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Morane et al.

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[54] **METHOD AND APPARATUS FOR SEPARATELY PACKAGING TWO LIQUIDS WHICH ARE TO BE SIMULTANEOUSLY DISPENSED**

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[51] **Int. Cl.**.....**B67d 5/60**

[58] **Field of Search**.....222/94, 129, 188, 135, 136, 222/508, 80, 399, 402.11, 95, 105, 389, 386–386.5, 399; 169/32; 128/272, 218

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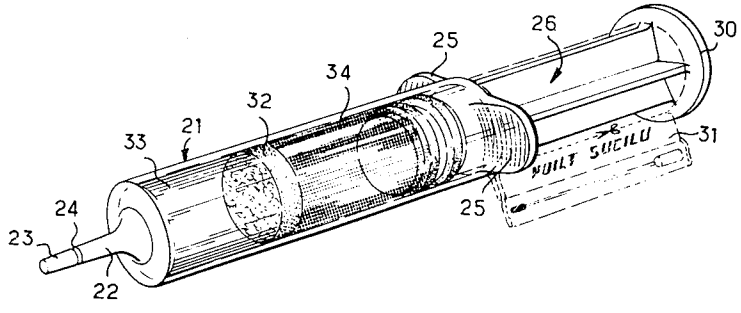
[57] **ABSTRACT**

Two liquids are stored in a single jacket on opposite sides of a plug of compressible material. The fluids are mixed by applying fluid pressure to compress the plug and the mixture is then dispensed through a valve or nozzle in the jacket. The pressure may be supplied by actuating a piston or by releasing a compressed fluid into the jacket, or both.

21 Claims, 5 Drawing Figures



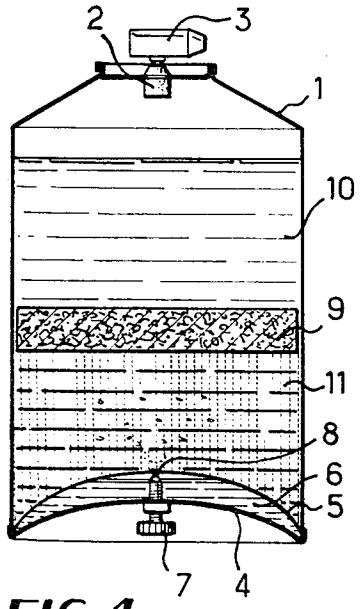


FIG. 1

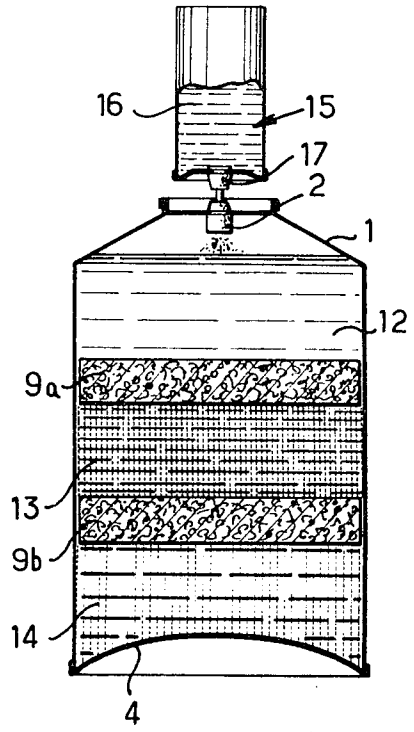


FIG. 2

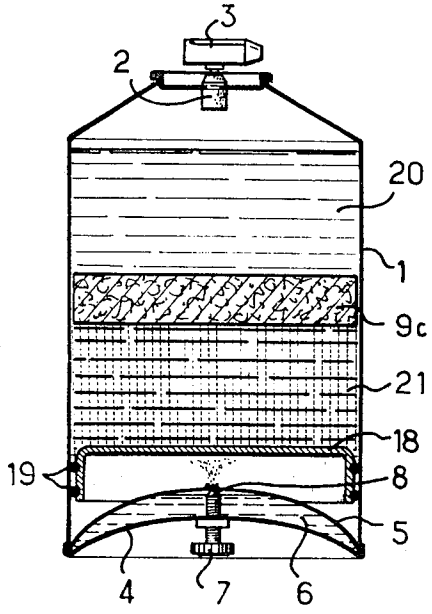
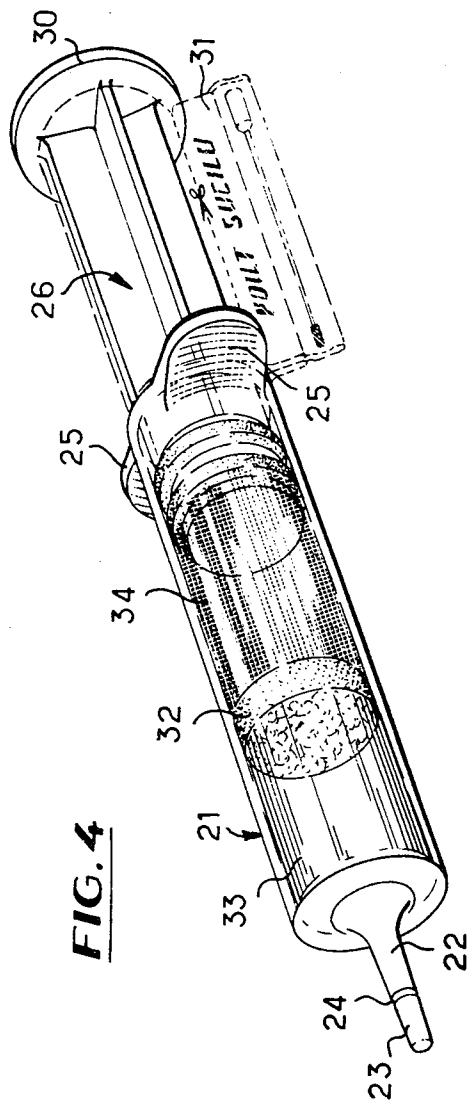


FIG. 3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SHIELD
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FIG. 4

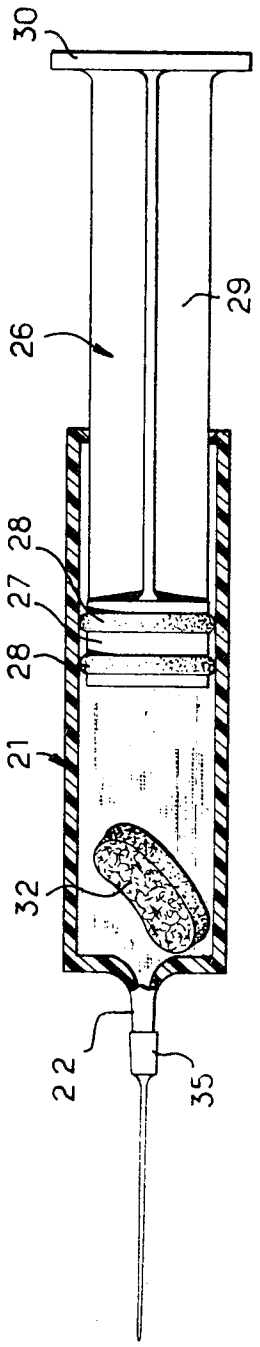
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FIG. 5

METHOD AND APPARATUS FOR SEPARATELY PACKAGING TWO LIQUIDS WHICH ARE TO BE SIMULTANEOUSLY DISPENSED

SUMMARY OF THE INVENTION

In the cosmetic industry, in the pharmaceutical field, and in the packaging of household cleaning products, it is frequently necessary to use two products simultaneously which react with each other when they are brought into contact. It is obvious that this contact cannot be permitted during storage, since the reaction which must take place at the moment of use would then take place during storage. Such products have accordingly been packaged in separate containers, but this procedure has the disadvantage of making it necessary for the user to simultaneously operate at least two containers holding the products to be dispensed.

It is the purpose of the present invention to provide a method of packaging and dispensing under pressure at least two products which must be simultaneously dispensed, but which must be separately stored, as well as a container for use in carrying out this process. Each product which is separately packaged may comprise a mixture of different chemical compounds. The particular advantage of the device according to the invention is that it operates in a very simple manner and is very inexpensive.

The method and apparatus according to the invention is essentially characterized by the fact that at least one of the products to be dispensed is enclosed in one compartment of a plurality of distinct compartments formed inside a single jacket, each compartment being separated from the remaining space inside of the jacket or from the inside of any other compartment by a partition in the form of a plug which is compressible in all directions. A pressure is developed inside the jacket by any suitable means to compress the plug and bring the compartments into communication with each other. The jacket may then be shaken to produce a mixture of the various products therein and the mixture formed in this manner is then dispensed.

A first specific embodiment of the above invention is essentially characterized by the fact that at least two distinct closed compartments are formed in a single outer jacket equipped with a dispensing valve. These compartments are separated at the storage pressure by a plug which is compressible in all directions. The pressure of a pressurizing gas is then applied inside the outer jacket, the container is shaken to produce a homogeneous mixture of the two products, and these are dispensed through the valve in the outer jacket.

In a preferred form of this embodiment, at least one plug or cushion is inserted in an outer jacket carrying a dispensing valve. This plug is so adjusted as to seal fluid-tight against the walls of the jacket at the storage pressure, and is made of a material which is compressible in all directions. At least one of the products to be distributed is introduced on opposite sides of the plug. A pressurizing gas is introduced into one of the compartments formed in the jacket by the plug or plugs. The container is then shaken to insure a homogeneous mixture of the products which were initially separated by the plug or plugs, and the mixture is dispensed by the valve in the outer jacket. It should be noted that the essence of the invention consists in using plugs which are compressible in all directions, preferably in a non-isotropic manner, to separate two distinct compartments inside a single container. It follows that the invention may also be carried out by locating independent containers having flexible walls stoppered by means of plugs made of the above mentioned material inside a single outer jacket. A pressure capable of compressing the said plugs in all directions is produced inside this outer jacket at the moment of use. The plugs, when thus compressed, no longer close the containers, and the products which they contain escape so that the desired mixture may be produced. The above mentioned pressure and the subsequent dispensing of the mixture may be produced either by direct injection of the propellant into the outer jacket or by the action of a propellant on a movable piston inside the outer jacket.

In a first embodiment of the invention the outer jacket carries a dispensing valve at its upper end and a chamber filled with a pressurizing gas at its lower end. This gas may or may not be liquefied and the chamber may be brought into communication with the compartment adjacent thereto by means of a pin which can be actuated by the user from outside the jacket. In this case, the contents are dispensed by turning the container upside down, that is to say, placing the valve on the outer jacket downward. In a variation of this embodiment the pressurizing gas is introduced through the dispensing valve of the outer jacket from an independent cartridge holding the pressurizing gas under pressure.

It is therefore the object of the present invention to provide as a new article of manufacture a container adapted for use in carrying out the above process, which container is essentially characterized by the fact that it comprises, on the one hand, an outer jacket provided with a dispensing valve at its upper end, and on the other hand, at least one plug made of a material which is compressible in all directions positioned inside the jacket and engaging the wall of said jacket tightly enough to constitute a fluid-tight separator at the storage pressure. This container may also have a chamber containing a pressurizing gas, which may or may not be liquefied, which chamber is equipped with a pin adapted to bring the chamber into communication with the inside of the outer jacket.

In a second embodiment of the invention, the container also comprises at the bottom of its outer jacket a chamber containing a pressurizing gas which may be placed in communication with the inside of the outer jacket by using a pin. This chamber is surmounted by a movable piston which is slidable in fluid-tight contact with the inner wall of the outer jacket. The free space above this piston is divided into at least two compartments by at least one compressible plug inserted in the outer jacket in such a way as to separate the two compartments which it creates in a fluid-tight manner. In this case the mixture produced may be dispensed regardless of the position of the valve in the outer jacket, that is to say, regardless of whether the jacket is right side up or upside down.

It is a further object of the present invention to provide as a new article of manufacture, a container for use in carrying out the process according to the invention, which container is essentially characterized by the fact that it comprises on the one hand, an outer jacket provided with a dispensing valve at its upper end and a chamber holding a pressurizing gas at its lower end. This chamber is equipped with a pin adapted to place it in communication with the inside of the outer jacket, which jacket contains a movable piston adapted to slide in fluid-tight contact with its outer wall and is initially positioned near the bottom of the container. At least one plug made of a material compressible in all directions is positioned inside the outer jacket so as to divide said jacket into two compartments in a fluid-tight manner at storage pressure.

It is obvious that either of the two types of devices which have just been described may be modified by using containers in which the outer jacket holds several compressible plugs positioned one above the other which separate several products which are to be individually stored.

In a preferred embodiment of the invention the compressible plug is made of a foamed plastic material such, for example, as polyethylene foam. This foam material has closed cells and its walls are not rigid. It is essential that the cells of the foam be closed so that the material may be compressed in a suitable manner. It is probable that non-homogenity in compression of the different cells of the material is an important factor in making the device according to the invention work well but the scope of the invention is not limited to foam materials of which this is true. The foam used may have been expanded by means of any suitable gas such, for example, as nitrogen. It is obvious that the material forming the foam must be chosen from among those which do not react with the products to be stored, which will be in contact therewith. The diameter of the plug and its thickness are selected as to insure a fluid-tight seal between the two compartments separated by the plug. The compressible plug may also be made from an en-

velope of flexible material inflated by means of a gas such as air or nitrogen, for example. However, it is preferable in this case to insure non-homogeneous compression of the envelope by providing ribs at suitable positions, which render it partially rigid.

The containers according to the invention may be used to hold many types of cosmetic, pharmaceutical or cleansing products and, among other purposes, for holding regenerative capillary lotions, mixtures of bleaches for the hair, coloring products for use in permanent waving of the hair, fixatives for permanent waving compositions, depilatory products, and pharmaceutical products obtained from a lyophilized powder. Moreover, one of the products to be distributed may be a powder or a paste.

When one of the products is capable of slow spontaneous decomposition, it is necessary that the user be able to determine the state of the interior of the container before using it. The outer jacket may then be made of a transparent material making it possible to determine the state of preservation of the products therein. If the spontaneous decomposition of one of the products generates gas, it may be necessary to make the outer jacket of a resistant material, which may be reinforced. This jacket may also have a safety valve for the compartment holding the product in question. In particular, when one of the products to be stored is a peroxide, as is the case for instance in the case of oxidation dyes for the hair, it is preferable to select a peroxide which is stable under the storage conditions, for example a perborate, a persulfate, or urea peroxide.

A second specific embodiment of the invention is essentially characterized by the fact that, in a cylindrical envelope having a valve at one end adapted to receive an injection needle, and a piston at its other end which can be moved by the user, there is at least one plug between the valve and the piston, which plug is compressible in all directions. This plug is in sealing contact with the inner wall of the cylindrical jacket. The products to be dispensed are introduced on opposite sides of the plug. Sufficient force is exerted on the piston to depress it while holding the dispensing valve firm. The container may then be shaken; the valve at the end is opened; the injection needle is inserted; and the piston is depressed to produce ejection.

The particular embodiment of the invention which has just been described is for use as a syringe for use in injections, thus considerably decreasing the cost of said syringes. It is well known to package within a single syringe two products which are incompatible and separated by a slidable partition inside the syringe, each of the products being positioned on opposite sides of the sliding partition. At the moment of use the user actuates the piston associated with the syringe and the first product, which is positioned between the injection needle and the slidable partition is injected into the patient at the same time that the sliding partition moves toward the needle. Then the partition reaches an enlarged portion of the syringe. At this moment the second product, positioned between the piston and the sliding partition may pass through the enlarged zone and mix with the remainder of the first product and finally be injected. This arrangement necessitates the use of syringes which have a section of larger diameter than the remainder of the syringe. This makes the manufacture of the syringe which holds the material to be injected relatively expensive. It is consequently also the object of the present invention to provide as a new article of manufacture an injection syringe which holds the product to be injected and consists of a cylindrical jacket comprising at one end a nozzle to which an injection needle may be attached, and at its other end a piston which can be actuated by the user. This device is essentially characterized by the fact that inside the cylindrical jacket is at least one plug made of a material which is compressible in all directions. This plug forms a seal between the two compartments which it separates, each of which contains at least one of the products to be injected.

In a preferred embodiment of the invention the cylindrical jacket of the syringe and its associated piston are made of a plastic material. The piston, which slides in the syringe, is provided with sealing rings. The nozzle at one end of the syringe is closed during storage and may be opened at the moment of use by breaking off its tip. The injection needle is mounted on the nozzle of the syringe after this tip has been broken off. The plug which is compressible in all directions is in the shape of a disc, the outer diameter of which is equal to the inner diameter of the syringe. The plug is inserted inside the outer jacket of the syringe under a certain initial compression so as to insure a fluid-tight seal between the two compartments which it separates. The plug is made of an expanded material having closed cells, and in particular of a closed-cell polyethylene, neoprene or polyurethane foam which has been expanded by nitrogen. The syringe comprises at the end opposite the nozzle two lateral projections facilitating the depression of the piston of the syringe. The piston is held in its initial position during storage by retaining means such as a removable ring or a removable flange.

It will be seen that in order to use the injection syringe according to the invention the user must press on the piston of the syringe without having opened the nozzle, but after having removed the retaining means associated with the piston. This pressure on the piston increases the pressure inside the cylindrical jacket of the syringe and this increase in pressure causes contraction of the plug or plugs inside the syringe. The various compartments inside the syringe defined by the plugs are thus brought into communication with each other. The user then shakes the syringe while maintaining pressure on the piston to insure mixture of the products. He then breaks off the point of the syringe nozzle and attaches the injection needle thereto. The patient may now be injected. During this injection the pressure inside the cylindrical jacket exerted by the piston is sufficient to insure that the foam plug remains contracted and does not prevent the free flow of the products contained inside the syringe.

In order that the invention may be better understood, four specific embodiments thereof will now be described purely by way of illustration and example, with reference to the accompanying drawings, on which:

FIG. 1 is an axial sectional view showing a container according to the invention comprising a chamber for pressurizing gas and a single compressible plug;

FIG. 2 is an axial sectional view showing a container according to the invention holding two compressible plugs and actuated by an independent cartridge of pressurizing gas;

FIG. 3 shows in axial section, a container according to the invention comprising a compressible plug and a movable piston;

FIG. 4 is a perspective view showing an injection syringe according to the invention as it appears during storage; and

FIG. 5 shows in axial section the syringe of FIG. 4 at the moment of injection.

Referring now to the drawings, and particularly to FIGS. 1 to 3, it will be seen that reference numeral 1 indicates the outer jacket of the container according to the invention. This jacket carries at its upper end a dispensing valve 2 and a push-button 3. The jacket 1 is cylindrical and conical at its upper end. The conical portion terminates in a collar to which the valve 2 may be crimped in a fluid-tight manner. Reference numeral 4 indicates the bottom of the jacket 1.

In the embodiment of FIG. 1, the chamber 5 is located on the bottom 4 of the jacket 1. This chamber holds a liquefied gas such as a mixture of Freon 11 and Freon 12. The chamber 5 is provided with a pin 7 which may be moved by the user from outside the jacket. The pin 7 has a tip 8 adapted to bring the chamber 5 into communication with the inside of the outer jacket 1 by rupturing the barrier therebetween. A plug 9 is positioned inside the jacket 1 and is made of a closed-cell polyethylene foam material which has been expanded by means of nitrogen. This plug is about 3 cm thick and is a force fit against the inner wall of the jacket 1, which it engages at a predetermined position. The jacket 1 is turned upside down and the product 11 introduced thereinto. The bottom 4 and its

associated chamber are then crimped onto the jacket wall. The jacket is then turned rightside up and the product **10** introduced. The upper end of the jacket is then closed by mounting the valve **2**.

This container may be used by actuating the pin **7**. This causes the pressure of the pressurizing gas **6** to be exerted on the lower surface of the plug **9** and deforms and compresses this plug in both the axial and radial directions. The decrease in the diameter of the plug **9** brings the products **10** and **11** into contact with each other. This decrease in diameter is, of course, a function of the vapor tension of the liquefied gas **6**. The user shakes the container to insure a homogeneous mixture of the products **10** and **11**, turns it upside down, and dispenses the products as desired by actuating the valve **2** by means of the pushbutton **3**.

In the device shown on FIG. **2** it will be seen that the jacket **1** holds two plugs **9***a*, and **9***b*. These plugs are made in the same manner as has been described in connection with the plug **9**. When the jacket is to be filled the valve **2** is mounted on top of the jacket **1** and the jacket is turned upside down. A certain quantity of the product **12** is then poured into the jacket and the plug **9***a* is put in place. The desired quantity of the product **13** is then poured into the jacket and the plug **9***b* inserted. Finally, the jacket is filled with the desired quantity of the product **14** and closed by attaching the base **4**.

When the container according to FIG. **2** is to be used, a separate cartridge **15** containing a liquefied gas **16** is positioned over the valve **2**. This cartridge is provided with a dispensing valve **17**. The liquefied gas **16** is transferred through the valves **17** and **2** into the jacket **1**. The pressure of this liquefied gas inside the compartment containing the product **12** deforms and compresses the plug **9***a* in all directions. The pressure in the compartment holding the product **13** deforms and compresses the plug **9***b* in all directions. The user then shakes the container to produce a homogeneous mixture of the products **12**, **13** and **14** and turns the container right side up. He then actuates the valve by means of a pushbutton to dispense the desired mixture.

Referring now to FIG. **3**, it will be seen that the jacket **1** holds a plug **9***c* made of the same material as the plug **9**, and having the same dimensions. The bottom **4** of the jacket supports, as in the case of FIG. **1**, a chamber **5** holding a pressurizing gas **6** and equipped with a pin **7** the tip **8** of which is adapted to bring the interior of the chamber **5** into communication with the interior of the outer jacket **1** by rupturing the barrier therebetween. When the device is being filled, the jacket **1** with its valve **2** is positioned upside down. The desired quantity of the product **20** is then inserted. The plug **9***c* is then forced in and the desired quantity of the product **21** introduced. The piston **18** is then inserted and the container closed by crimping the base **4** carrying its chamber **5** onto the jacket wall. When the device according to FIG. **3** is to be used, the user actuates the pin **7**. The liquefied gas **6** exerts pressure against the lower surface of the piston **18** which transmits this pressure through the liquid **21** to the plug **9***c* so as to deform it and break the seal between the compartments holding the products **20** and **21**. The piston **18** moves in the direction of the valve **2** until the products between the piston **18** and the valve **2** are subjected to a pressure substantially equal to that exerted by the pressurizing gas **6**. When this pressure is exerted on the plug **9***c*, the plug is compressed in all directions and the user need only shake the jacket to mix the products **20** and **21**. He may then actuate the valve **2** by means of the pushbutton **3** so as to dispense the mixture **20**, **21**, regardless of the position of the valve **2**.

It will be seen that the embodiments and methods of operation which have just been described are particularly simple. The value of these devices accordingly resides in the fact that they are very inexpensive.

Referring now to FIGS. **4** and **5**, it will be seen that reference numeral **21** indicates the cylindrical jacket constituting the injection syringe. At one end thereof the jacket **21** carries a nozzle **22** equipped with a point **23** which may be separated from the main body of the nozzle **22** at a line **24** along which the spout is scored. At its other end the cylindrical jacket **21** is provided with two projections **25** which are diametrically opposite each other and perpendicular to the axis of the jacket **21**. The piston **26** slides inside the jacket **21** and comprises a head **27** provided with two sealing rings **28** insuring fluid-tight closure of the jacket **21**. The head of the piston **27** may be moved by a rod **29** at the end remote thereof from the head, which end is provided with a disc **30**. The piston rod **29** comprises during storage a retaining flange **31** positioned between the disc **30** and at the end of the jacket **21**. The retaining flange **31** holds the piston **26** in position. It may be removed by the user at the moment at which the syringe is to be operated.

Between the head of the piston **27** and the nozzle **22** inside the jacket **21** is a disc **32** made of a closed-cell polyethylene foam which has been expanded by nitrogen. The disc **32** is introduced into the jacket **21** under a slight initial compression. Between the disc **32** and the nozzle **22** is a liquid **33** which is to be injected. Between the disc **32** and the head of the piston **27** is another liquid which is to be injected **34**. The injection needle **35** is adapted to be mounted on the nozzle **22** after the point **23** has been broken off.

The syringe according to the invention appears during storage as shown in FIG. **4**. The piston head **27** is at the end of the jacket **21** which carries the projections **25**. This position is maintained by the retaining flange **31**. The two liquids **33** and **34** are separated by the disc **32** which forms a fluid tight seal.

When the user wants to use the syringe according to the invention he tears off the retaining flange **31**, and presses on the end disc **30** while holding the jacket **21** by means of the projections **25**. The liquids **33** and **34** are compressed. During this compression the disc **32** decreases in volume so as to permit the liquids **33** and **34** to mix. The mixture may be improved by shaking the syringe.

The user then breaks off the point **23** and mounts the injection needle **35** on the nozzle **22**. The patient is then injected by progressively depressing the piston **26** inside the jacket **21**. In the course of this movement the mixture of liquids **33** and **34** is injected.

It will of course be appreciated that the disc **32**, when initially compressed is, in general, lighter than the liquid mixture which is to be injected, so that the disc may float and come into contact with the piston so as to avoid any risk that the nozzle may be blocked.

It will also be appreciated that the embodiments which have been described have been given purely by way of example and may be modified as to detail without thereby departing from the basic principles of the invention. Particularly, in the case of the injection syringe shown on FIGS. **4** and **5**, flanges may be provided in the nozzle end of the syringe to prevent blockage of the syringe by the disc **32**.

What is claimed is:

1. A container comprising an outer jacket having two ends spaced by a side wall, at least one plug mounted inside the jacket transversely of said side wall and in liquid-tight sealing relationship therewith, said plug being made of a cellular material having closed cells which responds to an increase in fluid pressure thereagainst by contracting in all directions, and means for increasing the fluid pressure within said jacket to an extent sufficient to cause contraction of said plug transversely of said side wall and thereby terminate the sealing relationship between said plug and side wall.

2. A container as claimed in claim **1** in which said plug divides said container into two compartments, each of which has, adjacent to said plug, a diameter as small as that of the section of said container in which said plug is located.

3. A container as claimed in claim **1** which holds two different liquids, one on each side of said plug.

4. Container as claimed in claim **1** in which the compressible plug is made of a synthetic expanded foam material having closed cells.

5. Container as claimed in claim **4** in which the synthetic material is polyethylene.

6. Container as claimed in claim 1 in which the compressible plug is an envelope containing a compressed gas.

7. Container as claimed in claim 6 in which the envelope is provided with localized stiffening ribs.

8. A container as claimed in claim 1 in which said means for increasing the pressure inside said jacket comprises a sealed chamber at one end of said jacket enclosing a pressurizing fluid, and means for bringing said chamber into communication with the inside of said jacket.

9. A container as claimed in claim 8 comprising a movable piston slidably mounted within said jacket, and dividing said jacket into two parts, one of which contains said plug, and said chamber is adapted to be brought into communication with the other part of said jacket.

10. A container as claimed in claim 1 in which said pressure increasing means is a piston having a head in sealing contact with the walls of said jacket and a rod projecting from one end of said jacket.

11. A container as claimed in claim 10 comprising frangible means for preventing movement of said piston rod.

12. A container as claimed in claim 11 in which said dispensing means is a nozzle at one end of said jacket terminating in a frangible closure.

13. In combination a container as claimed in claim 12 and an injection needle adapted to be mounted on said nozzle when said frangible closure is removed.

14. A container as claimed in claim 12 comprising lateral projections extending radially outward from the end of said jacket remote from said nozzle.

15. A container as claimed in claim 12 provided with transverse ribs inside the end of said jacket carrying said nozzle.

16. Method of separately storing and simultaneously dispensing two liquids which comprises the steps of storing said liquids within a single jacket on opposite sides of a compressible plug in sealing engagement with the side walls of said jacket and dividing said jacket into two parts, said plug being made of a cellular material having closed cells which responds to an increase in pressure thereagainst by contracting in all directions, applying fluid pressure to said plug until it contracts sufficiently in a direction transverse to said side walls to permit mixture of said liquids, and then dispensing the resulting mixture through a valve at one end of said jacket which is kept closed while said plug is being compressed.

17. Method as claimed in claim 16 in which said plug is compressed by exerting fluid pressure thereagainst.

18. Method as claimed in claim 17 in which said fluid pressure is applied by admitting a pressurized fluid to one side of said plug.

19. Method as claimed in claim 17 in which said fluid pressure is applied by pressing a piston against the liquid on one side of said plug.

20. Method as claimed in claim 19 in which said piston is manually actuated.

21. Method as claimed in claim 19 in which said piston is actuated by fluid pressure.

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