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G. MAXON, JR., ET AL
LOADING MECHANISM FOR MIXERS

2,213,047

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FIG. 1.

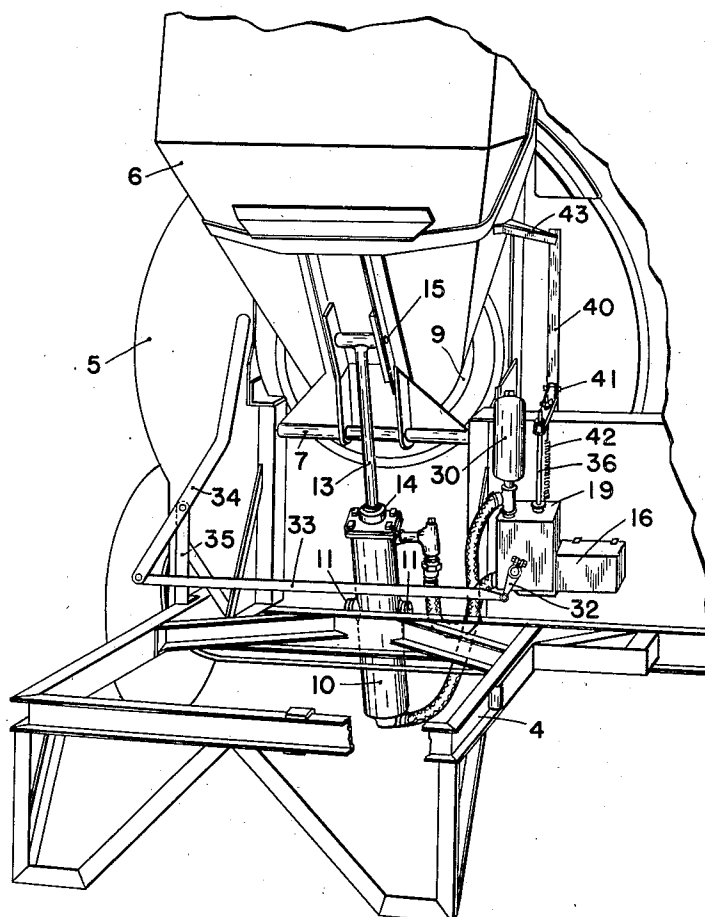
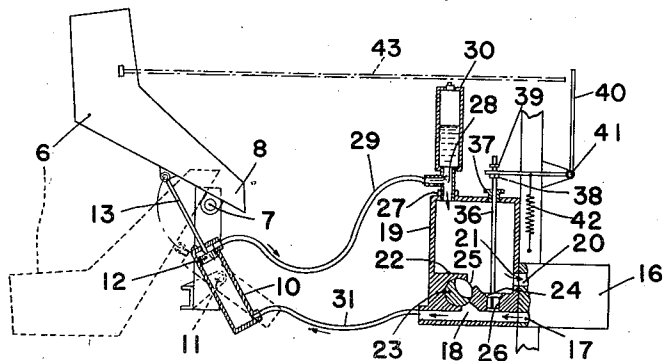


FIG. 2.



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LOADING MECHANISM FOR MIXERS

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Application June 30, 1938, Serial No. 216,656

5 Claims. (Cl. 259—167)

The invention relates to mixers and more particularly to the loading or unloading mechanism therefor.

The charging of concrete aggregates into the drums of concrete mixers is usually accomplished by means of loading hoppers or skips which are pivotally mounted on the frame of the machine adjacent the charging opening provided in one end of the drum. The skips are power actuated, heretofore usually by a drum and cable mechanism driven by the power plant of the mixer, and in their lowered or charge receiving position they ordinarily rest upon the ground with substantially all of their structure below the horizontal plane of the skip pivots. From this position they are moved by said power mechanism to an elevated position for discharging the materials into the drum, in which position the major portion of their structure is above the said horizontal plane of their pivots, the arc through which they travel being ordinarily about 95° to 100°, located partly below and partly above said horizontal plane. In the lowered or charge receiving position the rear wall of the hopper inclines downwardly away from the charging opening of the drum, the angle of the incline ordinarily being about 50° to said horizontal plane, while in the raised or discharging position the said rear wall inclines downwardly toward said drum charging opening, usually at an angle of from 45° to 50° to said horizontal plane, whereby the materials may slide into the drum by gravity action.

In present day concrete mixing practice it is highly desirable to get the materials into the drum in the shortest possible time, and it is therefore important that the raising of the hopper be accomplished as rapidly as is practicable. It is also desirable that the apparatus be made as compact as possible, since the space available for the mixers is frequently limited.

It has been heretofore proposed to provide hydraulically operated mechanism in lieu of the widely used cable and drum devices for elevating the skip, but so far as we are aware, no practical apparatus of this character has up to now been devised. However, by the present invention, we have provided a hydraulic skip operating mechanism which considerable actual commercial use has demonstrated to be thoroughly practical. In the said invention we employ a hydraulic cylinder having a reciprocating piston working therein at a substantially constant speed, which, through a suitable mounting of the cylinder and connection of the piston with the skip, secures a raising of

the skip with a constantly accelerating motion, whereby such raising is accomplished in the shortest practical time. Since the motion of the skip is constantly accelerating up to the point of discharge, when the skip is suddenly stopped at that point, the energy which has been imparted to the load by such accelerating motion materially assists in the discharge of the concrete materials into the drum.

The object of the invention is to provide a new and improved mechanism for operating the material-handling skip and for shaking the same to assist in the discharge of its contents, particularly where the skip is associated with a concrete mixer.

A further object of the invention is to provide an hydraulically operated skip hoist wherein the hydraulic cylinder is pivotally mounted intermediate its ends and the piston working in said cylinder is connected to the loading hopper or skip, when in a loading position, below its point of pivotal mounting with the result that as the hopper is raised, the moment arm from the pivot point of the hopper to the piston rod decreases or becomes shorter while the speed of the piston remains substantially constant with the result that the movement of the hopper is accelerated as said hopper moves to its upper position, and this condition is of special advantage in helping to loosen the aggregate from the hopper.

A further object of the invention is to provide simple and effective mechanism for automatically operating the hydraulic controls, so that the hopper will be moved up and down at the end of its hoisting movement to shake the material loose from the walls of the hopper.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawing:

Fig. 1 is a perspective view of a concrete mixer equipped with hoisting apparatus embodying the invention, parts being broken away;

Fig. 2 is a diagrammatic view showing parts of the hydraulic system in section.

Referring to the drawing, the numeral 4 designates generally the frame of a concrete mixing machine, 5 a mixing drum suitably mounted to rotate on said frame, 6 a charging hopper or skip for said mixer pivotally mounted near one end on a hinge pin 7 carried by the frame and movable from a lowered or charge-receiving position to an upper charge-delivering position in which the end 8 of said hopper projects into the opening 9 of the drum 5.

In the present instance the raising and lowering of the hopper 6 is accomplished through hydraulically operated mechanism including an hydraulic cylinder 10 pivotally supported intermediate its ends at 11 upon parts of the frame 4, a piston 12 working in said cylinder and having a rod 13 working through a stuffing box 14 at one end of said cylinder and operatively connected at its outer end by a pin 15 to the skip at a point which is normally below the hinge or pivot pin 7 when the hopper 6 is in its lowered or charge-receiving position. With this arrangement when hydraulic fluid is introduced into the lower end of the cylinder, the piston rod 13 will be moved outwardly and the hopper 6 upwardly from the dotted line position to the full line position shown in Fig. 2, the cylinder 10 swinging about its support during this movement. It is also to be noted that when the skip is in its lowered position, as indicated in dotted lines in Fig. 2, the axis of the cylinder 10 and consequently the direction of movement of the piston rod 13, is substantially normal, i. e. perpendicular, to a straight line extending between the centers of the pivots 7 and 15. Since upon the application of fluid pressure back of the piston 12, the said piston will substantially instantaneously start outwardly at its normal constant speed, the skip will be started upwardly at the minimum angular velocity attainable at such constant piston speed, due to the fact that the pivot 15 is at the point in its arcuate path of travel at which its angular velocity will be the lowest for such piston speed. However, during the upward movement of the skip the moment arm or perpendicular distance between pivot point 7 of the hopper and the piston rod 13 decreases or becomes shorter while the speed of the piston remains substantially constant with the result that the movement of the hopper is accelerated as the hopper moves to its upper position, and this helps to loosen aggregate from the hopper when the latter is suddenly stopped. When the hydraulic fluid is introduced into the upper end of the cylinder, the piston rod 13 will be moved downwardly, and consequently the skip will be lowered, but as hereinafter described the weight of the hopper may be used to lower it or assist in its lowering action.

The hydraulic fluid is supplied from any suitable hydraulic pump 16 driven in any suitable manner by the prime mover which drives the mixing drum 5 and whose pressure side 17 discharges into a passage 18 in a housing 19 and whose exhaust side 20 communicates with a passage 21 in said housing. The passage 21 is separated from the passage 18 by a partition 22 having a rotary control valve 23 and a poppet relief valve 24 therein respectively controlling passages 25 and 26 extending therethrough. A passage 27 leads from the upper end of the housing and connects by a T-fitting 28 with a flexible pipe 29 leading to the upper end of the cylinder 10 and with a pressure balancing chamber or air dome 30. Flexible piping 31 connects the passage 18 with the lower end of the cylinder 10.

The rotary valve 23 is a two-way valve which has an open and closed position controlled by the operator through a crank 32, secured to said valve connected by a link 33 to an operator controlled lever 34 pivotally mounted on a bracket 35 mounted on the frame of the machine.

The stem 36 of the valve 24 extends through a stuffing box 37 in the housing, and its exposed end carries spaced nuts 38 and 39 adjustably

mounted thereon and adapted to be engaged by the forked end of an arm of a bell crank lever 40 pivotally mounted on the frame at 41 and normally urged to valve-closing position by a tension spring 42 connected at one end to said lever and at the other to said frame. The lever engages the nut 38 in the closed position of the valve and engages the nut 39 to raise the valve to open the relief passage 26 when the upper arm of said lever is struck by a projection or lug 43 on the hopper or skip, said lug being of exaggerated size in the diagram Fig. 2 as compared to its actual size in Fig. 1.

With the above construction the pump 16 runs continuously while the mixer is operating, and the valve 23 is normally turned to off or open position, so that the hydraulic fluid simply circulates from the outlet 17 to inlet 20 of the pump through then open passage 25. When it is desired to raise the skip or hopper, the lever 34 is shifted to turn the valve 23 to the closed position shown in Fig. 2, and under these conditions the hydraulic fluid is delivered by the pump through the passages 17 and 18 and pipe 31 to the lower end of the cylinder 10 while the fluid above the piston 12 is exhausted through the piping 29, fitting 28, upper compartment of housing 19 to the passages 21 and 20. When the hopper 6 approaches its uppermost position, the lug 43 thereon strikes the lever 40 which thereupon raises the relief valve 24, so that pressure fluid may by-pass back through the passage 26 to the inlet side of the pump, and under these conditions the piston may move downwardly, so that the skip will move downwardly under its own weight until the lug 43 releases from the lever 40 permitting the valve 24 to close, and then the hopper is again moved upwardly until the lever 40 is again engaged. Thus the hopper swings up and down through a small angle, and the shaking action thus produced acts to loosen aggregate that may tend to adhere to the bottom of the hopper and obviates the necessity of striking the bottom of the drum with a hammer or other implement. After shaking the hopper through the opening and closing of the relief valve 24, the hopper is lowered by swinging the lever 34 so as to open the valve 23, and then under these conditions the pressure fluid is by-passed from the discharge passage 18 through passage 25 to the inlet passage 20, and the weight of the hopper 6 will act through the piston 12 to force hydraulic fluid out of the lower end of the cylinder 10 and allow the hopper to descend to its lowered position.

The introduction of hydraulic fluid in the upper end of the cylinder 10 is not absolutely essential, but it acts as a stabilizer and serves to check a too rapid outward movement of the piston. The rate of descent of the hopper 6 under its own weight is also controlled by the rate the hydraulic fluid is released from the lower end of the cylinder 10. By pivoting the cylinder 10 intermediate its ends, and preferably at or near its longitudinal center, and by mounting the pivots 11 on the frame in proximity to the vertical plane of the face of the forward or charging end of the drum, and also in proximity to the horizontal plane of the bottom of the drum, i. e. adjacent the lower forward corner of the drum, it is possible to utilize a cylinder of the length necessary to secure the piston travel required to swing the hopper through its arc of movement while at the same time in the lowered position of the hopper the cylinder may occupy a posi-

tion substantially normal to the rear hopper wall thereby decreasing the length of present day standard machines. In the lowered position of the skip, the lower end of the cylinder extends backwardly under the drum, while in the upper position of the skip, the upper portion of the cylinder is closely adjacent the forward wall of the drum. From the lowered position, the hopper may be started up at the minimum angular velocity attainable at any given constant piston speed, thus minimizing the shock of starting the loaded hopper upwardly, and reducing wear and tear on the apparatus.

We desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What we claim as our invention is:

1. In a concrete mixing apparatus, the combination of a pivotally supported loading hopper, a hydraulic cylinder provided with a piston operatively connected to said hopper to swing the same about its pivot to a discharge position with angular acceleration, means for supplying said cylinder with operating fluid, a spring closed relief valve automatically operable at a predetermined pressure of said operating fluid, and means, operated by said hopper near the end of its raising movement, for positively opening said valve to permit successive lowerings of the hopper for the purpose of violent agitation of its contents.

2. In a concrete mixing apparatus, the combination with a loading hopper, hydraulically operated means for raising said hopper to a discharging position with accelerated motion including an hydraulic cylinder, means for supplying said cylinder with operating fluid under pressure, a spring closed valve opening outwardly under the action of said operating fluid, and exteriorly disposed adjustable operating means for said valve to open the same as said hopper reaches the end of its discharging movement whereby to permit lowering of said hopper a short distance and to thereafter close until the hopper is again raised and to repeat this operation to cause a jarring of the contents of said hopper.

3. In a concrete mixing apparatus, the combination with a pivotally supported loading hopper, a pivotally supported hydraulic cylinder, a piston working in said cylinder and operatively connected to said hopper at a point below the pivot of said hopper when in a loading position to

control the raising and lowering of said hopper, said hopper and cylinder being so related to each other that the hopper is accelerated at the end of its raising movement, of means for supplying hydraulic fluid to said cylinder under pressure, a safety valve automatically operable to maintain the pressure of said fluid at a predetermined maximum, and means for quickly and positively opening and holding open for a short interval said safety valve as the hopper reaches the end of its upward movement whereby to permit lowering of said hopper a short distance and to thereafter close until the hopper is again raised and to repeat this operation to cause a jarring of the contents of said hopper.

4. In a concrete mixing apparatus, the combination with a frame, a mixing drum mounted thereon and a loading hopper for charging materials into one end of said drum pivotally mounted on said frame, of a hydraulic cylinder having supporting pivots intermediate its ends and below the pivotal mounting of said hopper, said pivots being supported on the frame in proximity to the vertical plane of the face of the charging end of said drum and also in proximity to the horizontal plane of the bottom of the drum, a piston working in said cylinder and operatively connected to said hopper at a point below the pivotal mounting of said hopper when in a loading position to control the raising and lowering thereof, and means for supplying operating fluid to said cylinder.

5. In a concrete mixing apparatus, the combination with a frame, a mixing drum mounted thereon, and a loading hopper pivotally mounted on the frame for movement from a lowered material-receiving position to an elevated material-discharging position, of a fluid pressure cylinder having pivotal connections with said frame, the pivots thereof being located intermediate the ends of the cylinder and being positioned on the frame in proximity to the lower forward corner of said drum and approximately vertically below the pivots of the hopper, said cylinder in the material-receiving position of the hopper occupying a position substantially normal to the hopper, a piston reciprocable in said cylinder operatively connected to said hopper, and means for supplying fluid pressure to said cylinder.

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CERTIFICATE OF CORRECTION.

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It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the grant, line 2, name of inventor, for "MICHAEL GIBSON" read --MICHAEL GILSON--; and line 12, for "Michael Gibson" read --Michael Gilson--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of October, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.