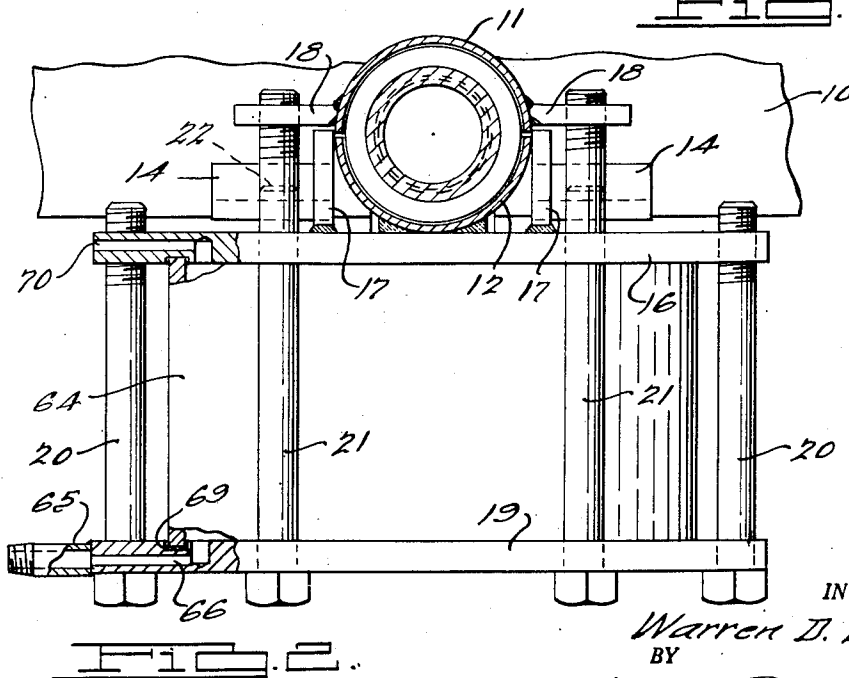
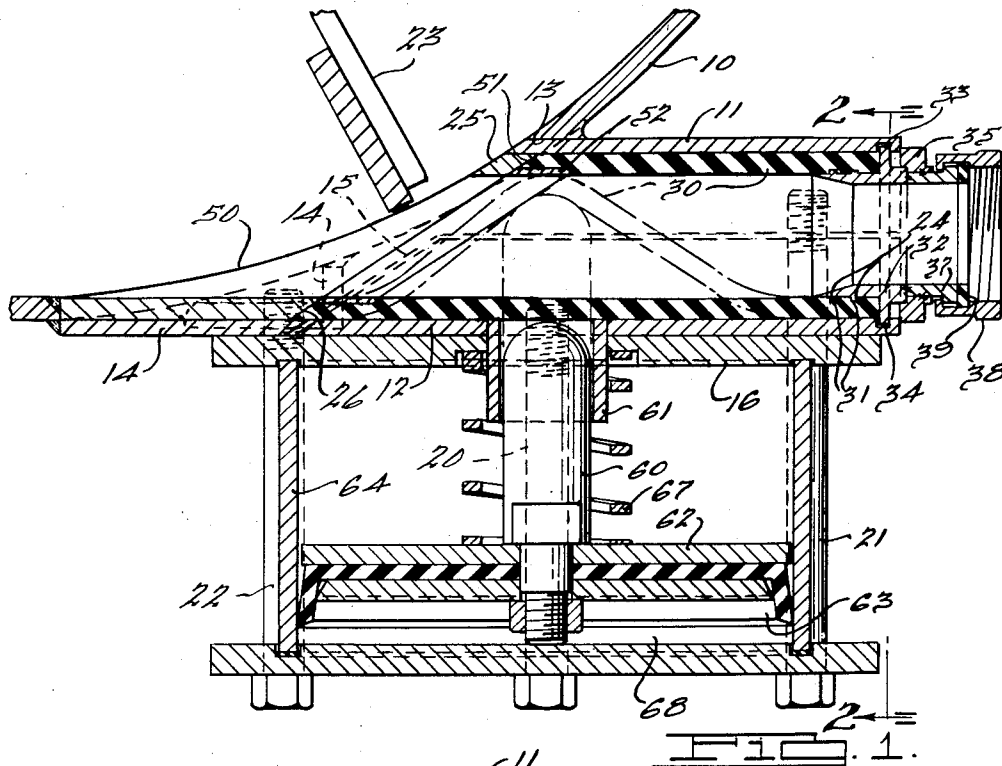


W. D. BROWN
NON-CLOGGING OUTLET VALVE FOR TANK FOR
MIXING CEMENTITIOUS MATERIALS
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INVENTOR.
Warren D. Brown.
BY
Harness, T. Dickes & Pierce
ATTORNEYS.

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NON-CLOGGING OUTLET VALVE FOR TANK FOR MIXING CEMENTITIOUS MATERIALS

Warren Durand Brown, Detroit, Mich.

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7 Claims. (Cl. 222—212)

The present invention relates generally to the mixing of cementitious materials. More specifically, the invention relates to a non-clogging outlet valve for tanks used for both the mixing of cementitious materials and the dispensing of same under pressure.

Cement, concrete mixtures, mortar, plaster and other cementitious mixtures are sometimes mixed in tanks by means of agitators, or by tumbling or rotating the tank, and the completed, uniform mixture conveyed to the point of use by pressurizing the mixing vessel and forcing the mix through tubes, hoses or piping. In some cases, the mix is prepared in one tank and then transferred to a second tank to which pressure is applied for transporting the material to the place where it is to be used. In either case a valve is required on the discharge line adjacent to the mixing tank, which is commonly of the folded rubber tube type, to control the movement of material in the discharge line subsequent to pressurization.

When cement, sand, aggregate and water are dumped into a mixing tank with a revolving agitator, the mixture is non-homogeneous for a period of several minutes. A plug of the imperfectly mixed material is likely to form in the discharge opening and prevent movement of the charge through the discharge line by the pressure in the tank. Even if the discharge opening is not plugged, unmixed ingredients collected in the discharge opening are likely to be carried into the discharge line with the charge to cause plugging elsewhere in the lines wherever a restriction of some sort is encountered. In two tank systems, the rubber valve between the tanks contains no restriction and the discharge line is short so that plugging is less likely to occur. In single tank machines, however, the discharge line valves previously used, even if containing little restriction in themselves, are placed of necessity a few inches behind the tank outlet to accommodate coupling, so that unmixed material, which is swept into the discharge line by the action of the revolving mixer blades, often forms a plug at this point which necessitates "blowing back" for removal. "Blowing back" consists of discharging the mixing tank air pressure, and then applying a high air pressure to the far end of the hose or piping so that the pressure differential will force the plug back into the swirling mass. If the plug formed by the mixing action does not jam or wedge in the opening, it will travel inside the pipe under the air pressure until some restriction in cross-sectional area, or sharp bend in the hose is reached, and there form a wedge which is often extremely difficult to remove if it cannot be blown back immediately. Even though it does not harden by setting of the cement, the time required to locate the plug, remove the section of hose containing it, and then slowly washing it out, often amounts to an hour or more. It can be seen that such manipulation is extremely costly in a labor saving device of this sort where a large volume of material must be mixed and forced continuously through the hose to the discharge nozzle location in order to make it economical. "Blowing back" is costly,

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and anything which will cause a "plug" in the hose must be avoided.

Plugging can occur in the discharge line from two tank systems as well, if the unmixed lump does not get broken up before being swept out through the second tank outlet, and so a valve of my new design is useful, also, as the valve between the two tanks. Two tank systems are more expensive than one tank system, and are used principally on the larger projects.

Also, when a cement tank has been blown, a small amount of the mix is generally left in the valving mechanism where it has the opportunity to set slightly before the next charge is blown. This also leads to plugging of lines and interference with valve operation.

It is a principal object of this invention, therefore, to provide a non-clogging outlet valve for tanks for mixing cementitious materials, and particularly for tanks adapted also for dispensing such material under pressure.

It is a further object of this invention, therefore, to provide a valve in tanks for mixing cementitious materials which will prevent formation of clogging formations and unmixed ingredients in the inlet portion of the valve.

A still further object is to provide a non-clogging valve which is self-cleaning, that is, which will not only prevent collection of poorly mixed or partially set mixtures but which also will return residual mixture therein to the tank for mingling with a subsequent charge therein.

A yet further object is to provide a simple, rugged and non-clogging valve for cement tanks which may be readily attached to already existing tanks and other cement-handling equipment and which is readily serviced, inspected and maintained.

Still other objects and advantages will be apparent, or will become apparent, from the following more detailed description of the invention, when taken in conjunction with the drawings, in which:

Figure 1 is a fragmentary elevational view, with portions broken away, showing a portion of a tank wall and a valve of this invention attached thereto; and,

Figure 2 is a front view, partially in section, showing positioning of the valve of Figure 1, the view being taken along the line 2—2 of Figure 1.

Referring now to the drawings, it will be seen that the tank 10 has a curved wall and is provided with a revolving agitator blade 23. Near its lowermost point the tank 10 is provided with an aperture 13 in which is mounted a valve embodying the improvements of the present invention. The valve includes a tubular casing 11 which is received in the aperture 13 and secured to the tank 10 by a continuous weld extending completely around the tubular casing 11 to form a complete seal between the casing 11 and the tank 10. The casing 11 includes a separate lower section 12 which may be formed by cutting the tubular casing along the line indicated by the reference character 15 which extends longitudinally along the casing from its right-hand end, as viewed in Figure 1, to a point spaced from the tank 10, and thence downwardly with a slope approximating that of the tank wall at the aperture 13. Two short angles 14 are mounted on the tank 10 at opposite sides of the casing 11 by welding the ends of their horizontally and vertically extending flanges to the tank 10.

The lower casing section 12 is welded to the upper side of a horizontally disposed plate 16 which extends in spaced relation below the horizontal flanges of the angles 14. Two supports 17 are mounted on the plate 16 and extend upwardly therefrom to engage the casing section 12 at opposite sides thereof to provide additional support therefor. Two supporting brackets 18 are welded to the main or upper portion of the casing 11 adjacent the outer or right-hand end of the casing 11 as seen in Figure 1. A second plate 19 is disposed in spaced, parallel

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relation below the plate 16 and secured thereto by a pair of bolts 20. The assembly comprising the lower casing section 12, the plates 16 and 19 and the herein-after described parts carried thereby is supported from the angles 14 and the supporting brackets 18 by a first pair of bolts 21 which extend through the plates 16 and 19 and into tapped openings provided in the supporting brackets 18, and a second pair of bolts 22 extending through the plates 16 and 19 and into tapped openings provided in the horizontal flanges of the angles 14. It will now be seen that in the above described construction the lower casing section 12 and the main casing 11 will be forced together by tightening the bolts 21 and 22.

A flexible resilient liner is disposed within the casing 11 and may be made of rubber, plastic or other suitable material. The outer or right-hand end of the liner 30 is anchored relative to the right-hand end of the casing 11, as viewed in Figure 1, by a sleeve member 32 extending into the outer end of the liner 30 and provided with annular radially outwardly projecting flanges 24 which are received in complementary grooves 31 formed in the inner surface of the liner 30. The sleeve member 32 is also provided with a larger radially outwardly extending flange 33 which overlies the outer end of the liner 30 and its outer marginal portion is received in an annular groove 34 formed internally of the casing 11, adjacent its outer end, the lower part of the groove 34 being formed in the lower section 12 of the casing. Outwardly of the flange 33 the sleeve member 32 is brazed or welded to an annular retaining collar 35 which is also secured to the male portion 37 of a pipe union or other connecting device. Male portion 37 of the union fits inside a female coupling member 38 having an inner gasket or sealer ring 39 to provide a tight seal with the other half of the coupling, not shown. By this construction, the sleeve member 32 is held in place by collar 35 engaging the ends of the casing members 11 and 12 and when these are forced together, the outer end of the liner 30 is sealed against leakage of materials from the tank 10, the interior of which is at times under a pressure of the order of 100 lbs. per square inch or more.

The liner 30 is also sealed about the tank discharge opening 13 in a novel manner. At its inner end 51 the liner 30 is inclined with a slope substantially equal to the sloped portion of cut line 15 between the casing sections 11 and 12. It will be noted that the liner 30 extends slightly beyond the cut line 15 so that the inner end 51 of the liner 30 is disposed wholly within the main section of the casing 11. The casing 11 also includes a portion 25 disposed adjacent the end 51 of the liner 30 and providing an annular shoulder 26 against which the end 51 of the liner 30 is abutted. In the preferred embodiment illustrated, this casing portion 25 is formed of a short tubular piece securely mounted in the main tubular casing portion 11 at its inner or left-hand end as viewed in Figure 1 and having its inner end arcuately formed as indicated at 50 to form a continuation of the inner surface of the tank 10.

The casing portion 25 has an internal diameter substantially equal to forming a continuation of the passage defined by the liner 30. The liner 30, adjacent its inner end 51 is anchored in abutting relation with casing portion 25 by a tubular ferrule 52 which also serves to prevent collapsing of liner 30 at its inner end 51 and provide a seal between the inner end 51 of the liner 30 and the tubular casing 11. The ferrule 52 has an internal diameter substantially equal to the internal diameter of the liner 30 when the latter is in its free condition, and is received within the liner 30 at the end 51. The ferrule 52 extends parallel to the liner end 51 and has an axial extent such that, and is so disposed that it overlies the inclined portion of the parting line 15 between the casing sections 11 and 12. It will thus be seen that tightening

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of the bolts 21 and 22 will grip the portion of the liner 30 adjacent the end 51 between the ferrule 52 and the casing parts 11 and 12 and press the liner end 51 against the abutting surface 26 of the casing portion 25, thereby securely anchoring the inner end of the liner 30 and preventing leakage between the liner 30 and the casing parts 11 and 12.

Closure of the valve of this invention is effected by displacing the bottom portion of liner 30 upwardly until it assumes a position as indicated in dotted lines in Figure 1. In this position, the top inner tubular surface of ringlike element 52 functions as a seat against which the closure of the tubular liner is effected. Lifting of liner 30 is effected by a pistonlike finger 60 mounted below the plate 16. The finger 60 is fitted within a guide sleeve 61 which is extended upward through plate 16 and lower casing member 12. Vertical movement of the finger 60 is effected by a piston 62 attached to finger 60. The piston 62 has a flexible sealer element 63 of leather or rubber to insure sealing thereabout within a cylindrical casing or cylinder 64 carried between plates 16 and 19. Air, steam, hydraulic fluid or other pressurized fluid is introduced under piston 62 through an inlet line 65 and a passageway 66 bored in plate 19. Return to the lower rest position is accomplished by a compression spring 67 positioned around finger 60 and between guide collar 61 and piston 62. The space 68 is made airtight by means of a ringlike gasket 69 located in a circular recess formed in the upper side of plate 19 and receiving the lower edge of cylinder 64. An airtight seal above piston 62 is not required, in fact, an air vent passageway 70 is provided in upper plate 16, as is shown in Figure 2, in order to facilitate up and down movement of piston 62.

As indicated above, the introduction of air or other fluid under pressure under piston 62 raises finger 60, forcing it upwardly through sleeve 61 and into contact with liner 30. At its point of fullest extension, the finger 60 forces the lower half of the liner 30 into sealing engagement against a part of the inner circumference of ringlike element 52 and a part of the inner surface of the upper half of the liner 30.

When the finger 60 is in this upper position in which the passage through the liner 30 is closed, the liner assumes a position substantially as shown in broken lines in Figure 1, in which the liner 30, inwardly of the casing 11 from the finger 60, assumes a contour approximating the contour of the adjacent portion of the tank 10 so that when the tank is charged with dry sand, cement and water, no plugs or clogs of unmixed material can lodge in the outlet out of the path of the agitator blades 23, where upon opening the outlet valve they would be forced into the hose whereupon the plug of unmixed material reaching a restriction or the nozzle, the discharge would be interfered with and eventually stopped. It will thus be seen that it is an important feature of the present invention that in closing the valve the liner 30 is so folded that the resulting pocket in the outlet area is very small and unmixed lumps would quickly be swept back into the main swirling mass within the tank 10 by the agitator blades 23. To facilitate this result the annular surface 26 against which the inner end of the liner 30 abuts, is disposed close to the inside surface of the tank 10 so that when the finger 60 is in its raised or closed position the liner 30 is folded correspondingly close to the inner surface of the tank 10. The up and down movement of liner 30 has a purging action which cleans the valve-sealing surfaces and insures proper action and tight sealing at all times. If desired, the action of finger 60 can be integrated with the materials charging inlet of the tank to prevent the opening of the discharge valve during charging of unmixed ingredients. The simple attaching means makes it relatively easy to install the valve of this invention on existing cement mixing equipment.

While it is clear that the embodiment of the invention illustrated is well calculated to accomplish the objects of

this invention, it will be understood that numerous modifications and changes may be made without departing from the spirit of the invention.

What is claimed is:

1. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall portion adjacent its lowermost point defining a discharge aperture and having an agitator blade which is moved along the inner surface of said wall portion during operation of said tank, said valve comprising a tubular casing having its inner end adapted to be secured to said tank around said aperture and formed with a curvature similar to that of said wall portion whereby said casing has a short side and a long side, a flexible tubular liner received in said casing and having one end inclined and disposed adjacent said inner end of said casing, means for securing said one end of said liner against movement relative to said casing and providing a seal preventing material from said tank from getting between said casing and said liner, said tubular casing having an aperture radially thereof in said long side, a finger mounted for movement through said aperture between a closed position in which it is effective to collapse said liner to prevent the flow of material through said liner and an open position in which said liner is permitted to assume its normal tubular shape, said aperture and said finger being so spaced relative to said one end of said casing that movement of said finger into the position in which said liner is collapsed causes a portion of the liner at one side of said finger to assume a position in which it approximates the contour of the inner surface of said wall portion of said tank adjacent said aperture whereby said casing and said portion of said liner define a pocket outwardly of the inner surface of said tank which is so small that any masses of unmixed material collecting therein will be removed therefrom by the action of the agitator blade before reaching a size sufficient to produce a clogging effect, and means for moving said finger between said closed position and said open position.

2. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall portion adjacent its lowermost point defining a discharge aperture and having an agitator blade which is moved along the inner surface of said wall portion during operation of said tank, said valve comprising a tubular casing having its inner end adapted to be secured to said tank around said aperture and formed with a curvature similar to that of said wall portion whereby said casing has a short side and a long side, a flexible tubular liner received in said casing and having one end inclined and disposed adjacent said inner end of said casing, said casing including a section at said long side of said casing, one end of which is inclined similarly to said one end of said liner and disposed to overlie said liner adjacent said one end thereof, a cylindrical ferrule fitted within said one end of said liner and having its inner and outer edges parallel to said one end of said casing section and disposed at opposite sides thereof, said ferrule supporting said one end of said liner against collapse, means for moving said one end of said casing section to grip said one end of said liner between said ferrule disposed internally thereof and said casing and casing section disposed externally thereof for securing said one end of said liner against movement relative to said casing and providing a seal preventing material from said tank from getting between said casing and said liner, said tubular casing having an aperture radially thereof in said long side, a finger mounted for movement through said aperture between a closed position in which it is effective to collapse said liner to prevent the flow of material through said liner and an open position in which said liner is permitted to assume its normal tubular shape, said aperture and said finger being so spaced relative to said one end of said casing that movement of said finger into the position in which said liner is collapsed causes a portion of the liner at one side of said finger to assume a position in which it approximates

the contour of the inner surface of said wall portion of said tank adjacent said aperture whereby said casing and said portion of said liner define a pocket outwardly of the inner surface of said tank which is so small that any masses of unmixed material collecting therein will be removed therefrom by the action of the agitator blade before reaching a size sufficient to produce a clogging effect, and means for moving said finger between said closed position and said open position.

3. A non-clogging outlet valve as defined in claim 2 wherein said finger in moving between said open and closed positions moves along a line intersecting the portion of said ferrule at said short side of said casing and when in said closed position collapses a part of the portion of said liner normally at said long side of said casing against said portion of said ferrule.

4. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall portion adjacent its lowermost point defining a discharge aperture and having an agitator blade which is moved along the inner surface of said wall portion during operation of said tank, said valve comprising a tubular casing having its inner end adapted to be secured to said tank around said aperture and formed with a curvature similar to that of said wall portion whereby said casing has a short side and a long side, a flexible tubular liner received in said casing and having one end inclined and disposed adjacent said inner end of said casing, means for securing said one end of said liner against movement relative to said casing and providing a seal preventing material from said tank from getting between said casing and said liner, said casing having a short section at said inner end having an internal diameter substantially equal to the internal diameter of said liner and having an inclined annular shoulder engaging and supporting said one end of said liner, said tubular casing having an aperture radially thereof in said long side, a finger mounted for movement through said aperture between a closed position in which it is effective to collapse said liner to prevent the flow of material through said liner and an open position in which said liner is permitted to assume its normal tubular shape, said aperture and said finger being so spaced relative to said one end of said casing that movement of said finger into the position in which said liner is collapsed causes a portion of the liner at one side of said finger to assume a position in which it approximates the contour of the inner surface of said wall portion of said tank adjacent said aperture whereby said casing and said portion of said liner define a pocket outwardly of the inner surface of said tank which is so small that any masses of unmixed material collecting therein will be removed therefrom by the action of the agitator blade before reaching a size sufficient to produce a clogging effect, and means for moving said finger between said closed position and said open position.

5. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall portion adjacent its lowermost position defining a discharge aperture, said valve being adapted to provide an unrestricted outlet passage for said materials and comprising a cylindrical casing disposed tangentially of said curved wall portion, a resilient tubular liner disposed within said casing, one end of said casing having an arcuate shape substantially the same as that of said wall portion of said tank at said aperture and providing a long side of said casing and a short side thereof, said liner having its end adjacent said tank sloped similarly to said wall portion at said aperture and disposed close to said one end of said casing, said casing including a movable section at said long side thereof and having its end adjacent said tank inclined and disposed to overlie said liner adjacent said sloped end of said liner, means for preventing collapse of said end of said liner and maintaining an outlet passage through said end of said liner substantially equal in diameter to the internal diameter

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of said tubular liner when the latter is in its free condition, means for moving said movable section to grip said liner between said first named means and said casing to anchor said sloped end of said liner against movement relative to said casing and provide a seal between said sloped end of said liner and said casing, and means for moving a part of said liner normally disposed at said long side of said casing toward said short side of said casing adjacent said arcuate end thereof to collapse said casing to prevent the flow of materials therethrough and move said liner to a position in which a part thereof intermediate said means and said end of said liner assumes a contour closely adjacent to and approximating that of said arcuately shaped one end of said casing.

6. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall portion adjacent its lowermost position defining a discharge aperture, said valve comprising a cylindrical casing, a resilient tubular liner disposed within said casing, one end of said casing having an arcuate shape substantially the same as that of said wall portion of said tank at said aperture and providing a long side of said casing and a short side thereof, said liner having its end adjacent said tank sloped similarly to said wall portion at said aperture and disposed close to said one end of said casing, said casing including a movable section at said long side thereof and having its end adjacent said tank inclined and disposed to overlie said liner adjacent said sloped end of said liner, a short tubular ferrule fitted within said sloped end of said liner to support a short portion of said liner at and parallel to said sloped end against collapsing, means for moving said movable section to grip said liner between said first named means and said casing to anchor said sloped end of said liner against movement relative to said casing and provide a seal between said sloped end of said liner and said casing, and means for moving a part of said liner normally disposed at said long side of said casing toward said short side of said casing adjacent said arcuate end thereof to collapse said casing to prevent the flow of materials therethrough and move said liner to a position in which a part thereof intermediate said means and said end of said liner assumes a contour closely adjacent to and approximating that of said arcuately shaped one end of said casing.

7. A non-clogging outlet valve for a tank adapted for mixing cementitious materials and having a curved wall

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portion adjacent its lowermost point defining a discharge aperture and having an agitator blade which is moved along the inner surface of said wall portion during operation of said tank, said valve comprising a tubular casing having one end adapted to be secured to said tank around said aperture and formed with a curvature similar to that of said wall portion whereby said casing has a short side and a long side, a flexible member received in said casing and having one end sealed to said casing to prevent access of said material between said casing and one side of said member, said member in its free position overlying at least the part of the inner surface of said casing at said long side thereof, said casing having an aperture radially thereof in said long side, a finger mounted for movement through said aperture between a closed position and an open position and being effective during movement from said open position to said closed position to move a part of said member from said long side of said casing toward said short side thereof to prevent the flow of materials through said casing, said aperture and said finger being so spaced relative to said one end of said casing that movement of said finger into said closed position causes a portion of said flexible member intermediate said part of said member and said one end thereof to assume a position in which it approximates the contour of the inner surface of said wall portion of said tank adjacent said aperture whereby said casing and said portion of said member define a pocket outwardly of the inner surface of said tank which is so small that any masses of unmixed material collecting therein will be removed therefrom by the action of the agitator blade before reaching a size sufficient to produce a clogging effect, and means for moving said finger between said closed position and said open position.

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