temperature is again defined by the flash point or the breakdown temperature as hereinbefore set forth.

Other objects and the various features of the invention will be evident upon a persual of the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a front elevation view of the improved apparatus;

FIG. 2 is a sectional elevation view of the mist generating apparatus;

FIG. 3 is a side elevation view partially in section of the air heater;

FIG. 4 is a plan view of the air heater;

FIG. 5 is a perspective view of a portion of the air heater; and

FIG. 6 is an enlarged view of the oil mist generating assembly shown in FIG. 2.

Briefly, the improved apparatus comprises a sealed lubricant reservoir **2**, a mist generator **4** secured at the top of the reservoir **2**, an air supply line **6**, a water separator **8**, an air pressure regulator **10**, a heater **12**, a temperature gauge **14** for measuring the temperature of air heated by the heater **12** and a pressure gauge **16** for measuring the pressure of the oil mist at the top of the reservoir **2**. A safety valve **18** is provided for venting the upper end of the chamber **2** in the event that the pressure becomes unduly high. A conventional thermostatic switch assembly **20** is provided for controlling the supply of energy to an electrical heater **22** which is utilized if desired, for fast warm-up to maintain a desired lubricant temperature in the reservoir **2**. The desired lubricant temperature is generally selected at about that temperature which fluid flow of the oil in the reservoir **2** will occur.

A solenoid valve **24** which may be operated manually or by a timer (not shown) controls the passage of air through the system. Air passes from a high pressure compressor source (not shown) through the line **6**, the water separator **8**, solenoid valve **24**, pressure regulator **10** and heater **12** and into the mist generator **4**. The water separator **8** separates moisture from the air stream in a well known manner. The heater **12** raises the temperature of the air for purposes to be described in detail later.

A 90° elbow **26** connects the chamber **30** at the upper end of the reservoir **2** to the pressure safety valve **18**, to the pressure indicating gauge **16**, and to a solenoid switch **32**. The switch **32** operates contacts to open the operating circuit of the solenoid valve **24** to close the valve in the event that the mist pressure in the chamber **30** is above a predetermined maximum value.

The heater **12** comprises a body assembly **40** defining an internal chamber **42** having an air inlet **44** and an air outlet **46**. The body assembly comprises an outer shell **48** with head portions **50** and **52** and an inner shell **54** with head portions **56** and **58**. A layer of insulating material **60** surrounds the inner shell.

The inner shell **54** supports a heat exchange structure **62**. The heat exchange structure comprises a generally U-shaped electrical heater element **64** having terminal assemblies **66** and **68**. A helical heat exchange surface area **70** extends along substantially the entire surface of the heater element **64**. A baffle structure **72** best shown in FIG. 5 includes a central wall **74** extending from the head portion **58** through a substantial portion of the chamber **42**. A pair of generally semi-circular transverse walls **76** and **78** are secured to the central wall **74**, for example by welding.

The wall portions **76** and **78** include apertures **80** and **82** for receiving and supporting the heating element **64**. The wall portions **76** and **78** extend across only about two-thirds of the central wall portion **74** to permit air flow around the various baffles in a tortuous winding path for optimum absorption of heat from the element **64**.

A thermostatic safety switch **84** is carried by the head portion **56** for preventing air temperatures above a predetermined maximum value. The switch **84** includes contacts (not shown) which normally electrically connect conductors **86** and **88** which are in the circuit of the heater element **64**. These contacts open the circuit when the maximum temperature is exceeded.

The mist generator **4** (FIG. 2) includes a body portion **100**. The air outlet conduit **46** from the heater **12** is connected to an air inlet **102** of the mist generator by way of a T connector **103** and conduit **105**. The temperature gauge **14** is also connected to the connector **103**.

Air from the inlet **102** enters a chamber **104** and passes through circumferentially spaced apertures **106** into a second annular chamber **107**. A mist generating assembly **110** includes a body portion **112** secured to the body **100** within the chamber **104** sealing both ends of the chamber. The body portion **112** includes a central bore or oil passage **114** and a counterbore receiving a tubular element **116** therein. The element **116** is spaced a slight distance readily inwardly from a second annular element **118** received in a second counterbore in the body portion 112. This spacing provides a restricted annular venturi passageway 108 for the air from the chamber 107 to the enlarged chamber 120 which increases the velocity of the air passing therethrough.

Air passing into the chamber 120 through passageway 108 produces by venturi action an area of low pressure within the element 116 serving as the venturi throat. The space in the element 116 is connected in fluid conducting relation to a lower portion of the reservoir 2 by way of the bore 114, bores 122 and 124, and an oil lift tube 126. The slightly superatmospheric pressure at the upper end of the reservoir space 30 acting on the oil and the area of reduced pressure in the element 116 result in a pressure differential urging oil upwardly through the tube 126 into the element 116 for admixture with the incoming air in the chamber 120 in a well known manner. As previously described the heated air enters the chamber 104 and surrounds the body portion 112 through which the oil passage extends. Heat passes from the air through the body portion 112 to the oil passing through passage 114 to raise the temperature of the oil to its aerosolization point. The aerosilization point is the temperature at which the viscosity of the oil is low enough to permit aerosolization. An adjusting needle valve 130 regulates the rate of oil flow through the element 116 in a well known manner.

The increased velocity air impinges on the oil entering the admixing chamber 120 through passage 114 to break it into minute particles to form the aerosol. The resulting oil mist enters a baffle 132 and passes through apertures 134 therein into the space 30 in the upper end of the reservoir 2. The baffle 132 condenses heavy oil globules entrained in the mist and permits the oil thus condensed to flow through the lowermost apertures 134 into the reservoir 2. An additional baffle plate (not shown) may be interposed between the baffle 132 and an aerosol outlet 136.

The aerosol outlet conduit 136 is connected to a plurality of bearing surfaces such as 140. Flow regulating fittings such as 142 are transposed between the conduit 136 and the bearing surfaces 140.

The operation of the improved apparatus will now be described in detail. An air compressor (not shown) supplies air at a high pressure to the water separator 8 by way of conduits 6. Moisture in the air is removed in a well known manner by the separator 8. The air then passes to the solenoid valve 24. As indicated earlier the solenoid valve is opened either manually or by time clock means.

The high pressure air passes through the open valve 24 to the air pressure regulator 10. The air is permitted to flow through the conduit 44 at a pressure predetermined by the regulator. The air passes through the heater 12 and thence to the outlet conduit 46 at a predetermined temperature. The air is applied to the inlet 102 of the mist generator 4 and thence passes through the mist generating structure 112 to entrain particles of oil in the air stream.

The heavy particles of oil are condensed from the aerosol stream by the baffle 132 and the aerosol passes into the chamber 30. From the chamber 30, the aerosol travels through the conduit 136 for application to the various surfaces to be lubricated. Various types of fittings 142 may be used for application of the oil to the surface in mist form, in spray form, or in liquid form.

In the event that the temperature of the air passing through the heater 12 exceeds the predetermined maximum value, the thermostat 84 will deenergize the heating element 64. In a typical system, the thermostat 84 will operate cyclically to cause corresponding cyclical energization and deenergization of the heating element 64 for maintenance of a desired average temperature.

In the event that the aerosol pressure in the chamber 30 becomes unduly high, the pressure will be vented by the safety valve 18 and the solenoid switch 32 will operate to close the solenoid valve 24.

The oil heater 22 will be cyclically energized and deenergized by the switch assembly 20 to maintain a relatively constant desired oil temperature. As indicated above, there will be many applications which will not require the utilization of the oil heater 22. Also the heater must not cause excessively high localized oil temperatures.

While there have been described what are at present believed to be the preferred embodiments of the invention, it will be understood that various changes and modifications may be made therein; and it is contemplated to cover in the appended claims all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a lubrication system; apparatus for creating an aerosol with lubricating oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F. comprising a reservoir for the oil; means defining an admixing chamber; means defining a passage for said oil from said reservoir to said admixing chamber; a heater adapted for connection to an air source for heating air to a temperature in the range of about 200° F. to 300° F.; means including said air for forcing oil from said reservoir through said passage to said admixing chamber; means including said heated air for heating said oil while passing through said passage from said reservoir to said admixing chamber; means including said heated air for breaking up the oil in said admixing chamber into minute particles to form the aerosol; the energy for forcing the oil from the reservoir to said admixing chamber, for raising the temperature of the oil from its reservoir temperature to its temperature point of aerosolization and for breaking up the oil into minute particles being furnished solely by said air; and means for removing non-suspended oil particles from the aerosol and returning the removed oil particles to the oil reservoir.

2. In a lubrication system; apparatus for creating an aerosol with lubricating oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F. comprising a reservoir for the oil; means defining an admixing chamber; means defining a passage for said oil from said reservoir to said admixing chamber; a heater adapted for connection with an air source for heating air to a temperature of about 150° F. and greater but less than the breakdown temperature of the oil at which chemical decomposition will occur, the lower viscosities requiring the lower temperatures and vice versa; means including said air for forcing oil from said reservoir through said passage to said admixing chamber; means including said heated air for heating said oil while passing from said reservoir to said admixing chamber; means including said heated air for breaking up the oil into minute particles to form the aerosol; the energy for forcing the oil from the reservoir to said admixing chamber, for raising the temperature of the oil from its reservoir temperature to its temperature point of aerosolization and for breaking up the oil into minute particles being furnished solely by the heated air; and means for removing non-suspended oil particles from the areosol and returning the removed oil particles to the oil reservoir.

3. In a lubrication system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F. comprising a reservoir for the oil; means defining an admixing chamber; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for transporting oil from said reservoir to said oil passage; a heater adapted for connection with an air source for heating air to a temperature in the range of about 200° F. to 300° F.; means including said body portion for heating said oil in said oil passage with said heated air; a venturi in communication with said oil heating means and adjacent said oil inlet to said admixing chamber for drawing oil from said reservoir through said passage into said admixing chamber and for passing heated air into said admixing chamber to break up said oil into minute particles to create an aero-

sol; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heated air; and means for removing non-suspended oil particles from the areosol and returning said particles to said reservoir.

4. In a lubricating system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F., comprising a reservoir for the oil; means defining an admixing chamber; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for transporting oil from said reservoir to said oil passage; a heater adapted for connection to an air source for heating air to a temperature of 150° F. or greater, but less than the breakdown temperature of the oil at which chemical decomposition due to excessive heat will occur, the lower viscosity oil requiring the lower temperatures and vice versa; means including said body portion for heating said oil in said passage with said heated air; a venturi in communication with said oil heating means and adjacent said oil inlet to said admixing chamber for drawing oil from said reservoir through said passage into said admixing chamber and for passing heated air into said admixing chamber to break up said oil into minute particles to create an aerosol; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heated air; and means for removing non-suspended oil particles from the aerosol and returning said particles to said reservoir.

5. In a lubricating system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F. comprising a reservoir for the oil; means defining an admixing chamber; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for transporting oil from said reservoir to said oil passage; a heater adapted for connection to an air source for heating air to a temperature in the range of about 200° F. to 300° F.; means defining another chamber surrounding said body portion for passing heated air thereabout to heat the oil passing through the oil passage therein to its temperature point of aerosolization; a restricted passage between said other chamber and said admixing chamber for passing high velocity heated air to said admixing chamber; said heated air passage surrounding said oil inlet for drawing oil by venturi effect from said reservoir through said conduit means and body portion into said admixing chamber; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heat and velocity of the air; and means for removing non-suspended oil particles from the aerosol and returning said particles to said reservoir.

6. In a lubricating system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F. comprising a reservoir for the oil; means defining an admixing chamber; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for transporting oil from said reservoir to said oil passage; a heater adapted for connection with an air source for heating air to a temperature of about 150° F. or greater, but less than the breakdown temperature of the oil at which chemical decomposition due to excessive heat will occur, the lower viscosity oil requiring the lower temperatures and vice versa; means defining another chamber surrounding said body portion for passing heated air thereabout to heat the oil passing through the oil passage therein to its temperature point of aerosolization; a restricted passage between said other chamber and said admixing chamber for passing high velocity heated air to said admixing chamber; said heated air passage surrounding said oil inlet for drawing oil by venturi effect from said reservoir through said conduit means and said body portion into said admixing chamber; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heat and velocity of the air; and means for removing non-suspended oil particles from the aerosol and returning said particles to said reservoir.

7. In a lubricating system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F. comprising a sealed reservoir partially filled with oil; means defining an admixing chamber in direct communication with the space above the oil in said reservoir; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for flowing oil from the reservoir to said oil passage; a heater for heating the oil in the reservoir during relatively cold ambient conditions to about the minimum temperature required to product fluid flow of the oil through the conduit means; a heater adapted for connection with an air source for heating air to a temperature in the range of about 200° F. to 300° F.; means defining another chamber surrounding said body portion for passing heated air thereabout to heat the oil passing through the oil passage therein to its temperature point of aerosolization; a restricted passage between said other chamber and said admixing chamber for passing high velocity heated air to said admixing chamber and into said reservoir; said heated air passage surrounding said oil inlet for drawing oil by venturi effect from said reservoir through said conduit means and body portion into said admixing chamber; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heat and velocity of the air; and means for removing non-suspended oil particles from the aerosol and returning said particles to said reservoir.

8. In a lubricating system; apparatus for producing an aerosol with lubricating oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F. comprising a sealed reservoir partially filled with oil; means for heating the oil in the reservoir during relatively cold ambient conditions to about the minimum temperature required to produce fluid flow of the oil; means defining an admixing chamber in direct communication with the space above the oil in said reservoir; a body portion defining an oil passage and an oil inlet to said admixing chamber; conduit means for transporting oil from said reservoir to said oil passage; a heater adapted for connection with an air source for heating air to a temperature of about 150° F. or greater, but less than the breakdown temperature of the oil at which chemical decomposition due to excessive heat will occur, the lower viscosity oil requiring the lower temperatures and vice versa; means defining another chamber surrounding said body portion for passing heated air thereabout to heat the oil passing through the oil passage therein to its temperature point of aerosolization; a restricted passage between said other chamber and said admixing chamber for passing high velocity heated air to said admixing chamber and into said reservoir; said heated air passage surrounding said oil inlet for drawing oil by venturi effect from said reservoir through said conduit means and said body portion into said admixing chamber; the energy for drawing the oil from said reservoir to said admixing chamber, for heating the oil from its reservoir temperature to its temperature of aerosolization and for breaking up the oil into minute particles being provided by the heat and velocity of the air; and means for removing non-suspended oil particles from the aerosol and returning said particles to said reservoir.

9. In a method of lubricating with an aerosol of oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F.; comprising the steps of heating air to a temperature in the range of about 200° F. to 300° F.; increasing the velocity of said heated air by a restricted air passage; drawing oil from a reservoir to the inlet of an admixing chamber by means of the venturi effect of increasing the velocity of said heated air; raising the temperature of said oil from its reservoir temperature to its temperature of aerosolization as it passes to the oil inlet by means of said heated air; admixing said heated oil with said increased velocity heated air in the admixing chamber to break up the oil into minute particles and create an aerosol; the energy for drawing the oil from the reservoir to the admixing chamber, for raising the temperature of the oil fom its reservoir temperature to its aerosolization temperature and for breaking up the oil into minute particles being provided completely by the heat and the velocity of the air; removing the non-suspended oil particles from the aerosol; and returning the particles to the reservoir.

10. In a method of lubricating with an aerosol of oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F., comprising the steps of heating air to a temperature of about 150° F. and greater, but less than the breakdown temperature of the oil at which chemical decomposition due to excessive heat will occur, the lower viscosity oil requiring the lower temperatures and vice versa; increasing the velocity of said heated air by a restricted air passage; drawing oil from a reservoir to the inlet of an admixing chamber by means of the venturi effect of increasing the velocity of said heated air; raising the temperature of said oil from its reservoir temperature to its temperature of aerosolization as it passes to the oil inlet by means of said heated air; admixing said heated oil with said increased velocity heated air in the admixing chamber to break up the oil into minute particles and create an aerosol; the energy for drawing the oil from the reservoir to the admixing chamber, for raising the temperature of the oil from its reservoir temperature to its aerosolization temperature and for breaking up the oil into minute particles being provided completely by the heat and the velocity of the air; removing the non-suspended oil particles from the aerosol; and returning the particles to the reservoir.

11. The method of lubricating with an aerosol of oil having a viscosity in the range of 1,000 to 75,000 SSU at 100° F.; comprising the steps of heating the oil in a reservoir during relatively cold ambient conditions to about the minimum temperature required to produce fluid flow of the oil; heating air to a temperature in the range of about 200° F. to 300° F.; increasing the velocity of said heated air by a restricted air passage; drawing oil from the reservoir to the inlet of an admixing chamber by means of the venturi effect of increasing the velocity of said heated air; raising the temperature of said oil from

its reservoir temperature to its temperature of aerosolization as it passes to the oil inlet by means of said heated air; admixing said heated oil with said increased velocity heated air in the admixing chamber to break up the oil into minute particles and create an aerosol; the energy for drawing the oil from the reservoir to the admixing chamber, for raising the temperature of the oil from its reservoir temperature to its aerosolization temperature and for breaking up the oil into minute particles being provided completely by the heat and the velocity of the air; removing the non-suspended oil particles from the aerosol; and returning the particles to the reservoir.

12. In a method of lubricating with an aerosol of oil having a viscosity in the range of 1,000 to 450,000 SSU at 100° F.; comprising the steps of heating the oil in a reservoir with an oil heater during relatively cold ambient conditions to about the minimum temperature required to provide fluid flow of said oil; heating air to a temperature of about 150° F. and greater, but less than the breakdown of the oil at which chemical decomposition due to excessive heat will occur, the lower viscosity oil requiring the lower temperatures and vice versa; increasing the velocity of said heated air by a restricted air passage; drawing oil from the reservoir to the inlet of an admixing chamber by means of the venturi effect of increasing the velocity of said heated air; raising the temperature of said oil from its reservoir temperature to its temperature of aerosolization as it passes to the oil inlet by means of said heated air; admixing said heated oil with said increased velocity heated air in the admixing chamber to break up the oil into minute particles and create an aerosol; the energy for drawing the oil from the reservoir to the admixing chamber for raising the temperature of the oil from its reservoir temperature to its aerosolization temperature and for breaking up the oil into minute particles being provided completely by the heat and the velocity of the air; removing the non-suspended oil particles from the aerosol; and returning the particles to the reservoir.

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