

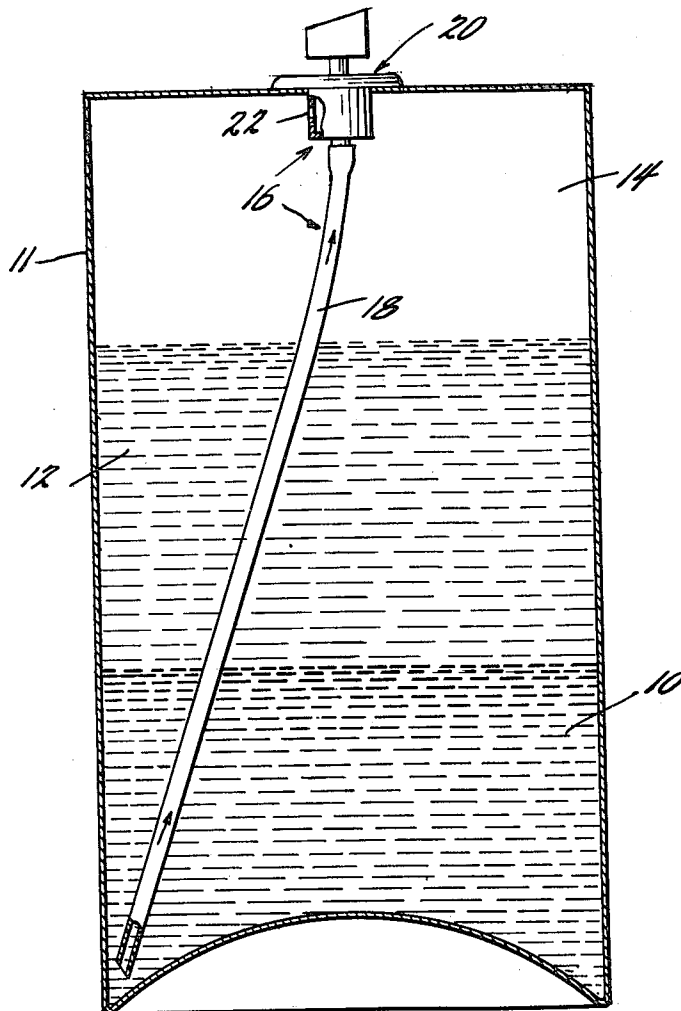
Sept. 8, 1964

R. J. MARSH

3,148,127

AQUEOUS PVP SOLUTION IN TWO PHASE AEROSOL HAIR SPRAY

Filed May 16, 1960



INVENTOR

*Robert J. Marsh*

BY

*Watson, Cole, Grindle & Watson*  
ATTORNEYS

1

3,148,127

## AQUEOUS PVP SOLUTION IN TWO PHASE AEROSOL HAIR SPRAY

Robert J. Marsh, Havertown, Pa., assignor, by mesne assignments, to American Home Products Corporation, New York, N.Y., a corporation of Delaware  
Filed May 16, 1960, Ser. No. 29,515  
4 Claims. (Cl. 167-87.1)

This invention relates to a pressurized self-dispensing package of ingredients which act to hold the hair in place after it has been set or combed, which are commonly known in the trade as hair lacquers, hair sprays or hair sets.

In the past, products of the kind with which this invention is concerned consisted of one-phase liquid systems which were maintained under pressure in a container and dispensed in the manner common to the aerosol industry. For the most part these compositions contain substantial amounts of alcohol which cause a flame extension if the spray is brought into contact with an open flame. The compositions themselves were relatively expensive because of the high cost of the propellants used, the amount of propellant necessary (over 50%), and the cost of alcohol, which has been used as the carrying agent for the active hair-setting ingredients. The propellants generally used have been dichlorodifluoromethane (propellant 12) and trichloromonofluoromethane (propellant 11), used in a 50-50 blend. It was known that the alcohol content of the compositions had an adverse effect on the hair when used with regularity, and the flammability of the composition made it necessary to take precautions with its use. It was also the general practice to formulate the compositions so that they consisted of but one phase, as this was regarded as a requisite to proper dispensing of the composition from the pressurized package, and also to proper functioning of the composition as a hair set. Because of this, and the severe corrosion problem created by packaging propellant 11 and water together, the use of water as an ingredient was avoided, even though it was known that certain ingredients which functioned as hair sets were soluble in water, and that the cost of the composition could be lowered if water were employed in lieu of certain of the organic components used.

A hair spray made according to this invention provides a number of advantages over those presently in use, and at the same time can be made at lower cost. A hair spray according to this invention is nonflammable, even though substantial amounts of hydrocarbon propellants are employed, and has the additional advantage that it permits the elimination of all combustible alcohols, whose chief disadvantage is the harmful effect on the hair. Another advantage is the elimination of the cold feel common to aerosol hair sprays. Since the propellant escapes as gas only, not liquid, the extreme cooling effect is removed.

In general, this invention provides a hair spray which comprises two distinct liquid phases in the container. The lowermost of these is a water phase containing the active hair setting ingredient. The supernatant liquid phase is a liquid propellant, such as, for example, isobutane. The relative specific gravities of these two phases is an important factor in the employment of the invention. It is important that the liquid propellant be lighter than the water phase, so that it remains supernatant at all times, and also that it be immiscible with the water phase. These two factors result in an extremely rapid separation of the two phases, even though the container is shaken and the contents agitated. The container itself is of a size in excess of the combined volume of the liquid phases, so as to provide space for a vapor phase of the propellant above the body of the liquid propellant. The container must also include a dispensing mechanism generally compris-

2

ing a dip tube reaching about to the bottom of the container, and a valve, this mechanism being provided with an opening into the vapor phase, so that the vapor may be mixed with the water phase which is forced up through the dip tube when the valve is operated. Another aspect of the invention is that the proportion by volume of the water phase and the liquid propellant is such that the propellant is exhausted slightly before or at the same time as the water phase, so that at no time can the liquid propellant itself be sprayed from the container. This objective is achieved at least in part by a proportioning between the flow of vapor into the dispensing mechanism relative to the flow of the water phase.

A further feature of the invention is that the aforementioned proportioning of the liquid propellant, if it be a flammable hydrocarbon, and the water phase is such that the mixture discharged from the container is not flammable. One of the further advantages of a hair spray of the general kind described above is that the ingredients such as polyvinyl pyrrolidone (PVP) has a better solubility in water than, for example, in alcohol, so that more effective amounts of the active ingredient may be incorporated into the composition without a settling out which would interfere with the dispensing or cause an unsightly appearance when the composition is used as a hair set. An additional advantage of the invention is that the spray emitted from the container consists in large part of the propellant vapor, and is not as wet when deposited on the hair as the spray characteristic of hair sets in present use. Consequently, the drying time of a hair set according to this invention, even though water is used, is no greater than that of compositions presently in use. Excessive wetness of the spray is also prevented by the fact that the vapor admitted into the dispensing mechanism acts to break up the water phase into fine particles.

The accompanying drawing is a diagrammatic illustration, in vertical section, of a hair set package according to the present invention. It will be understood that this merely illustrates one form of the invention, and that the following description is merely exemplary of one manner in which the invention may be carried out.

Referring to the drawing, it may be seen that the composition within the container 11 comprises two distinct liquid phases. The lowermost one of these is the water phase 10 which contains the active ingredient. The supernatant phase 12 is the liquid propellant, and above this in the vapor space of the container is the vapor generated on top of the propellant body when the container and its contents are at room temperature. The dispensing mechanism 16 is shown consisting of a dip tube 18 which extends to about the bottom of the container, the lower end of the dip tube opening into the water phase 10. The dispensing mechanism also comprises a valve mechanism 20 to which the dip tube is connected in the usual manner. The dispensing mechanism in the vapor space is provided with an aperture or vapor tap 22, through which the vapor 14 is admitted to the valve mechanism. This vapor tap may be located at any point in the vapor phase, that is, in the valve body itself or in the portion of the dip tube which passes through the vapor phase when the container is filled to the maximum extent.

Regarding the water phase 10, the active ingredient used therein is soluble in water, and is also selected for its insolubility in the propellant phase 12. A specific active ingredient which has been found to be satisfactory is polyvinyl pyrrolidone (PVP), although many other materials meet the requirements mentioned, as is or may later be known to those skilled in the art.

The propellant phase 12, in the illustration, is isobutane, although many propellant combinations may be employed as long as the propellant phase itself is substantially lighter than the water phase and non-soluble therein, as it is essen-

tial to the invention that the propellant phase be immiscible with the water phase and supernatant. Some examples of other propellants and propellant combinations which may be employed are

Normal butane  
Normal butane and propane  
Normal butane, propane and iso-butane  
Normal butane and propellant 12  
Iso-butane and propellant 12

Specifically, the composition of the exemplary package is as follows:

|                                       | Percent |
|---------------------------------------|---------|
| Water -----                           | 65      |
| Polyvinyl pyrrolidone (PVP) -----     | 3       |
| Perfume (soluble in iso-butane) ----- | 1       |
| Isobutane -----                       | 31      |

No emulsifiers are used, and the described liquid phases remain separate even when shaken vigorously, thus making it possible upon operation of the valve 20 to press out the entire water phase with its active ingredient without dispensing any of the liquid propellant phase in any form other than vapor. As explained earlier, the proportions recited above are such that the liquid propellant phase is exhausted slightly before the water phase has been entirely dispensed.

The method of dispensing the described composition involves all of the propellant escaping through the vapor tap 22 in vapor form while the water phase with its active ingredients are carried up the dip tube alone, being mixed with the propellant vapor at the vapor tap and on through the valve 20 itself. The propellant vapor and the water phase thus escape through the valve together, and this provides sufficient break-up of the water into fine particles. This fact, plus proper rate of flow and selection of valve button, makes the drying time of the described composition substantially the same as the hair spray compositions in use which contain substantial amounts of volatile alcohols.

It has been mentioned above that a certain ratio is maintained between the flow of propellant vapor and the water phase, so that the propellant may be exhausted slightly prior to or at the same time as the water phase. In order to obtain this result, and a spray with satisfactory characteristics, with the composition described specifically above, the vapor tap 22 in the valve body, in this case, has a diameter of .030 inch, and the stem orifice of the valve is .018 inch in diameter. However, good results can be obtained with different sized openings, depending upon the pressure exerted by the particular propellant which is used. For example, I have found that with the following compositions satisfactory results are obtained with the vapor tap openings ranging from .025 to .033. The openings should be changed proportionally with changes in the viscosity of the contents being dispensed.

In the specific example, the valve employed is a nylon precision valve using the precision mechanical break-up button which is a standard product commercially available from the Precision Valve Corporation, of Yonkers, New York. Specifications for the particular valve used in the above example are as follows: Nylon valve with .030 vapor tap, .030 interior orifice, .018 body orifice and a mechanical break-up button.

It will be understood that if the mechanical break-up button is not employed, the spray might be wetter than desired and that it would be necessary to compensate for this by enlarging the size of the vapor tap opening, or employing a propellant combination with a higher effective pressure, as is understood in the art.

The hair spray according to the example given has the advantages of being low in cost and of eliminating alcohol, which has been one of the major objectives in the past. In addition, there is no flame extension from the composition when exposed to an open flame, and it is also free of emulsifiers which frequently introduce problems of foaming and corrosion.

Having thus described the invention, what I claim as new is:

1. A self-dispensing non-flammable pressurized package consisting of a valved container having therein a hair-setting charge to be dispensed, said hair-setting charge consisting essentially of an aqueous first layer containing in solution a minor amount of polyvinyl pyrrolidone; a hydrocarbon propellant selected from the group consisting of propane, normal butane, iso-butane and mixtures thereof, said hydrocarbon propellant forming a liquid second layer immiscible with said first layer, having a superatmospheric vapor pressure at room temperature and having a substantially lower specific gravity than said first layer, whereby said second layer floats on said first layer, and a vapor space above said second layer saturated with the vapors of said second layer, said polyvinyl pyrrolidone dissolved in said first layer being substantially insoluble in said second layer; the container being provided with a discharge valve and a dip tube extending from the discharge valve into said first layer near the bottom of the container and the discharge valve being provided with an orifice communicating with the vapor space above said second layer, whereby when the discharge valve is opened liquid first layer material consisting essentially of water and polyvinyl pyrrolidone is discharged through the dip tube unaccompanied by liquid hydrocarbon of the second layer but accompanied by vapors of the latter.

2. A self-dispensing non-flammable pressurized package as defined in claim 1 wherein said orifice in communication with the vapor space above said second liquid layer has a diameter of from .025 to .033 inch.

3. A self-dispensing non-flammable pressurized package as defined in claim 1 wherein the charge to be dispensed contains 65% water, 3% polyvinyl pyrrolidone, 31% iso-butane, and 1% perfume.

4. A self-dispensing non-flammable pressurized package as defined in claim 3 wherein said discharge valve has a stem orifice having a diameter of .018 inch and said orifice in communication with the vapor space above said second liquid layer has a diameter of 0.30 inch.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |               |               |
|-----------|---------------|---------------|
| 2,040,302 | Fortier ----- | May 12, 1936  |
| 2,070,167 | Iddings ----- | Feb. 9, 1937  |
| 2,524,590 | Boe -----     | Oct. 3, 1950  |
| 2,871,161 | Spiegel ----- | Jan. 27, 1959 |
| 2,995,278 | Clapp -----   | Aug. 8, 1961  |