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(54) **PROCEDE DE SOLIDIFACTION ET D'ELIMINATION DE PETROLE DEVERSE SUR LE SOL ET DANS L'EAU**

(54) **A PROCESS TO SOLIDIFY AND REMOVE SPILLED OIL ON LAND AND WATER**

(57) Water is the most precious and abundant liquid on the face of the earth. All life forms are dependent on water for their existence. It quenches thirst, nurtures growth, hosts multitudes of life forms essential to the delicate food chains through which we exist, and when harnessed provides the energy essential to modern civilization. Oil, although not as abundant, has become a vital commodity utilized and solicited by every country. It serves not only as an essential fuel but its derivatives are used as components of a myriad of other byproducts. Since oil is bountiful in only select locations the growing market has necessitated the formation of transportation alternatives to evolve. These consist of shipping routes, with loading and receiving ports serving the colossal tankers that ply the high seas as well as pipelines winding through long expanses of pristine wilderness. Both liquids are beneficial to life and the standard of living on Earth, yet when accidents occur spilling oil as sea the results are catastrophic. The oil spills engulf everything in their wake, leaving a trail of destruction and devastation that cap take centuries to recover. The cost cannot be estimated in billions of dollars; the extent of damage to marine life is immeasurable and unfathomable for decades following the spill and in many instances is irreparable. As the demand for oil continues to surge, the amount of oil in transit grows and presents a constantly burgeoning and inevitable threat that human error or natural and unforeseeable consequences will cause more spills or leakages at sea or along harbours or coastal shores. The degree of entropy of Earth, or the measure of disorder, is steadily increasing and it is the objective, and indeed the responsibility, of technology to control it. For many years spills of crude and bunker oils and diesel fuel resulting from the collision of ships into one another or into reefs or shorelines, or pipeline fractures have been left unattended or uncontrolled. As the immense environmental threats have become recognized both the environmentalists and the shipping industry have realized the enormity of the clean up responsibilities. It has been demonstrated though, that all known procedures and solutions have proven costly, ineffective and dangerous to native marine life and their habitat. Presently environmentalists are combating more oil spills around the globe than at any other period in history, yet little has been achieved in devising methods to prevent or rectify the damage incurred by oil spills. Current technology cannot control an oil spill's devastation. Once inner tidal zones, cliff faces, swamps, estuaries, beaches or pools have been coated in oil the prospect of successful restoration using the present methods are extremely poor. Superficially depicting this invention in a simplified and elementary manner can be achieved by describing the 3 fundamental principles it utilizes. ♦ Oils and fuels do not dilute with water and rise to the water surface. ♦ Molten wax does not dilute with water and rises to the water surface. ♦ As the wax cools it hardens, trapping the oils and fuels, creating a solid that can be removed from the water surface, leaving the water clear of these pollutants. The embodiments of this invention have been proven to be cost efficient, effective, expedient, reliable and capable of controlling the devastation of a spill. Furthermore its application poses no threats to marine life or its habitat and the pollutants can be easily recovered refined and recycled. Therefore, for these reasons and vantages this invention should be implemented.

## ABSTRACT

Water is the most precious and abundant liquid on the face of the earth. All life forms are dependent on water for their existence. It quenches thirst, nurtures growth, hosts multitudes of life forms essential to the delicate food chains through which we exist, and when harnessed provides the energy essential to modern civilization.

Oil, although not as abundant, has become a vital commodity utilized and solicited by every country. It serves not only as an essential fuel but its derivatives are used as components of a myriad of other byproducts. Since oil is bountiful in only select locations the growing market has necessitated the formation of transportation alternatives to evolve. These consist of shipping routes, with loading and receiving ports serving the colossal tankers that ply the high seas as well as pipelines winding through long expanses of pristine wilderness.

Both liquids are beneficial to life and the standard of living on Earth, yet when accidents occur spilling oil at sea the results are catastrophic. The oil spills engulf everything in their wake, leaving a trail of destruction and devastation that can take centuries to recover. The cost cannot be estimated in billions of dollars; the extent of damage to marine life is immeasurable and unfathomable for decades following the spill and in many instances is irreparable. As the demand for oil continues to surge, the amount of oil in transit grows and presents a constantly burgeoning and inevitable threat that human error or natural and unforeseeable consequences will cause more spills or leakages at sea or along harbours or coastal shores. The degree of entropy of Earth, or the measure of disorder, is steadily increasing and it is the objective, and indeed the responsibility, of technology to control it.

For many years spills of crude and bunker oils and diesel fuel resulting from the collision of ships into one another or into reefs or shorelines, or pipeline fractures have been left unattended or uncontrolled. As the immense environmental threats have become recognized both the environmentalists and the shipping industry have realized the enormity of the clean up responsibilities. It has been demonstrated though, that all known procedures and solutions have proven costly, ineffective and dangerous to native marine life and their habitat. Presently environmentalists are combating more oil spills around the globe than at any other period in history, yet little has been achieved in devising methods to prevent or rectify the damage incurred by oil spills. Current technology cannot control an oil spill's devastation. Once inner tidal zones, cliff faces, swamps, estuaries, beaches or pools have been coated in oil the prospect of successful restoration using the present methods are extremely poor.

Superficially depicting this invention in a simplified and elementary manner can be achieved by describing the 3 fundamental principles it utilizes.

- Oils and fuels do not dilute with water and rise to the water surface.
- Molten wax does not dilute with water and rises to the water surface.
- As the wax cools it hardens, trapping the oils and fuels, creating a solid that can be removed from the water surface, leaving the water clear of these pollutants.

The embodiments of this invention have been proven to be cost efficient, effective, expedient, reliable and capable of controlling the devastation of a spill. Furthermore its application poses no threats to marine life or its habitat and the pollutants can be easily recovered refined and recycled. Therefore, for these reasons and vantages this invention should be implemented.

## SPECIFICATIONS - DISCLOSURE

This invention provides a preventative approach to the problem of oil spills at sea and on land. The details of this invention depict a process pertaining to the application of hot wax and polyethylene mixture to oils, fuels and any liquid hydrocarbons spilled on water or ground surfaces; and how once treated, the oil can be safely removed and recovered from land and sea. The spilled oil is altered to a non-adhesive, non-contaminating easily removable solid, thus eliminating the threat of danger to birds, marine life and the coastlines. There are no known procedures that can accomplish this.

### Components & their Properties

The petroleum waxes suitable to be utilized in this formulation in conjunction with polyethylene, and their associated properties are as follows:

* petroleum waxes obtained from petroleum distillates
* petroleum waxes obtained from lignite low temperature hydrogenation tar
* petroleum waxes obtained from tars derived from shale retorting
* waxes obtained synthetically from the hydrogenation of carbon monoxide, e.g. by the Fischer-Tropsch-Ruhrchemine synthesis.

The ordinary or regular paraffin waxes consisting of the straight-chain configuration of hydrocarbons with 20-30 carbon atoms, having a melting point of 44-46°C and 48-52°C. This includes the paraffin waxes precipitated from crude tar consisting of isoparaffin with 23-26 carbon atoms and straight-chain configuration paraffins with 26-28 carbon atoms.

The polyethylene incorporated in this formula is $(H_2C{=}CH_2)x$. The molecular weight is 2000-5000. It is a translucent white solid and dissolves in wax when heated to 250-350°F . This increases the overall density of the formula. Ambient temperatures affect the rate of solidification, so that the oil-polyethylene-wax mixture sets at faster rates in cooler temperatures than at higher ones. Polyethylene acts as a catalyst to hasten the hardening process and in situations where the temperature exceeds 110°F the amount of polyethylene would be increased. The ratio of polyethylene to wax can vary within the range of 50 parts, by weight, of wax : 1 part, by weight, of polyethylene to 50 parts, by weight, of wax : 25 parts, by weight, of polyethylene, dependent on the type of oil being treated and the temperature. The level of polyethylene can be increased up to 50% of the wax, that is 1 part wax : 0.5 parts polyethylene, in order to expedite the solidification process in the event of extreme atmospheric heat and direct unabating sunlight.

The temperatures of the wax polyethylene mixture can be applied at up to 350°F on the surface of all oils and fuels not combustible at this temperature such as diesel oil, lubricating oils and bunker oils. High octane fuels and oils, that have lower combustion thresholds can be treated by this method dependent on the combined effect of the ambient temperatures and specifically utilizing .those waxes that have the lowest melting points.

When the wax and polyethylene mixture comes in contact with oils or liquid fuels it sets into a solid controllable non-adhesive and non-contaminating mass approximately 1/8 inch thick.

**Availability and Accessibility of Supplies**

Wax and polyethylene can be obtained from oil refineries in three states:

1) A liquid state transportable via tanker, rail car, tank-truck, plane or ship.
2) A solid state transportable via pallets on open rail car, plane, truck or ship.
3) A granulated state obtainable in 50 lb bags and transported via open rail car, plane, truck or ship.

There is an abundance of wax and polyethylene found in the USSR, the Middle East, Canada, and the USA.

**Methods of Application**

The prescribed mixture with specified ratios, dependant on the oil or fuels being treated and the atmospheric conditions, can be heated in tanks or equipped trucks in the same manner as tar and then applied where necessary.

The mixture penetrates through even the thickest of oil deposit layers. In some cases the mixture must be sprayed on the oil surface by using flair jet nozzles in order to penetrate thick viscous oils. In other scenarios the mixture can be applied gently by pouring the mixture on the oil coated surface.

There are three alternate methods of application that can be utilized to provide the maximal results under diverse predicaments. These are:

1) Air delivery may be achieved with the use of low flying light aircraft, similar to crop dusters.

2) Hot wax can be sprayed from boat using air pressure through the usage of boons and hoses, or poured manually onto the surface.

3) Application of wax can be achieved manually on land in areas only accessible by foot and not by boat or plane. Common examples are areas where oil is lodged in tidal pools or trapped in inner tidal zones, beach coves and hidden pockets along rugged shore lines.

**Advantages of this Method**

**Cost Efficiency** - Applying a hot wax and polyethylene mixture onto oil is the most economical and efficient method of solidifying oil on water and land. When the wax and polyethylene mixture comes into contact with the highly solvent crude oil, the wax polyethylene mixture is rapidly dissolved and forms in combination with the oil into a non-adhesive, non-contaminating solid which can be recovered and ultimately be refined and recycled.

Another cost efficient benefit is that the recovered oil-wax solid can be reheated and utilized several times until the mixture attains a level of density where it can no longer be reused in its existing state and would require refining. In this manner, the possibility exists to reuse the wax-polyethylene mixture up to 3 times.

**Environment Friendly** - This treatment prevents the spreading of oil. Immediate application after a spill would dramatically reduce the threat of contamination. Additionally application of this method poses no threat to native marine life and its habitat. In the event that the oil-wax-polyethylene solid mass cannot be removed immediately, it can remain in place without danger to animals and birds. The capability of refining the recovered solid is another environmental friendly attribute and alleviates the present cost and dilemma of disposing the recovered pollutants.

**Oil - Wax - Polyethylene Retrieving Procedure**

1) Skids pulled by light machinery can be used to remove the oil-wax-polyethylene conglomerent solid from beaches.

2) Nets or screens attached to boats would act as skimmers to collect and remove the floating wax/oil solid on the water.

3) Light, floating, one inch mesh nets can be spread over oil-coated water prior to, or shortly after application. The wax, polyethylene oil conglomerate will adhere or cling to the nets while in the semi-solid stage. These nets may then be winched onto a barge through rollers or ringers; or winched from the shore into containers through rollers or ringers; and the net re-used again and again. This method is superior as very large sections of oil can be removed from the water's surface.

All environmentalists must be made aware about this method of controlling oil pollution and that existing equipment presently utilized (e.g. skimmers and slick lickers) can be utilized to remove the wax treated oil.

Quantities of wax needed to solidify crude oil is a ratio of approximately 1 part wax : 3 part oil. One thousand lbs. of wax will solidify 3,000 sq. yds. of oil-coated beach or water surface. When all procedures are completed the oil-wax-polyethylene mixture can be possibly reused, or barreled or put into holding tanks and shipped to a refinery to be refined and the separated properties can be recycled, perhaps for the next inevitable oil spill.

**Caution**

It should be noted that carrying hot wax containers, and the propane gas containers used to heat the wax can be hazardous and proper caution must be observed.

When applied to oils containing highly toxic substances such as PCB oils, the heat of the wax causes vaporization and emissions into the surrounding environment. This could be toxic and must be applied properly and with protection. Safety glasses, gloves and respirators are especially recommended when applying this hot mixture to oils from transformers and capacitors.

When applied to high octane oil or fuels caution must be taken to use specifically the paraffin waxes with the lowest melting point of 131°F, and effects of ambient weather must be considered to prevent the heat from reaching the fuel's flash point.

## CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A process for solidifying spilt fuels or oils from land, sea or ice surfaces, including concrete and aggregates surfaces, swamps, estuaries, tidal pools and submerged oils clinging to rock and cliff faces, by application of a hot wax-polyethylene mixture, thus preparing the solid for removal, reuse and/or refining.

2. A process for solidifying PCB oils in preparation of burial or storage using a hot petroleum wax-polyethylene mixture.

3. A process as defined in Claims 1 and 2 where the petroleum waxes used are petroleum waxes obtained from petroleum distillates, from lignite low temperature hydrogenation tar, from tars derived from shale retorting or waxes obtained synthetically from the hydrogenation of carbon monoxide, e.g. by the Fischer-Tropsch-Ruhrchemine synthesis.

4. A process as defined in Claims 1 and 2 where the polyethylene's formula is $(H_2C{=}{=}CH_2)x$.and its molecular weight is 2000-5000.

5. A process as defined in Claims 1 and 2 where the petroleum wax and polyethylene are heated between 250-300 degrees Fahrenheit, at a ratio ranging from 50 parts, by weight, of wax : 1 part, by weight of polyethylene to 50 parts by weight, of wax : 25 parts, by weight of polyethylene dependant on the fuel and ambient weather.

6. A process as defined in Claims 1 and 2 where the hot petroleum wax-polyethylene mixture is applied to the surface of the contaminated area through any effective medium, including but not restricted to; air delivery from planes, from boats via boons and hoses, from trucks, from pressurized tanks or manually

7. A process as defined in Claims 1 and 2 where the non-toxic, semi-solid oil-wax-polyethylene mixture can be recovered to be reused for the usage of these processes to a maximum of 3 times or to be refined.