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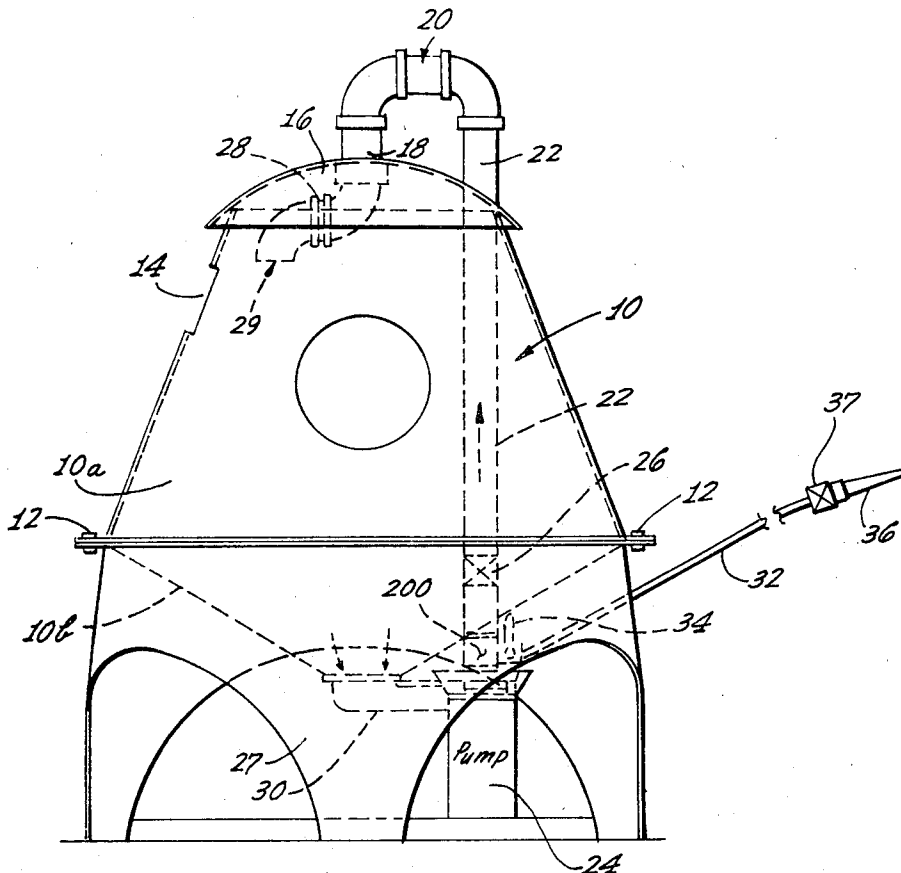
[54] **AGRICULTURAL APPARATUS**
3 Claims, 7 Drawing Figs.

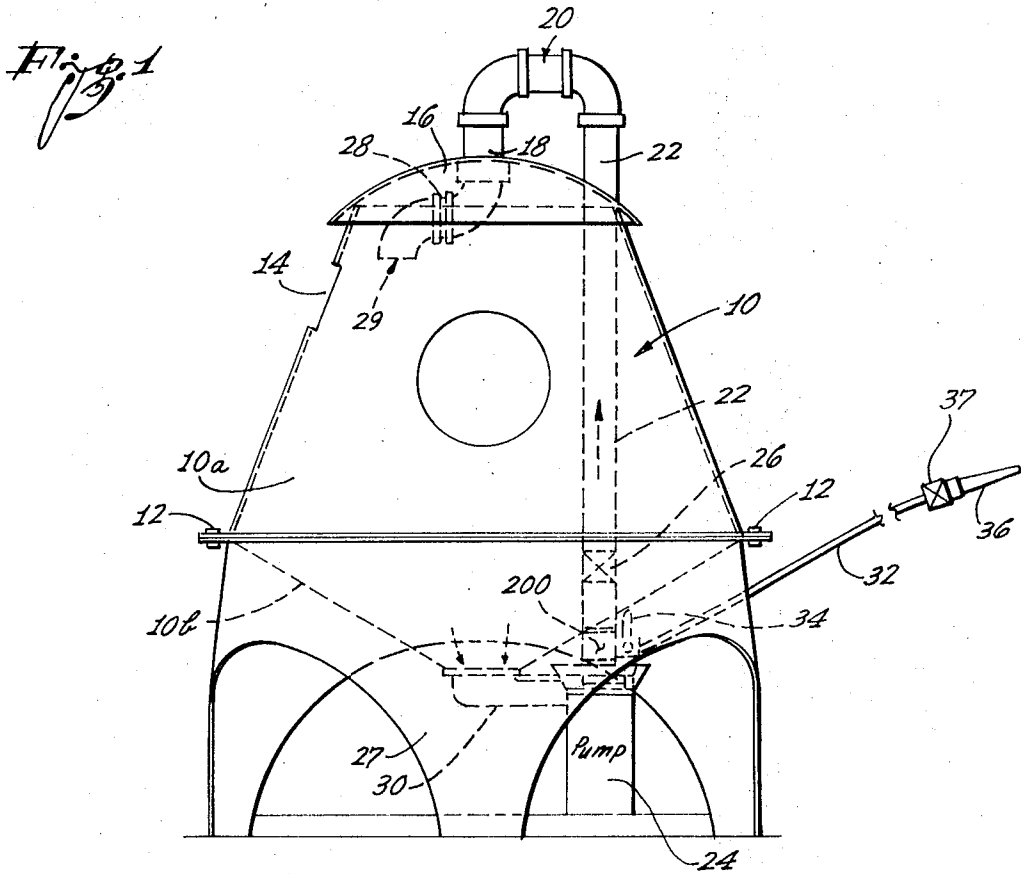
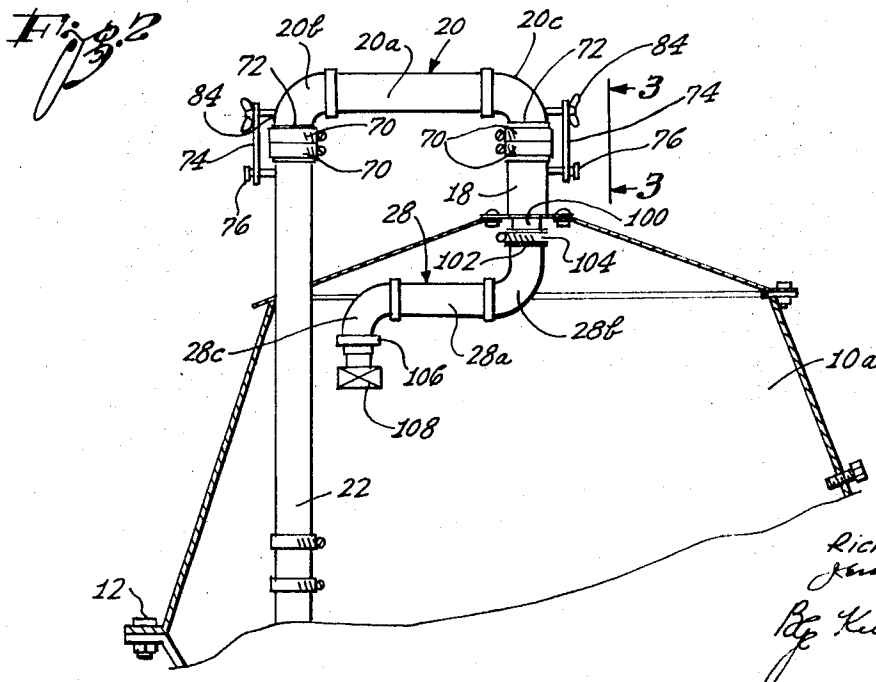
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127, 327, 662, 251, 259; 222/318, 144.5; 137/255,
256; 285/276; 308/230

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ABSTRACT: Improved agricultural apparatus is provided which, for example, may be mounted on the back of a truck, or on a trailer, and which may be used conveniently and efficiently to mulch, fertilize and seed an area. The apparatus to be described includes a tank containing a slurry of the seed, mulch and fertilizer. A circulating pump is coupled to the tank for circulating the slurry through the tank, and a spray dispensing hose is coupled to the circulating line from the pump for receiving a portion of the circulating slurry to be sprayed thereby over the area.





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Fig. 3

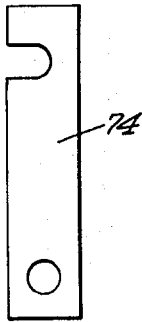


Fig. 4

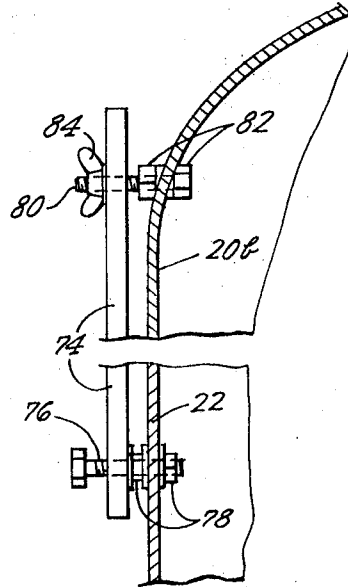
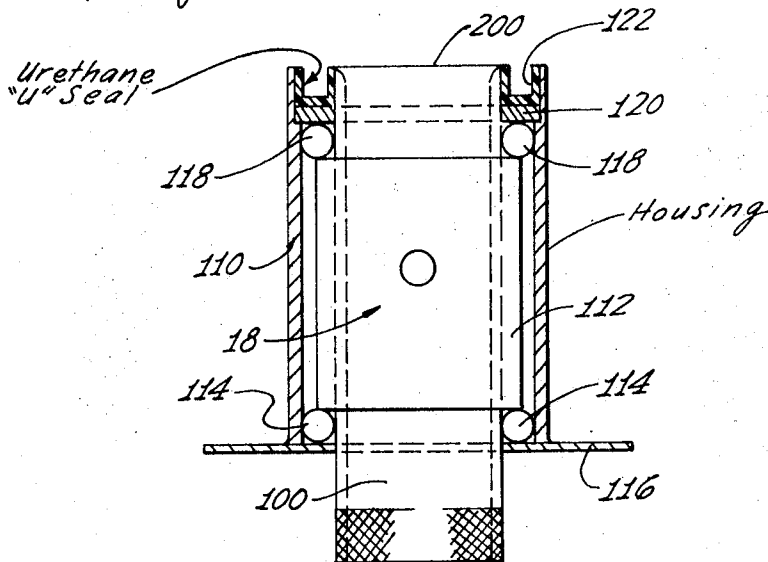
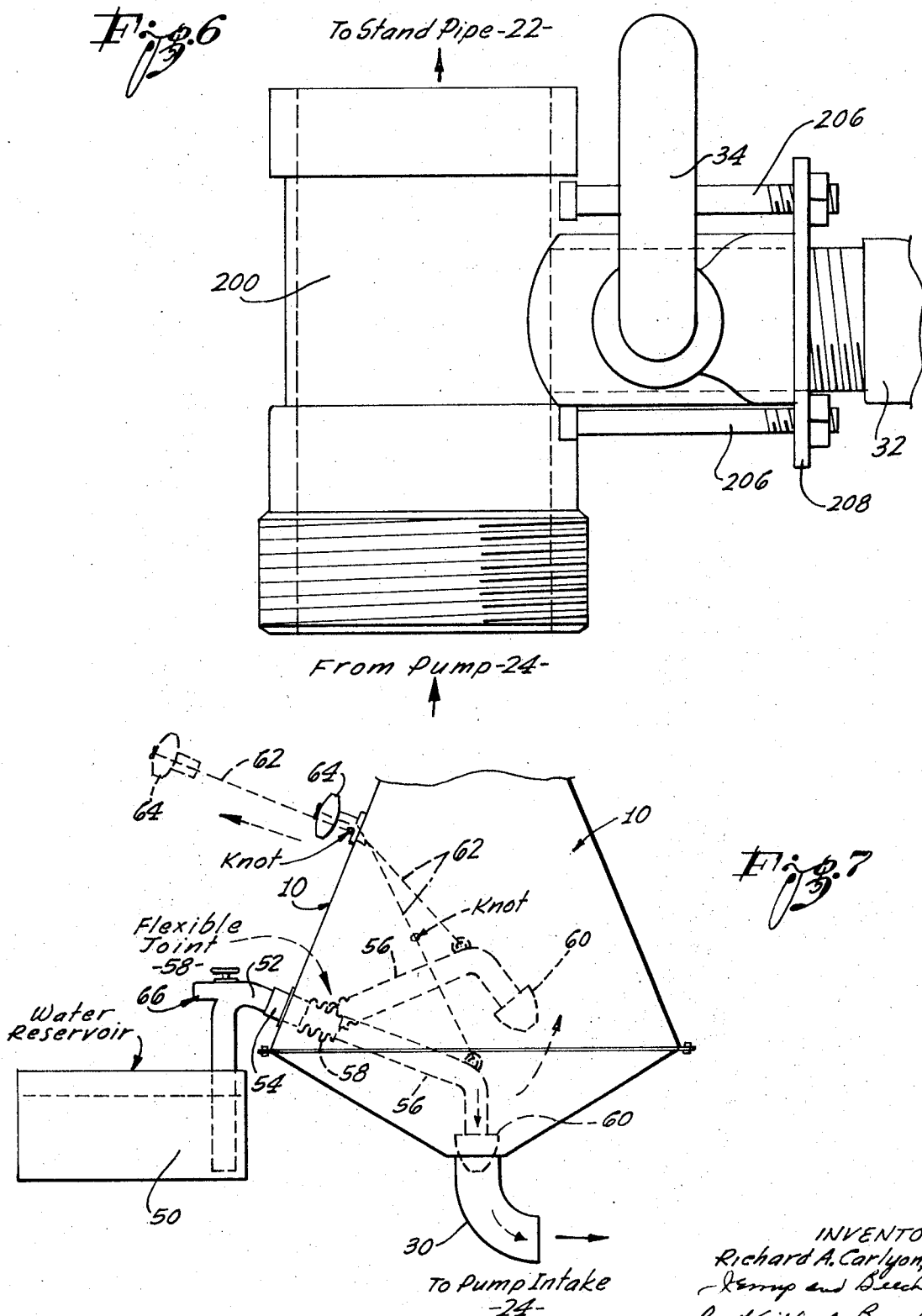


Fig. 5



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AGRICULTURAL APPARATUS

A feature of the apparatus of the invention is an improved mounting means for supporting a rotatable nozzle within the top of the tank, the rotatable nozzle being used to circulate the slurry into the tank for even distribution. A further feature of the apparatus is an improved mechanism whereby the circulating pump may be coupled to a reservoir to circulate fresh water into the tank, or into the spraying hose coupled to the apparatus, and at the same time closing off the flow of the slurry from the tank.

BACKGROUND OF THE INVENTION

The apparatus to be described herein is of the same general type as described in copending application Ser. No. 712,034, which was filed Mar. 11, 1968, and in copending application Ser. No. 768,038 which was filed Oct. 16, 1968, both in the name of the present inventor.

As described in the aforesaid copending applications, agricultural apparatus is known which may be transported to a particular site, and which may be operated at the site to spray a slurry of seed, mulch and fertilizer over the area on which a lawn, or other ground cover, is to be grown.

As mentioned in the copending applications, apparatus of the general type referred to above usually includes a tank, and a pump and hose which are used in conjunction with the tank. The tank and other components may be mounted, for example, on the back of a truck, or on a trailer, so that the apparatus may be conveniently moved from place to place. The tank may be filled with water at the site, and mulch, seed and fertilizer may be poured into the tank through a convenient chute. The ingredients are mixed with the water in the tank into a slurry either mechanically or manually in the prior art apparatus, and the slurry is then pumped through the hose and sprayed over the area to be covered, as the hose is manipulated by the operator.

In the apparatus described in the copending applications, a movable nozzle is provided within the tank itself, the nozzle being used to circulate the slurry from the pump back into the tank. This movable nozzle maintains the slurry ingredients evenly distributed within the tank. A feature of the apparatus of the present invention is the provision of an improved mounting means and support for such a movable nozzle, whereby the nozzle may be mounted conveniently and easily, and whereby the components may be easily removed for cleaning purposes.

The apparatus to be described also includes other structural features. For example, it includes an improved valve assembly for directing a portion of the circulating slurry from the tank to the spraying hose and nozzle. The hose receives a portion of the circulating slurry and causes it to be spread over the area to be covered, as the operator moves the nozzle over the area. The improved valve assembly of the present invention, as will be described, is constructed to be self-cleaning so that there is no tendency for the slurry ingredients to congregate and clog the valve in the event that there may be a slight leakage in the valve.

As mentioned above, the apparatus of the invention in the embodiment to be described also includes an improved mechanism, whereby fresh water may be circulated conveniently from a reservoir into the tank by the aforesaid pump, in areas where there is no pressurized water supply, for example, with the outlet from the tank being automatically shut off during such circulation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation representing one embodiment of the invention, on a somewhat schematic basis;

FIG. 2 is an enlarged partially sectional view of the upper portion of the assembly shown in FIG. 1, and showing particularly the structural details of the power head coupling assembly of the unit;

FIG. 3 is a detail of one of the elements of the assembly of FIG. 2, taken essentially along the line 3-3 of FIG. 2;

FIG. 4 is an enlarged representation of the aforesaid element, and of certain associated components;

FIG. 5 is a sectional view of an enlarged scale of a portion of the power head shown in FIGS. 1 and 2;

FIG. 6 is an enlarged representation of an output valve illustrated in the assembly of FIG. 1; and

FIG. 7 is an adaptation of the apparatus of FIG. 1, and shows a simple means whereby fresh water from a reservoir may be pumped into the system.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

It will be appreciated as the present description proceeds, and as mentioned above, that the agricultural apparatus of the present invention is essentially a self-contained assembly, and it may be driven or hauled to a selected site. The apparatus may conveniently be mounted on a small pickup truck, or on a separate trailer, as desired.

When the apparatus is transported to a particular site, it may be operated to provide a pressurized stream of a slurry of mulch, fertilizer and seed to a spray hose having a nozzle at its remote end. The operator then directs the spray from the nozzle over the area to be covered by the slurry. As also explained, the apparatus has the feature of being operable in areas where there is no readily available water supply, since it is capable of carrying its own reservoir, and of using its circulating pump to supply water from its reservoir to the circulating system.

As shown particularly in FIG. 1, for example, the apparatus of the present invention includes a tank 10 having an upper section 10a and a lower section 10b, the upper and lower sections being joined together, for example, by bolts 12 which extend through corresponding flanges, with a rubber gasket, or equivalent sealing means being interposed between the flanges.

The tank 10, like the tanks in the aforementioned copending applications, has a generally conical configuration. A hopper 14 is provided at one side of the tank to permit the seed, fertilizer and mulch to be introduced into the interior of the tank. Also, when makeup water is available from a pressurized source, it also may be introduced into the interior of the tank 10 through the hopper 14 by means, for example, of a hose or other waterline.

The tank 10 includes a lid 16, and a power head 18 is supported on the lid 16. A coupling assembly designated generally as 20, and which will be described in more detail subsequently, couples the power head 18 to standpipe 22. The standpipe 22 extends through the tank 10 from the outlet of a pump 24 mounted within a leg assembly 27, the leg assembly serving to support the tank 10 in an upright position. A valve 26 is mounted in the standpipe 22, and may be closed so as to prevent the output from the pump from reaching the power head 18.

A rotating nozzle assembly 28 extends down from the power head 18 into the interior of the tank 10. In a manner similar to that described in the copending applications, a nozzle 29 is coupled to the rotating assembly 28, and the nozzle is constructed to introduce fluid at an angle into the tank 10, so that when pressurized fluid is fed to the nozzle through the power head 18, the nozzle 29 rotates about the axis of the power head. As mentioned in the copending applications, the use of a single nozzle, such as the nozzle 29, permits a relatively large diameter pipeline and nozzle to be used, and thus avoids any tendency for the system to clog.

As also mentioned in the copending applications, the nozzle 29 is turned slightly with respect to the plane of the drawing, so that when the slurry is forced through it under pressure, it rotates slowly distributing the returning slurry evenly over the entire surface of slurry within the tank and at the same time drawing the slurry within the tank downwardly, thereby

violently agitating it. This action prevents the solid ingredients of the slurry from floating to the surface and separating.

The intake 30 of the pump 24 is coupled to the bottom of the tank 10, as shown in FIG. 1. Therefore, when the valve 26 is opened, and the pump 24 is operated, the slurry is caused to circulate from the bottom of the tank through the intake 30 and through the pump, through the valve 26 and standpipe 22, through the power head coupling assembly 20 and through the power head 18 to the nozzle 29. The pressurized circulating slurry issuing from the nozzle 29 causes the nozzle to rotate about the axis of the power head 18, as mentioned above, so that the circulated slurry is evenly distributed within the tank 10. The pump 24 is driven by any appropriate motor, not shown, which may be the motor of the truck on which the apparatus is mounted, or a separate electric motor, or any other suitable drive means.

A spray hose 32 is coupled through a gas cock-type output valve 34 to the outlet of the pump 24, as shown. A nozzle 36 and valve 37 are provided at the remote end of the spraying hose 32. When the valve 34 is closed, the slurry is circulated through the system by the pump 24. However, when the valve 34 is opened, a portion of the circulating slurry bleeds off through the spraying hose 32, and may be sprayed over the area to be covered through the valve 37 and the nozzle 36, as the operator manipulates the nozzle. The valve 37 gives the spraying operator control of on and off of slurry at the nozzle 36 without returning to the machine to operate the valve 34.

The valve 26 is provided, for example, to facilitate fresh water flushing of the hose 32 and nozzle 36, as will be described, and also to build up a high pressure at the spray nozzle 36, if so desired. For example, when the valve 26 is closed, the pump 24 is operating to draw the slurry out of the tank 10, and if the output valve 34 is opened, the pump will discharge the slurry with high pressure through the hose 32 and spraying nozzle 36.

When make up water is needed, and when no pressurized source is available, the modification shown in FIG. 7 may be used. The modification includes a separate reservoir 50 for fresh water, and which may be carried, for example, on the truck itself. A line 52 extends from the reservoir 50 and is coupled into the interior of the tank 10 through any suitable coupling 54. A further L-shaped pipeline 56 the pipe provided in the interior of the tank 10, and the pipeline 56 may be composed of an appropriate plastic material, such as polyvinyl chloride, or other suitable material may be used.

The pipe 56 is coupled to the coupling 54 through a flexible coupling 58, which may, for example, be a length of rubber hose clamped to the coupling 54 and to the pipe 56. The remote end of the pipe 56 extends through the opening in the bottom of the tank 10, and a tubular rubber seal 60, or a seal of other appropriate material, is provided at the remote end of the pipe 56. It will be appreciated that when the pipe 56 is lifted up out of the aperture in the bottom of the tank 10, the slurry in the tank is free to be circulated through the system, as described above.

However, when the pipeline 56 is dropped into the opening in the bottom of the tank 10, and sealed by the seal 60, the pump then draws fresh water from the reservoir 50. This fresh water can be circulated into the system for make up purposes, by opening the valve 26 and by closing the valve 34 in the system of FIG. 1. Alternately, the water may be used to provide a rinse for the spray hose 32 and nozzle 36, this being achieved by closing the valve 26 and opening the valve 34.

The pipeline 56 may be controlled by means, for example, of a line 62 and an external handle 64. The handle may be used to pull up the pipe 56 out of the opening in the bottom of the tank 10 for normal operation of the system, and to permit the pipe 56 to drop into the opening in the bottom of the tank 10, when make up water from the reservoir 50 is desired, for the purposes described above. Since suction is too great to overcome merely by pulling on the handle 64, a bypass valve 66 is needed which, when in the open position, allows air to enter the pipeline 56 from the atmosphere, thus breaking the

pump suction and allowing easy removal of the pipeline 56 and seal 60 from the outlet of the tank. When suction is desired, the valve 66 is in a closed position.

The power head coupling assembly 20, the power head 18, and the nozzle 28 are shown in further detail in FIG. 2. The coupling assembly, for example, may include a straight portion of pipe designated 20a, coupled to a pair of elbows 20b and 20c at each end of the pipe 20a. The stand pipe 22 may be clamped to the elbow 20b by appropriate clamps 70 and a length of rubber hose 72. The couple joints may be held firmly together by means, for example, of a strip of metal 74. The strip 74 is supported on a bolt 76 (see also FIG. 4) which is mounted in the wall of the standpipe 22 by means, for example, of nuts 78 and appropriate sealing washers. The other end of the strip 74 may be slotted, as shown in FIG. 3, and is received by a like bolt 80 which is supported in the elbow 20b by means of nuts 82 and associated sealing washers. The strips 74 being held in place by means, for example, of a wingnut 84. A similar type of coupling is used to couple the elbow 20c to the top of the power head 18, and the coupling is designated by the same numerals.

The coupling formed by the strips 74 provides a positive restraining force between the components of the assembly, and obviates any tendency for the various components to come part under pressure. However, the strips 74 may be easily removed by removing the wingnuts 84, whenever it is desired to dismantle the equipment.

As shown in FIG. 2, the assembly 28 is made up, for example, of a straight central pipe section 28a which may be composed, for example, of polyvinyl chloride, the central section being coupled at each end of respective elbows 28b and 28c which also may be formed of polyvinyl chloride. The elbow 20b is coupled to a tubular shaft 100 in the power head 18 by means, for example, of a length of rubber hose 102 and appropriate clamp 104. The tubular shaft 100 is rotatable in the power head 18, as will be described. The elbow 28c, on the other hand, is coupled through an appropriate coupling 106 which also may be composed of polyvinyl chloride, to a male nozzle designated schematically as 108. As mentioned above, the nozzle 108 is positioned so that when the pressurized slurry is passed through it, it causes the nozzle assembly 28 to rotate the tubular shaft 100 within the power head 18.

The power head 18 is shown in greater detail in FIG. 5. It will be seen that the tubular shaft 100 is rotatably mounted within an external casing 110 with the tubular shaft 100 and the casing extending coaxially with one another. A tubular collar 112 is welded to the tubular shaft 100, and has an increased diameter with respect to the diameter of the drive shaft. The collar 112 is positioned within the casing 110, and it rests on a series of loose ball bearings 114 which are located between the lower edge of the collar 112 and a bottom plate 116 which is welded to the casing 110. A second series of balls 118 is positioned on the upper edge of the collar 112, and a washer 120 fits over the latter set of balls, and rests on a peripheral shoulder on the inner wall of the casing 110, as shown. A U-shaped seal 122 is positioned between the upper extremity of the tubular shaft 100 and the upper end of the wall of the casing 110.

As mentioned above, and as shown in FIG. 2, the elbow 20c is coupled by the coupling 72 to the outer wall of the casing 110 of the power head 18, and the seal 122 which may be formed, for example, of urethane, provides an adequate seal and directs the slurry from the elbow into the interior of the rotating tubular shaft 100, and thence to the nozzle assembly 28. A feature of the assembly shown in FIG. 5 is that the seal and other components of the power head may be easily removed for cleaning and servicing purposes. The components of the power head, for example, with the exception of the urethane seal, may be formed appropriately of steel, or other suitable material. The washer 120, however, is preferably formed of cadmium.

As shown in FIG. 6, a suitable coupling 200 is provided between the output from the pump 24 and the stand pipe 22 in

FIG. 1, and the spray hose 32 is coupled into the side of the coupling by means of the valve cock 34, as mentioned in the description of FIG. 1. The valve 34 may be similar to a usual gas cock, and it is supported in the wall of the fitting 200 by means of bolts 206. The spray hose 32 is coupled through a washer 208 formed, for example, of cadmium, to the cock 34. When the cock is closed, the slurry or other fluid passing through the fitting 200 passes without interference from the pump to the standpipe 22. However, when the cock 34 is opened, a portion of the circulating slurry, or other fluid, bleeds through the cock 34 and into the spray hose 32.

Since there is a tendency for the slurry to separate, and for the wood cellulose in the slurry to pack behind and clog any valve which exhibits even a slight leak, there is a resulting straining action in leaky valves which results in an eventual clog-up behind the valve, so that the valve is inoperative, even when opened. This action is prevented by the assembly of FIG. 6, since the entrance to the valve 34 is essentially tangential to the flow of the slurry. Therefore, when the valve 34 is closed, even slight leaks in the valve do not result in a congregation of the slurry ingredients around the valve intake, instead the flow of the liquid across the face of the valve maintains a self-cleaning action, so that clogging is prevented.

As described in the copending applications, the shape of the tank 10 is such that as the level of the slurry in the tank rises and falls, it follows the general contour of the spray from the nozzle 108 (FIG. 2). This spray also serves to maintain the interior of the wall of the tank 10 in a clean condition, as it rotates continuously around the tank. The shape of the tank provides for a maximum engagement between the spray and the surface of the slurry in the tank, with minimum interference by the side of the tank, regardless of the level of slurry in the tank.

The invention provides, therefore, improved agricultural apparatus which may be constructed at a relatively low cost and sold at a relatively low price. The apparatus of the inven-

tion, moreover, is simple and easy to operate, and is effective even at sites where no pressurized water is available. In addition, the unit is self-contained, requiring no external power sources, apart from the truck itself, as suggested above.

I claim:

1. In agricultural apparatus for providing a mixture of mulch, seed, fertilizer, or the like, to be selected area to be cultivated, said apparatus including: a tank forming a reservoir for a slurry of the aforesaid mixture and water, said tank having an inlet at the top thereof and an outlet at the bottom thereof; a pump having an intake and an outlet; pipeline means coupling the outlet of said tank to the inlet of said pump, and generally vertical pipeline means coupling the outlet of said pump to the inlet of said tank; the combination of: a generally horizontal pipe having a first elbow at one end thereof coupled to the top of said vertical pipeline and having a second elbow at the other end thereof, a rotating nozzle assembly extending into said inlet at the top of said tank, and a power head coupling said nozzle assembly to said second elbow, said power head including a tubular housing, a tubular shaft rotatably mounted within said housing in coaxial relationship therewith, a tubular collar mounted coaxially on and affixed to said tubular shaft, a first series of ball bearings contained in said casing between said tubular shaft and the inner peripheral surface of said casing and adjacent one end of said collar, and a second series of ball bearings contained in said casing between said tubular shaft and the inner peripheral surface of said casing and adjacent the other end of said collar.

2. The combination defined in claim 1, and which includes an apertured end plate affixed to one end of said casing for retaining said first series of ball bearings within said casing.

3. The combination defined in claim 2, and which includes a removable washer and a removable seal at the other end of said casing for retaining said second series of ball bearings in said casing.

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