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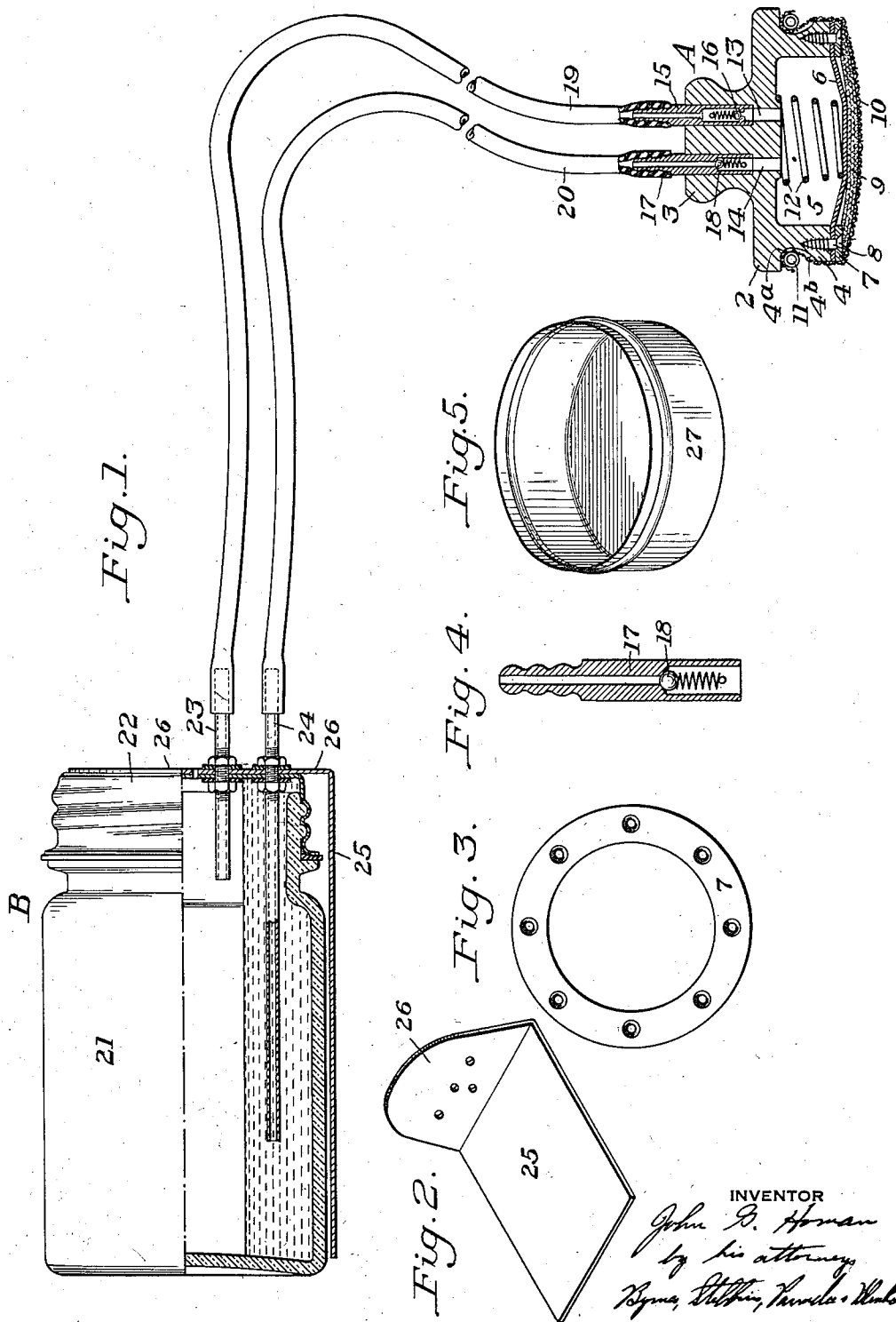
J. G. HOMAN

2,011,635

CLEANING OR MOISTENING DEVICE

Filed Feb. 18, 1932

2 Sheets-Sheet 1



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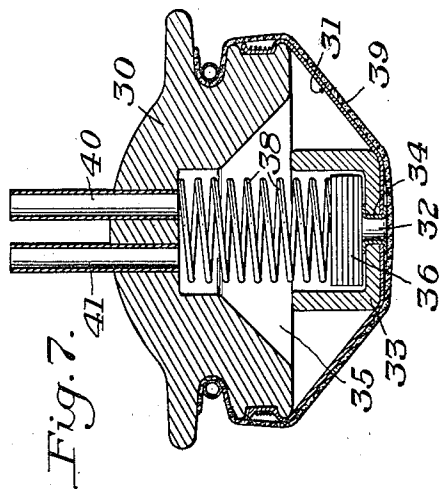
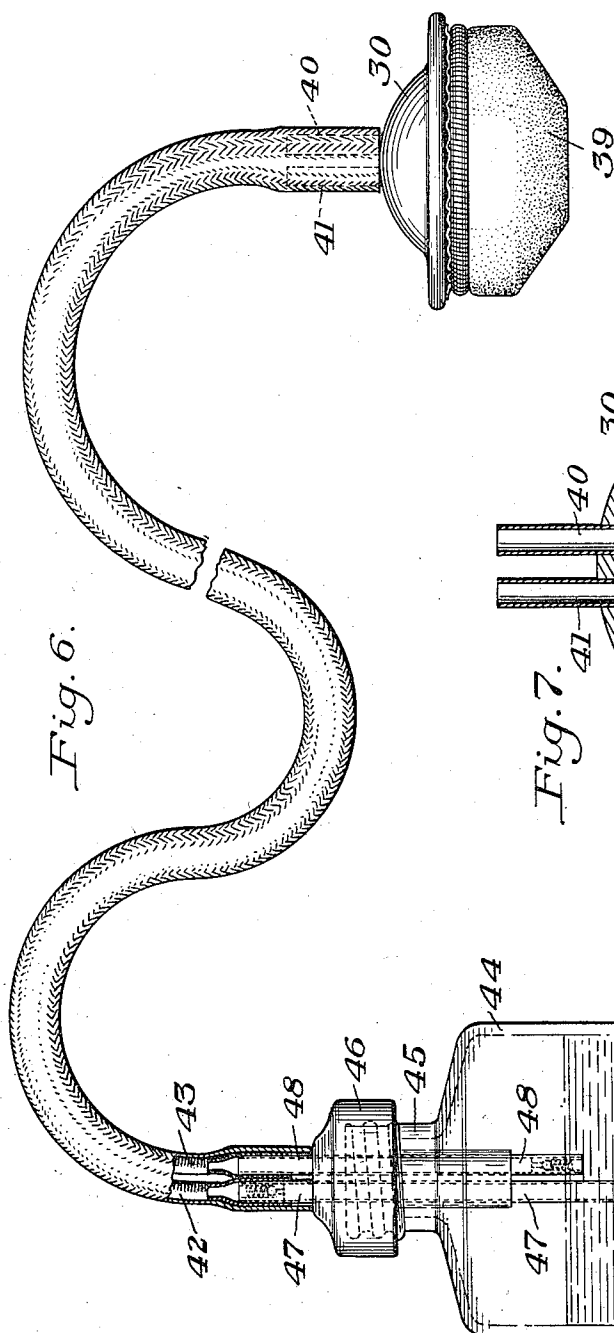
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,011,635

CLEANING OR MOISTENING DEVICE

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Application February 18, 1932, Serial No. 593,784

17 Claims. (Cl. 15—123)

This invention relates to an improvement in devices for applying liquid to a surface to be wetted. It is applicable, for instance, to the application of a solvent to a surface from which a grease spot or stain is to be removed or for the application of water to an adhesive surface and various other uses where it is desired to wet a surface with a liquid by the use of a swab which is rubbed over the surface to be wetted. It is particularly useful where the liquid is to be conserved, as for instance, where the liquid used is a cleaning fluid that is highly volatile and relatively expensive.

The invention contemplates the use of a swab device having a surface for applying the liquid to the article to be wetted, the surface conveniently comprising a suitable fabric. Within the swab device is a chamber for holding the fluid and a membrane, which is only slightly pervious to the liquid, permits the gradual escape of fluid to the surface of the swab or the applicator. The invention further contemplates the provision of a reservoir connected with the swab or applicator in such manner that fluid may be circulated from the reservoir into the applicator and back to the reservoir, the applicator being constructed with a pump by means of which the circulation is maintained. Moreover, fluid applied to the fabric to be cleaned may, to some extent, be withdrawn from the fabric and forced back into the reservoir.

The invention may be readily understood by reference to the accompanying drawings in which

Figure 1 shows the applicator and the reservoir connected together by means of rubber tubes, the applicator being shown in section and the reservoir being shown partly in section and partly in elevation;

Figure 2 is a detail perspective view on a somewhat smaller scale showing the supporting plate for the reservoir;

Figure 3 is a detail view showing in elevation the metal washer used for securing the membrane onto the body of the swab or applicator;

Figure 4 is a detail view of one of the check valves;

Figure 5 is a perspective view of a cover or container for the applicator;

Figure 6 is a view similar to Figure 1 of a slightly modified and more commercially practical form of my device; and

Figure 7 is a vertical section through the swabbing device shown in elevation in Figure 6.

Referring to the drawings, the device shown comprises an applicator A and a reservoir B.

The applicator A comprises a body member 2 having a central knob 3 forming a handle, and having an annular depending flange 4. Inside the body of the applicator is a chamber 5. Closing the chamber 5 is a membrane 6 which is slightly pervious to the fluid which is to be used in the device. As an example, if the device is used as a cleaning device and gasoline or other extremely light hydrocarbon is the cleaning fluid, the membrane 6 may comprise a soft leather. This membrane is secured in place by means of a washer 7 which clamps the edge of the membrane to the flange 4, the washer being held in place by a plurality of screws 8.

On the outer surface of the membrane or diaphragm 6 is a padding 9, and over this padding there is a cloth 10. The cloth 10 is sufficiently large that the edges of it extend up around the flange 4. The flange 4 is provided with an annular groove 4a. An annular band, which is preferably resilient, extends around the flange 4 in the groove 4a and serves to hold the cloth 10 onto the body of the swab or applicator. I have shown this resilient band as being in the form of a coiled wire spring, but obviously it would be an ordinary piece of cord or wire. This coiled wire spring is designated 11. One side of the groove 4a is abrupt, while the other side, designated 4b, is sloped downwardly. This enables the spring 11 to be easily forced down and expanded when it is desired to remove the cloth 10 to replace it.

Within the body 5 is a coil spring 12, the lower end of which presses against the diaphragm 6 and the upper end of which bears against the inside of the top of the body 2. The function of the spring 12 is to resiliently urge the diaphragm 6 downwardly or outwardly so that the surface of the swab is normally convex as shown in Figure 1.

Opening into the chamber 5 through the body is a port 13 and beside it another port 14. These ports are preferably located in the knob portion 3. In the port or passage 13 is a tubulation 15 having an outwardly closing check valve 16 therein. I have shown this check valve as comprising an ordinary spring operated ball check.

Set into the port or passage 14 is a somewhat similar tubular member 17 having an inwardly or downwardly opening check valve 18 of the same type. In Figure 4 one of these tubular members 17 is shown in detail. The outer ends of the members 15 and 17 are preferably corrugated to retain a hose when the same is fitted over the corrugated end. A flexible tube 19 is secured to the tubular member 15 and a flexible hose 20 is attached to the member 17. Certain

solvent resistant gray rubber hose has been found quite satisfactory for this purpose.

The reservoir B conveniently comprises a glass jar of the ordinary Mason or screw cap type, this jar being designated 21. It is provided with a screw cap 22. A tube 23 passes through the top of this screw cap, and it is sealed in the cap to prevent the escape of fluid. A longer tube 24 is similarly passed through the cap and sealed against the escape of fluid. The tube 24 is closer to the outer edge of the cap than is the tube 23, the latter being closer to the center of the cap. There is a sheet metal plate 25 having an angle portion 26 secured to the top of the cap, which plate 25 extends along the side of the jar and provides a supporting surface by means of which the jar can be laid on its side as shown in Figure 1 without rolling. The plate 25 is shown in detail in Figure 2.

For the purpose of illustration it may be assumed that the device is to be used for applying cleaning fluid to fabrics to remove spots therefrom. The cleaning fluid is usually a highly volatile hydrocarbon such as gasoline, naphtha or carbon tetrachloride. In the use of the device for this purpose, the jar 21 is unscrewed from the cap 22 and a small quantity of the cleaning fluid is poured into the jar. The quantity of fluid should be such that when the jar is laid in the horizontal position, as shown in Figure 1, the end of the long tube 24 will be immersed, while the end of the short tube 23 will be above the liquid level. The amount of fluid should be such that when the jar 21 is in the horizontal position the tube 24 will be immersed, but when the jar 21 is in a vertical position the end of the tube 24 will be above the level of the liquid in the jar. After the liquid has been placed in the jar the cap 22 is screwed on tightly and the jar turned to the horizontal position as shown in Figure 1. The swab or applicator is then pressed up and down on the surface to be cleaned. The movement of the diaphragm 6 in and out operates the check valves 16 and 18, causing liquid to be pumped into the chamber 5 and the air expelled therefrom into the jar 21. When the liquid flows into the chamber 5 some of it will slowly permeate the diaphragm 6 and saturate the pad 9 and the cloth 10 with the cleaning fluid.

As the applicator is rubbed back and forth over the surface to be cleaned, it is naturally pressed against the surface and then lifted away. This causes the pumping action to be continued, but the excess fluid is pumped back into the jar 21 through the tube 19 so that there is no considerable fluid pressure built up inside the chamber at any time, although the slight pressure which is created in the chamber 5 when the diaphragm 6 is pressed in does assist in forcing the fluid through the diaphragm. When the pad 9 and the cloth 10 have become sufficiently moist, the jar may be turned to its upright position. In this position the end of the long tube is above the level of the liquid in the jar and the continued pumping action caused by rubbing the applicator with variable pressure against the surface to be cleaned results in the liquid in the chamber 5 being pumped back into the jar, and since the end of the long tube is above the liquid level in the jar, no further fluid will flow into the chamber 5 until the jar is again turned on its side.

By reason of this arrangement the surface of the applicator is always kept sufficiently moist to serve the purpose for which it is required, but it is not too moist at any time. The excess liquid

supplied to the applicator is pumped back into the reservoir. The system is practically a closed system and very little waste occurs by reason of the volatilization of the fluid by reason of circulation of air through the device itself.

With the diaphragm 6 of the proper permeability, the pad 9 and cloth 10 can be kept at the proper point of saturation without there being an excess of fluid dripping therefrom and if the diaphragm is not of the proper permeability the pad and cloth can be kept somewhat near the proper degree of saturation by setting the jar in a vertical position after a sufficient amount of fluid has been applied to the swab, pumping the excess back into the jar, and then turning the jar back when additional liquid is required. The device serves to conserve the cleaning fluid because it is possible to keep the applicator moist to the extent required, which further conserves the cleaning fluid because it reduces evaporation losses and because the excess fluid from the applicator can be pumped back into the reservoir. The device can be constructed very cheaply and can be made in sizes suitable for the use to which the device is to be put.

While I have described the device particularly for applying cleaning fluid to garments or the like, it can be adapted to various scrubbing devices, moistening devices and the like.

In order to further reduce evaporation losses the invention contemplates the provision of a receptacle, such as the receptacle 27 in Figure 5 into which the applicator A may fit tightly when the device is not being used, both to reduce evaporation losses and to keep the applicator clean, and also reduce the fire hazard where the device is being used with inflammable solvents.

In the modification shown in Figures 6 and 7, the same general principle is employed. In this view the swab device comprises a body 30 to the open lower end of which is secured a diaphragm 31. The diaphragm 31, instead of being permeable over its entire area to the cleaning fluid, has a central orifice at 32, and a small metal cup 33 is riveted to the center of the diaphragm by means of the eyelet designated 34. The opening through the eyelet at the center of the diaphragm provides for the passage of fluid from the chamber 35 inside the swab to the outer surface of the swab. In order that the fluid may not flow too freely through this opening, I place within the cup 33 one or more washers 36, preferably several of them. These washers are preferably of a fibrous material, more especially leather. They are retained in place by means of a compression spring 38 one end of which seats in the cup on top of the washers and the other end of which seats in a central cavity in the body 30. This spring tends to resiliently urge the diaphragm outwardly. Covering the diaphragm is a removable cloth 39 which is held in place similar to the cloth 10 described in Figure 1.

The circulation of fluid into the chamber 35 is established by means of tubes 40 and 41. These tubes are connected to flexible hose 42 and 43, respectively. As shown in Figure 6, the rubber tubes 42 and 43 are contained within a common flexible covering. The reservoir for the cleaning fluid comprises a bottle 44 having a screw neck 45 onto which is screwed a cap 46. This cap has two tubes passing through it similar to the cap shown in Figure 1, the longer tube, connected to the rubber hose 42, being designated 47, and the shorter tube, connected to the hose 43, being designated 48. The check valves for controlling

the circulation of the fluid may conveniently be placed in the tubes 47 and 48 as indicated, instead of being in the tubes passing through the swab as shown in Figure 1. The location of the check valves of course is merely a matter of election.

The operation of the device is the same as that of the device shown in Figure 1. The movement of the cleaning surface under varying pressure in and out generates a pumping action which establishes the circulation of fluid from the reservoir to the swab and back to the reservoir, some of the fluid escaping through the diaphragm to wet the cleaning surface of the swab. The provision of the washers 36 enables the flow of fluid through the orifice 34 to be regulated, a greater number of washers allowing a greater filtration of fluid than a single washer. It is of course also necessary that the washers provide for a restricted passageway that an effective pumping action can be created, as too free a passage would enable the air to be sucked in and out through the opening 34 without generating the desired pumping action.

It will be seen that in either form of the device there is a diaphragm or membrane which is only slightly pervious to the passage of fluid therethrough, the diaphragm in Figure 6 being perforated at one point, whereas the diaphragm in Figure 1 is permeable over its entire surface but to a limited extent.

It will be observed, moreover, that some of the fluid applied to the fabric being cleaned may be sucked or pumped out of the fabric back to the reservoir. This is evidenced by the fact that after a cleaning solvent has been used for a time it will be discolored. The device therefore not only applies the solvent to loosen or spread grease, but actually effects the removal of some of it.

The pumping action herein described tends to build up an air pressure in the fluid reservoir. This can be overcome, where it is not desired, by venting the cap in a suitable way, as for instance by slightly unscrewing the cap 46 of Figure 6 during the operation of the device or by providing a small hole in the cap as shown in Figure 1.

While I have shown and described a particular embodiment of my invention, it will be understood that various changes and modifications may be made in the construction and arrangement of the various parts within the contemplation of my invention and under the scope of the following claims.

I claim:

1. A device of the class described comprising an applicator having an absorbent surface, a reservoir, and a pump means for effecting a circulation of fluid between the applicator and the reservoir, said pump means being arranged to be actuated by pressures on the absorbent surface of the applicator.

2. A device of the class described comprising an applicator having an absorbent surface thereon, a reservoir, means for connecting the applicator with the reservoir for supplying liquid to the applicator, means connecting the applicator with the reservoir through which excess fluid can be returned to the reservoir, and pump means forming part of the applicator for effecting a circulation of fluid from the reservoir to the applicator and back to the reservoir.

3. A device of the class described comprising an applicator having an absorbent surface there-

on, a reservoir, means for connecting the applicator with the reservoir for supplying liquid to the applicator, means connecting the applicator with the reservoir through which excess fluid can be returned to the reservoir, said means including passageways between the reservoir and applicator having oppositely acting check valves therein, and means associated with the applicator for effecting the flow of liquid, said means comprising a member resiliently urged against the absorbent surface of the applicator whereby it is pressed in when pressure is put on the applicator and is moved out when pressure against the applicator is relieved.

4. A device of the class described comprising an applicator having an absorbent surface thereon, a reservoir, means for connecting the applicator with the reservoir for supplying liquid to the applicator, means connecting the applicator with the reservoir through which excess fluid can be returned to the reservoir, said means including two separate passageways between the reservoir and the applicator, each having a check valve therein, the check valves being oppositely acting and means associated with the applicator for effecting the flow of liquid to and from the applicator, said means comprising a member resiliently urged against the absorbent surface of the applicator whereby it is pressed in when pressure is put on the applicator and is moved out when pressure against the applicator is relieved, said member comprising a diaphragm under the absorbent surface of the applicator and slightly pervious to the liquid used.

5. A device of the class described comprising an applicator having a body with a chamber therein, a diaphragm closing the chamber, an absorbent material over the diaphragm, a spring in the chamber for urging the diaphragm outwardly, a fluid supply passage opening into the chamber, a fluid outlet passage leading out of the chamber, and oppositely acting check valves in said passages, said diaphragm permitting a restricted passage of fluid therethrough.

6. A device of the class described comprising an applicator having a body with a chamber therein, a diaphragm closing the chamber, an absorbent material over the diaphragm, a spring in the chamber for urging the diaphragm outwardly, a fluid supply passage opening into the chamber, a fluid outlet passage leading out of the chamber, oppositely acting check valves in said passages, and a reservoir with which both the said passages communicate, said diaphragm being slightly permeable to the fluid used.

7. The combination with an applicator having a fluid-receiving chamber therein, of a reservoir comprising a container adapted to set in either a vertical or a horizontal position and having two tube members entering the container, one being a long member and the other being a short member, the long member being so positioned that it is immersed when the container is in a horizontal position and out of the fluid when the container is in a vertical position, the short tube member being positioned to be out of the liquid when the container is in either of said two positions, conduits separately connecting the two tubes with the applicator, and pump means in the applicator for circulating fluid between the reservoir and the applicator.

8. An applicator of the class described comprising a hollow body, a flexible diaphragm secured to the body serving to provide a closed chamber within the body, said diaphragm being slightly

pervious to the flow of liquids therethrough, a spring within the chamber for pressing the diaphragm outwardly, and means for supplying fluid to the chamber.

9. An applicator of the class described comprising a cup-like body, a flexible diaphragm secured to the body serving to provide a closed chamber within the body, said diaphragm being slightly pervious to the flow of liquids therethrough, a spring within the chamber for pressing the diaphragm outwardly, and an absorbent material held in place over the outside of the diaphragm.

10. An applicator of the class described comprising a hollow body, a flexible diaphragm secured on the body serving to provide a closed chamber within the body, said diaphragm being slightly pervious to the flow of liquids therethrough, a spring within the chamber for pressing the diaphragm outwardly, an absorbent material held in place over the outside of the diaphragm, an intake port in the body having an inwardly opening check valve, an outlet passage in the body having an outwardly opening check valve, flexible tubes through which fluid is supplied to the inlet port and discharged from the outlet passage, and a common reservoir to which said tubes connect.

11. An applicator of the class described comprising a body having an annular flange thereon, a flexible diaphragm secured to the flange on the body serving to provide a closed chamber within the body, said diaphragm being slightly pervious to the flow of liquids therethrough, a spring within the chamber for pressing the diaphragm outwardly, an absorbent material held in place over the outside of the diaphragm, an intake port in the body having an inwardly opening check valve, an outlet passage in the body having an outwardly opening check valve, flexible tubes through which fluid is supplied to the inlet port and discharged from the outlet passage, and a common reservoir to which said tubes connect, said common reservoir comprising a container having a long tube entering it adapted to be immersed in liquid in the reservoir and which is connected with the fluid supply tube and having a shorter outlet tube which is positioned to remain above the liquid level in the reservoir and which is connected to the outlet tube from the applicator.

12. A device of the class described comprising an applicator having a body with a chamber therein, a diaphragm closing the chamber, said diaphragm having an opening therethrough, a washer within the applicator slightly permeable to the flow of fluid therethrough and positioned over the opening in the diaphragm, a spring in the chamber for urging the diaphragm outwardly, a fluid supply passage opening into the chamber and a fluid outlet passage leading out of the chamber, said passage having valves therein, and a reservoir with which both said passages communicate.

13. A device of the class described comprising an applicator having a body with a chamber

therein, a diaphragm closing the chamber, said diaphragm having an opening therethrough, a washer within the applicator slightly permeable to the flow of fluid therethrough and positioned over the opening, a spring in the chamber for urging the diaphragm outwardly, a fluid supply passage opening into the chamber and a fluid outlet passage leading out of the chamber, said passage having valves therein, and a reservoir with which both said passages communicate, said spring bearing against the washer for retaining it in place.

14. A device of the class described comprising a body having a chamber therein, a diaphragm closing the chamber having an opening therein providing a fluid passage through the diaphragm, and means within the chamber for restricting the fluid passage, said means comprising a cup with an opening registering with the opening in the diaphragm and having a plurality of superimposed washers therein, and a spring in the chamber having one end thereof bearing against the washers in the cup.

15. A device of the class described comprising a body having a chamber therein, a diaphragm closing the chamber having an opening therein providing a fluid passage through the diaphragm, means within the chamber for restricting the fluid passage through the diaphragm comprising a cup having means therein slightly permeable to the passage of fluid therethrough, the cup being carried on the diaphragm and having an opening in the bottom thereof registering with the one in the diaphragm, and a spring having one end received within the cup and the other end bearing against the inside of the body for normally urging the diaphragm outwardly.

16. The combination with an applicator having an inlet and an outlet and pump means for effecting the circulation of fluid therethrough, of a pair of flexible tubes connected to said inlet and outlet, and a reservoir comprising a liquid container adapted to set in either of two positions and having two ducts leading from the outside of said container to the inside and to whose outer ends the tubes are connected, the inner end of the duct connected to the inlet of the applicator being so positioned that it is immersed when the container is in one of the two positions and out of the liquid when the container is in the other position.

17. A device of the class described comprising a body having a chamber therein, a diaphragm enclosing the chamber, said diaphragm having an opening therein to permit of a restricted flow of fluid therethrough, a holder secured to the diaphragm inside the chamber and movable with the diaphragm relatively to the body, a semi-permeable element in the holder for controlling the escape of fluid through the opening in the diaphragm, and means in the body through which fluid may be supplied to the chamber.

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