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METHOD OF REMOVING OIL FROM THE SURFACE OF WATER

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ABSTRACT OF THE DISCLOSURE

A felted fibrous sheet treated with a water repellent sizing material is used to remove oil floating upon the surface of water by absorbing the oil in preference to the water.

Increasingly in recent years industrial accidents and other causes have created pollution problems where oil, such as crude oils, soy bean oil and other oils and petroleum products, have contaminated large bodies of water including lakes, rivers, and even portions of the ocean notably adjacent the shore and the beaches.

Such floating oil creates great problems of removal of the same with a consequent expense and great damage to the water and to the surrounding shorelines.

This invention is directed to a method of removing the same from water in a clean, expeditious and economical manner.

Another object of this invention is to permit, where desired, the reclamation of the oil pollutant.

These and other objects will be apparent to those skilled in the art from the following specification.

It has been found that porous fibers, such as the vegetable fibers, and more particularly the wood fibers, have approximately as much affinity for oil as for water; however, efforts to use their fibers as absorbers for oil floating upon water give relatively poor results because of the preferential absorptivity of such fibers for water.

Applicants have found that by treating such porous fibers with suitable water repellents the fibers may be made preferentially absorptive of the oil thus enhancing their use.

The preferred fiber is a wood fiber from aspen that has been defibrated in a known type of defibrating machine such as an Asplund Defibrator and which fiber is then sized with a suitable water repellent or size. The preferred sizing material is that disclosed in U.S. Pat. No. 2,754,206, issued July 10, 1956, to Robert C. Olson. As disclosed in said U.S. patent, the size comprises crude paraffin wax, rosin, bentonite clay, aluminum sulfate and water which has been made into a substantive emulsion by first melting the solids content of wax and rosin, mixing in the clay and water, and passing the same through a colloid mill. This dispersion is mixed with the fibers whereupon the dispersion is exhausted by the deposition on the fibers of the solids of the dispersion.

Aspen fibers so treated with adequate size to provide three pounds of the wax constituent per one hundred pounds of fiber were then tested in the laboratory as follows. Eight hundred milliliters of water were placed in a beaker and thirty grams of crude oil added thereto. The crude oil rapidly floated to the surface of the water whereupon one gram of the treated fiber was applied to the surface of the floating oil. After five minutes, the fibers were removed with a spatula and the water remaining was visually inspected. It was found that no visual trace of the oil remained; however, the fibers were heavily soaked with the crude oil, thus making handling difficult. While the above test indicates that so treated fibers will preferentially absorb oil to the extent of as much as thirty times their weight, it is preferred to use the fibers on a ratio of about two grams of fiber to thirty grams of oil in order to provide some clean fibers in the final oil saturated fiber in order to increase handleability.

The above test was made both with the water in the beaker being still and with agitation and with both tap water and salted water with no discernible difference in the ability of the fibers to absorb the oil.

Refined sulfite pulp was similarly treated with the size of Pat. No. 2,754,206 in a quantity to provide three pounds of wax to one hundred pounds of fiber and a pulp lap formed in known manner. Such a sulfite sheet was similarly tested on thirty grams of crude oil floating on eight hundred milliliters of water with one gram of the sulfite sheet. While the absorption time was somewhat longer for the sheet it was found that the chemically refined sulfite pulp was equally successful in removal of all of the visible oil from the surface of the water.

Kraft pulp was similarly treated with the same size to provide three pounds of wax to one hundred pounds of fiber and formed into a sheet which was tested in the same fashion as the aspen fibers and the sulfite sheet. It was found that one gram of the kraft sheet similarly adequately absorbed all the visible oil (thirty grams having been used) with little or no absorption of water.

Other tests of the same kind have been made in which the crude oil was replaced with crankcase oil, kerosene, gasoline, and soy bean oil with similar results and complete removal of all visible oil.

While reference has been made herein to the use of the particular sizing compound disclosed in U.S. Pat. No. 2,754,206, other water repellent materials have been found to contribute this preferential absorptivity to wood fibers including abietic acid (rosin in water), polyvinyl alcohol, wax emulsions, and Mobilicer L and Mobilicer C marketed by the Mobil Oil Company.

Bonded felted fibrous sheets or blankets in which fibers of aspen, sulfite, kraft, or the like are felted and bound together with a suitable binder such as starch in which the fibers have been previously treated with sizing have also been tested as indicated above with similar results. Such felted blankets may be made by any one of several known ways including air deposition as disclosed in U.S. Pat. No. 2,746,895. Such blankets of sized fibers also work well and have the added advantage of relatively easier handling of the fibers because of their blanket form.

After the oil soaked fibers, either loose or in blanket form, are removed from the liquid the fibers may then be treated to extract the oil therefrom by squeezing, centrifuging, or by other suitable means thus permitting recovery of the valuable oil constituent.

It will be appreciated that because of the relatively low cost of treating the fibers and the relatively low cost of such fibers themselves, this method of removing oil from the surface of water is both efficient and extremely economical. When the fibers are used in blanket form the handleability is enhanced since the blankets may merely be rolled upon the surface of the water, left to absorb the oil, and then retrieved readily by picking up the blanket in any of a number of ways including re-rolling the same.

It has also been found that when so treated fibers are applied to an oil slick in a quantity such that the oil is less than adequate to completely saturate the fibers, the fibers will merely continue to float upon the surface of the water awaiting more oil to absorb thus providing an opportunity to supply an excess of fibers when it is expected that the oil contamination will continue over a period of time as when the contaminating source continues to discharge its oil onto the surface of the water.

We claim:

1. The method of removing oil from the surface of

water which comprises depositing a felted fibrous sheet on the oil floating on the water, said sheet comprising porous vegetable fibers having a water repellent sizing material on the surface of vegetable fibers thereof, permitting the sheet to remain in contact with the oil to absorb said oil, and removing the sheet containing the absorbed oil from the water surface.

2. The method of claim 1 in which said felted fibrous sheet is bonded.

3. The method of claim 1 further including the step of removing the absorbed oil from the sheet.

4. The method of claim 2 further including the step of removing the absorbed oil from the sheet.

5. The method of claim 1 in which said sheet is flexible.

6. The method of claim 2 in which said sheet is flexible.

7. The method of claim 2 in which said sheet is a flexible blanket.

References Cited

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