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METHOD OF AND AGENT FOR PRODUCING FIRE EXTINGUISHING FOAM

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This invention relates to the production of fire extinguishing foam, and more particularly to a process making use of an agent capable of producing superior results.

In the production of fire extinguishing foam several basically different methods are employed. Chemical foam is generally made by the reaction of two or more chemical compounds to produce a gas that forms bubbles, and stabilizing agents are ordinarily employed to improve the character of the foam. Gas, water and foam stabilizing agents are sometimes mixed under pressure and projected in the form of a foam stream upon a fire for extinguishing purposes. In producing foam by the latter process the several ingredients are positively forced into the correct association with each other and the stream is frequently mechanically agitated to increase the volume of foam.

My invention is particularly effective when employed in a third class of methods for producing foam which comprises the aspiration of a gas, such as air into a liquid stream, as described in the patent to Clemens Wagener No. 1,821,914, granted September 1, 1931. According to this method the gas is incorporated in a mass of liquid by the aspiration action of the liquid in the form of a jet. The foam stabilizing agent is supplied to the liquid in any suitable manner, usually by aspiration, although it may be mixed with the water stream in any convenient way prior to the incorporation of the air.

When air or other gas is incorporated in the liquid stream by the aspiration action of the stream, the foam stabilizing agent is afforded only a very brief space of time to perform its function. Accordingly, it is important to select a stabilizing agent which is rapid and particularly effective in its action in order to obtain the best results. Agents which produce foams of superior character and volume when employed in the chemical or pressure methods do not necessarily produce superior results when used in the aspiration method.

One object of my invention is to provide foam stabilizing agents which are particularly effective for use in the aspiration method of producing fire extinguishing foam.

Another object of this invention is to provide foam stabilizing agents having these properties which are readily available and relatively inexpensive.

Another object is the provision of foam stabilizing agents of superior qualities which are easy to handle and store prior to and during use thereof.

Still another object is to provide an improved method of producing fire extinguishing foam, making use of a stabilizing agent of the character mentioned.

Further objects and advantages of my invention will be explained and will be apparent from the following description:

I have discovered that potassium or ammonium soaps made from fatty acid glycerides contained in non-drying oils having an iodine number below about 25 have special utility in producing fire extinguishing foam of the Wagener type. Potassium and/or ammonium soaps of coconut oil are especially suitable, while other soaps, which are generally considered closely related to soaps of my invention, do not produce comparable results. I shall not attempt to explain the exact reason for the difference in effect between agents of the same class or family, but it may be expressed in a general way as the difference in the rates of dispersibility or adjustability of the various agents.

One helpful quality of a satisfactory foam stabilizing agent for use in making foam, when the agent is aspirated into a liquid stream, is the ability of the stabilizer to dissolve in water to form a concentrated solution of low viscosity suitable for aspiration. Sodium soaps as a class do not have this property since solutions containing much more than 20% of soap immediately form a gel and become very difficult to handle. Most other stabilizing agents which are sufficiently soluble do not become adjusted or dispersed rapidly enough to produce foam of high volume and good character.

By way of comparison, the following table illustrates the effect of different foam stabilizing agents in producing fire extinguishing foam by the aspiration of air and the stabilizing agent. In the tests to determine the volume of foam produced, the same rate of water supply, the same nozzle and injection apparatus was employed in each case, the only difference residing in the stabilizing agent employed. 30% solutions of foam stabilizing agents were employed except in the case of the sodium soaps where only 20% solutions were used because of gel formation and increased viscosity at higher concentrations.

Table I

Foam stabilizing agent	Gallons of foam in 2 minutes
Saponin, casein, licorice, milk sugar, and sulfite waste liquor and sodium soaps of oils mentioned below	60–90
Commercial green soap (potassium—linseed oil)	125
Potassium—corn oil	125
Potassium—palm kernel oil	160
Potassium—coconut oil	220
Ammonium—coconut oil	220

The foams made with agents in accordance with my invention were the only foams of this group which were sufficiently light and stable to be

acceptable commercially. The comparative volumes of foam clearly illustrate the superiority of foam stabilizing agents in accordance with my invention. While I do not wish to be limited to this theory, I attribute the difference in foam volume to the different rate of adaptability of the agents. Whereas the stabilizing agent in the pressure method of making foam may have from three to ten seconds to adapt itself to the correct state for increasing the foam volume, the stabilizing agent in producing foam according to the Wagener method must do its work in a very short time, of the order of a fraction of a second.

Other determining factors in foam production are the ability of foam to hold and retain moisture and its stability or rate of shrinking after it has been produced. Foam made with a potassium or ammonium soap of coconut oil is also superior in these respects and, consequently, resists the action of the heat of a fire and high winds to a greater degree.

Foams made with licorice, saponin, sodium soaps and the like, according to the Wagener method, have a very low stability. That is, some froth may be produced but it is quickly dissipated and is, therefore, not satisfactory for blanketing fires. The potassium soaps of linseed and corn oil produce better foams generally speaking, but these too, are of insufficient volume and of too heavy texture to be commercially acceptable.

Potassium and ammonium soaps of coconut oil, on the other hand, enable the production of large volumes of light texture foam which will stick on vertical surfaces and which will effectively retain its water for comparatively long periods of time. Such foam is thus not as susceptible to being blown about by wind as foam made with the more expensive sulfonates, and is more suitable for outdoor use. These sulfonates, such as sodium naphthalene sulfonate, with or without glue and alcohol, produce foams which are of good volume, but which dry out too fast and consequently have a tendency to break freely when exposed to such materials as hot gasoline vapors. Such sulfonates are expensive and are also very corrosive and difficult to handle as compared with soaps.

The potassium and/or ammonium soaps of other non-drying oils having an iodine number below about 25, are reasonably inexpensive stabilizing agents and will produce foam of good volume and texture which has the ability to hold water for substantial periods of time. The coconut oil soaps are preferred because of the high volume of foam which can be produced thereby; potassium and ammonium soaps of palm kernel oil are, however, also suitable for use as stabilizing agents, although they produce somewhat lower volumes of foam. The character and texture of the foam produced by these agents is comparable with the foam made by the use of coconut oil soap.

Potassium and/or ammonium soaps may also be used which are made from various mixtures of oils of non-drying character having an iodine number below about 25. For example, soaps made from a mixture, say equal quantities or any other desired proportions, of coconut and palm kernel oils may be used, or the oil mixture may contain quantities of other oils which do not change the predominant characteristics of the resultant ammonium and/or potassium soaps. Either the oil in its natural state, a mixture of fatty acid glycerides, or the fatty acids themselves, may be used for making the soap. In other words, an amount of glycerine in the resultant soap obtained by reaction of the alkali with the glycerides is not detrimental.

Various other stabilizing agents and/or aids may also be used in combination with the foam stabilizing soaps of my invention, provided that such other agents and/or aids are not employed in such proportions as to prevent the effective action of said soaps.

The superiority of the stabilizing agents of my invention will be clear from a consideration of the foregoing description and table. A further advantage of these agents is that they may be readily and conveniently handled or stored in metal containers without difficulty.

By the term "oil" used in the claims is meant any single oil or mixture of two or more oils having the qualities specified in the claims.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

I claim:

1. In a process of producing fire extinguishing foam in which a gas is incorporated in a liquid stream by aspiration, the step of adding to said liquid a soap of the group consisting of potassium and ammonium soaps of non-drying oils having an iodine number below substantially 25.

2. In a process of producing fire extinguishing foam in which a gas is incorporated in a liquid stream by aspiration, the step of adding to said stream a soap of the group consisting of potassium-coconut oil, potassium-palm kernel oil, ammonium coconut oil and ammonium palm kernel oil soaps.

3. The method of producing fire extinguishing foam which comprises introducing a foam stabilizing agent into a flowing stream of water, and incorporating a gas in said stream by aspiration, said agent including potassium coconut oil soap.

4. The method of producing fire extinguishing foam which comprises introducing a foam stabilizing agent into a flowing stream of water, and incorporating a gas in said stream by aspiration, said agent including ammonium coconut oil soap.

5. The method of producing fire extinguishing foam which comprises introducing a foam stabilizing agent into a flowing stream of water, and incorporating a gas in said stream by aspiration, said agent comprising a concentrated aqueous solution of potassium coconut oil soap.

6. The method of producing fire extinguishing foam which comprises introducing a foam stabilizing agent into a flowing stream of water, and incorporating a gas in said stream by aspiration, said agent comprising a concentrated aqueous solution of ammonium coconut oil soap.

7. A method of producing fire extinguishing foam which comprises introducing a potassium coconut oil soap into a flowing stream of water by the suction action of said stream, and incorporating air in said stream by aspiration.

8. A method of producing fire extinguishing foam which comprises introducing an ammonium coconut oil soap into a flowing stream of water by the suction action of said stream, and incorporating air in said stream by aspiration.

9. In a process of producing fire extinguishing foam in which a gas is incorporated in a liquid stream by aspiration, the step of adding to said stream a foam stabilizing agent comprising a potassium soap of palm kernel oil.

10. A method of producing fire extinguishing foam comprising admixing with water a soap of the group consisting of potassium-coconut oil, potassium-palm kernel oil, ammonium-coconut oil, and ammonium-palm kernel oil soaps, and incorporating a gas in a stream of said water by the aspiration action of said stream.

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