CORNER SWEEPING MEANS FOR CLARIFICATION BASINS

Figure 1
This invention relates to a noncircular, cornered liquid treating basin, such as a clarification basin, wherein one or more liquid distributing conduits or arms are rotatable about the basin axis, and more particularly to means for keeping the portions of the basin outside the circular area over which the arms travel free of deposit.

It is an object of this invention to provide a device of the type referred to which is simple and economical in construction and efficient in operation.

Another object is to provide hydraulic means for sweeping free of deposits the portions of a tank outside the rotary path of travel of the rotating distributing conduits.

Another object is to provide a device for hydraulically cleaning the corner areas of a square tank.

Another object is to provide a hydraulic corner-sweeping device which is automatically actuated when its associated distributing conduit or arm approaches a corner area, and automatically stopped when the conduit travels along, and in proximity to, a wall of the tank or basin.

Other objects will become apparent upon consideration of the detailed description and of the claims which follow.

In liquid treating basins utilizing rotating distributing conduits or arms for uniform distribution of the liquid entering for treatment, the belt area subjacent the path of travel of the distributing conduits usually is kept free from deposits, either by mechanical or by hydraulic means. For example, to clean the bottom mechanically, scraper blades are suspended from the arms and rotate with them adjacent the bottom, moving solids deposited on the floor of the basin to a depression or sump, from which they are withdrawn. Hydraulic sweeping of the bottom area underneath rotating distributing conduits has been disclosed in United States Patent No. 2,673,181.

When the basin is circular, such mechanical or hydraulic sweeping can be effected by relatively simple means, but when the rotating mechanism is installed in a noncircular cornered basin, such as a square basin, cleaning the area outside the circular path of the distributing arms poses a serious problem. Various auxiliary corner scraping devices have been used in connection with mechanically cleaned basins, all of which have in common that they involve relatively complicated structures.

The present invention is designed to provide simplified means for cleaning the corner areas of a noncircular basin, which can be used in conjunction with mechanical as well as hydraulic sweeping of the circular area below the rotating conduits. To this end I provide an outlet port at the outer end of some or all of the rotating distributing conduits so that liquid is discharged outwardly therefrom over the areas outside the circular path.

If liquid were allowed to discharge from this outlet port during the entire path of rotation of the conduit, the liquid would strike violently against the basin wall when an arm passes along the wall, and the resulting boil-up would carry considerable disturbance into the quiescent clarification zone. I therefore provide valve means which are automatically operated to close the outlet port as the distributing conduit passes along a wall of the basin, and to open it as the conduit passes an area outside its rotary path.

The invention will be more readily understood by reference to the drawings which form a part hereof and wherein:

Figure 1 is a diagrammatic horizontal sectional view of the lower portion of a basin with rotary distributor arms utilizing the invention;

Figure 2 is a plan view, on an enlarged scale, of the valve assembly of Figure 1;

Figure 3 is a sectional view along line 3—3 of Figure 2; and

Figure 4 is a partial diagrammatic plan view of rotary distributor arms utilizing a modified valve assembly.

The liquid treating basin 10 diagrammatically shown for purposes of illustration in Figure 1 has a bottom 11 and four upstanding, substantially equal walls 12, 13, 14 and 15 at right angles to each other. Fills 16 are provided in the corners formed by the basin walls. An inlet well 17 receives the liquid to be treated through an inlet conduit 18. A sump 19 is provided in the bottom 11.

A plurality of liquid distributing arms or conduits 25 are rotatably supported in the basin by any suitable means. As shown in Figure 1, the conduits 25 extend from the inlet well 17 across the basin 10. While six conduits 25 are shown in the drawing for purposes of exemplification, a greater or smaller number can be used, depending on the size of the basin. In the diagrammatic showing of Figure 1 it may be assumed that the inlet well is rotatable and driven by any suitable means, not shown, and that the conduits 25 are affixed to, and rotatable with, the well. However, the conduits 25 can be supported by other means, such as, for example, a rotatable member surrounding the inlet well and receiving liquid therefrom, as shown and described in United States Patent No. 2,673,181.

The length of the conduits 25 is such that they are in proximity to the basin walls when they pass their center portions. The conduits 25 are in hydraulic communication with the inlet well 17 through their inner ends, and have liquid discharge orifices 26 which are suitably sized and spaced along the conduits to provide for a substantially uniform distribution of liquid over the area served. Solids depositing on the bottom 11 are moved to the sump 19 either by scrapers, not shown, which may be attached to the distributing conduits 25 and rotate with them, or hydraulically by directing the discharge from the conduits 25 downwardly so as to create an inwardly sweeping current of liquid which moves the solids to the sump, as described in United States Patent No. 2,673,181.

As shown in Figure 1, some of the arms 25 have closed outer end walls 27, while others are provided with a port 28 in their outer end wall 27 through which liquid can discharge. Preferably, alternate arms will be fitted with closed ends and with ports, respectively. To provide a high discharge of liquid from the end ports, the arms with such ports preferably have a reduced number of orifices 26 or may not have any orifices.

To prevent liquid discharging from the ports 28 against a wall of the basin, a valve member 30 is provided for each port, and means for automatically holding the valve member seated on the port while the outer end of the respective arm travels in proximity to a wall, and for holding it unseated while the arm approaches and passes a corner area. As clearly shown in Figure 1, the arm...
25c travels in proximity to the wall 14 and its port 28 is closed by valve member 30. Arm 25b is just leaving a corner area and approaching wall 13. Its valve member 30 is still open but will be closed after a short further clockwise travel. Arm 25c is passing the corner area between walls 15 and 12 and, accordingly, its valve member 30 is unseated and will remain unseated until the arm has reached the proximity of wall 12.

The means for automatically seating and unseating the valve member are shown for one conduit in detail in Figures 3 and 5. As there shown, fulcrum bracket 41 is affixed to the conduit 25 and provided with a slot 33. An arm 35 is pivotally supported from the conduit 25 by a pin 36 which passes through the slot 33 of fulcrum bracket 32. One end of the arm 35 is bifurcated, as shown in Figure 3. A roller 37 is mounted between the fork ends of the arm 35, and is free to revolve about its axis.

The valve member 30 is pivoted on the roller arm 35 intermediate the roller 37 and the fulcrum point of arm 35. A clevis 38 is pinned to the other end of roller arm 35.

Fixed to the conduit 25 is a spring guide 40 provided with an opening 41 through which a spring rod 42 passes. One end of the spring rod 42 is rigidly connected to the clevis 38 and is held in place by means such as a nut 43. A compression spring 45 is placed upon the spring guide 40 and bears with one end against the spring guide 40 and with the other end against an adjustable spring seat 46, which passes over the spring rod 42. The spring seat 46 is adjusted along the free end portion of the rod 42 and held in place by an adjusting nut 47 and a locking nut 48. A stop 49 is provided to limit the movement of the arm 35.

In operation, when the outer end of a conduit 25 provided with a port 28 is adjacent to one of the walls of the basin, such as conduit 25a in Figure 1, the respective roller 37 engages the basin wall and holds its arm 35 at right angles to the longitudinal axis of the conduit 25, as shown in full lines in Figure 2, against the force of the spring 45, which, in this position of the arm 35, is compressed between the spring guide 40 and the spring seat 46 and urges the arm 35 to swing about its fulcrum point and unseat the valve member 30. As long as the arm 35 is in this position, the valve member 30 is firmly seated on the port 28, and no liquid is discharged through the port.

As the conduit 25c continues to rotate clockwise from the position shown in Figure 1, the distance between the outer end of the conduit and the wall 14 increases. As soon as this distance is sufficiently large that the roller 37 is no longer in contact with wall 14, the compression spring 45 expands and swings the arm 35 about its pivot to the position shown in dotted lines in Figure 2. In this position of the arm 35 the valve member 30 is unseated, allowing liquid to be discharged through the port 28 over the bottom of the respective corner area of the basin to sweep it free of deposits.

The valve assembly shown in Figure 4 is somewhat simpler with respect to the valve opening means, but has the same valve closing means as shown in Figures 1 to 3. As in Figures 1 to 3 the assembly includes an arm 35 pivotally supported on a fulcrum bracket 32 affixed to the conduit 25, a valve member 30 supported on the arm 35 and closing the port 28 of the conduit 25 when the arm is at right angles to the longitudinal axis of the conduit 25, as shown at the left of Figure 4, and a roller 37 mounted at one end of the arm 35 for rolling engagement with a wall of the basin while the conduit travels along a radius.

In this embodiment an extension spring 55 is used for opening the valve and is fixed with one end to the end of arm 35 opposite the roller 37, and to a bracket 56 on the conduit 25 with its other end. The spring 55 is extended when the arm 35 is in valve closing position.
discharge port at their outer end, the combination with each discharge port of a valve assembly comprising a valve member adapted to close said port, an arm supporting said valve member, said arm being pivotally supported from said conduit, a roller carried by said arm and, while said conduit moves along a basin wall, engaging said wall, said arm holding said valve seated on said port when said roller engages successive walls of said basin, and a spring operatively connected to said arm and adapted to swing said arm through an angle about its pivot to valve open position when said roller is out of contact with a basin wall.

5. In a noncircular, cornered liquid treating basin having a bottom and four upstanding walls and means for collecting solids deposited on said bottom and withdrawing them from said basin, a plurality of distributing conduits rotatable about the vertical axis of said basin, each conduit having at its inner end inlet means for liquid to be treated in hydraulic communication with a source of liquid to be treated, some of said conduits having a discharge port at their outer end, the combination with each discharge port of a valve assembly comprising a valve member adapted to close said port, an arm supporting said valve member, said arm being pivotally supported from said conduit, a roller mounted at one end of said arm and engaging successive walls of said basin while said conduit moves along said walls, said arm holding said valve seated on said port when said roller engages a wall of the basin, a rod pinned to the other end of said arm, a spring guide affixed to said conduit, said rod passing through said spring guide, a spring seat positionable along the free end portion of said rod and movable therewith, and a compression spring between said spring guide and said spring seat.

7. In a basin of the type described, a conduit rotatable about the vertical axis of said basin, said conduit having a liquid inlet at its inner end adapted for hydraulic communication with a source of liquid, a port in the outer end of said conduit, a valve member adapted to be seated on and close said port, an arm supporting said valve member, said arm being pivotally supported intermediate its ends from said conduit, a roller rotatably mounted on said arm on one side of its pivot point for engagement of a basin wall while said conduit travels along said basin wall, and an extension spring connected with one end to said arm on the other side of said pivot point, and to said conduit with its other end.

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