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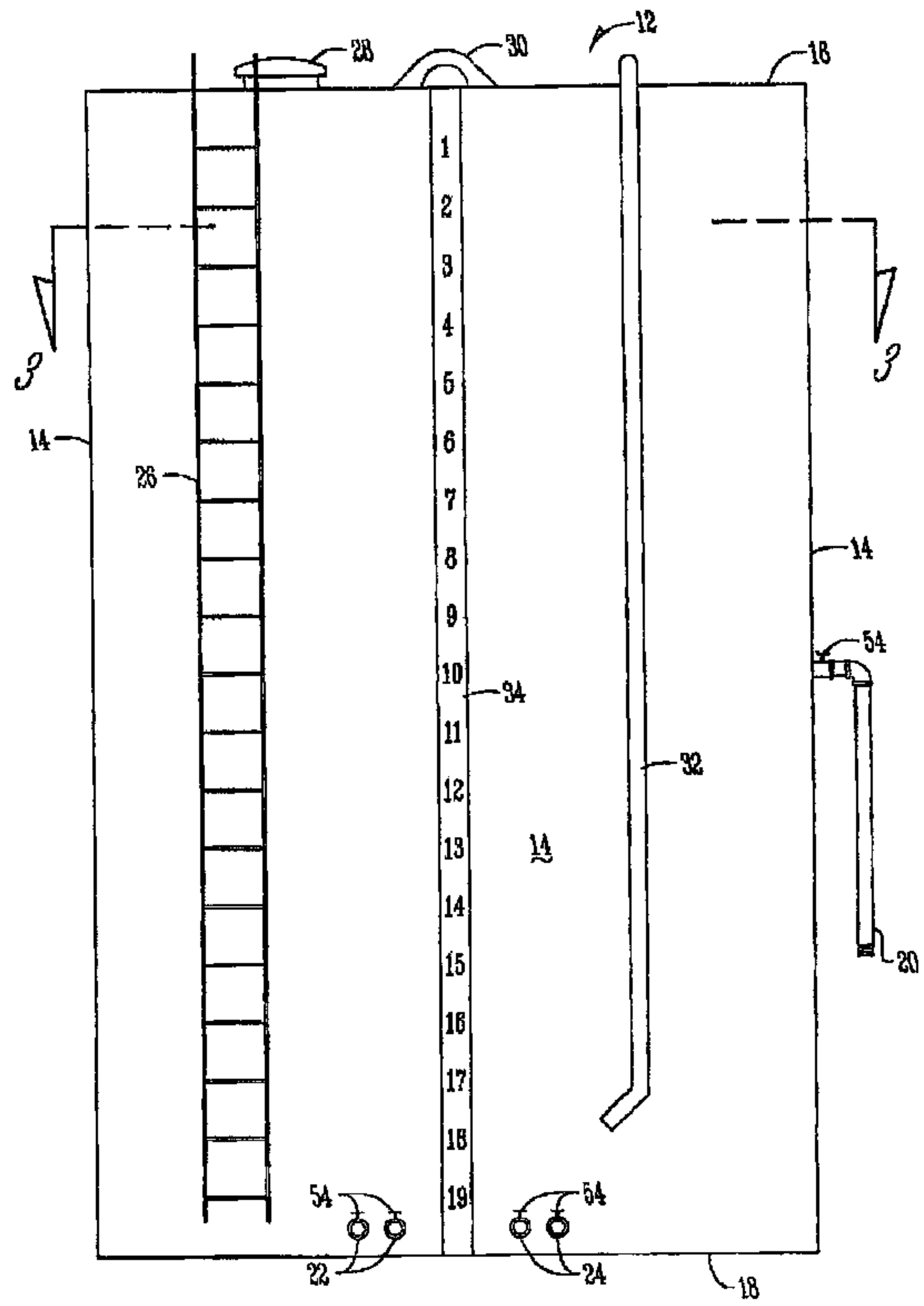
(54) Titre : SYSTEME DE JETS POUR RESERVOIR VERTICAL
(54) Title: UPRIGHT TANK JET SYSTEM



(57) Abrégé/Abstract:
A jet system is beneficial in keeping a drilling particulates of a drilling fluid evenly mixed within an upright storage tank having a side wall, a top wall and a bottom wall. The jet system has a nozzle on each half section of a horizontally disposed upper arm and a plurality of nozzles on each half section of a lower rotatable arm disposed adjacent the bottom wall for keeping particulates of the drilling fluid suspended above the upper and lower arm. The upper arm redistributes and suspends particulates of the drilling fluid from near the bottom of the tank above the upper arm to thereby keep particulates of the drilling fluid suspended throughout the entire volume.

ABSTRACT OF THE DISCLOSURE

A jet system is beneficial in keeping a drilling particulates of a drilling fluid evenly mixed within an upright storage tank having a side wall, a top wall and a bottom wall. The jet system has a nozzle on each half section of a horizontally disposed upper arm and a plurality of nozzles on each half section of a lower rotatable arm disposed adjacent the bottom wall for keeping particulates of the drilling fluid suspended above the upper and lower arm. The upper arm redistributes and suspends particulates of the drilling fluid from near the bottom of the tank above the upper arm to thereby keep particulates of the drilling fluid suspended throughout the entire volume.

TITLE: UPRIGHT TANK JET SYSTEM

This application claims priority based on United States Patent Application No. 11/687,167 entitled "UPRIGHT TANK JET SYSTEM" filed March 16, 2007, which is herein incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to an improved upright tank jet system for keeping particulates of a drilling fluid evenly mixed and suspended throughout the total volume of the fluid in the tank.

BACKGROUND OF THE INVENTION

It is of utmost importance to keep particulates within drilling fluid evenly mixed, dispersed and suspended to thereby maintain an optimal density for the drilling fluid and eliminate the potential for flocculation of the particulates on the floor of the tank. Keeping particulates of the drilling fluid evenly dispersed helps prevent valves from becoming clogged, pumps from failing prematurely, unwanted and expensive tank cleanings required to remove buildup, and the loss of drilling fluid resulting from the foregoing problems. Therefore, there is a need to provide a jet system for an upright drilling fluid tank that prevents particulates from settling out of the drilling fluid while keeping the drilling fluid and particulates evenly mixed and dispersed throughout the entire volume of the fluid in the tank.

Upright holding tanks for storing drilling fluids can be 20 foot in height by 12 foot in diameter and have a capacity of 400 barrels. The drilling fluid stored in the tank is commonly referred to as drilling "mud". The drilling mud may consist of bentonite clay (gel) with additives such as barium sulfate (barite or "bar"), calcium carbonate (chalk) or hematite. Both barite and hematite are high-density additives. Thus, drilling fluids or drilling "mud" is typically a dense, viscous and cohesive fluid. Moreover, the high-density additives such as bar have a tendency to settle out of the drilling fluid over time if left unagitated or disrupted. Therefore, an upper jet system in combination with a lower jet system is needed to provide maximum disruption and agitation of the total volume of drilling fluid in the tank to keep particulates of the drilling fluid, such as bar, suspended and evenly dispersed in the drilling fluid. There is also a need to redistribute drilling fluid from the bottom portion of the tank to the upper portion of the tank through the upper jet system to keep an even distribution of particulates. In addition, because of the density of the drilling fluids, there is a need to provide a jet system in the upper portion of the tank to thereby agitate, disrupt and suspend particulates of the drilling fluid within the upper portion of the tank.

BRIEF SUMMARY OF THE INVENTION

Therefore, it is a primary object, feature, or advantage of the present invention to improve over the state of art.

It is a further object, feature, or advantage of the present invention to provide a jet system capable of operating and meeting working objectives in a "deep" surface environment, such as in an upright tank having a drilling fluid depth of 20 feet.

Yet another object, feature, or advantage of the present invention is to provide a jet system wherein the nozzles remain unclogged of the heavy weighted drilling "mud".

A further object, feature, or advantage of the present invention is to provide a jet system wherein the equipment costs for constructing the jet system are minimal.

Yet another object, feature, or advantage of the present invention is to provide a jet system wherein the lower arm covers the entire diameter of the tank bottom.

Still a further object, feature, or advantage of the present invention is to provide a jet system wherein the upper arm redistributes fluid taken from the bottom of the tank into the portion of the tank above the upper arm.

Another object, feature, or advantage of the present invention is to provide a jet system wherein the nozzles are capable of operating between 60-80 psi, the common operating head pressure for drilling fluid pumps.

A still further object, feature, or advantage of the present invention is to provide a jet system wherein the upright tank is used to store oil rig drilling fluids.

Yet another object, feature, or advantage of the present invention is to provide a jet system wherein the total volume of drilling fluid in the tank is agitated to prevent "dead spots" from developing in the tank where particulates, such as "bar", can settle out of the drilling fluid.

A further object, feature, or advantage of the present invention is to provide a jet system wherein the lower arm is rotatable to sweep over the bottom of the tank to thereby prevent flocculation of the particulates, clogging of the valves and nozzles, and destruction or damage to pumps.

Another object, feature, or advantage of the present invention is to provide a jet system wherein the nozzles have an orifice size best suited for creating a jet stream of the drilling fluid.

A further object, feature, or advantage of the present invention is to provide a jet system wherein the upper arm may also rotate to redistribute drilling fluid from the bottom of the tank above the upper arm and agitate particulates of the drilling fluid above the upper arm.

A still further object, feature, or advantage of the present invention is to provide a jet system wherein the upright tank has a 20 foot height and a 12 foot diameter for standing in the upright position.

Yet another object, feature, or advantage of the present invention is to provide a jet system wherein the jets on the lower arm are counterbalanced and offset from each other to cause the lower arm to rotate.

One or more of these and/or other objects, features or advantages of the present invention will become apparent from the specification and claims that follow.

According to one aspect of the present invention, a jet system for keeping particulates of a drilling fluid evenly mixed within an upright storage tank having a side wall, a top wall and a bottom wall is disclosed. The jet system has a nozzle on each half section of a horizontally disposed upper arm and a plurality of nozzles on each half section of a lower rotatable arm disposed adjacent the bottom wall for keeping particulates of the drilling fluid suspended above the lower arm. The upper arm redistributes and suspends the drilling fluid near the bottom wall of the tank above the upper arm to thereby keep particulates of the drilling fluid suspended throughout the entire volume of drilling fluid within the tank. In the preferred form, the lower arm is in fluid communication with the upper arm and the lower arm is rotatable. The upper arm is positioned 9 feet from the bottom wall of the tank. Each nozzle on the upper arm is positioned on outermost portions of each half section.

A new method for keeping particulates of a drilling fluid evenly mixed and dispersed within an upright storage tank having a side wall, a top wall, and a bottom wall is disclosed. The method includes providing a jet system having a nozzle on each half section of an upper arm and a plurality of nozzles on a lower rotatable arm within the tank. The method also includes redistributing the drilling fluid at or near the bottom wall of the tank above the upper arm and suspending particulates of the drilling fluid above the upper arm and the lower arm by agitating the entire volume of drilling fluid in the tank. In the preferred form, the method includes angling the plurality of nozzles on the lower arm alternately upward and downward from vertical for rotating the lower arm and sweeping the bottom wall of the tank of settled particulates of the drilling fluid. The method also includes the step of angling each nozzle on the upper arm away from vertical for suspending and agitating particulates of the drilling fluid above the upper arm. The method also includes providing the nozzle on the upper arm being positioned on outermost portions of each half section.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a front view of an upright storage tank according to one exemplary embodiment of the present invention.

Fig. 2 is a top view of an upright storage tank according to one exemplary embodiment of the present invention.

Fig. 3 is a cross-sectional view of the upright storage tank in Fig. 1 taken along line 3-3.

Fig. 4A is a cross-sectional view of the upright storage tank and jet system in the "off" condition taken along line 4A-4A in Fig. 2.

Fig. 4B is shows the upright storage tank and jet system in Fig. 4A in the "on" condition.

Fig. 5A is a cross-sectional view taken along line 5A-5A in Fig. 4A showing the orientation of the nozzles on the upper arm.

Fig. 5B is a cross-sectional view taken along line 5B-5B in Fig. 4A showing the orientation of the nozzles on the lower arm.

Fig. 6 shows the upright tank in Fig. 4A and another embodiment of the jet system in the "on" condition.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention includes a number of aspects, all of which have broad and far-reaching application. Although specific embodiments are described herein, the present invention is not limited to these specific embodiments. The present invention contemplates numerous other options and design and use of the jet system.

Fig. 1 shows a commonly used upright storage tank for storing drilling fluids. The upright storage tank 12 has a pair of substantially upright side walls 14 ending in a top wall 16 and a bottom wall 18. Tank 12 is commonly fitted with a ladder 26, top hatch 28 and manway 36 (shown in Fig. 2) for gaining access into the tank 12. The tank 12 is also fitted with several features for monitoring and handling the fluid within the tank 12. For example, the tank 12 is fitted with at least one suction line 22 for drawing fluid out of the tank 12 and at least one discharge line 24. The tank 12 also has a fill line 32 for filling the tank 12 with fluids. A gauge 34 is positioned on the tank for monitoring fluid levels within the tank 12. A jet line inlet 20 ingresses the side wall 14 of the tank 12 to provide fluid for the jet system 10 shown in Fig. 3. Other fixtures are provided on the tank 12 for handling, such as lifting eye 30 and skid 38 (shown in Fig. 2). The suction lines 22, discharge lines 24 and jet line inlet 20 each have valves 54 for moving the lines from an open to a closed position. Generally, upright storage tanks 12 used to store drilling fluids have a height of 20 feet and a diameter of 12 feet and a holding capacity of 400 barrels of drilling fluid. The storage tank 12 is built to stand upright resting on the bottom wall 18. Thus, when the tank 12 is completely full of fluid, the depth of the fluid can reach 20 feet.

Fig. 3 shows a cross-sectional view of the upright storage tank taken along line 3-3 in Fig. 1. The jet system 10, shown in Fig. 3, has an upper arm 40 in fluid communication with a lower arm 42 and jet inlet 20. The upper arm 40 has two half sections 46 attached together using tee fitting 50. On each half section 46 is a nozzle 44. The nozzle 44 is positioned on the outer most part of each half section 46. One half section 46 is connected to the tee fitting 50 on one end and has a cap fitting 64 on the opposite end positioned within retainer 62 on the side wall 14 of the tank 12. The other half section 46 is connected to tee fitting 50 and egresses the side wall 14 of the tank 12 by way of egress sleeve 74 and is in fluid communication with the jet line inlet 20. In the preferred form, the half sections 46 or arm 40 would be constructed of 4-inch outer diameter pipe but could be altered to suit the needs of the jet system 10. Also, in the preferred embodiment, the upper arm 40 is positioned at or near 9 feet above the bottom wall 18 of the tank 12. The height of the upper arm 40 could be moved higher or lower within the tank 12 based on the height of the tank 12. As shown, each nozzle 44 is positioned at or near the outermost portions of each half section 46 of the upper arm 40. Fig. 5A shows the orientation of the nozzles 44 on the upper arm 40. Each nozzle 44 is angled upward relative to vertical line 78. For example, one nozzle 44 may be oriented at -15 degrees from the vertical line 78 along orientation line 80 and the opposite nozzle 44 may be oriented +15 degrees from the vertical line 78 along orientation line 80. The angle of orientation for each nozzle 44 may vary. However, in the preferred embodiment, the nozzles 44 are angled alternately upward at + and -15 degrees from the vertical line 78. In the preferred embodiment, a nozzle 44 is mounted on each half section 46 of the upper arm 40. If need be, additional nozzles 44 could be added to each half section 46 of the upper arm 40 to maximize the effectiveness of the jet system 10. Additionally, the orientation of each nozzle 44 could be altered from the vertical line 78 to change the agitation dynamics of the jet system 10.

As shown in Fig. 4A, the upper arm 40 is in fluid communication with the lower arm 42 using center arm 58. The center arm 58 is connected to the upper arm 40 by way of the tee fitting 50. A swivel joint 60 is connected to the center arm 58 so that the lower arm 42 may rotate. The center arm 58 is connected to the lower arm 42 by the cross fitting 52. The half sections 46 of the lower arm 42 are connected to the sides of the cross fitting 52. A cap fitting 64 is connected to the cross fitting 52 on the side opposite the center arm 58.

The cap fitting 64 rests within retainer 66 and upon wear plate 68 on the bottom wall 18 of the tank 12. In one embodiment, for example, the center arm 58 is constructed of four inch pipe, the half sections 46 of the lower arm 42 are constructed of three inch pipe, and the swivel joint 60 is preferably a four inch chickson swivel joint. Each half section 46 on the lower arm 42 is attached to the cross fitting 52 and capped at opposite ends using a cap fitting 64. Each half section 46 of the lower arm 42 has a plurality of nozzles 44 mounted thereon. Fig. 5B shows the orientation of the plurality of nozzles 44 on each half section 46 of the lower arm 42. For example, on one half section 46 of the lower arm 42, each nozzle 44 is alternately oriented along orientation line 80 at -12 degrees upward and +12 degrees downward from the vertical line 78. The plurality of nozzles on the other half section 46 of the lower arm 42 are alternately oriented along orientation line 81 at +12 degrees upward and -12 degrees downward from the vertical line 78. Thus, the plurality of nozzles 44 on one half section 46 are angled to create a counter-clockwise rotation similar to the plurality of nozzles 44 on the opposite half section 46. This combined with the alternating orientation of the plurality of nozzles 44 on each half section 46 of the lower arm 42 from the vertical line 78 causes the arm to rotate in the direction shown by rotation arrows 48 in Fig. 3. It is preferred that the lower arm 42 be positioned adjacent the bottom wall 18 of the tank 12 but may also be positioned off of the bottom wall 18 if needed. The preferred structure shown in Fig. 4A shows four nozzles 44 mounted on each half section 46 of the lower arm 42. However, it is understood that fewer or more nozzles may be mounted to each half section 46 as needed to control the agitation dynamics within the tank 12. Similarly, the orientation of each nozzle 44 can be altered to control the rate of rotation of the lower arm 42 as well as the agitation dynamics within the tank. For example, in one embodiment, a thread 'o' lette is welded to the upper arm 40 and lower arm 42. A two inch by one inch swage jet nozzle may be threaded to the thread 'o' lette on the lower arm 42 and a two inch by three-quarter inch swage jet nozzle may be threaded to the thread 'o' lette on the upper arm 40. It is understood that varying size nozzles and makes may be implemented and used in the jet system 10 to achieve maximum disruption and agitation of the drilling fluid 56 within the tank 12.

Fig. 4A also shows how the suction line 22 ingresses the side wall 14 of the tank 12 ending in an elbow fitting 70. The elbow fitting 70 is turned down toward the bottom wall

18 of the tank 12 so that the suction line 22 pulls drilling fluid 56 from off or near the bottom wall 18 of the tank 12. A valve 54 is positioned on the suction line 22 for moving the line to an open and closed position.

Fig. 4A shows the jet system 10 positioned within the upright tank 12 filled with drilling fluid 56. The drilling fluid 56 has heavier particulates 72 which have a tendency to want to settle out of the drilling fluid 56. Over time, the particulates 72 also have a tendency of flocculating on the bottom floor 18 of the tank 12. Thus, as shown in Fig. 4A, if the drilling fluid 56 is left undisturbed or unagitated over a period of time, the particulates 72 settle out of the mid and upper portions of the tank 12 and near the bottom wall 18. The settling and flocculation of particulates 72 on the bottom wall 18 of the tank 12 can clog suction line 22 and ultimately damage a pump (not shown) used to extract the drilling fluid 56 from the tank 12. Prolonged buildup of particulates 72 on the bottom wall 18 of the tank 12 can require the tank to be cleaned professionally resulting in thousands of dollars of expense. Also, because the drilling fluid 56 has high-density additives, such as barite or "bar", the resulting drilling fluid 56 is a very thick, cohesive, viscous fluid. Consequently, the jet system 10 must be specifically tailored to redistribute the particulates 72 of the drilling fluid 56 throughout the entire volume of drilling fluid 56 within the tank 12. To evenly redistribute, agitate, and disrupt the particulates 72 of the drilling fluid 56 within the tank 12 requires multiple nozzles 44 and arms 40, 42 located at varying elevations within the tank 12. For example, using a single lower arm 42 with nozzles 44 may not evenly distribute and suspend the particulates 72 of the drilling fluid 56 throughout the entire volume of drilling fluid 56 within the tank 12. The jet stream from the nozzles 44 on lower arm 42 would lose energy before entering the mid or upper level portions of the tank 12 due to the viscosity and the high-density of the drilling fluid 56. Thus, particulates 72 of the drilling fluid 56 would flocculate near the mid and lower portions of the tank 12, as shown in Fig. 4A.

When the jet system 10 is operating, as shown in Fig. 4B, the particulates 72 of the drilling fluid 56 are kept evenly distributed and suspended throughout the entire volume of drilling fluid 56 within the tank 12. The even distribution in suspension of particulates 72 is accomplished in the following manner. Drilling fluid 56 is suctioned from near the bottom wall 18 of the tank 12 out of suction line 22. The drilling fluid 56 is pressurized and pumped into jet line inlet 20. The drilling fluid 56 travels through the upper arm 40 and is redistributed into the mid and upper portions of the tank 12 through nozzles 44 on each half section 46 of the upper arm 40. The resulting jet stream 76 from pressurized drilling fluid 56 exiting the nozzles 44 on the upper arm 40 causes the particles to be suspended in the portion of the tank 12 above the upper arm 40. The drilling fluid 56 passes through the upper arm 40 into the center arm 58 and the lower arm 42. The drilling fluid 56 exits the lower arm 42 through the plurality of nozzles 44 on each half section 46 of the lower arm 42. The jet stream 76 of drilling fluid 56 exiting each nozzle 44 on the lower arm sweeps the bottom wall 18 of the tank 12 of particulates 72 to prevent flocculation of the particulates 72 on or near the bottom wall 18 of the tank 12. The jet stream 76 of drilling fluid 56 from nozzles 44 on the lower arm 42 also, because of their orientation as previously set forth, causes the lower arm 42 to rotate in the direction of the arrows 48 shown in Fig. 3. The rotation of the lower arm 42 helps sweep the bottom wall 18 of the tank 12 of particulates while keeping particulates 72 of the drilling fluid 56 suspended and evenly dispersed and mixed above the lower arm 42. Thus, as can be seen by the illustration in Fig. 4B, the jet system 10 using the upper arm 40 and the lower arm 42 suspends particulates 72 of the drilling fluid 56 within the tank by agitating the entire volume of drilling fluid 56. Moreover, the jet system 10 keeps the particulates 72 of the drilling fluid 56 evenly dispersed within the tank by redistributing the particulates 72 at or near the bottom wall 18 of the tank 12 through the upper arm 42; thus, particulates 72 are continually redistributed into the tank 12 above the upper arm 40. This is important as upright storage tanks such as the tank 12 shown in Fig. 5B are commonly 20 feet in height, thereby requiring a redistribution system such as the upper arm 40 in combination with jet streams 76 for suspending and agitating particulates 72 within the tank 12.

Fig. 6 shows another embodiment of the jet system 10. In Fig. 6, the upper arm 40 has half sections 46 attached to cross fitting 52. The half sections 46 of the upper arm 40 have a nozzle positioned at or near the outermost portion of each half section 46. The center line 58 attached to the upper portion of the cross fitting is connected to a swivel joint 60 so that both the upper arm 40 and the lower arm 42 rotate when the jet system 10 is operating. In operation, the upper arm 40 redistributes particulates 72 of the drilling fluid 56 within the tank 12, above the upper arm 40, as well as suspends and agitates the particulates 72 using jet stream 76 from nozzles 44 on each half section 46 of the upper arm 40. The lower arm uses jet stream 76 to sweep the bottom wall 18 of tank 12 and suspend particulates 72 of the drilling fluid 56 above the lower arm 40.

It is preferred that the pipe and fittings be constructed of a material capable of withstanding the corrosion effects of the chemicals within the drilling fluid. For example, the pipe and fittings could be fabricated from chromoly steel.

The preferred embodiment of this present invention has been set forth in the drawings and specification and those specific terms are employed, either used in the generically descriptive sense only and are not used for the purposes of limitation. Changes in the form proportion of parts as well as the substitution of equivalence are contemplated as circumstances may suggest or render expedient without departing from the spirit and scope of the invention as further defined in the following claims.

What is claimed is:

1. A jet system for keeping particulates of a drilling fluid evenly mixed within an upright storage tank having a sidewall, a top wall and a bottom wall, the jet system comprising:

a nozzle on each half section of a horizontally disposed upper arm;

a plurality of nozzles on each half section of a lower rotatable arm disposed adjacent the bottom wall for keeping particulates of the drilling fluid suspended above the lower arm; and

the upper arm for redistributing and suspending the drilling fluid from near the bottom wall of the tank above the upper arm to thereby keep particulates of the drilling fluid suspended throughout the entire volume of drilling fluid within the tank.

2. The jet system of claim 1 wherein the lower arm is in fluid communication with the upper arm.

3. The jet system of claim 1 wherein the upper arm is rotatable.

4. The jet system of claim 1 wherein the upper arm is positioned 9 feet from the bottom wall of the tank.

5. The jet system of claim 1 wherein each nozzle on the upper arm is positioned on outermost portions of each half section.

6. A method for keeping particulates of a drilling fluid evenly mixed and dispersed within an upright storage tank having a sidewall, a top wall and a bottom wall, the method comprising:

providing a jet system having a nozzle on each half section of an upper arm and a plurality of nozzles on a lower rotatable arm within the tank;

redistributing the drilling fluid at or near the bottom wall of the tank above the upper arm; and suspending particulates of the drilling fluid above the upper arm and the lower arm by agitating the entire volume of drilling fluid in the tank.

7. The method of claim 6 further comprising the step of angling the plurality of nozzles on the lower arm alternately upward and downward from vertical for rotating the lower arm and sweeping the bottom wall of the tank of settled particulates of the drilling fluid.

8. The method of claim 6 further comprising the step of angling each nozzle on the upper arm away from vertical for suspending and agitating particulates of the drilling fluid above the upper arm.

9. The method of claim 6 further comprising providing the nozzle on the upper arm being positioned on outermost portions of each half section.

10. A jet system for keeping a drilling fluid evenly mixed within an upright storage tank having a sidewall, a top wall and a bottom wall, the jet system comprising:
a drilling fluid inlet;
an upper arm horizontally disposed within the tank and in fluid communication with the drilling fluid inlet;
a nozzle positioned on outermost portions of each half section of the upper arm;
a lower arm horizontally disposed adjacent the bottom wall of the tank and in fluid communication with the upper arm;
a plurality of nozzles on each half section of the lower arm; and
the nozzle on each half section of the upper arm for redistributing the drilling fluid from near the bottom wall of the tank above the upper arm to thereby keep the drilling fluid evenly mixed.

11. The jet system of claim 10 wherein the nozzle on one half section of the upper arm is oriented upward at +15 degrees from vertical and the nozzle on the other half section is oriented upward -15 degrees from vertical.

12. The jet system of claim 10 wherein one half section of the upper arm is operatively attached to the sidewall of the tank.

13. The jet system of claim 10 wherein one half section of the upper arm egresses the sidewall of the tank.

14. The jet system of claim 10 wherein half sections of the upper arm are connected with a tee fitting.

15. The jet system of claim 14 wherein a center arm being vertically disposed is connected to the tee fitting.

16. The jet system of claim 15 wherein the lower arm is rotatably mounted to the center arm using a swivel joint.

17. The jet system of claim 16 wherein a cross fitting connects half sections of the lower arm to the center arm and a cap fitting.

18. The jet system of claim 17 wherein the cap fitting is operatively housed within a seat on the bottom wall of the tank.

19. The jet system of claim 18 wherein the cap fitting rests on top of a wear plate within the seat on the bottom wall of the tank.

20. The jet system of claim 10 wherein the plurality of nozzles on one half section of the lower arm are oriented alternately upward +12 degrees and downward -12 degrees from vertical.

21. The jet system of claim 20 wherein the plurality of nozzles on the other half section of the lower arm are oriented alternately downward +12 degrees and upward -12 degrees from vertical.

22. The jet system of claim 10 wherein the plurality of nozzles on the lower arm are oriented to cause the lower arm to rotate.

23. The jet system of claim 10 wherein an elbow fitting egresses the sidewall near the bottom wall of the tank for suctioning the drilling fluid near the bottom wall to be pumped back into the tank through the drilling fluid inlet.

24. The jet system of claim 10 wherein half sections of the lower arm extend outward to a position adjacent the sidewall of the tank.

25. The jet system of claim 10 wherein the upper arm is rotatably mounted to a swivel joint for rotating the upper arm and the lower arm.

26. A method for keeping particulates of a drilling fluid evenly mixed and dispersed within an upright storage tank having a sidewall, a top wall and a bottom wall, the method comprising:

providing a jet system having an upper arm horizontally disposed within the tank, a nozzle positioned on outermost portions of each half section of the upper arm, and a lower arm horizontally disposed adjacent the bottom wall of the tank having a plurality of nozzles on each half section;

suctioning the drilling fluid from the tank at or near the bottom wall;

pumping the drilling fluid into the upper arm and the lower arm;

redistributing the drilling fluid within the tank using each nozzle on the upper arm and the plurality of nozzles on the lower arm; and

suspending particulates of the drilling fluid within the tank by agitating the entire volume of drilling fluid with each nozzle on the upper arm and the plurality of nozzles on the lower arm to thereby keep the drilling fluid and particulates evenly mixed.

27. The method of claim 26 further comprising providing a swivel joint between the upper arm and the lower arm.

28. The method of claim 27 further comprising the step of rotating the lower arm using the plurality of nozzles.

29. The method of claim 26 further comprising the step of sweeping particulates of the drilling fluid from off the bottom wall using the plurality of nozzles.

30. The method of claim 26 further comprising the step of disrupting and suspending particulates of the drilling fluid above the upper arm using the nozzle on each half section of the upper arm.

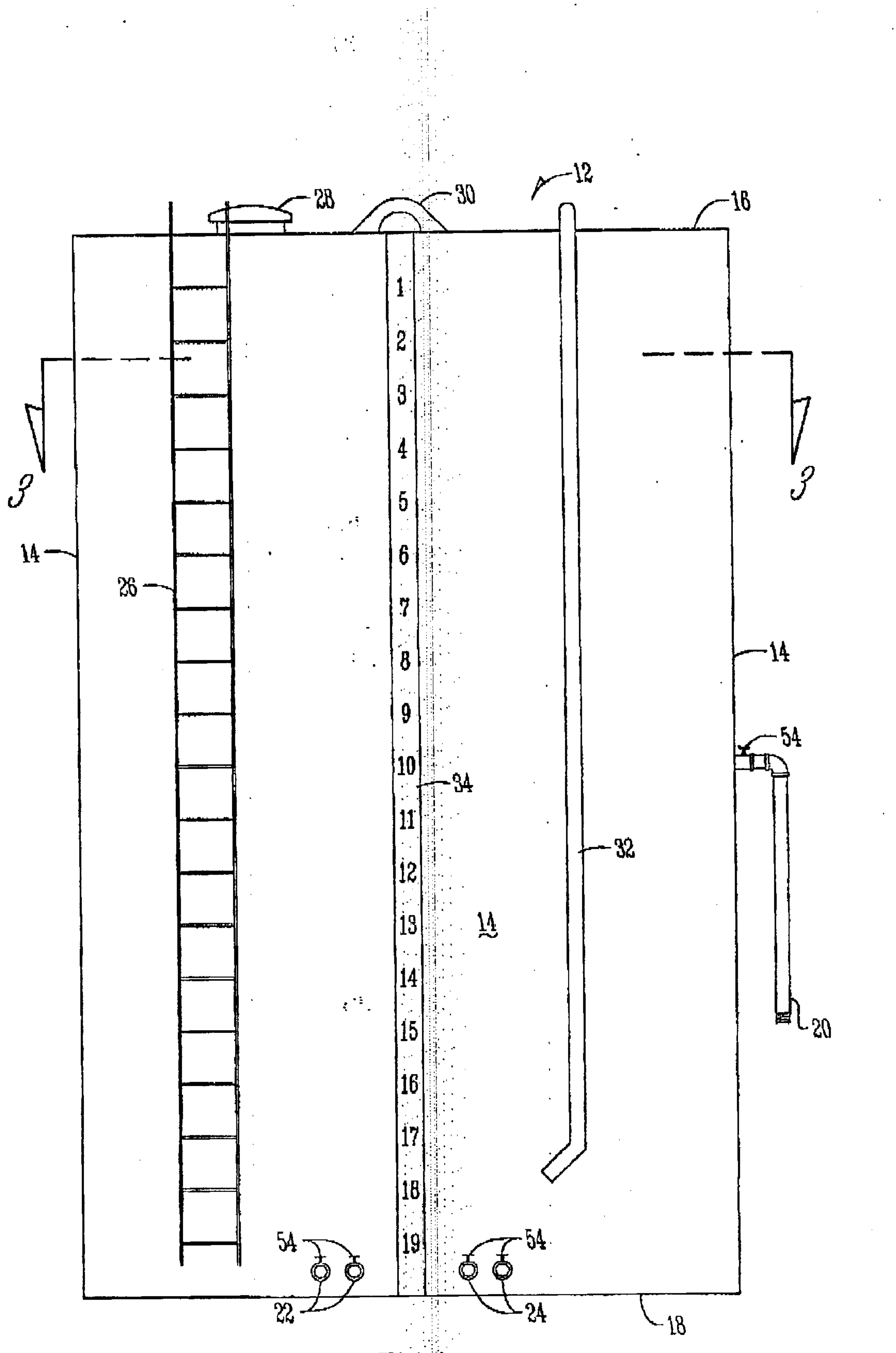

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Fig.1

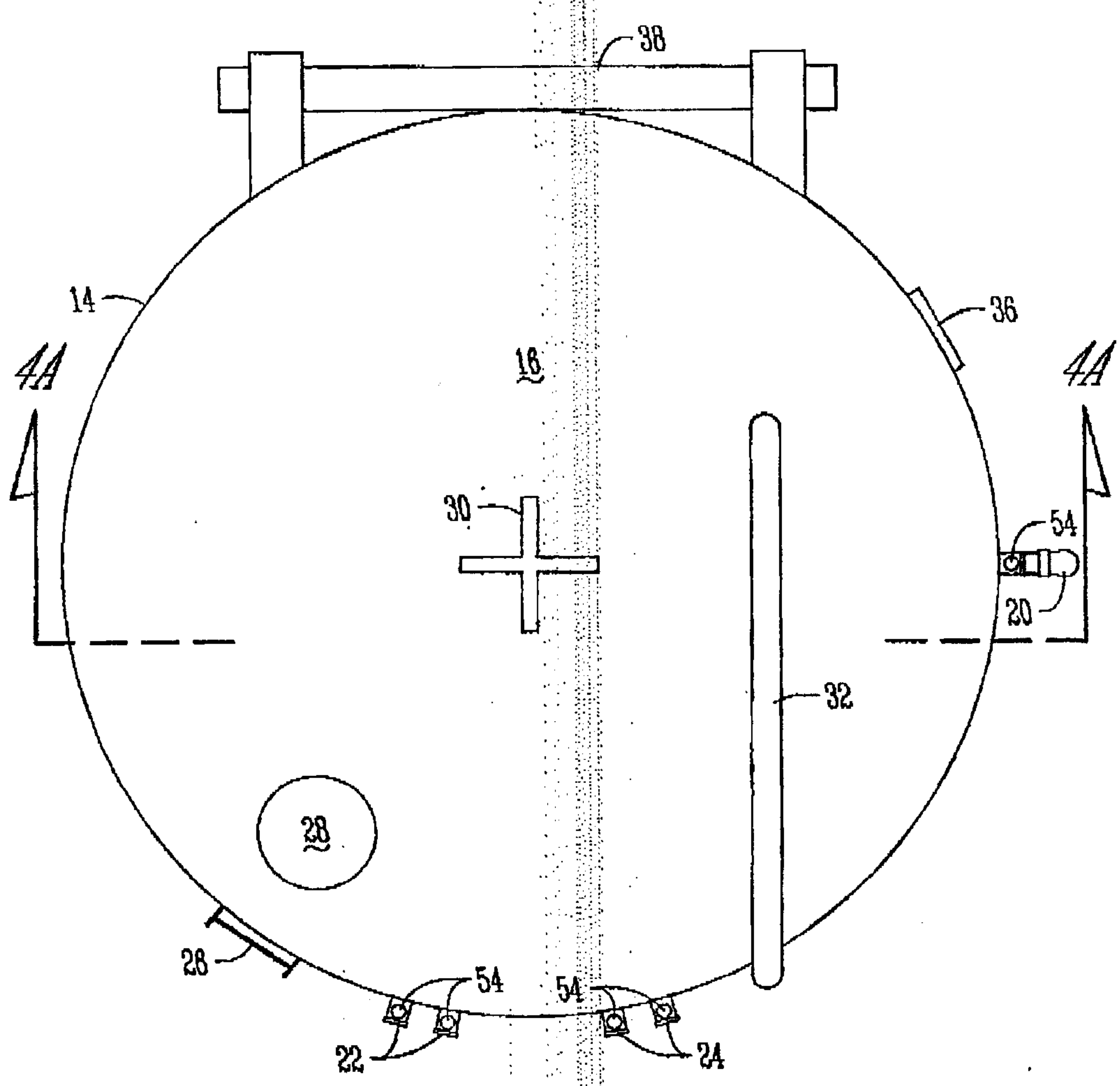

Fig.2

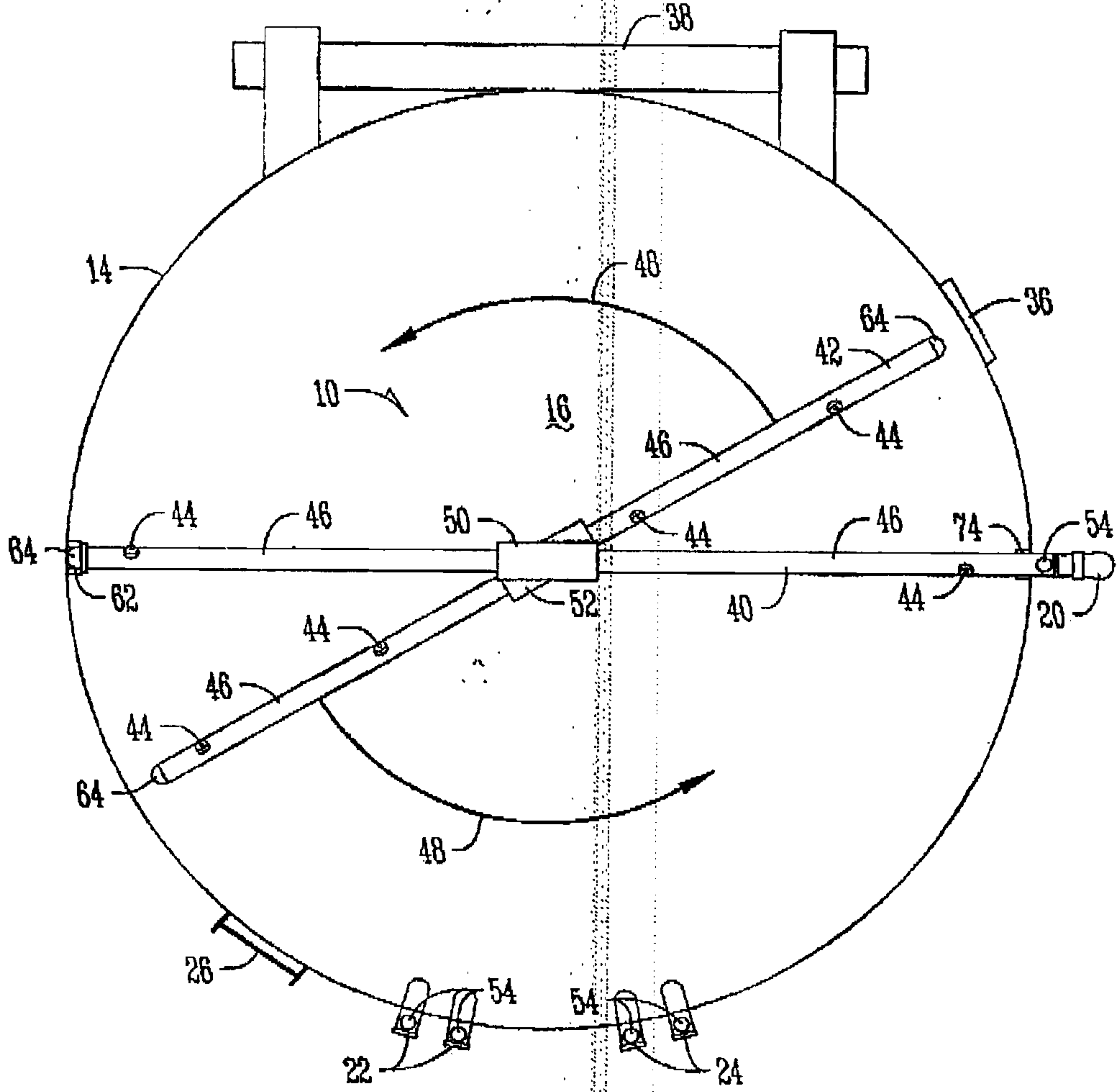
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Fig.3

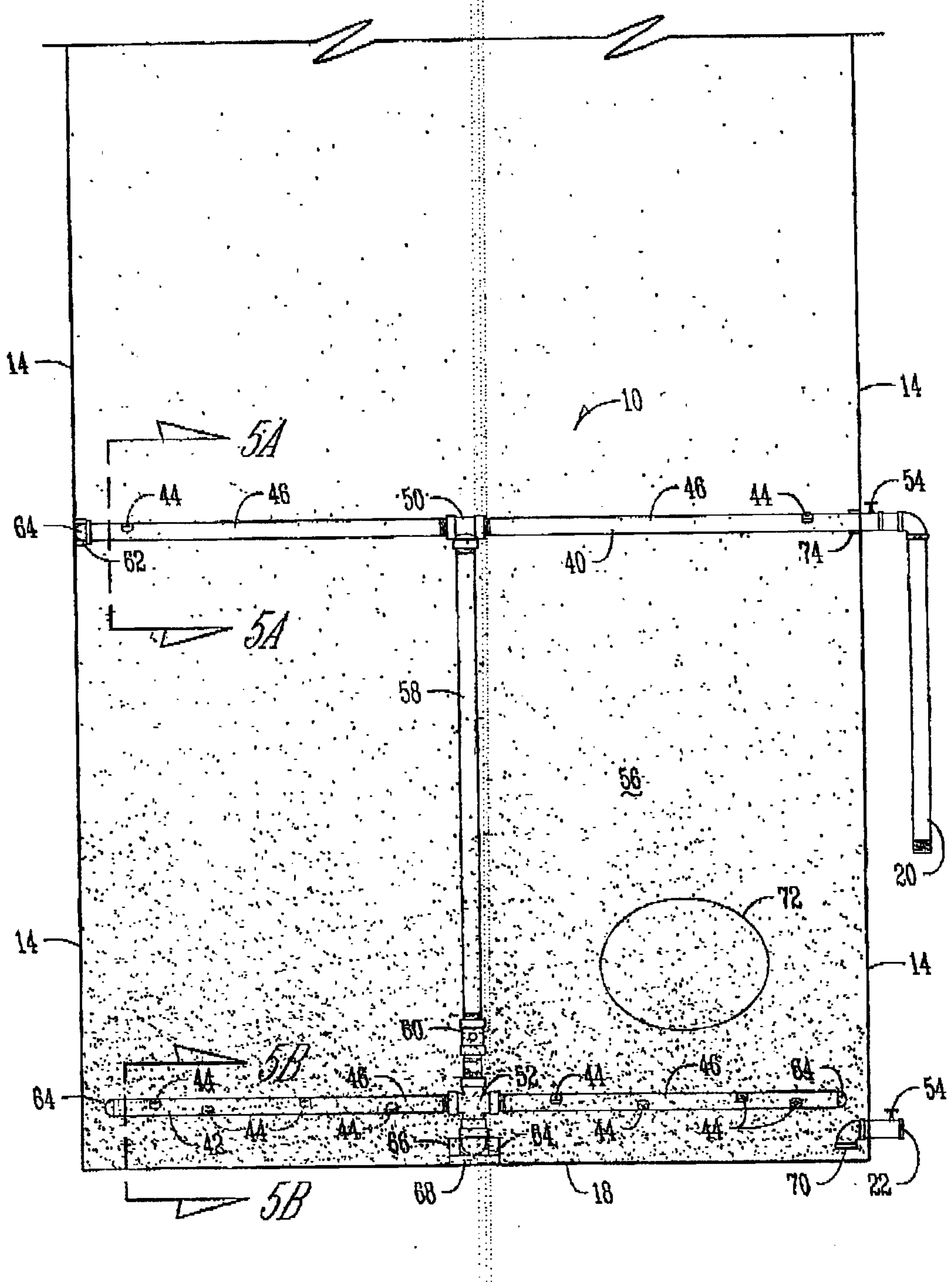
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Fig. 4A

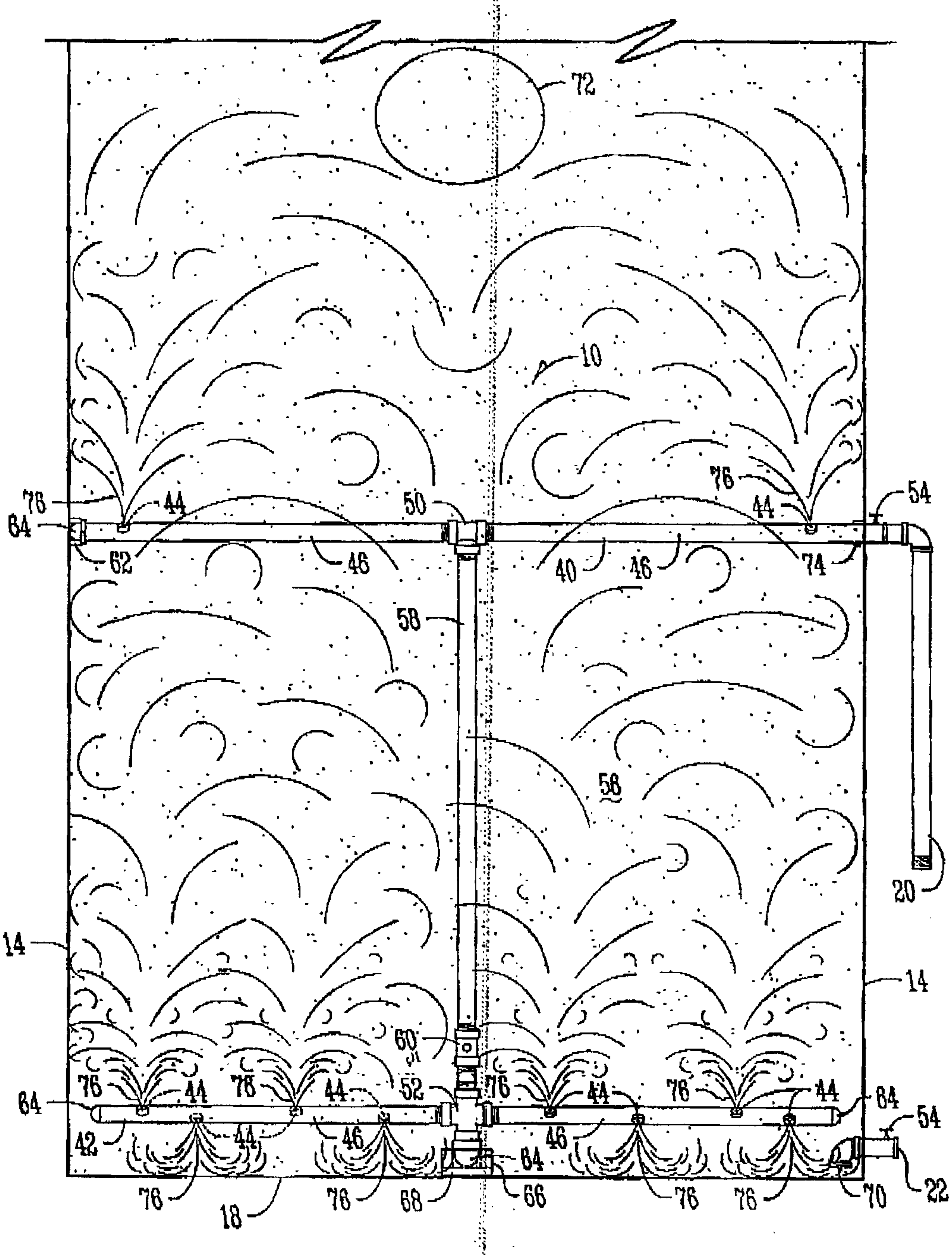

Fig.4B

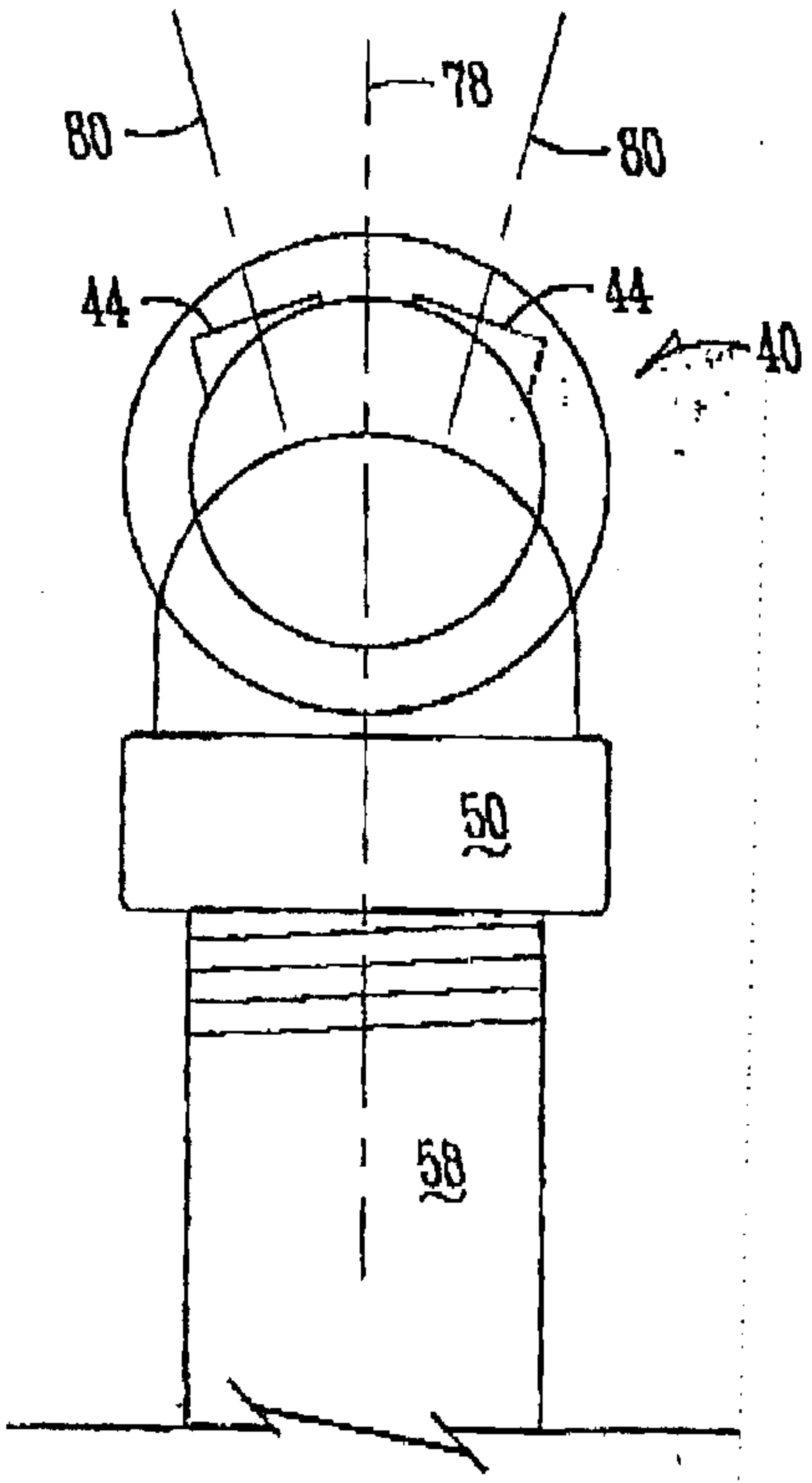

Fig.5A

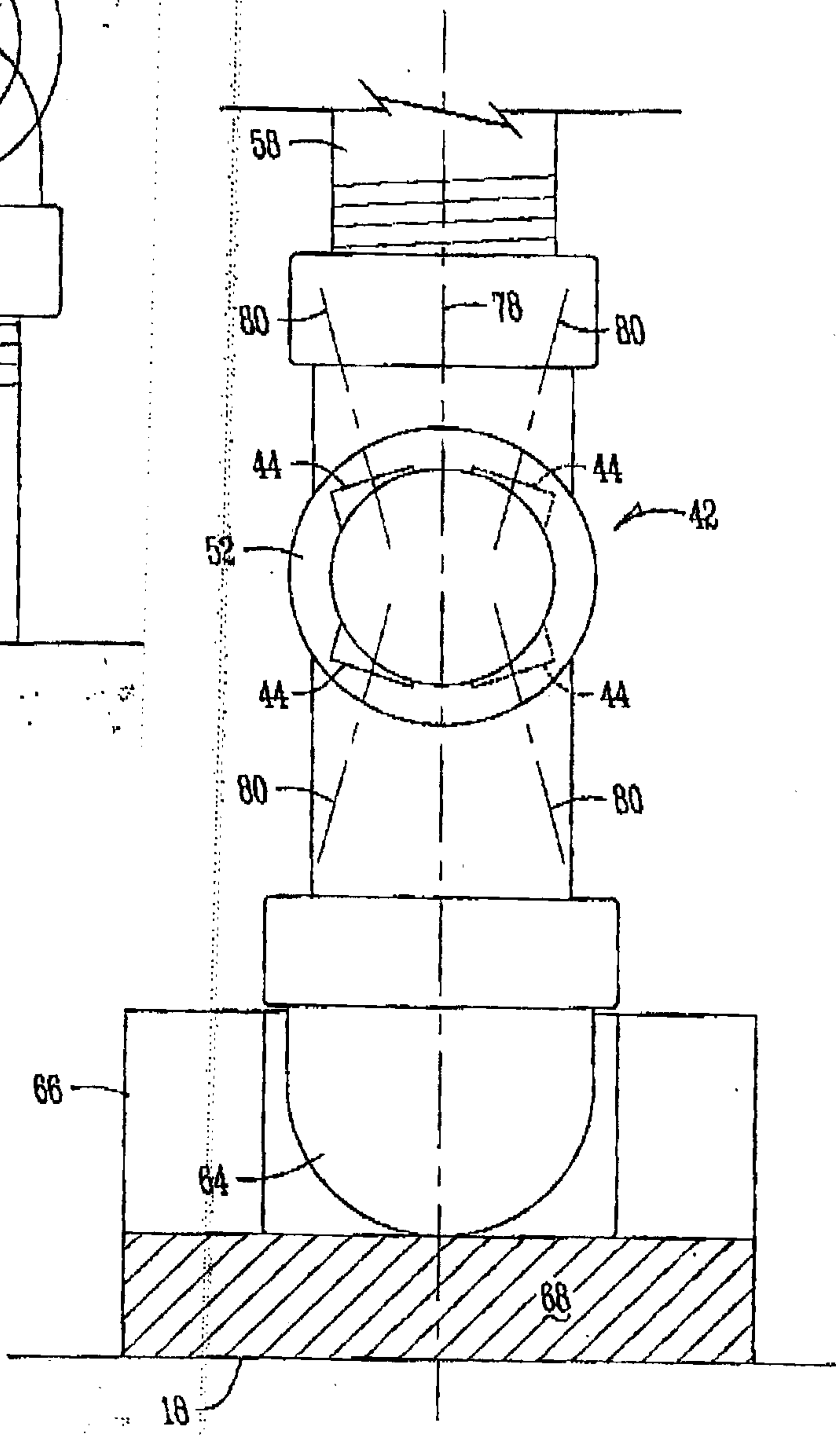

Fig.5B

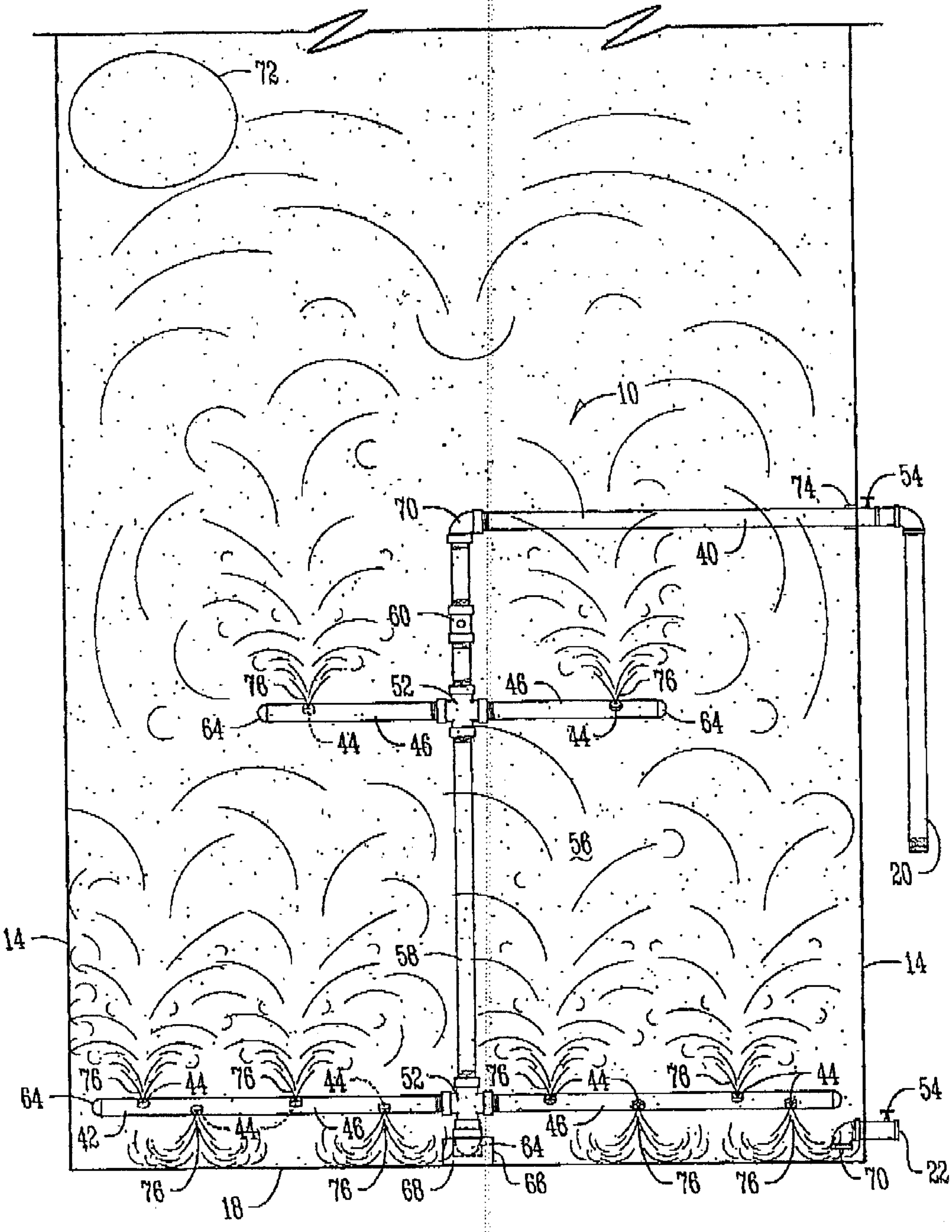
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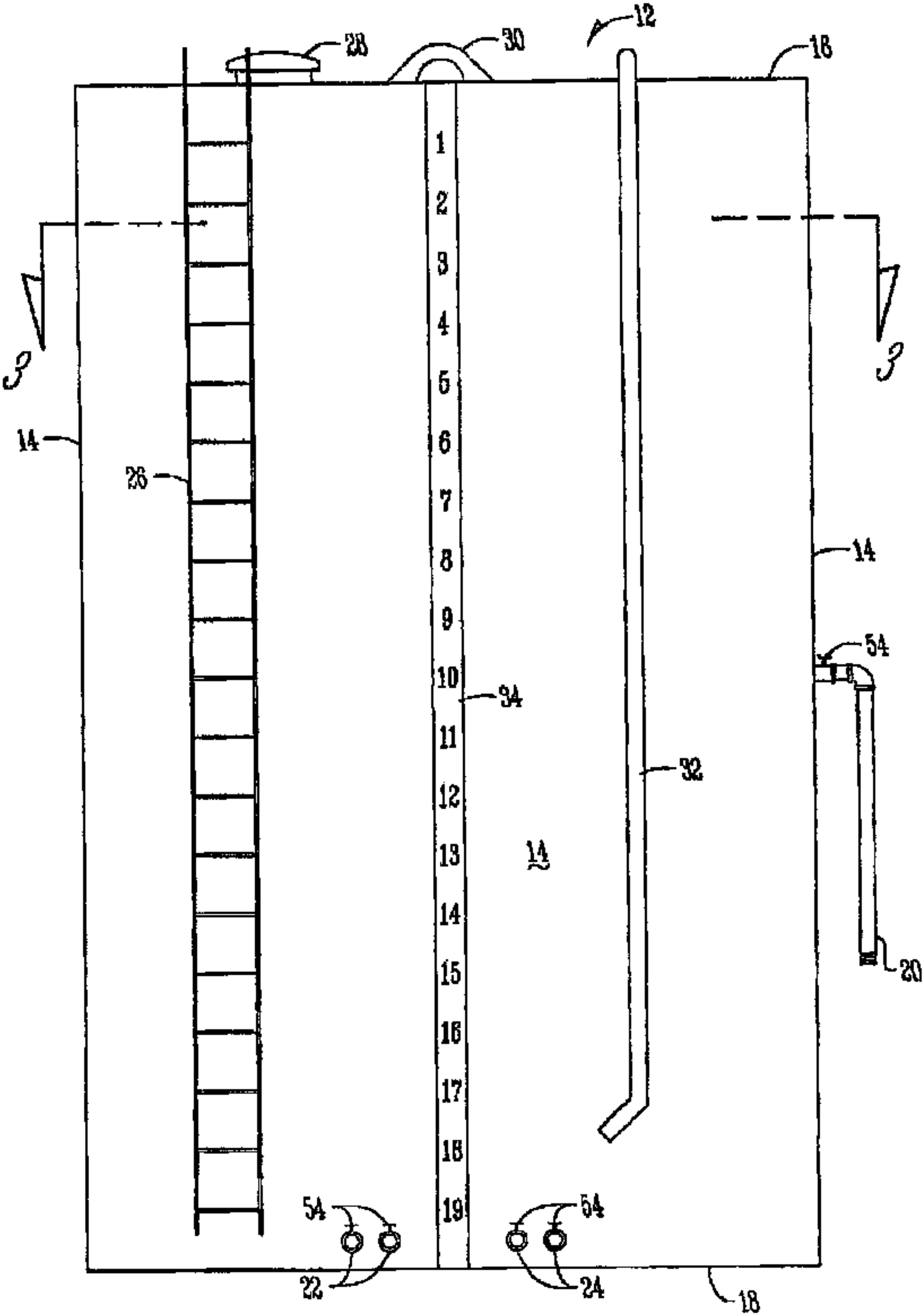
Fig.6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