March 18, 1941. C. L. BEAL 2,235,445

MANUFACTURE OF DIPPED GOODS

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Fig-4

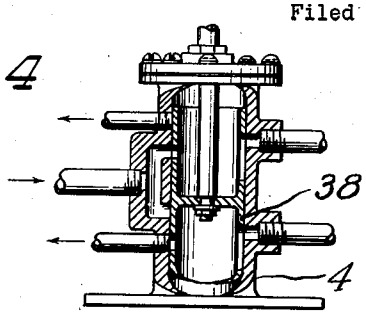
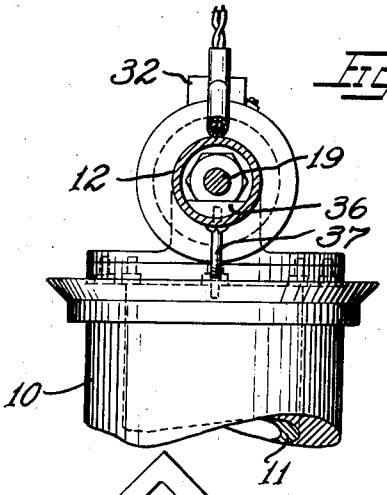


Fig-5



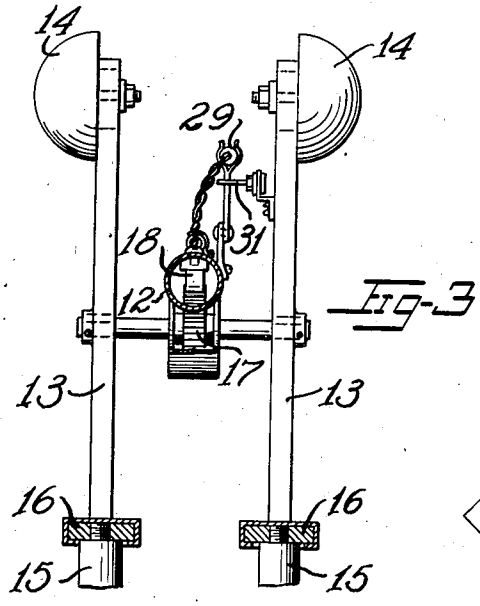
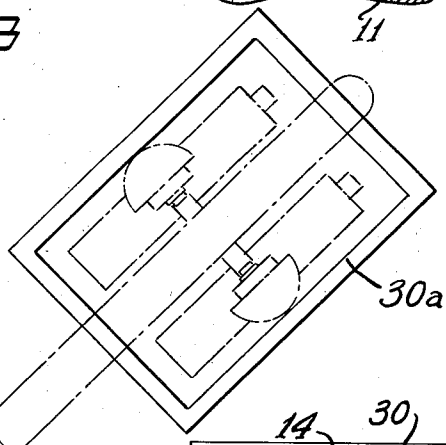


Fig-3



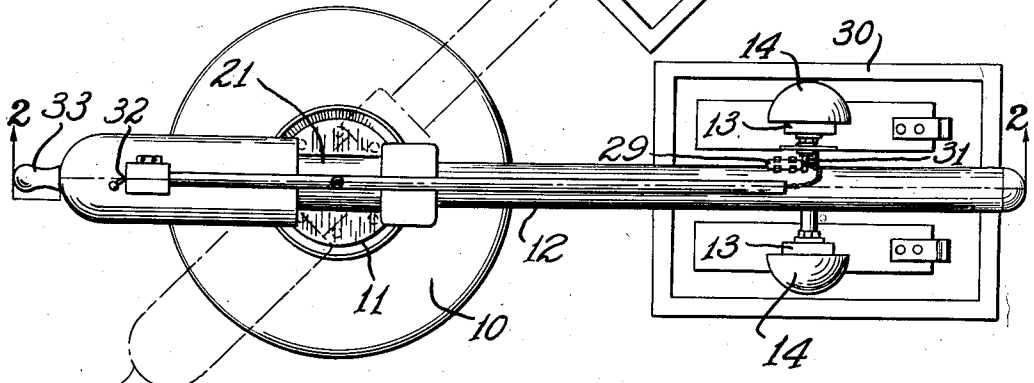


Fig-1

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Fig-6

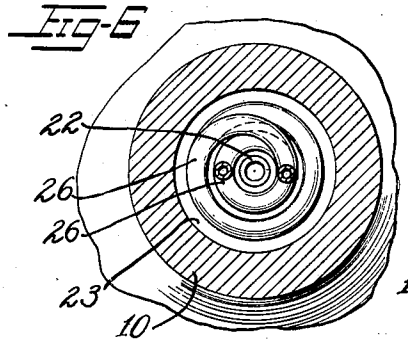


Fig-7

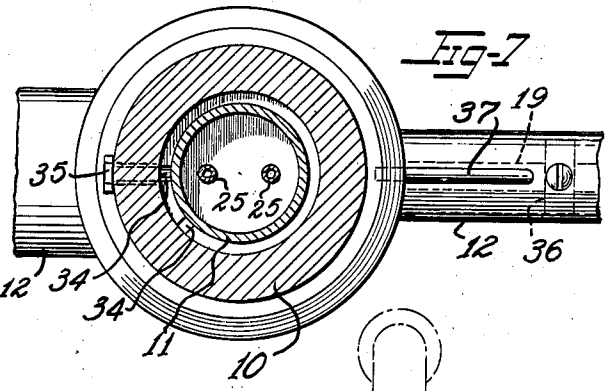
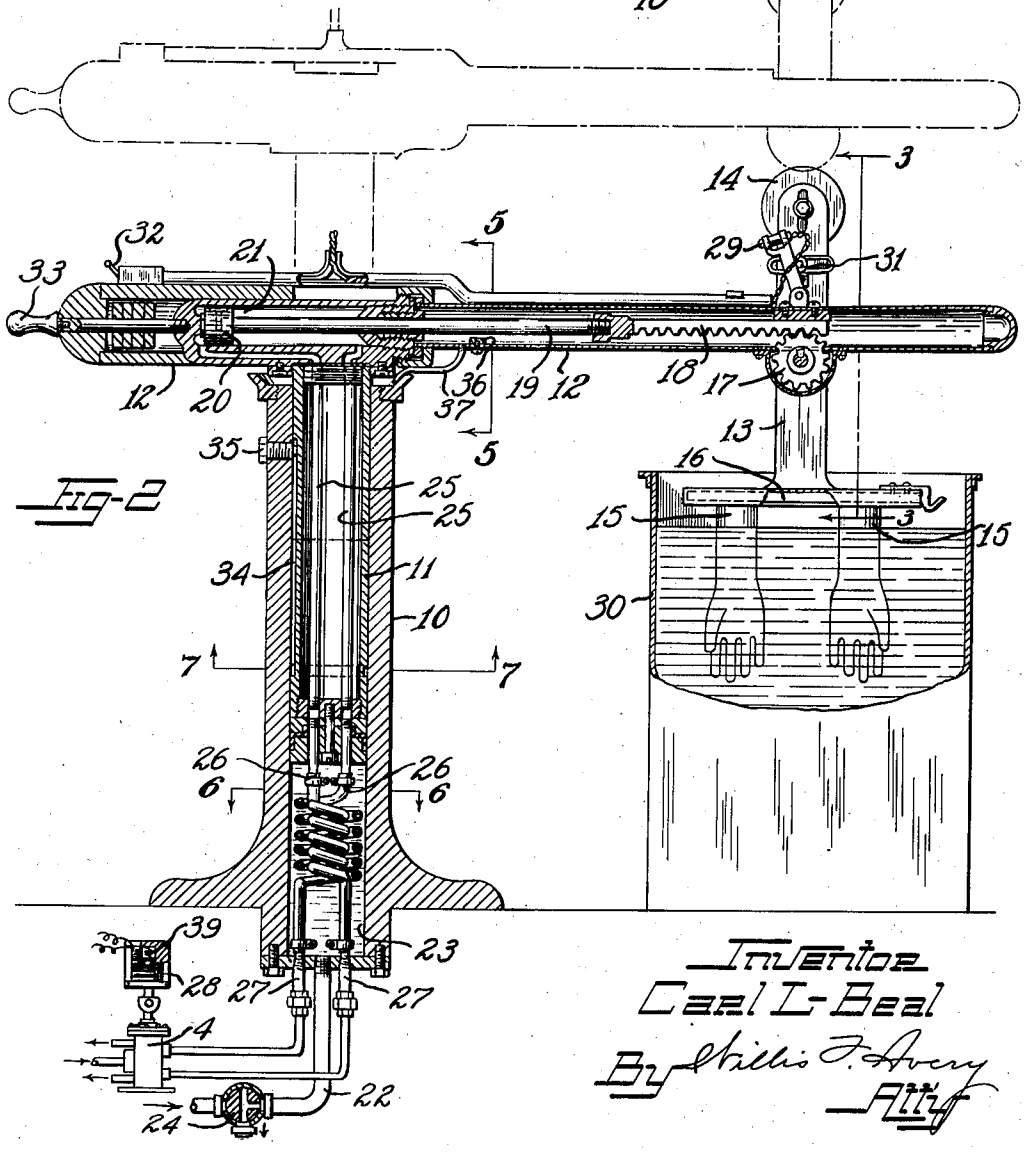


Fig-2



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Patented Mar. 18, 1941 2,235,445

UNITED STATES PATENT OFFICE

2,235,445

MANUFACTURE OF DIPPED GOODS

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Application March 20, 1940, Serial No. 324,958

8 Claims. (Cl. 91—46)

This invention relates to the manufacture of dipped rubber goods by the method of dipping forms into liquid dispersions of rubber, particularly latex. The chief object of this invention is the provision of a new and improved machine for carrying out the manufacture of such dipped rubber goods.

In this invention I have perfected a compact and efficient machine for manufacturing dipped rubber goods. In its preferred embodiment, as hereinafter disclosed, the machine is streamlined with its component parts completely enclosed within the main body portion of the machine for added efficiency as well as for better appearance. The dipping machine proper contains a hydraulic cylinder and a hydraulic lift with the fluid conduits to the hydraulic cylinder completely enclosed within the body of the machine. To insure an even deposition of rubber in the manufacturing cycle of the machine, the forms are first covered with an even layer of coagulant by rotation of the forms in a vertical circular path after these forms have been dipped in and withdrawn from a coagulant composition. This rotation of the forms is periodically and automatically reversed at a predetermined point in their arc of rotation by electrical control means.

Generally, the dipping machine that is the subject of this invention comprises a pedestal, a hydraulic lift built in conjunction with the pedestal, a horizontal member mounted on the hydraulic lift, a form support rotatably mounted on the horizontal member, means for rotating the form support, and control means including an electrical control element intermittently engaged by the rotating form support for automatically reversing the direction of rotation at a predetermined point in the arc of rotation of the rotatably mounted form support.

The dipping machine can best be described by reference to the accompanying drawings, of which

Fig. 1 is a top view of the dipping machine.

Fig. 2 is a sectional elevation of the machine taken along line 2—2 of Fig. 1.

Fig. 3 is an elevation of the rotatably mounted form supports with a cross-section of the horizontal member taken along line 3—3 of Fig. 2.

Fig. 4 is an elevation in cross-section of a reciprocating control valve constituting an element of the apparatus shown in Fig. 2.

Fig. 5 is a cross-sectional view of the horizontal member taken along line 5—5 of Fig. 2.

Fig. 6 is a cross-sectional view of the pedestal taken along line 6—6 of Fig. 2.

Fig. 7 is a cross-sectional view taken along line 7—7 of Fig. 2.

In the following description of the dipping machine all references to parts of the machine will be made with respect to the view of one facing the machine as shown in Fig. 2 with the horizontal member extending out to the right from the machine.

The machine illustrated in the drawings has a vertical pedestal 10 containing a vertical hydraulic lift 11. Mounted on this hydraulic lift 11 is a horizontal member 12, on one end of which is mounted a rotatable form support 13 in the shape of a yoke (Fig. 3). On one end of this yoke are counter weights 14, 14 while on the other end are the forms 15, 15 fastened to a base 16, 16 so as to be readily fixed to and removed from the rotatably mounted form support 13. The form support 13 is actuated by means of a pinion gear 17 fixed to the form support 13. This pinion gear 17 is engaged by a rack gear 18 which is connected by means of a shaft 19 to the piston 20 of a double acting hydraulic cylinder 21. The pinion 17, the rack 18, the shaft 19, and the double acting hydraulic cylinder 21 are all housed within the horizontal member 12.

In order to raise and lower the horizontal member of the dipping machine as shown there is provided a pipe conduit 22 leading directly to a pressure chamber 23 in the pedestal 10 beneath the hydraulic lift 11. Flow of fluid to and from the pressure chamber 23 to raise and lower the cylinder of the hydraulic lift 11 is directed preferably by a two-way valve 24 in the pipe conduit 22.

The double-acting hydraulic cylinder has the two chambers connected to pipes 25, 25 extending through the cylinder of the hydraulic lift 11. These pipes connect to rubber tubes 26, 26 each of which has been pre-molded in the shape of a helix. One of these rubber tubes is made in a helix of smaller diameter than the other so as to fit inside the coils of the larger. These rubber tubes extend through the pressure chamber 23 and are made in the shape described so they can elongate and retract as the hydraulic lift is raised and lowered. The tubes are made flexible to allow for turning of the machine on its pedestal but they are also made heavy enough that the tubes will not collapse under the pressure in the pressure chamber 23. The pre-molded rubber tubes are connected at the lower end to two pipes 27, 27 that lead out of the pressure chamber.

Flow of hydraulic fluid to and from the cham-

bers of the double-acting hydraulic cylinder is directed by means of a reciprocating valve 4 (Fig. 4) which regulates direction of flow of the fluid in the conduits. The valve 4 is actuated by an electric solenoid 28 which is connected electrically to a mercury switch 29 mounted on the horizontal member 12 in close proximity to the rotatable form support 13. The current is turned on in the machine when the forms are out of the tank 30 and hydraulic fluid flows through a conduit to one end of the hydraulic cylinder 21 causing the piston to move, thereby revolving the form support 13 by means of motion transmitted through the shaft 19 to the rack 18 and the pinion 17. When the revolving form support 13 reaches any predetermined point in its arc of rotation a pin 31 trips the mercury switch 29, shutting off the current to the solenoid 28 and a spring 39 in the solenoid reverses the position of the plunger in the valve, thereupon reversing direction of flow of fluid to the hydraulic cylinder, moving the piston 20 counter to its former movement, and reversing the direction of rotation of the form support 13. The new motion is maintained until the pin 31 again strikes the mercury switch and causes a flow of current to the solenoid 28 again reversing the direction of rotation. The form support 13 in its rotation goes through substantially a complete circle. In the view shown (Fig. 2) current is cut off to the solenoid and the forms are in a downward position. During the rotation the forms 15 will always return to a downward position when the electric current to the machine is cut off. This is true because as soon as current ceases to flow in the solenoid 28 a spring 39 in the solenoid immediately pushes the plunger 38 in the reciprocating valve 4 down and causes hydraulic fluid to flow into the right chamber of the hydraulic cylinder until the piston 20 is as far to the left as it can go. Then the pin 31 contacting the mercury switch 29 will have no effect as no current is flowing in the machine and in spite of the fact the mercury switch is in the "on" position the motion of the form support 13 will stop with the forms 15 pointing downward. As soon as the switch 32 is turned on, motion will begin.

The horizontal member 12 of the dipping machine may be turned in a horizontal plane so as to transfer the deposition base forms from one tank to another (Fig. 1) by manual operation on a handle 33 affixed to one end of the horizontal member. The raising and lowering of the cylinder of the hydraulic lift 11 is also manually controlled by the two-way valve 24. Turning of the horizontal member 12 on which the form support 13 is mounted can only be done while the hydraulic lift is in a raised position with the forms 15 out of the tank 30. This raising, and lowering, is provided for by means of vertical guide channels 34, 34 cut in the cylinder of the hydraulic lift 11. In the dipping machine illustrated there are two of these vertical guide channels as there are but two tanks into which the forms are lowered. These two vertical guide channels are connected with a horizontal guide channel near the bottom of the hydraulic cylinder extending beyond the vertical channels to allow the horizontal member 12 to be turned, with the hydraulic lift as an axis, in transferring the forms 15 from one tank 30 to another 30*a* and also to a loading station, not shown, which may be placed wherever convenient. A set screw 35 is provided in the pedestal 10 and the end of the set screw projects into the guide channels 34, 34 thereby serving as a guide screw.

In case of any leakage of hydraulic fluid from the double acting hydraulic cylinder 21 a dam 36 is provided in the horizontal member 12 to prevent the hydraulic fluid from flowing down the horizontal member. A drainage conduit 37 is also provided for draining the hydraulic fluid from the horizontal member and into the pedestal.

The dipping machine as shown in the drawings is not in operation and the current is off. The valve 24 is also on an "off" position with the hydraulic lift 11 lowered. As the current to the solenoid 28 is shut off the spring 39 in the solenoid has forced the inner sliding portion of the reciprocating valve 38 (Fig. 4) down so that hydraulic fluid flows through the upper conduit (Fig. 2) into the right side of the double-acting hydraulic cylinder 21. The rotatable form support 13 is pointed downward and the pin 31 has forced the mercury switch 29 to the left thereby making contact in the switch. The forms 15 are shown in the tank of fluid 30, which is in this case a solution of a coagulant for latex.

To operate the dipping machine through one cycle of operation the control valve 24 to the hydraulic lift is turned so as to admit fluid to the pressure chamber 23 of the hydraulic lift 11. The hydraulic lift rises slowly raising the forms 15, 15 from the liquid in the tank 30. The guide screw 35 in the pedestal slides in the guide groove 34 as the hydraulic lift is raised. As soon as the forms are clear of the liquid and the tank 30 electric current is turned on the machine by means of the switch 32. As the mercury switch 29 is in a position of contact current flows to the solenoid 28 lifting the sliding portion 38 of the reciprocating valve (Fig. 4). The hydraulic fluid flows into the valve 4 and out through the lower conduit to the left side of the hydraulic cylinder 21. This moves the piston 20 to the right revolving the form support 13 in a clockwise direction. When the form support goes through virtually a complete revolution the pin 31 strikes the mercury switch 29 on the other side from that illustrated and breaks the electrical contact in the mercury switch. The spring 39 in the solenoid 28 forces the sliding portion 38 of the reciprocating valve 4 down and this causes hydraulic fluid to flow through the upper conduit from the valve 4 to the right side of the hydraulic cylinder reversing the motion of the piston 20. The fluid from the left side of the piston flows out of the machine through the lower conduit of the reciprocating valve 4. The counterclockwise motion of the form support continues until the pin 31 again strikes the mercury switch 29 and makes the electrical contact and the motion in the form support is again reversed to a clockwise rotation as explained in the first part of this paragraph. These reciprocal rotations are continued, at the discretion of the operator, until the coagulant solution is evenly dispersed over the forms 15, 15 and a portion of the volatile constituents of the coagulant solution have evaporated.

After the reciprocal rotation has been carried on for a sufficient time the current is cut off by the switch 32 whereupon the forms return to a downwardly projecting position as explained, and the horizontal member 12 is manually turned by means of the handle 33 until the forms are over tank 30*a* (Fig. 1). The valve 24 is turned to the position shown and the hydraulic lift 11 is low-

ered. Fluid from the pressure chamber **23** beneath the hydraulic lift flows out through the valve **24** and the forms **15** are thereby lowered into the liquid, in this case latex, in the tank **30***a*. After submersion of the forms the valve **24** is turned so as to allow fluid to flow into the pressure chamber **23** and lift the forms from the latex. Reciprocal rotation is again set up as explained above to evenly disperse the latex over the forms and to partially dry the latex rubber. The coated forms **15** are then removed from the base **16** and new forms are put on. The cycle of operation may then be repeated.

This invention is applicable to the coating of any form or article with any type of liquid coating material. The coating machine is used preferably, however, for the coating of forms with rubber from aqueous dispersions of rubber, such as latex. The deposition base forms may be coated with either a temporary or a permanent coating of rubber.

It is understood that, although the dipping machine which is the subject of this invention has been described in considerable detail with particular reference to the machine as illustrated in the enclosed drawings, many variations may be brought about in the machine itself, as well as in the individual elements of the machine, without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A dipping machine comprising a pedestal, a hydraulic lift, an adjacent pressure chamber for fluid for the hydraulic lift, a horizontal member mounted on the hydraulic lift, a form-supporting member rotatably mounted on said horizontal member, means for rotating the form-supporting member reciprocally through a substantially vertical arc, said means for rotating the form-supporting member comprising a double-acting hydraulic cylinder associated with the horizontal member, conduits for conveying fluid to the double-acting hydraulic cylinder including extensible and retractable rubber hose extending through the pressure chamber of the hydraulic lift, means for controlling the flow of said fluid to the double-acting cylinder, said control means comprising a reciprocating valve for directing flow of the fluid to the chambers of the double-acting hydraulic cylinder, a solenoid for operating the reciprocating valve, and a switching means mounted for intermittent actuation by the rotating form-supporting member to control the flow of electric current to the solenoid, the control means being so constructed and arranged as to effect reciprocating rotation of the form-supporting member and to return it to a downwardly projecting position when such rotation is stopped.

2. A dipping machine comprising a vertical pedestal, a vertical single-acting hydraulic lift contained within the vertical pedestal, a pressure chamber for hydraulic fluid actuating the vertical lift, a horizontal member mounted on the hydraulic lift, a form-supporting member rotatably mounted adjacent one end of the horizontal member, means for rotating the form-supporting member reciprocally through a substantial arc in a vertical plane, said means for rotating the form-supporting member comprising a double-acting hydraulic cylinder contained within the horizontal member, conduits for conveying hydraulic fluid to the chambers of the double-acting hydraulic cylinder comprising pipes extending through the hydraulic lift and flexible but non-collapsible extensible and retractable tubes extending through the pressure chamber of the hydraulic lift, control means for effecting reciprocal rotation of the rotatably mounted form supports, said control means comprising a reciprocating valve for directing the flow of hydraulic fluid to the chambers of the double-acting hydraulic cylinder, a solenoid for operating the reciprocating valve, a switching means for governing flow of electric current to the solenoid, the control means being so constructed and arranged as to return the form-supporting member to a downwardly projecting position whenever rotation of the member is stopped, irrespective of the position of the member in its arc of rotation where the stopping of the member takes place.

3. A dipping machine comprising a vertical pedestal, a vertical hydraulic lift within the pedestal, an adjacent pressure chamber within the pedestal for fluid actúating the hydraulic lift, a horizontal member mounted on the vertical hydraulic lift for movement with the lift, a form-supporting member rotatably mounted on the horizontal member, means for rotating the form-supporting member through a substantial arc, said means for rotating comprising a pinion gear fixed to the form-supporting member, a rack gear engaging the pinion, a double-acting hydraulic cylinder within the aforesaid horizontal member for actuating the rack, conduits for conducting fluid to the chambers of the double-acting hydraulic cylinder including non-collapsible but flexible extensible and retractable rubber tubes pre-molded in the shape of helices and extending through the pressure chamber of the hydraulic lift, a reciprocating valve for directing the flow of fluid through the conduits, a solenoid for operating the valve, a switch electrically connected to the solenoid for intermittent actuation by the rotating form support, the control means being so constructed and arranged as to return the form-supporting member to a downwardly projecting position whenever rotation of the member is stopped.

4. A dipping machine comprising a pedestal, a hydraulic lift, a horizontal member mounted on the hydraulic lift, a form support rotatably mounted on the horizontal member, means for rotating the form support, and control means including a control element intermittently engaged by the form support for automatically reversing the direction of rotation at a predetermined point in the arc of rotation of the form support.

5. Apparatus comprising, in combination, a hydraulic lift with an adjacent pressure chamber, a hydraulic cylinder mounted for movement with the hydraulic lift, and conduits for conducting fluid to the hydraulic cylinder, said conduits including extensible and retractable tubes extending through the pressure chamber of the lift.

6. Apparatus comprising, in combination, a hydraulic lift with an adjacent pressure chamber, hydraulically operated mechanism mounted for movement with the hydraulic lift, and conduit means for conducting fluid to the said hydraulically operated mechanism, said conduit means including an extensible and retractable tube extending through the pressure chamber of the lift.

7. Apparatus comprising, in combination, a single-acting hydraulic lift, a double-acting hydraulic cylinder mounted for movement with the hydraulic lift, and conduits for conducting fluid to the hydraulic cylinder including two non-collapsible rubber tubes pre-molded in the shape of

helices and extending through the pressure chamber of the hydraulic lift.

8. Apparatus for effecting reciprocal rotation of a rotatable member comprising, in combination with the rotatable member, a pinion gear associated with the member, a rack gear engaging the pinion, a double-acting hydraulic cylinder for actuating the rack, a reciprocating valve for directing the flow of hydraulic fluid to the chambers of the hydraulic cylinder, a solenoid for operating the valve, and a switch electrically connected to the solenoid and mounted for intermittent actuation by the rotating member.

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