A non-pressurized package containing a product, especially a cosmetic product selected from the class consisting of those to be applied to skin and hair, said product comprising two separate compositions which are adapted to be mixed together to form a final heated composition which is dispensed from said package, said package having two separate compartments for separate storage of said two compositions, one of said compartments containing a composition comprising an oxidant in an aqueous medium, and the other of said compartments containing a substantially anhydrous composition which includes a reductant, a water-soluble organic solvent, a compressible gas which is substantially water-insoluble but which is soluble in said organic solvent, said compressible gas existing as a gas at a temperature in the range of ambient temperature to about 70°C and existing as a liquid at said temperature under superatmospheric pressure, the aforesaid two separate compositions, when admixed, resulting in the release of said compressible gas by reason of the insolubility of said gas in the solution of said organic solvent and said water.

12 Claims, 11 Drawing Figures
NON-PRESSURIZED PACKAGE CONTAINING SELF-HEATING PRODUCTS

This invention relates to novel self-heating products, especially cosmetic products of the type which are applied to skin and hair, and which are in the form of two separate compositions which are packaged in a non-pressurized package or container and which are adapted to be mixed together to form a final heated composition which is dispensed from said package for use. The invention is especially applicable to the production of self-heating shaving creams, but it is also useful in other self-heating products, particularly cosmetic products which are intended for application to the skin and hair and where enhancement of the utility of said products results from heat and the evolution of a gas or, in certain instances, the production of a foam. Illustrative of such other products are topical medicaments, liniments, cleaners for household or other applications, after-shave products or lotions, cleansing creams, astringent lotions, hair dyes, hair dye removers, hair bleaches, hair rinses, hair shampoos, hair conditioners, hair dressings, body and underarm deodorants, and other toiletries. The invention will be described below in connection with cosmetic products where it appears to have its greatest utility but it will be understood that it is not so limited.

Self-heating cosmetic products, notably shaving creams or shaving preparations have heretofore been known. Illustrative of such products are those shown in U.S. Pat. No. 3,341,418. These comprise two-part compositions which are adapted to be mixed together, the two different parts being packaged in a single package having two compartments for separate storage of the two parts of the compositions, one of said parts containing an oxidant and the other containing a reductant, said two parts being adapted to be dispensed simultaneously with mixing whereby, on being admixed, an exothermic reaction occurs. Each of the two-part compositions contains various ingredients, in addition to their respective oxidant and reductant, including substantial proportions of water. The packages or containers in which said two-part compositions are packaged and from which they are dispensed and pressurized with a liquefied gaseous propellant. Other illustrative self-heating preparations and pressurized containers or aerosol dispensers in which they are packaged are shown in U.S. Pat. Nos. 3,240,396; 3,325,056; 3,326,416 and 3,372,839.

The product compositions and the non-pressurized packages containing the same of my present invention are radically different from those of the previously known types referred to above and operate on an entirely unrelated principle of gas formation and evolution or the production of foam. While they employ separate compositions, one of which contains an oxidant and the other of which contains a reductant, and which separate compositions when admixed together evolve heat and give off a gas or form a foam, they achieve this result in an entirely different way from heretofore known practices and procedures, and which enables packaging in non-pressurized packaging, thereby avoiding problems and hazards which are associated with pressurized packaging or aerosol dispensers.

Briefly speaking, the non-pressurized package of my present invention which contains a cosmetic product of the type which is intended for application to the skin and hair, wherein said cosmetic product comprises two separate compositions which are adapted to be mixed together to form a final heated composition which is dispensed from said package, and wherein said package has two separate compartments for separate storage of said two compositions, houses in one of said compartments a composition comprising an oxidant in an aqueous medium. In the other of said compartments there is housed a substantially anhydrous composition which includes a reductant, a water-soluble organic solvent, a compressible gas which is substantially water-insoluble but which is soluble in said organic solvent, said compressible gas being of that type which exists as a gas at a temperature in the range of ambient temperature to about 70°C. and exists as a liquid at said temperature under superatmospheric pressure. The aforesaid two separate compositions, when admixed, become heated and, in addition, cause the release of said compressible gas by reason of the insolubility of said gas in the solution of said organic solvent and said water. Thus, in addition to the generation of heat and the resulting formation of a warm or hot shaving or other cosmetic product for application to the skin or hair, the evolution of gas which also occurs causes a mechanical action leading, in certain cases, to foam formation and spreading. Quite high temperatures can be reached upon admixture of the two separate compositions as, for instance, of the order of 70°C., depending upon a number of factors including the selection of particular oxidants and reductants.

The oxidant-containing composition which, for convenience, may be called the A composition, may comprise simply an aqueous solution of an oxidizing agent, or a mixture of oxidizing agents, as, for instance, a 1 to 20 percent aqueous solution of hydrogen peroxide. While aqueous solutions of other oxidizing agents can be employed, such must be reasonably stable. The oxidizing agents can be used with or without stabilizers such as are shown, for example, in U.S. Pat. No. 3,341,418. It is particularly preferred, however, to employ aqueous solutions of hydrogen peroxide as the oxidant, aqueous solutions containing from about 5 to 10 percent hydrogen peroxide being very satisfactory in most cases.

The oxidant-containing composition can, if desired, include other ingredients, depending, for instance, on the nature of the particular cosmetic product which it is desired to produce. Among such other ingredients are thickeners, illustrative of which is polyethylene glycol 300 monostearate and amine oxides such as dimethyldialkylamine oxides (e.g., "Standamox-01," Standard Chemical Products, Hoboken, N.J.); surfactants such as those referred to below; sodium silicate or other alkali metal silicates or other non-reactive inorganic salts or compounds; hydrogenated castor oil; sodium hexametaphosphate, trisodium phosphate, and sodium tripolyphosphates.

The reductant-containing composition which, for convenience, may be called the B composition, will generally contain the reductant (or reducing agent) in proper amount to react with the quantity of oxidant in the A composition. Various reductants can be employed such as sodium or potassium salts of sulfuric acid or thiosulfuric acid as, for instance, sodium sulfite or potassium thiosulfate. Other reductants which can be utilized are shown, for example, in the aforemen-
tioned patents. It is particularly preferred to use sodium sulfite. The proportions of the oxidant and reductant, in relation to each other, are variable and will depend, of course, upon the particular oxidants and reductants utilized, generally being employed in approximately the proper stoichiometric proportions to achieve the exothermic reaction. In the case of the use of hydrogen peroxide as the oxidant and sodium sulfite as the reductant, 1 mol % of hydrogen peroxide is desirably used with about 3.7 mol % of sodium sulfite on the anhydrous basis.

In addition to the reductant, or mixtures of reductants, the B composition will also contain a nonaqueous organic solvent in which the reductant is soluble or dispersible or suspendable, and in which organic solvent compressed or compressible gas or gases are dissolved whereby to lower the vapor pressure of the resultant solution to a point at which said solution can be maintained at ambient temperatures in nonpressurized containers.

The organic solvent, which is used in the B composition, must be water-soluble, and must also be a solvent for the compressed gas which is to be dissolved therein. Illustrative examples of such organic solvents, which generally are liquids at normal or ambient temperatures, are saturated aliphatic monohydric alcohols containing one to three carbon atoms such as ethyl alcohol, n-propyl alcohol and isopropyl alcohol; and di-alkyl ketones in which the alkyl groups contain one to three carbon atoms, such as acetone and methyl ethyl ketone. It is, however, especially desirable to utilize normally liquid water-soluble polyethylene glycols such as polyethylene glycol 200, 400, 600, 800, 1,000, 1,450, and higher polyethylene glycols. Various aliphatic polyhydric alcohols such as glycerol, monoalkylene and polyoxyalkylene glycols in which the alkylene groups contain from two to four carbon atoms, such as ethylene glycol, propylene glycol, dipropylene glycol, 1,3-butylene glycol, hexylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol and somewhat higher polyethylene glycols, such as those mentioned above, can be used. In certain cases, the organic solvent can be in the form of one or more normally liquid organic surface active agents or surfactants, of nonionic, anionic, cationic or amphoteric character. Illustrative of such nonionic surfactants are alkylene oxide, particularly ethylene oxide, adducts of fatty or aliphatic long chain (straight or branched) alcohols, or fatty acids, or alkyl phenols as, for example, 8 to 22 mol ethylene oxide adducts of octyl alcohol, decyl alcohol, dodecyl alcohol, tridecyl alcohol, oxo-alcohols such as o xo-tridecyl alcohol, oleic acid, palmitic acid, diethylphenol, nonylphenol, dinonylphenol, and the like. Other normally liquid nonionic surfactants, for example, those sold under the designation "Pluronics," are condensates or adducts of ethylene oxide with polyoxypropylene glycols of molecular weight 1,200 or higher. They are disclosed, for example, in U.S. Pat. Nos. 2,674,619 and 2,677,700. Normally liquid anionic surfactants are commonly in the form of sulfates, sulfonates and phosphates and are well known in the art, and the situation is the same in regard to the cationic surfactants and amphoteric surfactants of which there is an extensive literature. Mixtures of two or more organic solvents can be utilized and, where the mixtures of organic solvents comprise a liquid at ambient temperatures, to the extent that one or more of them is a surfactant, said surfactant, per se, need not be a liquid at ambient temperatures. The organic surfactants may, per se, be solids or liquids at ambient temperatures. While, as stated above, the anionic, cationic and amphoteric surfactants are well known, illustrative examples are sulfated fatty alcohols and sulfated derivatives of fatty alcohols, and sulfonated long chain alkyl benzenes or toluenes, advantageously in the form of their salts, typical of which are sodium lauryl sulfate, sodium myristyl ether sulfates, dodecylbenzene sodium sulfonate and octadecylbenzene sodium sulfonate, and the corresponding sulfates in the form of their amine salts such as the ethanolamine, diethanolamine, triethanolamine and isopropylamine and isopropanolamine salts; quaternary ammonium compounds such as lauryldimethylbenzylammonium chloride, cetylpolydimethyl ammonium chloride, and lauric acid ester of colophonium; myristyl pyridinium chloride; and dodecylbetaine, sulfated imidazolines, and reaction products of dodecyl taurine with hydrophobic tertiary amines. The proportions of the organic solvent, or solvent mixtures, utilized in the B compositions are variable but will, in general, lie in the range of about 20 to about 90 percent by weight, or somewhat more or less, usually about 25 to about 40 percent. Any volatile organic material which exists as a gas at room temperatures, or use temperatures, namely, the temperatures which are produced by the interaction of the oxidant and the reductant when the A and B compositions are mixed together (at ambient or atmospheric pressure) and which exists as a liquid at the same temperatures under superatmospheric pressures, and is soluble in the organic solvent (or mixtures thereof) utilized, and is substantially insoluble in water, can be used as the gas-producing agent. Especially suitable are the C_{12}-C_{18} aliphatic hydrocarbons, namely, liquefied propane, n-butane, isobutane, isobutylene, n-pentane, isopentane, n-hexene, and hexene-2; and halogenated aliphatic hydrocarbons which contain from 1 to 2 carbon atoms and include, by way of example, ethyl chloride, chloroform, trichloroethylene, methylchloride, dichlorodifluoromethane, monochlorodi- fluoromethane, dichlorotetrafluoroethane, trichlorofluoromethane, trichlorofluoroethane, difluoroethane, difluoromonochloroethane, chlorotrifluoroethane, and mixtures of two or more thereof, most desirably the saturated hydrocarbons and halogenated saturated aliphatic hydrocarbons. The boiling points of said aliphatic hydrocarbons and halogenated aliphatic hydrocarbons should fall within the range of about -30°C. to about 60°C. at atmospheric pressure, preferably about 3°C. to about 37°C. The proportions thereof in the B compositions of the present invention will, in general, range from about 1 to about 20 percent, by weight, preferably about 5 to about 10 percent. The vapor pressure of the B compositions is, in general, in the range of from 0 to 10 psig at 25°C., and not greater than about 15 psig at 50°C. The selection of the compressed gas is dependent, among other considerations, upon the amount of gas production of foam production desired, as the case may be, and the vapor pressure that is desired in the solution of the compressed gas in the organic solvent in the B composition.

The B compositions will also contain a foaming agent or agents, independently of considerations of solvency characteristics or properties thereof in relation to the
compressed gas. Such foaming agents are surfactants which may, in certain instances, impart detergency and thickening properties to the B compositions. Such surfactants may be various soaps as, for instance, alkanolamine soaps of fat-forming fatty acids such as diethanolamine, triethanolamine and diisopropanolamine soaps of coco or coconut oil fatty acids or special cuts or fractions thereof such as those containing mainly lauric acid or myristic acid, and said soaps of such other fatty acids as palmitic acid, oleic acid, stearic acid, and mixtures thereof. Others of such surfactants, which may be of anionic, nonionic or amphoteric character, include, by way of illustration, sodium lauryl sulfate, diocetyl sodium sulfosuccinate, nonyl phenoxy polyethylenoxyethanol, disodium N-lauryl beta-iminodipropionate, and others such as have been mentioned above. The B compositions may also contain other agents such as thickening agents, suspending agents, foam stabilizers such as lauryl alcohol or other known foam stabilizers, perfumes, dyes and the like, certain of which are employed simply to impart cosmetic elegance to the system. While, in general, it is desirable to incorporate such agents into the B compositions, it should be understood that, where compatible, such agents can be incorporated into the A compositions or into both the A and B compositions.

The A composition may be liquid, or a solid, such as a paste (or cream) or a gel; and the B composition may be a liquid or a solid, such as a paste (or cream) or a gel.

The following examples are illustrative of self-heating products made in accordance with my invention. It will be understood that numerous other self-heating products can readily be made in the light of the guiding principles and teachings of the present invention disclosed above. The examples given are, therefore, by way of illustration and not by way of limitation. All parts listed are in terms of weight %.

**EXAMPLE 1**

| A Composition |  
| --- | --- |
| 6% Water Solution of Hydrogen Peroxide | 97 |
| Dimethylalkylamine Oxide (“Standavox-01,” Standard Chemical Products, Hoboken, N.J.) | 3 |
| B Composition |  
| Stearic Acid (Triple Pressed) | 126 |
| Coconut Oil Mixed Fatty Acids | 3 |
| Diethanolamine | 10.4 |
| Polyethylene Glycol 400 | 32 |
| Cetyl Alcohol | 10 |
| Polyethylene Glycol 400 Monostearate | 5 |
| Sodium Sulfate | 21.5 |
| Isopentane | 5 |
| Perfume | 0.5 |

All of the ingredients of the B composition, other than the perfume and the isopentane, are melted together at about 60°C. and stirred and then, while continuing the stirring and while cooling, the perfume is added and then the isopentane is added. The resulting A and B compositions are placed in separate compartments of a non-pressurized package. On admixing said A and B composition, a relatively thick warm to hot foam or lather results which is applied to the skin to facilitate shaving.

**EXAMPLE 2**

| A Composition |  
| --- | --- |
| Hydrogen Peroxide | 6 |
| Polyethylene Glycol 300 Monostearate | 2 |
| Deionized Water | 92 |
| B Composition |  
| “0epal CA 630” (Octylphenoxypolyethylenoxyethanol) | 40 |
| Sodium Sulfate (Anhydrous) | 22 |
| Sodium Lauryl Sulfate | 17 |
| Lauryl Alcohol | 11 |
| Trichlorofluoromethane (Propellant 11) | 10 |

The A and B compositions are each somewhat viscous fluids. They are packaged in separate compartments in a non-pressurized package. On being admixed and dispensed therefrom, a stiff hot shaving lather results. The temperature of the lather reaches about 55°C. quite quickly and has the appearance of giving off steam.

A suitable non-pressurized package or container for the packaging, admixing and dispensing of the A and B or two-part cosmetic products of the present invention includes two flexible or collapsible compartments, one for holding the oxidant-containing composition and the other for holding the reductant-containing composition, the construction being such that, when the package or container is squeezed in the hand, substantially equal internal pressures are created in both compartments. Separate ports are provided for each compartment at the outlet end of the container and outlet check valves control the outflow through these ports. A dispenser cap is received over the outlet end of the container enclosing the ports and valve means. The cap provides an intermixing passage communicating with both the port means at its inner end when the valves are open and its outer end with a dispensing outlet; and, intermittently, means are preferably provided for promoting thorough intermixing of the two fluids being dispensed. While various package constructions can be utilized, a particularly suitable one is of the type which is shown in the application of John A. Cella, Ser. No. 774,803 filed Nov. 12, 1968, now U.S. Pat. No. 3,581,940, for Dispensing Container, and assigned to the assignee of the present application.

As set forth in said application, an illustrative embodiment of a non-pressurized package or dispenser container is shown in the accompanying drawings in which:

**FIG. 1** is a perspective view of the dispenser container, the container being shown in use position with the hand of a user in a suitable position for dispensing a proportioned, intermixed mixture of the A and B compositions;

**FIG. 2** is a view similar to **FIG. 1** with the cap and dispensing end portion of the container broken away to show the internal construction, the appearance of the container when full being indicated by the broken lines, while the solid lines show the container in partially dispensed condition;

**FIG. 3** is an enlarged sectional detail view of the dispensing end of the dispenser container of **FIGS. 1 and 2**, as the compositions A and B would appear for dispensing of the two intermixed compositions;

**FIG. 4** is a view similar to **FIG. 3**, except that the compositions A and B are shown in the relation that they would have when the container is not being used for dispensing.
FIG. 5 is an exploded perspective view of the components of the dispensing end of the container;
FIG. 6 is a transverse sectional view taken on line 6—6 of FIG. 1 and looking toward the dispensing end of the container;
FIG. 7 is a reduced scale elevational view of the two-compartment tube;
FIG. 8 is a sectional view of the tube taken on line 8—8 of FIG. 7;
FIG. 9 is a transverse sectional view of the two-compartment container taken on line 9—9 of FIG. 2 showing the compartments in partially collapsed condition;
FIG. 10 is a fragmentary sectional view of the closure end of the two-compartment container taken on line 10—10 of FIG. 7; and
FIG. 11 is a fragmentary detailed view of the dispensing end of the two-compartment container looking in the direction indicated by the line 11—11 in FIG. 7.

Looking first at FIGS. 1 and 2, the dispenser container, which is capable of providing on demand substantially uniform dispensing of both the A and B compositions in any desired increments, and dispensing the resulting heated product as a proportioned reacting mixture, while avoiding back-flow and reacting of the compositions A and B within the storage compartments of the container, includes an elongated tube or tubular container means designated generally by the number 10. Container means 10 is formed of flexible material such as plastic or a plastic laminate and provides opposite outer walls 11 and 12. Central wall means 13, 14 divide the container 10 into two longitudinally-extending compartments 15 and 16, which, preferably, and in the embodiments shown, are of substantially equal volume.

The dual compartmented container tube 10 is dimensioned to be grasped by one hand, for example, as shown in FIG. 1, for simultaneously and substantially uniformly collapsing the outer walls 11, 12 and the central wall means 13, 14 toward a central longitudinal plane substantially bisecting the container, as indicated by a line x—x in FIG. 1. With this construction, upon the squeezing pressure being applied to the outer walls 11, 12 when the container is grasped by the hand, for example, between the palm and fingers, the volume of the compartments 15 and 16 can be correspondingly reduced to achieve substantially uniform dispensing of both compositions A and B.

As shown more clearly in FIG. 2, the tubular container 10 has an outlet end and a closure end, the closure end being shown at the top and the outlet end at the bottom, as the unit is preferably held for dispensing. It will also be noted, as shown in both FIGS. 1 and 2, that the container means 10 tapers from the lower or outlet end toward the upper or closure end so that the compartments 15, 16 progressively reduce in cross-section toward the closure end, or, stated otherwise, progressively enlarge in cross-section toward the outlet end.

The tapering and cross-sectional shape of the tube elements which provide the compartments or chambers 15, 16 can be seen more clearly by comparing the cross-section of FIG. 6 with the cross-section of FIG. 8. These cross-sections show the tubular elements substantially as they would appear in expanded condition, the section of FIG. 6 being taken adjacent the outlet end, while the section of FIG. 8 is taken adjacent the closure end. As can be seen, the compartments 15, 16 have approximate cross-sections of half ellipses, the outer walls 11, 12, respectively, forming the outer boundary of each half of the ellipse, while the inner walls 13, 14, generally coincide with the major axes of the ellipse. When considered from this standpoint, it can be seen that the minor axes, or, more accurately, the half of the minor axes within each of the compartments (15, 16), progressively shortens from the outlet end to the closure end of the compartments, the half minor axes becoming zero at the sealing juncture 17. The arcuate outer walls 11, 12 are readily collapsible against the relatively straight or flat inner walls 13, 14.

Thus, this particular cross-sectional shape and the tapering of the generally elliptical two-compartment container contributes to the desired uniformity of collapsing, creating essentially equal pressures within each of the compartments (15, 16), as well as essentially equal reductions in compartment volumes. Both of the tube elements can be simultaneously compressed by the grasp of a single hand, as shown in FIG. 1. When substantially fully collapsed, the outer walls 11, 12 closely approach the inner walls 13, 14 and become substantially parallel thereto, as shown more clearly in FIG. 9.

At the closure end, the outer walls 11, 12 and the central wall means 13, 14 are brought together and united along a transverse line, as indicated at 17. The transverse closure seam 17 lies in substantially the same longitudinal plane toward which the outer walls collapse as the container is squeezed. A 90° rotation of the closure line 17 is less desirable. If the closure line 17 is perpendicular to the plane x—x toward which the outer walls 11, 12 collapse, there is much greater likelihood of the dispensing from the respective compartment 15, 16 being unequal and variable. In general, therefore, closure line 17 is oriented so as to be generally parallel to the central longitudinal plane of the container toward which the outer walls are collapsed.

As indicated in FIG. 2, and shown more clearly in FIGS. 3 and 4, the outlet end of the container provides outlet port or port means 18, 19 which separately communicate with the compartments, the port 18 communicating with the compartment 15, and the port 19 communicating with the compartment 16. Outlet check valve means, designated generally by the numbers 20 and 21, are associated with each of the port means. The check valve means 20 controls the port 18 and includes spring means for biasing the valve to close the port when the container 10 is under ordinary atmospheric pressure while permitting the ports to open when the compartment 15 is exposed to pressure by the grasp of a hand. The outlet check valve 21 is of similar construction and similarly controls the port 19 for compartment 16. The design of the check valves 21 is not critical, provided they perform their intended function of permitting dispensing of the compositions A and B under pressure, while effectively precluding back-flow.

A dispenser cap or cap means, designated generally by the number 22, is received on the outlet end of the tubular container 10 enclosing the port means 18, 19 and the valve means 20, 21. The cap 22 provides a common passage or passage means 23 communicating at its inner end (the upper end as shown in FIG. 2) with both of the port means 18, 19 when they are opened by the valve means 20, 21. As will subsequently be explained in greater detail, the passage means 23 includes
flow-interrupting means, such as baffle or orifice means, for promoting intermixing of the two fluids, the object being to achieve a turbulent, intermixing type of flow, rather than a smooth or laminar flow.

The entire tubular container 10 is desirably formed as an integral unit from a thermoplastic material such as polyethylene or polypropylene. The container 10 is advantageously formed by blow-molding with the closure ends of the compartments being left open. The appearance of the container at this stage is shown more clearly in FIG. 6. As there shown, the outlet end of the container is closed by a horizontally-extending disk portion 24, which provides the outlet ports 18 and 19. The compartment 15 is provided between the arcuate or semicircular wall 12 and the central generally straight wall portion 14. Similarly, the compartment 16 is defined by the outer curved wall 11 and the inner relatively straight wall 13. The walls 13 and 14 near their transverse center are connected by an integral rib 25, which facilitates the blow molding of the dual compartment container. The adjacent surfaces of the central wall means 13, 14 can be partially or completely united to define a composite central wall. With other types of molding, such as extrusion molding, the container 10 may be formed with the central wall means comprising a single integral partition.

The groove-like openings 26 and 27 between the walls 13, 14 can be reduced in size and partially closed when the closure end of the tube is sealed. This is the construction shown in FIGS. 1 and 2 where the closure line 17 is formed by a heat seal, which fuses and unites the portions of walls 11, 12, 13 and 14 immediately adjacent the closure end of the container. Typically, the closure line 17 will extend along a straight transverse line, as shown in FIG. 7. FIG. 7 differs from the construction of FIGS. 1 and 2, however, in that the outer corners, respectively between the walls 12, 14 and 11, 13 are brought together and heat sealed or fused to form the longitudinally-extending flanges 28, 29, as shown in FIGS. 7 and 8, said heat seals 28, 29 being preferably utilized to improve the appearance of the container. With the construction of FIGS. 7 and 8, the central wall members 13, 14, are, in effect, one unitary partition wall, but, with either the construction of FIGS. 7 and 8 or that of FIGS. 1 and 2, there is provided central wall means which divide the container into the two compartments 15 and 16, and the outer and central walls are collapsible toward the longitudinal central plane, such as the plane x-x.

Referring now to FIGS. 3, 4 and 5, which show more clearly the individual components which provide the outlet check valve 20, 21, the cap 22, and the passage 23, the components of the cap assembly, as shown in the exploded view of FIG. 5, can be molded from a suitable plastic, such as a polyvinyl plastic or a vinyl-acetate copolymer plastic. This includes the valve housing insert 30, the cooperating spring retainer 31, the cover 32, and the outlet spout 33. The ball valves 34 and the springs 35 can be formed of metal, such as steel. The assembly of these components is shown more clearly in FIGS. 3 and 4.

The member 31 includes a horizontal disk portion 31a from which project pin portions 31b, 31c, which retain the springs 35 in the assembly, as shown in FIGS. 3 and 4. Pin portion 31b, 31c, which retain the springs 35 in the assembly, as shown in FIGS. 3 and 4. Pin portions 31b, 31c are provided, respectively, with channels or grooves 31d, 31e which communicate, respectively, with cross channels 31f, 31g. In the center of disk portion 31a is provided an opening 31b the side walls of which are in communication with the cross channels 31f and 31g. The disk portions 30c and 31a can be sealed together by heat fusion, or can be connected by a press fit.

In the embodiment shown, the cover 32 is provided with internal threads 32a which cooperate with the external threads 36 on neck portion 37 of the container. However, cover 32 can be permanently attached to the container, with the other components assembled substantially as shown in FIGS. 3 and 4, or can be attached in other suitable ways. Cover 32 also provides a spout portion 32b, which slides to receive the tubular portion 32c of spout member 33, the intermediate portion of the spout providing an annular boss or lug 33h, which can be snapped into spout portion 32b over the annular ledge 32c, while thereafter being retained therein for movement between the open position shown in FIG. 3 and the closed position shown in FIG. 4. The purpose of this operation will be subsequently explained.

The disk portion 30c provides a circular recess 30d for receiving the inner end of tubular section 33a, as shown in FIG. 4. In this position, the inner end portion of spout section 33a closes and effectively seals the cross-flow channels 31f and 31g.

When the elements are in open position, as shown in FIG. 3, the inner end 33c of spout 33a projects into the cross-flow passages 31f, 31g, thereby tending to interrupt the flow and forcing the compositions A and B to enter the recess 33d, reverse direction and intermix, and then flow outwardly through the passage 23, as indicated by the arrows in FIG. 3. A turbulent intermixing type of flow is desirable to promote through intermixing of the compositions A and B being dispensed, and therefore it is desirable to provide flow-interrupting or baffle means for promoting the intermixing.

In the operation of the dispenser container, compositions A and B are filled into their respective compartments, such as the compartment 16 for the reducing-containing composition before the end closure 17 is formed, and compartment 15 for oxidant-containing composition. The heat sealed end closure is then formed, as previously described, so that the compartments decrease in cross-section from the outlet end of the closure end, and the closure line extends in a plane, which preferably is approximately the same as the plane centrally bisecting the container between the compartments and running generally parallel to the inner compartment walls, 14, 15. The rib 25, which connects the walls 13, 14 along the longitudinal center line of the container, preferably terminates at a spaced distance from the transverse union line 17, leaving a space 28, as shown more clearly in FIG. 10. The rib connection 25 can extend continuously from space 28 up to and into the neck portion 38, as shown in FIG. 11. For shipment and storage, manually-operable means is provided for selectively preventing accidental opening of the outlet check valves. As shown in FIGS. 3 and
4, the inner end of the common passage 23 through the outlet spout 33 communicates with the port means 18, 19 through separate passage extensions 31f, 31d and 31g, 31e. Manually-operable means, comprising the slideable spout member 33, is provided for selectively closing the outer ends of the passage extensions, namely, the cross-flow passages 31f, 31g. As shown, the inner end of spout portion 31g can be moved across the passages 31f, 31g and inserted into the recess 30d, thereby effectively closing the cross-flow passages and preventing communication between the compartments 15, 16 and the outlet passage 23.

Preparatory to dispensing operation, spout 33 can be grasped by the button end portion 33d and pulled outwardly to the position shown in FIG. 3, which opens the passage 23 to cross-flow channels 31f, 31g. The dispenser container is then inverted so that, for instance, if the compositions A and B in the compartments 15 and 16 are liquid or flowable, they will run down toward the outlet end. In this position, the container tube 10 can be grasped with one hand, for example in the manner indicated in FIG. 1, and substantially equal force applied to squeeze the outer walls 11, 12 toward the inner walls 13, 14, and toward the center line x-x. The result of this squeezing action is to simultaneously open the outlet check valves 20, 21 by depression of the balls 34 against the springs 35, as shown more clearly in FIG. 3. This permits the two fluids to flow downwardly and merge in the common passage 23, as indicated by the outlet arrows in FIG. 3. As previously explained, the inner end portion 33c of outlet spout 33 serves as a flow-interrupting or baffle means, which directs the compositions A and B into the recess 30d, thereby causing them to intermix and reverse direction before flowing outwardly through the passage 23. As soon as the squeezing pressure is relaxed, the balls 34 will return to their seated positions as shown in FIG. 4, closing the valve ports 30e, 30f, and preventing any back-flow which might contaminate the composition within one of the compartments 15, 16.

The dispensing operation is assisted where the dispensing end of the container provides a relatively rigid neck portion 37 surrounding the port means 20, 21, and it is also desirable that neck portion 37 be connected to tube 10 by an outwardly extending annular shoulder or shoulder means 38. Shoulder portion 38 enlarges the compartments at the dispensing end of the container and tends to prevent the outer walls 11, 12 from collapsing against the central wall means 13, 14 adjacent the port means 20, 21.

With the construction shown, the compartments 15, 16 are completely sealed by the container means 10 except for the port means 18, 19. The operation of the outlet check valves 20, 21, which close as soon as a squeezing pressure is discontinued against the walls 11, 12, is such as to maintain a partial vacuum within the compartments 15 and 16 between incremental dispensing of the compositions A and B. This can cause the outer walls 11, 12 to be held in partially depressed or collapsed condition against the remaining composition in each compartment.

In FIG. 1, compartments 15, 16 are shown approximately half filled with the compositions A and B, indicating that a portion of the compositions has previously been dispensed. When fully charged as in the initial formation of the package, the outermost portions of outer walls 11, 12 may occupy positions somewhat as shown in the dotted lines of FIG. 2. As the dispensing continues, they will tend to press in against the remaining composition, as indicated by the solid lines in FIG. 2, where the compositions A and B have been reduced to about one-third the maximum volume of the compartments 15, 16. In the section of FIG. 9, the appearance of the compartment walls when substantially fully collapsed is indicated, the level of the compositions A and B being below the section line 9—9 as shown in FIG. 2.

The shoulder portion 36 holds the dispensing end of the compartments open for drainage collection of the last portions of the compositions, where the latter are liquids or are flowable, while the container can be milked downwardly by hand pressure to dispense the last increments of the compositions while still maintaining relatively uniform intermixing.

I am aware that it has heretofore been disclosed to prepare self-soaping or gas-releasable compositions, which are adapted to be packaged in non-pressure containers, such as collapsible or squeezable metallic tubes, plastic containers, and the like and which, when spread out in a thin layer, foam spontaneously. Such compositions, which are disclosed in U.S. Pat. No. 2,995,521, and may be in the form of shaving creams, comprise a mixture of (a) at least one substance of the class of C3 to C8 saturated aliphatic hydrocarbons and various Freons, which may be jellified with aluminum octoate, and (b) a mixture of a plurality of ingredients comprising, in the case of a shave cream, vegetable oils, stearic acid, potassium hydroxide, glycerine, lauryl sulfonate and a substantial content of water, the water constituting about 37 percent of the (b) mixture and about 30 percent of the shaving cream as a whole. The gas is suspended in a metastable state in the examples as described in the above patent, and the release of the gas is effected by the spreading out of the compositions in a thin layer. The non-pressurized packaged cosmetic products of my invention are sharply distinguishable therefrom in a number of particulars in that, for instance, my products are self-heating and the B compositions thereof are anhydrous or substantially anhydrous, and the gas-producing agent or agents are in solution in an organic solvent and are displaced or released from said solution when contacted with water and issue as a gas at the temperatures encountered in the environment of their use.
disclosures and teachings in said patents is readily apparent from the foregoing detailed disclosures and teachings. My packaged products are not only self-heating and not only are packaged in non-pressurized containers, but, indeed, if even the B composition were simply placed as such, and without more, in an aerosol container, it would not be dispensable therefrom.

I claim:

1. A non-pressurized packaged product comprising two separate compositions which are adapted to be mixed together to form a final heated composition which is dispensed from said package, said package having two separate compartments for separate storage of said two compositions, one of said compartments containing a composition comprising an oxidant in an aqueous medium, and the other of said compartments containing a substantially anhydrous composition which includes a reductant, a water-soluble organic solvent, a compressible gas which is substantially water-insoluble but which is soluble in said organic solvent, said compressible gas existing as a gas at a temperature under superatmospheric pressure, the aforesaid two separate compositions, when admixed, resulting in the release of said compressible gas by reason of the insolubility of said gas in the solution of said organic solvent and said water.

2. A non-pressurized package containing a cosmetic product selected from the class consisting of those to be applied to skin and hair, said cosmetic product comprising two separate compositions which are adapted to be mixed together to form a final heated composition which is dispensed from said package, said package having two separate compartments for separate storage of said two compositions, one of said compartments containing a composition comprising a peroxide oxidant in an aqueous medium, and the other of said compartments containing a substantially anhydrous composition which includes a sodium or potassium salt of sulfurous or thiosulfuric acid as a reductant, a water-soluble organic solvent, a compressible gas which is substantially water-insoluble but which is soluble in said organic solvent, said compressible gas existing as a gas at a temperature in the range of ambient temperature to about 70°C and existing as a liquid at said temperature under superatmospheric pressure, the aforesaid two separate compositions, when admixed, resulting in the release of said compressible gas by reason of the insolubility of said gas in the solution of said organic solvent and said water.

3. The package of claim 2, in which the oxidant is hydrogen peroxide.

4. The package of claim 2, in which the reductant is sodium sulfite.

5. The package of claim 2, in which the oxidant is a 1 to 20 percent aqueous solution of hydrogen peroxide, and in which the reductant is sodium sulfite.

6. The package of claim 2, in which the cosmetic is a shave cream.

7. The package of claim 6, in which the reductant-containing composition includes stearic acid, coconut oil fatty acids, diethanolamine, a water-soluble alkylene glycol, cetyl alcohol, and a polyethylene glycol monostearate.

8. The package of claim 3, in which the vapor pressure of the reductant-containing composition is in the range of from 0 to 10 psig at 25°C and not greater than about 15 psig at 50°C.

9. The package of claim 8, in which the compressible gas at least one member selected from the group consisting of C₂ to C₆ aliphatic hydrocarbons and halogenated C₁ to C₂ aliphatic hydrocarbons.

10. The package of claim 9, in which the compressible gas is a chlorofluoro C₁ to C₂ saturated aliphatic hydrocarbon.

11. The package of claim 10, in which the organic solvent in said reductant-containing composition comprises a water-soluble alkylene glycol.

12. The package of claim 6, in which the compressible gas constitutes from about 1 to about 20 percent, by weight, of the solution thereof in said organic solvent.

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