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FROTH FOR SEALING VOLATILE LIQUIDS

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The object of my invention is to produce a froth having a high degree of permanence ond a sufficiently light weight to float on gasoline and similar volatile liquids, which may be used to protect said liquids from evaporation, oxidation or ignition.

I produce my improved sealing froth by violently agitating together the following ingredients:

a—water

b—a substance, such as a soap, which acts to increase the surface tension of the water

c—an oil of suitable characteristics.

As an example of the actual manufacture of a froth suitable for sealing and protecting tanks of gasoline, I may cite the following:

Dissolve from 2 to 7 parts by weight of a fatty acid soap in from 5 to 15 parts by weight of water. Agitate vigorously with an air blast until the soap solution is converted into a light froth. Add slowly sufficient water-white kerosene to make 100 parts, total weight, exclusive of the weight of air thus incorporated in the mixture, continuing the agitation until the oil is completely blended with the soap solution and the whole converted into froth. I thus produce an oil-in-water emulsion which is insoluble in the oil to be protected.

This froth may be spread over the surface of a tank of oil in a layer from three to six inches thick, by pumping or other convenient means. If portions of the froth pass below the surface of the oil to be protected such portions will rise to the surface and coalesce with the remainder of the layer. This layer will retain its position over the oil for a long time, particularly if protected from the direct rays of the sun. It will completely prevent the access of air to the surface of the oil and thus prevent evaporation and oxidation.

It will not prevent the evolution of vapor from gasolines so volatile as to have a vapor pressure materially above atmosphere at atmospheric temperature, but vapor bubbles may pass through it and escape without breaking down the froth. It is positively noninflammable and is destroyed only by heating for an extended time to a temperature above the boiling point of water, so that it offers a high resistance to the ignition of the contents of a tank, which must be caused to boil before its vapor can be ignited.

The permanence of my improved sealing froth is due to the characteristics of the oil used in producing it. As the froth is formed into a layer and exposed to the air a very thin skin of oil and soap forms on its surface, and this skin, being of substantially nonvolatile material, protects the froth from further evaporation of water. The oil, therefore, must be substantially nonvolatile, it must be of such color as not to stain the oil being protected in case minute quantities pass out of the froth into solution, and it must be free from impurities which would depreciate the quality of the protected oil.

Thus, for protecting gasoline and kerosene I prefer to produce a froth with purified kerosene, while for protecting light crude oils or other dark and impure liquids the oil used in making the froth may be a gas oil or even a lubricating fraction. The heavier oils produce more permanent froths than the lighter and are thus desirable ingredients when not inhibited for other reasons.

In place of soap I may use other agents for increasing the surface tension of the water, such for instance as glue, casein, sugar, licorice and the like, but when the froth layer is to be maintained for the longest possible time it is obviously desirable to avoid substances which ferment or putrefy, and I consider a soap the most suitable material. Again, a potash soap is to be preferred to a soda soap and an oleate to a stearate, because of the greater solubility in water of the potash soaps and the oleates, increasing the quantity which may be incorporated into the froth.

The quantity of soap used is limited to that quantity which may be brought into solution without producing a gel. The proportion of water is limited in both directions—if too little is used the oil in the froth will not be sufficiently protected by water skins and the froth may be partly oil soluble,—if too much is used a portion of it will separate from the froth. Increasing the vigor of the agitation will, within limits, increase the amount of water which may be permanently incorporated.

While I have described the manufacture of my improved froth by blowing with air it will be understood that any incombustible and nonreactive gas, such for instance as carbon dioxid or flue gas, may be used instead of air without departing from the spirit of my invention.

Having thus described my preferred materials and the manner in which they are used, I would have it understood that I do not restrict myself to the specific materials and proportions given, but desire to claim broadly equivalent materials and such proportions as may produce the best results in any specific instance of use.

I claim as my invention:

1. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent seal-

ing froth consisting of an emulsion of water, a relatively nonvolatile oil, a water-soluble substance tending to increase the surface tension of the water, and a sufficient proportion of entrained incombustible gas to cause said froth to float on said oil, said water being the continuous phase of said emulsion.

2. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of an emulsion of kerosene in water containing a substance tending to increase its surface tension, and a sufficient proportion of incombustible gas incorporated in said emulsion to cause said froth to float on said oil.

3. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of an emulsion of a relatively nonvolatile oil in an aqueous solution of a fatty acid soap, a sufficient proportion of incombustible gas being incorporated with said emulsion to cause said froth to float on said oil.

4. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of an emulsion of a relatively nonvolatile oil in water containing in solution a substance tending to increase its surface tension, a sufficient proportion of air being incorporated in said emulsion to cause said froth to float on said oil.

5. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of an emulsion of a relatively nonvolatile oil in water containing in solution a substance tending to increase its surface tension, a sufficient proportion of incombustible gas being incorporated in said emulsion to cause said froth to float on said oil.

6. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of an emulsion of kerosene in an aqueous solution of a soap, a sufficient proportion of air being incorporated in said emulsion to cause said froth to float on said oil.

7. A method of protecting a body of volatile oil from evaporation, comprising: floating on the surface of said oil a substantially permanent sealing froth consisting of water 5 to 15 parts by weight; a soap 2 to 7 parts by weight; a relatively nonvolatile oil in quantity sufficient to make 100 parts by weight, and air in quantity sufficient to cause said froth to float on said oil, said materials being strongly emulsified and mutually being incorporated.

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