

[54] LEAKPROOF HEAD FOR HAND SPRAYER

3,685,739 8/1972 Vanier 239/333

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[22] Filed: Jan. 30, 1973

[57] ABSTRACT

[21] Appl. No.: 327,968

A hand-operated liquid sprayer attached to a liquid container is provided with a hand rotatable screw collar which can be screwed up or down to open or close an atmospheric vent passage to the container and thus to prevent liquid leakage from the container through the vent when the vent passage is closed regardless of the attitude of the container, and, to allow atmospheric venting of the container's interior when the vent passage is open.

[52] U.S. Cl. 239/333, 239/347

[51] Int. Cl. B65d 83/14

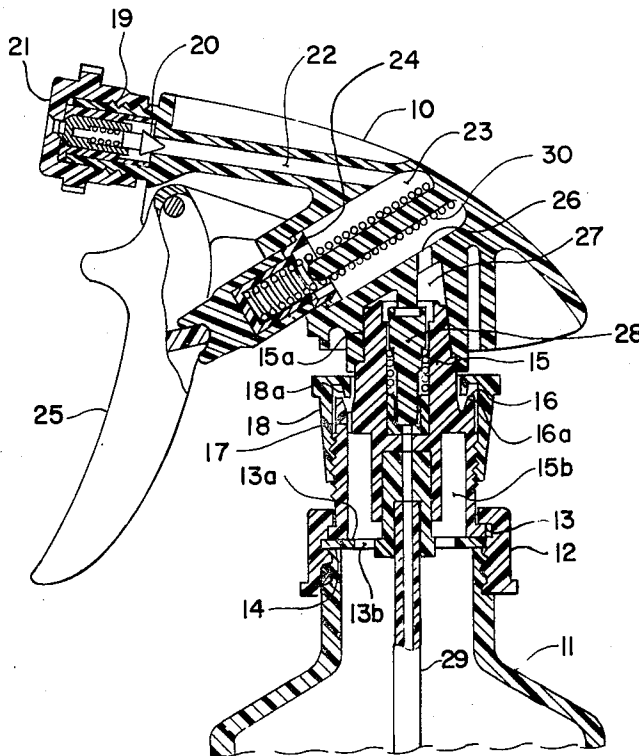
[58] Field of Search 239/333, 347, 355; 222/375, 383, 401

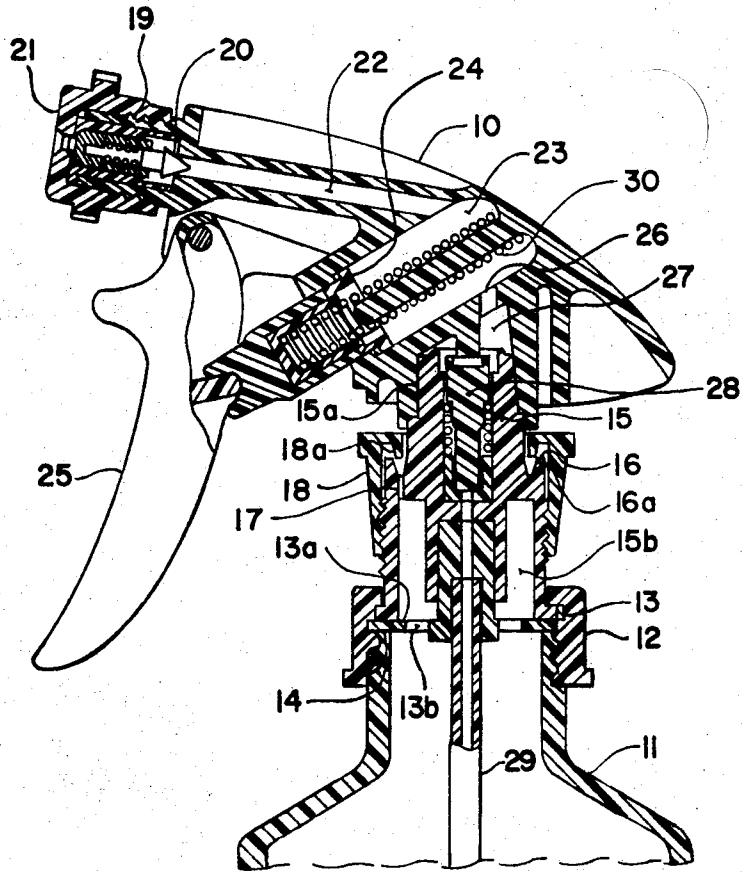
[56] References Cited

UNITED STATES PATENTS

2,556,050 6/1951 Zihelr 239/333 X

8 Claims, 1 Drawing Figure





LEAKPROOF HEAD FOR HAND SPRAYER**BACKGROUND, UTILITY, AND OBJECTS OF THE INVENTION**

A problem associated with hand sprayers for liquid such as the type disclosed in U.S. Pat. No. 3,061,202 to Tyler is to keep liquid from leaking from the associated container during shipment or during periods when the user might wish to lay the sprayer container down or to carry it from job to job. The sprayer is usually provided with at least one internal check valve which prevents leakage of liquid out of the spray nozzle itself but the problem arises from the necessity for a vent from the interior of the container to the atmosphere in order to allow air to enter it as liquid is drawn from it up and through the sprayer and thus to prevent either collapse of the container or a cessation of the liquid flow, both of which are undesirable. If, however, a plain vent hole along is provided liquid can leak out through it when the container is laid on its side or inverted. The present invention solves this problem by providing a vent passage seal which may be easily opened or closed as desired and which effectively prevents leakage of liquid in a positive manner.

It is, therefore, an object of the present invention to provide a vent and seal combination which is easily, quickly, conveniently and positively closed or opened and which provides a liquid-tight seal when in the closed position and allows the passage of atmospheric air into the container when in the opened position.

It is also an object of the present invention to provide a vent and seal combination wherein the seal will not open inadvertently in normal use.

It is also an object of the present invention to provide a vent seal of the foregoing type which is easily, quickly and inexpensively manufactured and lends itself to large quantity production.

Other objects advantages of the present invention will be apparent from the detailed description and drawing which follow. In the drawing:

The FIGURE is a cross section view of the sprayer and vent seal attached to a container and with the seal in the opened position.

DESCRIPTION AND OPERATION OF THE INVENTION

As will be seen in the single figure of the drawing, a hand sprayer 10 is attached to the top of a container 11 by means of a screw cap 12 with annular flange 13 between it and the annular rim 14 of the container, and, when cap 12 is hand tightened in place with gasket 13a between flange 13 and rim 14, a liquid-tight seal is created about the rim. Extended upwardly from flange 13 and integral with it is a hollow cylindrical sleeve or neck 15 which is stepped on its exterior at annular shoulder 16 and terminates in an upward portion 15a of reduced external diameter above shoulder 16 and where it attaches to the sprayer 10. Shoulder 16 is provided with an annular vee-shaped slant-sided open groove 16a formed in its upper face in the manner shown and at least one vent passage 17 is provided down through shoulder 16 to afford communication between groove 16a and the hollow interior 15b of the body 15 which in turn is in communication with the interior of container 11 through a central opening 13b in gasket 13 a.

As will be seen in the drawings, sleeve or neck 15 is threaded and is fitted with a cooperating threaded screw collar 18 which can be screwed up or down thereon by hand and is provided with flats or a roughened surface portion on its exterior to provide for a good finger grip. About the upper edge of collar 18 is an annular ridge or rim 18a which extends downwardly and which is aligned with groove 16 and is dimensioned that it can enter groove 16 but with an interference fit with the slanted annular sides so that it will create contact throughout their peripheries and wedge in the annular groove. Rim 18a is preferably vee-shaped in cross section but could be rectangular rounded on the like as desired provided that peripheral contact is made with both slanted sides of groove 16. These parts are made of slightly resilient polypropylene or a like material so that as they contact each other a liquid tight seal is created about their line of contact because of the semi-resiliency of the material and the pressure exerted by the screw action and also, so that the screw threads will seal upon one another as collar 18 becomes seated in rim 18a.

The sprayer 10 itself includes a spray nozzle 19 having a spring-loaded check valve 20 and an outer outlet screw cover 21 which can be screwed in or out on nozzle 19 to change the extent of the opening and is capable of closing it completely as desired when screwed down to the full extent of its travel as shown in the drawing. A passage 22 communicably connects nozzle 19 with pump chamber 23 in which is located spring-loaded plunger 24 which in turn is longitudinally movable in chamber 23 by manipulation of pump lever 25. Chamber 23 is communicably connected through passage 26 to the chamber 27 surrounding normally-open check valve 28 from which communication is afforded to liquid pickup tube 29 when the valve 28 is open.

The sprayer 10 is operated by grasping the sprayer in one hand and squeezing lever 25 to move piston 24 inwardly thereby compressing the air in pump chamber 23 and forcing it to flow past nozzle check valve 20 and out into the atmosphere. Lever 25 is then allowed to return to its normal position under the urging of spring 30 which allows plunger 24 to retract and causes both check valves 20, 28 to close because of the reduced air pressure in chamber 23, spring 30 being of sufficient strength to overcome the air pressure differential on plunger 24 in addition to the fact that the projected area over which the pressure in chamber 23 acts on plunger 24 is greater than that acting on its exterior area which produces a resultant force in the same direction as the force of the spring 30. Since chamber 23 is in communication with the surface of the liquid in container 11, a pressure unbalance between it and the atmospheric pressure acting upon the liquid's surface other than in the pickup tube 29 forces liquid up the tube and into chamber 21, the atmospheric air entering through vent passage 17 in neck 15. Without this vent, no air can enter the space in container 11 above the liquid and as the liquid level lowers as liquid is used the internal air pressure will decrease below atmospheric on the exterior of container 11 resulting in malfunction of the sprayer and possible collapse or deformation of the container 11.

When it is desired that the container 11 be sealed off with no leakage as would be the case during shipment with liquid in the container and with nozzle 17 tightly closed, collar 18 is grasped by the fingers and is

screwed downward on neck 15 until tight contact is made between rim 18a and groove 16 about their entire peripheries. This forms a liquid-tight seal as mentioned in the foregoing paragraph and prevents the passage of liquid out of container 11 by blocking the exit path of vent passage 17. Thereafter, when the sprayer is to be put in use, collar 18 is screwed upward in the reverse direction of rotation and rim 18a is lifted off its seat in groove 16 thus exposing passage 17 to the atmosphere and allowing air to enter the container 11 freely as needed to maintain the normal pressure balance on the liquid as it is drawn from the container during a spraying operation. It should be noted that after collar 18 is hand tightened in place in the "sealed" position with the vent passage 17 blocked, collar 18 is not likely to loosen under normal conditions encountered during shipment or storage, particularly in view of the semi-resilient qualities of its material and that of neck 15.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment of the same and that various changes in the shape, size and arrangement of parts may be restored to without departure from the spirit of the invention or the scope of the subjoined claims.

What is claimed is:

1. In combination, a spray nozzle, hand operated pump means connected thereto and in communication therewith, a neck communicably connecting said pump means and the interior of a liquid container, liquid pickup means communicably connected therebetween and extended below the level of liquid contained in the container, closure means for said container, an annular shoulder on said neck having an annular open groove in its upper face, a vent passage through said shoulder in communication with the open groove and the interior of the container, a screw collar threadably engaged

with said neck and capable of being screwed up and down thereon, an annular rim on said collar extended toward and aligned with said open groove and so located with respect to it that as the collar is screwed toward the groove the rim will enter the groove and contact it in a liquid-tight manner to close the vent passage to any flow of liquid, whereby leakage of liquid from the container is prevented.

2. The invention set forth in claim 1 with the annular groove vee-shaped in cross section with slanted annular sides and adapted to intercept the rim of the collar as it is screwed toward the container.

3. The invention set forth in claim 1 with the annular rim and the annular groove both vee-shaped in cross section with slanted sides adapted to contact one another as the collar is screwed toward the container.

4. The invention set forth in claim 1 with the annular rim rectangular in cross section.

5. The invention set forth in claim 1 with the closure means comprising a screw cap through which said neck is extended and which intercepts an annular flange on the neck with the flange abutting the rim of a screw-threaded opening in the container upon which the cap is screwed, whereby the flange is clamped between the cap and the container opening rim to effect a liquid-tight seal between the flange and the rim.

6. The invention set forth in claim 5 with an annular gasket between the rim of the opening and the flange.

7. The invention set forth in claim 1 with flats on the exterior of at least a portion of the collar to facilitate screwing thereof by hand.

8. The invention set forth in claim 1 with a roughened surface on at least part of said collar to facilitate screwing thereof by hand.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,780,951 Dated December 25, 1973

Inventor(s) Richard T. Powers

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 19, change "along" to -- alone --;

" " line 34, change "nromal" to -- normal --;

" " line 39, after "objects" insert -- and --;

Column 4, (Claim 3) line 15, after "slanted" insert -- annular --.

Signed and sealed this 23rd day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents