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C. S. BAKER
CONTROLLING DEVICE
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2,494,279

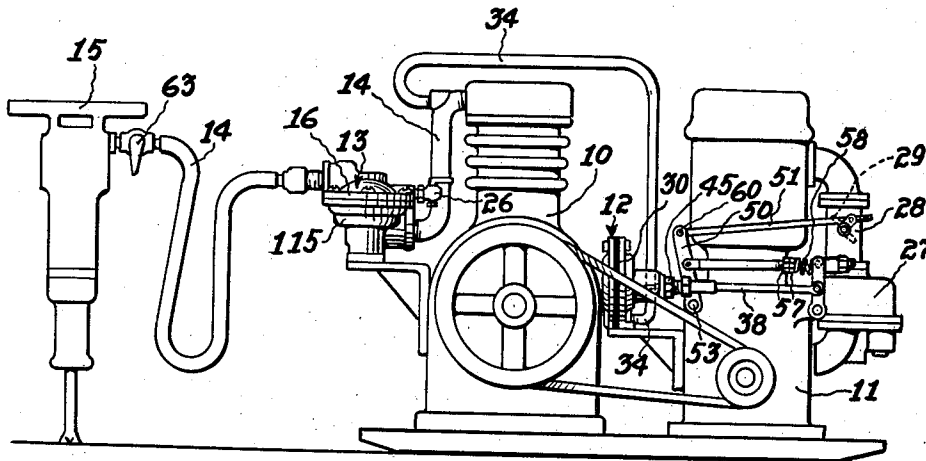


FIG. 1.

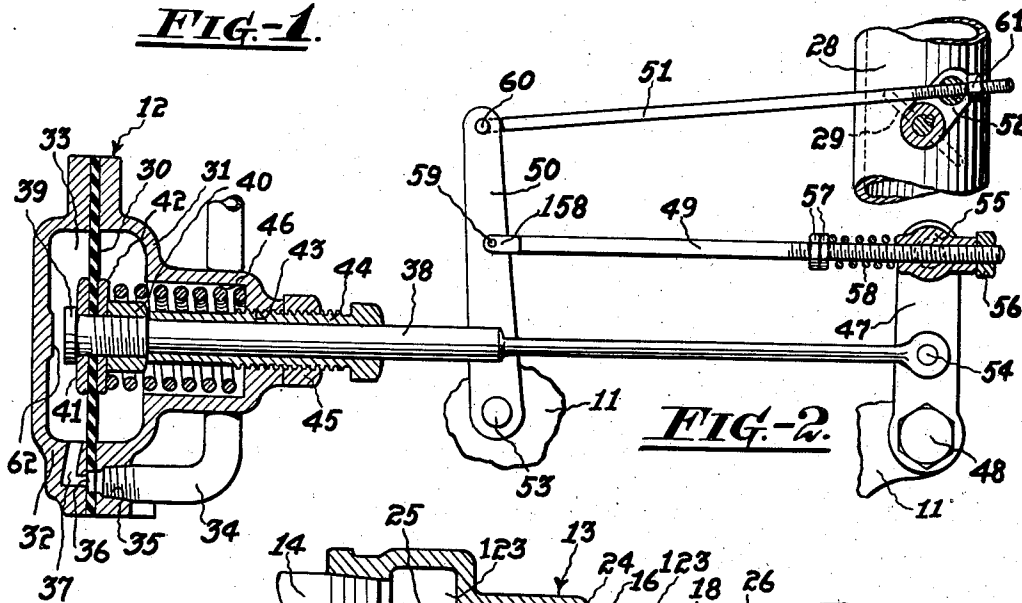


FIG. 2.

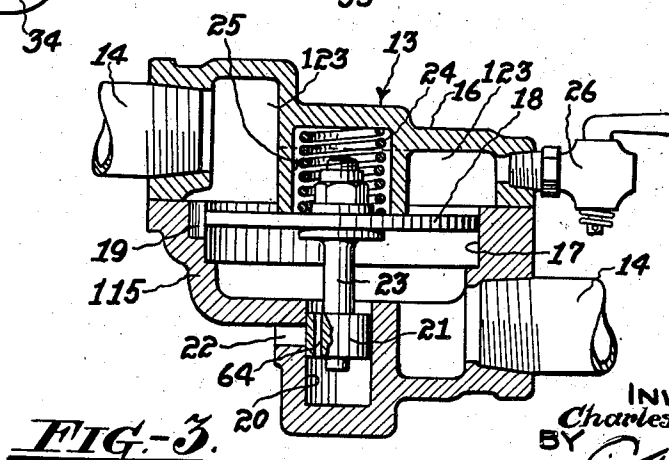


FIG. 3.

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CONTROLLING DEVICE

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2 Claims. (Cl. 230-11)

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This invention relates to an air compressor system and more particularly to a system for unloading the air compressor when the demand for air ceases.

One object of the invention is to provide a compressor system which eliminates the necessity for an air receiver.

Another object of the invention is to provide a system of this type which unloads the compressor and slows its driving motor when the demand for air ceases.

Other objects and advantages of the system will be in part obvious and in part pointed out hereinafter.

The drawing illustrates a preferred embodiment of the invention and includes

Fig. 1, an elevation view of a compressor, its driving motor and regulators constructed in accordance with the practice of the invention, together with a pneumatic tool adapted to be associated therewith,

Fig. 2, a detailed view partly in longitudinal section of the speed regulator for the motor and the connection to the throttle valve thereof, and

Fig. 3, a vertical section through the compressor unloader.

As indicated in Fig. 1, the compressor system comprises a compressor which is adapted to be driven by a motor 11 in this case a gasoline engine, a speed regulator 12 for the engine 11, and an unloader 13 for the compressor 10 associated with a discharge conduit 14 which in this instance is shown adapted to conduct compressed air to a pneumatic drill 15. As will be noted, the compressor 10 is not provided with an air receiver and the discharge line 14 is directly connected with the tool to be operated. Interposed in the discharge conduit 14 is the unloader 13 which in this instance is provided with a casing having a base 115 and a cover portion 16 suitably bolted together. Within the base 115 is provided a cylinder 17 forming a guide for a piston 18 forming an obstruction to the passage of air through the cylinder 17. Air is permitted, however, to flow by the piston 18 at the groove 19 in the wall of the cylinder 17, it being understood that while air is flowing normally by the piston there will be a slight pressure drop providing a condition of unbalanced pressure on the piston whereby the piston is kept at an elevated position as shown in Fig. 3.

Also formed in the base 115 is the cylinder 20 within which is adapted to reciprocate a spool valve 21 for the control of the pressure relief port 22 formed in the wall of the cylinder 20. A

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stem 23 connects piston 18 with the spool valve 21 so that the two move together as a unit.

The cover 16 is provided with a cavity 123 forming a convenient passage for air flowing from the groove 19 to the conduit 14. Cavity 123 also permits the upper face of the piston 18 to be exposed to air pressure from above. Normally the piston 18 is biased toward the downward position (Fig. 3), by means of a coil spring 24 contained within cylindrical pocket 25 formed integrally with the cover 16 and which acts as an upper stop for the piston 18. The petcock 26 is provided in the cover 16 to communicate with the cavity 123.

The gasoline engine 11 is provided with a conventional form of carburetor 27 at its intake 28 and its speed is controlled by a suitable butterfly valve 29. For regulating the speed of the engine 11 there is provided the regulator 12 which is responsive to the pressure in the discharge conduit 14. In this instance, the regulator 12 comprises a diaphragm 30, mounted within a housing consisting of a base portion 31 and a cover 32 suitably bolted together with the diaphragm 30 between them. The space between the cover 32 and the diaphragm 30 indicated at 33 is a pressure chamber adapted to receive pressure fluid from the discharge conduit 14 by way of a suitable pipe 34 attached at a threaded aperture 35 in the base 31 which communicates by way of a hole 36 through the diaphragm 30 and a port 37 in the cover 32 with the pressure chamber 33. Diaphragm 30 is adapted to transmit force to a plunger 38 having a head 39 and a nut 40 for gripping the diaphragm 30, suitable washers 41 and 42 being provided under the head 39 and the nut 40 respectively. Plunger 38 extends through a threaded aperture 43 having a correspondingly threaded bushing 44 which is adapted to be screwed into and out of the base 31 and which acts as an adjustable stop for the rod 38 in cooperation with the nut 40. Bushing 44 may be locked in place by means of a nut 45. Pressure exerted against the diaphragm 30 by fluid within the chamber 33 is opposed by a spring 46 contained within the base 31 and bearing against the washer 42. The pressure of the spring 46 is merely sufficient to overcome the idling pressure of the compressor 10 and to operate the throttle valve 29 as will be described.

Force exerted on the rod 38 is adapted to operate the throttle valve through a system of links and levers including lever 47 suitably pivoted at the stud 48, a link 49, lever 50 and link 51 attached to the arm 52 of the throttle valve 29. Levers 47 and 50 are suitably pivoted at the stud 48 and

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pivot 53 respectively mounted on the engine base. Rod 38 is attached at the pivot 54 intermediate the ends of lever 47. At the swinging end of the lever 47 is attached a pivoted member 55 slidingly engaging the rod 49 the effective length of which is adjustable by means of a nut 56 provided on the rod 49 and corresponding locking nuts 57 forming an abutment for a spring 58 about the rod 49 and bearing against the member 55. At the end of the link 49 the forked end 158 thereof is pivotally attached as at 59 to the lever 50 intermediate its ends. The swinging end of the lever 50 is pivotally attached as at 60 to the link 51. The opposite end of link 51 is provided with an adjusting nut 61 which adjusts the effective length of the link.

The motion of the throttle valve 29 is a function of the motion of the rod 38 and accordingly the degree of movement is governed by the adjustment of the sleeve 44 which is adapted to contact the nut 40 and a stop or boss 62 which is adapted to contact the head 39 of the rod 38 when the pressure within the chamber 33 is reduced.

As indicated in Fig. 1 the compressor system is adapted to operate a pneumatic hammer drill indicated at 15 which may be provided with a suitable throttle valve 63. When the system is in operation, that is to say, when the engine is running and the drill 15 is drilling with the throttle valve 63 open, air flows through the conduit 14 and in its passage through the unloader 13 provides pressure against the relatively large area of the piston 18 on its lower side to hold that piston in its extreme upward position. Air thus flows through the groove 19 and thence to the tool 15. The size of the groove 19 is preferably regulated so that an appreciable pressure drop exists on the upper and lower sides of the piston 18. If it be assumed that a normal pressure of 80 pounds per square inch is provided at the compressor 10, a suitable pressure drop of say, five pounds would be adequate to hold the piston in its upward position against the pressure of spring 24. No unbalance is provided by the associated relief valve 21 since that valve is provided with an equalizing port 64 connecting both of the ends of the cylinder 25. At the same time, pressure fluid from the discharge conduit 14 is admitted by way of the pipe 34 to the pressure chamber 33 depressing the diaphragm 30 and through the associated system of links and levers the throttle valve 29 is forced to its open position.

Upon closure of the throttle valve 63 the pressure on opposite faces of the piston 18 immediately balance, permitting the spring 24 to depress the piston and the valve 21 to uncover the vent 22 whereupon the pressure in the conduit 14 very soon drops to a relatively low value. Correspondingly, the pressure within the chamber 33 of regulator 12 drops permitting the spring 46 to force the rod 38 to its extreme position toward the left, thereby closing the throttle 29 to its idling position. It is preferable that while idling the compressor 10 should produce a relatively small

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pressure, as for instance, about 15 pounds within the conduit 14. Obviously, the vent 22 cannot be sufficiently large to drop the pressure within the conduit to zero, because upon reopening of the throttle valve 63 there would be relatively no flow of air to the tool. It will, therefore, be seen that the minimum pressure within the conduit 14 will be that which will produce a pressure differential on the piston 18 sufficient to force the piston 18 to an upward position when the throttle valve 63 is open. When a relatively small tool is connected to the conduit 14 the flow of air through the conduit may not be sufficient normally to cause a pressure drop which would operate the piston 18 to close the relief valve. For this purpose the petcock 26 is provided which, when open provides an additional flow of air to cause such a pressure drop. Since in such an instance the compressor 10 is more than adequate in capacity to operate the tool the loss of air through the petcock 26 is of no great consequence. Also, when idling the slight pressure drop existing on the piston 18 due to the opening of the petcock 26 will not effect the operation of the piston. Its function is to help the action of the piston by increasing the pressure differential.

Thus by the above construction are accomplished among others, the objects hereinbefore referred to.

I claim:

1. In a controlling device, the combination with a compressor, a motor for driving the compressor, a discharge conduit for said compressor, a speed regulator for the motor acting responsively to the pressure in said discharge conduit, a relief valve in said discharge conduit, of a guiding cylinder forming part of said conduit, a piston in said cylinder acting responsively to the flow of fluid in said conduit to close said relief valve, a stem connecting said piston with said relief valve, and a spring biasing said relief valve to its open position.

2. In a controlling device, the combination with a fluid compressor, a discharge conduit for the compressor having an exhaust port, a relief valve in the conduit to control the exhaust port, of a guiding cylinder forming part of the conduit, a piston in said cylinder responsive to the flow of fluid in the conduit to operate said relief valve, a stem connecting said piston with said relief valve, and a spring biasing said relief valve to its open position.

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