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3,263,871

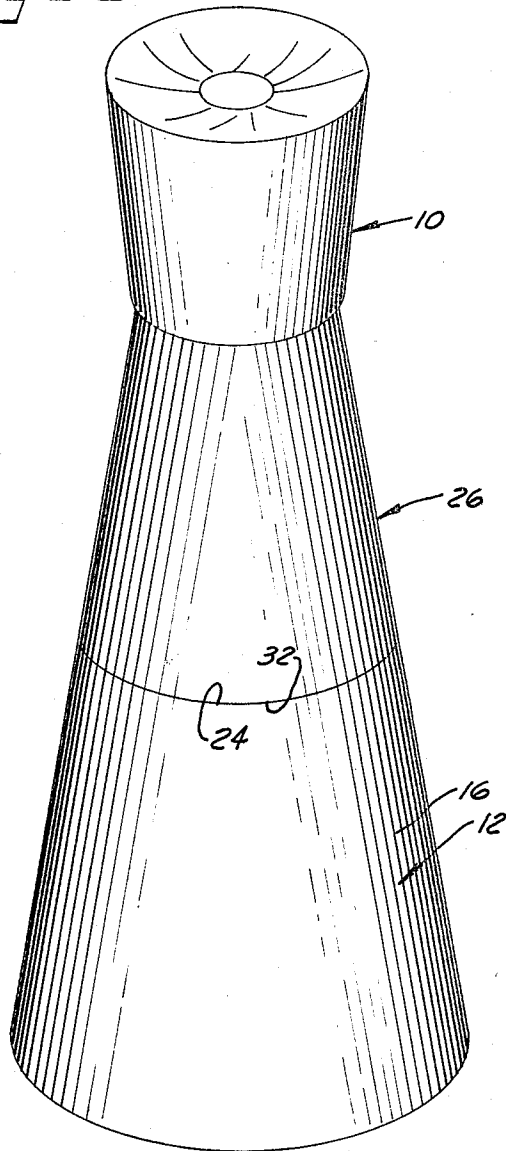
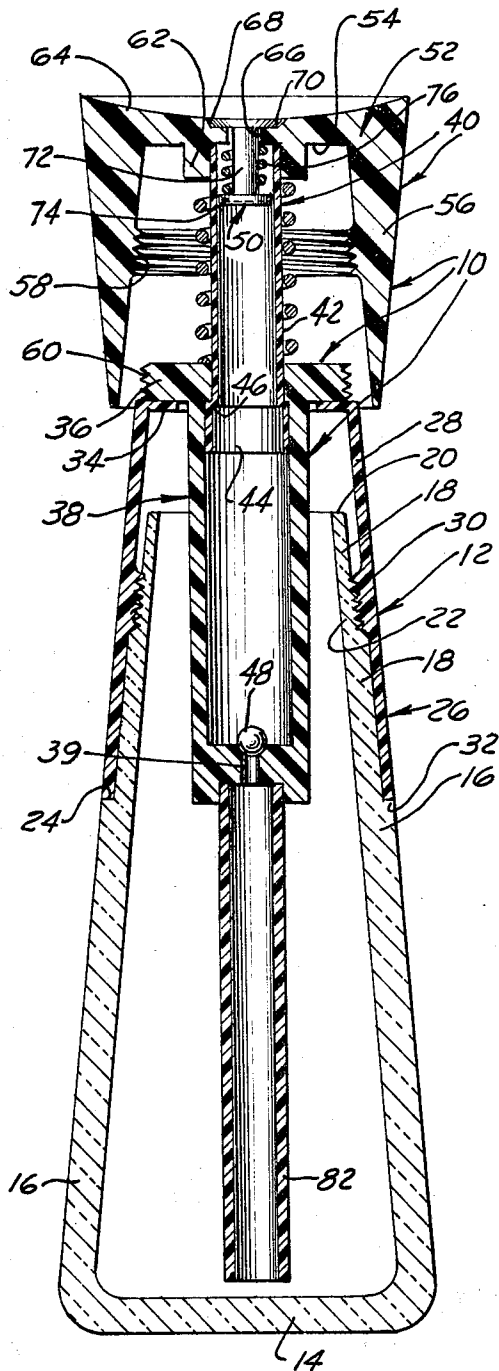
DISPENSING PUMP FOR A CONTAINER

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FIG-2

FIG-1



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Fig. 3

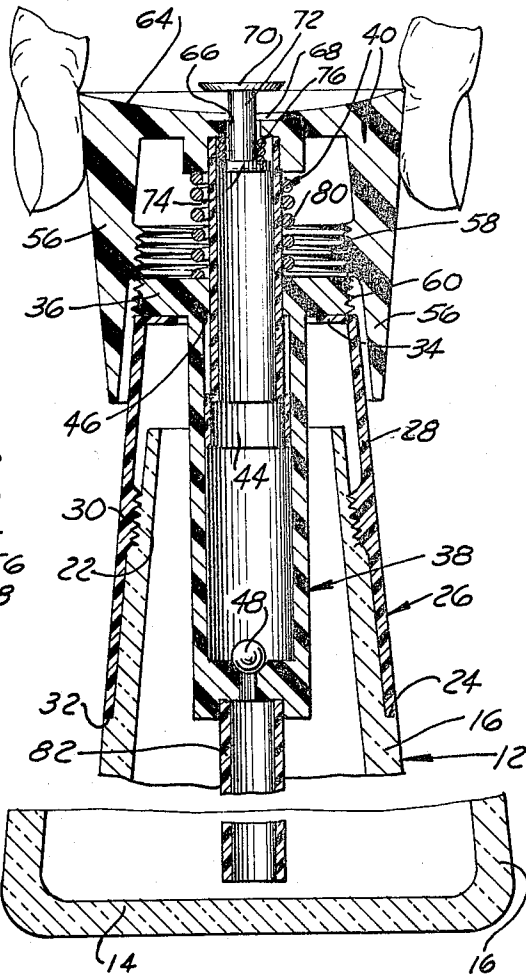
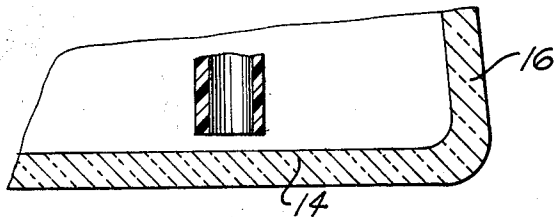
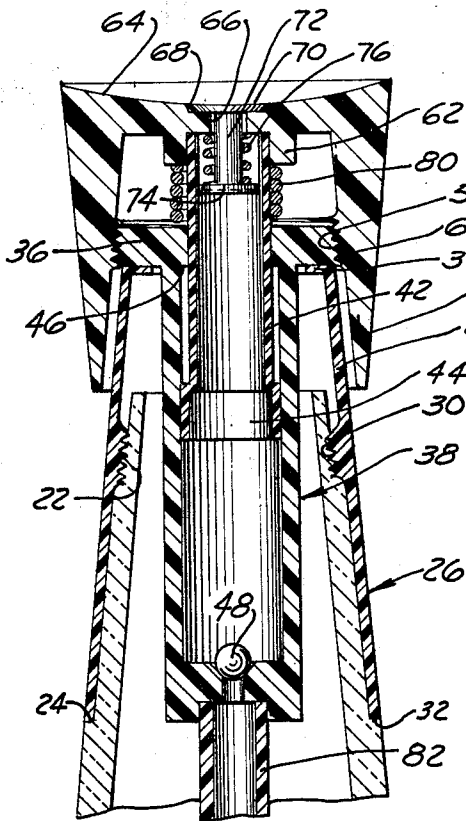


Fig. 4



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DISPENSING PUMP FOR A CONTAINER
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The improved pump comprising the present invention is designed for use primarily in dispensing a viscous cosmetic preparation such as a face or hand cream, a face or hand lotion, a hair creme or a shampoo liquid, the pump being applicable to a container within which such a preparation is enclosed or packaged. The pump, when operatively installed upon such a container, provides a dispenser for the viscous preparation whereby measured quantities of the preparation may be withdrawn from the container and made available for use. The invention is, however, capable of other uses and a dispensing pump constructed in accordance with the principles of the present invention may, if desired and without modification, be employed for the dispensing of a liquid or a semi-liquid regardless of its viscosity or of the use to which such a liquid or semi-liquid may be put. For example, the dispensing pump of the present invention may be found useful in connection with the dispensing of a medicated creme, an ointment, a salve or a biological preparation that is intended for use by hand application to the body of the user. Irrespective, however, of the particular use to which the invention may be put, the essential features thereof are at all times preserved.

Heretofore, in connection with the dispensing of liquid and semi-liquid preparations intended for hand application, various spout type dispensing pumps have been commonly employed. A spout type pump requires the use of two hands, one to pick up the container and manipulate the pump, and the other to receive the discharged or dispensed quantity of the liquid or semi-liquid preparation. Furthermore, in using such a pump, it is necessary to aim the dispensing spout at the region of application of the preparation, i.e., at the palm or fingers of the hand which receives the preparation and frequently, if one's aim is poor, some of the preparation is spilled. A spout type dispensing pump also is subject to the objection that there is usually drippage from the spout after a given dispensing operation has been completed, the last drop of liquid usually adhering to the outer or discharge end of the spout. Thus, if drippage does not occur, each drop of liquid may, if it be of a volatile nature, harden on the spout and clog the latter. Similarly, whatever liquid remains within the spout on the outlet side of the outlet valve that is usually associated with a conventional spout type dispensing pump is likely to harden within the spout and effect clog thereof.

A still further and serious limitation that is associated with a conventional spout type dispensing pump resides in the inability of the operator or user to dispense fractional charges of the liquid undergoing dispensing. Whereas, such a pump will, upon full depression of the pump plunger, dispense a full measured charge of liquid, when a smaller or fractional quantity of a charge is required, the operator is at a loss to ascertain the proper displacement of the pump plunger in order to effect discharge of the desired fractional charge. Where a full measured charge is small, much of the charge remains in gravitational transit as it falls from the spout so that it does not reach the palm of the hand by the time that the pump plunger has reached the limit of its downward stroke. This is particularly true when the involved liquid is of a viscous nature and tends to adhere to the spout and flow slowly therefrom. By the same token, when a desired fractional charge is extremely small, amounting to only a drop or two, such a charge may not separate from the spout and

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must be wiped therefrom. Additionally, after a given partial charge of liquid has been deposited in the palm of the operator's hand, its volumetric content is difficult to ascertain because palm sizes and palm depths will vary appreciably. For these reasons it is difficult, if not impossible, for an operator to effect proper fractional or partial pump displacement when using a conventional spout type dispensing pump. Finally, a spout type dispensing pump is difficult to clean and residual liquid contained within the spout, even if it does not harden before a subsequent application or dispensing operation, may lose its therapeutic value, especially if such liquid is of a biological nature.

The present invention is designed to overcome the above-noted limitations that are attendant upon the construction and use of a conventional spout type dispensing pump and, toward this end, the invention contemplates the provision of a novel dispensing pump which is readily applicable to conventional cosmetic or other container without requiring modification of the container and which, when so applied, presents an upwardly facing shallow bowl-shaped dispensing well, the volumetric capacity of which is only slightly greater than the volume of a single charge of the liquid undergoing dispensing. A small opening in the bottom of the dispensing well communicates with the discharge outlet of the pump and the well itself constitutes a part of the movable pump plunger. Thus, during depression of the pump plunger, filling of the well will take place to a degree commensurate with the extent of depression of the plunger. The well is of shallow concavity so that whatever quantity of liquid is received therein from the pump outlet may be conveniently wiped from the bowl by one or more fingers of the user for purposes of application to the face, scalp or other area of the body where the liquid is to be applied. The well inlet is normally closed by a valve, the body of which presents a curved surface conformable to the curvature of the well and completes the well contour when the valve is seated. The use of such a valve makes it unnecessary to employ a separate closure cap for the container when the dispenser is not in use.

An important feature of the present invention resides in the ease with which the dispensing pump may be manipulated when it is operatively installed upon a liquid container. Assuming that the container is so designed that it may be positioned in an upright position on a supporting surface with an appreciable degree of stable equilibrium, the user may, by utilizing a single hand, depress the pump plunger in order to cause a predetermined amount of liquid to be discharged into the well, after which such liquid may be readily wiped from the bowl with one or more fingers of the same hand, thus allowing the other hand to be free for other purposes. Upon release of the pump plunger, the inlet from the pump cylinder to the well automatically becomes closed and the container as a whole is thus sealed and will remain sealed until the next operation of the dispensing pump.

The provision of a dispensing pump of the character briefly outlined above being among the principal objects of the invention, another and important object is to provide such a pump in which novel means are provided for locking the pump plunger in an inoperative position so that it may not be manipulated for dispensing purposes, while at the same time, the valve that is associated with the well inlet is maintained in its seated position so that the container remains sealed, such positions of the plunger and valve being provided for shipping and storage purposes.

The provision of a dispensing pump which is of simple construction and, therefore, may be manufactured at a low cost; one in which the principal component parts thereof readily lend themselves to conventional plastic molding processes so that, by utilizing plastic materials for

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their construction, manufacturing costs may be further reduced; one which is comprised of a minimum number of moving parts and, therefore, is unlikely to get out of order; one which is rugged and durable and, therefore, will withstand rough usage; one which is attractive in its appearance and pleasing in its design; and one which otherwise is well adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

Numerous other objects and advantages of the invention, not at this time enumerated, will readily suggest themselves as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention is shown.

In these drawings:

FIG. 1 is a perspective view of a liquid container showing the improved dispensing pump of the present invention operatively applied thereto;

FIG. 2 is a sectional view taken substantially centrally and vertically through the container and pump of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken substantially centrally and vertically through the container and pump, and showing the pump plunger in its fully depressed position; and

FIG. 4 is a sectional view similar to FIG. 3 but showing the pump plunger in its locked inoperative position.

Referring now to the drawings in detail and in particular to FIGS. 1 and 2, a dispensing pump constructed according to the present invention is designated in its entirety by the reference numeral 10 and it is shown as being operatively installed upon or applied to a liquid container 12. The container 12 may be of any suitable shape and it may be formed of any suitable material such, for example, as glass. In the exemplary form of the container illustrated herein, the container is shown as being of upright conical configuration of small slant angle and appreciable height. The circular bottom wall 14 of the container merges gradually with a conical or upwardly tapered side wall 16 and the latter terminates at its upper end in a reduced neck portion 18 which presents an open upper rim 20, is provided with an externally threaded section 22 a short distance below the rim 20, and also presents a short distance beneath the threaded section 22 an upwardly facing annular seating shoulder 24.

The dispensing pump 10 is essentially a lift pump and is in the form of an assembly of parts including a frusto-conical cap 26 by means of which the pump as a whole is supported upon the container 12. The cap 26 is provided with a side wall 28 having a medially and interiorly threaded section 30 which is designed for threaded engagement with the exteriorly threaded section 22 of the reduced neck portion 18 of the container side wall 16 and has a lower circular rim 32. The latter is designed for seating engagement with the upwardly facing annular seating shoulder 24 when the cap 26 is operatively installed upon the container 12. The upper rim of the frusto-conical cap 26 is provided with an inturned annular flange 34 which underlies and is suitably fixedly secured to an enlarged annular head 36 on the upper end of a vertically extending pump barrel 38. The latter projects downwardly through the annular flange 34 and is in concentric relation with the cap 26. The lower end of the barrel 38 is provided with the usual pump inlet 39.

The barrel 38 constitutes the body portion or cylinder of a lift-type pump assembly, the assembly further including a composite plunger assembly 40. The plunger assembly 40 is comprised of a tubular plunger 42 which is vertically reciprocable in the pump barrel 38 and is provided with an enlarged cylindrical lower end section 44. The latter cooperates with a downwardly facing annular shoulder 46 on the inner portion of the head 36 in preventing withdrawal of the tubular plunger 42 from the barrel 38. A gravity-biased ball valve 48 which functions

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as a check valve is provided in the lower region of the barrel 38 and it normally closes the pump inlet 39. A spring-pressed lift valve 50 is provided at the upper end of the tubular plunger 42 as is customary in connection with a conventional lift-type valve.

Except for certain design features, the arrangement of parts thus far described is of more or less conventional construction and no claim is made herein to any novelty associated with the pumping system as such, the novelty of the present invention consisting rather in the specific arrangement of the lift valve 50 and its association with a novel form of dispensing or pump actuator which will now be more fully described and subsequently claimed.

Still referring to FIGS. 1 and 2, the aforementioned dispensing or pump actuator is in the form of an inverted cup-shaped body 52, the underneath side of which is formed with a relatively deep socket 54. The latter has an open bottom and is defined by a downwardly tapered apron 56 which is, in effect, the side wall of the cup-shaped body 52. The medial region of the apron 56 is formed with an internally threaded section 58 which is designed for threaded engagement with an external screw thread 60 on the outer surface or periphery of the enlarged head 36 at the upper end of the pump barrel 38. The upper end of the tubular plunger 42 is cemented or otherwise fixedly secured within an annular downwardly extending retaining boss 62 on the portion of the body 52 that defines the top portion of the socket 54 in order that the head 52 is movable bodily with the plunger 42.

The upper side of the top wall of the head 52 is formed with a shallow frusto-spherical well 64 of large radius. A vertical bore or passage 66 in the central portion of the top wall of the head 52 establishes communication between the extreme lower portion of the well and the upper end of the tubular plunger 42, such bore 66 constituting or establishing a pump outlet. The portion of the top wall of the body 52 that surrounds the upper end of the pump outlet 66 is provided with a comparatively large shallow recess 68 in order to form a valve seat for a circular disk-like valve plate 70 which is formed on the upper end of the lift valve 50. The valve 50 further includes a reduced valve stem 72 and a lower outwardly extending annular flange 74. A spiral compression spring 76 surrounds the stem 72 and bears at its lower end against the flange 74. The upper end of the spring abuts against the portion of the top wall of the body 52 that surrounds the valve outlet 66 with the result that the spring urges the lift valve into its closed position as shown in FIGS. 2 and 3.

It is to be noted at this point that the valve plate 70 of the lift valve 50 completely fills the recess 68 and that the spring 76 serves normally to maintain the valve plate 70 seated within the recess 68 so that the normal condition of the lift valve is a closed one. The upper surface of the disk-like valve plate 70 is dished so that it presents a smooth substantial continuation of the curvature of the well 64 when the lift valve is in its closed condition.

The plunger assembly 40, including the tubular plunger and its attached dispensing or pump actuator in the form of the inverted cup-shaped body 52, is movable bodily as a unit between the normal raised position wherein it is shown in FIG. 3. The former position is limited by engagement of the enlarged lower end section 44 of the tubular plunger 42 with the aforesaid annular shoulder 46 and it is normally maintained by reason of a spiral compression spring 80 which surrounds the upper region of the tubular plunger 42 and has its lower end in abutment with the enlarged annular head 36 of the pump barrel 38 and its upper end in abutment with the lower end of the annular retaining boss 62. The depressed position of the plunger assembly 40 is limited by interengagement between the internally threaded section 58 of the apron 56 and the external screw thread 60 on the enlarged annular head 36 of the pump barrel 38, the lowermost threaded convolution of the threaded section 58

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engaging the uppermost thread convolution of the screw thread 60. The plunger assembly is also capable of being moved to an overrun extreme lowermost position (see FIG. 4) wherein the internally threaded section 58 is threadedly received over the screw thread 60 for plunger assembly locking purposes in a manner and for a purpose that will be described in greater detail presently.

The lower end of the barrel 38 of the composite plunger assembly 40 communicates with the upper end of a vertically extending dip tube 82, the tube extending downwards to a point adjacent to the bottom wall 14 of the container 12 when the dispensing pump 10 is operatively mounted on such container.

In the operation or use of the herein described dispensing pump, the pump is applied to the neck portion 18 of the container 12 by threading the cap 26 onto the externally threaded portion 22 of the container neck portion until the cap and the container assume a sealed condition as shown in FIG. 4. Thereafter, the composite plunger assembly 40 is turned in a direction to unscrew the apron 56 from the enlarged head 36 of the barrel 38, whereupon the spring 80 will force the plunger assembly 40 upwardly so that the parts assume the position in which they are illustrated in FIG. 2.

Assuming that the container 12 is filled with a liquid substance such as a face cream or lotion, upon upward shift of the plunger assembly 40 into the position shown in FIG. 2, liquid flows from the container into the interior of the barrel 38 via the dip tube 82 and the pump inlet 39, the ball valve 48 remaining open during upward movement of the assembly. A few pumping strokes of the plunger assembly 40 may be required initially to fill the pump barrel 38 but, when the barrel is filled, each downward stroke of the plunger assembly will cause the lift valve 50 to be elevated from its seat so that a small quantity of the liquid will pass upwardly through the pump outlet 66 and collect in the well 64. Upon release of the plunger assembly 40, the spring 80 will restore the assembly to its uppermost position and, during upward movement thereof, the ball valve 48 will open and permit liquid from the container 12 to flow into the barrel as heretofore indicated. During downward movement of the assembly the ball valve is in its closed position thus preventing downward flow of the liquid in the barrel 38 back to the container. At the end of the upward movement of the plunger assembly, the lift valve 50 will become seated so that such liquid as has collected in the well 64 will remain therein in the form of a pool which then is readily available for immediate application to various portions of the body of the user. The amount of liquid which is pumped into the well depends upon the amount or degree of downward movement of the assembly 40. The maximum amount is obtained when the assembly is depressed to its fullest extent, that is, until it is arrested as the result of the internally threaded section 58 of the apron 56 striking against the screw thread 60.

The entire quantity of liquid of the pool in the well 64, or any desired fractional portion thereof, may be removed from the well by a wiping action, utilizing the fingers of the same hand which was employed for initial manipulation of the plunger assembly 40. Thus, repeated applications of the liquid from the pool may be made if desired until such time as the pool is depleted. If an additional quantity or charge of the liquid is required, it is merely necessary for the operator again to depress the plunger assembly 40.

It is to be noted at this point that because the well 64 and the valve plate 70 present a smooth continuous frusto-spherical surface, the well 64 may readily be wiped clean of its liquid content so that no liquid will remain in the

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well to become evaporated or hardened before the next depression of the plunger assembly.

For purposes of shelf storage when the container 12 and its applied dispensing pump 10 are not in use and to preclude unauthorized use thereof, by children for example, the apron 56 that forms the side wall of the cup-shaped body 52 may be screwed downwardly onto the screw thread 60 on the enlarged head 36 of the barrel 38, preferably at the time of last use of the dispensing pump. The plunger assembly 40 will then assume a lowered position such as is shown in FIG. 4 wherein it is securely held or locked in a fixed position wherein it may not be manipulated, the lift valve 50, of course, remaining closed under the influence of the compression spring 76.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A dispensing pump for threaded application to the threaded neck portion of a liquid container, said pump comprising a pump barrel adapted for vertical projection into the container through the neck portion thereof in sealed relationship, said barrel being provided with a pump inlet in the lower region thereof, a check valve normally closing said pump inlet, a tubular plunger slidable vertically within said barrel between a raised and a lowered position and projecting upwardly and outwardly through the upper end thereof, the lower end of said plunger being in open communication with the interior of the barrel, the upper end of said plunger being provided with a pump outlet, a dip tube in communication with the pump inlet, a tubular pump actuator on the upper end of said plunger and movable bodily therewith, said actuator being provided with a shallow upwardly facing frusto-spherical concavity in the upper surface thereof, there being a vertical passage in said pump actuator establishing communication between the frusto-spherical concavity and the pump outlet, the upper rim region of said passage being provided with a shallow recess providing an annular valve seat, a lift valve mounted on said actuator for cooperation with said valve seat and normally closing the passage, said lift valve substantially filling and lying wholly within the confines of said recess when the valve is in its passage-closing position, spring means yieldingly urging the plunger and actuator toward its raised position, and releasable interengaging means on the exterior of the barrel and the interior of the actuator for maintaining said actuator and plunger in their lowered position.

2. A dispensing pump as set forth in claim 1 and wherein said releasable interengaging means comprises an internal screw thread on the interior of the tubular pump actuator and a cooperating external screw thread on the exterior of the barrel.

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