

UNITED STATES PATENT OFFICE

LEON BUEHLER, JR., OF WAYNESBORO, PENNSYLVANIA, ASSIGNOR TO FRICK COMPANY,
OF WAYNESBORO, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

UNLOADER FOR COMPRESSORS

Application filed February 29, 1932. Serial No. 595,937.

The starting torque required for compressors increases directly with the pressure differences between the suction and the discharge ports of the compressor. When these pressures are equal the torque is at a minimum.

My invention provides means for automatically equalizing the discharge and suction pressures of the compressor at the point of starting of the compressor. This equalization is effected by connecting the discharge with the intake ports as the compressor is started and then automatically closing communication between these ports when the starting motor has attained approximately its maximum speed.

A general object of the invention therefore is to provide means for unloading a compressor until its operating motor has reached approximately maximum speed.

A further specific object is to provide a time lag switch which will delay operation of the compressor motor until a by-pass valve has been opened to unload the compressor and which will start the main compressor after the by-pass valve is open.

Means are further provided for closing said by-pass when the main motor has come to full speed.

Referring to the accompanying drawing, which is made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 shows in side elevation a compressor with an unloader valve shown in section,

Figure 2, a somewhat diagrammatic view of the unloader means, and the circuits for controlling and operating the unloader.

In the drawing numeral 10 indicates a compressor having a discharge port 11 and having a pipe 12 controlled by a valve 13 connecting the discharge of the compressor with the intake of the same. The compressor is driven by means of an electric motor 14.

The motor 14 is operated by current supplied through lines 15 and 16 which are connected to lead-in lines 17 and 18 through switch 29 and line 34. The by-pass valve

13 is operated by means of a piston 19 operating within a cylinder 20. When the valve is in the position shown in Figure 1 the compressor is operating to discharge the compressed fluid through the outlet 11. Means for opening the by-pass valve 13 will now be described. This consists of a pump 21 having a discharge pipe 22 which communicates with a port 23 in communication with the space beneath the piston 19 within the cylinder 20. When the pump 21 is operating, oil or other fluid is delivered through the pipe 22 beneath the piston 19 to raise this piston against the tension of the spring 24. This opens the by-pass valve 13 and connects the discharge with the intake of the compressor 10. The pump 21 is operated by a motor 25 supplied with current through lines 26 and 17. Within the line 26 is a switch 27 which is operated by a solenoid 28. Switch 29 is controlled by a time lag circuit 30 of any suitable kind. This circuit is connected through wires 31 and 32 with the wires 26 and 17 respectively. At 33 is shown a main control switch for the system. This switch may be a thermostat switch which is closed upon the rise of temperature to a predetermined degree or it may be a manually operable switch used to start the system at the will of the operator.

In operation the switch 33 is closed either manually or in response to the rise of the temperature in the room. The switch 27 is closed. Closing of switch 33 starts the motor 25 which drives the pump 21 to deliver pressure fluid beneath the piston 19 to open the by-pass valve 13. When the switch 33 is closed the motor 25 immediately starts. There is provided, however, a time lag or time delay coil 30 which delays closing of the switch 29 until the pump 21 has developed sufficient pressure to open the by-pass valve 13. By the time the by-pass valve has been opened the switch 29 will have been closed to close circuit from lines 17 and 26 through lines 34, 15 and 16 with the motor 14 to start operation of the compressor. Since the valve 13 is open, the compressor may start without a load. This facilitates

starting. When the motor 14 has come to full speed the solenoid 28 will be operated in response to the load on the motor 14 to open the switch 27. This stops operation of the motor 25 and the pump 21 permitting the valve 13 to close in response to pressure of the spring 24. The system then is in full operation and the compressor is given its full load. The system will continue to operate until the switch 33 is again opened; when this occurs the switch 27 will automatically close so that the parts will be in position for starting again when the switch 33 is closed.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention and therefore I do not limit myself to what is shown in the drawing and described in the specification, but only as indicated by the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. An unloader for compressors comprising a fluid operated by-pass valve positioned in a passage connecting the discharge with the intake of the compressor, fluid pressure means for holding said valve open during the starting of the compressor, means for generating said fluid pressure, and a switch in control of circuits to a motor for driving said compressor, and means for delaying operation of said motor until the pressure generating means has caused said by-pass valve to be opened, substantially as set forth.

2. Means for reducing the starting torque on compressors which comprises a fluid passage connecting the discharge and the suction sides of the compressors, a valve in said passage, means operable independently of the compressor for holding said valve open during the starting of the compressor, said means comprising a pump and a motor, a switch in control of said motor, a switch in control of a motor for operating said compressor and a time delay device for delaying operation of the compressor motor until said pump has come to full speed, substantially as set forth.

3. Means for reducing the starting torque on compressors which comprises a fluid passage connecting the discharge and the suction sides of the compressors, a valve in said passage, means operable independently of the compressor for holding said valve open during the starting of the compressor, said means comprising a pump and a motor, a switch in control of said motor, a switch in control of a motor for operating said compressor and a time delay device for delaying operation of the compressor motor until said pump has come to full speed, and means for stopping said pump when the

motor which operates the compressor comes approximately to full operating speed, substantially as set forth.

4. An unloader for compressors comprising an equalizing line between the suction and the discharge of the compressor, a valve in said line, an auxiliary pressure means for opening said valve, a motor for operating the said compressor and a time delay device for delaying operation of said motor until the auxiliary pressure means has opened the said valve, and means controlled by the load on the said compressor motor for stopping operation of the auxiliary pressure means when the said motor has come to approximately operating speed, substantially as set forth.

5. In a compressor, a motor for operating the compressor, electrically controlled means for unloading said compressor, an inertia switch in control of said motor, said switch causing operation of said motor only after said electrically controlled means has functioned, substantially as set forth.

6. In a compressor, a motor for operating the compressor, electrically controlled means for unloading said compressor, an inertia switch in control of said motor, said switch causing operation of said motor only after said electrically controlled means has functioned, and means controlled by the load on said motor for stopping operation of said electrically controlled means when said motor has reached approximately operating speed, substantially as set forth.

7. In a compressor having an operating electric motor, an unloader for the compressor comprising a pipe connecting the discharge with the intake of the compressor, a valve in said pipe, a switch for controlling said motor, means for opening said by-pass valve, a motor in control of said means, means for delaying operation of said compressor motor until said other motor has caused the said valve to be opened, said delaying means comprising an inertia switch in control of said compressor motor, substantially as set forth.

In witness whereof I have hereunto set my hand at Waynesboro, Pennsylvania, this 11th day of February, A. D. nineteen hundred and thirty-two.

LEON BUEHLER, JR.