

Sept. 9, 1969

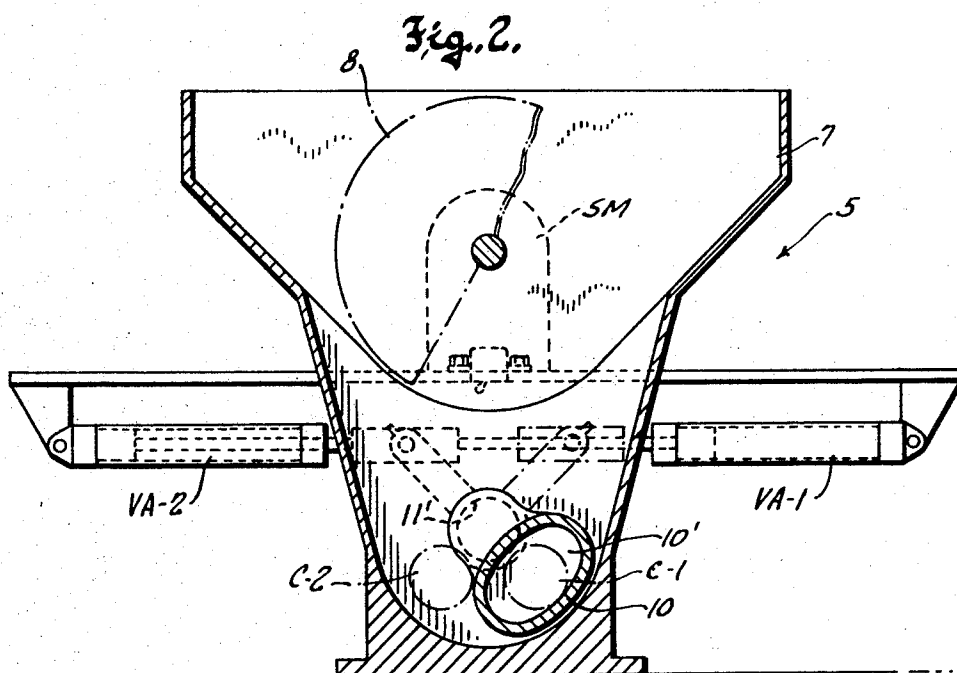
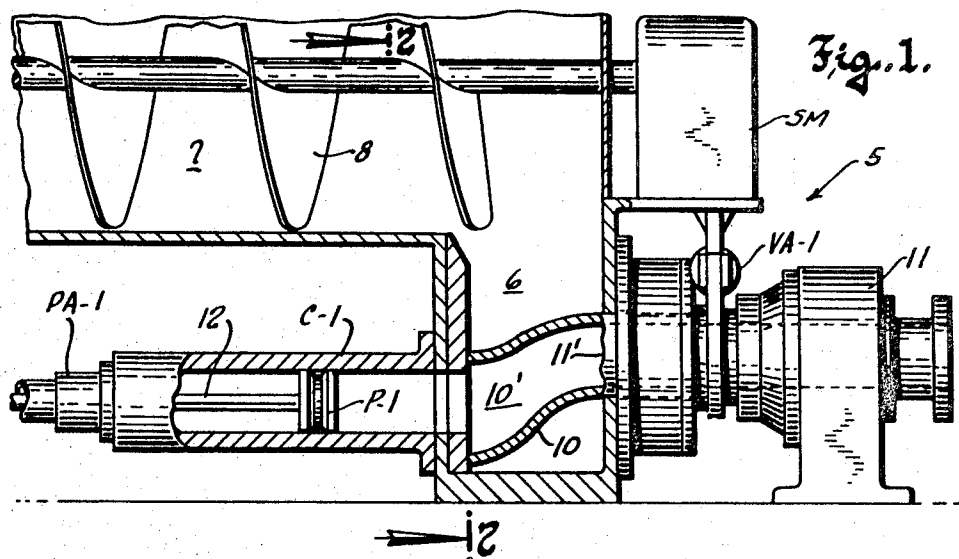
E. L. SHERROD

3,465,685

SELF-CLEARING ROTATING CONVEYOR

Original Filed Feb. 3, 1966

3 Sheets-Sheet 1



INVENTOR
EUGENE L. SHERROD
BY *Donald H. Jones*
ATTORNEY

Sept. 9, 1969

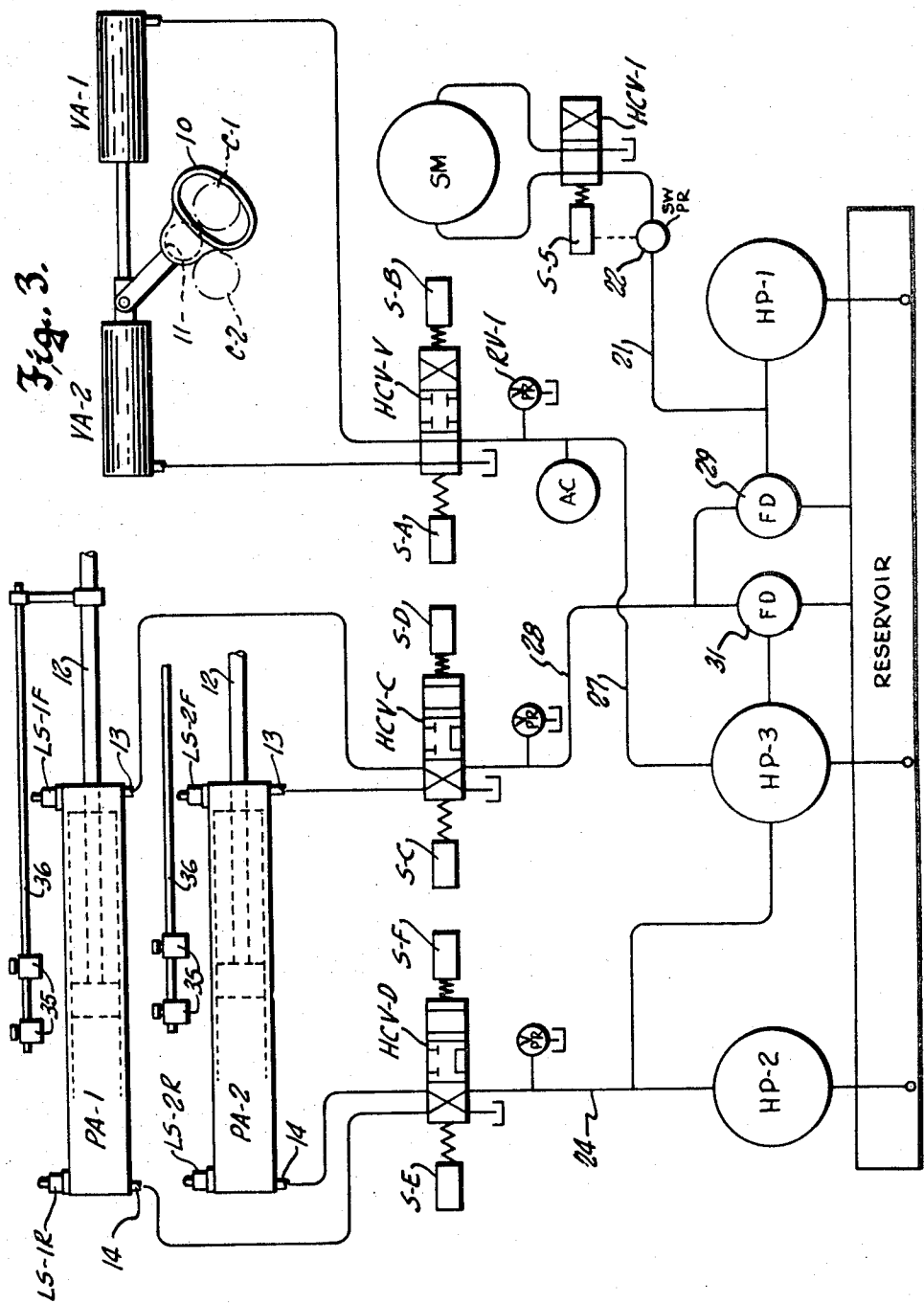
E. L. SHERROD

3,465,685

SELF-CLEARING ROTATING CONVEYOR

Original Filed Feb. 3, 1966

3 Sheets-Sheet 2



INVENTOR
EUGENE L. SHERROD
BY *E. L. Sherrod*
ATTORNEY

Sept. 9, 1969

E. L. SHERROD

3,465,685

SELF-CLEARING ROTATING CONVEYOR

Original Filed Feb. 3, 1966

3 Sheets-Sheet 3

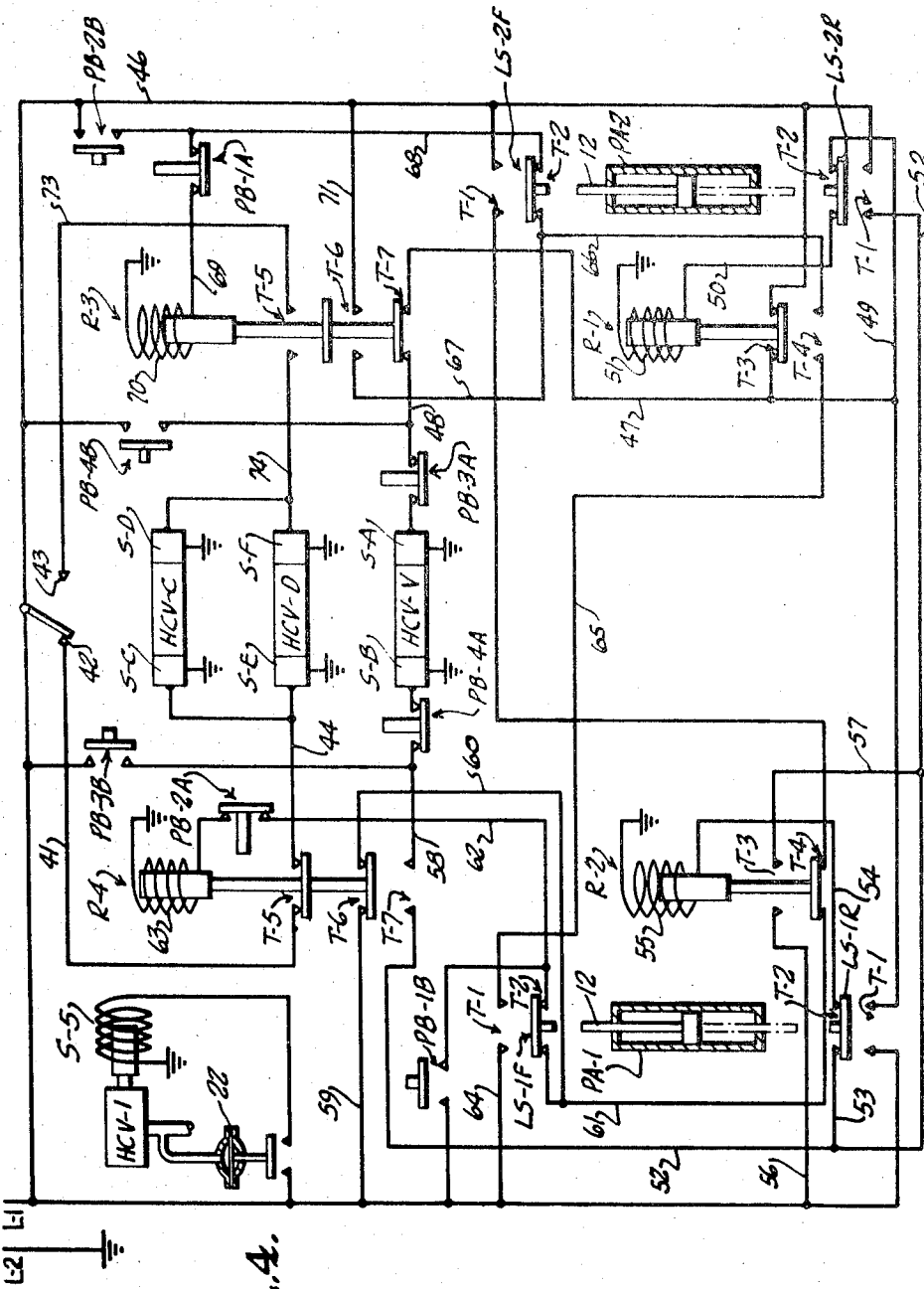


Fig. 4.

INVENTOR
EUGENE L. SHERROD
BY *Eugene L. Sherrod*
ATTORNEY

1

3,465,685

SELF-CLEARING ROTATING CONVEYOR

Eugene L. Sherrod, Brookfield, Wis., assignor of one-half interest to Robert T. Sherrod, Milwaukee, Wis.

Original application Feb. 3, 1966, Ser. No. 524,675.

Divided and this application Feb. 21, 1968, Ser.

No. 707,115

Int. Cl. F04b 17/00; B65g 43/00

U.S. Cl. 103—49

3 Claims

ABSTRACT OF THE DISCLOSURE

A screw or similar rotating conveyor for feeding concrete and the like is driven by a reversible fluid motor fed from a hydraulic pump and controlled by a two-way valve that is normally maintained in its position to effect forward conveyor rotation. Jamming of the conveyor causes a rise in fluid pressure which actuates a pressure responsive instrumentality that shifts the valve to its motor reversing position. The valve automatically shifts back to its position for forward conveyor rotation when fluid pressure returns to normal.

This application is a division of my copending application, Ser. No. 524,675, filed Feb. 3, 1966, for Automatic Control System for Concrete Pump, now Patent No. 3,380,388.

This invention relates to hydraulically actuated cylinder type pumps for freshly mixed concrete and other substantially heavy, viscous materials, and the invention is more particularly concerned with means for providing a steady supply of material to be pumped to the feed chamber of a hydraulically actuated piston pump for concrete and the like.

Pumps of the type here under consideration comprise two or more cylinders, each open at its front end and in each of which a piston is reciprocable; a hopper or trough containing a fed screw or other rotating propulsion device to convey material to be pumped into a feed chamber in front of the cylinders so that material can be drawn from the feed chamber into each cylinder during rearward charging motion of its piston; and a delivery line into which material is expelled from the cylinder during the forward discharging stroke of its piston. Such a pump must also include valve means to selectively control communication between each cylinder and the feed chamber or delivery line.

In pumps of the type here referred to, the screw conveyor or other rotating propulsion device by which freshly mixed concrete is conveyed along the feed trough to the feed chamber frequently jams as a result of stones in the concrete mix becoming wedged between the propulsion device and the bottom or sides of the feed trough. In the past, this has always necessitated manual manipulation of the controls of the control system to first stop the conveyor, then reverse the drive therefor, and finally restart the drive after the obstruction was cleared. In cases where severe jamming of the conveyor occurred, it was sometimes necessary to shun down the entire pump rather than have it continue to operate uselessly while the obstruction to conveyor rotation was cleared.

With this objection in mind, it is an object of this invention to provide the rotating conveyor of a pump of the character described with a reversible motor and with control means for said motor which effects normal or forward rotation of the conveyor thereby as long as the load on the motor is more or less normal, but which control means responds to a rise in the load on the motor to a predetermined value, such as occurs when a stone in the feed trough interferes with normal rotation of the

2

conveyor, to automatically effect reversal of the conveyor drive motor the slight extent necessary to dislodge the obstruction to normal rotation of the conveyor and to thereafter automatically restart the motor for normal rotation of the conveyor.

With these observations and objects in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawings. This disclosure is intended merely to exemplify the invention. The invention is not limited to the particular structure disclosed, and changes can be made therein which lie within the scope of the appended claims without departing from the invention.

The drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a longitudinal sectional view of a pump for concrete and similar materials, embodying the principles of this invention;

FIGURE 2 is a cross sectional view taken generally on the plane of the line 2—2 in FIGURE 1;

FIGURE 3 is a diagram of the hydraulic system of the pump of this invention; and

FIGURE 4 is a diagram of the electrical system of the pump.

Referring now to the accompanying drawings, and more particularly to FIGURES 1 and 2, the numeral 5 designates generally a pump of the general type to which this invention relates, intended for pumping freshly mixed concrete and similar heavy, viscous materials. In general, such a pump comprises a plurality of cylinders, disposed substantially horizontally at the bottom of the machine and in side-by-side relationship. By way of illustration, the pump here illustrated is shown as having two cylinders designated by C-1 and C-2. Each of the cylinders is open at its front to a feed chamber 6 that forms a downward extension of a hopper-like feed trough 7 which overlies the cylinders. A rotary conveyor 8 in the trough, illustrated as a worm screw, is rotatably driven by a hydraulic motor SM to advance material along the trough and into the feed chamber 6 so that said chamber is always full of material when the machine is in operation.

Pistons P-1 and P-2 are reciprocable in the cylinders C-1 and C-2 respectively. As each piston moves rearwardly in its charging stroke, it draws material into its cylinder, through the open front of the latter, from the feed chamber 6. When the piston moves forwardly in its discharging stroke, a valve 10, which is then in register with the front of the cylinder, conducts material expelled from the cylinder through a generally S-shaped passage 10' in the valve to a delivery line 11. Hence, the valve passage 10' in effect forms a part of the delivery line, and because of the shape of this passage, the valve 10 can be conveniently referred to as an S-valve.

The inlet 11' of the delivery line is so located with respect to the cylinders that its axis and their axes define the points of an isosceles triangle, and the S-valve 10 is swivable about the axis of the delivery line to a pair of defined operating positions, in each of which it is in register with the front of one of the cylinders and leaves the other in open communication with the interior of the feed chamber. It will be seen that the S-valve must always be in register with the discharging cylinder (that it, the cylinder whose piston is moving forwardly), while the other cylinder is being charged from the feed chamber 6.

The S-valve 10 is actuated in such swinging motion by hydraulic motor means here shown as comprising a pair of single acting reciprocating hydraulic actuators VA-1 and VA-2, and it will be observed that the extension of

actuator VA-1 swings the S-valve into register with cylinder C-1, while extension of actuator VA-2 swings the S-valve into register with cylinder C-2. The means by which the actuation of the S-valve 10 is coordinated with reciprocation of pistons P-1 and P-2 is described in the above mentioned parent application, Ser. No. 524,675 (now Patent No. 3,380,388), to which reference can be made for a complete description of the electrical and hydraulic circuits illustrated in FIGURES 3 and 4.

Each of the pistons P-1 and P-2 is reciprocated by its own double-acting hydraulic driver or cylinder PA-1 and PA-2, the rod 12 of the hydraulic cylinder being rigidly attached to the piston in its associated pump cylinder. When pressure fluid is introduced through a port 13 in the rod or front end of the hydraulic cylinder PA-1 or PA-2, the associated piston is moved rearwardly in its charging stroke, and when pressure fluid is introduced into another port 14 in the rear or head end of the hydraulic cylinder, the piston is moved forwardly in its expulsion or discharge stroke.

Referring now more particularly to FIGURE 3, hydraulic pressure fluid is supplied to the several actuators SM, VA-1, VA-2, PA-1 and PA-2, from hydraulic pump means, in this case shown as comprising three hydraulic pumps designated HP-1, HP-2 and HP-3. These pumps are of course connected with suitable drive means (not shown) such as an electric motor or a gasoline engine.

The pump HP-1 supplies pressure fluid, through a duct 21 and a two-position control valve HCV-1, to the screw drive motor SM. The valve HCV-1 is biased to, and normally maintained in, the position to drive the motor SM in its forward direction of rotation. However, if a stone or the like becomes wedged against the screw 8, obstructing its rotation, pressure in the duct 21 rises to the point at which a pressure responsive switch 22 in said duct is actuated, closing an energizing circuit (see FIGURE 4) to a solenoid S-5 by which control valve HCV-1 is shifted to its position in which it effects retrograde rotation of the screw drive motor SM. The screw turns in its reverse direction until solenoid S-5 is de-energized, as occurs in consequence of opening the pressure switch 22. The switch 22 can open when the pressure in the duct 21 falls to a normal operating value. The screw then resumes rotation in its normal direction. The relatively brief period of retrograde screw rotation produced by this arrangement is usually adequate to clear a stone jam, and the mechanism just described, by reason of its fully automatic operation, eliminates the need for constant attendance upon the machine.

From the foregoing description taken with the accompanying drawings it will be apparent that this invention provides simple and reliable means for so controlling the operation of a motor that drives a rotary conveyor by which concrete or the like is charged into the feed chamber of a piston pump as to insure a steady, constant flow into the feed chamber of material to be pumped,

and whereby any jamming of the conveyor, due to the lodgement of a stone or the like, is promptly and automatically corrected.

What is claimed as my invention is:

1. In a piston pump for concrete and similar materials having a feed chamber from which the pump cylinders are charged, and a rotary conveyor for propelling material to the pumped into the feed chamber in consequence of rotation of the conveyor in one direction:

(A) a reversible fluid motor drivingly connected with the conveyor;

(B) a control valve for the fluid motor shiftable between a normal position in which it effects operation of the motor to drive the conveyor in said one direction and a motor reversing position in which it effects operation of the motor in the reverse direction; and

(C) pressure sensitive actuating means for the control valve, responsive to a rise in fluid pressure in the motor above a predetermined value to effect shifting of the control valve from its normal position to its motor reversing position.

2. In combination with a rotary conveyor for moving concrete and similar materials:

(A) a reversible fluid motor drivingly connected with the conveyor for rotating the same;

(B) means for delivering pressure fluid to the motor;

(C) a control valve connected between said pressure fluid delivery means and the fluid motor and having a valve element which is shiftable between a normal position to which it is biased and in which it effects forward rotation of the conveyor and a motor reversing position in which it effects retrograde rotation of the conveyor; and

(D) a fluid pressure responsive instrumentality operatively associated with the control valve and arranged to shift the valve element thereof to its motor reversing position when the pressure of fluid delivered to the motor exceeds a predetermined value.

3. The apparatus of claim 2 further characterized by said fluid pressure instrumentality comprising:

(A) a normally open pressure responsive switch; and

(B) an electromagnetic actuator for the valve element connected with said switch to be energized upon pressure responsive closure thereof.

References Cited

UNITED STATES PATENTS

2,232,545 2/1941 Lum ----- 198-213

ROBERT M. WALKER, Primary Examiner

U.S. Cl. X.R.

198-232