CONCRETE PUMP

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Filed: Sept. 18, 1970

Appl. No.: 73,449

U.S. Cl. ........................................417/516, 417/900

Int. Cl. ........................................F04b 7/00, F04b 15/02

Field of Search ................................417/516, 517, 900

References Cited

UNITED STATES PATENTS

3,298,322 1/1967 Sherrod ..................417/900 X

2,033,338 3/1936 Kirby ..................417/900 X

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ABSTRACT

A constant flow concrete pump having a number of hydraulically actuated concrete pump assemblies connected to inlet openings in one wall of a semi-fluid concrete hopper which has a single discharge opening in the opposite wall, and a valve mounted in the hopper and having an inlet of sufficient length to encompass at least two of the inlet openings in the hopper wall, relative movement is provided between the valves and inlet openings to provide constant flow of concrete through the hopper. The valve can be fixed, oscillated or rotated.

18 Claims, 21 Drawing Figures
CONCRETE PUMP

BACKGROUND OF THE INVENTION

There has been a need since the initial idea of pumping concrete was developed to provide for a uniform constant flow of concrete through the discharge hose. Concrete pumps generally available today as seen in Sherrod U.S. Pat. Nos. 3,298,322, and Re. 25,568 entitled Pump for Semi-Fluid Material, use an intermittent feed system wherein reciprocating concrete piston and cylinder assemblies are intermittently connected to a discharge outlet to pump concrete to the discharge hose. This is due to the interval or pause which is necessary to move the valve between the termination of the discharge stroke of one piston and the beginning of the discharge stroke of the next piston. This interval or pause produces pipe line jumping or kicking from shock loads on each pump stroke. The valve is moved rapidly from one concrete cylinder to the next to minimize back pressure leakage however, an intermittent or pulsed flow of concrete is produced in the delivery or discharge hose. No attempt is made by others to have more than one pump assembly at the same time exerting pressure on the discharge duct.

SUMMARY OF THE INVENTION

The constant flow concrete pump of the present invention provides for continuous flow of concrete to the delivery or discharge duct by maintaining communication between a discharging concrete pump assembly and the delivery duct at all times. This is accomplished in a number of ways, one embodiment of which involves the addition of an auxiliary concrete cylinder assembly which is charged or filled with concrete from the valve while one of the main concrete cylinders is discharging into the valve and is discharged into the valve while the valve is moved from one of the concrete assemblies to the other.

Another embodiment of the invention achieves continuous flow by using an oscillating type valve which has an arcuate opening of sufficient length to encompass two or more concrete assemblies at one time. The valve is moved continuously to provide communication with a discharging concrete pump assembly and the next concrete pump assembly near the end of the discharge stroke of the first assembly. The second pump assembly can commence discharging concrete into the valve immediately after the first concrete pump assembly reaches the end of its discharge stroke. This continuous motion of the valve will disconnect the first pump assembly from the valve so that it can be recharged from the hopper.

A further embodiment of this invention provides continuous flow by mounting the valve for continuous rotary motion. The valve is provided with an inlet of sufficient length to again encompass at least two of the concrete pump assemblies at one time and is moved continuously in a revolving motion in timed sequence with the discharging of the pump assemblies to provide continuous pressure on the concrete in the discharge duct.

A further embodiment of this invention provides continuous flow by mounting the valve in a fixed position and then moving the pump assemblies. The valve is provided with an inlet of sufficient length to again encompass at least two of the concrete pump assemblies at one time and the pump assemblies themselves are moved continuously or intermittently in a timed sequence with the discharging of the pump assemblies to provide continuous pressure on the concrete in the discharge duct.

In all of the above embodiments, leakage is prevented between the valve and the inlet openings for the pump assemblies by an enlarged seal section provided on the leading edge of the valve. This enlarged section will completely seal or close the open end of the pump assemblies before they are connected to the valve. A constant pressure is maintained on the seal at all times by an independent hydraulic system. The back pressure of the concrete in the valve is thus prevented from leaking through the next pump assembly into the hopper before the connection is complete between the valve and the next pump assembly. Once this connection has been completed the next pump assembly can commence discharging concrete into the valve. This seal also makes it possible to pump water through the pump to clean out the hose.

Other objects and advantages will become apparent from the following detailed description when read in connection with the accompanying drawings.

THE DRAWINGS

FIG. 1 is a top view of a two cylinder concrete pump according to the invention with the valve in a position to provide communication from one of the concrete cylinder assemblies to the discharge duct or hose;

FIG. 2 is a top view of the concrete pump of FIG. 1 with the swing valve shown in a position to provide communication between both concrete cylinder assemblies and the discharge duct or hose;

FIG. 3 is a top view of the pump of FIG. 1 with the valve in a position to provide communication between the other concrete cylinder assembly and the discharge duct or hose;

FIG. 4 is a view taken on line 4—4 of FIG. 1 showing the valve in communication with the first concrete cylinder assembly;

FIG. 5 is a view taken on line 5—5 of FIG. 2 showing the valve in communication with both concrete cylinder assemblies;

FIG. 6 is a view taken on line 6—6 of FIG. 3 showing the valve in communication with the other concrete cylinder assembly;

FIG. 7 is a view of another embodiment of the concrete pump of this invention showing two concrete cylinder assemblies and an auxiliary concrete cylinder assembly with the valve in a position to provide communication between the auxiliary cylinder assembly and one of the concrete cylinder assemblies and the discharge duct;

FIG. 8 is a top view of the pump shown in FIG. 7 with the valve in a position to provide communication between the auxiliary assembly and the discharge duct;

FIG. 9 is a view taken on line 9—9 of FIG. 7 showing the seal for the valve when positioned to encompass one of the concrete assemblies and the auxiliary cylinder;

FIG. 10 is a view taken on line 10—10 of FIG. 8 showing the seal for the valve when moved to the intermediate position between the concrete assemblies;

FIG. 11 is another embodiment of the concrete pump of this invention wherein the concrete cylinder assemblies are mounted for pivotal movement with respect to a valve having an enlarged inlet opening;

FIG. 12 is a top view of the embodiment shown in FIG. 11 with both of the concrete assemblies in communication with the inlet opening of the valve;

FIG. 13 is a top view of the embodiment shown in FIG. 11 with the concrete assemblies moved to the other side of the valve;

FIG. 14 is taken on line 14—14 of FIG. 11 showing one of the concrete assemblies in communication with the inlet opening of the valve;

FIG. 15 is taken on line 15—15 of FIG. 12 showing both of the concrete cylinder assemblies in communication with the inlet opening of the valve;

FIG. 16 is taken on line 16—16 of FIG. 13 showing the second concrete cylinder assembly in communication with the inlet opening of the valve;

FIG. 17 is a top view of a concrete pump having a revolving type valve;

FIG. 18 is a view taken on line 19 of FIG. 17 showing the revolving valve in communication with one of the concrete cylinder assemblies;

FIG. 19 is a view similar to FIG. 18 showing the valve in communication with two of the concrete cylinder assemblies;

FIG. 20 is a view similar to FIG. 18 showing the valve in communication with the second cylinder assembly; and
FIG. 21 is a view similar to FIG. 18 showing the valve in communication with the second and third cylinder assemblies.

DESCRIPTION OF THE INVENTION

The concrete pump 10 of this invention generally includes a base or frame 12 and a concrete hopper 14. A number of hydraulically actuated concrete pump assemblies 16 are mounted on the base or frame 12 and are operably positioned to withdraw concrete from and pump concrete through the concrete hopper 14 to a discharge duct or hose 18. The constant flow of concrete from the assemblies 16 to the discharge duct 18 is provided by means of a valve 20 which is positioned in the hopper 14. The valve 20 can be a reciprocating type valve as shown in FIGS. 1 through 10, a fixed valve as shown in FIGS. 11 through 16, or a revolving type valve as shown in FIGS. 17 through 21. In any one of these embodiments, the relative motion between the valve 20 and the assemblies 16 is timed or synchronized to provide continuous communication between the valve and a discharging pump assembly, as more particularly described hereinafter.

FIG. 1 THROUGH 6

Referring more particularly to FIGS. 1 through 6, the concrete pump 10 shown is of the reciprocating valve type having the valve 20 positioned within the concrete hopper 14 to provide continuous communication between a discharging pump assembly and the discharge duct 18. In this regard, the suction 3 concrete material is confined on the frame by means of the concrete hopper 14 which includes a front wall 22, a back wall 24, and a pair of side walls 26 mounted on the base 12. Concrete is poured into the hopper from the top as is generally understood in the art. A single outlet opening 28 is provided in the back wall 24 and a pair of inlet openings 30 are provided in the front wall 22.

A reciprocating material is withdrawn from the hopper 14 by means of the concrete pump assemblies 16a and 16b which are connected to the inlet openings 30 in the front wall 22. Concrete drawn into the assemblies 16a and 16b is forced or pumped into the valve 20 for discharge through the duct or hose 18. In this regard, each of the pump assemblies 16a and 16b includes a concrete cylinder 32a and 32b and a piston 34a and 34b. The cylinders 32a and 32b are sealed in the openings 30. The pistons 34a and 34b are sealed in the cylinders 32a and 32b, respectively, by means of glands and seals 36 provided on the outer periphery of the pistons 34a and 34b to prevent leakage of the liquid or water in the concrete from flowing past the pistons 34a and 34b.

Means are provided for actuating the pump assemblies 16a and 16b to withdraw concrete from the hopper. Such means is in the form of hydraulic piston and cylinder assemblies 38a and 38b which are operatively connected to the pump assemblies 16a and 16b. Each hydraulic assembly 38a and 38b includes a cylinder 40a and 40b and a piston 42a and 42b. The pistons 42a and 42b are connected to the pistons 34a and 34b, respectively, by piston rods 44a and 44b and 46b which extend through an opening 46 provided in the end wall 28 of the cylinders 40a and 40b. The pistons 42a and 42b are sealed in the cylinders 40a and 40b, respectively, by means of glands or O-rings 50a and 50b to form hydraulic pressure chambers at each end of the cylinders 40a and 40b. The hydraulic piston assemblies 38a and 38b are therefore double-acting and are connected to a conventional hydraulic system by means of hoses 52a and 52b to provide double acting motion. It should be noted that on movement of pistons 42a and 42b to the left in FIGS. 1 through 6, concrete material will be drawn into the cylinders 40a or 40b and on movement to the right, concrete will be discharged from the cylinders 40a and 40b.

In accordance with the invention, means are provided for connecting the inlet openings 30 to the discharge opening 28 in the form of the valve 20 which is reciprocated in the hopper 14. In this regard, means are provided for supporting the valve 20 on the frame 12 for reciprocal motion within the hopper 14. Such means is in the form of the discharge duct 18 which is mounted for reciprocal motion in bearings 54 provided on frame 12 and extends through opening 28 in the back wall 24. The valve 20 is provided with an internal curved passage 56 which terminates at one end in an inlet opening 58 which is of sufficient length to encompass both openings 30 and at the other end in an outlet opening 60 which is connected to the discharge duct 18. The valve 20 is oscillated about the axis of the discharge duct 18 by means of a hydraulic piston and cylinder assembly 62. The assembly 62 includes a cylinder 64 which is pivotally connected to the frame 12 and a piston rod 66 which is pivotally connected to a link 68 provided on the discharge duct 18.

Means are provided for sealing the openings 30 during the change in the connection of the pump assemblies 16a and 16b from the hopper 14 and to the valve 20. This seal means prevents leakage of concrete from the valve 20 through the openings 30 due to the back pressure of the concrete in the valve 20. Such means is in the form of a flange or plate 70 provided on each end of the valve 20. Each of the plates 70 extends outwardly from the valve a distance sufficient to completely cover one of the openings 30 before the opening 30 is connected to the inlet opening 58 in the valve.

Means are provided for maintaining a constant pressure on the seal provided between the plates 70 and the inside surface of the wall 22. Such means is in the form of an independent hydraulic system 25. In this regard, the end of the duct 18 is connected to the fixed discharge pipe 27 by means of a cylindrical bearing 29 mounted in a fixed bearing bracket 37 and having a swivel joint, slip joint and pressure seal. Pressure is applied to the seal by a hydraulic piston and cylinder assembly 31 having a piston 33 connected to a collar 51 mounted to slide on the duct 18 and a cylinder 35 connected to the cylindrical bearing 29. The collar 51 is positioned to bear on a flange provided on the duct 18. Pressure is maintained in the cylinder 35 by a hand pump 39 connected to the cylinder 35 by a line 41 and an accumulator 43. A pressure relief valve 45 is provided in the line 41 to allow for flow back to a reservoir 47 whenever the pressure exceeds a predetermined maximum. This can occur if a hard object such as a rock enters the seal between the plate 70 and wall 22.

The motion of the valve 20 and the operation of the pump assemblies 16a and 16b is timed to provide continuous communication between a discharging pump assembly 16 and the valve 20. In this regard, the valve 20 is moved slowly in a continuous motion back and forth within the hopper 14. Each time the valve 20 reaches a position where the inlet opening 58 is in communication with both of the openings 30, one of the pump assemblies 16 should be reaching the end of its discharge stroke and the other pump assembly 16 should be commencing its discharge stroke. This can be more easily understood by referring to FIG. 4, where the valve is shown in the extreme right hand position with the opening 30 for the pump assembly 16b in communication with the inlet opening 58 in the valve 20. The pump assembly 16b should be drawing concrete from the hopper 16 when the valve 20 reaches this position. As soon as the pump assembly 16b is filled with concrete, the assembly 62 is actuated to start to rotate the valve 20 counterclockwise toward the left hand position. When the valve 20 reaches the intermediate position shown in FIG. 5, both of the openings 30 will be in communication with the inlet opening 58 in the valve. The assembly 16a should be at the end of its discharge stroke and the assembly 16b should be actuated to commence its discharge stroke. The assembly 62 will continue to move the valve counterclockwise to the extreme left hand position shown in FIG. 6. As soon as the flange 70 on the right hand end of the valve 20 clears the opening 30 for the assembly 16a, the assembly 16a can be actuated to commence drawing concrete into the assembly 16a. When the valve 20 reaches the extreme left hand position, as shown in FIG. 6, the assembly 62 is reversed to start a clockwise motion of the valve 20 to repeat the cycle. It should be noted that the time allowed for filling one of the pump assemblies 16a or 16b is equal to the time allowed to...
discharge one of the pump assemblies. The rest of the pumping cycle consists of the short time interval when two cylinders are discharging at the same time, thus producing constant flow.

FIGS. 7 THROUGH 10

In the embodiment of the concrete pump 10, shown in FIGS. 7 through 10, of this invention, a constant flow of concrete is achieved by means of an auxiliary pump assembly 72 positioned between the pump assemblies 16a and 16b. The pump includes a frame or base 12 and a concrete hopper 16 having a back wall 22 with a single discharge opening 28 and side walls 26. A front wall 74 provided with three openings or ports 76 is substituted for the front wall 22 described above. The auxiliary pump assembly 72 is connected to the side openings 76. The pump assemblies 16a and 16b are connected to the side openings 76. A continuous flow of concrete to the discharge duct or hose 18 is provided to the hopper 14 by means of a valve 78 connected to the discharge duct 18 and mounted for pivotal movement in the hopper 14. Constant flow of concrete is achieved by maintaining the auxiliary pump 72 in constant communication with the valve 78 as the valve 78 moved between the side openings 76 for the pump assemblies 16a and 16b.

In this regard, and referring to FIGS. 7 through 10, the valve 78 includes a tapered passage 80 which terminates at one end in a rectangular inlet opening 82 having a diagonal length which is long enough to encompass the center opening 76 and one of the side openings 76. The other end of the valve 78 terminates in a discharge opening 84 which is connected to the discharge duct 18. It should be apparent that the auxiliary assembly 72 will always be in communication with the passage 80 in the valve 78 through the openings 76 for the pump assemblies 16a and 16b. The valve 78 is oscillated by means of the hydraulic assembly 62 which is pivotally connected to the frame 12 and to the link 68 provided on the discharge duct 18.

Means are provided for sealing the side openings 76 for each of the pump assemblies 16a and 16b during the change of communication of the pump assemblies 16a and 16b from the hopper 14 to the valve 78. This seal prevents concrete under pressure in the valve 78 from flowing through the side openings 76 into the hopper 14. Such means is in the form of a plate or flange 86 provided on each end of the valve 78. Plate 86 is long enough to completely cover openings 76 before the pump assemblies are connected to the passage 80 in the valve 78.

A controlled seal pressure is maintained by the hydraulic assembly 25 as described above. It should also be noted that a bearing 29 is also provided at the connection of the duct 18 to the fixed pipe 27.

In operation, whenever one of the pump assemblies 16a or 16b is discharging concrete into the valve 78, the auxiliary pump assembly 72 will be retracted drawing a small amount of concrete from the valve 78 into the auxiliary pump assembly 72. When the discharging assembly 16a nears the end of its discharging stroke, the auxiliary pump assembly 72 will be actuated to commence discharging concrete into the valve 78. The valve 78 will be rotated by the hydraulic piston and cylinder assembly 62 to align the valve 78 with the opening 76 for the other pump assembly 16b. As soon as the pump assembly 16b is actuated to discharge concrete into the valve 78, the auxiliary pump assembly 72 will be reversed to commence withdrawing concrete from the valve 78 into the pump assembly 72. The cycle is then repeated.

FIGS. 11 THROUGH 16

In the embodiment of the concrete pump of this invention shown in FIGS. 11 through 16, continuous concrete flow is achieved by means of a fixed valve 86, and a pair of pump assemblies 16a and 16b mounted for pivotal movement on the frame 12. This pump includes a concrete hopper 14 having a back wall 24 with a discharge opening 28 and side walls 26. An arcuate front wall 88 is provided on the front of the hopper 14 and has a radius of curvature equal to the distance of the pivot point for the pump assemblies 16a and 16b and the midpoint of the front wall of the hopper 14. A pair of openings 90 are provided in the wall 88. Seals 92 are provided at each end of the side walls 26 in a position to engage the arcuate wall 88. The fixed valve 86 includes a passage 94 and is positioned in the hopper 14. One end of the passage 94 terminates at an inlet opening 96 of sufficient length to encompass both of the openings 90 in the front wall 88. The other end of the passage 94 includes an outlet opening 98 which is operatively connected to a discharge duct 100 which is connected to the opening 28 in the back wall 24.

The pump assemblies 16a and 16b are actuated by means of hydraulic piston and cylinder assemblies 38a and 38b as described above, and are mounted for pivotal movement on the frame 12 to selectively position one or both of the pump assemblies 16a and 16b in communication with the inlet opening 96 of the valve 86. In this regard, the pump assemblies 16a and 16b are secured to a plate 102 which is secured at one end to the front wall 88 and at the other end to a pivot pin 104. Assemblies 16a and 16b are oscillated and reciprocated on the frame 12 by means of a hydraulic piston and cylinder assembly 106 which includes a cylinder 108 pivotally connected to the frame 12 and a piston 110 pivotally connected to a bracket 112 on the plate 102.

Means are provided for sealing the openings 90 in the front wall 88 during the change in connection of the pump assemblies 16a or 16b from the hopper 14 to the valve 86. The seal prevents the concrete which is under pressure in the valve 86 from flowing through the opening 90 back into the hopper 14. Such means is in the form of a flange 114 provided on each side of the valve 86. The plate 114 is long enough to completely cover the openings 90 until the opening is clear of the inlet opening 96 to the valve 86.

A controlled pressure is maintained between the flange 114 and the wall 88 by means of the hydraulic system 25 and the bearing 29 as described above.

In operation as seen in FIGS. 11, 14, 15, the pump assembly 16a is operatively positioned in communication with the inlet opening 96 of the valve 86. When the pump assembly 16b is fully retracted and filled with concrete from hopper 14, the hydraulic assembly 106 is actuated to pivot the pump assembly 16a and 16b to the intermediate position shown in FIGS. 12 and 15. Pump assembly 16a should be nearing the end of its discharge stroke when the assemblies are in the intermediate position. The pump assembly 16b is actuated when the assemblies 16a and 16b reach this intermediate position to commence discharging of concrete into the valve 86. The hydraulic assembly 106 continues to move the assemblies 16a and 16b to the position shown in FIGS. 13 and 16. The pump assembly 16b will be in communication with the inlet opening 96 of the 86 and the pump assembly 16a will be in communication with the hopper 14. Pump assembly 16b is then retracted to fill the assembly 16a with concrete, and the cycle is then repeated in the opposite direction.

FIGS. 17 THROUGH 21

In the embodiment of the concrete pump of this invention shown in FIGS. 17 through 21, a revolving valve 116 is shown in the hopper 14 for connecting a number of pump assemblies 16a, 16b, and 16c, sequentially to discharge duct 18. The hopper 14 in this embodiment includes a front wall 117 having three openings 118 positioned at equal distances from each other and from a discharge opening 120 in the back wall 24. Each of the pump assemblies 16a, b, and c, includes a hydraulic piston assembly 38a, 38b, and 38c, respectively, as described above, and is actuated in timed sequence to the motion of the valve 116.

In this regard, the valve 116 includes an arcuate inlet opening 122 of a length sufficient to encompass two of
openings 118 at one time. Inlet opening 122 is connected by passage 124 to the discharge duct 120. Means are provided for rotating the valve at a continuous slow rate about the axis of the discharge duct to sequentially connect the pump assemblies 16a, 16b, and 16c to the discharge duct 18. Such means in the form of a gear 126 mounted on the discharge duct 18 and having a gear 128 on its outer periphery. A motor 130 is mounted on the frame 112 and includes a gear 132 on the drive shaft 134 of the motor oppositely positioned to engage the peripheral gear 128. As the valve 116 rotates in the hopper, the pump assemblies 116 are actuated in timed sequence to discharge concrete into the inlet opening 120 of the valve 116.

Means are provided to seal the opening 118 in the front wall of the hopper opening 120 in the valve 116. Such means is in the form of a plate 136 provided on the leading edge of the valve and having a length sufficient to completely close the opening before the opening is connected to the inlet opening 118 of the valve 122. The plate 136 will cover the opening 118, in the interval between the connection of the pump assemblies 16a, 16b, or 16c with the hopper 14 and the valve 122.

A controlled pressure is maintained on the seal provided between the flange 136 and the front wall 117 by means of the hydraulic assembly 25 and the bearing 29.

CLEANING OF THE APPARATUS

It should be noted that in each of the above described embodiments of this invention, complete discharge of concrete can be accomplished due to the controlled pressure seal arrangement. As is conventional in the art, a pin valve is provided in the discharge pipe 27 to allow for disconnection of the pump of the pipe 27. A rabbit is then inserted into the pipe 27. The entire assembly is then flushed with water. The pump is reconnected to the pipe 27 and filled with water. The hydraulic assembly 25 is pressurized to reset the seal between the valve and cylinders. The pump is then completely sealed and water is pumped through discharge pipe 27 until the rabbit is discharged from the pipe 27.

RESUME

The concrete pump as described herein provides for the continuous flow of concrete by maintaining communication between a discharging pump assembly and a valve having an inlet opening of sufficient length to span two of the inlet openings in the hopper. The valve can be either oscillated, revolved or fixed. The continuous motion of the valve with respect to the pump assemblies is slow to provide sufficient time for the pump assemblies to completely discharge concrete from the pump assemblies to fill the assemblies with concrete from the hopper. Leakage of concrete from the valve due to the back pressure of concrete in the valve is prevented by seal flanges or plates provided on the valve.

The principals of constant flow if this invention is applicable to all types of moving pump assemblies including pivotal in a horizontal plane, pivotal in a vertical plane, oscillating about a horizontal axis, swinging about a horizontal axis, complete rotary motion about a horizontal axis, or transverse motion in either a vertical, horizontal or tilted plane.

A concrete pump with constant flow would have no abrupt pipe line jumping and kick from shock loads in every cycle of the pistons. This is of great advantage since less restraint would be required to hold the pipe line in place during the pumping. The pipe line would also have a much longer life since the constant kicking movement of the pipe line is eliminated and the life of the clamping devices thereby increased. The pipe line would not be subjected to the high shock loads as with present pumps which must repeatedly overcome inertia of the pipe line concrete. The pipe line discharge hose would be safer for personnel to handle with the removal of the kick. Boom cranes which are now used to handle concrete pump pipe should have a remarkable increase of operating safety and range with the use of a constant flow pump to remove shock loads caused by pipe kick which now occurs with every cycle of the pistons in intermittent pumps.

A concrete pump with constant flow is a more efficient pump because once the initial inertia of the concrete in the pipe is overcome, the momentum of the concrete is maintained and not lost as it is in present-day intermittent pumps only to be overcome and lost again. This constant flow pump will require less power to do the same task as an intermittent pump and will therefore have an increase range with equal power.

1 claim:

1. A constant flow concrete pump comprising:
   a frame,
   a concrete hopper mounted on said frame having a number of inlet openings and an outlet opening,
   a number of concrete pump assemblies corresponding to said inlet openings, each assembly including a concrete cylinder connected to one of said inlet openings, and a piston mounted for reciprocating motion in said cylinder, one of said assemblies being operated at all times to provide a continuous flow of concrete through one of said inlet openings, a discharge duct positioned in said outlet opening, a valve positioned in said hopper and having a passage terminating at one end in an inlet of sufficient length to encompass two of said inlet openings and an outlet at the other end operatively connected to said outlet opening, and means for producing continuous motion between said valve and inlet openings.

2. The pump according to claim 1 including means for oscillating said valve in said hopper.

3. The pump according to claim 1 including means for rotating said valve in said hopper.

4. The pump according to claim 1 including means for moving said pump assemblies laterally in said hopper.

5. The pump according to claim 1 wherein said producing means includes an auxiliary hydraulic pump assembly operatively connected to one of said inlet openings.

6. The pump according to claim 5 wherein said auxiliary pump assembly is directly connected to said valve at all times.

7. The pump according to claim 1 including in a large flange on said valve for sealing the inlet openings prior to connecting an inlet opening to said valve.

8. The pump according to claim 7 including a hydraulic assembly operatively connected to said valve for maintaining a predetermined pressure between the flange and the hopper.

9. A constant flow concrete pump comprising:
   a frame,
   means for confining a semi-fluid concrete material on said frame,
   a discharge duct operatively connected to said confining means,
   means connected to said confining means for withdrawing a portion of the semi-fluid material from said confining means,
   a valve having a passage terminating at one end in an inlet of sufficient length to communicate with two of said withdrawing means and an outlet at the other end operatively connected to said discharge duct,
   said withdrawing means being discharged into said valve, and means for maintaining communication between said valve and the discharging withdrawing means to produce a constant flow of material through said discharge duct.

10. The pump according to claim 9 including means for sealing the connection of said withdrawing means to said valve prior to completing the connection of said withdrawing means to said valve.

11. The pump according to claim 10 wherein said sealing means includes a hydraulic assembly for maintaining a controlled seal pressure.

12. The pump according to claim 9 including means for oscillating said valve.
13. The pump according to claim 12 wherein said withdrawing means comprises at least two hydraulically actuated pump assemblies.

14. The pump according to claim 12 wherein said withdrawing means comprises two hydraulically actuated pump assemblies and an auxiliary pump assembly.

15. The pump according to claim 9 including means for rotating said valve.

16. The pump according to claim 15 wherein said withdrawing means includes three hydraulic pump assemblies.

17. The pump according to claim 9 wherein said withdrawing means includes two hydraulic pump assemblies.

18. The pump according to claim 17 wherein said pump assemblies are mounted for pivotal movement on said frame and further including means for oscillating said pump assemblies.