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METHOD FOR REDUCING FIRE HAZARD IN SMALL BOATS

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This invention relates to compositions for reducing fire hazards resulting from accumulations of inflammable hydrocarbons in water and more particularly to compositions and methods for rendering accumulations of gasoline and other inflammable hydrocarbons in the bilge water of small boats relatively non-inflammable.

It is standard practice to maintain a quantity of water in the bilges of wooden boats for ballast and also for the purpose of preventing dry rot in the hulls of such boats. Where boats of this type are powered by internal combustion engines, gasoline and the highly inflammable lighter components of other hydrocarbons employed with these engines drain into the bilge water and float on the surface thereof. The bulk of this accumulation, of course, may be traced to leakage in fuel lines, carburetor flooding and spilling during tank filling operations. The vapors from the accumulated hydrocarbons form inflammable and often explosive gaseous mixtures within the hulls of boats which constitutes one of the greatest known hazards in the use of such boats. Thus, electrical discharges from the ignition system, heat from exhaust lines, or the introduction of an open flame in the region where the inflammable gaseous mixtures are confined may produce flash fires or explosions which cause loss of life and destruction of the boat.

It is an object of this invention to reduce the inflammability of gasoline and other light hydrocarbons which accumulate in the bilge water of a boat and prevent the formation of inflammable or explosive gaseous mixtures in the bilge compartment of boats.

Another object of this invention is to eliminate the immiscible layers of gasoline and other light hydrocarbons which accumulate and float on the surface of the bilge water of a boat and disperse these inflammable materials in a relatively non-inflammable state homogeneously throughout the bilge water.

Still another object of this invention is to disperse an accumulation on the surface of bilge water of inflammable materials in a relatively non-inflammable state homogeneously throughout the bilge water and prevent such inflammable materials from vaporizing to form inflammable or explosive gaseous mixtures in the bilge compartment of a boat.

A further object of this invention is to provide a composition and method for forming an oil-in-water emulsion in the bilge water of a boat wherein the dispersed oil phase comprises a relatively non-inflammable non-volatile hydrocarbon which is a solvent for gasoline and other light hydrocarbons which accumulate on the surface of the bilge water of a boat.

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A still further object of this invention is to provide a composition and method for forming an oil-in-water emulsion in bilge water of a relatively non-inflammable, non-volatile hydrocarbon which is a solvent for gasoline and other light hydrocarbons, and for causing the gasoline and other light hydrocarbons which accumulate on the surface of bilge water to become dissolved in the dispersed oil phase of said emulsion whereby the accumulation of inflammable materials is rendered relatively non-inflammable and non-volatile.

Other objects will be apparent from the following description of the invention.

The foregoing objects are accomplished by the following invention which comprises providing a concentrated emulsion of water and a relatively non-inflammable non-volatile hydrocarbon having a high boiling range and a flash point of over 150° F. which hydrocarbon is a solvent for gasoline and other highly inflammable and volatile light hydrocarbons. The emulsions comprising this invention contain the following ingredients in the proportions specified below:

	Percent
Free fatty acid	20–30
Alkali Metal Caustic, 45° Bé	1.5–3
Alcohol	0.5–1
Hydrocarbon (flash point over 105° F.)	50–60
Water	5–30

The foregoing proportions are given in percentages by weight.

In preparing the foregoing emulsions, either saturated or unsaturated free fatty acids having from eight to twenty-two carbon atoms may be employed and mixtures thereof as are found in commercially available fats and oils may be used. Fatty acids; such as, for example, palmitic, stearic, oleic, linoleic and linolenic acids are typical of those which are satisfactory for the typical of those which are satisfactory for the urpurposes of this invention. It is preferred, however, to employ distilled fats which are substantially odorless. Of these, it is preferred to use distilled soya bean oil fatty acids and distilled tall oil fatty acids or mixtures thereof. The caustic employed in the above compositions may be either caustic soda or caustic potash. The alkali metal caustic reacts with the fatty acid to form an alkali metal soap though an excess of fatty acid may be present. The alcohols employed in the above compositions are the higher monohydric and polyhydric alcohols and serve as a coupling agent or a common solvent for the soap and hydrocarbon components. Among the monohydric alcohols which may be employed are the following: n-butyl, isobutyl, n-propyl, isopropyl, second-

ary butyl, tertiary butyl; and amyl alcohols. Polyhydric alcohols; such as, for example, the monomethyl and monobutyl ethers of ethylene glycol, diethylene glycol monobutyl ether and propylene glycol may also be used. The hydrocarbons employed may be selected from the kerosene or gas oil range, however, it is essential that the hydrocarbon employed have a high boiling range and flash point over 105° F. It is preferred to employ Stoddard solvent, a high boiling mineral spirit having a flash point over 105° F. The several ingredients are mixed with water in the proportions specified to form a stable concentrated emulsion of the hydrocarbon component and water. The soaps, any free fatty acids, and alcohol function as emulsifying agents and emulsion stabilizers.

In use, the emulsions comprising this invention are added to the bilge water of the boat and mixed therewith. The emulsion concentrate is not broken by the introduction of bilge water into the aqueous phase of the emulsion but may be reversed, regardless of whether the bilge water is composed of fresh water or salt water. The oil phase of the oil in water emulsion in the bilge water comprises Stoddard solvent or a similar hydrocarbon and the small amounts of soap and alcohol associated therewith, homogeneously and uniformly dispersed throughout the bilge water. The dispersion of the oil phase in the bilge water is accomplished by the ordinary rocking movement of a boat that is afloat. Any gasoline or other inflammable light hydrocarbon which has collected on the surface of the bilge water or which subsequently accumulates thereon becomes rapidly dissolved in the oil phase of the emulsion and this action is likewise accomplished by the above-mentioned movement of the boat. The inflammable materials are, therefore, uniformly distributed throughout the bilge water of the boat and only minute quantities of gasoline are present on or adjacent the surface of the bilge water at which point the vaporization of such inflammables occurs. Furthermore, such minute quantities of gasoline or the like which are present at the surface of the bilge water are dissolved in the oil phase of the emulsion which decreases the tendency of these materials to vaporize and form inflammable or explosive gaseous mixtures in the bilge. It will also be apparent that the great bulk of the oil phase of the emulsion with the inflammable materials dissolved therein, is disposed beneath the surface of the bilge water. Under such conditions the inflammable materials are surrounded by water which further provides a protective barrier capable of shielding these materials from an open flame. The bilge water in a boat may thus be rendered relatively free from fire hazard by adding thereto the emulsion concentrates comprising this invention in the ratio of about six per cent by weight of emulsion based on the weight of bilge water to be treated. This emulsion is capable of completely emulsifying three per cent by weight of gasoline based on the weight of the bilge water present. A larger proportion of the emulsion concentrates may be employed but it is extremely rare for as much or more than three per cent of gasoline, as described, to accumulate in the bilge compartment of a boat. The emulsion concentrates may be employed in an amount as low as three per cent by weight based on the weight of the bilge water to be treated but it is preferred to employ the larger percentage mentioned above. The amounts of gasoline which are emulsified by various amounts of the emulsion concentrates comprising this invention are as follows:

Per cent By Weight of Emulsion in Water	Per cent By Weight of Gasoline Emulsified
3.00	2.1
4.00	2.3
5.00	2.6
6.00	3.0

A small boat having a length of forty feet or less which is powered by a single engine may carry from two to fifty gallons of bilge water but about five gallons is the normal amount employed. Under the most extreme conditions not more than a pint of gasoline collects in the bilge water. The addition of from one to three gallons of the emulsions comprising this invention to the bilge water depending upon the amount of the latter present will eliminate the fire hazard caused by the accumulation of gasoline or the like therein. In the case of boats having a length up to fifty feet which are powered by dual engines not more than one quart of gasoline collects in the bilge water. Therefore, approximately from two to six gallons of the concentrated emulsions are added to the bilge water of such a boat, depending upon the amount of water present, to overcome the fire hazard.

The invention is illustrated by the following examples:

Example 1

A concentrated emulsion was prepared from the following ingredients:

	Per cent
Distilled soya bean oil fatty acids	15
Distilled tall oil fatty acids	15
Caustic soda 45° Bé	1.5
Caustic potash 45° Bé	1.5
n-Butyl alcohol	1.0
Stoddard solvent	60
Water	7.5

Mixtures of gasoline and water containing 2 ml. of gasoline and 100 ml. of water were prepared. Three ml. of the above emulsion were added to the gasoline-water mixture and mixed therewith. The atmosphere one-half inch above the surface of the mixture was tested immediately and after a four minute period with a M. S. A. Model Explosimeter. The readings indicated that no explosive mixture was present. The same test was carried out employing 6 ml. of the emulsion with a separate portion of a gasoline-water mixture containing 3 ml. of gasoline and 100 ml. of water with the result that combustion could not be induced at the surfaces of the mixtures. The same results were obtained when the temperature of the gasoline-water mixtures were maintained within the range of from 100–125° F.

Example 2

A concentrated emulsion was prepared from the following ingredients:

	Per cent
Distilled soya bean oil fatty acids	25.00
Caustic soda 45° Bé	2.50
Isopropyl alcohol	0.75
Stoddard solvent	55.00
Water	16.25

Six ml. of the above emulsion were added to a gasoline-water mixture containing 3 ml. of gaso-

line to 100 ml. of water and mixed therewith. Readings taken with a M. S. A. Model Explosimeter a half inch above the surface of the mixture immediately and after a four minute period indicated no explosive mixture to be present.

Example 3

A concentrated emulsion was prepared from the following ingredients:

	Per cent
Distilled tall oil fatty acids	30.0
Caustic potash 45° Bé	3.0
Propylene glycol	1.0
Kerosene (flash point over 105° F.)	60.0
Water	7.5

Six ml. of the above emulsion were added to a gasoline-water mixture containing 3 ml. of gasoline to 100 ml. of water and mixed therewith. Readings taken with a M. S. A. Model Explosimeter a half inch above the surface immediately and after a four minute period indicated no explosive mixture to be present. The same result was obtained when the test mixture was maintained at temperatures between 100–125° F.

Example 4

A concentrated emulsion was prepared from the following ingredients:

	Per cent
Distilled soya bean oil fatty acids	20.0
Caustic soda 45° Bé	1.5
Sec-butyl alcohol	.5
Gas oils (flash point over 105° F.)	50.0
Water	28.0

Six ml. of the above emulsion were added to a gasoline-water mixture containing 3 ml. of gasoline and 100 ml. of water and mixed therewith. Readings taken with a M. S. A. Model Explosimeter under the conditions set forth in the foregoing examples indicated that no explosive mixture was present.

If desired, a small percentage, 1.0% or less of a corrosion inhibitor; such as, for example, morpholine, benzyl amine or the like may be incorporated in the emulsion concentrates comprising this invention in order to prevent deterioration of metal parts of the boat or the equipment therein which come into contact with the bilge water.

Similarly, anti-foaming agents may be added to the emulsions if desired and necessary.

I claim:

1. The method of reducing the fire hazard in boats resulting from the accumulation of gasoline and other inflammable light hydrocarbons in the bilge water of said boats which comprises the steps of; adding to the bilge water in a boat a concentrated emulsion consisting of from 20 to 30% saturated and unsaturated free fatty acids having from eight to twenty-two carbon atoms, 1.5 to 3.0% alkali metal caustic, 0.5 to 1.0% of a non-inflammable alcohol selected from the group consisting of n-butyl, isobutyl, n-propyl, isopropyl, sec-butyl, tertiary butyl and amyl alcohols and propylene glycol, 50 to 60% of a high boiling hydrocarbon having a flash point above 105° F. selected from the group consisting of Stoddard Solvent and kerosene, and 5 to 30% water; mixing said emulsion with said bilge water to disperse the oil phase of said emulsion homogeneously throughout the bilge water; and dissolving said gasoline and other inflammable light hydrocarbon components of the mixture thereof with said bilge water.

2. The method set forth in claim 1 wherein said concentrated emulsion is added in amounts ranging from 3 to 6 per cent by weight based on the weight of bilge water to which said emulsion is added.

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