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OIL SLICK DISPERSION METHOD

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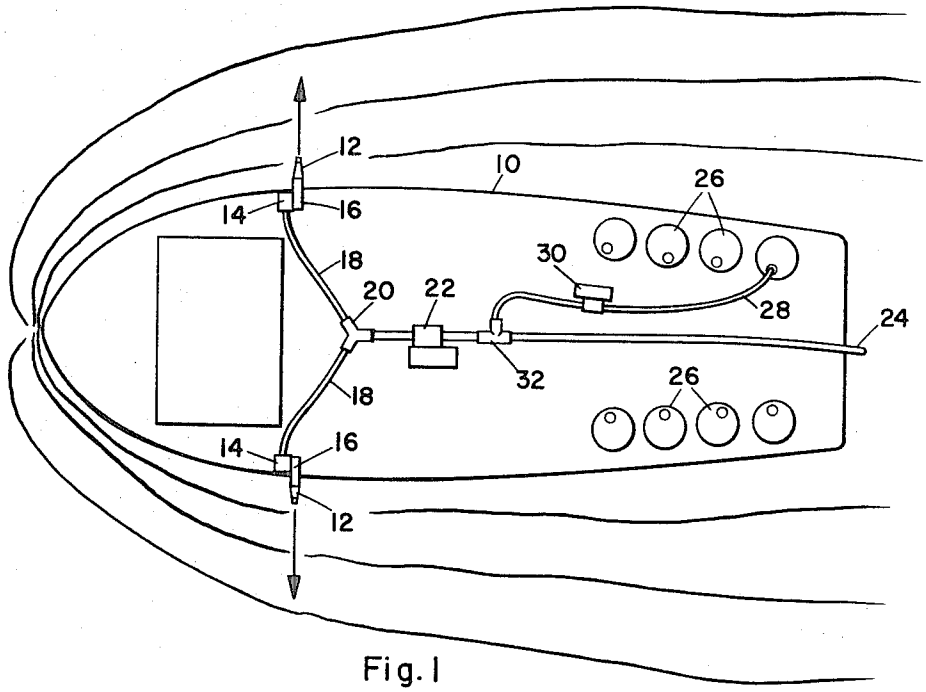


Fig. 1

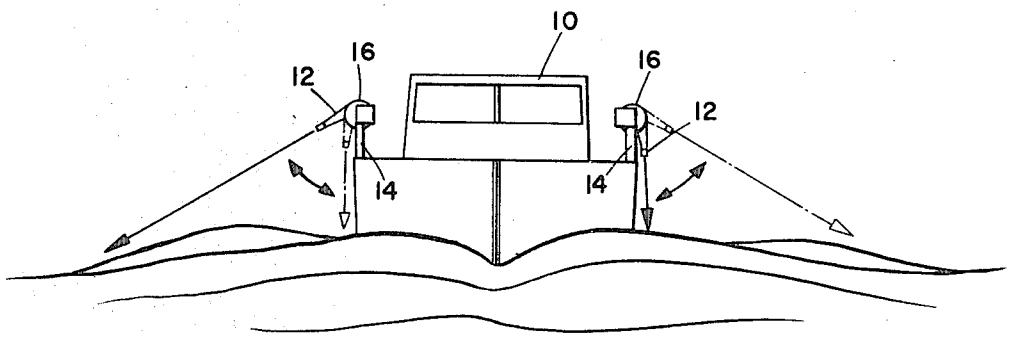


Fig. 2

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OIL SLICK DISPERSION METHOD

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U.S. Cl. 210—59 9 Claims

ABSTRACT OF THE DISCLOSURE

An oil slick on a body of water is dispersed by dividing the oil slick and concentrating the oil on the bow wave created by a boat propelled through the oil slick. At the same time a mixture of water and chemical dispersant is sprayed in high pressure jets which are swept across the bow wave in a cyclic oscillating motion substantially perpendicular to the length of the boat, thus producing a zig-zag spray pattern on the oil slick due to the forward motion to the boat. A near constant angular speed in the oscillatory motion of the jets automatically applies a greater concentration of dispersant adjacent the boat, where the oil is heaviest on the bow wave. The high dilution of the dispersant with environment water increases emulsification and turbulence for increased efficiency.

BACKGROUND OF THE INVENTION

The present invention relates to decontamination of water and specifically to an oil slick dispersion method.

Techniques for cleaning up oil spilled on water include spraying of detergents or other chemicals to break up the oil, soaking up oil in straw or similar material, enclosing the oil within floating barriers and other such means. With small oil spills on calm water, such techniques may be suitable, but with very large oil slicks they are slow and inefficient, particularly if the water is rough. Speed is essential when the oil slick is close to shore, since the volatiles in the oil evaporate and leave a tarry deposit on any surface contacted.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top plan view of a specially equipped boat, showing the basic dispresal technique; and

FIG. 2 is a front view of the boat showing the jet action.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The method will be more clearly appreciated if five characteristics or simultaneous steps are recognized, namely: first, the use of high pressure jets, rather than fan sprays, to emulsify the oil into tiny droplets; second, the division of the oil slick and concentration of the oil in bow waves; third, the graduation of the jet directly in proportion to the concentration of oil achieved by lateral oscillatory constant angular motion of the jets; fourth, liberal use of environmental water for dilution increasing turbulence; finally, inter-related dilution and jet pressure, these also closely related to the speed and size of the boat, but with definite limits imposed by considerations of effects on wild life and water pollution. These characteristics or methods will now be explained more fully, but not necessarily in the same order.

Although the method is not thus strictly limited, the operation may be carried out by a boat **10**, which is preferably a wide beam type with a blunt bow to create a wide bow wave at low speed. When such a boat is driven through an oil slick, the oil slick is divided and the oil is concentrated in the bow wave, with the heaviest concentration close to the sides of the boat. It has been found that a boat with a 25 foot beam, moving at 3 to 6 miles an hour, will create a 20 to 25 foot wide surface disturbance of the oil slick area on each side of the boat. When the oil slick is treated according to this invention there results a clear path at least 60 feet wide being made in the oil slick at one pass of the boat. This is merely an example to indicate the rapidity and extent of clearing possible with a single small boat.

A highly successful implementation of the method achieved the necessary lateral, high pressure spraying by a pair of hose nozzles **12** mounted on opposite sides of the boat. The basic method does not require mounting directly on the boat or any particular part of the boat, but a convenient installation is near the bow, either on the deck as shown or on superstructure of the boat if the arrangement is suitable. Since the flow rates and pressures are considerable, the nozzles are preferably mounted on supports **14** and are pivoted to swing in generally vertical planes substantially perpendicular to the length of the boat. The angular range of swing is sufficient to enable a jet to be directed downwardly very close to the side of the boat and outward to the approximate width of the bow wave disturbance, as indicated in the full broken line positions in FIG. 2. For most efficient employment of the method the nozzles **12** are actuated by water powered monitor units **16**, of conventional type, which provide a constantly timed sweep over a preset angular range. However, manual operation of the nozzles is practical in some circumstances.

Supply hoses **18** extend from nozzles **12** to a branch coupling **20**, which is connected to the outlet side of a primary pump **22**, a pick-up hose **24** leading from the inlet side of the pump into the water clear of the oil ordinarily at the stern of the boat. In this connection it should be noted that very high dilution of the dispersant by water from this environmental source produces a large volume in the dispersant spray. This large volume results in increased turbulence and emulsification. The boat carries a supply **26**, diagrammatically illustrated, of chemical dispersant, from which a pick-up hose **28** leads to an injection pump **30**, the injection pump delivering dispersant at a controlled rate to an injection T-fitting **32** in hose **24** at the inlet side of the primary pump. On a boat not fitted with a suitable tank, the dispersant could be stored in barrels secured on the after deck.

A chemical dispersant particularly suited to the technique is sold under the trade name of Gold Crew Dispersant by Ara Chem. Inc. and is compatible with fresh or salt water. The water can thus be obtained directly from the main body of water on which the boat is operating and need not be stored on board, which is a limiting requirement with some other techniques. The efficient method of application permits the dispersant to be used in highly diluted form. A ratio of one part of dispersant to 40 parts of water has been found effective on heavy oil and a ratio of one part dispersant to 80 parts water for light oil. The actual proportions are variable and can be quickly detremined by tests. By comparison, sprinkler type sprays used on boats or aircraft normally use dispersant to water ratios on the order one to four, and leave residual contamination in the water.

In a large oil slick the boat is driven at a constant speed through the oil, while the nozzles are operated to swing the jets with a cyclic oscillation across the bow wave. To avoid missing any spots the rate of oscillation must be fairly rapid, on the order of one two complete in and out cycles a second, although this will vary with boat speed and jet divergence. It is in this mode of operation that powered monitor operation of the nozzles is necessary, since prolonged manual operation at such rates would be too tiring. For patchy oil, manually controlled nozzles could be used alone or in combination with the automatic nozzles.

Flow rates from the nozzles vary from 40 to 150 gallons per minute, depending on oil thickness, speed and other factors, the delivery pressure being on the order of 150 to 200 p.s.i. from pump **22**. The jets thus strike the oil with considerable impact and break up the oil into microscopic droplets or particles with an emulsifying action, and the particles are spread through the water by turbulence and the jet force, such that the film of oil from the surface is widely dissipated. The violent action of the high pressure jets in breaking up the oil makes it practical to use the chemical dispersant in highly diluted form. This results in a minimum of contamination of the water by the dispersion operation, well within the requirements of the Federal Water Pollution Control Administration.

It should be noted that there is a unique result from applying the jets of dispersant in the described manner across the bow wave. The oil will naturally be more concentrated close to the boat where the separation and disturbance are greatest, and the dispersant is distributed accordingly. From FIG. 2 it can be seen that, with the nozzles swinging at a constant rate, considerably more dispersant will be applied to the oil close to the boat in the inner part of the swing motion where the nozzles are directed substantially downward. The distribution of dispersant and the force of the jet action is thus generally in proportion to the concentration of oil across the bow wave.

Once dispersed in the described manner the oil does not tend to collect again and the water remains clear. In one instance involving a spill of 80,000 gallons of black fuel oil, the oil was completely dispersed and there was no detectable damage to marine life in the area.

The technique is practical in rough water and windy conditions, which would break up floating barriers and scatter light sprays. Operations have been successfully carried out in up to 10 foot ocean swells and gusty winds. One boat of the size described is capable of cutting a clear path 60 feet or more in width. With repeated passes, slightly overlapping to allow for drift, a large area can be clear rapidly and the process can be safely used close to shoreline property.

What is claimed as new is as follows:

1. A method dispersing an oil slick on a body of water, comprising:

dividing the oil slick and concentrating the oil on a bow wave along the sides of a boat by propelling the boat through the oil slick;

and spraying high pressure jets of chemical dispersant highly diluted with water on the oil with a cyclic sweeping action across the bow wave.

2. The method of claim **1** wherein the sweeping action of each of the jets is in a plane substantially perpendicular to the length of the boat, so that the dispersant is sprayed in a zig-zag pattern on the oil slick due to the forward motion of the boat.

3. The method of claim **1** wherein the sweeping action of the jets ranges from a near vertically downward direction adjacent to the boat to an angularly outward direction toward the lateral extremity of the bow wave disturbance.

4. The method of claim **2**, wherein the sweeping action represented by the angular movement of the jets is at a substantially constant rate, so that a greater volume of dispersant is directed onto the bow wave close to the side of the boat.

5. The method of claim **2**, wherein the rate of the sweeping action is on the order of one to two cycles a second.

6. The method of claim **1**, wherein the ratio of dispersant to water is on the order of from 1:40 to 1:80.

7. The method of claim **1** wherein environmental water is used as a dilutant, greatly increasing the volume of the sprayed liquid and therefore greatly increasing desired turbulence and emulsification.

8. The method of claim **6**, wherein the source pressure of the jets is on the order of 150 to 200 pounds per square inch.

9. The method of claim **8**, wherein the ratio of dispersant to water is on the order of from 1:40 to 1:80, the water dilutant being environmental water, the jets are directed laterally of the boat, and the forward speed of the boat is on the order of 3 to 6 miles per hour.

References Cited

UNITED STATES PATENTS

481,615	8/1892	Eyle	114—1
707,636	8/1902	Proskey	114—233
2,464,204	3/1949	Baker	210—40

FOREIGN PATENTS

931,594	7/1963	Great Britain.

MICHAEL E. ROGERS, Primary Examiner

U.S. Cl. X.R.

114—0.5; 210—242