March 17, 1964 M. T. VUKICH 3,125,257

LOADING DEVICE FOR A PUMPING MACHINE

Filed July 5, 1962 3 Sheets-Sheet 1

FIG. 1.

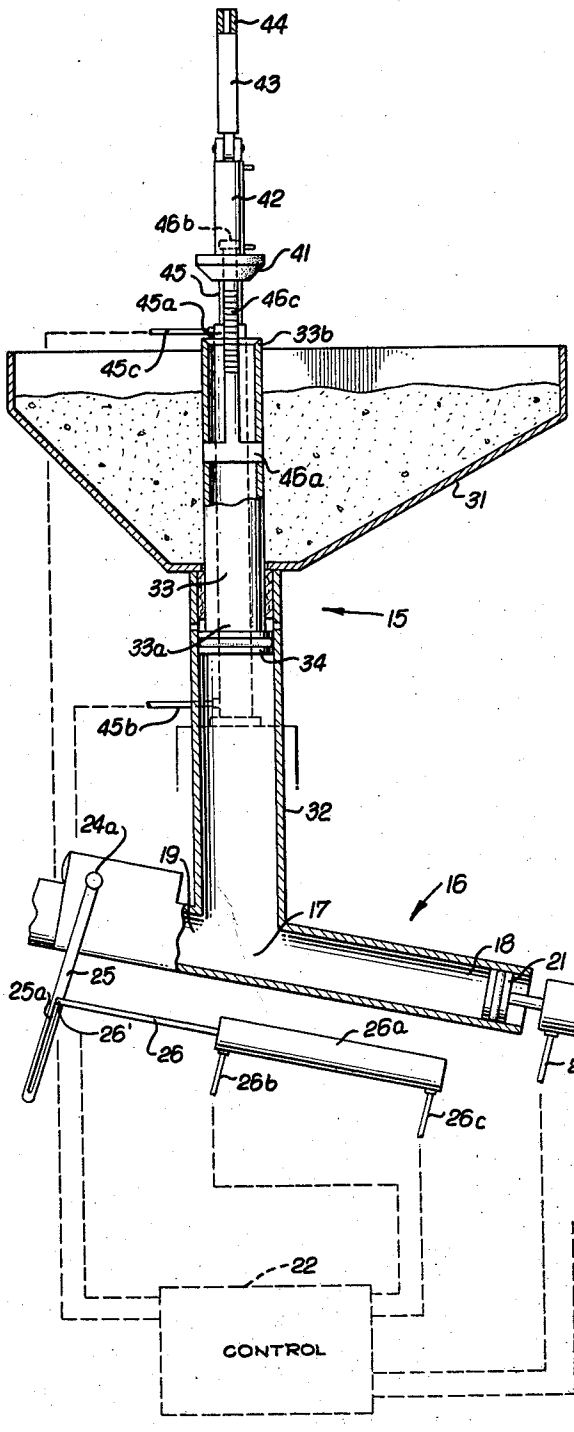
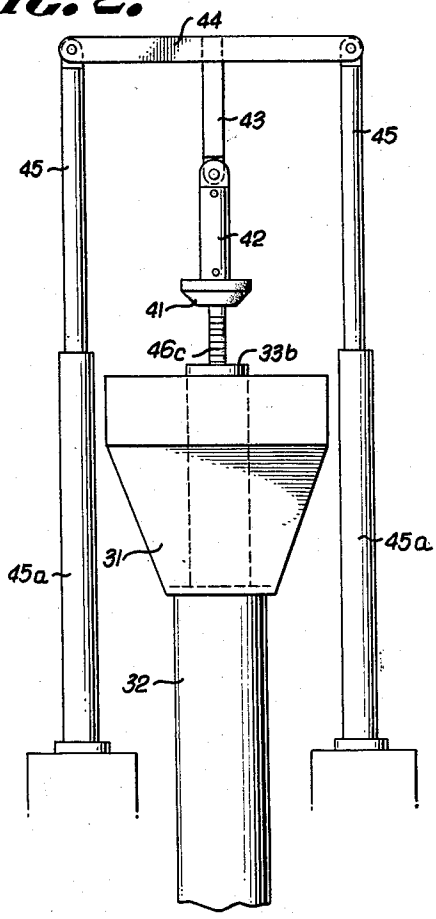


FIG. 2.



INVENTOR.
MARTIN T. VUKICH
BY
Miketta and Glenny
ATTORNEYS.

March 17, 1964 M. T. VUKICH 3,125,257

LOADING DEVICE FOR A PUMPING MACHINE

Filed July 5, 1962 3 Sheets-Sheet 2

FIG. 3.

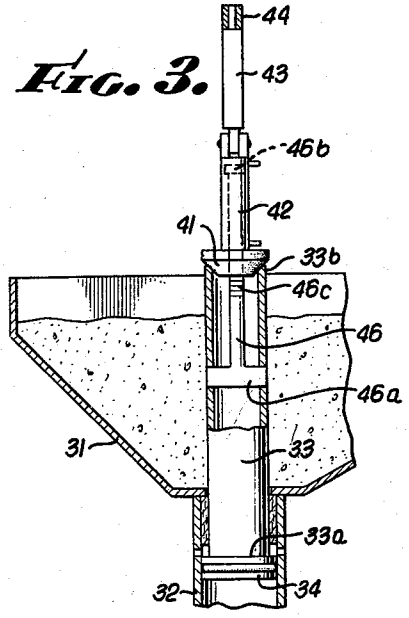


FIG. 5.

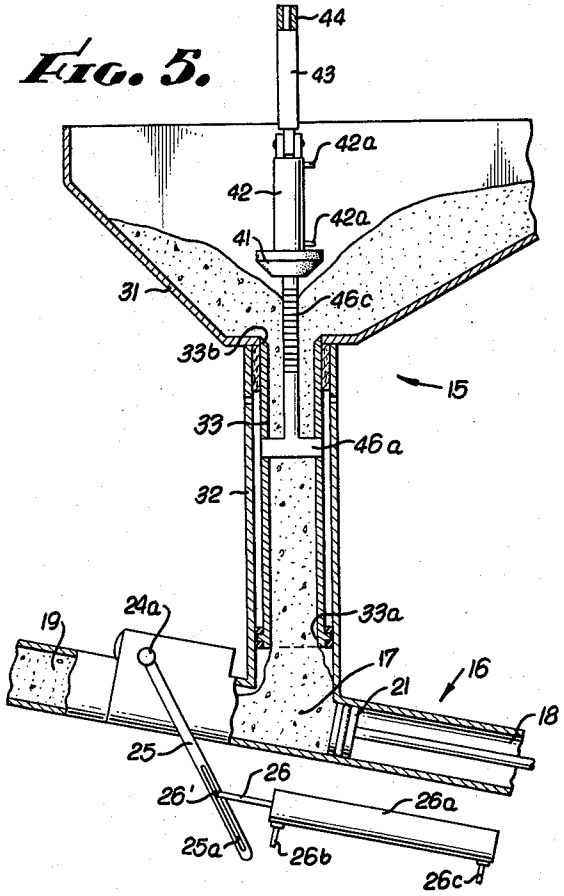


FIG. 4.

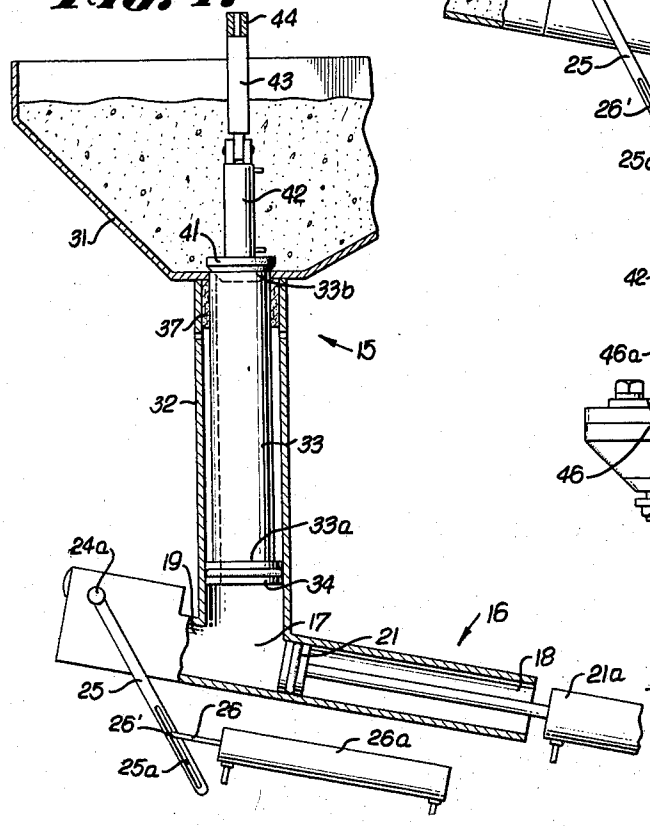
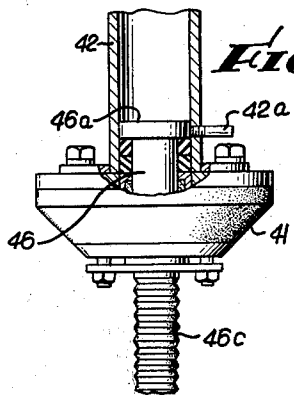


FIG. 6.



INVENTOR.
MARTIN T. VUKICH
BY
Miketta and Glenny
ATTORNEYS.

March 17, 1964 M. T. VUKICH 3,125,257

LOADING DEVICE FOR A PUMPING MACHINE

Filed July 5, 1962 3 Sheets-Sheet 3

FIG. 7.

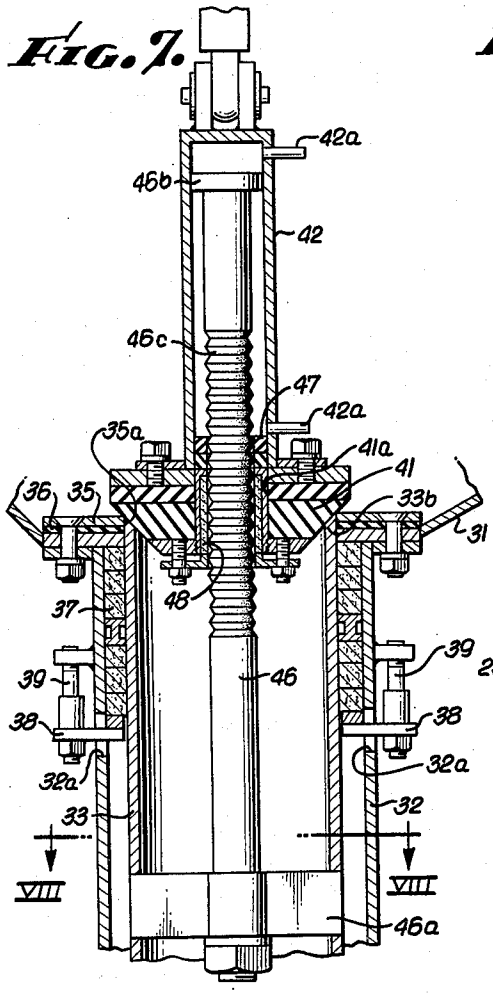


FIG. 8.

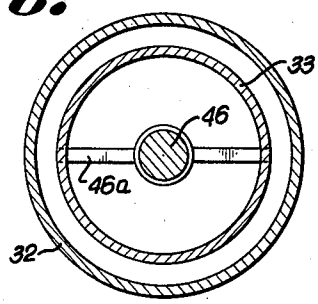


FIG. 10.

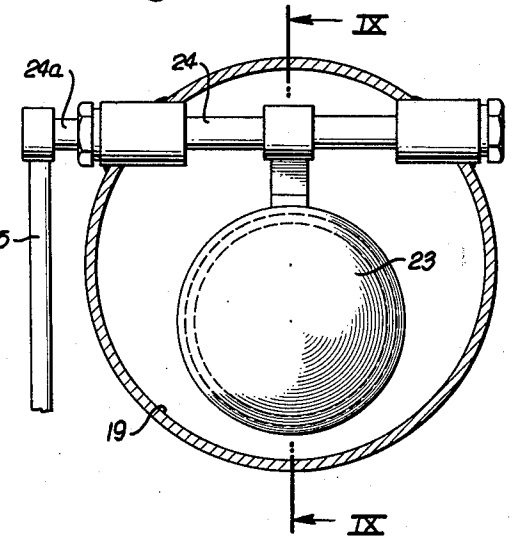
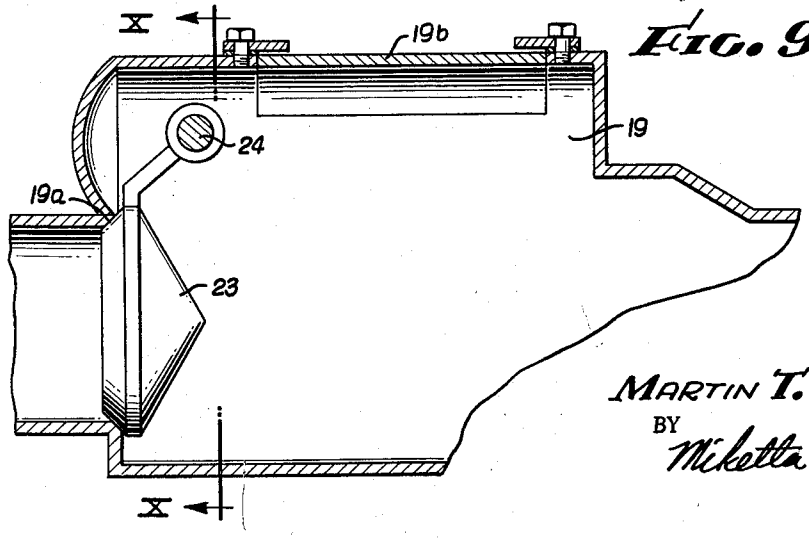


FIG. 9



INVENTOR.
MARTIN T. VUKICH
BY
Miketta and Glenny
ATTORNEYS.

United States Patent Office 3,125,257 Patented Mar. 17, 1964

3,125,257

LOADING DEVICE FOR A PUMPING MACHINE

Martin T. Vukich, 10891 Olinda St., Sun Valley, Calif.

Filed July 5, 1962, Ser. No. 207,706
7 Claims. (Cl. 222—255)

This invention relates to a loading device for a machine for pumping material containing aggregate and sand, and more particularly to such a loading device which is jamproof, leakproof, and measures and delivers a uniform amount of material to a loading chamber of a pumping machine for each pumping cycle.

Heretofore, machines for pumping material, such as concrete compositions containing aggregate, have been inefficient and frequently become inoperative due to the aggregate or rock in the mixture becoming lodged or wedged in the loading device or the inlet valve. When the loading device or inlet valve was jammed, the concrete composition from the feeding hopper deluged or flooded the loading chamber and caused the pumping piston to become inoperative. The entire machine was then required to be disassembled, cleaned and cleared of all jamming rocks or aggregate. Since cementitious compositions must be used promptly before setting, all of the premixed composition or material in the loading hopper would have to be discarded.

Moreover, even when the loading device or inlet valve was not jammed and operated properly, the cement portion of the composition or material would leak past the valve or through the loading device. Since the cementitious composition or material had a rather heavy consistency due to the aggregate and sand, there was a preformed clearance provided between the valve and valve housing to allow the valve to actuate freely. This clearance allowed the composition or material to leak down into the loading chamber when the inlet valve or loading device was closed. In time, a sufficient amount of the material or composition would flow behind the piston, causing it to operate very sluggishly or to become inoperative.

In addition, loading devices or inlet valves for concrete pumping machines used heretofore would deposit non-uniform loads of concrete composition into the loading chamber for each pumping cycle. This provided a spasmodic or fluctuating delivery or flow of the concrete composition from the outlet of the machine rather than a smooth and continuous delivery.

The present invention obviates the above disadvantages of loading devices used heretofore by providing a hopper means for holding a supply of material to be loaded, and a hollow loading cylinder slidably mounted to move within a discharge duct extending from the lower portion of the hopper supply means. The loading cylinder is adapted to move axially within the discharge duct and through the hopper supply means between a filling position when the filling port of the loading cylinder is adapted to be open and in contact with the material in the lower portion of the hopper supply means and a discharging position when the filling port of the loading cylinder is adapted to be closed by a valve means and is out of contact with the material in the hopper supply means. This device prevents the aggregate or sand contained within the material provided in the hopper supply means from jamming the loading device, and also prevents leakage into the loading chamber.

The present invention also includes means for actuating the valve, drive means for moving the loading cylinder between the filling position and the discharging position, and control means operatively connected to the valve actuating means and the loading cylinder drive means for sequentially operating the various elements in timed relationship to move the loading cylinder between the filling position and the closing position.

As the open loading cylinder of the present invention is moved through the material in the hopper supply means, the material pours through the filling port and into the loading chamber of the pumping machine. The amount of material thus provided to the loading chamber is uniform during each pumping cycle.

Accordingly, it is a general object of the present invention provide a loading device for a pumping machine that avoids all of the foregoing disadvantages of similar type loading devices used heretofore.

An object of the present invention is to provide a loading device for a machine adapted to pump material containing aggregate, such loading device being leakproof, jamproof and adapted to meter and deliver a uniform amount of material to the loading chamber of a pumping machine.

A further object is to provide a novel loading device for controlling material containing aggregate which is leakproof, jamproof and meters and delivers a uniform amount of material.

Other objects and advantages of this invention will be readily apparent from the following description when considered in connection with the appended drawings.

FIG. 1 is a side elevation, partly in section, of an exemplary loading device of the present invention connected to a pumping machine, the exemplary controls therefor being diagrammatically shown.

FIG. 2 is an end elevation of the loading device shown in FIG. 1.

FIG. 3 is a side elevation, partly in section, of the loading device in FIG. 1 in the discharging position wherein the filling port of the loading cylinder is closed by the valve and the discharging stroke is adapted to begin.

FIG. 4 is a side elevation, partly in section, of the device wherein the loading cylinder is at the end of the discharging stroke and the valve is still closing the filling port of the loading cylinder.

FIG. 5 is a side elevation, partly in section, of the device in the filling position wherein the filling port of the loading cylinder is open and the filling stroke is adapted to begin.

FIG. 6 is a side elevation, partly in section, of an exemplary connection between the valve actuating means and drive means for the loading cylinder.

FIG. 7 is an enlarged longitudinal section of the device wherein the loading cylinder is at the end of the discharging stroke as shown in FIG. 4.

FIG. 8 is a transverse section of the device taken along VIII—VIII of FIG. 4.

FIG. 9 is a side elevation, partly in section, of the pumping machine taken along IX—IX of FIG. 10 showing the swinging check valve in the closed position during the filling stroke of the loading device.

FIG. 10 is a transverse section of the pumping machine taken along plane X—X of FIG. 9.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 an exemplary loading device **15** of the present invention connected to a machine **16** adapted to preferably pump material, such as concrete, containing aggregate and sand. It is understood that the loading device of the present invention may be connected to and cooperate with other machines, but has particular advantages with those machines pumping material containing aggregate and sand as the loading device is jamproof and leakproof.

The pumping machine **16** may have a loading chamber **17**, an inlet end **18**, and outlet end **19**. A pumping or power piston **21** is slidably mounted in the inlet end **18** and is adapted to move toward and away from the loading chamber **17** during the filling and discharging strokes as will be described in detail hereinafter. The piston **21**

may be connected to a cylinder **21***a* provided with fluid ports **21***b* and **21***c*, at either end thereof. Fluid control lines adapted to be connected to ports **21***b* and **21***c* are shown in dotted lines and are adapted to be connected to well-known controls **22** shown in dotted lines.

The control system adapted to be used with the pumping machine **16** and the loading device **15** of the present invention is well known by those skilled in the art and need not be described in detail. Since the control system forms no part of the present invention, it will be shown in dotted lines. It is understood that hydraulic, compressed air or even electric control systems could be used in connection with the present invention.

It is preferred that the longitudinal axis of the pumping machine **16** is inclined upwardly toward the outlet end **19**. It has been found that an angle of 7°–13° between the axis of the machine **16** and the horizontal produces satisfactory results during the pumping cycles. However, it is understood that such longitudinal axis of the pumping machine may also be horizontal.

A check valve **23** may be provided in the outlet end **19** of the machine **16** for controlling the flow of material therethrough from the loading chamber **17**. It is preferred that the valve **23** is of the swinging gate type, although rotary or butterfly valves may be used. The check valve may be rigidly connected to a rotatable transverse shaft **24** adapted to move the valve **23** between open and closed positions in timed sequence with movement of the piston **21**.

The shaft **24** has one end **24***a* which is adapted to be rigidly connected with one end of a control arm **25** having an elongated slot **25***a* provided in the other end thereof. A control piston **26** may be provided for rotating or oscillating the shaft **24** by having a pin **26'** carried on the outer end of piston **26** and slidably received in slot **25***a* in control arm **25**. A cylinder **26***a* having fluid ports **26***b* and **26***c* may be provided for actuating piston **26** and fluid lines may be provided for connecting the ports **26***b* and **26***c* with the control apparatus **22**. It is understood that actuation of the piston **26** causes the shaft **24** to rotate and move the valve **23** between open and closed positions.

In the closed position, the valve **23** is adapted to engage seat **19***a* (FIG. 9) provided in the outlet end **19** of the machine **16**. A removable cleanout door **19***b* may be provided in the outlet end **19** for emergency purposes.

The loading device **15** of the present invention includes a hopper means **31** for holding a supply of material, such as concrete containing aggregate, to be loaded into the loading chamber of the pumping machine **17**. An elongated, substantially vertical, discharge duct **32** extends from the lower portion of the hopper supply means **31** and communicates with the loading chamber **17** of the machine **16**. The discharge duct **32** may be rigidly secured to the supply hopper **31** and machine **16** by any suitable means, such as welding, to insure that the duct **32** is stationary.

The supply hopper **31** is preferably provided with a bottom inclined downwardly and toward the discharge duct **32**. The angle of inclination may vary but preferably it should be between 20° and 60°.

A hollow loading cylinder **33** is slidably mounted in the discharge duct for axial movement. The loading cylinder **33** includes an open discharge end **33***a* within the discharge duct **32** and a filling end including a filling port **33***b* adapted to extend into and move through the material provided in the supply hopper **31**. The filling port **33***b* may have inclined surfaces (FIG. 5) to provide a seat for a valve adapted to open and close such port.

The loading cylinder **33** is adapted to move axially within the discharge duct **32** and through the hopper supply means **31** between a filling position (FIG. 5) when the filling port **33***b* is open and in contact with the material in the lower portion of the supply hopper **31**, and a discharging position (FIG. 3) when the filling port **33***b* is closed and out of contact with the material in the supply hopper.

An annular delivery piston means **34** is provided around the discharge end **33***a* of the loading cylinder **33** and is in sliding contact with the inner surface of the discharge duct **32**. The delivery piston **34** is adapted to act upon material left in the discharge duct **32** by the loading cylinder and force the material out of the discharge duct and into the loading chamber **17** of the machine during the discharge stroke. The piston **34** also acts as a guide for and centers the loading cylinder **33** during movement within the discharge duct **32**.

Sealing means may be provided to prevent material within the supply hopper **31** from leaking through the connection between the discharge duct **32** and supply hopper **31**. Such means may include an annular clamping ring **35** (FIG. 7) including a synthetic rubber gasket **36**, such ring **35** adapted to be welded to the discharge duct **32** and the bottom of the supply hopper **31**. An opening **35***a* is provided in the sealing ring **35** and has a diameter approximately equal to the outer diameter of the hollow loading cylinder **33** which is adapted to slidably move through such opening **35***a* in tight sliding contact.

Packing rings **37** are provided in the upper portion of the discharge duct **32** between the loading cylinder **33**, the sealing ring **35** and the inner surface of the duct **32**. These packing rings also prevent leakage of the material from the supply hopper **31** and are retained in a tightly compressed condition in the upper end of duct **32** by a plurality of retaining fingers **38** adapted to extend into the duct **32** through elongated openings **32***a* and contact the lower packing ring **37**. Clamping means **39**, such as bolts and nuts, may be provided on the duct **32** for urging the retaining fingers **38** upwardly in the openings **32***a* and for compressing the packing rings **37** into tight sliding contact with the loading cylinder **33**. The openings **32***a* also function as vents for the chamber provided in the duct **32** through which delivery piston **34** moves, such chamber being provided between duct **32** and cylinder **33**.

In addition to the above functions, the packing rings **37** also retain and hold the loading cylinder **33** in an elevated position when the filling port is being closed just prior to the discharge stroke. This will be described in detail hereinafter. It may be desirable to provide passageways and other means for continuously applying lubrication to the center packing ring **37** to allow a smoother sliding action for the loading cylinder **33**.

A movable valve **41** may be carried by the loading device **15** for opening and closing the filling port **33***b* of the loading cylinder **33**. Such valve **41** may have inclined surfaces for tight mating contact with the inclined seating surface on the filling port **33***b* and may be made of various materials. It is preferred that the inclined surfaces of the valve **41** be made of resilient material, such as synthetic rubber, for insuring a tight frictional contact with the seat of filling port **33***b* of the loading cylinder **33**.

In the exemplary valve **41** shown of the present invention, an inner bore **41***a* (FIGS. 6 and 7) may be provided in the valve **41** for receiving means adapted to drive and control the loading cylinder **33**.

Valve actuating means is provided and is operatively connected with the valve **41** for moving the valve into and out of sealing relation with the filling port **33***b*. A preferred valve actuating means may include a movable, closed cylinder **42**, as best seen in FIG. 7, which is rigidly connected to the upper portion of the valve **41** and whose axis is coaxial to the axis of opening **41***a* in valve **41**. Vents **42***a* may be provided on either end of the movable cylinder **42**.

As best seen in FIG. 2, cylinder **42** and valve **41** may be moved as a unit by means of a supporting link **43** pivotally connected to the upper end of cylinder **42**, a crossbar **44** pivotally connected at each of its ends io drive pistons **45** which are actuated by cylinders **45***a*. The upper end of supporting link **43** is rigidly secured by weld-

ing or other well-known means, to the midpoint of the cross-bar 44. Fluid ports 45*b* and 45*c* may be provided to each of the driving cylinders 45 and are adapted to be connected with fluid lines communicating with the control apparatus 22.

It can now be understood that as the driving pistons 45 are actuated, the cylinder 42 and valve 41 are moved as a unit and valve 41 is moved into and out of sealing contact with the filling port 33*b* of the loading cylinder 33.

Drive means is provided and operatively connected with the loading cylinder 33 for moving such cylinder 33 axially within the discharge duct 32 and through the hopper supply means 31 between the filling position (FIG. 5) and discharging position (FIG. 3). Such means preferably includes an elongated rod 46 rigidly connected at its lower end to the loading cylinder 33 by a transverse connecting member 46*a* adapted to be rigidly secured on the rod 46, by well-known means, such as a nut threaded on the lower threaded end of rod 46. The ends of the transverse connecting member 46*a* may be welded to the inner surfaces of the loading cylinder 33.

The rod 46 is adapted to extend upwardly, through opening 41*a* in valve 41, and into the movable cylinder 42. A piston element 46*b* may be provided on the upper end of the rod 46, such piston element 46*b* being in slidable contact with the inner surface of the movable cylinder 42. An accordion-type resilient housing 46*c* may be provided around the mid-section of the rod 46 and resilient bumper elements 47 may be provided in the lower portion of the movable cylinder 42 to absorb shock when the valve 41 is opened. The piston element 46*b* on rod 46 is adapted to contact the resilient bumper elements 47 when the valve is opened, but is spaced from and is not adapted to engage the top of the movable cylinder 42 during any stage of the pumping cycle, as seen in FIG. 7.

Suitable packing means 48 may be provided in the valve opening 41*a* to prevent leakage of material and it is preferred that releasable means be provided for replacing such packing 48 as it becomes worn.

As stated above, the control means 22 forms no part of the present invention and is diagrammatically shown together with fluid lines (dotted) communicating with the fluid ports of the actuating cylinders 21*a*, 26*a*, and 45*a* for the power piston 21, check valve 23, and valve 41 and loading cylinder 33, respectively. Such control means 22 is operatively connected with the valve actuating means and the drive means for the loading cylinder for sequentially operating such means in timed relationship to move the open loading cylinder 33 from the filling position (FIG. 5) through the material in the supply hopper 31, causing material to pour through the cylinder into the loading chamber 17 to the discharging position (FIG. 3), to close and seal the filling port 33*b* with the valve 41 when the filling port is out of contact with the material in the supply hopper 31, and to return the closed loading cylinder 33 to the position shown in FIG. 4 where the valve 41 is opened to allow the cylinder 33 to assume the filling position of FIG. 3.

In operation with the pumping machine 16, the following sequence of steps occurs by the elements of the loading device 15 and machine 16;

Starting with the elements in the filling position of FIG. 5, the loading cylinder 33 is in its lowermost position and is about to begin the filling stroke; and the valve 41 is spaced from the cylinder 33 to open the filling port 33*b*. The power or pumping piston 21 is in its most extended position at the end of a power stroke. The check valve 23 is closed as shown in FIG. 9; and the piston element 46*b* on rod 46 is resting on the bumper elements 47 in cylinder 42.

In timed sequence and as controlled by the control apparatus 22, the pistons 45 are moved upwardly and cylinder 42, valve 41, and loading cylinder 33 are lifted as a unit through the material in the supply hopper 31 causing such material to flow downwardly through the loading cylinder 33 into loading chamber 17. The loading cylinder continues upwardly until the filling port 33*b* is above the level of the material in the supply hopper 31 as shown in FIG. 1. During this filling stroke the power piston 21 has moved toward the cylinder 21*a* thus causing a suction to be created in loading chamber 17. This aids in drawing material from the supply hopper 31 into the loading chamber.

In the discharge stroke, the drive pistons 45 are moved downwardly causing the movable cylinder 42 and valve 41 to move downwardly as a unit until the valve is tightly seated on and seals the filling port 33*b* of the loading cylinder 33 above and out of contact with the material in the supply hopper 31; this is the discharging position of the loading device 15 as shown in FIG. 3. During this closing of the filling port 33*b*, the loading cylinder 33 was held and maintained in this elevated position by the tight frictional contact of the packing rings 37 in the discharge duct 32.

Further downward movement of the drive pistons 45 move the cylinder 42, valve 41 and now closed loading cylinder 33 downwardly during the discharge stroke until the cylinder 33 assumes the position shown in FIG. 4. During the discharge stroke, the check valve 23 was open to allow material to pass through the outlet end 19, and the pumping piston 21 moved through its power or pumping stroke from adjacent cylinder 21*a* into the loading chamber 17.

In addition to the action of power piston 21, it should be understood that a second pumping or power force acts on the material in the loading chamber 17 to move the material through the outlet end 19. The closed loading cylinder 33 and delivery piston 34 moving downwardly in the discharge duct 32 during the discharge stroke functions as a piston and adds a second or additional pumping action or force to the material in the loading chamber 17. This places the material under a double head or load and produces greater pumping efficiency for the machine.

To begin the next cycle, the drive pistons 45 are raised until the movable cylinder 42 and valve 41 are moved away from the loading cylinder 33 into the filling position shown in FIG. 5. It is understood that the loading cylinder 33 remains stationary until the piston element 46*b* on rod 46 contacts the bumper elements 47 in movable cylinder 42. The power piston 21 also remains stationary during the opening of the filling port 33*b* in this position.

The filling and discharging strokes sequentially continue in timed relationship to provide a pumping machine which is more efficient than other similar type machines. Moreover, the loading device 15 is jamproof and leakproof, eliminating loss of time, money and effort now required to frequently clear and unjam inlet valves and loading devices on pumping machines for material containing aggregate.

It should be understood that the supply hopper 31 is continuously supplied with freshly mixed material to be loaded into the machine 16. It is preferred that a uniform load of material be maintained in the supply hopper 31 so as to provide a substantially uniform level above which the filling port 33*b* of the loading cylinder 33 is adapted to be closed by the valve 41.

Loading devices or inlet valves, as used on concrete pumping machines heretofore, operated within the concrete supply and thus were prevented from fully opening and closing during each cycle. This, of course, caused a jammed condition at the pump or in the line. In addition, the size of the aggregate used in the material being pumped was required to be relatively small due to the valve opening for the inlet valve or loading device. In comparison, the loading device of the present invention is adapted to load material containing relatively large pieces of aggregate into a pumping machine and there is no

practical limitation on the size of the opening of the loading device.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. For example, other means such as springs may be provided for maintaining the loading cylinder **33** in the position shown in FIG. 1 just prior to the valve **41** being moved downwardly to seal the filling port **33***b* of the cylinder **33** above the level of the concrete or material within the supply hopper **31**. These springs or other means may function separately from or in addition to the packing rings **37** provided in the upper portion of the discharge duct **32**. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. In a leakproof, jamproof loading device for a pumping machine having a loading chamber adapted to receive material containing aggregate, the provision of:

hopper means for holding a supply of material to be loaded;

a discharge duct extending from the lower portion of said hopper supply means and adapted to communicate with the loading chamber in a pumping machine

a hollow loading cylinder slidably mounted in said discharge duct for axial movement

said loading cylinder having an open discharge end within said duct and a filling end including a filling port adapted to extend into and move through the material in said hopper supply means

said loading cylinder being adapted to move axially within said discharge duct and through said hopper supply means between a filling position when said filling port is adapted to be open and in contact with the material in the lower portion of said hopper supply means and a discharging position when said filling port is adapted to be closed and out of contact with the material in said hopper supply means;

a movable valve carried by the loading device for opening and closing said filling port of said loading cylinder;

valve actuating means operatively connected with said valve for moving said valve into and out of sealing relation with said filling port;

drive means operatively connected with said loading cylinder for moving said loading cylinder axially within said discharge duct and through said hopper supply means between said filling position and said discharging position;

and control means operatively connected with said valve actuating means and said loading cylinder drive means for sequentially operating said means in timed relationship to move said open loading cylinder from the filling position through the material in said hopper supply means to the discharging position causing material to pour through said cylinder, to close and seal said filling port with said valve when the loading cylinder is in said discharging position and the filling port is out of contact with the material in said hopper supply means, and to return the closed loading cylinder to the filling position where the filling port is opened by removing the valve therefrom.

2. A loading device as stated in claim 1, including:

delivery piston means carried by said loading cylinder at the discharge end thereof to act upon material left in said discharge duct by said loading cylinder and force the material out of said discharge duct.

3. A loading device as stated in claim 1, wherein:

said hopper supply means include a bottom inclined downwardly and toward said discharge duct.

4. A loading device as stated in claim 1, wherein

said drive means for said loading cylinder includes an elongated rod rigidly connected with said loading cylinder, said rod having a piston element thereon;

and said valve actuating means includes a movable cylinder surrounding and adapted to slidably contact said piston element on said rod and being rigidly connected to said valve, said movable cylinder having vent ports.

5. In a leakproof, jamproof loading device for a pumping machine having a loading chamber adapted to receive material containing aggregate, the provision of:

hopper means for holding a supply of material to be loaded;

a discharge duct extending from the lower portion of said hopper supply means and adapted to communicate with the loading chamber in a pumping machine;

a hollow loading cylinder slidably mounted in said discharge duct for axial movement;

said loading cylinder having an open discharge end within said duct and a filling end including a filling port adapted to extend into and move through the material in said hopper supply means;

said loading cylinder being adapted to move axially within said discharge duct and through said hopper supply means between a filling position when said filling port is adapted to be open and in contact with the material in the lower portion of said hopper supply means and a discharging position when said filling port is adapted to be closed and out of contact with the material in said hopper supply means;

a movable valve carried by the loading device for opening and closing said filling port of said loading cylinder;

and means for sequentially operating said valve and loading cylinder in timed relationship to move said open loading cylinder from the filling position through the material in said hopper supply means to the discharging position, thus causing material to pour through said cylinder, to close and seal said filling port with said valve when the loading cylinder is in said closed position and the filling port is out of contact with the material in said hopper supply means, and to return the closed loading cylinder to the filling position where the filling port is opened by removing the valve therefrom.

6. A loading device as stated in claim 5, including

delivery piston means carried by said loading cylinder at the discharge end thereof to act upon material left in said discharge duct by said loading cylinder and force the material out of said discharge duct.

7. A loading device as stated in claim 5, wherein

said hopper supply means include a bottom inclined downwardly and toward said discharge duct.

References Cited in the file of this patent

UNITED STATES PATENTS

2,017,975	Kooyman	Oct. 22, 1935
2,032,163	Bagby	Feb. 25, 1936
2,056,902	Longenecker	Oct. 6, 1936
2,062,200	Ball	Nov. 24, 1936