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(54) **LUBRICANT AEROSOL DISPENSING
CONTAINER**

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(57) **ABSTRACT**

An aerosol dispensing container or pressurized vessel such as a metallic spray can at least contains a non-flammable aerosol propellant and a polytetrafluoroethylene (PTFE) lubricant mixture (propellant/lubricant mixture). The propellant/lubricant mixture has been formulated such that is non-migrating, i.e., stays where it is applied rather than spreading into surrounding areas. The propellant/lubricant mixture has a wide range of applications and is especially well formulated for automotive applications for which smooth, repeated movement is essential. The low coefficient of friction characteristic of the propellant/lubricant mixture translates to superior effectiveness. By providing this propellant/lubricant mixture in the pressurized vessel, the PTFE lubricant of the present invention can be applied in places that conventional liquid lubricants could not reach. For example in small spaces between plastic, rubber, or metal parts that cause unwanted squeaking, rattling or other noise.

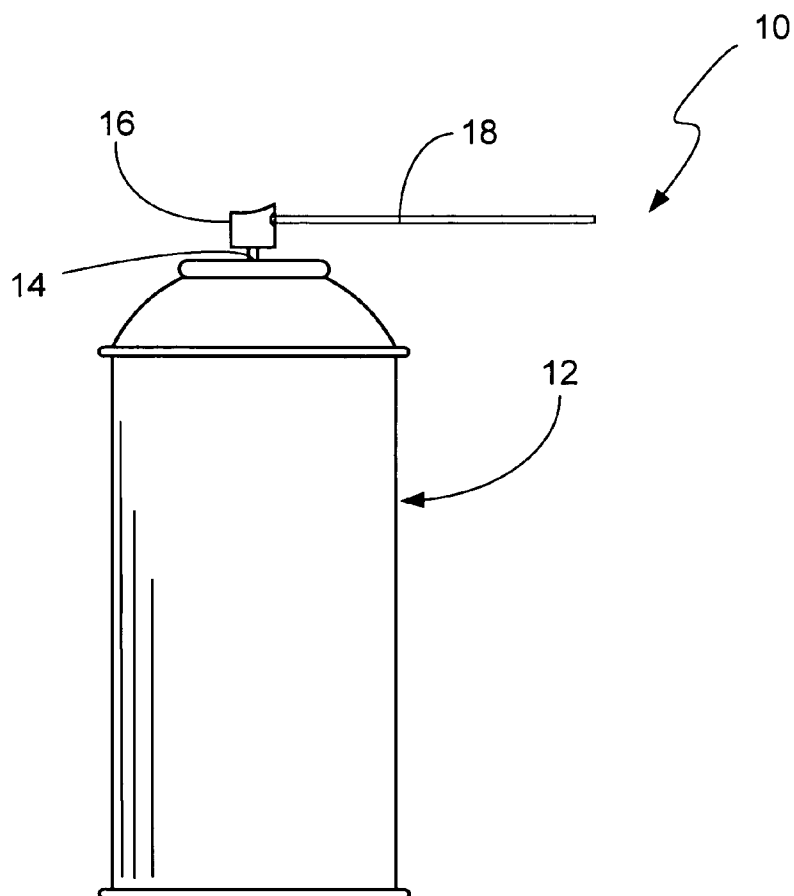


Fig. 1

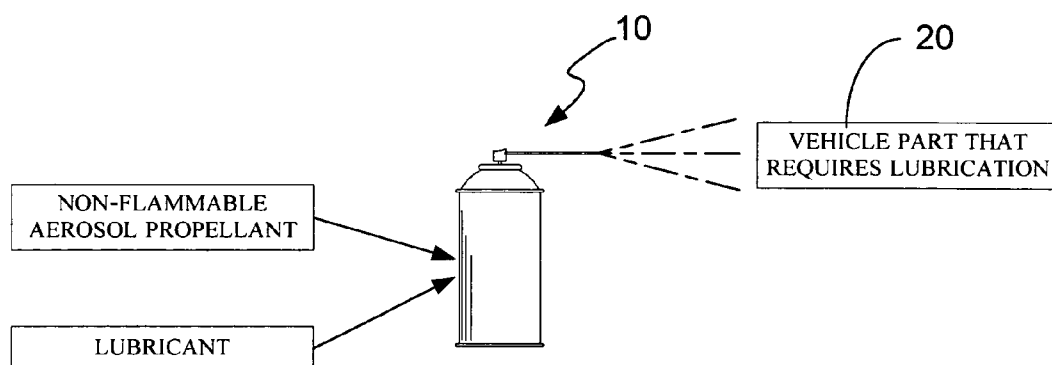


Fig. 2

LUBRICANT AEROSOL DISPENSING CONTAINER**BACKGROUND OF THE INVENTION****[0001] 1. Field of the Invention**

[0002] The present invention generally relates to a lubricant in an aerosol dispensing container such as a spray can. More specifically, the present invention relates to a spray on lubricant that deposits a thin film that remains on a surface to be lubricated.

[0003] 2. Background Information

[0004] Currently, many different lubricants and/or protective coatings are available on the market for a variety of applications. However, not every lubricants and/or protective coatings is suitable for every application. For example, in the automotive industry, it is important that the lubricant does not harm the wide variety of materials that are used in vehicle parts. Moreover, in the automotive industry, it is important that the lubricant stays where it is applied rather than spreading into surrounding areas. Also in the automotive industry, sometimes it is desirable or necessary to lubricate a part that is a hard to reach area.

[0005] While aerosol lubricants are known, such as WD-40®, there are aerosol lubricants are not suitable for certain automotive applications. For example, some aerosol lubricants are difficult to apply in a precise location. Other aerosol lubricants do not stay in place when applied, but rather drip or run across the surface of the part from where it was applied. Some of these aerosol lubricants have a high viscosity that requires very high pressure to apply. Some of these aerosol lubricants contain flammable aerosol propellants, which are not suitable for certain automotive applications.

[0006] Because of their remarkably low coefficient of friction as well as their high level of inertness, fluoropolymers, such as polytetrafluoroethylene, have gained widespread acceptance for reducing surface friction and as protective coatings. In particular, polytetrafluoroethylene (PTFE) has been used on various types of surfaces from the familiar frying pan to rubbing parts or valves in complex apparatus, such as artificial human hearts. Unfortunately however, the cost of either making entire parts from PTFE or applying PTFE coatings to existing surfaces is relatively expensive.

[0007] In view of the above, it will be apparent to those skilled in the art from this disclosure that there exists a need for an improved lubricant in an aerosol dispensing container. This invention addresses this need in the art as well as other needs, which will become apparent to those skilled in the art from this disclosure.

SUMMARY OF THE INVENTION

[0008] It has been discovered that an aerosol dispensing container such as a spray can, which contains a lubricant is very useful certain automotive applications, especially in small spaces of the vehicle between plastic, rubber, or metal parts that cause unwanted squeaking, rattling or other noise. However, in certain automotive applications, it is important that the lubricant stays where it is applied rather than spreading into surrounding areas.

[0009] The present invention was conceived in light of these facts. One object of the present invention is to provide a lubricant that can be sprayed on to an automotive part such that the lubricant stays where it is applied rather than spreading into surrounding areas. In other words, it was conceived that a lubricant should be combined with one or more additional substances that will result in a non-migrating lubricant film, i.e., a lubricant film that stays where it is applied rather than spreading into surrounding areas.

[0010] To achieve the foregoing object, a lubricant aerosol dispensing container is provided in accordance with the present invention that basically comprises a pressurized vessel having a spray outlet. A non-flammable aerosol propellant is contained in the vessel along with a lubricant that is composed of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2. The propellant is formulated with retention properties to propel the lubricant and retain the lubricant on a surface where the lubricant is sprayed.

[0011] These and other objects, features, aspects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses a preferred embodiment of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Referring now to the attached drawings which form a part of this original disclosure:

[0013] FIG. 1 is a elevational view of an aerosol dispensing container or pressurized vessel such as a spray can which includes a non-flammable aerosol propellant and a lubricant being composed of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2 in accordance with the present invention; and

[0014] FIG. 2 is a schematic illustration of a method of applying a lubricant being composed of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2 to an vehicle part in accordance with the present invention

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Selected embodiments of the present invention will now be explained with reference to the drawings. It will be apparent to those skilled in the art from this disclosure that the following descriptions of the embodiments of the present invention are provided for illustration only and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

[0016] Referring to FIG. 1, an aerosol dispensing container or pressurized vessel **10** such as a metallic spray can is illustrated in accordance with a first embodiment of the present invention. As explained below, the pressurized vessel **10** at least contains a non-flammable aerosol propellant and a liquid polytetrafluoroethylene (PTFE) lubricant that form a sprayable mixture (propellant/lubricant mixture). The propellant/lubricant mixture is pressurized to a sufficient

level to substantially atomize the PTFE lubricant and the aerosol propellant together. The propellant/lubricant mixture, as set forth below, has been formulated such that is non-migrating, i.e., stays where it is applied rather than spreading into surrounding areas. The propellant/lubricant mixture of the present invention has a wide range of applications and is especially well formulated for automotive applications for which smooth, repeated movement is essential. The low coefficient of friction characteristic of the propellant/lubricant mixture of the present invention translates to superior effectiveness.

[0017] By providing this propellant/lubricant mixture in the pressurized vessel **10**, the PTFE lubricant of the present invention can be applied in places that conventional liquid lubricants could not reach. For example in small spaces between plastic, rubber, or metal parts that cause unwanted squeaking, rattling or other noise. In other words, the aerosol allows the PTFE lubricant of the present invention to be forced into the small spaces by the force of the aerosol, instead of only by the natural action of the liquid lubricant. Also, the PTFE lubricant of the present invention being mixed with a polymer of the aerosol propellant aids in retaining the PTFE lubricant of the present invention in the location where it was applied by the force of the aerosol. In other words, by applying the propellant/lubricant mixture to a surface of an automotive part or other item to be lubricated, a lubricating film as the thin film is left on the surface of the automotive part or other item.

[0018] As seen in FIG. 1, the pressurized vessel **10** has a main body **12** with a spray outlet **14**. The pressurized vessel **10** is preferably a metallic aerosol spray can. Aerosol spray cans are well known and thus, the precise structure of the pressurized vessel **10** will not be discussed or illustrated in detail. Preferably, a nozzle **16** is attached to the spray outlet **14** in a conventional manner. When a user pushes down on the nozzle **16**, this will open an internal valve (not shown) of the spray outlet **14** to propel the lubricant from inside the pressurized vessel **10**. Optionally, the nozzle **16** can be provided with a tube or straw **18** so that the lubricant can be precisely directed onto a vehicle part **20** as diagrammatically illustrated in FIG. 2.

[0019] It has been discovery that not all PTFE lubricants are suitable in automotive applications. In particular, the PTFE lubricant of the present invention needs to be durability in use on the vehicle and sprayable in an aerosol form, as well as to be able to be applied and used in hot and cold weather conditions. Other aspects of the PTFE lubricant of the present invention includes that it stays where sprays, and it does not fade colored vehicle parts when applied thereto. It has been discovery that a PTFE lubricant consisting essentially of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2 is suitable for automotive applications. Such a PTFE lubricant for automotive applications is commercially available from DuPont® under the trademark Krytox®. More specifically, there are many different grades of PTFE lubricant that are marketed by DuPont® under the trademark Krytox®, and it has been discovered that Krytox® 105 is particularly suitable for automotive applications and can be pressurized and sprayed. However, at the time of this invention, Krytox® 105 has not been developed as a spray on PTFE lubricant.

[0020] In order to use Krytox® 105 as a spray on PTFE lubricant, a polymer need to be added to ensure the PTFE lubricant stays in the location that the aerosol forced the PTFE lubricant onto. A series of tests were performed to obtain a correct formulation of an aerosol propellant and a PTFE lubricant mixture that produced the desired results of a non-migrating lubricant that is well suited for automotive applications.

[0021] Thus, a propellant was formulated with retention properties to propel the lubricant and retain the lubricant on a surface where the lubricant was sprayed. It has been discovered that a propellant with a suitable polymer was commercially available from DuPont® under the trademark Dymel® 134-a. This propellant (Dymel® 134-a) was found to provide the retention properties to propel the PTFE lubricant (Krytox® 105) and retain the PTFE lubricant (Krytox® 105) on a surface where the PTFE lubricant (Krytox® 105) was sprayed. The PTFE lubricant (Krytox® 105) and the propellant (Dymel® 134-a) are put into the pressurized vessel **10** under pressure with the mixture comprising 80% of the PTFE lubricant (Krytox® 105) by weight and the remaining 20% by weight being the propellant (Dymel® 134-a). Of course, the pressurized vessel **10** can contain some small quantity of volatile organic compounds (VOC's), preferably less than one percent by weight.

[0022] This propellant/lubricant mixture of the present invention met the durability wear requirements needed for automotive applications as well as the compatibility requirements for the vehicle parts that the propellant/lubricant mixture will contact, e.g., color fastness/fade requirements on contacting materials. In other words, this formulation of the propellant/lubricant mixture of the present invention has good wear capacity and will not stain the vehicle parts, especially the color plastic vehicle parts. Also when the propellant/lubricant mixture is applied to a surface, the coating or thin film exhibits outstanding lubricity (low coefficient of friction) and antistick or release properties. The propellant/lubricant mixture can be used under a wide variety of environmental conditions ranging that an automotive vehicle might encounter. These characteristics of the propellant/lubricant mixture of the present invention results in a stable, highly effective, and easy to use lubricant.

[0023] Applications for the spray (propellant/lubricant mixture) of the present invention include, but not limited to, seal lubricity and squeak, hinge squeak, hinge lubrication, improve door closing efforts, seat squeaks, panel squeaks, molding squeaks, and other vehicle trim and vehicle body related squeaks.

[0024] While only selected embodiments have been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. Furthermore, the foregoing descriptions of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents. Thus, the scope of the invention is not limited to the disclosed embodiments.

What is claimed is:

1. A lubricant aerosol dispensing container comprising:
a pressurized vessel having a spray outlet;
a non-flammable aerosol propellant contained in the vessel; and
a lubricant contained in the vessel, the lubricant being composed of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2,
the propellant being formulated with retention properties to propel the lubricant and retain the lubricant on a surface where the lubricant is sprayed.
2. The lubricant aerosol dispensing container according to claim 1, wherein
the pressurized vessel is a metallic can.
3. A method of coating a surface with a thin film comprising:
providing a pressurized vessel having a spray outlet;
providing a non-flammable aerosol propellant in the vessel;

providing a lubricant in the vessel, with the lubricant being composed of dihydrodecafluoropentane 138495-428, polytetrafluoroethylene 9002-84-0, perfluoroalkylether 60614-51-4, and tetrafluoroethane 811-97-2;

mixing the aerosol propellant and the lubricant as a mixture in the container; and

applying the mixture to the surface to leave a lubricating film as the thin film on the surface.

4. The method according to claim 3, wherein

the pressurized vessel is a metallic can.

5. The method according to claim 4, wherein

the applying of the mixture includes forming lubricating film on an automobile part that includes the surface.

6. The method according to claim 3, wherein

the applying of the mixture includes forming lubricating film on an automobile part that includes the surface.

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