PRECISION NON-CONTAMINATION OILER

The present application is a divisional application filed pursuant to 35 U.S.C. §§120 and 121 and claims the benefits of prior application Ser. No. 09/518,170 filed Mar. 2, 2000, now U.S. Pat. No. 6,390,241, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

The invention relates to lubricating machines for lubricating an o-ring on a fuel injector.

BACKGROUND OF THE INVENTION

After manufacture, fuel injectors are tested on a test line to ensure that they have been properly manufactured. Prior to leak testing, a manual spraying of a test fluid onto the top of an injector o-ring lubricates the o-ring. However, some of the lubricating fluid tends to drain through orifice openings in the injector, contaminating the injector. Additionally, a typical prior art spraying device is a manual sprayer, requiring manual labor to apply the test fluid to the o-ring. Since the test fluid is applied in a spray, volatile organic compound emissions would be generated, causing potential health hazards to the person applying the spray.

Due to the manual nature of lubricating the o-ring and the physical mess generated by the spray, not every injector is sprayed prior to leak testing. This lack of lubrication allows some injectors to give false failure readings from the test stand, resulting in good injectors being discarded.

It would be beneficial to develop an apparatus for which automatically lubricates the o-ring on each injector without the need for manual application and which does not contaminate the interior of the injector with lubricating oil.

SUMMARY OF THE INVENTION

The present invention is an apparatus for lubricating a surface. The apparatus comprises a cylinder having an interior wall extending longitudinally therethrough. The wall defines an opening. The apparatus also comprises a lubricating fluid reservoir located upstream from the opening and at least one path communicating the reservoir and the opening. The apparatus also includes a valve located in the at least one path. The valve is operable between a closed position and an open position. The valve is biased to the closed position to close the path. At least one valve opening member is disposed in the opening. The at least one valve opening member is operatively connected to the valve to bias the valve to the open position.

The present invention is also a method of lubricating a surface comprising the steps of inserting a lubricating apparatus over a surface to be lubricated, the surface to be lubricated engaging at least one valve opening member disposed in an interior wall of the lubricating apparatus, the at least one valve opening member opening a valve in the lubricating apparatus; and allowing lubricating fluid in the lubricating apparatus to discharge past the valve and the at least one valve opening member to the surface to be lubricated.

The present invention is also an apparatus which comprises a cylinder having an interior wall extending longitudinally therethrough. The wall defines an opening. The apparatus also comprises a lubricating fluid reservoir located upstream from the opening and at least one path communicating the reservoir and the opening. The apparatus also includes a valve located in the at least one path. The valve is operable between a closed position and an open position. The valve is biased to the closed position to close the path. At least one valve opening member is disposed in the opening. The at least one valve opening member is operatively connected to the valve to bias the valve to the open position. A surface to be lubricated is insertable, into the opening such that the surface engages the at least one valve opening member. The at least one valve opening member opens the valve, allowing the fluid to flow downstream from the reservoir, through the path of fluid communication and to the opening to the surface to be lubricated.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated herein and constitute part of this specification, illustrate the presently preferred embodiment of the invention, and, together with the general description given above and the detailed description given below, serve to explain the features of the invention. In the drawings:

FIG. **1** is a side view, in section, of an o-ring oiler in a closed position according to a preferred embodiment;

FIG. **2** is a side view, in section, of the o-ring oiler in an open position according to the preferred embodiment;

FIG. **3** is a schematic view of the oil supply of the o-ring oiler;

FIG. **4** is a side view of an o-ring oiler assembly according to the preferred embodiment; and

FIG. **5** is a top plan view of the o-ring oiler assembly taken along line **5**—**5** of FIG. **4**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, like numerals are used to indicate like elements throughout. An oiler **10** according to the preferred embodiment is shown in FIGS. **1**–**3**. The oiler **10** is used to lubricate an o-ring **610** on a fuel injector **60** prior to inserting the injector **60** in a test stand (not shown). The oiler **10** includes a head **20**, a solenoid **30** which regulates flow of lubricating fluid to the head **20**, and an oil supply pot **40** which retains lubricating fluid in a reservoir under pressure, preferably between 0.5 and 1.5 pounds per square inch (psi). The pot **40** is fluidly connected to the head **20**. Referring to FIG. **1**, the head **20** includes a longitudinal centerline **201**, a generally cylindrical body **202**, a generally cylindrical cap **207** which is disposed upstream off the body **202**, and a generally cylindrical applicator **210** which is disposed downstream of the body **202**. As used herein, the term "upstream" is defined to mean "toward the top of the figure being referenced" and "downstream" is defined to mean "toward the bottom of the figure being referenced".

The body **202** has an interior wall **203** which extends longitudinally therethrough such that the entire wall **203** defines a generally tubular body opening or channel **204**. The cap **207** has an interior wall **208** which extends longitudinally therethrough such that the entire wall **208** defines a generally tubular cap opening or channel **209**. A downstream end of the cap **207** includes a generally annular channel **232** for reasons that will be explained. The applicator **210** has an interior wall **211** which extends longitudinally therethrough such that the entire wall **211** defines a generally tubular applicator opening or channel **212**. An upstream end of the applicator **210** includes a beveled generally annular seat **234** for reasons that will be explained. The body and cap channels and **209** are generally centered on the longitudinal axis **201** and are in fluid communication