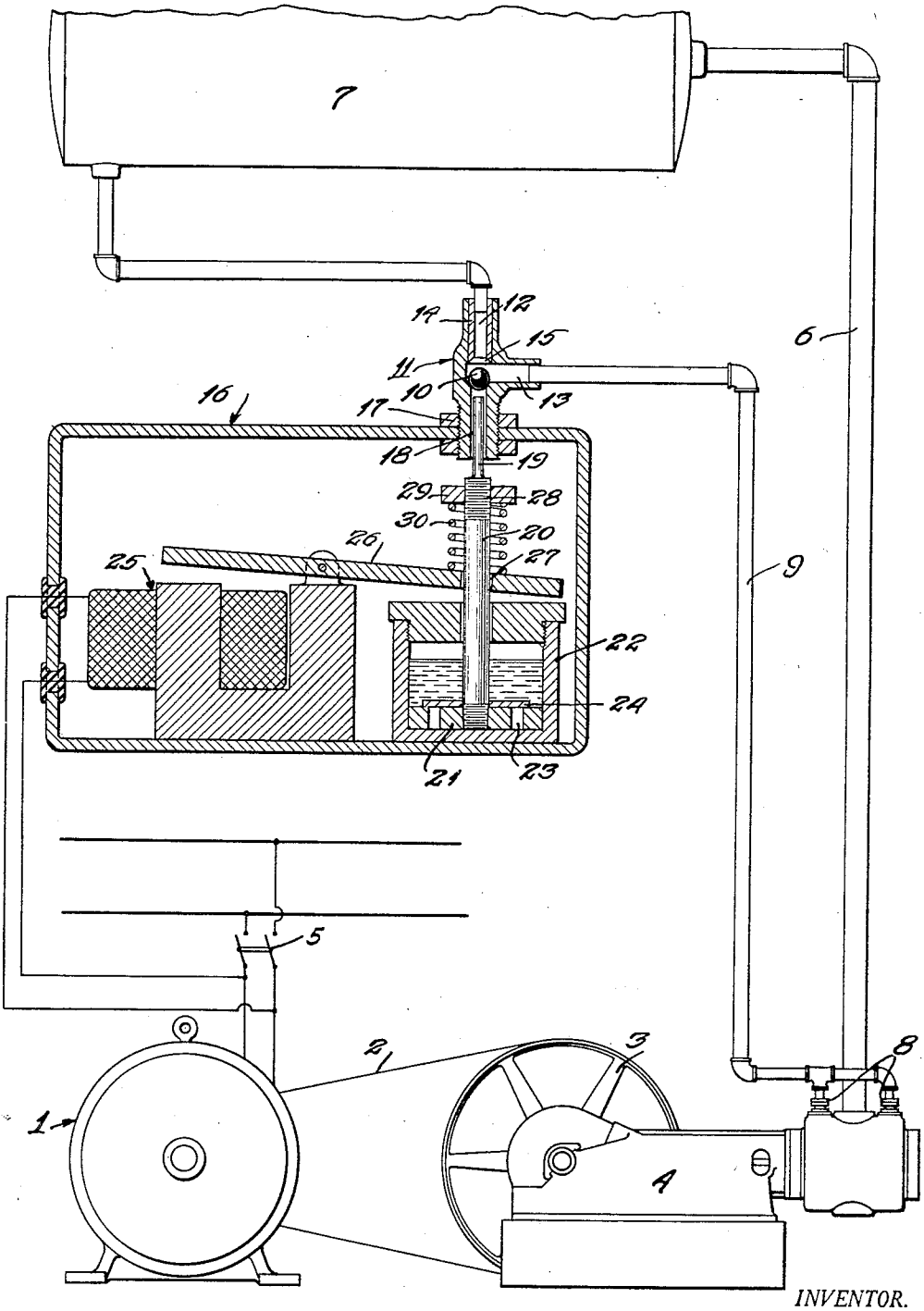
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COMPRESSOR CONTROL APPARATUS

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COMPRESSOR CONTROL APPARATUS

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Our invention relates to apparatus for automatically controlling the operation of compressors, pumps and the like. It is particularly adapted to the use of compressors operated by prime movers having a low starting torque, such as the usual squirrel cage type of electric motor.

The principal object of the invention lies in the provision of means for permitting the motor to attain its full speed before the compressor loads up. Without such a control serious disturbances and possible damage to the prime mover are likely to occur.

In the accompanying drawing we have shown for the purpose of illustration one embodiment which our invention may assume in practice.

In the drawing we have shown a diagrammatic view of a compressor outfit having an illustrative embodiment of our improved control mechanism associated therewith.

Referring to the drawing in detail, there is shown a prime mover having a low starting torque, such as a squirrel cage electric motor 1, connected through a suitable driving connection such as a belt 2, with a fly-wheel 3 mounted on the crankshaft of a compressor 4. The type of compressor shown in the drawing is the usual horizontal reciprocatory type, although it may be understood that our invention is equally applicable to any of the general types of compressors.

In the drawing, the electric motor 1, is shown as being connected to a suitable source of electrical energy and in its circuit is included a control switch 5. The control switch 5 as illustrated is a manually actuated one, but it is, of course, to be understood that this switch may be operated by fluid pressure from a receiver which will be hereinafter described.

Fluid is discharged from the compressor 4 through a suitable pipe 6 leading to a receiver 7, from which it may be supplied through the usual outlet for any purpose whatsoever desired.

The compressor 4 is provided with conventional inlet and fluid operated unloading valves 8, having connected thereto a fluid supply pipe 9 leading from the receiver 7.

To control the flow of fluid from the receiver 7 to the unloading valves 8 there is positioned within the pipe 9 a ball valve 10 arranged in such a manner that when in one of its operating positions it will permit the unobstructed passage of fluid from the receiver to the unloading valves. When in its second position the flow of fluid is interrupted. As shown in the drawing the ball valve 10 is maintained within a casing 11, having right angle passages 12 and 13 to which sections of the pipe 9 are connected. It will be noted that the passageway 12 has pressed therein a bushing 14, forming at its lower end a seat 15 for the ball.

To control the movement of the ball valve 10 we have provided an electrically operated device including a casing 16 to which the valve casing 11 is connected as shown at 17. A passageway 18 is provided in that part of the casing 11 forming connection with the casing 16 for the reception of a movable plunger 19 adapted to engage the ball valve 10, moving it upwardly to engage its seat 15, thus breaking the flow of fluid from the receiver to the unloading valves 8.

As illustrated in the drawing the plunger 19 is merely the reduced extension of a vertically disposed piston rod 20, having at its lower end a valved piston 21, movable vertically of an oil chamber 22 fixed within the casing 16. The piston 21 fits loosely within the chamber 22 so as to permit the passage thereabout of oil. The piston is also provided with oil passages 23 closed by a movable plate 24, slidable within a predetermined limit upon the piston rod 20.

Positioned within the casing 16 is a suitable electro-magnet 25 connected within the leads of the circuit including the prime mover or motor 1 and the control switch 5 previously mentioned.

The electro-magnet 25 includes a pivoted arm 26, one end of which overlies the magnet to be attracted thereby upon its energization, while its other end is provided with an opening 27 for the passage of the piston rod 20.

The piston rod 20 is provided with a threaded portion 28 for the reception of an adjusting nut 29. Positioned between the nut 29 and the upper face of the arm 26 is a coil spring 30.

In operation, assuming that the various elements of the assembly are in the positions shown in the drawing, upon the completion of the electric circuit by closing the switch 5, the prime mover or electric motor 1 is started, at the same time the electro-magnet 25 is energized, attracting the arm 26 and swinging it upon its pivot. Such a movement of the arm moves its right hand portion upwardly and by reason of the fact that the valve piston 21 is maintained in its lowermost position by weight of oil resting thereupon, the spring 30 will be compressed. In time the pressure exerted by the compressed spring 30 has a tendency to move the piston upwardly, as the oil passes around and through the piston to the lowermost portion of the chamber the piston will eventually move upwardly. When this movement of the piston occurs the reduced portion 18

of the piston rod will engage the ball valve 10 moving it to its seat 15, thus interrupting the flow of fluid from the receiver 7 to the unloading valves 8, permitting them to close, whereupon the compressor starts to build up a supply of air under pressure. When the maximum air pressure is obtained in the receiver 7 the switch 5 is operated breaking the circuit to motor 1 and at the same time de-energizing the magnet 25. The spring 30 then functions, moving the arm 22 upon its pivot to the position shown in the drawing, thereby relieving the tension of the spring bearing against the adjusting nut 29 of the rod 20. By reason of the weight of the oil remaining upon the upper face of the piston, plus the pressure exerted by the fluid upon the ball valve 10, the latter will be moved from its seat. This downward movement of the piston is unrestricted by reason of the openings 23 provided within the piston and the leakage of oil thereabout. When the piston has reached the position approximately shown in the drawing the ball valve 10 is permitted to move from its seat 15, thus establishing the line of fluid flow from the receiver 7 to the unloading valves 8, permitting the unloading of the compressor.

With this structure it will be observed that by adjusting the nut 29 the tension of the spring 30 may be varied, thus permitting the desired time interval to elapse before the closing of the valves 8 and the loading up of the compressor.

From the foregoing it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What we claim as our invention is:

1. In a regulating device of the class described, the combination of a compressor having unloading valves adapted to be rendered operative by fluid pressure, a valve for interrupting the flow of fluid pressure to said unloading valves, an electric motor for driving the compressor, means for moving the controlling valve to its functioning position included in the motor circut and rendered operative upon the closing thereof, and said means having adjustable means permitting the lapse of a predetermined time interval between the start of the motor and the closing of the control valve.

2. In a regulating device of the class described, the combination of a compressor having unloading valves adapted to be rendered operative by fluid pressure, a valve for interrupting the flow of fluid pressure to said unloading valves, an electric motor for driving the compressor, electrical means including an arm for moving the controlling valve to its functioning position included in the motor circuit and rendered operative upon the closing thereof, a stem movable to engage the valve, a dash pot for retarding the movement of the stem, and adjustable means on the stem engageable with the arm, permitting the lapse of a predetermined time interval between the start of the motor and the closing of the control valve.

3. In a regulating device of the class described the combination of a compressor having unloading valves adapted to be rendered operative by fluid pressure, an element controlling the flow of fluid pressure to said unloading valves, an electric motor for driving the compressor, means for moving the controlling element to its functioning position included in the motor circuit and rendered operative upon the closing thereof, and said means having adjustable means permitting the lapse of a predetermined time interval between the start of the motor and the operation of the element.

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