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### (54) Fluid storage tank

(57) A fluid storage tank (2) comprising a chamber (4) having a roof (6) arranged to float upon a body of fluid contained in the chamber (4). A nozzle (8) is suspended from the roof (6) and pumping means (18) are

arranged to circulate a flow of oil through the chamber (4) via the nozzle (8), to inhibit or disperse a build-up of solid or semi-solid materials upon the floor of the chamber (4).

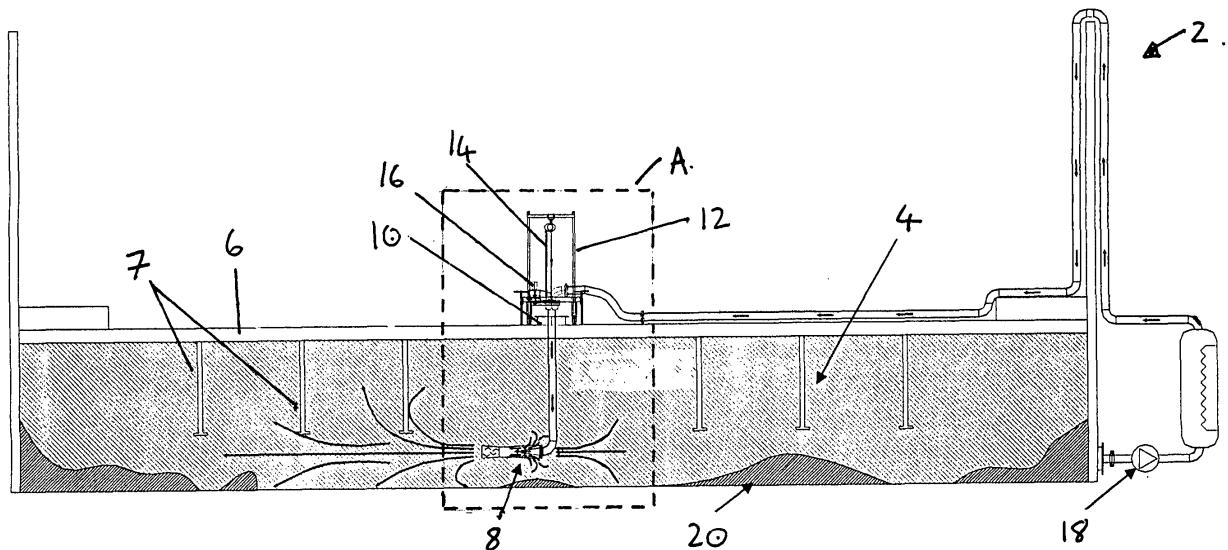


Figure 1

**Description**

**[0001]** The present invention relates to a fluid storage tank and, more particularly to an oil tank comprising means for inhibiting or dispersing a build-up of sludge therein.

**[0002]** It is known to provide bulk storage means for a liquid material, in the form of a tank comprising a chamber having a roof arranged to float upon a body of liquid contained therein.

**[0003]** The chamber roof is typically provided with a plurality of legs, which support the roof above the floor of the chamber, when the chamber is emptied, to allow access to the interior of the base region of the tank for cleaning or maintenance.

**[0004]** However, it is common for solid or semi-solid materials to accumulate in the base of such a tank, when it is used to store certain fluids, e.g. oil, thereby preventing the legs of the chamber roof from landing securely upon the base of the chamber when the chamber is emptied, or at least impeding access to the interior of the base region of the tank, for removing the accumulated material therefrom.

**[0005]** We have now devised an arrangement which overcomes the limitations of existing fluid storage tanks.

**[0006]** In accordance with the present invention, there is provided a fluid storage tank comprising a chamber having a roof arranged to float upon a body of fluid contained in the chamber, a nozzle suspended from the roof and pumping means arranged to circulate a flow of fluid through the chamber via the nozzle, to inhibit or disperse a build-up of solid or semi-solid materials upon the floor of the chamber, the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.

**[0007]** Because of the arrangement of the nozzle, the nozzle has been found to be surprisingly effective in dispersing sludge and like material on the floor of the chamber.

**[0008]** Preferably the nozzle is arranged to direct the outflow of fluid therefrom in a plane extending parallel to the base of the chamber.

**[0009]** The nozzle is preferably arranged to rotate about a vertical axis in said parallel plane and/or may be vertically displaceable with respect to the roof.

**[0010]** Preferably a plurality of legs depend from the roof for supporting the roof above the floor of the chamber, the nozzle being vertically displaceable to direct the outflow of fluid therefrom in a plane extending below the distal ends of the legs.

**[0011]** Preferably the pumping means comprise means for heating the flow of fluid.

**[0012]** Also in accordance with the present invention, there is provided fluid circulation means for use with a fluid storage tank comprising a chamber having a roof arranged to float upon a body of fluid contained in the

chamber, the circulation means comprising a nozzle, means for suspending the nozzle from the roof and pumping means arranged to circulate a flow of fluid through the chamber via the nozzle, to inhibit or disperse a build-up of solid or semi-solid materials upon the floor of the chamber, the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.

**[0013]** The nozzle is preferably arranged to be fitted to the roof to direct the outflow of fluid therefrom in a plane extending parallel to the base of the chamber.

**[0014]** The circulation means preferably comprise means for rotating the nozzle about a vertical axis in said parallel plane and/or displacing the nozzle vertically with respect to the roof.

**[0015]** The pumping means preferably comprise means for heating the flow of fluid

**[0016]** Further in accordance with the present invention, there is provided a method for inhibiting or dispersing a build-up of solid or semi-solid materials upon the floor of a fluid filled chamber, comprising circulating a flow of fluid through the chamber via a nozzle suspended from the roof of the chamber, the roof being arranged to float upon the body of fluid contained in the chamber, and the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.

**[0017]** Preferably the nozzle directs the outflow of fluid therefrom in a plane extending parallel to the base of the chamber.

**[0018]** The nozzle preferably rotates about a vertical axis in said parallel plane.

**[0019]** A plurality of legs may depend from the roof for supporting the roof above the floor of the chamber, in which case, the nozzle is preferably retractably positioned to direct the outflow of fluid therefrom in a plane extending below the distal ends of the legs.

**[0020]** Preferably the flow of fluid is heated, externally of the chamber, as it is circulated.

**[0021]** 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 vertical section through an oil tank in accordance with the present invention; and

Figure 2 is an enlarged view of the region A of Figure 1.

**[0022]** Referring to the drawings, an oil storage tank 2 is shown comprising a chamber 4 having a roof 6 arranged to float upon a body of fluid contained in the chamber 4 and having a plurality of support legs 7 depending therefrom.

**[0023]** A nozzle 8 is suspended through a manway 10

at the centre of the chamber roof 6, from a gantry 12 provided with a pulley 14 for raising and lowering the nozzle 8, and a hydraulic actuator 16 for rotating the nozzle 8 about a vertical axis in a plane extending parallel to the floor of the chamber 4.

**[0024]** Pumping means 18 are arranged to draw a flow of oil from the chamber 4, to heat the flow and to re-introduce the flow into the chamber via the nozzle 8, whilst the nozzle 8 is rotated, to disperse the mounds of sludge 20 that will tend to accumulate upon the floor of the chamber 4.

**[0025]** As shown in detail in Figure 2, the nozzle 8 is of venturi type, comprising a tapered outlet port 22 for releasing the flow of fluid therethrough as a concentrated jet, at the same time drawing additional fluid into the jet and through the nozzle 8, via inlet apertures formed in a shroud 24 thereof.

**[0026]** It will be appreciated that, by pumping fluid through the nozzle 8 with the nozzle 8 lowered and rotating below the level of the distal ends of the support legs 7 of the chamber roof 6, the floor of the chamber 4 may be cleared of sludge, thereby allowing the legs 7 of the chamber roof 6 to be landed securely on the floor of the chamber 4, as the chamber 4 is emptied.

**[0027]** The arrangement thus described obviates the requirement for manual disbursement of sludge deposits which might accumulate at the bottom of an oil filled chamber.

## Claims

1. A fluid storage tank comprising a chamber having a roof arranged to float upon a body of fluid contained in said chamber, a nozzle suspended from said roof and pumping means arranged to circulate a flow of fluid through said chamber via said nozzle, to inhibit or disperse a build-up of solid or semi-solid materials upon the floor of said chamber, the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.
2. A fluid storage tank as claimed in Claim 1, wherein said nozzle is arranged to direct the outflow of fluid therefrom in a plane extending parallel to the base of said chamber.
3. A fluid storage tank as claimed in Claim 2, wherein said nozzle is arranged to rotate about a vertical axis in said parallel plane.
4. A fluid storage tank as claimed in any preceding claims, wherein said nozzle is vertically displaceable with respect to said roof.

5. A fluid storage tank as claimed in any Claim 4 appended to Claim 2 or Claim 3, wherein a plurality of legs depend from said roof for supporting said roof above the floor of said chamber, said nozzle being vertically displaceable to direct the outflow of fluid therefrom in a plane extending below the distal ends of said legs.
6. A fluid storage tank as claimed in any preceding claim, wherein said pumping means comprise means for heating said flow of fluid.
7. Fluid circulation means for use with a fluid storage tank comprising a chamber having a roof arranged to float upon a body of fluid contained in said chamber, said circulation means comprising a nozzle, means for suspending said nozzle from said roof and pumping means arranged to circulate a flow of fluid through said chamber via said nozzle, to inhibit or disperse any build-up of solid or semi-solid materials upon the floor of said chamber, the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.
8. Fluid circulation means as claimed in Claim 7, wherein said nozzle is arranged to be fitted to said roof to direct the outflow of fluid therefrom in a plane extending parallel to the base of said chamber.
9. Fluid circulation means as claimed in Claim 8, comprising means for rotating said nozzle about a vertical axis in said parallel plane.
10. Fluid circulation means as claimed in any of Claims 7 to 9, comprising means for displacing said nozzle vertically with respect to said roof.
11. Fluid circulation means as claimed in any of Claims 7 to 10, wherein said pumping means comprise means for heating said flow of fluid.
12. A method for inhibiting or disbursing a build-up of solid or semi-solid materials upon the floor of a fluid filled chamber, comprising circulating a flow of fluid through said chamber via a nozzle suspended from the roof of the chamber, said roof being arranged to float upon the body of fluid contained in said chamber, and the nozzle having a tapered outlet end through which said flow of fluid issues as a jet, said outlet end being provided with a tubular shroud which is formed with apertures for drawing additional fluid from said chamber and through said nozzle.
13. A method as claimed in Claim 12, wherein the nozzle directs the outflow of fluid therefrom in a plane

extending parallel to the base of said chamber.

14. A method as claimed in Claim 13, wherein said nozzle rotates about a vertical axis in said parallel plane. 5

15. A method as claimed in Claim 13 or Claim 14, wherein a plurality of legs depend from said roof for supporting said roof above the floor of said chamber, said nozzle being retractably positioned to direct the outflow of fluid therefrom in a plane extending below the distal ends of said legs. 10

16. A method as claimed in any of Claims 12 to 15, wherein said flow of fluid is heated, externally of said chamber, as it is circulated. 15

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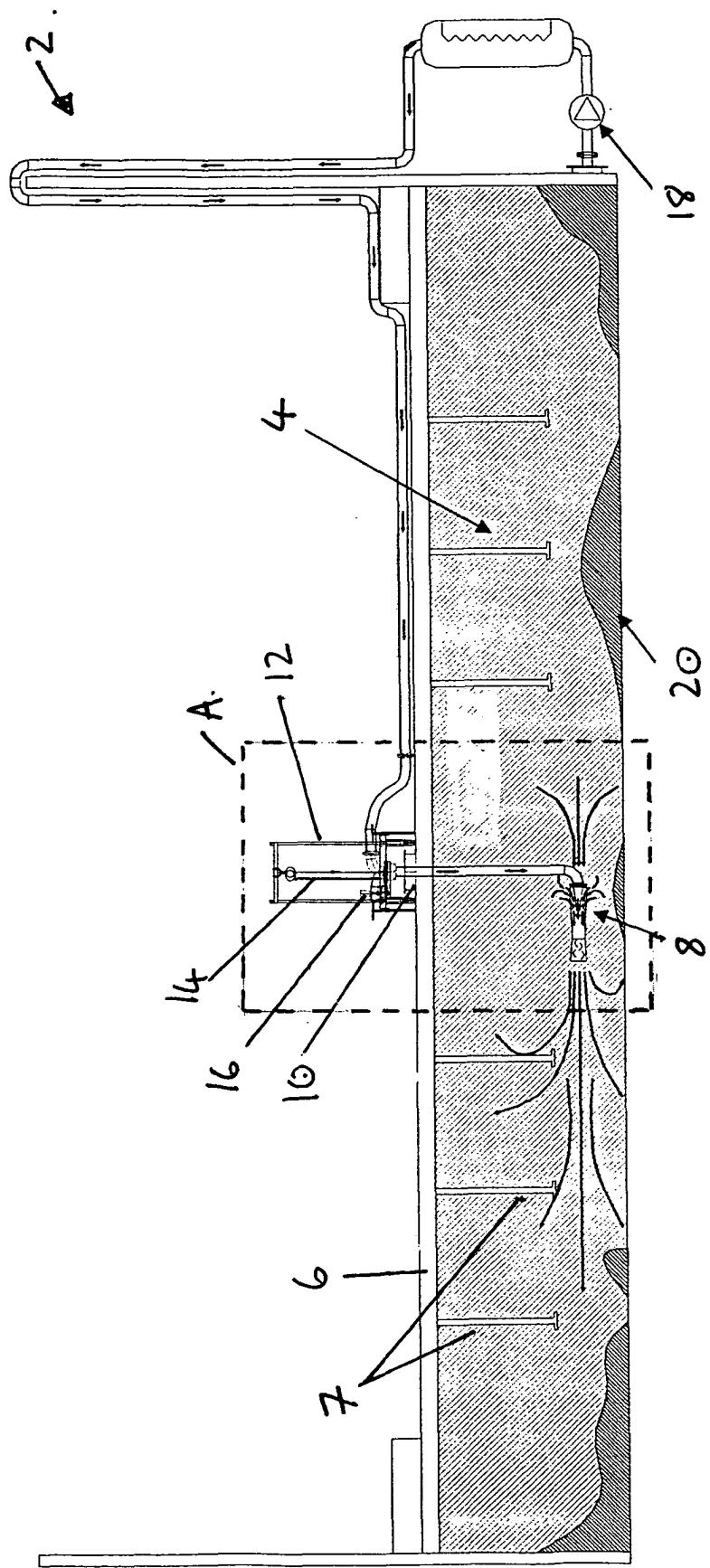


Figure 1

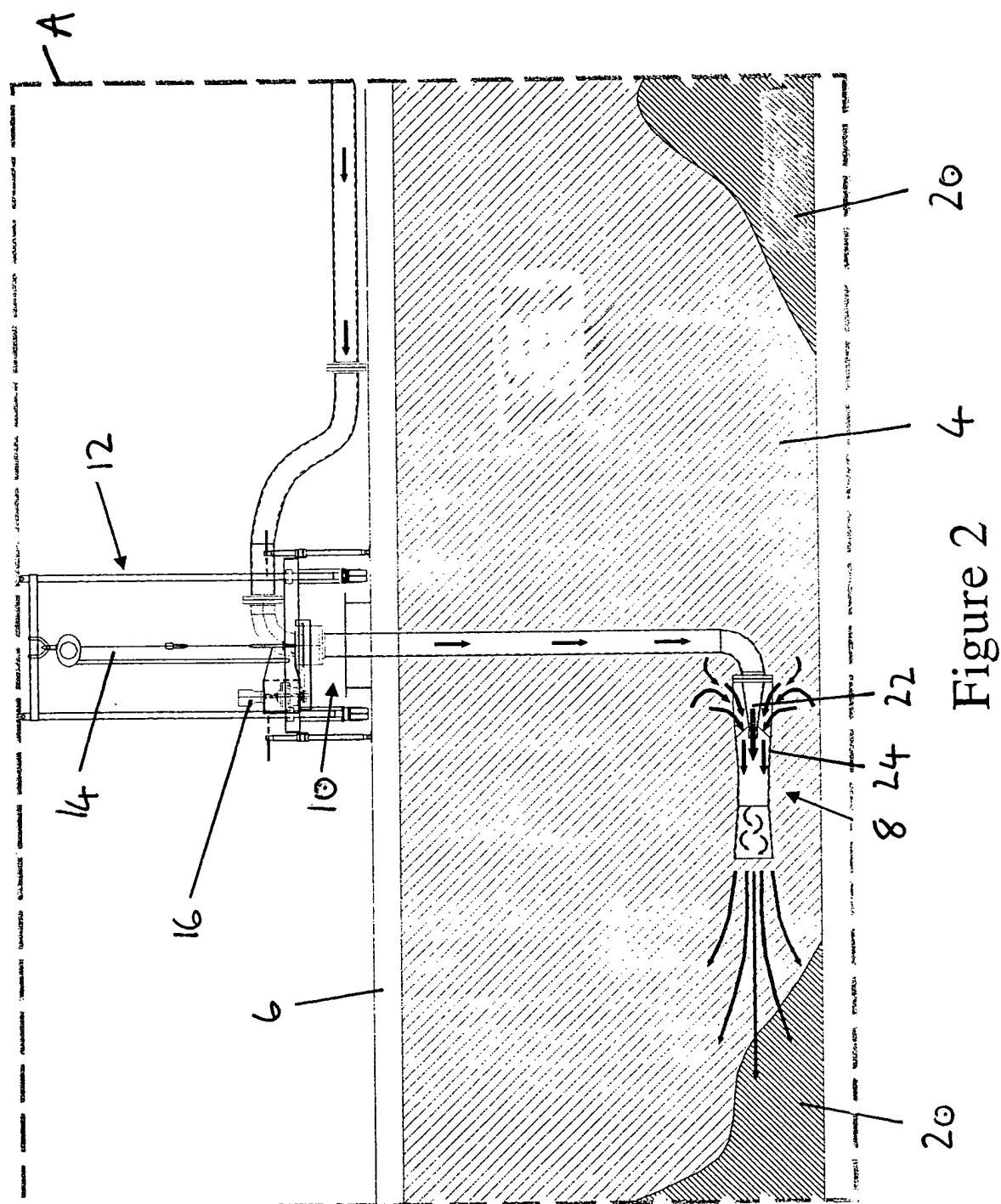


Figure 2 4