June 9, 1936. N. E. OGLESBY ET AL 2,043,262

APPARATUS FOR DISPENSING LIQUIDS FROM AIRPLANES

Filed Feb. 5, 1932 2 Sheets-Sheet 1

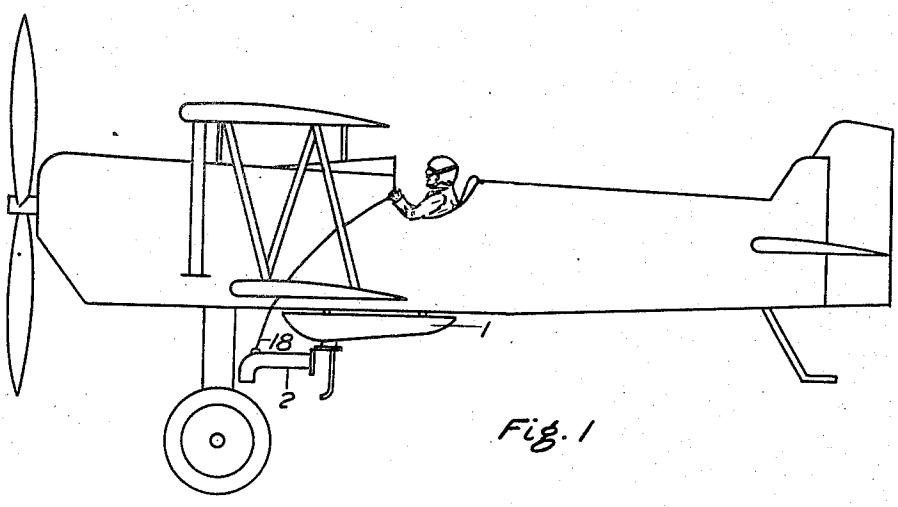


Fig. 1

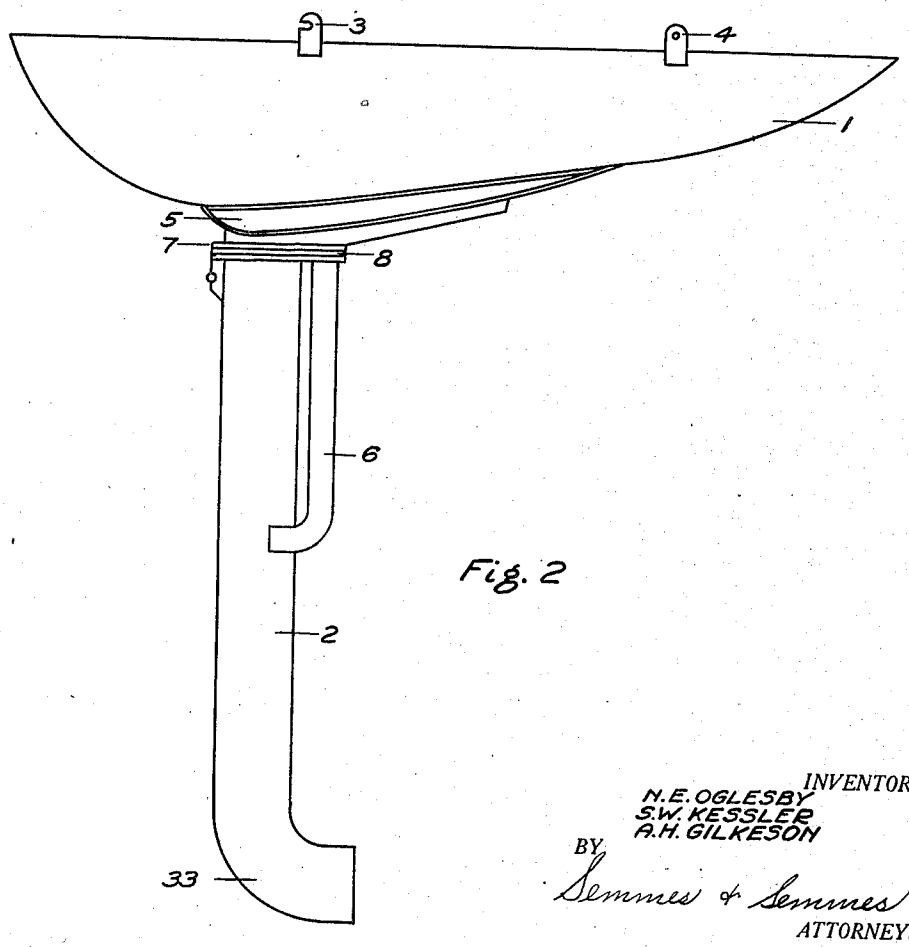


Fig. 2

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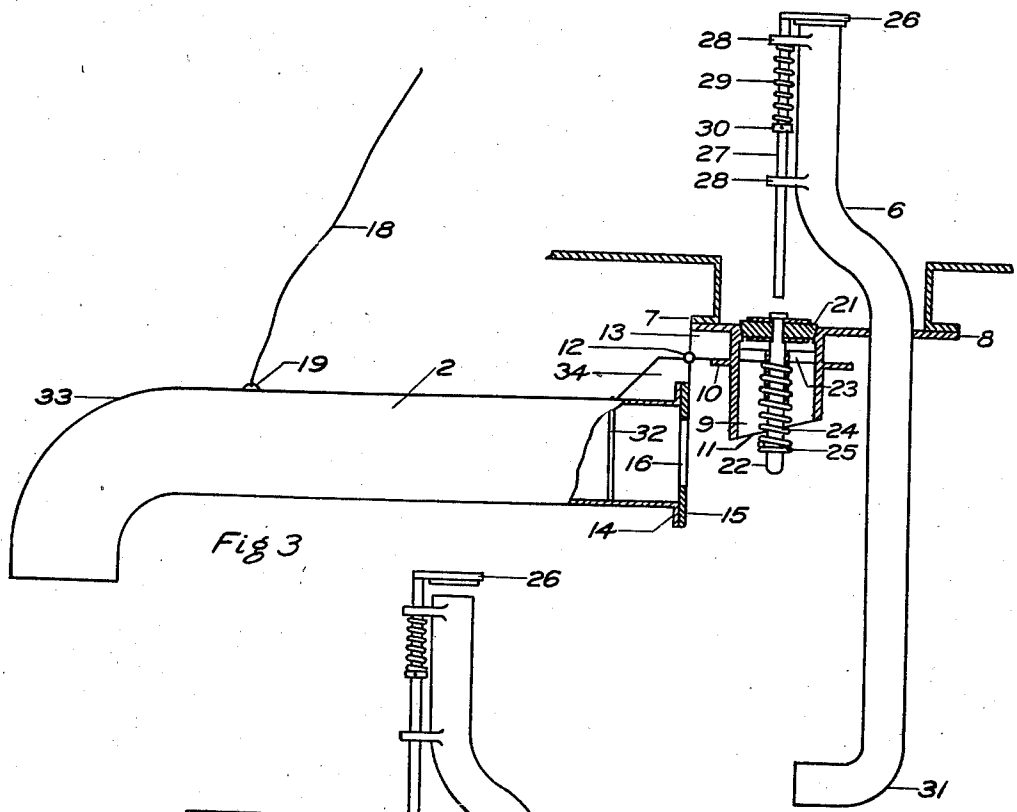


Fig 3

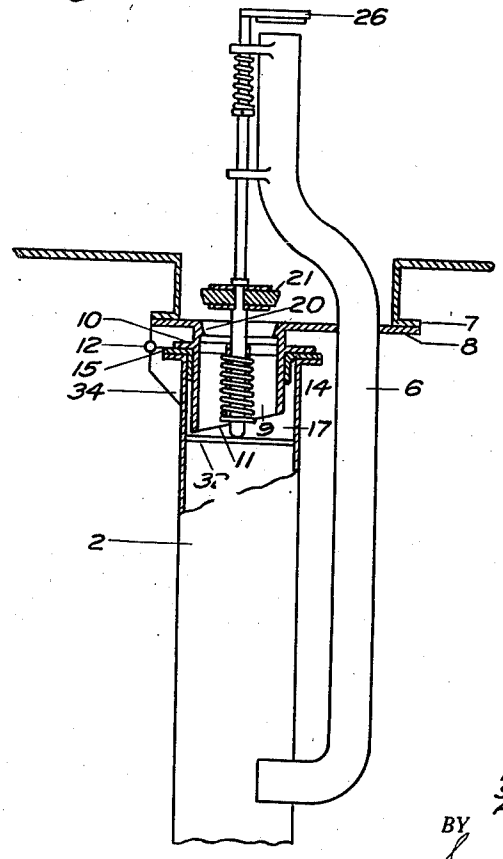


Fig. 4

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APPARATUS FOR DISPENSING LIQUIDS FROM AIRPLANES

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12 Claims. (Cl. 244—1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates in general to discharging devices, and more particularly has reference to an apparatus for dispersing liquids from moving aircraft.

Previous to this time, difficulty has been experienced in dispersing liquids from airplanes without the liquids coming in contact with either the plane or personnel therein. It will be appreciated that the liquids dispersed may be of a corrosive or toxic nature such that contact of the same with a plane or its personnel may be highly injurious or even fatal.

An object of this invention is to provide an apparatus for dispersing liquids from airplanes, insuring against contact of the material dispersed with the plane or its personnel.

Another object of this invention is to provide an apparatus for carrying liquids on airplanes and for dispersing the same remotely therefrom.

A further object of this invention is to provide an apparatus for carrying liquids adapted to be dispersed from airplanes, which may be conveniently dropped therefrom to eliminate any hazard attending carrying the same.

A still further object of this invention is to provide an apparatus for dispersing liquids from airplanes at a distance therefrom, which will not interfere with the take-off or landing of the airplane, the operation of which provides for the automatic disperson of the liquids.

This invention broadly comprehends the use of a readily detachable container adapted to afford little resistance to an airplane in flight, for carrying liquids adapted to be dispersed therefrom, having a hinged pipe communicating therewith for dispersing the liquids at a distance from the airplane to prevent contact thereof with the plane or its personnel, and which in its operation is adapted to provide for the automatic dispersion of the liquid in the container from the airplane.

With these and other objects in view, which may be incident to our improvements, the invention consists in the parts and combination to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising our invention may be varied in construction, proportions and arrangement without departing from the spirit and scope of the appended claims.

In order to make our invention more clearly understood, we have shown in the accompanying drawings means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the drawings forming a part of this specification:

Figure 1 is a side elevational view of an airplane showing a container and discharge device, forming the subject matter of this invention, attached thereto.

Figure 2 is a side elevational view of the device.

Figure 3 is a sectional view showing the moving elements of the device in inoperative position.

Figure 4 is a sectional view of the moving elements of the device shown in operative position.

Referring more particularly by numerals to the drawings and especially to Figure 1, there is shown a conventional airplane, having a device consisting essentially of a container 1 and a discharge line 2 attached to the underside of the fuselage thereof.

The container as shown in Figure 2 is preferably of streamlined configuration corresponding generally to a type of auxiliary fuel tank now in use. The container is adapted to be attached to the underside of an airplane fuselage, or to any suitable portion thereof such as to the underside of a wing, through lugs 3 and 4 fixed in any suitable manner on each side thereof. The forward lugs 3 are provided with notches for engaging bolts on a bar fixed on the airplane, and the lugs 4 with apertures, adapted to be engaged by rods forming elements of a conventional release mechanism, (not shown).

It will be appreciated that the forward lugs 3 are adapted to be normally held in alignment with the rods or bolts fixed on the airplane by connection of the lugs 4 with the release mechanism. On disengagement of the lugs 4 with the mechanism, the container will manifestly be allowed to fall from the airplane as the lugs 3 will readily become disengaged when the same are unsupported. In this manner, if the container affords a hazard such as in the event of a forced landing, the same may be readily dispensed with, and thus the danger attending the proximity of the contents of the container to the airplane, eliminated.

The underside of the container is formed with a sump 5 and provided with a closure 8, fitted on the face of a flange 7, surrounding an opening in the bottom of the container. The closure

8 is provided with a pair of offset apertures for receiving a valve casing 9 and a vent tube 6.

The valve casing 9 is provided with an outer peripheral flange 10, and is formed to terminate in an oblique rim 11. The discharge line 2 is provided with a longitudinal projection 34 adjacent its top rim, adapted to be connected to a hinge 12 and a projection 13 formed on the closure 8. The top rim of the discharge line 2 is provided with a flange 14 on which is adapted to be seated a washer 15 having a central aperture 16.

It will thus be seen that the flange 14 on the top rim of the discharge line 2, is adapted to be seated against the peripheral flange 10, formed on the valve casing 9 through swinging movement about the hinge 12. In seating of the flange 14 with the discharge line against the flange 10 on the valve casing, with the washer 15 interposed therebetween, the valve casing is adapted to be telescoped in the top portion of the discharge line 2, as shown at 17 in Figure 4. The discharge line 2 is normally adapted to be held in inoperative position as shown in Figure 3, out of longitudinal alignment with the valve casing 9, held by a cable 18, operable in any suitable manner within the control of the personnel in the airplane, connected to the discharge line adjacent its lower end by an eyelet 19 fixed thereon.

The container is provided with three apertures, one an inlet (not shown), adapted to be suitably sealed by a conventional closure in the usual manner, the valve casing 9 and the vent tube 6. The valve casing 9 is provided with a seat 20 adjacent its top rim, in which there is normally adapted to be seated a valve seal 21 provided with a stem 22 adapted to pass through a spider 23 fixed in the casing. The valve seal 21 is normally adapted to be held in the seat 20 by a spring 24 engaging against the lower face of the spider at one end, fitting against a collar 25 fixed on the stem 22 adjacent its lower end.

The top rim of the vent tube 6 projecting within the container is adapted to normally be sealed by a valve 26 fixed on a stem 27 secured in aligned apertures provided in lugs 28 formed on, and suitably attached, to the side of the vent tube 6. The stem 27 is aligned with, and terminates above the stem 22. The valve 26 is held seated on the top rim of the vent tube by a spring 29 engaging the underside of the top lug 28 at one end, and a collar 30 fixed on the stem between the lugs 28 at the other end. It will be appreciated that by raising the stem 22 against the tension of the spring 24 that the valve seal 21 will be raised to allow liquid in the container to flow through the valve casing 9. Continued raising of the stem 22 will cause it to come in contact with the stem 27 to raise the valve 26 and allow air to pass in the container through the vent tube 6, the lower end of which is bent upwardly as at 31 to expose the entire cross section of the rim directly to the flow. There is thus a delayed action in the opening of the valve 26 with respect to the valve 21, the valve 21 opening first.

The valves 21 and 26 are adapted to be operated by lowering of the discharge line 2, when the same is brought into longitudinal alignment with the valve casing 9. A cross bar 32 is fixed within the discharge line 2, adapted to contact with and raise the valve stem 22 when the line 2 is brought into alignment with the valve casing 9, so that the flanged rim 14 of the discharge line seats against the peripheral flange 10 on the valve casing. As the discharge line 2 is lowered, the valve stem 22 will be raised on contact with the cross bar 32 in the discharge line, and the valve stem 27 raised when the stem 22 is raised to contact with the end of the discharge line, which is bent as at 33 to direct the liquid flowing therethrough to the rim.

The operation of this invention will be readily understood. The tank 1 is adapted to be filled with the liquid which it is desired to spray from the airplane. This liquid may be of any of a variety of substances according to what it is wished to accomplish in the spraying of the liquid. In generating smoke screens, such liquids as titanium tetrachloride, stannic chloride, oleum, or chlorsulphonic acid may be employed. These latter, however, are somewhat less effective and more dangerous that titanium tetrachloride. For the production of lachrymatory clouds of gas, solutions of chloracetophenone in such solvents as benzene, chlorpicrin, monochloracetone and the like may be found desirable. Vesicant liquids of the character of mustard gas may also be dispersed, and it is within the scope of the invention to use liquids suitable for spraying orchards, cotton fields and the like to destroy injurious insects, as well as for distributing liquids suitable for the destruction of mosquito larvae over swamps, etc.

It will be appreciated in connection with the spraying of various types of liquids that the devices necessarily should be constructed of a metal not affected by the particular liquid. Steel and Monel metal have generally been found satisfactory as unaffected by a majority of materials which have been used. Similarly the valves and washers are composed of material which will not be affected by the liquid which is employed. Rubber is of course preferably used, but as there is a deleterious action thereon by the liquid, another equivalent material such as bakelite, not so affected, may manifestly be substituted therefor.

The container 1 as previously explained, is adapted to be loaded through any suitable opening (not shown) provided with a conventional closure capable of being effectively sealed. The container may be filled with a fluid which it is desired to disperse previous to attaching to the airplane, or may be loaded while attached to the aircraft, if found desirable. Attachment of the container to the aircraft, as has hereinbefore been described, is accomplished by the lugs 3 and 4. The notches in the lugs 3 are adapted to engage bolts on bars transversely arranged on the airplane, and the lugs 4 are designed to be held by any suitable release mechanism engaging the apertures therein. The container may thus be immediately dropped on an occasion where its proximity to an aircraft constitutes a hazard.

It is the purpose of this invention to provide for the remote discharge of fluids carried on aircraft in the event of contact of the fluid with an aircraft or its personnel, as has been previously explained. Inasmuch as it is manifestly desirable to discharge material of this character from beneath an airplane, the discharge line 2 communicating with the container is provided. The discharge line is hinged so that in its inoperative position it may be raised to the horizontal. This is of particular importance when an airplane is on the ground, as the discharge line projecting therefrom to remotely discharge the material from the container would otherwise constitute an objectionable obstruction.

Also when the airplane is in flight, the discharge line in its raised position presents a comparatively small cross section adding to the resistance of the airplane in only a negligible degree. The container is streamlined to add as little to the resistance of an airplane as possible. The discharge line is normally held in a raised, inoperative position by the cable 18, which is adapted to be controlled by the personnel within the airplane.

When the container is loaded with any suitable material which it is desired to dispense, the same is effectively sealed therein by the valves 21 and 26 sealing the valve casing and the vent line, respectively, and the opening in the container for receiving the fluid is also sealed. The discharge line 2 is raised in an inoperative position, held by the cable 18.

When it is desired to discharge and atomize the fluid within the container during the flight of an airplane carrying the same, the cable 18 is released allowing the discharge line 2 to travel from the horizontal toward the vertical under the pull of gravity. The discharge line swinging on the hinge 12 under the influence of gravity comes under the influence of the air pressure caused by the speed of the airplane. This positively assists the force of gravity to bring the line into a vertical position, and the air pressure maintains a fluid-tight seal between washer 15 and flange 10 to prevent leakage of the fluid.

In assuming the vertical position, the cross bar 32 in the line engages the end of the valve stem 22, raising the valve seal 21 against the tension of the spring 24, permitting the fluid in the container to flow through the valve casing 9 to the discharge line. The valve 21 on raising contacts with the valve stem 27 to lift the valve seal 26 after a slight delay. This opens the vent line 6, allowing air to be forced into the container to drive out the fluid therein under pressure through the discharge line.

The liquid flowing out of the discharge line is atomized into small droplets by the counter motion of the air into which the liquid is delivered. The atomization of the fluid passing out of the discharge line may be controlled by the pressure set up within the container by the air forced therein through the vent pipe. If sufficient pressure is set up within the container to drive out the fluid in the same by opposite velocity to that to which the airplane is traveling, the fluid may be poured directly downwardly without atomization in substantially the same manner as if it were poured at zero motion.

According to the preferred form of this invention, it is contemplated, however, to merely introduce sufficient pressure within the container through the vent pipe to assure the positive discharge of the fluid therein through the line 2, and the material thus atomized through contact with the air.

When it is desired to discontinue the discharge of fluid from the container through the line 2, a predetermined length of the cable 18 is taken in, raising the discharge line from the vertical toward the horizontal to a slight degree, so that the valve seal 26 is allowed to close under the action of the spring 29, and subsequently after a delayed action the valve seal 21 closes under the action of the spring 24 by withdrawal of the support to the valve stem 22 by the cross bar 32 in the discharge line swinging out of contact therewith, and the discharge line allowed to drain free of liquid, when it may be raised to a horizontal position and anchored.

It would appear that selective quantities of the fluid in the container may be discharged at different intervals, by reason of the operation described.

Although the present drawings show this invention applied to an airplane having landing wheels, it is equally applicable to sea planes having pontoons for landing on water. In the appended claims, therefore, the term "landing gear" is intended to include any means to alight on solid ground or water, and the word "ground" is intended to mean the earth's surface whether solid ground or water.

There is accomplished by this invention an apparatus for dispensing fluids from airplanes, which may be dropped if the proximity thereof constitutes a hazard providing for the selective dispersion of the fluid remotely therefrom to avoid contact thereof with the airplane or its personnel.

While we have shown and described the preferred embodiment of our invention, we wish it to be understood that we do not confine ourselves to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention, or exceeding the scope of the appended claims.

We claim:

1. An apparatus for dispersing fluid from moving aircraft, comprising a container for storing fluid on aircraft, a valve casing and a vent line therein, valve seals for normally closing the valve casing and the vent line, a discharge line hinged on the container adjacent the valve casing normally adapted to be held in a raised, inoperative position by a cable operable by the personnel in the aircraft, means associated with the discharge line adapted to contact with the stem on the valve seal closing the valve casing on lowering of the discharge line by release of the cable, to allow fluid within the container to pass therethrough, the valve seal and the valve casing being open, and being adapted to contact with the stem on the valve seal closing the vent line to successively open the valve through delayed action to introduce pressure into the container and assist in the dispensation of the fluid in the container through the discharge line.

2. An apparatus for dispensing fluid from a moving aircraft comprising a tank for storing the fluid on the aircraft, a pivoted discharge line adapted to be lowered to operative discharging position, a valve controlling flow of fluid from said tank through said discharge line, a vent pipe communicating with said tank and means operable by lowering of said discharge line for opening said valve and subsequently opening said vent pipe.

3. An apparatus for dispensing fluid from moving aircraft comprising a container for storing fluid on the aircraft, a discharge line and a vent line connected to said container, valves for controlling flow through each of said lines, and common means for opening the discharge valve and subsequently opening the vent line valve, whereby the fluid may begin discharge from the container prior to the venting of the container.

4. An apparatus for dispensing fluid from moving aircraft comprising a container for storing fluid on the aircraft, a discharge line and a vent

line connected to said container, valves for controlling flow through each of said lines, and common means for operating said valves in sequence, the vent line valve closing prior to closing of the discharge line valve whereby the vent line is closed prior to closing of the discharge line.

5. An apparatus for dispensing fluid from moving aircraft comprising a container for storing fluid on the aircraft, a discharge line and a vent line connected to said container, separate valves controlling flow through said vent line and said discharge line, means biasing said valves toward closed position, and common means for opening said valves in sequence the discharge valve opening prior to the opening of the vent valve and closing after closing of the vent valve.

6. An apparatus for dispensing fluid from moving aircraft comprising a container for the fluid mounted on the aircraft, a vent line connected to the container and having its opening facing substantially forward of the aircraft, a discharge line connected to the container, a vent line valve and a discharge line valve controlling the flow through their respective lines, springs biasing said valves to closed positions, and common operating means for first opening the discharge valve and subsequently opening the vent valve, the valves closing in reverse sequence, whereby air pressure is placed on the fluid after the discharge valve is opened and the air pressure is cut off before the discharge valve closes.

7. An apparatus for dispensing fluid from moving aircraft comprising a container for the fluid mounted on the aircraft, a vent line connected to the container and having its opening facing substantially forward of the aircraft, a discharge line connected to the container, reciprocating valves controlling flow through said lines, springs biasing said valves closed, means for reciprocating the discharge valve to open position, and a lost-motion connection between said means and said vent valve whereby the vent valve opens last and closes first.

8. An apparatus for dispensing fluid from moving aircraft comprising a container for storing the fluid on the aircraft, having a normally closed outlet, a rigid discharge line pivoted to said container adjacent said outlet, means to raise said line forwardly of the aircraft to a substantially horizontal non-discharging position and to permit lowering thereof to a substantially vertical discharging position, and sealing means between the outlet and the discharge line, the pressure of air on the discharge line due to forward movement of the aircraft compressing said sealing means.

9. An apparatus for remotely dispensing fluid from moving aircraft having landing gear, to avoid contamination of the aircraft or personnel thereof, comprising a container for storing the fluid on the aircraft, a rigid discharge line hinged to said container adapted to swing forwardly of the aircraft to a substantially horizontal non-discharging position above the point of contact of the landing gear and ground, means to hold said discharge line in the non-discharging position, means limiting downward movement of the discharge line to a substantially vertical discharging position, and sealing means between said discharge line and container rendered fluid-tight by the pressure of air against said discharge line when in vertical discharging position.

10. The invention as defined in claim 9, characterized in that a valve on said container controls flow of fluid through said discharge line, and means on said discharge line to open said valve when said line moves to discharging position.

11. An apparatus for dispensing fluid from moving aircraft, comprising a container for storing fluid on aircraft, a valve casing and a vent line in the container, valve seals for closing the valve casing and the vent line, a discharge line hinged on the casing adjacent the valve casing to swing forwardly and upwardly on its pivot and to be held in a raised non-discharging position, and to be lowered to a substantially vertical discharging position with its discharge end below and remote from the aircraft, and means associated with the discharge line to open the valves on the valve casing and vent line by lowering of the discharge line to allow fluid in the container to flow therethrough and to be dispensed therefrom under pressure remotely from the aircraft, the pressure of air on the discharge line due to forward movement of the aircraft causing a fluid-tight seal between the inlet of said discharge and said container.

12. An apparatus for dispensing fluid from a moving aircraft comprising a container for storing fluid on the aircraft, a rigid discharge line pivoted to said container for movement forwardly and upwardly of the aircraft to a horizontal non-discharging position and downwardly and backwardly to a vertical discharging position, a valve for controlling flow of fluid from said container through said discharge line, and means for opening said valve by movement of said line to its discharging position, said discharge line being movable to and held in fluid-tight discharging position by pressure of air thereon due to forward movement of the aircraft.

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