June 15, 1954 S. C. McMILLION 2,681,168

ENVELOPE CONTAINING A FRAGILE CAPSULE

Filed July 9, 1949

2 Sheets-Sheet 1

Fig. 1.

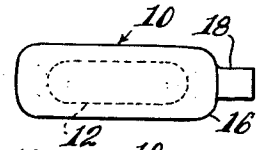


Fig. 2.

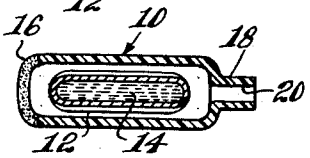


Fig. 3.

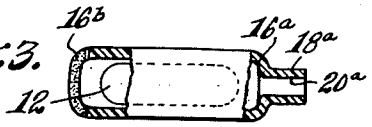


Fig. 4.

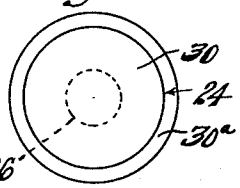


Fig. 5.

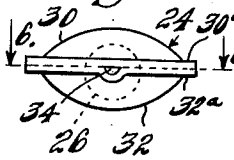


Fig. 6.

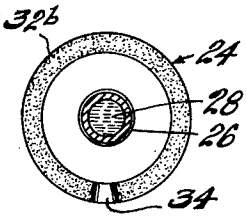


Fig. 7.

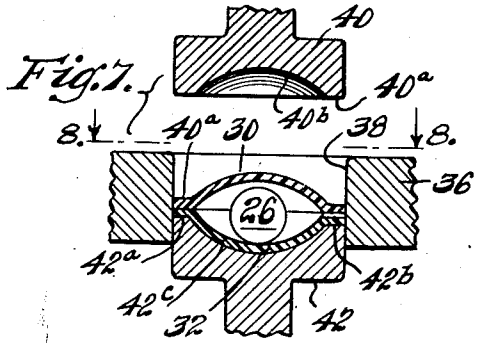


Fig. 8.

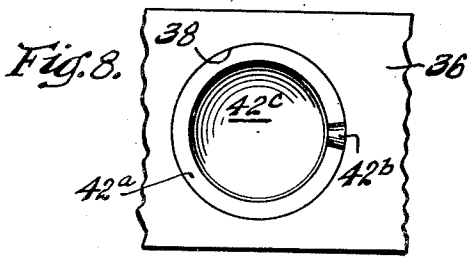


Fig. 9.

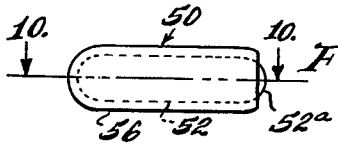


Fig. 10.

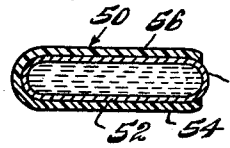


Fig. 11.

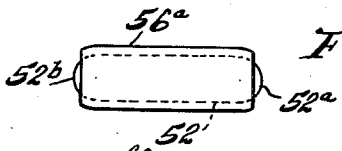


Fig. 12.

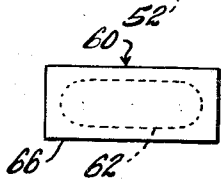


Fig. 13.

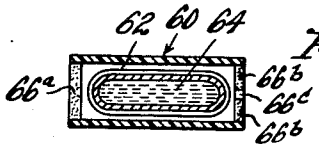


Fig. 14.

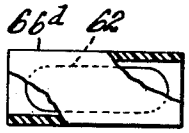


Fig. 15.

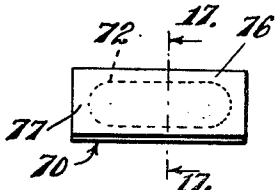
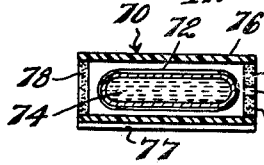


Fig. 16.



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Fig. 17.

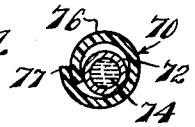


Fig. 18.

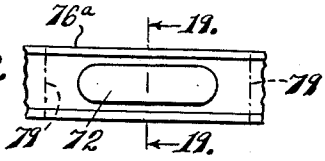


Fig. 19.



Fig. 20.

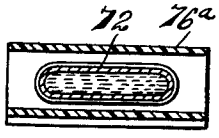


Fig. 21.

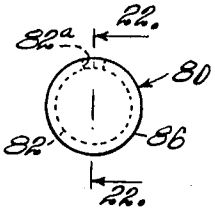


Fig. 22.

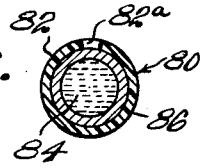


Fig. 23.

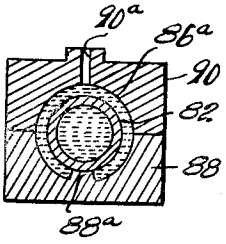


Fig. 24.

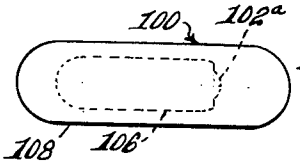


Fig. 25.

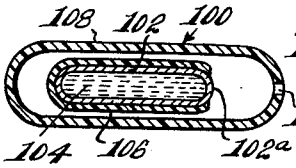


Fig. 26.

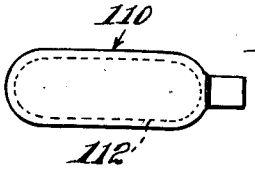


Fig. 27.

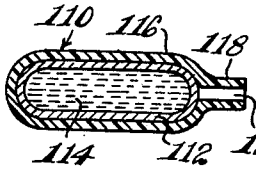


Fig. 28.

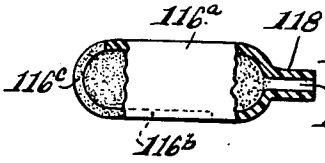


Fig. 29.

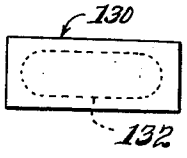
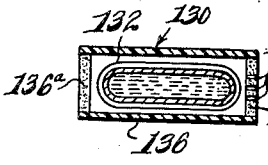


Fig. 30.



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Patented June 15, 1954

2,681,168

UNITED STATES PATENT OFFICE

2,681,168

ENVELOPE CONTAINING A FRAGILE CAPSULE

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Application July 9, 1949, Serial No. 103,920

4 Claims. (Cl. 222—94)

1

This invention relates to containers comprising a single fragile capsule made up of a material insoluble in water together with a flexible envelope enclosing said capsule and provided with a single dispensing aperture or with a plurality of closely grouped dispensing apertures.

In the case of ordinary gelatin capsules, the material making up the walls is water-soluble so that the capsule contents are released by simply dissolving the capsules in water. The capsules are either swallowed whole, as when a pharmaceutical composition is contained therein, or else are placed in an aqueous liquid with which the capsule contents are to be admixed. The capsules are made strong enough to withstand digital pressure on handling, so that there is no chance of the fingers being stained or soiled with material contained within the capsules. There is, of course, no possibility of using the capsules for dispensing the capsule contents or a part thereof at a predetermined location, at a predetermined place, and without having the capsule contents then admixed with an aqueous liquid containing dissolved gelatin.

Applicant is the coinventor with Blasey T. Palermo of a gelatin capsule adapted to contain liquid or gelatinous or viscous or granular material and characterized, at least under predetermined humidity conditions, by any desired predetermined breaking strength for instance from 200 to 1000 or more grams, and, preferably, about 500 grams (the indicated weight being that required for breakage when applied normally to the plane of sealing of the capsule), as disclosed in our copending application Serial No. 79,908, filed March 5, 1949, now Patent No. 2,578,943, dated December 18, 1951, and entitled "Fragile Gelatin Capsule and Method of Making the Same." Reference is made to said copending application for details. For the purpose of the present invention, the following facts concerning the capsules of said copending application are of importance. First, the method of said copending application involves a treatment of gelatin capsules with a formaldehyde which renders the capsules more or less insoluble in water. Secondly, the release of the capsule contents is effected by applying pressure to the capsule so as to break up the capsule wall into fragments. If the capsules are held manually and broken by digital pressure, then the capsule contents come in contact with the hands and soil or stain the hands. Further, part of the capsule contents are thus wasted. The capsule contents can not be dispensed or applied to a particular place or spot. The capsule contents tend to squirt or to be otherwise forcibly ejected for some distance when the capsules are broken. Finally, fragments of the capsule walls still remain associated with at least part of the capsules' contents.

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For the reasons indicated in the preceding paragraph the fragile capsules of our copending application have heretofore been principally employed in the following manner. The fragile capsules are enclosed within a flexible container along with material with which the capsule content is ultimately to be admixed. At the time the mixing is to be effected, pressure is applied through the flexible container wall to break the capsule and to cause the capsule contents then to be admixed with the other material within the container. It has been proposed to separate the fragile capsule from the main space within the container by a reticulate or multi-apertured sheet having margins attached to the inside of the container, for the purpose of preventing fragments of broken capsules from being admixed with the material within the container along with the capsule contents. But then the material within the container tends to flow into or to become displaced into the pocket defined between the inside of the container and said sheet which originally received the fragile capsule. The result is not only that the capsule fragments become admixed with the part of the material within the container, but this part, being confined within said pocket can not easily or practically be recovered and therefore is often wasted. In any event, it is difficult, impractical or impossible to utilize said fragile capsules so as to dispense the capsule contents completely at any particular locality without having the capsule contents admixed with other material, including fragments of broken capsules.

It is therefore an important object of the present invention to provide a container comprising a single fragile capsule made up of water insoluble material together with a flexible envelope enclosing such capsule and provided with a single dispensing aperture or with a plurality of dispensing apertures grouped together over a limited area, said container being adapted for manual grasping over imperforate areas for dispensing the whole capsule content at a definite spot, the container forming an individual unit altogether apart and separate from any material with which its contents eventually may be admixed so that any such material can be completely recovered after such admixture.

Another important object of the present invention is to provide a container comprising a single fragile capsule made up of water insoluble material together with a flexible envelope enclosing said capsule and provided with a single dispensing aperture or with a plurality of dispensing apertures, said container being adapted for dispensing the whole capsule contents without admixture of other or foreign material, in particular, fragments of broken capsules.

Another important object of the present invention is to provide methods for making containers of the type indicated.

Other and further objects and features of the present invention will become apparent from the following description and appended claims as illustrated by the accompanying drawings showing, by way of examples, containers according to the present invention and methods for making the same. More particularly:

Figure 1 is a plan view of a container according to the present invention;

Figure 2 is a central horizontal cross sectional view of the container of Figure 1;

Figure 3 is a plan view, with parts broken away, of the container of Figures 1 and 2 in an intermediate stage of manufacture;

Figure 4 is a plan view of a second container according to the present invention;

Figure 5 is a side elevation of the container of Figure 4;

Figure 6 is a cross sectional view taken along the line 6—6 of Figure 5;

Figure 7 is a fragmentary central vertical cross sectional view through a device for manufacturing the container of Figures 4 through 6, showing also the various parts of the container assembled together in an intermediate stage of the manufacture of said container;

Figure 8 is a plan view taken along the line 8—8 of Figure 7, the device being shown empty;

Figure 9 is a plan view of a third container according to the present invention;

Figure 10 is a cross-sectional view taken along the line 10—10 of Figure 9;

Figure 11 is a plan view of the container of Figures 9 and 10 in an intermediate stage of manufacture;

Figure 12 is a plan view of a fourth container according to the present invention;

Figure 13 is a central horizontal cross sectional view of the container of Figure 12;

Figure 14 is a plan view, with parts broken away, of the container of Figures 12 and 13 in an intermediate stage of manufacture;

Figure 15 is a plan view of a fifth container according to the present invention;

Figure 16 is a central horizontal cross sectional view of the container of Figure 15;

Figure 17 is a cross sectional view taken along the line 17—17 of Figure 15;

Figure 18 is a plan view of the article of Figures 15 through 17 in an initial stage of manufacture;

Figure 19 is a cross sectional view taken along the line 19—19 of Figure 18;

Figure 20 is a horizontal cross sectional view similar to Figure 16 of the container of Figures 15 through 17 in an intermediate stage of manufacture;

Figure 21 is a side elevation of a sixth container according to the present invention;

Figure 22 is a cross sectional view taken along the line 22—22 of Figure 21;

Figure 23 is a central vertical cross sectional view through a device for the manufacture of the container of Figures 21 and 22;

Figure 24 is a plan view of a seventh container according to the present invention;

Figure 25 is a central horizontal cross sectional view of the container of Figure 24;

Figure 26 is a plan view of an eighth container according to the present invention;

Figure 27 is a central horizontal cross sectional view of the container of Figure 26;

Figure 28 is a plan view, with parts broken away, of the flexible envelope of the container of Figures 26 and 27 before the insertion of a fragile capsule to form the container of Figures 26 and 27;

Figure 29 is a plan view of a ninth container according to the present invention; and

Figure 30 is a central cross sectional horizontal view of the container of Figure 29.

The fragile capsules shown in the drawings in combination with flexible envelopes may be prepared by the method including, as an initial step, a gelatin capsule making and filling operation carried out, for instance, according to the method of the patent to Robert P. Scherer, No. 1,970,396, dated August 14, 1934. The filled capsules are subsequently treated with formaldehyde.

By way of example, filled capsules may conveniently be prepared from a composition consisting essentially of 27.0% (by weight) of gelatin, 47.5% of glycerin and 25.5% of water. The filled capsules are thereafter tumbled with an emulsion of aqueous formaldehyde in oil; then tumbled with sponges to remove excess emulsion; and finally dried. More particularly, 20,000 capsules of 6½ minim capacity may be tumbled for 20 minutes with 200 grams of an emulsion containing 50% of formaldehyde of 37% strength, 30% of light mineral oil USP and 20% of anhydrous lanolin. In general, the emulsion should contain from 20% to 65%, and preferably about 50% of aqueous formaldehyde of at least 10% strength and preferably of at least 35% strength. The ratio of gelatin to glycerin in the capsule walls should range between 0.5 to 1.5. The time of tumbling as well as the amount of emulsion should be sufficient to insure uniform action of the formaldehyde solution on the capsules.

While specific reference has been made herein to gelatin capsules of reduced strength prepared by treatment with formaldehyde and subsequent drying, it should be understood that other fragile gelatin capsules or capsules made of other materials may also be used, in particular, when the material making up the capsule walls is more or less insoluble in water. In other words, any fragile capsules insoluble in water may be employed for the purposes of the present invention regardless of the chemical composition of the capsules.

In the drawings, the fragile capsules have been shown as filled with flowable material, for instance, a solution of a dye in an oil. Nevertheless, the capsules may be filled with other liquids, jellies, viscous preparations or the like, such as medicinal or cosmetic pastes, salves, creams or solutions or other liquids or granular or powdery material.

Referring now to Figures 1 and 2 of the drawings, the reference numeral 10 indicates generally a container according to the present invention comprising an inner fragile gelatin capsule 12, filled with an oil solution 14 of a dye and surrounded by an outer spaced envelope 16 formed with a constricted apertured neck 18 defining a

dispensing aperture 20. The capsule 12 may be made of gelatin and treated as described hereinafter to render the capsule breakable under a pressure of from 200 to 1000 grams, preferably from 200 to 500 grams. The outer envelope 16 may be made of transparent or at least translucent flexible plastic material. When the container 10 is grasped manually and subjected to digital pressure, the fragile capsule 12 will be broken, and the contents thereof may be expelled from the outer envelope 16 through the dispensing aperture 20 by squeezing or, if the contents are not too viscous, by gravity flow. The capsule contents can readily be dispensed at any desired locality. The aperture 20 can be made small enough to retain most or all the fragments formed when the fragile capsule is broken.

A number of containers such as that shown in Figures 1 and 2 can be stored together and, if the internal capacity of the outer envelope 16 is large enough and/or if the discharge aperture 20 is small enough so that on accidental breakage of the fragile capsule 12 the contents of the capsule will be retained within envelope 16, then the remaining containers will not be soiled or stained due to the accidental breakage of one single container.

Figure 3 illustrates one method of manufacturing the container of Figures 1 and 2. For this purpose, the fragile capsule 12 may be placed inside an open ended flexible tube 16*a* having a constricted neck 18*a* defining a dispensing aperture 20*a*. The other end of the tube 16*a* may then be closed off by adhesive 16*b* applied over the terminal margins of the tube 16*a*.

Figures 4 through 6 illustrate a second container according to the present invention indicated generally by the reference numeral 24 and comprising an inner globular fragile gelatin capsule 26 filled with a solution 28 of a dye in oil. The capsule 26 is enclosed within an outer spaced envelope made up of two halves 30 and 32 having abutting margins 30*a* and 32*a* projecting radially to define a circumferential flange. A dispensing aperture 34 is formed in this flange.

The container of Figures 4 through 6 may be prepared by apparatus shown in Figures 7 and 8 as including a table 36 formed with one or more circular apertures 38. An upper piston 40 and a lower piston 42 are slidable within the aperture 38. The face of the lower piston 42 is formed with an outer annular plane surface 42*a* extending about the whole periphery, except for a recessed portion 42*b*. Within the surfaces 42 and 42*b*, the lower piston is arcuately recessed, as at 42*c*. The face of the upper piston 40 is formed with an annular plane surface 40*a* extending along the whole periphery of the piston and surrounding an arcuately recessed portion 40*b*. The two surfaces 40*a* and 42*a* are adapted to register with each other except over the area 42*b*. Thus, the lower piston 42 may be disposed within the aperture 38 at the level indicated in Figure 7 and the lower envelope half 32 of plastic material may be placed in the aperture followed by a capsule 26 and the upper envelope half 30 of plastic material. The upper piston 40 may then be forcibly brought down into the cavity 38 to compress the edges of the two envelope halves 30 and 32 between the surfaces 40*a* and 42*a*. If these edges or margins have an adhesive applied thereto or are then in plastic condition, for instance, due to heating or the application of an appropriate solvent, the edges will then be sealed together, as indicated at 32*b* in

Figure 6, except over the area 42*b*, to form the container shown in Figuers 4 through 6. After such sealing has been completed, the upper piston 40 may be raised to the position shown in Figure 7 and the finished container may be ejected from the aperture 38 by raising the lower piston 42.

While a number of commercially available plastic materials may be used in the processes illustrated in Figures 3 and 8, particularly good results have been obtained with vinyl resins, with cellulose derivatives, such as cellulose acetate, cellulose oxybutyrate, ethyl cellulose and the like, with acrylic resins, with polyethylene resins, with rubber hydrochloride and with paper or fibrous material impregnated with thermosetting resin-forming material. The preferred materials include modified polyvinyl chloride or polyvinyl chloride-acetate resins. The composition used to modify said polyvinyl resins include resinous plasticizers, such as nitrile type synthetic rubbers (copolymers of butadiene and acrylonitrile), polyester resins (permanently soft and thermoplastic saturated resins made from polyhydric alcohols and unsaturated organic acetates) and chemical plasticizers such as dioctyl phthalate, dicapryl phthalate, dibenzyl sebacate and dibutyl sebacate. Other preferred materials are polyethylene resins either unmodified or modified, as by incorporation of resinous plasticizers such as polyisobutylene or microcrystalline waxes, for conferring on the resins suitable adhesive and heat sealing characteristics.

Figures 9 and 10 show a third container according to the present invention indicated generally by the reference numeral 50 and including an inner capsule 52 containing a solution 54 of a dyestuff in oil. An outer envelope 56 adheres to the inner capsule except over one end portion 52*a* of the latter. When this container is subjected to sufficient manual pressure to break the inner capsule 52, any resulting fragments will still adhere to the outer envelope 56.

The container of Figures 9 and 10 may be prepared, as illustrated in Figure 11, by dipping the capsule 52 in a suitable viscous film-forming liquid. For instance, the capsule 52 may be grasped at its two ends and then dipped into the film-forming liquid, the two ends 52*a* and 52*b* being covered by the finger tips so that only the intermediate portion of the capsule will be covered by a film-forming layer 56*a*. Thereafter, one end 52*b* of the capsule may be dipped into the film-forming liquid to cover this one end, leaving the end 52*a* uncovered. While a number of film-forming materials may be employed in such a dipping method, particularly good results have been obtained by using gels made up with cellulose derivatives, particularly ethyl cellulose and cellulose acetobutyrate.

Figuers 12 and 13 show a fourth container according to the present invention generally indicated by the reference numeral 60 and including an inner fragile capsule 62 filled with a solution 64 of a dyestuff in oil. The capsule 62 is enclosed within an outer tubular envelope 66 having one end completely sealed off as at 66*a* and another end sealed off at 66*b*, but open at 66*c*. As shown in Figure 14, the container of Figures 12 and 13 may be prepared by enclosing a capsule 62 within a tube 66*d* open at both ends, and thereafter sealing off the two ends of the tube (only one end being completely sealed), as by heat and pressure, or by using an appropriate solvent or adhesive to form the container of Figures 12 and

13. For this purpose, any plastic material capable of bonding or sealing in the manner indicated may be used. Particularly good results have been obtained with vinyl resins and with polyethylene resins.

A fifth article according to the present invention is shown in Figures 15 through 17, and is there generally indicated by the reference numeral 70. This container includes an inner fragile capsule 72 filled with solution 74 of a dyestuff in oil. The capsule is enclosed within an outer envelope 76 of generally tubular shape made up of a sheet having margins overlapping at 77 and having its ends sealed together, as indicated at 78, except over an area 80 serving as a dispensing aperture. Figures 18 through 20 show a method for manufacturing the container of Figures 15 through 17. More particularly, a strip 76a of plastic material is formed into trough-shape and the capsule 72 placed therein, as shown in Figures 18 and 19. Next, the free edges of the strip 76a are overlapped, in the manner shown at 77 in Figure 17, bonding between the contacting surfaces being effected, as by means of a suitable adhesive or solvent. In the next step, the tubularly folded band 76a is cut transversely along the lines 79 to yield the article shown in Figure 20, and finally, the ends of the cut-off tubularly folded band 76a are sealed, as by the use of heat and pressure, a solvent or an adhesive, except over a limited area at one end, forming the finished container shown in Figures 15 through 17. Suitable materials for forming the outer envelope include rubber hydrochloride, polyethylene resins, acrylic resins, vinyl elastomers and cellulose derivatives such as cellulose acetate and ethyl cellulose.

A sixth container according to the present invention is shown in Figures 21 and 22 and there indicated generally by the reference numeral 60. This container includes an inner globular capsule 62 filled with a solution 64 of a dyestuff in oil. An outer envelope 66 adheres to the capsule 62 with the exception of a small area 62a. This article may suitably be cast in a device such as that shown in Figure 23 and including a lower mold half 88 and an upper mold half 90 together defining a globular molding cavity. The capsule 62 is placed upon a pedestal 88a projecting into the mold cavity from the mold part 88. Liquid material 66a capable of solidifying for forming the outer envelope is poured into the mold cavity through a top aperture 90a in the upper mold half 90. Suitable materials for such casting around the capsule include cellulose derivative jellies and microcrystalline waxes plasticized with resins such as polyisobutylene.

In Figures 24 and 25 there is shown a seventh container according to the present invention generally designated by the reference numeral 100. This article includes an inner capsule 102 filled with a solution 104 of dyestuff in oil and an envelope 106 adhering to the capsule 102 except over a small terminal area 102a. The capsule 102 with its adhering envelope 104 is enclosed within an outer spaced envelope 108 having a dispensing aperture 108a at one end. The container of Figures 24 and 25 may be made by first preparing the container of Figures 9 and 10 and thereafter enclosing the resulting container within an outer spaced envelope in a manner similar to the method of preparation of the container of Figures 12 and 13. In the case of the container of Figures 24 and 25, the dispensing aperture 108a can be made relatively large without any danger of capsule fragments being discharged therethrough, for the capsule fragments are retained by the adherent envelope 106.

An eighth container according to the present invention is shown in Figures 26 and 27 and there generally indicated by the reference numeral 110. The container includes an inner fragile capsule 112 filled with a solution 114 of a dyestuff in oil. An outer resilient envelope 116 adheres to the capsule 112. The envelope 116 has a constricted neck 118 apertured to define a dispensing conduit 120. The container of Figures 26 and 27 may be prepared by first providing a tubular member 116a open at one end and having at the other end a constricted neck defining a dispensing aperture 120a. Further, one side of the tubular member 116a is slotted longitudinally, as at 116b. This slot extends from the open end all the way or almost all the way to the neck 118. The interior of the tube 116a may be coated with adhesive, as indicated at 116c, as are also the walls of the slot 116b and the opposed marginal surfaces of the open end of the member 116a. The capsule 112 may then be inserted within the member 116a, and the envelope 116a is finally sealed off by adhesion between the opposed walls of the slot 116b and the opposed marginal surfaces of the member 116a at the open end thereof.

Figures 29 and 30 show a ninth container according to the present invention generally indicated by the reference numeral 130 and including an inner fragile capsule 132 filled with a solution 134 of a dyestuff in oil. The capsule 132 is enclosed within an outer tubular envelope 136 having one end completely sealed off as at 136a and another end sealed off at 136b but pierced by three narrow generally parallel discharge apertures 136c. The container of Figures 29 and 30 may be prepared similarly to the container of Figures 12 and 13, except that the end area 136b is initially sealed off completely and is thereafter pierced in three locations, as by a needle, to form the discharge apertures 136c. The latter are quite narrow and therefore the fragments of the capsule 132 are retained within the envelope 136 after breakage of the capsule 132. Further, the apertures 136c being grouped closely together at one end of the container 130 and being generally parallel, the contents of the capsule 132 can be dispensed from the container 130 at any desired location.

Numerous materials suitable for the preparation of both the fragile capsules and the outer envelopes are available to those skilled in the art. The chemical composition of these various materials is immaterial, since the suitability of any given material is determined largely by its physical properties, such as breaking strength (in the case of the inner capsule), and pliability or flexibility (in the case of the outer envelope). Likewise, numerous methods for preparing the articles of this invention are available to those skilled in the art besides those specifically disclosed hereinabove. For instance, it is possible completely to enclose an inner capsule within an outer flexible envelope that may or may not adhere to the inner capsule and may or may not be spaced from the inner capsule. After the inner capsule has been completely enclosed within the outer envelope, a suitable dispensing aperture may be formed in the outer envelope as by slitting or perforating the envelope. Or, a small area of the capsule to be enclosed may be covered with a mask, the capsule thereafter being coated and the mask being finally removed to

provide a dispensing aperture for the resulting envelope.

Many details of structure, composition and procedure can be varied within a wide range without departing from the principles of this invention and it is therefore not my purpose to limit this application otherwise than necessitated by the scope of the appended claims.

I claim:

1. A container for dispensing a fluid material at a predetermined location without admixture with foreign material, said container comprising a fragile capsule having walls rupturable at any point thereof and filled with said fluid material and two sheets of flexible material disposed one on each side of said capsule and having their opposed margins bonded together except over a small area defining a single permanently open dispensing aperture, portions of said opposed margins including said small area defining a radial flange for said container, said container having said material as its sole fluid content and forming a unitary article capable of being manipulated by itself to dispense only said fluid material through said aperture at said predetermined location after breakage of said capsule.

2. A method of preparing a container for dispensing a fluid material at a predetermined location without admixture with foreign material, said method comprising providing a fragile capsule having walls rupturable at any point thereof and filled with said fluid material, disposing said capsule between two flexible sheets and bonding the opposed margins of said sheets together except over a small area defining a single permanently open dispensing aperture the interspace between said capsule and said sheets being left empty and portions of said opposed margins including said small area extending radially from said capsule to form a flange for said container.

3. A container for dispensing a fluid material at a predetermined location without admixture with foreign material, said container comprising a capsule filled with said fluid material and having walls rupturable at any point thereof by application of manual pressure to said container,

said container further comprising a flexible envelope impermeable with respect to said fluid material enclosing said capsule and provided with a generally radially extending flange having a permanently open dispensing aperture extending therethrough and opening at the free edge of said flange, said container forming a unitary article having said material as its sole fluid component and capable of being manipulated by itself to dispense said fluid material through said aperture at said predetermined location after rupture of said capsule.

4. A method of preparing a container for dispensing a fluid material at a predetermined location without admixture with foreign material, said method comprising providing a capsule filled with said fluid material and having walls rupturable at any point thereof by application of manual pressure, providing flexible film material impermeable with respect to said fluid material, completely enveloping said capsule in said film material portions of the margin of said film material being brought into opposed relationship to form a radial flange, and sealing the margins of said film material around said capsule except for a limited area of said opposed margin portions left unsealed and permanently unobstructed to provide a dispensing aperture for the resulting container, any space between said capsule and said enveloping film material being maintained free from liquids.

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