April 26, 1966 M. J. SEIBERT 3,247,851

APPARATUS FOR APPLYING LIQUIDS TO THE BODY

Filed March 13, 1962

Fig. 1.

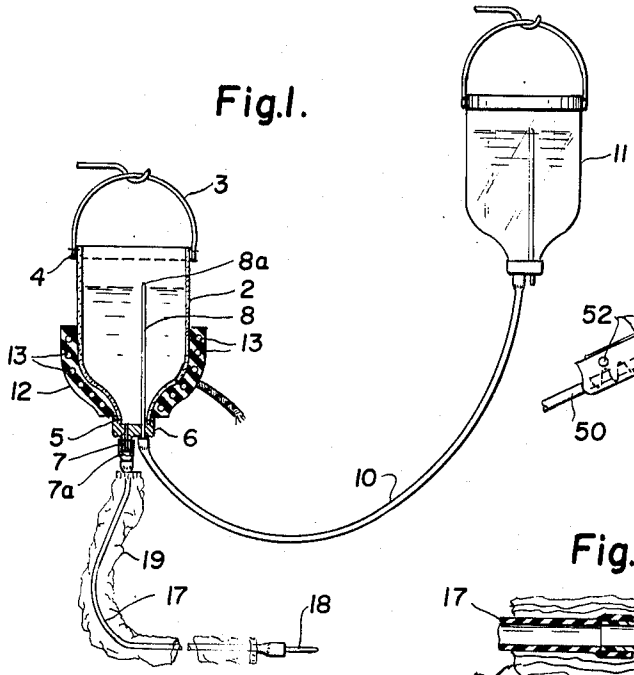


Fig. 7.

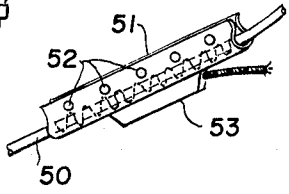


Fig. 2.

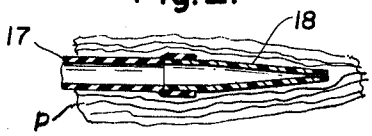


Fig. 3.

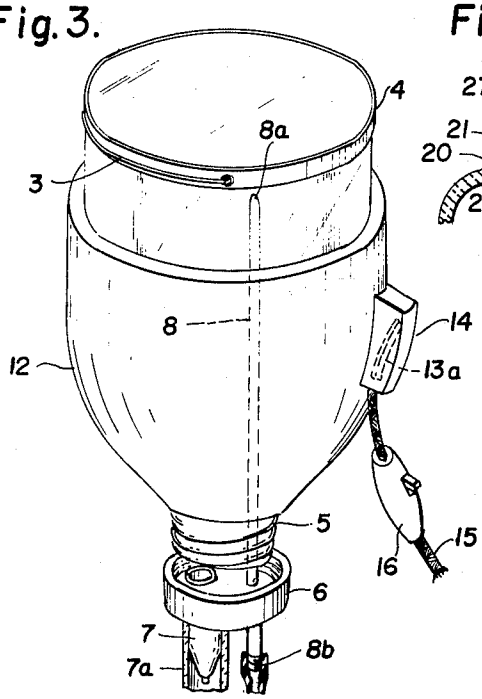


Fig. 4.

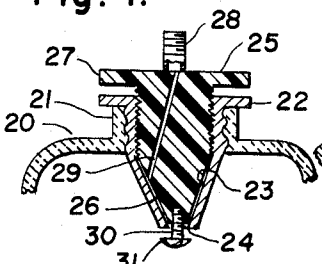


Fig. 5.

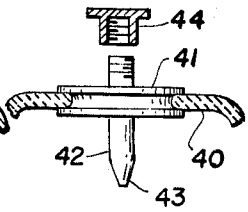
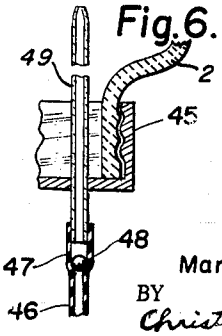


Fig. 6.



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3,247,851

APPARATUS FOR APPLYING LIQUIDS TO THE BODY

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3 Claims. (Cl. 128—254)

This invention relates to the treatment of various portions of the body by the application of liquids and is for an apparatus for supplying liquid to a pad or compress on the area to be kept moist. This application is a continuation-in-part of my application Serial No. 28,806, filed May 12, 1960, now abandoned.

In many cases post-operative treatment requires that the patient be denied water for a considerable period of time during which he suffers considerable discomfort. This can be relieved to a great extent by keeping the lips and mouth moist, but ordinarily a nurse cannot devote to one patient the attention necessary to do this with sufficient frequency. In my application above referred to, one form of apparatus is disclosed by means of which a gauze pad applied over the mouth is supplied with liquid at a controlled rate such as to keep the lips moist and humidify the air being inhaled, without, however, supplying it at a rate that will cause the patient to swallow, or so rapidly as to wet the bed clothes, although there may be some excess not evaporated, that may be absorbed by a towel.

In addition to this condition, there are many cases where doctors recognize the efficacy of warm wet compresses, but do not direct such treatment because it is impractical to expect a nurse to keep the pads properly moistened and at any reasonably uniform temperature. There is a further hazard of getting wet dressings too hot and actually burning the area to which they are applied. Use of electric heating pads is not permitted in most hospitals, where extreme care is taken to avoid any possibility of electric circuits being grounded or short-circuited in the presence of moisture or moist dressings with possible injury to the patient or an attendant.

Where wet dressings are used about open wounds, sterile medicated solutions are generally used, these being supplied in bottles, usually 1000 cc. bottles, by a drug concern or seller of hospital supplies, and while there is uniformity in the capacity of the bottles furnished by different suppliers and the closures are generally standard as to size, there is a variation of shapes of bottles supplied by different concerns.

According to the present invention I preferably provide a receptacle in the form of a bottle or vessel of glass or plastic with means for suspending it in an inverted position, and to which solution from any commercial source may be transferred. It is provided on the neck or outlet with a closure on which is a discharge nipple to which a flexible tube, such as a vinyl plastic tube, may be fitted. In the preferred form there is a second nipple on the closure which constitutes a continuation of a tube that extends up through the inverted bottle-like vessel to the top which may serve the double function of an air inlet tube, or a liquid inlet tube when liquid is being transferred from a supplier's bottle to this unit. At the discharge end of the flexible tube is an outlet terminal, preferably for most purposes one which tapers toward its free end to a restricted outlet constituting a metering orifice through which liquid will flow at a predetermined rate, these terminals or outlet nozzles being supplied in graduated sizes.

There is provided a jacket, of rubber or of plastic, but which is preferably somewhat resilient, which snugly fits about the lower end of the inverted vessel or receptacle, and in which is embedded an electric resistance heating wire, with a sealed-in thermostat, for heating the liquid in the dispensing vessel to a predetermined temperature.

The vessel is hung in an elevated position with the flexible tube which is several feet long, extending to the area of the patient's body to be treated. The metering terminal or nozzle is embedded in a gauze pad or other absorbent mass which is to be wet with the fluid. Where the heating jacket is used, a flexible disposable cellophane or similar tubing of several times the diameter of the vinyl tube is fixed about the vinyl tube to provide a dead air space around the vinyl tube through which the liquid is flowing.

An object of the present invention is to provide a safe gravity flow apparatus for keeping a pad or compress applied to an area of the body moist.

A further object is to provide an apparatus for this purpose which will keep the pad at the desired uniform temperature.

A further object of the invention is to provide a device which can be used with solutions furnished in the bottles of any manufacturer irrespective of their shape.

A further object is to provide apparatus for this purpose which can go for long periods of time without attention, while a still further object is to provide a safety feature for controlling the admission of air to the apparatus to prevent a rate of flow higher than that required.

These and other objects and advantages are secured by my invention which may be more fully understood by reference to the accompanying drawings which show certain embodiments thereof and in which:

FIG. 1 is a view partly in elevation and partly in section of one form of apparatus embodying my invention;

FIG. 2 is a section through the discharge terminal of the tubing showing it embedded in a pad of gauge or fabric;

FIG. 3 is an enlarged perspective view of the container shown in FIG. 1;

FIG. 4 is a fragmentary vertical section through a modified form of air inlet valve;

FIG. 5 is a view partly in elevation and partly in section of still another form of air inlet valve;

FIG. 6 is a detail fragmentary view showing an air inlet tube for the device of FIG. 3, having a check valve at the lower end thereof, the view having a vertical section; and

FIG. 7 is a fragmentary view showing more or less schematically an alternative arrangement for heating the liquid.

Referring to the drawings, and first to FIGS. 1 to 3, 2 designates a receptacle such as a bottle of either glass or plastic with a bail 3 secured to a band 4 clamped about the base so that it may be suspended in an inverted position from a stand in the same manner as vessels used for intravenous injection of fluid. It has a restricted neck 5 which is externally threaded, onto which a cap 6 is secured. The cap has a nipple 7 projecting therefrom, the inner end of which terminates inside the cap.

There is a tube 8 sealed in the cap with a short extension at the exterior of the cap, and a long portion that reaches well up into the bottle, preferably close to the opposite end. As here shown, the projecting outer end is externally threaded so that a closure cap may be removably secured thereto. However, in use, there may be many occasions involving long periods of treatment when a flexible plastic tube 10 is attached thereto. The opposite end of this tube is attached to the discharge nipple of another bottle 11 hung in an inverted position at the same or a higher elevation. The container or bottle 2 may be manufactured to be of uniform shape and size for all units, while the bottle 11 may be the container supplied by supplier of sterile solutions for use by hospitals, each supplier usually having a bottle different in some respect as to shape or contour from those of other suppliers. Usually both containers will be of standard 1000 cc. capacity.

Fitted about the lower portion only of the bottle-like

receptacle, that is the neck end, which is the lower portion when the bottle is inverted, is a rubber jacket **12** that envelopes only about half to two-thirds of the height of the bottle from the neck up. Its interior contour is accurately matched to the exterior contour of the receptacle **2**, which is the reason why it is preferred that **2** be a special bottle since the jacket could not conform to the variety of shapes furnished by different suppliers. The hospital may thus have one unit adapted for use with any solution from any supplier which any doctor on the staff may specify. The jacket has embedded within it electric resistance heating wires **13**. There is a protuberance **14** on the jacket in which is housed a completely sealed thermostat, which is of usual construction embodying a bi-metal strip that flexes as it heats or cools to open or close a circuit through the heater wires from an appliance cord **15** that is provided with a manual switch **16**, and which may be plugged into a standard outlet. The thermostat is schematically shown at **13*a*** in FIG. 3.

Since the thermostat is completely housed in rubber, it cannot be tampered with, nor is there any metal through which a "ground" may be made that would shock the patient or any attendant who happened to touch the device. Because of the resistance wire being completely embedded in rubber, and because of the bottle being of insulating material, the arrangement makes it impossible for any stray electrical current to reach the fluid, and through the fluid be conducted to the patient.

The heater will heat liquid in the receptacle **2** to a definite temperature specified by the instrument builder and the design of the thermostat. I have found that if the thermostat opens at a temperature of 180° F., the liquid in the bottle, if the receptacle is glass and the bottle contains 1000 cc. of solution, its maximum temperature will reach 145° F. As the liquid level in the bottle or receptacle **2** falls, there will be an inconsequential increase to 156° F., little increase occurring after the liquid level falls below the top of the heating jacket.

Attached to the nipple **7** is a more or less standard ready-packaged vinyl tube **17** with a sight glass **7*a*** at its upper end fitted about the nipple. This tube **17** is a disposable tube which is customarily replaced with each new patient. It terminates in a blunt-ended plastic nozzle **18**, preferably of a resilient, non-metallic material so that it cannot pierce the pad into which it is placed or injure the person to whom the pad is applied or be uncomfortable should the patient assume a position where the weight of his body would be likely to come against the nozzle. The nozzle has a discharge orifice of a carefully selected size that will pass no more than a predetermined number of drops per minute.

Hospitals are supplied with rolls of crushed cellophane tubing which, when opened out, is about an inch in diameter, and while being flexible it is irregularly contoured, somewhat stiff, and does not of itself flatten out or collapse. This tubing is presently used as a package for instruments which have been sterilized, a length of tubing being drawn from the crushed roll, cut off, the instruments placed therein, and the ends sealed by twisting them and putting a piece of adhesive tape or cellophane tape around the twisted ends. According to the present invention I use a length of this crushed plastic tubing approximately the length of the vinyl tube **17** and place it over the vinyl tube **17** as shown in FIG. 1, opening it out so that it is partially inflated. This enveloping tubing is designated **19** in FIG. 1. The upper end is twisted around the upper end of the vinyl tube **17** and it may be taped, if necessary, although the character of plastic from which it is made is such that it will usually remain twisted. The other end of the tubing **19** is similarly closed around the plastic tube **17** adjacent the nozzle. This provides a dead air space between the vinyl tube **17** and the air in the environment

in which the apparatus is used, so that there will be little transfer of heat from the liquid flowing in the vinyl tube from the container to the discharge nozzle.

In use the container **2** may be substantially filled with the solution to be applied to the patient and the closure **6** applied thereto. A receptacle comprising a bottle is then hung in an inverted position by means of the bail **3**. The tube **17** with its enveloping tubing **19** will have been preferably applied to the discharge nipple on the terminal and the nozzle **18** will be embedded in a pad of gauze or in a towel or other fabric compress indicated at P in FIG. 2. Usually it will be looped through the fabric to prevent its accidental removal. The size of the discharge orifice in the nozzle will have been determined by the physician. Assuming, however, that the temperature of the liquid in the container has been heated to the maximum of about 145 – 156° F. before treatment is started, the temperature of the gauze or compress will be determined by the rate at which the liquid is discharged from the nozzle **18**. At 60 drops per minute the temperature will be tepid; that is at about 99° F. At 80 drops per minute the temperature will be approximately 102° F., and at 120 to 140 drops per minute the temperature may be maintained between 108° F. and 115° F. Usually these higher temperatures are not employed for more than 2½ hours at a time, but during the time that the device is used, the temperature as indicated by a thermometer buried in the guazette or pad will undergo very little variation. This is effected very little whether the room temperature is 65° F. or 85° F. because of the insulating effect of the external plastic tubing provided by the tubing **19** forming a sheath and the dead air space between the tube **17** and the surrounding atmosphere. In initially starting the device the receptacle **2** may be filled from the manufacturer's receptacle, but if treatment is to be continued a long period of time the second receptacle, which may be the supplier's receptacle, and which is designated **11** in FIG. 1, is hung alongside the receptable **2** and at either the same or a higher elevation. A tube **10** leads from the discharge of the receptacle **11** to the outer end of the tube **8**. The tube **8** preferably has a restricted inner terminal **8*a***. As liquid runs by gravity through the tube **17** to the patient, it tends to lower the level of liquid in the vessel **2** whereupon liquid flows from the vessel **11** through the tube **10** and through the tube **8** into the top of the body of liquid in the vessel **2**. This arrangement is particularly desirable because the unheated liquid flowing into the receptacle **2** is warmed by passing up the tube **8** through the liquid already in the vessel and is discharged at the top of the liquid so that it is sure to be heated to the maximum temperature before it flows out the tube **17**. In this way the apparatus of the present invention can be adapted to use with the solution of any supplier without requiring that the electric heating device comprising the jacket **12** with its embedded resistance wires be of a different shape for the bottle of each different manufacturer. This arrangement also provides for the constant application of liquid to the patient for a sustained period of time without attention since the contents of the bottle **11** added to the initial contents of the receptacle **2** will have to be exhausted before the flow stops. As soon as the bottle **11** is emptied it can be replaced with a fresh bottle without taking the apparatus out of operation because of the reserve supply that is in the container **2**.

While the size of the nozzle **18** is of primary importance in controlling the rate of flow of the fluid, a safety factor may be added by regulating the admission of fluid, either air or liquid, to the receptacle **2** or the vessel **11**, or both. For example, the constriction of the tube **8** at **8*a*** will restrict the rate at which either air or liquid may enter the vessel or receptacle **2**. The tube **8** has its outer end threaded as indicated at **8*b*** and an ordinary screw closure cap, like that used on a tire valve or collapsible tube, may

be applied to this threaded terminal when the container **11** and tube **10** are not used, and by appyling it loosely or tightly, the admission of air may be further restricted or cut off entirely. The closure on the vessel **11** may be a duplicate of that on the vessel **2**, as illustrated, and air admission may be restricted and controlled in the same way.

In FIG. 4 I have shown a modification in which **20** designates the top of the inverted container or receptacle similar to the receptacle **2** but wherein it is formed with a bushing **21** that is threaded, and into which is screwed a sleeve **22** having a tapered inner end **23** terminating in an orifice **24**. There is a plug **25** screwed into this sleeve with a tapered or inverted conical inner end **26** that fits into the sleeve **22** at the top, but the taper of which diverges downwardly very slightly from the tapered interior of the sleeve. This plug has a flange **27** to facilitate turning it, and it has a central nipple **28** extending upwardly from the top. There is a diagonal passage **29** in the plug extending from the inner end of the nipple to the face of the inverted conical portion **26** terminating in the outer face of the portion **26** near the top thereof at a place where, when the plug is screwed down tight in the sleeve, the end of this passage will be closed by the inner sloping face of the tapered sleeve portion, but as the plug is turned in a direction to screw it upwardly, the end of this passage will move into a level where the portion **23** is of larger diameter and air or liquid may then flow from the nipple through the passage **29** and out the orifice **24**. A practically micrometer adjustment of the flow through the orifice is thus obtained.

On the lower end of the plug there is a stem **30** that passes through the orifice **23** and has an expanded terminal **31** thereon which is spaced from the lower end of the sleeve and the orifice **24** when the passage **29** is closed. As the plug is screwed up, and after it has moved a predetermined distance, the terminal **31** will close the orifice **24**, making it impossible to open the valve provided by the plug and sleeve too far. Thus the device is safe against injury to the patient should some one tamper with the valve. It may be used with a second container, as in FIG. 1, by attaching a tube, corresponding to **10**, to the second bottle and to the nipple **28**. The nipple **28** may be externally threaded to receive a closure cap. When a bottle is equipped with this type of valve, it is not necessary to use the tube **8** in the closure.

FIG. 5 discloses a different form of inlet for either air or liquid. In this figure, **40** designates the inverted bottom of a container or receptacle such as **2**. Sealed into it is an insert **41** through which extends a tube **42** with a threaded outer end and a restricted orifice in its constricted inner terminal **43**. It may have a screw cap, as above referred to, such as the cap **44**, that is screwed onto or off this nipple to admit or exclude air while the restricted inner end of the tube limits the flow. If more restriction is required than that provided by the restricted inner terminal, the cap **44** may be loosely applied to the outer end of the tube **42**, and thereby further impede the flow of air into the vessel. When it is desired to use a second bottle, the arrangement shown in FIG. 1 may be used, as with FIG. 4, by attaching a tube from the second bottle to the threaded nipple provided by the upper end of tube **42**.

In FIG. 6 there is shown a modification of the cap **6**, wherein the long tube has an outwardly-closing ball check valve at its lower end. In this figure, **45** is a cap, like **6**, and **46** is a tube corresponding to **8**, but instead of the lower end of the tube being threaded, a ball check valve **47** is fixed to its lower end with a downwardly-closing ball **48** therein. The hose-receiving nipple or air intake terminal is designated **49**.

With my invention the rubber jacket with embedded heating wires and sealed thermostat can be kept clean and sterile. It is electrically safe, and constant moist heat can be applied to any area where its application is

required with little possibility of a visitor dangerously molesting it. The container or receptacle **2** may be sterilized, and one such container replaced with another. Where heat is not required the jacket **12** need not be used, and in such case the encasing tubing **19** need not be used. Not only does the nozzle **18** meter the outflow, but by controlling the intake of fluid, either air or liquid, a further flow control to the fabric or gauzette may be secured.

Except as otherwise described, the modifications shown in FIGS. 4, 5 and 6 are used in the same way as the apparatus of FIGS. 1 to 3.

In FIG. 7 I have shown a modification of the apparatus wherein the liquid is heated as it flows from the receptacle by gravity through the tube. The apparatus may be generally the same as shown in FIG. 1, except that instead of a heating jacket enveloping the bottle there is a heating unit extending along a length of the tube from the bottle to the pad. In this figure, **50** designates a tube corresponding to tube **17** in FIG. 1, the upper end of which would be applied to the discharge nipple on the bottle closure, and the lower end of which would have a metering nozzle similar to **18**, these not being shown in this figure. There is a rubber or similar flexible sheath **51** made in the form of a flat sheet with cooperating snap fastener parts along the edges thereof, as indicated at **52**, so that it may be easily applied to and removed from the tube, and when it is closed about the tube, it snugly fits against it. It has heating wires embedded therein and a thermostat is sealed within the protuberance **53**. There is an appliance cord similar to **15** connected to it to the heating wires through the thermostat in the usual manner.

My invention provides apparatus for keeping a pad wet and at a substantially uniform temperature by discharging heated liquid, either water or solution, to the pad by gravity at a substantially constant and predetermined rate with the liquid heated to a predetermined temperature higher than that to be maintained in the pad so as to compensate for cooling that occurs in the pad from evaporation, from radiation and conduction, and from the constant dilution of the incoming liquid with the body of liquid absorbed in the pad, and otherwise. By reason of keeping the pad moist and at a selected controlled temperature, it may be used for the treatment of the body wherever constant moist heat is required with likelihood of burning the patient being practically nil, and with a minimum amount of attention.

Various forms and modifications have been illustrated and described, but it will be understood that various changes and modifications may be made in the apparatus by those skilled in the art within the contemplation of my invention and under the scope of the following claims.

I claim:

1. Apparatus for applying sustained moist heat to a human body comprising a pad of absorbent material, a receptacle having a discharge connection at one end and means by which it may be suspended with the discharge connection at the bottom, a flexible non-metallic tube joined to said connection for receiving liquid therefrom and conducting it to the absorbent pad, a restricted blunt-ended metering nozzle at the other end of the tube embedded in the pad for metering the flow of liquid into the pad from the receptacle to the pad at a predetermined rate, means for heating the liquid before it reaches the metering nozzle to a fixed temperature higher than the temperature at which the pad is to be maintained, said last-named means comprising a jacket formed of electrical insulating non-absorbent rubberous material removably fitted about the lower portion of the receptacle having electric heating wires embedded therein with means for connecting the wires to a source of current, and a thermostat for controlling flow of current to the heater wires, said thermostat being completely sealed within the jacket.

2. Apparatus for heating an area of the human body

by a constantly applied hot liquid compress comprising a pad of absorbent material, a receptacle having a discharge connection at one end and means by which it may be suspended with the discharge connection at the bottom, a flexible non-metallic tube joined to said connection for receiving liquid therefrom and conducting it to the absorbent pad, a restricted blunt-ended metering nozzle at the other end of the tube embedded in the pad for metering the flow of liquid into the pad from the receptacle to the pad at a predetermined rate, means for heating the liquid before it reaches the metering nozzle to a fixed temperature higher than the temperature at which the pad is to be maintained, said last-named means comprising a jacket formed of insulating non-absorbent rubberous material removably fitted about the lower portion of the receptacle having electric heating wires embedded therein with means for connecting the wires to a source of current, and a thermostat for controlling flow of current to the heater wires, and means comprising a moisture-proof insulating tubing surrounding said tube for reducing heat loss from liquid flowing through the tube, said tubing being of substantially larger internal diameter than the exterior diameter of the liquid-carrying tube which it encloses to provide a free air space between the liquid-carrying tube and the tubing which encases it.

3. Apparatus for heating a pad of absorbent material and keeping it wet with liquid comprising a receptacle having a discharge connection at one end and means by which it may be suspended with the discharge connection at the bottom, a flexible non-metallic tube joined to said connection for receiving liquid therefrom and conducting it to an absorbent pad, a restricted metering nozzle at the other end of the tube for metering the flow of liquid into the pad from the receptacle to the pad at a predetermined rate, means for heating the liquid before it reaches the metering nozzle to a fixed temperature higher than the temperature at which the pad is to be maintained, said last-named means comprising a jacket formed of insulating non-absorbent rubberous material removably fitted about the lower portion of the receptacle having electric heating wires embedded therein with means for connecting the wires to a source of current, and a thermostat for controlling flow of current to the heater wires and a crinkled cellophane tubing providing a sheath of larger internal diameter than the outside diameter of the flexible tube which it encloses extending along substantially the entire length of the flexible tube and enclosing the same to provide a dead air space thereabout.

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