Feb. 3, 1942. F. H. HEINE 2,271,518

ELECTRIC TILTING DEVICE

Filed Jan. 8, 1940 2 Sheets-Sheet 1

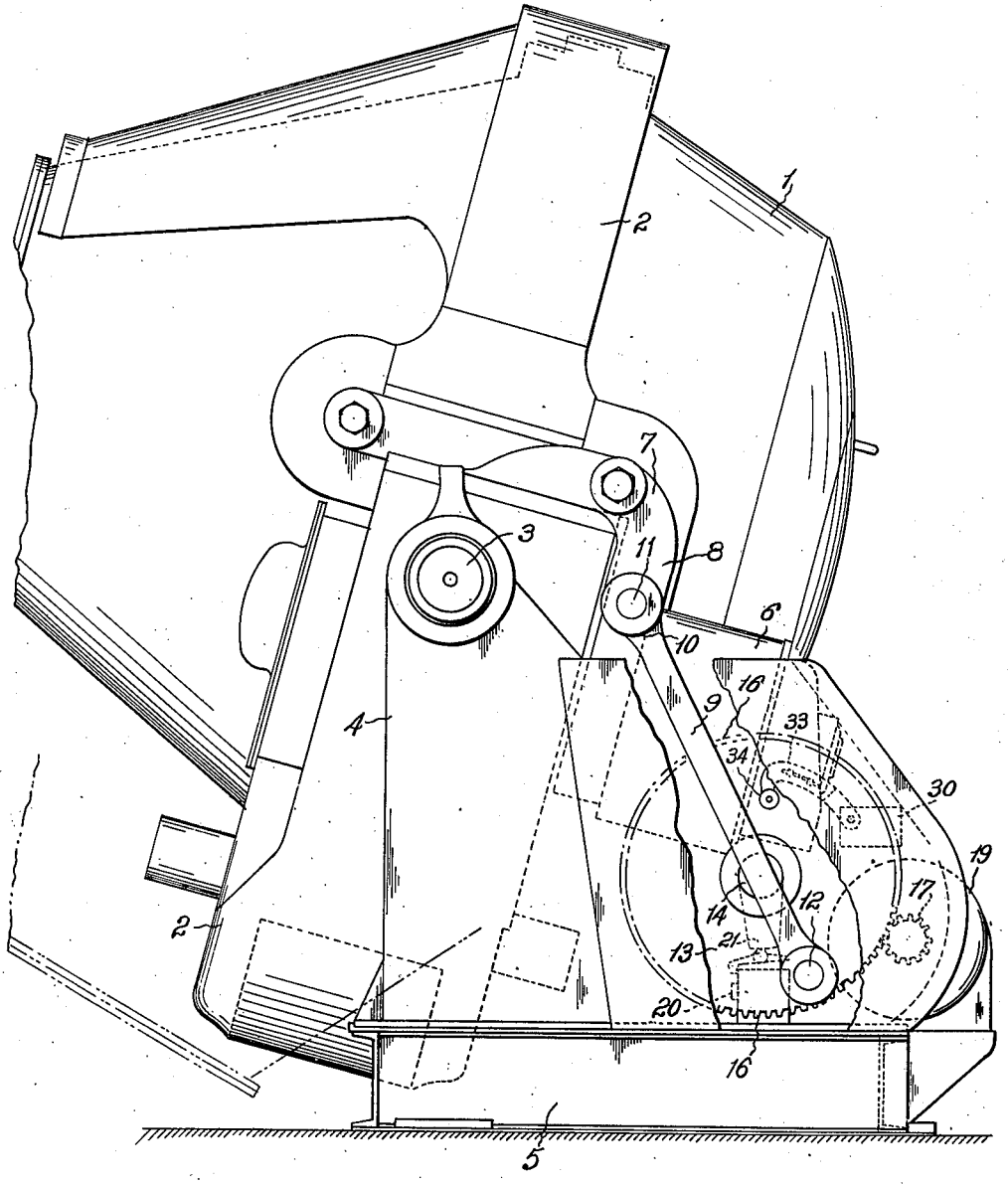


FIG. 1

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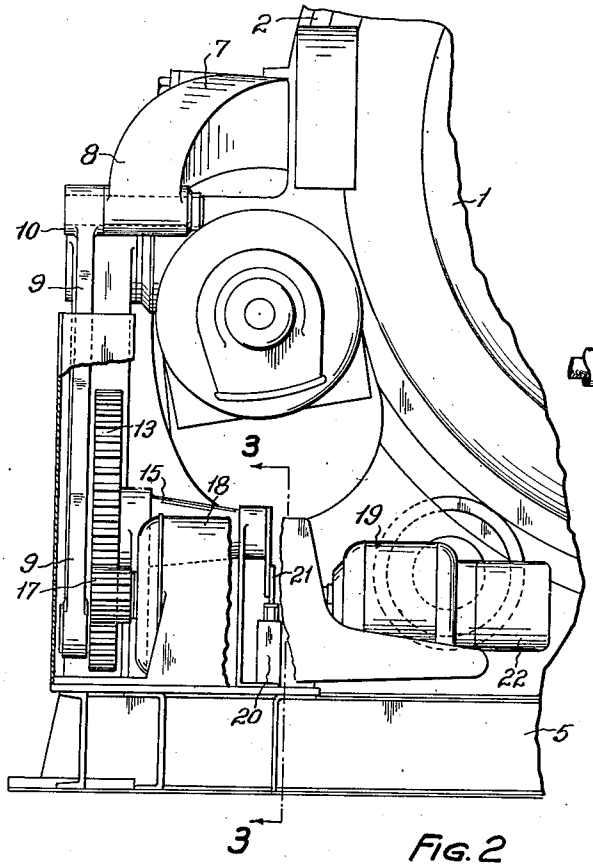


FIG. 2

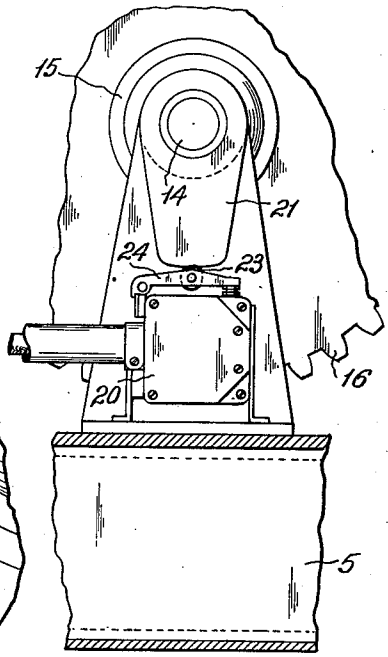


FIG. 3

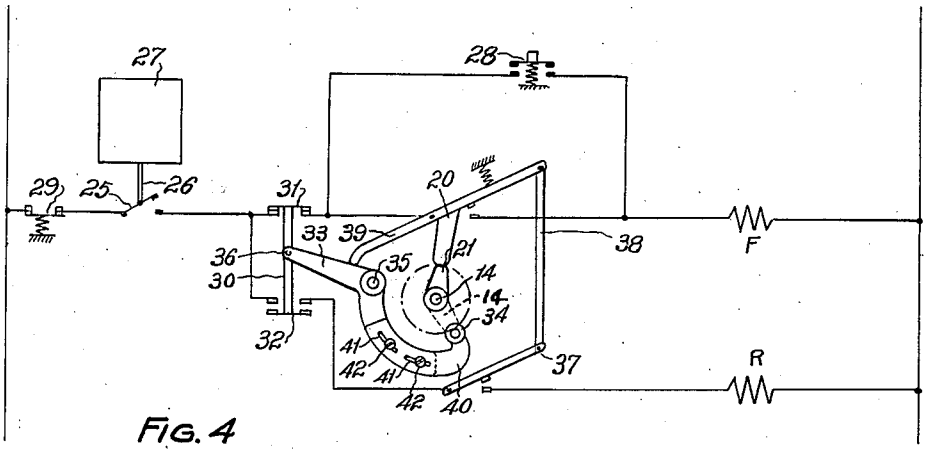


FIG. 4

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UNITED STATES PATENT OFFICE

2,271,518

ELECTRIC TILTING DEVICE

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Application January 8, 1940, Serial No. 312,971

9 Claims. (Cl. 259—171)

This invention relates to concrete mixers of the tilting type, and more particularly to novel tilting mechanism for imparting tilting movement to the concrete mixer.

In concrete mixers of the tilting type, the mixing unit is mounted for tilting movement from a mixing or charging position to a somewhat inverted or discharging position and power operated mechanism is usually employed for effecting the tilting movement of the mixing unit to and from its discharging position. Obviously, the mixing unit in such types of mixing machines will be subjected to severe shocks if the acceleration imparted to the mixing unit is too great when the mixer is adjacent either its charging or discharging positions. In other words, rapid starting and stopping of the tilting movement of the mixing unit will subject the unit to undesirable forces which will seriously affect the lift of the parts of the apparatus. The desirability of eliminating or decreasing the forces encountered in starting and stopping of the tilting movement of the mixer applies equally to all sizes of power operated tilting mixers, although more so to tilting mixers of the size adapted to mix several cubic yards of concrete at a single time and for which the tilting mechanism of this invention is particularly adapted.

One of the principal objects of this invention is the provision of tilting mechanism which will be effective to impart a tilting movement to the mixing unit, and in which the speed of movement of the mixing unit will be gradually increased or decreased as the mixing unit moves respectively toward or away from either its charging or discharging positions.

A further object is to provide, in a tilting mixer of the character referred to, a novel form of tilting mechanism having an electric drive and connected to the mixer unit for imparting a tilting movement thereto upon operation of the electric drive.

A further objects is to provide, in tilting mechanism employing an electric motor for effecting the tilting movement of the mixer unit, a novel arrangement of control instrumetalities for controlling the supply of electric current to the electric motor.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings there is shown a preferred embodiment of the invention. In this showing—

Figure 1 is a side elevational view of a mixer unit, a part thereof being broken away to show the tilting mechanism.

Figure 2 is a partial end elevational view of the apparatus shown in Figure 1, parts thereof being broken away.

Figure 3 is a fragmentary sectional view taken substantially on the line 3—3 of Figure 2.

Figure 4 is a diagrammatic illustration of the wiring circuit and control devices for the electric motor drive.

Referring to Figure 1, the numeral 1 indicates the tilting mixer which is supported by a tilting carriage 2 in a manner well known in the art. The carriage 2 is provided with trunnions 3 located at diametrically opposite sides of the carriage 2, only one of the trunnions 3 being shown in the drawings. The trunnions 3 are rotatably supported in a trunnion cradle 4 secured to the base 5 of the mixer. A motor 6 and suitable connections (not shown) are provided for imparting a rotating movement to the mixer 1 in the carriage 2, such movement effecting the mixing action of concrete through mixing blades mounted in the interior of the mixer 1. The parts thus far described are well known in the art and are of themselves no part of this invention, this invention being equally adapted to tilting mixers of all types as well as to the type shown in Figure 1.

In order to impart a tilting movement to the carriage 2 and mixer 1 which are tiltably movable together about the axis of the trunnions 3, a crank 7 is rigidly secured to the carriage 2 and extends outwardly therefrom so as to provide an end 8 thereeof spaced from the axis of the trunnions 3. An actuating member or pitman 9 has one end 10 thereof pivotally secured to the end 8 of the crank 7 by a wrist pin 11. The other end of the actuating member or pitman 9 is rotatably connected to a crank 12 mounted on a rotatable driving wheel 13.

The driving wheel 13 is keyed to a shaft 14 journaled in a housing 15 mounted on the base 5. The driving wheel 13 has gear teeth 16 formed on the outer peripheral edge thereof which mesh with the teeth of the pinion 17. The pinion 17 is driven from a gear speed reduction unit 18 which is in turn driven by an electric motor 19.

The arrangement of the actuating member 9 and the rotatable crank 12 on the driving wheel 13 provides a very efficient means for imparting tilting movement to the mixer unit 1 and carriage 2 without subjecting such devices to excessive forces from rapid starting and stopping

of the tilting movement. Since it is desirable that the tilting movement be started and stopped with as little shock as possible, it will be noted that the ends 10 and 12 of the member 9 occupy a dead center position with respect to the center of the shaft 14 on which the driving wheel 13 is mounted, when the mixer unit is in either its charging or discharging position.

By this arrangement, it will be apparent that initial movement of the driving wheel 13 by the pinion 17 will effect a relatively slow initial movement of the mixing unit and carriage 2 from its charging positon. As movement of the driving wheel 13 is continued, it will be apparent that the speed of tilting movement will be gradually increased until such speed becomes greatest after the driving wheel 13 has been rotated 90° at which point the actuating member 9 will be substantially tangential with respect to the driving wheel 13.

Thereafter, the speed of tilting movement will be gradually decreased until the mixer 1 reaches its inverted discharging position after movement of the driving wheel 13 through an angle of 180° at which point the mixing unit 1 will be in its discharging position. Continued movement of the driving wheel 13 will then be operative to return the mixing unit 1 and carriage 2 to its upright or charging position shown in Figure 1. It will thus be apparent that the driving mechanism provides for gradual stopping or starting of the tilting movement of the mixer 1 as the mixer 1 approaches either its charging or discharging position.

To effect automatic stopping of the motor 19 and tilting movement of the mixer 1 upon return of the mixer 1 to charging position, a limit switch 20 is placed in the circuit to the electric motor, and is mounted on the base 5. A cam 21 is keyed to the shaft 14 and is adapted to break the circuit to interrupt the flow of current to the motor 19 upon return of the mixing unit 1 to its charging position in a manner to be described. A magnetic disc brake 22 is provided to hold the motor 19 and the parts driven thereby in a fixed position upon interruption of the flow of current to the motor. The cam 21 is so positioned on the shaft 14 that when the apparatus returns to charging position with the actuating member 9 in the dead center position shown in Figure 1, the cam 21 will engage the roller 23 on the arm 24 and the arm 24 will be forced downwardly to operate the limit switch 20 to interrupt the flow of current to the motor 19.

Referring to Figure 4 illustrating diagrammatically the electric circuit and control instrumentalities for controlling the actuation of the electric motor 19, it will be noted that the limit switch 20 is shown in open position breaking the electric circuit of the motor 19. A second control switch 25 is also provided and is adapted to be operated by a member 26 under the control of a batchmeter 27 which may be a type of batchmeter such as shown in Winkler Patent No. 1,451,483. The operation of batchmeters of the type shown in the aforesaid patent is well known in the art, and it will be sufficient to point out that upon charging of the mixing unit 1, the control member 26, which is suitably connected to the control switch 25, will be operated to open the switch 25 as shown in Figure 4 and thereby break the circuit to the electric motor 19. Operation of the motor 19 to effect movement of the mixer unit to discharging position will thus be prevented until the end of the mixing period as controlled by the batchmeter 27.

In operation, assuming that the mixing unit 1 has been charged and the batchmeter 27 set into operation, at the end of the mixing period, the batchmeter 27 will operate the member 26 to close the switch 25. However, since the circuit to the motor 19 has been previously broken through the limit switch 20, as operated by the cam 21 upon movement of the mixing unit to charging position, the circuit to the motor will not be completed upon operation of the batchmeter 27 to close the switch 25. In order that tilting movement of the mixing unit 1 may be started, a manual switch 28 is connected in parallel with the limit switch 20. To start discharging movement of the mixing unit 1, the manual switch 28 is operated to by-pass the limit switch 20 and complete the circuit to the motor 19 through the switch 28. After manually starting the tilting movement, the cam 21 will pass the roller 23 and the limit switch 20 will then be operative to complete the circuit to the motor and the manual switch 28 may then be released without interrupting the tilting movement. Thereupon, the motor 19 will continue operating the mixer to tilt it to its discharging position and return the same to charging position at which point the circuit will be again interrupted by operation of the limit switch 20 to hold the apparatus in charging position.

A two-way reversing switch 30 having contacts 31 and 32 is provided to effect a reversing action of the tilting apparatus in a manner to be described. The description of the construction and operation of the apparatus thus far has proceeded on the assumption that the switch 30 is always in the position shown in Figure 4 with the contacts 31 closed for completing the motor circuit through the winding F. Upon operation of the switch 30 to open the contacts 31 and close the contacts 32, it will be apparent that the circuit through winding F will be broken and the circuit through winding R will be completed to effect a reversal of the action of the motor 19 and the tilting apparatus controlled thereby.

Although the switch 30 is manually operable by operator to effect a reversing action at any time desirable, as when operator desires to prevent discharge of a mix after tilting operation has been started, automatically operable mechanism is provided for effecting operation of the switch 30. The switch 30 is adapted to be operated automatically by an operating member 33 having a roller 34 positioned in the path of the cam 14. The position of the reversing switch 30 and its automatic operating member 33 is generally shown in Figure 1 and reference is now made to Figure 4 for a more complete showing of the mechanism by which the switch 30 is automatically controlled.

The operating member 33 is pivotally mounted on a pivot 35 and is pivotally connected to the switch 30 as at 36. A second limit switch 37 is placed in the circuit for effecting a reversal of operation of the motor and is adapted to be operated simultaneously with the limit switch 20 by a member 38 connecting the limit switch 37 to the limit switch 20.

Assuming that the control operation of the batchmeter has operated to close the switch 25 and the manual starting switch 28 has been operated to by-pass and permit closing action of the limit switches 20 and 37, the cam 21 will be caused to rotate clockwise from its position shown

in full lines in Figure 4. When the cam 21 reaches position shown in dotted lines in Figure 4, the cam 14 will contact the roller 34 and move the same downwardly to effect a pivotal movement of the member 33 and an upward movement of the switch 30. Initial upward movement of the switch 30 will break the motor circuit through the contacts 31 and stop the tilting movement of the mixer unit and final upward movement will close the contacts 32 and complete the circuit to the motor for effecting a reverse action of the motor and tilting apparatus.

After the direction of rotation of the motor 19 has been reversed, the cam 14 will be rotated counterclockwise until it contacts limit switch 20 to effect an actuation thereof. At the same time, the limit switch 37 will be operated to break the circuit to the motor 19 through the switch 37 and stop tilting movement of the mixer unit 1.

In order that the switch 30 will be returned to its original position with the contacts 31 closed and contacts 32 open, the limit switch 20 is provided with a member 39 adapted to engage and actuate the member 33. Upon operation of the limit switches 20 and 37 by the cam 14, the member 39 will move downwardly and engage and effect a counter-clockwise pivotal movement of the member 33. Such movement of the member 33 will effect a downward movement of switch 30 closing the contacts 31 and opening contact 32.

To permit adjustment of the roller 34 with respect to the path of the cam 14, the roller 34 is secured to the member 33 by an adjustable supporting member 40. Curved slots 41 are formed in the member 40 through which suitable fastening devices 42 extend to permit adjustable movement of the roller 34 with respect to the path of the cam. In this manner, an effective method of controlling the time of discharge action is provided. For example, if it is desired to hold the mixer in its inverted discharging position for a longer period of time, the roller 34 will be positioned to effect automatic reversal of the tilting movement after movement of the cam 14 through an arc of greater than 180°. Likewise, if it is desired to hold the mixer in discharging position for a shorter period of time, the roller 34 will be adjusted to effect automatic reversal and return of the mixer to its charging position before the cam 14 has travelled 180°.

If the automatic reversing action of the tilting apparatus is not desired, then it is merely necessary to remove the adjustable member 40 from the member 33 and the driving wheel 13 will be operated in a single direction to effect tilting action of the mixer unit. The switch 30, in such case, will be manually operable for reversing the direction of rotation of the driving wheel 13 at any time after operation of the same has been started.

From the foregoing, it will be apparent that there is provided an efficient arrangement of electrically driven mechanism by which tilting movement of the mixer 1 is started and stopped easily as it goes respectively to and from its charging and discharging positions. It will also be apparent that there is provided a novel arrangement of controls for controlling the motor driving the tilting mechanism referred to and employed for imparting tilting movement to the mixing unit 1, and for adjustably controlling the time in which the mixing unit is held in its inverted discharging position.

It is to be understood that the form of invention herein shown and described is to be taken as a preferred example of the same and that various changes may be made therein without departing from the spirit of the invention or the scope of the subjoined claims.

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 mixing unit, means supporting said unit for tilting movement between charging and discharging positions, and mechanism for effecting tilting movement of said unit comprising an actuating member having one end thereof connected to said unit, a crank connected to the other end of said member, an electric motor for rotating said crank to impart movement to said actuating member for effecting tilting movement of said mixing unit, an electric circuit connecting said motor to a suitable source of energy, a control switch in said circuit, a batchmeter operable upon charging of said mixing unit to actuate said control switch to open the circuit through said control switch and to close the circuit through said control switch after a predetermined period of time, a limit switch in said circuit, means operable as said unit approaches charging position to actuate said limit switch to open said circuit and stop further tilting movement of said mixing unit by said motor, said limit switch being normally operable to close said circuit after initial movement of said mixing unit from charging position, and a third switch operable upon actuation thereof to close the circuit to said motor after operation of said batchmeter to close the circuit through said control switch and while the circuit through said limit switch is open to effect initial movement of said mixing unit from charging position.

2. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, and mechanism for effecting tilting movement of said unit comprising an electric motor, an electric circuit connecting said motor to a suitable source of current, a control switch in said circuit, a batchmeter operable upon charging of said mixing unit to actuate said control switch to open the circuit through said control switch and to close the circuit through said control switch after a predetermined period of time, a limit switch in said circuit, means operable as said unit approaches charging position to actuate said limit switch to open said circuit and stop further tilting movement of said mixing unit by said motor, said limit switch being normally operable to close said circuit after initial movement of said mixing unit from charging position, and a third switch operable upon actuation thereof to close the circuit to said motor after operation of said batchmeter to close the circuit through said control switch and while the circuit through said limit switch is open to effect initial movement of said mixing unit from charging position.

3. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, means for effecting tilting movement of said unit comprising an electric motor and driving mechanism intermediate said motor and mixing unit, a pair of motor circuits for effecting operation of said motor in either of two directions, a reversing switch operable to close one or the other of said circuits, and means automatically operable upon

movement of said mixing unit to a predetermined discharging position from charging position for actuating said switch to effect operation of said motor in a reverse direction for returning said mixing unit to charging position, said last named means being selectively adjustable to different positions for varying the time in which said unit is held in discharging position by changing the predetermined discharging position from which the mixing unit is returned.

4. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, means for effecting tilting movement of said unit comprising an electric motor and driving mechanism intermediate said motor and mixing unit, a pair of motor circuits for effecting operation of said motor and said mixing unit in either of two directions, a reversing switch operable to close one or the other of said circuits, means automatically operable upon movement of said mixing unit in one direction to a predetermined position from charging position for actuating said switch from a first position to a second position to effect operation of said motor and said mixing unit in a reverse direction for returning said mixing unit to charging position, and means operable upon the return of said mixer to charging position for returning said switch from said second to said first position to permit operation of said motor in said first direction to effect a subsequent movement of said mixing unit to discharging position.

5. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, means for effecting tilting movement of said unit comprising an electric motor and driving mechanism intermediate said motor and mixing unit, a pair of motor circuits for effecting operation of said motor and said mixing unit in either of two directions, a limit switch in each of said motor circuits, means operable upon movement of said mixing unit to charging position for moving both of said limit switches from closed to open position, a reversing switch operable to close one or the other of said motor circuits, means operable upon movement of said mixing unit in one direction to a predetermined position for actuating said reversing switch from a first to a second position to effect operation of said motor in a reverse direction returning said mixing unit to charging position, and a control switch operable to by-pass one of said limit switches for actuating said motor and effecting initial movement of said mixing unit from charging position.

6. In a mixing machine of the class described, in combination, a mixing unit, means for supporting said unit for tilting movement between charging and discharging positions, and mechanism for effecting tilting movement of said unit comprising a rotatable driving wheel, power means for imparting rotation to said driving wheel, an actuating member operable by said driving wheel to impart a tilting movement to said mixing unit, said actuating member being adapted to occupy a substantially dead center position with respect to said driving wheel when said mixing unit is in charging position and operable upon rotation of said driving wheel through an angle of 180° to move said mixing unit from charging to discharging positions, and means operable upon movement of said mixing unit to a predetermined position for reversing the direction of rotation of said driving wheel to return said mixing unit to discharging position, said reversing means being adjustable to different positions to permit movement of said driving wheel through an angle of greater or less than 180° to vary the time in which said mixing unit is retained in discharge position.

7. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, and mechanism for effecting tilting movement of said unit comprising an electric motor, an electric circuit connecting said motor to a suitable source of current, a limit switch in said circuit, means operable as said unit approaches charging position to actuate said limit switch to open said circuit and stop further tilting movement of said mixing unit by said motor, said limit switch being normally operable to close said circuit after initial movement of said mixing unit from charging position, and a by-pass switch operable upon actuation thereof to close the circuit to said motor while the circuit through said limit switch is open to effect initial movement of said mixing unit from charging position, to permit closing of said circuit by said limit switch.

8. In a mixing machine of the class described, in combination, a mixing unit, means supporting said unit for tilting movement between charging and discharging positions, means for effecting tilting movement of said unit comprising an electric motor and driving mechanism intermediate said motor and mixing unit, a pair of motor circuits for effecting operation of said motor and said mixing unit in either of two directions, a limit switch in each of said motor circuits, means operable upon movement of said mixing unit to charging position for moving both of said limit switches from closed to open position, said limit switches being normally adapted to occupy closed positions after initial movement of said mixing unit from charging position, a reversing switch operable to close one or the other of said motor circuits, means operable upon movement of said mixing unit in one direction to a predetermined position for actuating said reversing switch from a first to a second position to effect operation of said motor and mixing unit in a reverse direction for returning said mixing unit to charging position, connections to said reversing switch operable upon movement of said limit switches to open position for returning said reversing switch from said second to said first position to permit operation of said motor in said first direction to effect a discharging action of said mixing unit, and a control switch to by-pass one of said limit switches to complete the circuit to said motor through said reversing switch in its first position while the limit switches are open to effect initial movement of said mixing unit from charging position.

9. A mixing machine as claimed in claim 8, wherein the operating means for said reversing switch is adjustable to different positions to effect the return of said mixing unit from different predetermined positions to vary the time in which said mixing unit is in discharging position.

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