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Appleby et al.

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[54] **DISPENSER FOR IMMISCIBLE LIQUIDS**

[76] Inventors: **Vernon L. Appleby,** 660 Scofield Ave.; **William P. McNutt,** 334 Whitman Ct., Palo Alto, both of Calif.

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[51] **Int. Cl.** **B65d 83/00,** B67d 5/60

[58] **Field of Search** 222/464, 4, 145, 222/382, 383, 394, 402.1, 402.17, 402.18, 402.19, 564, 376, 211, 321, 136; 239/311, 344; 169/31, 32

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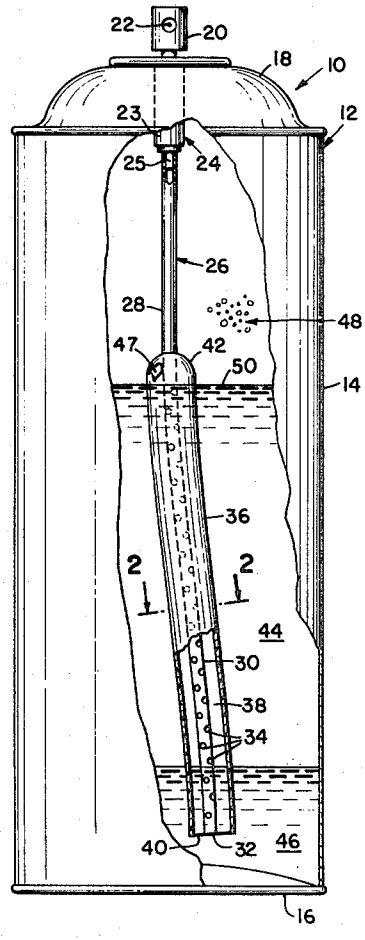
Primary Examiner—Robert B. Reeves
Assistant Examiner—Francis J. Bartuska
Attorney—Townsend & Townsend

[57] **ABSTRACT**

Apparatus for dispensing two immiscible liquids comprising a container having a fluid exit nozzle and a tubular stem for coupling the nozzle with the interior of the container. A lower segment of the stem is perforate and is surrounded by and spaced inwardly from an imperforate sleeve. The lower end of the sleeve is open and its upper end is closed. A valve across the path defined by the upper segment of the stem controls the flow of liquids to the nozzle and means is provided to cause a liquid flow to the nozzle when the valve is opened.

8 Claims, 3 Drawing Figures



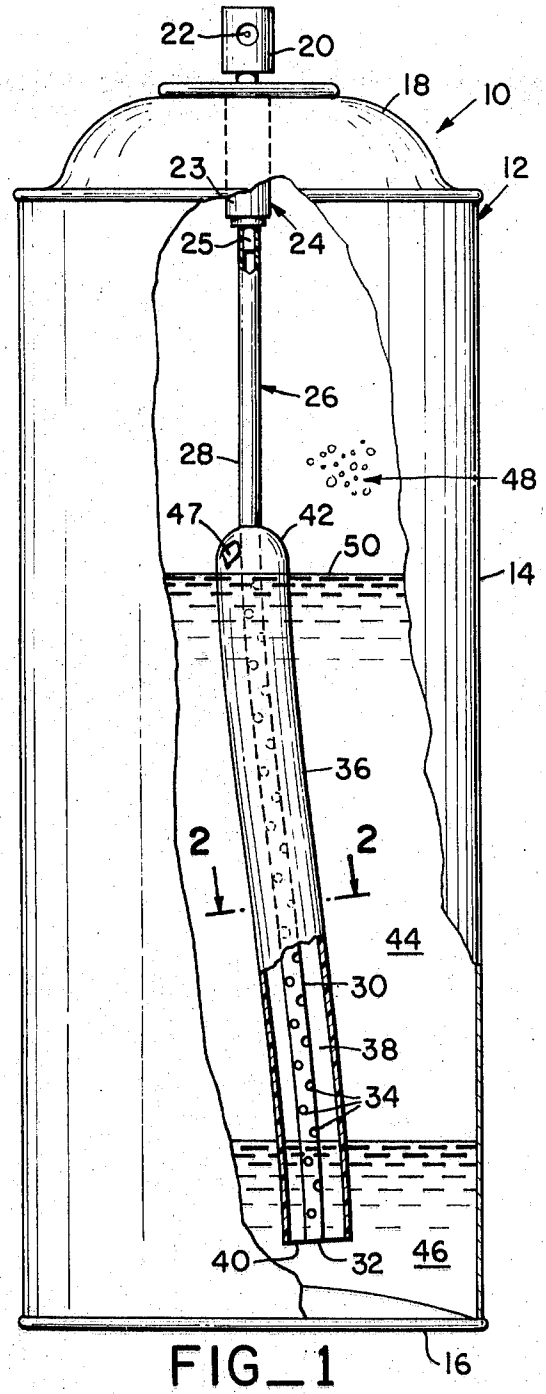


FIG_1

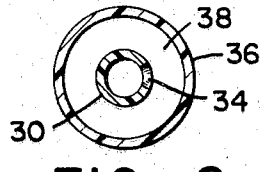


FIG_2

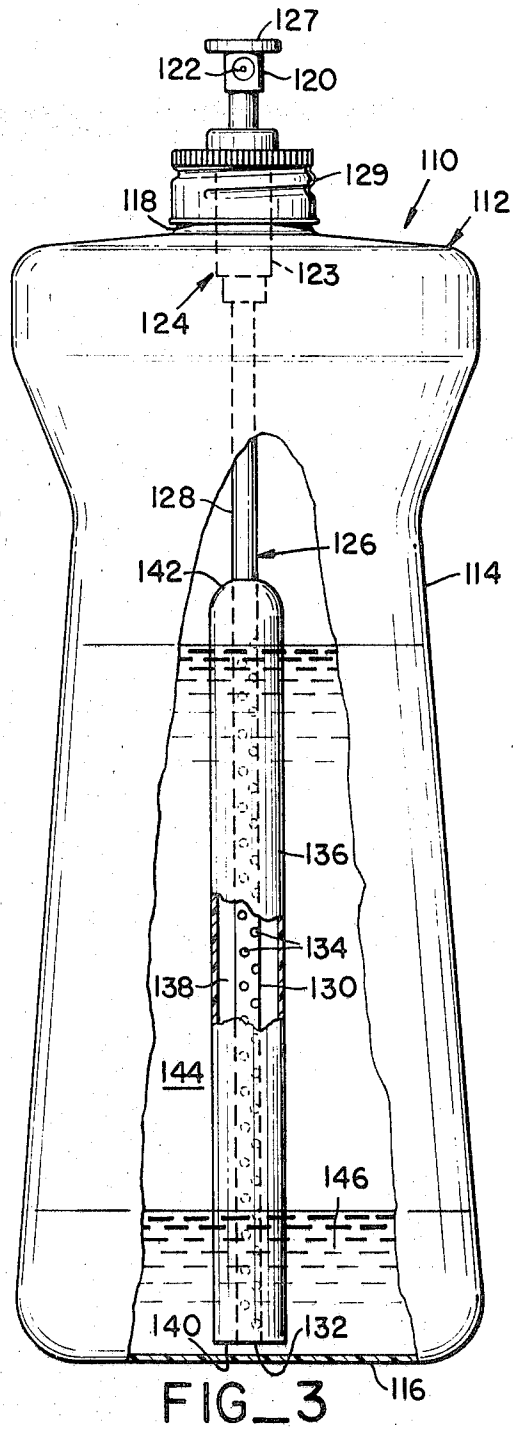


FIG_3

INVENTORS
VERNON L. APPLEBY
WILLIAM P. McNUTT
BY
ATTORNEYS

DISPENSER FOR IMMISCIBLE LIQUIDS

This invention relates to improvements in fluid dispensing devices and, more particularly, to apparatus for dispensing two immiscible liquids in the form of a spray.

While the present invention is suitable for use in dispensing immiscible liquids of different types, it is especially adapted for use in providing a means for spraying a mixture of salad oil and vinegar onto salads or other foods. The conventional container for salad oil and vinegar is a glass bottle having a screw cap at the top. After shaking the bottle with the cap on the top, the cap is removed and the mixture is poured onto the salad or other food item. Since the top opening in the bottle is relatively large, it is oftentimes difficult to keep from pouring too much of the mixture onto the salad. The fact that too much of the mixture can be accidentally poured onto the salad makes this method of dispensing unsatisfactory. Thus, a need exists for a dispenser for salad oil and vinegar which not only applies the mixture in a measured amount but also applies it quickly and easily and in accordance with a desired ratio of said oil to vinegar.

The present invention satisfies this need by providing a dispenser having an improved assembly within a container for directing two immiscible liquids together along a path out of the container and to a fluid exit nozzle. The assembly comprises an inner, perforate lower tube surrounded by and spaced inwardly of an outer, imperforate sleeve with the sleeve being closed at its upper end and open at its lower end. The assembly, when disposed in the container, permits the two liquids to be disposed in the sleeve and the perforate tube in a stratified relationship to each other before agitation of the liquids and in an admixed relationship after agitation of the liquids. Thus, when a force is applied to the liquids in the container, the two liquids within the sleeve and the tube, after being shaken or agitated and held in equal ratio in colloidal suspension in relation to the ratio of the immiscible liquids, travel upwardly through the stem and out of the container through the orifice of the nozzle. The liquids issue in the form of a spray from the nozzle and this spray can be directed onto a salad or other food item.

The invention is suitable for use with an aerosol dispenser of the type using a gas under pressure as the propellant. In an alternative embodiment, the container can have a finger-actuated pump and nozzle assembly for the propelling means. In either case, the stem and sleeve assembly will be utilized to hold portions of the two liquids and to allow the same to travel together to the nozzle for issuance therefrom as a spray.

The volumes of the two liquids in the container will generally be in accordance with a predetermined ratio. It has been found that the volumes of the two liquids in the effluent from the nozzle are of substantially the same ratio as the ratio of the volumes of the liquids in the container itself. This feature is especial important where it is desired to have a predetermined ratio of salad oil to vinegar directed onto a salad or other food item.

Another advantage of the present invention is that a conventional liquid dispenser can be used in combination with the improved stem and sleeve assembly of the invention. The assembly can be releasably coupled to the nozzle so as to minimize costs and production time.

Another advantage of the present invention is that it homogenizes two or more immiscible liquids instantaneously as the liquids issue from the nozzle. This is important because it renders an extra homogenization step unnecessary. The invention, when used, also would eliminate the need for wetting agents to reduce liquid surface tension between two immiscible liquids.

The primary object of this invention is to provide an improved dispenser of the type used for dispensing two immiscible liquids wherein the dispenser has an improved stem assembly for holding portions of two immiscible liquids and for allowing the two liquids to travel together toward the exit nozzle of the dispenser, so that the effluent from the nozzle will be a mixture of the two liquids and such mixture can be directed to any desired location.

Another object of this invention is to provide a dispenser of the type described wherein the stem assembly includes a lower perforate tubular segment surrounded by and spaced inwardly from an imperforate sleeve closed at the upper end and open at its lower end, so that the two liquids can enter the sleeve and thereby the tube and be confined until the upward flow in the stem is commenced, whereupon the two liquids in the sleeve and tube travel together through the stem toward the exit nozzle and issue therefrom as a homogeneous admixture in the form of a spray.

A further object of this invention is to provide an improved stem assembly for a liquid dispenser of the aforesaid character wherein the assembly can be releasably connected to the nozzle structure of the dispenser and can be operable to hold two immiscible liquids and to allow the liquids to travel together in an admixed condition to the nozzle when force is applied to the liquids.

Other objects of this invention will become apparent as the following specification progresses, reference being had to the accompanying drawing for an illustration of the invention.

IN THE DRAWING:

FIG. 1 is a side elevational view, partly broken away, of one form of the liquid dispensing apparatus of this invention, showing the way in which portions of two immiscible liquids are held in stratified relationship by a stem and sleeve assembly coupled with an exit nozzle;

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1; and

FIG. 3 is a vibw similar to FIG. 1 but illustrating a second embodiment of the apparatus of this invention.

The first embodiment of the apparatus for dispensing two immiscible liquids is broadly denoted by the numeral 10 and is illustrated in FIGS. 1 and 2. Apparatus 10 includes a closed container 12 having a sidewall 14, a bottom 16, a top 18 and a liquid exit nozzle 20 provided with an orifice 22 adjacent to the uppermost portion of top 18. Container 12 is of conventional construction and is sufficiently strong to withstand internal gas pressures therewithin.

A tubular extension 23 provides the outer housing for a conventional valve 24 which is operated when nozzle 20 is displaced relative to the container. Generally, the nozzle is moved laterally by finger pressure to actuate or open the valve whereby a fluid can pass through the valve and toward the nozzle for flow outwardly from orifice 22 in the form of a spray.

Extension 23 has a short, tubular projection 25 onto which a tubular stem 26 is press fitted. Thus, the stem is releasably coupled to projection 25.

Stem 26 has an imperforate upper segment 28 coupled with projection 25 and a perforate lower segment 30 having a lower open end 32 adjacent to and in proximity with bottom 16. Segment 30 is provided with a number of openings 34 therethrough along the length thereof. These openings may be disposed at random locations or at uniformly spaced locations on the segment.

An imperforate sleeve 36 surrounds segment 30 and is spaced therefrom as shown in FIG. 2. For purposes of illustration, stem 26 and sleeve 36 are circular in cross section and the sleeve is generally concentric with segment 30 to present a cylindrical, liquid-receiving space 38 which extends from the lower open end 40 of sleeve 36 to a location intermediate the ends of stem 26, preferably near the junction between segments 28 and 30. The upper end 42 of sleeve 36 is closed. It has a hole through which stem 26 can extend. The hole is sealed in any suitable manner, such as by a suitable sealing compound.

The lengths of segment 30 and sleeve 36 are preferably such that their upper ends will be near the uppermost level of the upper liquid in the container. For purposes of illustration, two immiscible liquids 44 and 46 are shown in the container in a stratified relationship with respect to each other. The liquids are in a volume ratio of about 4:1 but, again, this is for purposes of illustration since the volumes of the liquids could be selected in accordance with other ratios as well.

A mass 48 of an inert gas under pressure, such as Freon, nitrous oxide or the like, is disposed in container 12 above the upper level 50 of liquid 44. This gas is used as a propellant to force the liquids out of the container through stem 26, valve 24 and nozzle 20 when the valve is opened by the displacement of the nozzle.

Liquids 44 and 46 are placed in the container after stem 26 with sleeve 36 thereon has been coupled with projection 25. Generally, bottom 16 of the container will initially be separate from the container to permit the liquids to be directed thereinto. Then, the bottom is put into place and permanently secured to the sidewall of the container.

The liquids can be of any type. For purposes of illustration, it will be assumed that liquid 44 is salad oil and liquid 46 is vinegar so that the effluent from nozzle 20 will be a mixture of oil and vinegar in the form of a spray which can be directed onto salad or other foods.

Since the oil and vinegar are immiscible, they will become stratified with respect to each other both outside sleeve 36 and within the sleeve. It is preferable to shake the container before use to cause the liquids to mix together and thereby to assure that portions of the two liquids will be received within sleeve 36.

As shown in FIG. 1, the uppermost opening 34 in segment 30 is spaced below upper end 42 of sleeve 36. In practice, there will be a space of approximately one-half inch between the upper opening 34 and closed end 42. The area immediately above the opening 34 defines a gas trap 47 which will prevent gas from leaving segment 30 and passing upwardly to the nozzle. Generally, there will always be liquid in segment 30 up to and slightly above the upper opening 34 even after agitation of the dispenser. Any gas in gas trap 47 serves as an agitator for liquids in sleeve 36.

When the dispenser is agitated, such as by shaking it by hand, the two liquids go into colloidal suspension with the smallest particles of the suspension being near the upper end of segment 30 and the larger particles of the suspension being near the lower end thereof. Thus, when the valve is opened, substantially equal portions of large and small particles will flow into segment 30 from within sleeve 36 for travel upwardly to the nozzle. At the orifice of the nozzle, the liquids issue in a homogenized form, thus eliminating the need for an additional homogenizing step.

Sleeve 36, therefore, serves to form the outer boundary of the above-mentoned gas trap and prevents the propelling gas in the container from escaping to the nozzle. At the same time, the perforate segment 30 permits the larger and smaller particles in collidal suspension to travel equally well to the nozzle.

To use apparatus 10, it is generally preferable to shake the container before the valve is opened. In this way, the two liquids will be mixed together at least for a relatively short time although such is not deemed to be necessary in order for apparatus 10 to be fully operable. When the valve is opened, the gas pressure exerted on the upper level of liquid 44 causes an unbalanced force on the liquids to cause the two liquids to flow together upwardly in sleeve 36 and segment 30 and then into segment 28. The liquids then pass through valve 24 and exit from orifice 22 in the form of a spray. The liquids are mixed together in the spray. It has been found that the ratio of the volumes of liquids in the spray is substantially the same as the ratio of the volumes in the liquids in container 12 after the container has been sufficiently agitated. This is believed to be due to the unique construction of the stem and sleeve assembly which defines a fluid flow path from a region below the liquid level of liquid 46 to the exit nozzle.

The second embodiment of the apparatus of this invention is illustrated in FIG. 3 and is broadly denoted by the numeral 110. Apparatus 110 includes a container 112 having a sidewall 114, a bottom 116 and an externally threaded open neck 118. A nozzle 120 having an orifice 122 is carried on the upper end of a tubular extension 123 defining the outer housing for a conventional fluid pump 124 which is operated as nozzle 120 is reciprecated vertically. The nozzle has a finger pad 127 by means of which finger pressure can be exerted on the nozzle to force the same downwardly. A spring (not shown) forming a part of the pump operates to return the nozzle to its uppermost position after it has been depressed. The pump also utilizes valve means (not shown) within housing 123 and such valve means can thereby be said to be actuated upon displacement of nozzle 120 relative to container 112.

The means for placing pump 124 in fluid communication with the lower part of container 112 is essentially of the same construction as the stem and sleeve assembly of apparatus 10. To this end, a tubular stem 126 is releasably coupled to the lower end of housing 124 such as in the same manner in which stem 26 is coupled to projection 25 (FIG. 1). Stem 126 has an upper, imperforate segment 128 and a lower, perforate segment 130 provided with a lower open end 132. Segment 130 has a number of spaced holes 134 therethrough. An imperforate sleeve 136 is in surrounding,

spaced relationship to segment **130** to define a liquid-receiving space **138** between the interior surface of the sleeve and segment **130.** Sleeve **136** has a lower open end **140** surrounding end **132.** The upper end **142** of sleeve **136** is closed. Holes **134** are disposed throughout the length of segment **130** and up to a location adjacent to closed end **142** of sleeve **136.**

A cap **129** carries pump **124** and is threadably mounted on neck **118.** Thus, the pump and the stem and sleeve assembly can be removed from the container, if desired. The pump, when operated, draws a pair of immiscible liquids **144** and **146** out of container **112** through orifice **122.** The liquids generally assume a stratified relationship in the container after they have had time to settle in the container following agitation of the liquids. Generally, the two liquids will be funneled into the container before the stem and sleeve assembly is inserted into the container. When this assembly is moved into place in the container, the liquids enter the lower end of the sleeve and the lower end of segment **130** so that the liquids will be stratified in space **138** and within segment **130.**

Apparatus **110** is used by operating pump **124.** This is accomplished by reciprocating nozzle **120** with finger pressure on pad **127.** Preferably, the container is first shaken to cause admixing of the two liquids. Also, nozzle **120** is then moved downwardly several times to prime pump **124.** As the pump is being primed and thereafter, the two liquids which are held within segment **130** and sleeve **136** move upwardly in stem **126** and pass into and through the pump. As the pump continues to be actuated, the two liquids travel to orifice **122** and exit therefrom in the form of a spray. It has been found that the ratio of the volumes of the liquids in such a spray is substantially equal to the ratio of the volumes of the two liquids in the container. Again, this is believed to be due to the unique stem and sleeve assembly described above.

The two liquids selected for use with container **12** can be of any type, such as food products, hair sprays, hand lotions, shaving creams and other cosmetics, alcohol soluble products with water base, and aerosol insecticides having immiscible fillers. Also, more than two liquids can be in the container, with all of the liquids being immiscible with each other or with only two of such liquids being immiscible. For instance, the two liquids can be salad oil and vinegar to be sprayed on salads or other foods. An advantage of utilizing the embodiment of FIG. **3** is that the liquids can be marketed or stored without keeping the stem and sleeve assembly in the container. Also, such assembly can be removed from the container for cleaning or other purposes.

What is claimed is:

1. Apparatus for dispensing a pair of immiscible liquids, comprising a container adapted to receive and hold two immiscible liquids in stratified relationship with respect to each other; an exit nozzle for the container; and a tubular stem coupled with the exit nozzle for placing the latter in fluid communication with the interior of the container below the liquid level therein, said stem having a perforate, tubular segment and an imperforate sleeve in surrounding, spaced relationship to the segment, said sleeve having a closed upper end above the perforations of the stem and an open lower end and being adapted for isolating respective stratified portions of the two liquids from the main body of the container, said closed end of said sleeve preventing fluid communication between the perforations of the segment and the region above said liquid level, said segment extending throughout at least a major portion of the sleeve and being adapted for permitting the isolated liquids to flow thereinto from said sleeve and together toward the exit nozzle.

2. An apparatus as set forth in claim **1,** wherein said sleeve has its closed end intermediate the ends of the stem and has its open end adjacent to the lower end of the stem.

3. In apparatus as set forth in claim **2,** wherein said segment has a length sufficient to permit its lower end and the open end of the sleeve to be disposed adjacent to the bottom of the container.

4. In liquid dispensing apparatus of the type having a container and a fluid exit nozzle on the container, the improvement comprising: a tubular stem adapted to be coupled to the exit nozzle and to extend downwardly therefrom below the liquid level of the container, said stem including an imperforate sleeve for permitting a portion of a pair of liquids in the container to be isolated from the remainder of the liquids in the container and to be disposed in stratified relationship relative to each other, and a perforate segment within the sleeve and extending throughout a major portion of the length thereof, said sleeve having a closed upper end and an open lower end, the upper end of the sleeve being above the perforations of said segment, said closed end of said sleeve preventing fluid communication between the perforations of the segment and the region above said liquid level, said segment being adapted to permit the isolated liquids to flow together into and along the stem toward the exit nozzle when a force is exerted on the liquids in the container.

5. In apparatus as set forth in claim **4,** wherein the lengths of the stem and the tube are sufficient to position the open end of the tube adjacent to the bottom of the container when the stem is coupled with the exit nozzle.

6. The combination as set forth in claim **5,** wherein said forcing means comprises a manually actuated pump device across the path of liquid flow toward the exit nozzle.

7. In combination: a container having a pair of immiscible liquids therein with the liquids being capable of becoming stratified relative to each other; an exit nozzle on the container adjacent to the upper portion thereof; means within the container for placing the nozzle in fluid communication with the interior of the container below the liquid level of the lower liquid when the liquids are stratified, said placing means including a tubular stem having an imperforate sleeve and a perforate segment within and extending throughout a major portion of the length of the sleeve, said sleeve having an upper, closed end above the perforations of said segment and a lower open end and being adapted for isolating portions of the liquids from the remainder of the liquids in the container, said closed end of said sleeve preventing fluid communication between the perforations of the segment and the region above said liquid level, said segment being adapted for permitting the isolated liquids in the sleeve to flow together toward the nozzle when an unbalanced force is exerted on the upper level of the upper liquid; valve means coupled with the placing means for controlling the flow of the liquids toward the nozzle; and means within the container for causing an unbalanced force to be exerted on the upper liquid.

8. The combination as set forth in claim **7,** wherein said forcing means comprises a pressurized gas in the container above the liquid level therein.

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