

Oct. 11, 1938.

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2,133,170

TILTING MECHANISM

Filed Dec. 6, 1935

4 Sheets-Sheet 1

FIG. 1.

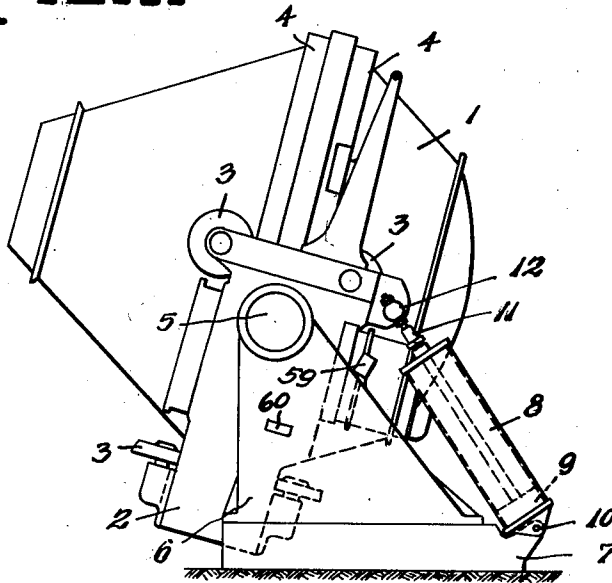
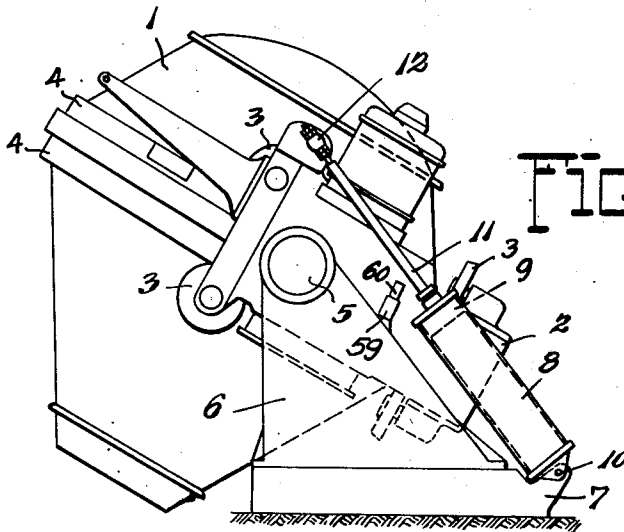


FIG. 2.

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FIG. 3.

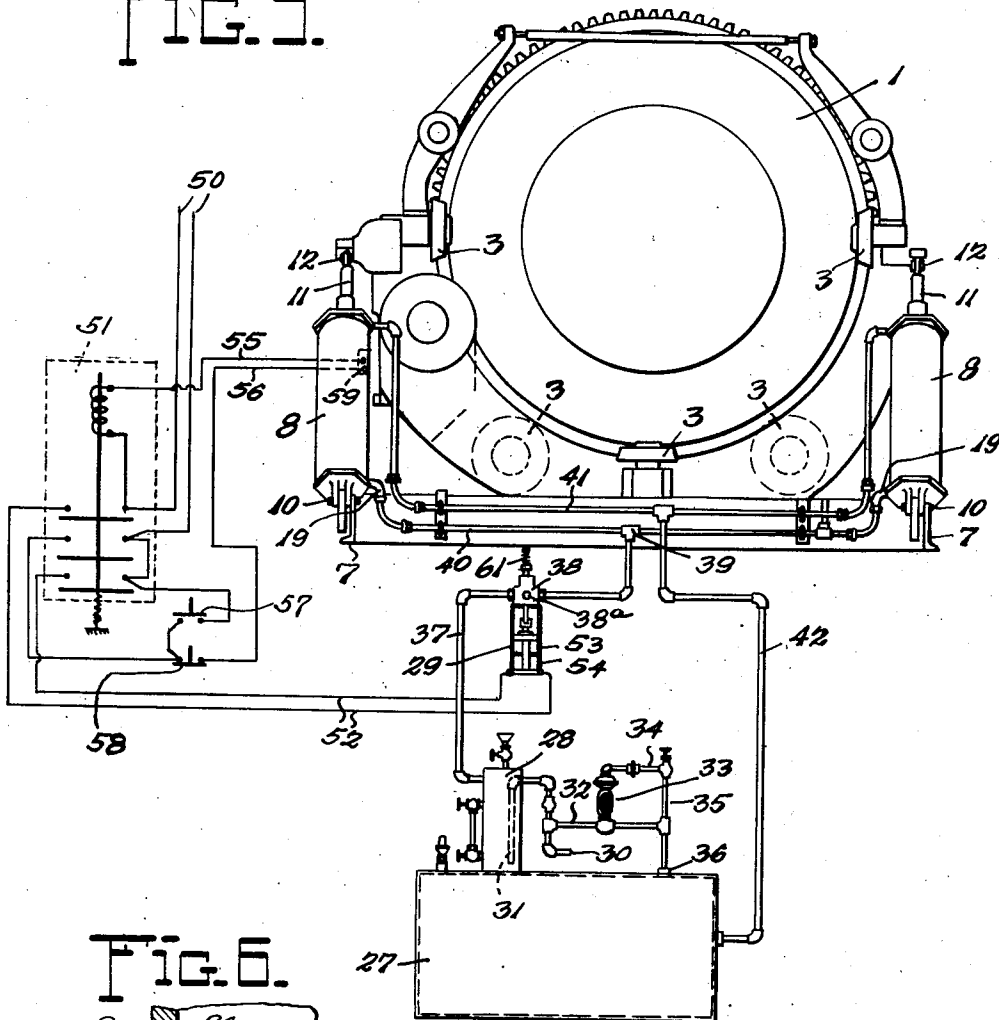
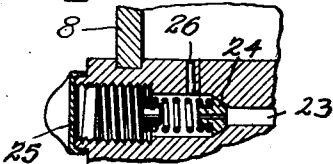


FIG. 6.



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FIG. 4.

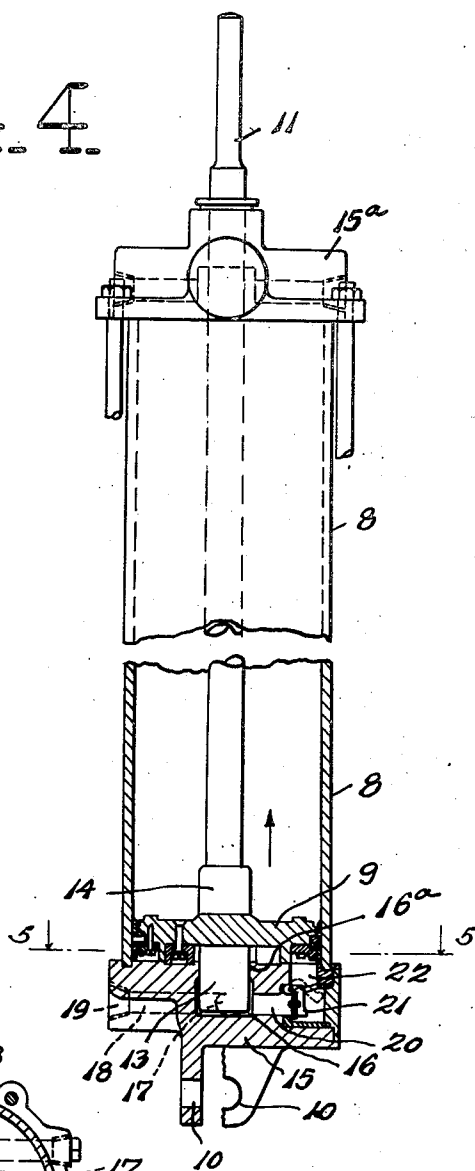
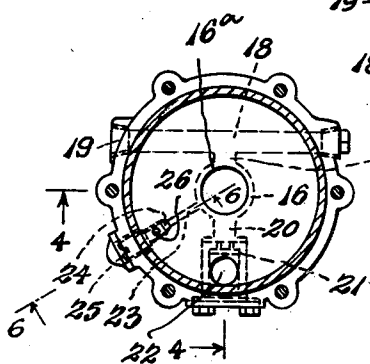


FIG. 5.

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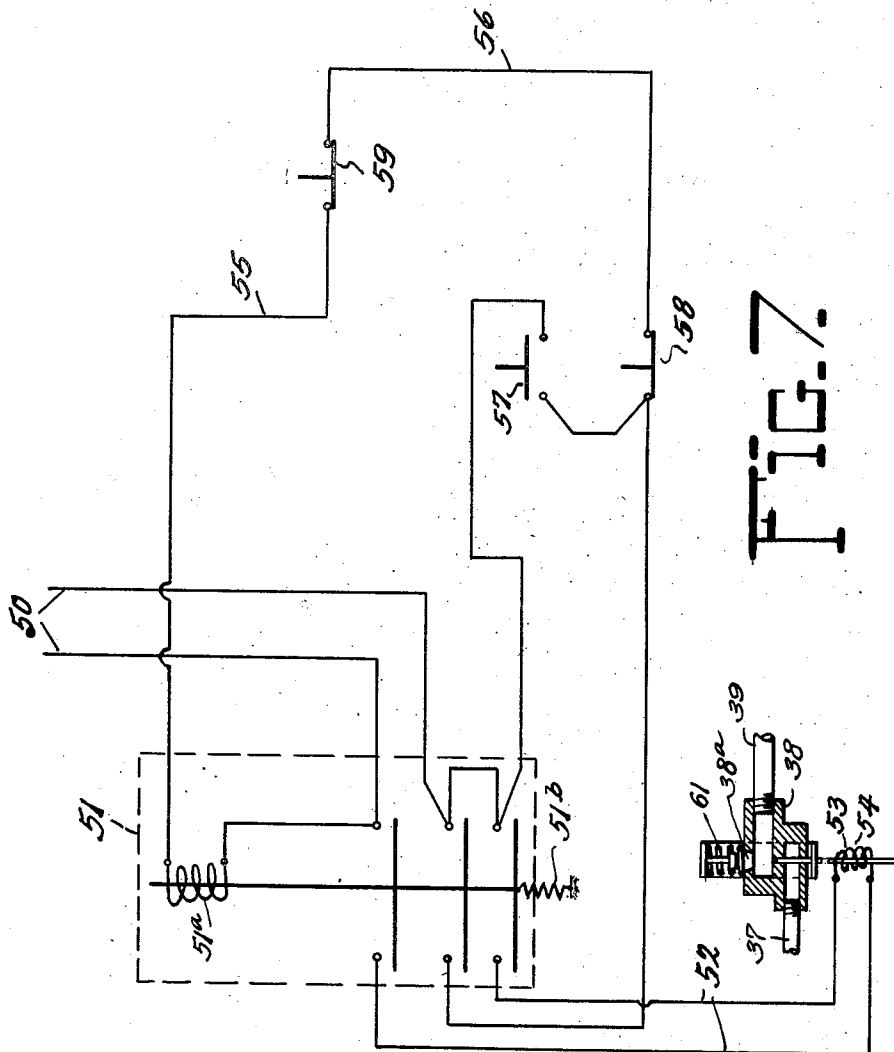
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TILTING MECHANISM

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4 Sheets-Sheet 4



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2,133,170

TILTING MECHANISM

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Application December 6, 1935, Serial No. 53,267

6 Claims. (Cl. 259—162)

The present invention embodies certain novel operating mechanism for concrete mixers of the so-called tilting type, said mixers ordinarily comprising a rotating mixing drum with a suitable blading arrangement therein for direct engage-
ment with the materials to be agitated.

The operating mechanism of the invention has been designed with a particular view to use in conjunction with large tilting mixer installations, though it is applicable to small types of mixers as well, pneumatic or air rams being utilized for the purpose of tilting the mixer from its charging and mixing position to its discharging position and for thereafter righting or restoring the mixer to its normal charging and mixing position. The pneumatic or air ram means employed for the purposes of the invention are of double acting construction, the air pressure being adapted to be directed to opposite sides of the ram piston in order to compel movements of the tilting mixer in opposite directions as necessary to adjust the mixer to occupy the positions above referred to. In the use of large size mixers of the type of the invention, which mixers may hold anywhere from two to six cubic yards of aggregates to be agitated, the mixer and its contents comprise bodies of very large weight and hence it is desirable to move the mixer and contents as expeditiously as possible and to reduce the shock of stopping and starting movements of the machine as it assumes its opposite positions for charging and discharging. To this end the pneumatic rams availed of are designed so as to control a relatively fast initial starting movement of the mixer toward either its charging or discharging position and to obtain a cushioning movement as the mixer approaches its final limit of movement in assuming either charging or discharging position.

According to the invention, the ram appliances availed of accomplish the desired functions above noted, and the operating stroke of the pneumatic ram to carry the mixer to discharging position with its full contents is cushioned adequately by the pneumatic pressure means employed, and, similarly, the return stroke of the ram means is cushioned as the mixer approaches its charging position after having been emptied of its contents.

With the foregoing in view, the invention involves the construction of device and novel functions therefor as more fully set out in the following description and accompanying drawings, in which—

Figure 1 is a side view of a tilting mixer in

charging position, according to the invention.

Figure 2 is a view similar to Figure 1, illustrating the rams operated to shift the mixer to its discharging position.

Figure 3 is an end view of the mixer showing the piping arrangements and including the circuit control means and the air pressure tanks with controlling connections and operating features, parts being omitted.

Figure 4 is a sectional view of one of the air rams taken longitudinally thereof.

Figure 5 is a sectional view of an air ram taken transversely thereof.

Figure 6 is a detail view of the spring pressed valve used in connection with the present invention.

Figure 7 is a diagrammatic view of the arrangement of switches 51, 57 and 58.

Describing the invention specifically, 1 denotes the tilting mixer or drum which is mounted in a suitable cradle 2 having rollers 3 for engaging roller paths 4 located at the central portion of the mixer. The mixer or drum body 1 is of somewhat double-cone shape with the smaller ends of the cones outermost. The cradle 2 is equipped with trunnions 5 which are mounted in supporting brackets 6 of a suitable frame or supporting base 7. Generally speaking, the construction of the tilting mixer as above set forth is not an essential feature of the invention because various types of tilting mixers may be employed in conjunction with the operating means of the invention as now to be set forth.

Said operating means includes one or more air rams 8 which consist of cylinders having pistons 9 therein. Since such air rams are of the same construction, one only will be described in detail. The lower end of the ram 8 is pivotally connected at 10 to an end portion of the base 7 at any suitable point, enabling the convenient application of the power to the ram for the tilting action of the mixer. The upper end of the piston rod 11 of the piston 9 is swivelly connected at 12 with the upper portion of the cradle 2 so that the cradle may swing freely with a movable connection intermediate the same and the piston rod 11 to accommodate the relative movement of said parts.

Referring now to Figure 4, it will be observed that the piston 9 is equipped with a pair of cushion plugs, the plug 13 projecting downwardly from the piston and the plug 14 projecting upwardly from the piston, the piston rod 11 virtually forming a continuation of said plug 14. At the lower end of the cylinder 8 the cylinder head 15 is

equipped with a plug recess 16 for the lower plug 13. The plug recess 16 has a passage 17 leading therefrom into a transverse passage 18 in the head 15, the passages 17 and 18 being opposite the lower end portion of the plug recess 16. The passages 17 and 18 form entrance and exhaust passages for the motivating pressure fluid which acts upon the piston 9 of the ram and the passage 18 is connected with the piping system at the port 19, as will later be set forth.

From the cushion recess 16 leads a branch passage 20 transverse to the axis of the cylinder 8, and located in this branch passage is a gate valve 21 which controls the passing of air through the passage 20 and through a passage 22 extending upwardly at right angles to the passage 20 and communicating with the interior of the cylinder 8. Leading off from the cushion recess 16, as seen best in Figure 5, is a bleed passage 23, in which is located a normally inwardly spring-pressed valve 24 held in place and rendered accessible by means of a trap 25, said bleed passage 23 having a vertical extension thereof, as shown at 26, the valve 24 permitting the free passing of air from the passage 23 into the cylinder 8, the vertical passage 26 directly communicating with the interior of said cylinder 8. The valve 24 will cause a restricted flow of air (bleeding) in a reverse direction from the cylinder 8 to the passage 23, as clearly seen in Figure 6.

It is to be understood that the upper head of each cylinder 8 is equipped with the same construction of plug recess 16 and other features as respects the valve and passages just referred to, the plug 14 of the piston, however, working in the upper plug recess 16, whereas of course the plug 13 works in the lower plug recess 16. In other words, the parts just described in reference to the lower head of the cylinder 8 are duplicated in the upper head of the cylinder.

Referring now to Figure 3, it is notable that there is shown a low pressure air tank 27, a high pressure air tank 28, a solenoid operated air valve 29, and suitable pipe connections and valve parts now to be set forth. A pipe line 30, which leads from a compressor, is connected to the high pressure tank or reservoir 28 and enters the same as shown at 31. From the pipe line 30 leads a branch line 32 having therein a pressure reducing valve 33 from which leads off the pipe 34, joining the pipe 35 which communicates at 36 with the low pressure tank or reservoir 27. From the high pressure tank 28 leads a high pressure line pipe 37, on the length of which is located a three-way valve 38, and said pipe 37 connects at 39 with a high pressure supply pipe 40 connected to the lower ends of the cylinders 8 at the ports 19 thereof, previously referred to. A low pressure supply line 41 leads from the upper ends of the cylinders 8 and connects with a low pressure line pipe 42 extending to the low pressure tank 27.

The purpose of the foregoing arrangement of pipes and control valves is to permit the admission into the lower ends of the cylinders 8 of high pressure air. As an example, the air pressure in the tank 28 may be 100 lbs. and such air pressure supplied to the lower ends of the cylinders 8 motivates the pistons 9 to push these pistons upwardly in the cylinders and move the mixer 1 from its charging and/or mixing position to its tilted or discharge position of Figure 2. Similarly, the movement of the mixer 1 is reversed to right it or restore it to its charging position and to this end low pressure air is supplied from the reservoir 27 through the pipe line

42 and pipe line 41 to the upper ends of the cylinders 8 at suitable entrance ports 19 in the upper heads. The pressure in the reservoir 27 may be 50 lbs. or about one-half of the air pressure in the reservoir or tank 28.

It should also be stated that the 50 lb. pressure in the pipe lines 42, 41 and the cylinders 8 is at all times maintained so that when the mixer is in a charge position as shown at Figure 1, the piston 9 remains under the pressure of 50 lbs. When the mixer is to be discharged, solenoid valve 38 is opened to connect line 37 with line 40 and an air pressure of 100 lbs. is admitted at the opposite side of the piston 9. This pressure will act against the opposing pressure of 50 lbs. and move the piston 9 up to position as shown in Figure 2 to effect tilting and discharging of the mixer. Subsequent operation of the air valve 38 which is a three-way valve, as hereinbefore described, and which is provided with an exhaust opening 38a will connect line 40 with the atmosphere, and the 100 lb. pressure which effected the movement of the mixer to the discharge position, will be released so that the 50 lb. air pressure which is still in action, will move the piston 9 down to its original position, as shown in Figure 1, and the mixer will be thereby righted to charge position.

Having in view the foregoing arrangement of pipe connections, reservoirs, and valves, the operation of the device to actuate the pistons in the cylinders 8 will now be specifically described.

When the three-way solenoid valve 38 is operated to connect the 100 lb. air pressure in tank 28 and pipe line 37, with the pipe line 40, compressed air will enter the rams 8 at 19 and be admitted to the lower plug recess 16, and passage 20, to thereby open gate valve 21 which will now assume its position, as shown in dotted lines in Figure 4. The 100 lb. air pressure may now enter past valve 21 through passage 22, below the piston 9 into cylinder or ram 8 and the piston 9 will be moved in an upward direction as shown by an arrow in Figure 4, and the piston rod 11 will, of course, perform a similar movement. It must be noted further that air enters immediately also through passage 26 into cylinder 8 and after piston 11 has moved to an extent that plug 13 is out of recess 16a, air will also enter through 16a into the cylinder 8, thus giving initially two inlet passages at the start of the stroke and three inlet passages shortly thereafter.

In view of the fact that the piston rod 11 is connected to the cradle 2 within which the mixing drum 1 is arranged, tilting of the mixer 1 downward to its discharging position will be effected. As already mentioned, an air pressure of 50 lbs. is maintained at the opposite side of piston 9, but in view of a much higher pressure acting against said 50 lb. air pressure to effect the tilting of the mixer, the air under 50 lb. pressure will be displaced from the ram or cylinder 8 and forced back over pipe lines 41, 42 into the low pressure tank 27.

When the mixer reaches its discharge position, three-way valve 38 is operated by means of instrumentalities, to be later described, to assume another position and connect the pipe line 40 to the exhaust opening 38a and the atmosphere. The 100 lb. air pressure which effected the tilting of the mixer is now released to the atmosphere, and the piston 9 will be returned downward to its position as shown in Figures 1 and 4 by means of the 50 lb. air pressure acting downwardly upon

the piston at all times to permit an immediate return of the mixer to its charging position.

The original 100 lb. pressure of the air will escape from the cylinder bottom, through an opening or bore 16a which establishes a communication between the recess 16 and the cylinder bottom, as clearly shown in Figure 4, into recess 16, through passage 18, pipe line 40, and into the atmosphere at 38a. The gate 21 will be automatically closed when the air under 100 lb. pressure is discharged, as will be obvious from Figure 4.

When the piston approaches the end of its stroke, plug 13 will enter the bore or opening 16a, and thereby close the communication between the cylinder and recess 16, and in view of the fact that the air entrapped below the piston 9 and head 15 must now, upon further downward movement of the piston, escape only through the small opening 26 in bleeding valve 24 and into passage 23, the speed of piston 9 will be materially reduced and effectively cushioned.

When all of the air in the lower or the 100 lb. pressure side of the piston 9 has been discharged, the latter has reached the position as shown in Figure 4. The 50 lb. air pressure at the other or top side of the piston which is maintained at all times, will hold the piston in this position and prevent an accidental discharge of the mixer. Subsequent operation of valve 38 will again permit admission of air through the pipe line 40 at a pressure of 100 lbs. and the cycle of operation repeats.

It should be noted that the admission of the air under 100 lbs. of pressure into the piston takes place by gate valve 21 through 26 and later through 16a so that an immediate and quick upward operation of piston 9 is effected, and only the motion during the end of the stroke of the same is reduced by means of the cushioning instrumentalities above referred to.

In the foregoing I have described the operation of the cushioning instrumentalities and valves located within the cylinder head 15 of Figure 4 and it must be understood that the cylinder head 15a is also provided with the same controlled instrumentalities as referred to in connection with head 15, and the operation of those instrumentalities are exactly alike so that a description of the same is not deemed necessary. It will, therefore, be seen that the operation of the piston 9 is cushioned at each end of its stroke, while the same may be rapidly started at the admission of 50 or 100 lbs. air pressure to effect the tilting or righting position of the mixer in a speedy manner and without loss of time.

In the following, instrumentalities are described, which control the operation of the solenoid valve 38. Wires 50 are provided to supply electric current to a magnetic switch 51, which is connected by means of wires 52 with the solenoid 53 of the solenoid valve 38. Wires 55 and 56 are provided to operatively connect the magnetic switch 51, which is of the lock in switch type and the push button control knobs 57 and 58 with an electric limit switch 59. The switch 59, see Figures 1 and 2, is secured to the frame 6 of the machine, and a knock-out pad 60 fixed on the cradle member 2 and arranged to interrupt the electric current to the wires 55 and 56, when the mixer 1 has assumed its tilted or discharge position, as shown in Figure 2. It will, therefore, be seen that with the mixer in charge position, switch 59 being closed, when the push button 57 is operated to close the electric circuit, within which

it is located, the magnetic switch 51 will be operated to supply electric current to the solenoid 53. The three-way valve 38 will be operated, as previously described, to effect tilting of the mixer to its discharge position, whereupon the knock-out pad 60 will engage electric limit switch 59, and will break the electric circuit between the wires 55 and 56 to thereby interrupt the flow of electric energy to solenoid 53, and the three-way valve 38 will then move under the influence of its spring 61 to connect the pipe line 40 with the exhaust port 38a, and the mixer will automatically return to a charging position.

As mentioned above, a stop switch 58 is also provided to permit manual interruption of the flow of electric current at any stage during the operation of the machine, so that the downward motion of the same may be stopped at will, in case of accident, or similar circumstances. The mixer will then return to its charging position.

Figure 7 illustrates the arrangement of the switches 51, 57, and 58. It will be seen from this figure that switch 57 is illustrated as biased to open position, which is the normal position of this switch. Switch 58 is shown as biased to closed position, this being the normal position of this switch. Figure 7 further discloses that the three current lines passing over the same are simultaneously closed by energization of the magnetic coil 51a and are simultaneously opened by the action of spring 51b upon the deenergization of the magnetic coil 51a.

From the description of the present invention set forth hereinbefore it will be apparent that the push button switch 57 is biased to open circuit position and requires only a momentary depression to close the three contacts of the magnetic switch 51 and thus to start operation of the device. In other words, the tilting operation is started by manual pressure on switch 57, which, when closed, causes the current to flow from 50, through switches 57, 58, 59, over coil 51a, to the other line 50. The coil is thereby energized, causing closing of the three lines adapted to be controlled by the switch 51. After such starting operation of the switch 57, the same remains open as the mixer goes from charge to discharge position and then from discharge back to the original charge position. The mechanism then comes to rest at charge position and requires a further depression of the push button on switch 57 to repeat the operation. Depression of 57, when the mixer is moving to charge position, will reverse the direction of motion of the mixer.

Furthermore, it should be noted that the push button switch 58 is normally biased to a closed circuit position. The switch is effective only when the mixer is moving to discharge position, and depression of its push button opens the circuit through limit switch 59 and magnetic coil of switch 51. Upon interruption of the flow of current through coil 51a all three contacts of the switch 51 open, the coil 53 is deenergized, and the three-way valve 38 moves to connect the bottom of the cylinder to the atmosphere with consequent reversal of motion of the mixer toward discharge position. Further operation of switch 58 will cause no further change until the switch 57 is first operated and the mixer is again moving to its discharge position. In other words, the switch 58 is not a stop switch to still the motion of the mixer, but is rather a motion reversing switch and is effective only during the first half of the cycle.

The switch 59 is biased to closed position and

is open only when the same comes in actual contact with the knock-out pad 60. The magnetic switch 51 is so constructed that upon deenergization of its coil 51a all three lines passing through the switch are simultaneously closed and remain closed as long as the coil is energized. Upon deenergization of the coil 51a all three lines are immediately opened by means of spring 51b and remain open until the starting switch 57 is operated. When both switches 57 and 58 are simultaneously operated, a reversal of motion will be effected with the mixer is moving to a discharge position, but such simultaneous operation of switches 57 and 58 will have absolutely no effect when the mixer is moving to charge position.

The three-way solenoid valve 53 is spring biased to connect the cylinder bottom to the atmosphere, and when its coil is energized it moves to connect the cylinder bottom to the high pressure system.

Figure 7 shows the electrical mechanical system and illustrates the construction of the three way valve 38 in a diagrammatic manner. In regard to this illustration, it should be noted that the armature of the solenoid 53, 54 forms an integral part with the valve member which closes and opens the passage 38a, so that upon energization of the solenoid 53, 54, the opening 38a is closed, while communication between pipe lines 37 and 39 is established. Upon de-energization of the solenoid 54, 53, spring 61 moves the armature upwardly to thereby establish communication between pipe line 39 and the atmosphere, while at the same time communication between pipe lines 37 and 39 is interrupted.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a mixing machine of the class described, in combination, a mixer, a tiltable unit for causing charging and discharging action of the mixer, pressure fluid operated rams connected with said unit for imparting opposite movements thereto, said rams including cylinders, anchoring means for the cylinders, a piston in each cylinder, a piston rod connecting each piston with said unit, pressure fluid passage and valve means for each cylinder, instrumentalities for maintaining said pistons at one side thereof under a predetermined fluid pressure, devices for imparting a higher fluid pressure at the other side of said pistons to move the same and said unit to cause discharging of the mixer, and automatic instrumentalities for releasing said higher pressure automatically to thereby return said unit and mixer under the influence of said predetermined pressure to charging position.

2. In a mixing machine of the class described, in combination, a mixer, a tiltable unit for causing charging and discharging action of the mixer, pressure fluid operated rams connected with said unit for imparting opposite movements thereto, said rams including cylinders, anchoring means for the cylinders, a piston in each cylinder, a piston rod connecting each piston with said unit, pressure fluid passage and valve means for each cylinder, instrumentalities for maintaining said pistons at one side thereof under a predetermined fluid pressure, devices for imparting a higher fluid pressure at the other side of said pistons to move the same and said unit to cause discharging of the mixer, automatic instrumentalities for releasing said higher pressure automatically to thereby return said unit and mixer under the influence of

the predetermined fluid pressure to charging position, and cushioning means for cushioning the movements of said pistons and unit at the end of each action.

3. In a mixing machine of the class described, in combination, a mixer, a movable mounting means for said mixer, instrumentalities for tilting said mounting means whereby to cause said mixer to assume charging and discharging positions, said instrumentalities including a pressure fluid operated ram connected with said mounting means for imparting movement thereto in opposite directions, said ram including a cylinder, anchoring means for said cylinder, a piston in said cylinder, a piston rod connecting said piston with said mounting means, and means controlled by the movement of said piston for cushioning the movement of said mixer as it approaches the opposite extremes of its movement in opposite directions, while permitting relative rapid initial movement of said mixer and between the positions of cushioned movement at the extreme opposite ends of its movement, one of said cushioning means comprising a pressure fluid passage in said cylinder for directing the admission and exhaust of pressure fluid into and from the cylinder at one side of the piston, pressure fluid operated valve means in said passage for permitting substantially unrestricted admission of pressure fluid into said cylinder, and means operable responsive to movement of said piston as it approaches the end of its stroke for restricting the exhaust of pressure fluid from said cylinder through said passage aforesaid, whereby to produce a cushioning effect on said piston and consequently on said mixer.

4. In a mixing machine of the class described, in combination, a mixer, movable mounting means for said mixer, instrumentalities for tilting said mounting means whereby to cause said mixer to assume charging and discharging positions, said instrumentalities including a pressure fluid operated ram connected with said mounting means for imparting movement thereto in opposite directions, said ram including a cylinder, anchoring means for said cylinder, a piston in said cylinder, a piston rod connecting said piston with said mounting means, and means controlled by the movement of said piston for cushioning the movement of said mixer as it approaches the opposite extremes of its movement in opposite directions, while permitting relative rapid initial movement of said mixer and between the positions of cushioned movement at the extreme opposite ends of its movement, said cushioning means comprising a pressure fluid passage in said cylinder for directing the admission and exhaust of pressure fluid into and from the cylinder at one side of the piston, pressure fluid operated valve means in said passage for permitting substantially unrestricted admission of pressure fluid into said cylinder, one of said means for cushioning these movements of said mixer including instrumentalities operable responsive to movement of said piston as it approaches the end of its stroke for restricting the exhaust of pressure fluid from said cylinder through said passage aforesaid, whereby to produce a cushioning effect on said piston and consequently on said mixer, said last named means comprising a plug member mounted on said piston and receivable in said passage aforesaid intermediate the pressure fluid operated valve means and the end of said passage to prevent the free exhaust of pressure fluid from said cylinder into said passage.

5. In a mixing machine of the class described, in combination, a mixer, a movable mounting means for said mixer, instrumentalities for tilting said mounting means whereby to cause said mixer to assume charging and discharging positions, said instrumentalities including a pressure fluid operated ram connected with said mounting means for imparting movement thereto in opposite directions, said ram including a cylinder, anchoring means for said cylinder, a piston in said cylinder, a piston rod connecting said piston with said mounting means, means controlled by the movement of said piston for cushioning the movement of said mixer as it approaches the opposite extremes of its movement in opposite directions, while permitting relative rapid initial movement of said mixer and between the positions of cushioned movement at the extreme opposite ends of its movement, said cushioning means comprising a pressure fluid passage in said cylinder for directing the admission and exhaust of pressure fluid into and from the cylinder at one side of the piston, pressure fluid operated valve means in said passage for permitting substantially unrestricted admission of pressure fluid into said cylinder, one of said means for cushioning these movements of said mixer including instrumentalities operable responsive to movement of said piston as it approaches the end of its stroke for

restricting the exhaust of pressure fluid from said cylinder through said passage aforesaid whereby to produce a cushioning effect on said piston and consequently on said mixer, and a bleeder passage in said cylinder leading from the passage aforesaid to the cylinder and having valve means therein for controlling the exhaust of pressure fluid from said cylinder during the movement of said piston from a point near the end of its stroke to the final limit of its movement.

6. In a mixing machine of the class described, in combination, a mixer, a tiltable unit for moving said mixer to and from charging and discharging positions of the mixer, pressure fluid operated rams connected with said unit for imparting opposite movements thereto, said rams including cylinders, anchoring means for said cylinders, a piston in each cylinder, a piston rod connecting each piston with said unit, instrumentalities for maintaining said pistons at one side thereof under a constant fluid pressure whereby to cause said mixer to normally assume a position at the extreme end of its movement in one direction, and means for imparting a higher fluid pressure at the other side of said pistons to move the same and said unit and mixer to the extreme ends of their movement in the opposite direction.

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