(12) UK Patent Application (19) GB (11) 2 367 256 (13) A

(43) Date of A Publication 03.04.2002

(21) Application No 0116797.2

(22) Date of Filing 10.07.2001

(30) Priority Data
(31) 0023627 (32) 27.09.2000 (33) GB

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(51) INT CL^7
B01D 21/00 // B01D 36/04

(52) UK CL (Edition T)
B1D DPAE DPLC

(56) Documents Cited
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US 4367145 A

(58) Field of Search
UK CL (Edition T) B1D DABA DACA DPAC DPAE DPDB
DPDC DPDD DPDE DPDF DPDG DPDX DPLC
INT CL^7 B01D 21/00 21/02 21/04 21/24
Online: WPI, EPODOC, JAPIO

(54) Abstract Title
Oil sludge settling tank with heating means

(57) A portable containerised plant for separating solid contaminants from an oil sludge comprises a settling tank 4 for receiving an oil sludge via an inlet port 6 of the container, means (14 Fig 4) for heating sludge held within the tank to reduce the viscosity of the sludge, thereby encouraging solid contaminants suspended in the sludge to fall to the bottom of the tank, means (21, 23 Fig 4) for dragging solid material from the base of the tank to a screening unit 24,28 for screening residual oil from the solid material and means 30 for delivering screened solids from the screening unit 24,28 to a receptacle 32 via an outlet port in the container.

The plant may thus be transported between geographic locations, as required, to process oil sludge.

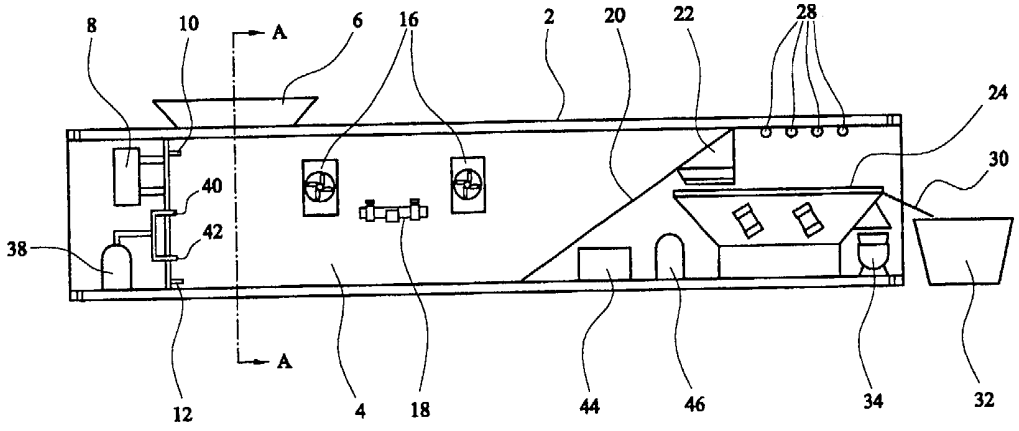

FIG. 1

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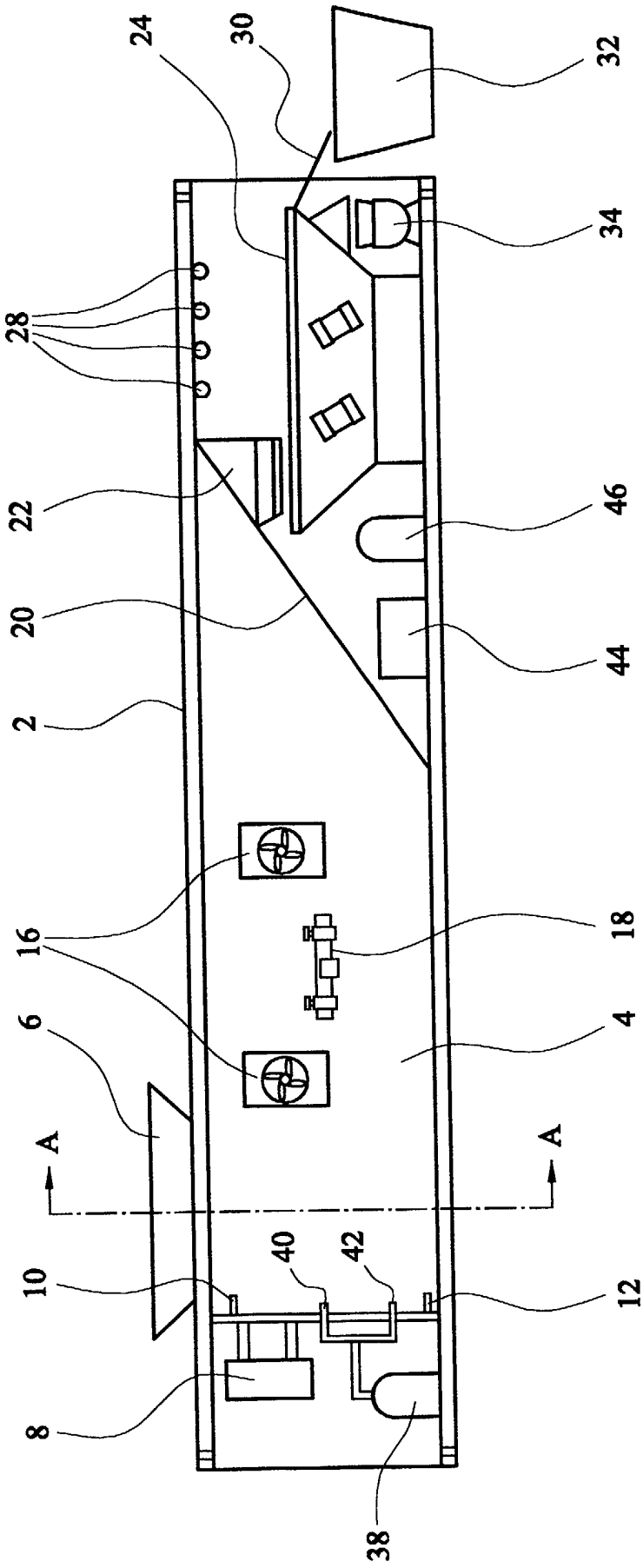

FIG. 1

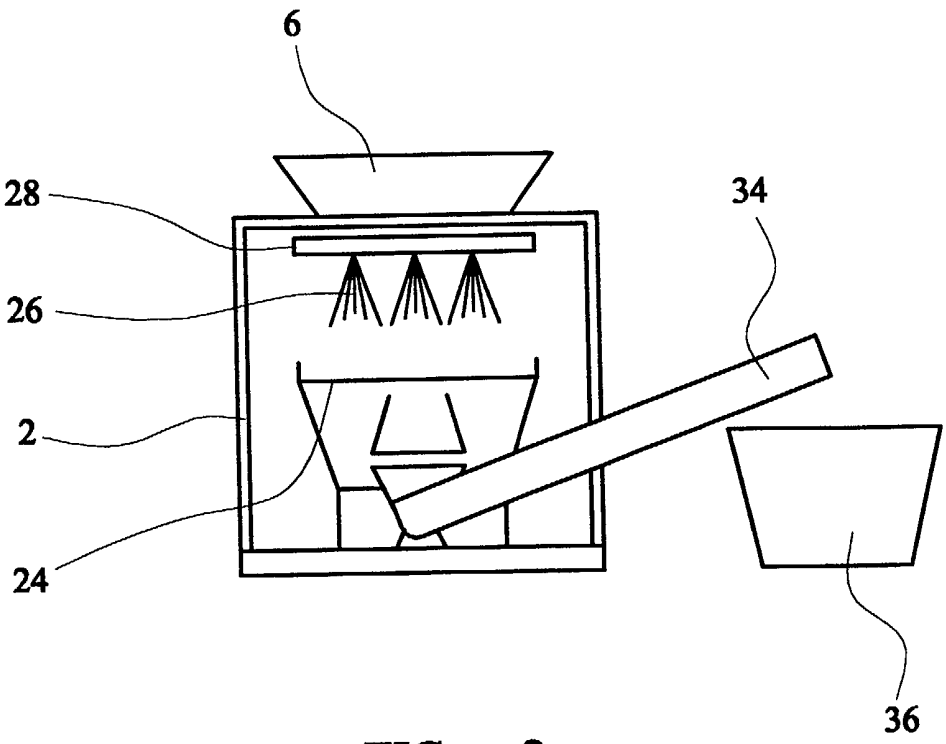

FIG. 2

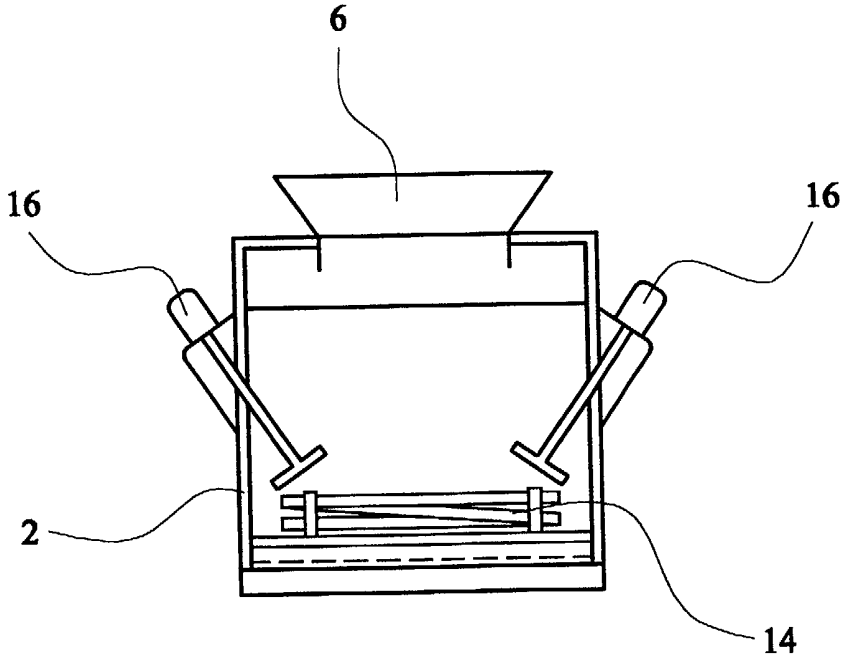

FIG. 3

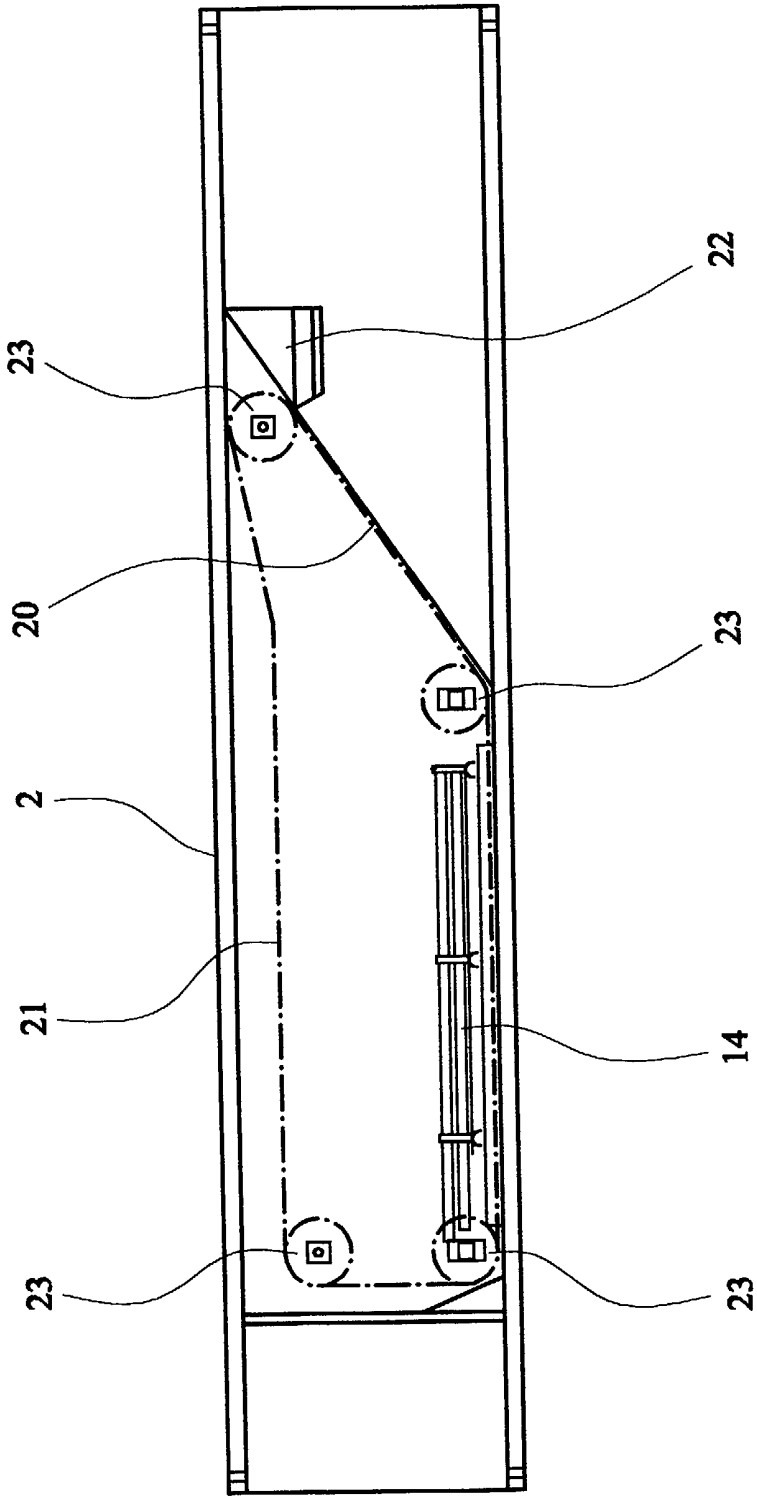

FIG. 4

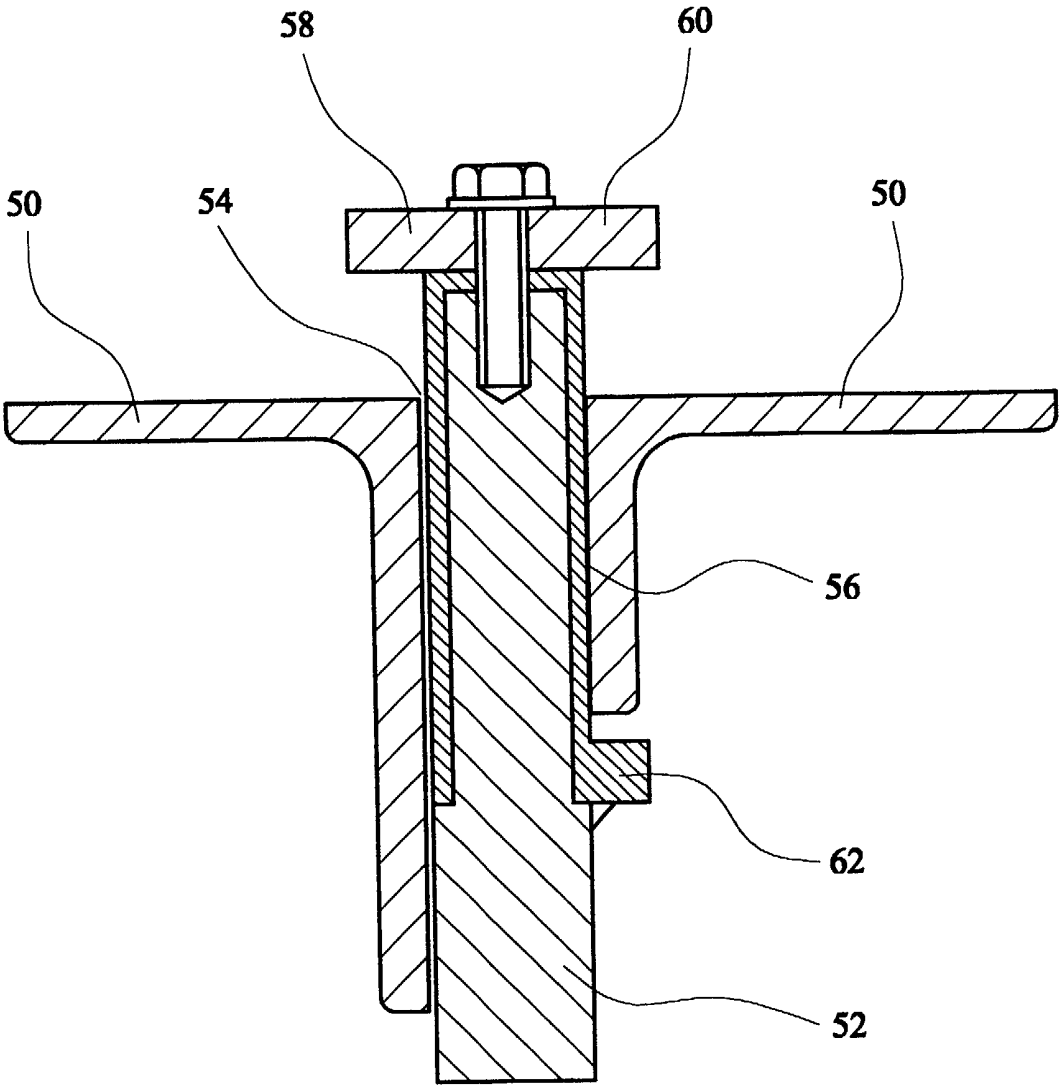

FIG. 5

Oil Sludge Processing Plant

The present invention relates to an apparatus for processing an oil sludge and, more particularly, to an apparatus for separating solid contaminants from an oil sludge.

The efficient processing of an oil sludge, for example to recover oil from a waste sludge, is often complicated by the presence in the sludge of solid contaminants.

The aim of the present invention is to provide a convenient and cost effective means for separating such contaminants from an oil sludge.

In accordance with the present invention, there is provided a portable containerised plant for separating solid contaminants from an oil sludge and comprising a settling tank for receiving an oil sludge via an inlet port of the container, means for heating sludge held within the tank to reduce the viscosity of the sludge, thereby encouraging solid contaminants suspended in the sludge to fall to the bottom of the tank, means for dragging solid material from the base of the tank to a screening unit for screening residual oil from the solid material and means for delivering screened solids from the screening unit to a receptacle via an outlet port in the container.

The containerised plant may thus be transported between geographic locations, as required, to process oil sludge and is therefore more versatile and cost effective than a permanently installed plant.

Preferably the dragging means comprise a re-circulating train of spaced-apart slats, the slats extending parallel to one another and transversely of the direction of travel of the train. The slats are preferably formed from a material, e.g. wood or plastic, which will not cause sparking when dragged across the base of the tank.

Most preferably each slat is arranged to independently rise and fall to follow the bottom contours of the tank and to maintain contact with the bottom of the tank as the tip of the

slat wears away. Preferably each slat is arranged to slide vertically within a slot provided in the body of a respective carrier. Preferably the extent to which each slat is free to rise and fall within its respective slot is limited by at least one stopper.

Preferably an upper portion of each slat is at least partially encased, a stopper of each slat being arranged to prevent the exposed portion of the slat from wearing away to the extent that its encasement comes into contact with the bottom of the tank. In this case, each encasement is preferably provided with a pair of stoppers in the form of respective projections which limit the extent to which the encasement may rise and fall within the slot provided its associated carrier, by abutting respectively against the lower and upper sides of the carrier. Preferably the trailing surface of each encasement extends closer to the tip of its associated slat than does its leading surface.

Preferably the plant comprises means for agitating heated sludge held within the holding tank.

Preferably the screening unit comprises a foraminous screen though which residual oil may drain from, or more preferably be washed from, solid material supported thereon. Preferably the screening unit comprises means for spraying water onto solid material supported on the screen, to wash residual oil therefrom. Preferably the screen is arranged to vibrate to agitate solid material supported thereon.

Preferably the plant comprises means for transferring material which has passed through the screen to a second receptacle via an outlet port of the container.

Preferably the containerised plant has the same overall dimensions as a standard shipping container to enable the plant to be readily transported between different geographic locations.

Also in accordance with the present invention, there is

provided a method for separating solid contaminants from an oil sludge and comprising the steps of:

containing the sludge within a settling tank;

heating the sludge contained within the tank to reduce the viscosity of the sludge, thereby encouraging solid contaminants suspended in the sludge to fall to the bottom of the tank;

dragging solid material from the base of the tank; and

screening solid material dragged from the base of the tank to remove residual oil therefrom,

wherein the above steps are carried out by a portable containerised plant, the container of which is formed with an inlet port for receiving the sludge and an outlet port for delivering the screened solids to a receptacle.

An embodiment of the present invention will now be described by way of an example only and with reference to the accompanying drawings, in which:

Figure 1 is a cut-away side view of a plant in accordance with the present invention;

Figure 2 is a cut-away end view of the plant;

Figure 3 is a sectional view through the plant along the line A - A';

Figure 4 is a sectional view showing the heating and conveying means provided within the settling tank of the plant; and

Figure 5 is sectional side view of a preferred slat mounting arrangement.

Referring to the drawings, a portable containerised plant is shown for separating solid contaminants from an oil sludge, the plant being provided within a container 2 having substantially the same overall exterior dimensions as a 40 foot shipping container and being arranged to operate as follows.

Oil sludge is introduced into a settling tank 4 via a hopper 6 on the top of the container 2, with the amount of sludge released into the tank 4 being regulated by control

means 8 connected to upper and lower float switches 10,12, to ensure that the level of oil within the tank 4 always remains between the two switches 10,12. The control means 8 are provided in an explosion-proof housing and are connected to further sensing and actuating means for controlling the overall operation of the plant.

The oil sludge contained within the tank 4 is heated by at least one steam coil 14 whilst, at the same time, being agitated by four stirring devices 16. The viscosity of the sludge is thereby reduced, causing solid contaminants suspended in the sludge to fall to the bottom of the tank 4. The overall temperature of the contained sludge is regulated by control means 18 fitted externally to the side of the container 2.

As shown in Figure 4, the solid contaminants falling onto the bottom of the tank 4 are dragged therefrom and up a sloping side-wall 20 of the tank by a train 21 of spaced-apart plastics slats re-circulating about rollers 23, the slats extending parallel to one another and transversely of the direction of travel of the train.

At the top of the sloping side-wall 20, solid material is released through a chute 22 onto the vibrating surface of a foraminous screen 24, through which residual oil is washed from the solid material supported thereon by water 26 sprayed onto the solid material from a plurality of spray bars 28 positioned above the screen.

The washed solids are conveyed along a platform 30, from the surface of the screen 24 to a receptacle 32 e.g. a skip, which is positioned at the rear of the plant, for subsequent disposal of the solids. The material that has passed through screen 24 is also conveyed through a channel 34, by means of a rotating screw, to a second receptacle 36 e.g. a skip, positioned to the side of the plant, for subsequent disposal of that material.

The plant also comprises a decanter pump 38 for removing de-contaminated oil from the tank 4 via one of the two

suction points 40,42. The suction points 40,42 are located respectively above and below the level of the steam coil(s). The suction point 40 is normally used to ensure that the level of oil never falls below the level of the coils, which, if exposed when hot, might ignite flammable gases sitting above the surface of the oil. The suction point 42 is only used when the coils are cold to drain the tank completely. The plant further comprises a hydraulic power pack 44 for operating various actuators of the plant, e.g. the recirculating train of slats 21 and the screw conveyor 34, and may optionally comprise a pump 46 for circulating sludge through a heater to further reduce its viscosity.

The plant may comprise a stand alone unit, or may provide a pre-treatment unit for a centrifugal separator system, which is fed with decontaminated sludge by the decanter pump 38.

A preferred mounting arrangement for each slat of the train 21 is shown in section in Figure 5 and comprises a carrier frame 50 arranged to be connected in series with adjacent frames of the train, with the opposite ends of each frame 50 being supported at a fixed height above the bottom of the tank 4.

A plastics slat 52 extends vertically through a slot 54 in the frame 50, the upper portion of the slat being capped by a metal encasement 56 from which upper projections 58,60 (provided by the opposite ends of a plate removably fastened to the top of the encasement by a bolt) and a lower projection 62 extend to form stops for respectively limiting the extent by which the capped slat 52 may fall and rise within the slot 54.

It will be appreciated that the advantage of such a mounting arrangement is that it allows each slat 52 to independently rise and fall to follow the bottom contours of the tank 4 and to maintain contact with the bottom of the tank

4 as the tip of the slat wears away, with the upper projections 58,60 of the encasement 56 acting to prevent the encasement from ever coming into contact with the bottom of the tank.

The plant thus described provides a versatile and cost effective means for separating solid contaminants from an oil sludge.

Claims

1) A portable containerised plant for separating solid contaminants from an oil sludge and comprising a settling tank for receiving an oil sludge via an inlet port of the container, means for heating sludge held within the tank to reduce the viscosity of the sludge, thereby encouraging solid contaminants suspended in the sludge to fall to the bottom of the tank, means for dragging solid material from the base of the tank to a screening unit for screening residual oil from the solid material and means for delivering screened solids from the screening unit to a receptacle via an outlet port in the container.

2) A portable containerised plant as claimed in Claim 1, wherein the dragging means comprise a re-circulating train of spaced-apart slats, the slats extending parallel to one another and transversely of the direction of travel of the train.

3) A portable containerised plant as claimed in Claim 2, wherein the slats are each formed from a material which will not cause sparking when dragged across the base of the tank.

4) A portable containerised plant as claimed in Claim 2 or Claim 3, wherein each slat is arranged to independently rise and fall to follow the bottom contours of the tank and to maintain contact with the bottom of the tank as the tip of the slat wears away.

5) A portable containerised plant as claimed in Claim 4, wherein each slat is arranged to slide vertically within a slot provided in the body of a respective carrier.

6) A portable containerised plant as claimed in Claim 5, wherein the extent to which each slat is free to rise and fall

within its respective slot is limited by at least one stopper.

7) A portable containerised plant as claimed in Claim 6, wherein an upper portion of each slat is at least partially encased, a stopper of each slat being arranged to prevent the exposed portion of the slat from wearing away to the extent that its encasement comes into contact with the bottom of the tank.

8) A portable containerised plant as claimed in Claim 7, wherein each encasement is preferably provided with a pair of stoppers in the form of respective projections which limit the extent to which the encasement may rise and fall within the slot provided its associated carrier, by abutting respectively against the lower and upper sides of the carrier.

9) A portable containerised plant as claimed in Claim 7 or Claim 8, wherein the trailing surface of each encasement extends closer to the tip of its associated slat than does its leading surface.

10) A portable containerised plant as claimed in any preceding claim, wherein the plant comprises means for agitating heated sludge held within the holding tank.

11) A portable containerised plant as claimed in any preceding claim, wherein the screening unit comprises a foraminous screen though which residual oil may drain from solid material supported thereon.

12) A portable containerised plant as claimed in Claim 11, wherein the screening unit comprises means for spraying water onto solid material supported on the screen, to wash residual oil therefrom.

13) A portable containerised plant as claimed in Claim 11 or Claim 12, wherein the screen is arranged to vibrate to agitate solid material supported thereon.

14) A portable containerised plant as claimed in any of Claims 11 to 13, comprising means for transferring material which has passed through the screen to a second receptacle via an outlet port of the container.

15) A portable containerised plant as claimed in any preceding claim, having the same overall dimensions as a standard shipping container.

16) A method for separating solid contaminants from an oil sludge and comprising the steps of:

containing the sludge within a settling tank;

heating the sludge contained within the tank to reduce the viscosity of the sludge, thereby encouraging solid contaminants suspended in the sludge to fall to the bottom of the tank;

dragging solid material from the base of the tank; and

screening solid material dragged from the base of the tank to remove residual oil therefrom,

wherein the above steps are carried out by a portable containerised plant, the container of which is formed with an inlet port for receiving the sludge and an outlet port for delivering the screened solids to a receptacle.

17) A portable containerised plant substantially as herein described with reference to the accompanying drawings.

18) A method for separating solid contaminants from an oil sludge, the method being substantially as herein described with reference to the accompanying drawings.

Application No: GB 0116797.2
Claims searched: 1-18

Examiner: Stephen Williams
Date of search: 10 January 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B1D (DACA, DPAE, DPAC, DPDB, DPDC, DPDD, DPDE, DPDF, DPDG, DPDX, DPLC, DABA)

Int Cl (Ed.7): B01D (21/00, 21/02, 21/04, 21/24)

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 0675241 A	(SILLEY) Pg 1, Lines 10-18.	
A	US 4367145 A	(SIMPSON) Whole document.	
A	DE 19649814 A	(JUERGEN) See Abstract.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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