

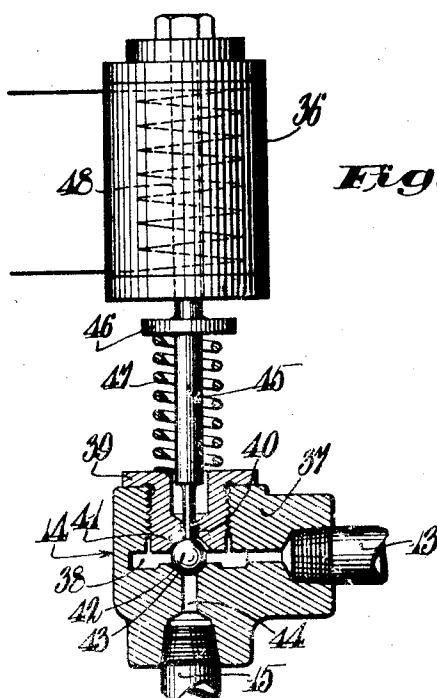
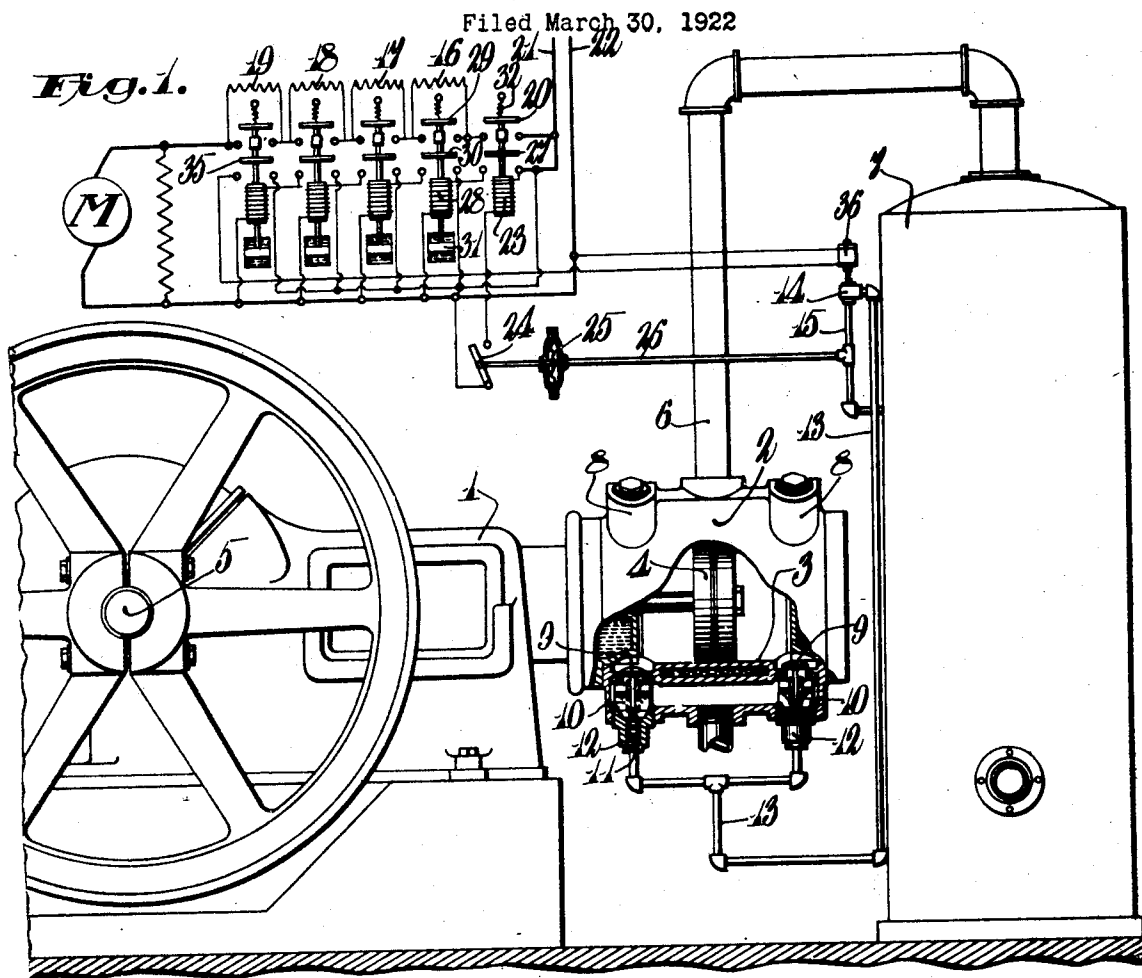
Nov. 22, 1927.

1,649,900

F. D. HOLDSWORTH

COMPRESSOR CONTROLLING MECHANISM

Filed March 30, 1922



Inventor:
Fred D. Holdsworth
by *[Signature]*
attorney.

UNITED STATES PATENT OFFICE.

FRED D. HOLDSWORTH, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

COMPRESSOR-CONTROLLING MECHANISM.

Application filed March 30, 1922. Serial No. 548,131.

My invention relates to compressor controlling mechanisms, and more particularly to automatic means for controlling the running of a compressor and its loading at appropriate times.

An object of my invention is to provide an improved compressor controlling mechanism. Another object of my invention is to provide improved means for controlling the starting and stopping of a compressor in accordance with the demands for compressed air and improved means controlled by the starting and stopping of the compressor for controlling the loading and unloading of the compressor. A further object of my invention is to provide improved electro-pneumatic means for the loading and unloading of a compressor. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a view mainly in elevation, but partially in section, of a compressor system provided with one illustrative form of my improved controlling means, the electric circuits and control means therefor being shown diagrammatically.

Fig. 2 is an enlarged detail view with parts shown in section, the positions of the parts corresponding to loaded condition.

In the form of my invention which I have shown for purposes of illustration, the same is disclosed as applied to a compressor 1 having a cylinder 2 in whose bore 3 a piston 4 is adapted to be reciprocated by means of a crank shaft 5 and operative connections (not shown). The compressor discharges by way of a pipe 6 to a receiver 7 through discharge mechanism 8 of any suitable form. The admission of air to the compressor cylinder takes place past inlet valves 9 of familiar construction, these valves being normally held closed by springs 10 and opened by reason of the reduction of pressure within the piston bore during the suction strokes of the piston. For the purpose of opening the inlet valves and maintaining them open to thereby unload the compressor when desired, I provide pistons 11 reciprocable in cylinders 12 to which air may be supplied by way of a connection 13 under control of mechanism 14 hereinafter more fully de-

scribed, the passage 13 being connected to the receiver by the passage 15 under control of the mechanism 14.

The compressor is driven by a motor diagrammatically shown at M, which motor is provided with starting means having a series of resistances 16, 17, 18 and 19, all of which are in circuit when the main switch 20 closes the circuit through the main wires 21 and 22 to the motor. It will be noted that the main switch 20 is controlled by a solenoid 23 which is controlled by a pilot switch 24 whose movements are regulated by a diaphragm 25 diagrammatically shown in Fig. 1, the diaphragm being responsive directly to receiver pressure by way of a direct connection 26 to the pipe 15, it being noted that when the receiver pressure is in excess of any predetermined desired amount, the pilot switch 24 will be open, while when the pressure falls below the desired limit, the pilot switch will close, and thereby close the main line switch 20. The main line switch has movable therewith a supplemental switch 27 which controls a circuit through a solenoid 28 which serves in turn to close a switch 29 shunting the first resistance 16. The switch 29 carries with it a supplemental switch 30 which closes an operating circuit which causes the next succeeding resistance 17 to be shunted and as each successive resistance shunting switch closes it brings about the completion of a circuit through a means for closing the next resistance shunting switch. As devices of this general type are now quite well known, no further description of the details is believed necessary, save that it may be stated that the movements of each of the resistance shunting switches are controlled by dashpot means diagrammatically shown at 31, these dashpots being constructed to provide a relatively slow closing movement of the switches, while permitting opening movements thereof under action of the springs 32 to be quite sharp. An examination of the connections shown will readily disclose that opening of the main line switch will cause the instantaneous opening of all the resistance shunting switches and so that each time the motor is stopped, it is brought up to speed by the gradual cutting out of the full resistance, it being observed that by reason of the presence of the dashpot mechanisms described, a sufficient time lapse between the closing of

the main line switch and the cutting out of all resistance is provided to permit the motor to come up to substantially running speed. It will be noted that the last resistance shunting switch carries a supplemental switch 35 which closes a circuit through a solenoid 36 forming a part of the mechanism 14, causing energization of the solenoid 36 to take place substantially when the motor has come up to full speed.

The mechanism 14 comprises a valve casing 37 having a chamber 38 therein closed at its top by a threaded plug 39, which plug is traversed by a passage 40 and terminates at its inner end in a conical valve seat 41. Within the chamber 38 is a ball valve 42 which is adapted to be seated upon a conical seat 43 opposite the seat 41 and to move between said seats under conditions which will be described. The seat 43 surrounds a passage 44 which communicates with the connection 15. The chamber 38 communicates with the pipe 13. Cooperating with the ball valve 42 is a plunger 45 extending loosely through the passage 40 and having a collar 46 thereon with which a spring 47 cooperates whereby the normal tendency of the spring is to raise the plunger 45 and to permit the lifting of the ball 42 from the seat 43 by receiver pressure and the seating of the ball 42 upon the seat 41, thereby closing off all escape of air through the passage 40. The plunger 45 is provided with an armature 48 which is attracted by the solenoid 36 so that upon supply of current to the solenoid upon closure of the switch 35, the armature 48 will be drawn downward, moving the plunger 45 with it and forcing the ball 42 to the seat 43 and opening the passage 40. It will therefore be evident that when the solenoid 36 is energized, receiver pressure will not be permitted to pass through the pipe 13 to the cylinders 12, but instead a vent 40 will be opened and any pressure will be permitted to pass from the cylinders 12 to the atmosphere.

From the foregoing description, the mode of operation of the illustrative form of my invention will be readily understood. Let it be assumed that the parts are in the position shown in Fig. 1. It will be evident that the inlet valves are being held open since, there being no current flowing through the solenoid 36, the receiver pressure acting upon the valve 42 and the spring 47 lifting the plunger 45 will serve to permit opening of the valve 42 in such manner as to connect the receiver and the lower ends of the cylinders 12. The compressor will accordingly be unloaded and the motor idle. As the receiver pressure drops due to air consumption, leakage, etc., the diaphragm 25

will move toward the right in Fig. 1 and close the pilot switch 24 and thereby cause closing of the main switch 20 and the starting and gradual bringing up to speed of the motor M. When the resistance has been cut out by the mechanism described, the switch 35 will close the circuit through the solenoid 36 and the latter being energized will move the armature 48 to force down the plunger 45 and so close communication between the receiver and the plungers 11, while opening the vent through the port 40. It will thus be seen that the compressor is loaded automatically substantially as full running speed is reached and that current economy is assured and the apparatus safeguarded by the avoidance of drawing a heavy current to start under full load.

It will be obvious to one skilled in the art, that my improved controlling mechanism can be adapted to use with intake type unloading mechanisms and that, if desired, various modifications can be made within the scope of my invention as defined in the appended claim.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claim.

What I claim as new and desire to secure by Letters Patent is:

In a compressor controlling system, a controlling valve mechanism comprising a casing member having a recess formed therein, said recess communicating freely with a connection to a space in which variations in pressure are desired and having also a connection surrounded by a valve seat leading to a source of fluid pressure, a plug extending into and closing said recess, said plug being disposed opposite said valve seat and having formed thereon a valve seat oppositely disposed with respect to said first mentioned valve seat, said plug being traversed by a port communicating with said second mentioned valve seat, a plunger extending through said port and of smaller diameter than said port, a spring normally tending to force said plunger out of said port, a solenoid operative on energization to move said plunger inward through said port in opposition to said spring, and a ball valve disposed in said recess and moved in opposite directions by said plunger and by pressure from said source.

In testimony whereof I affix my signature.

FRED D. HOLDSWORTH.