Feb. 6, 1968 J. E. PERSSON ET AL 3,367,562

MEANS FOR UNLOADING AND CONTROLLING COMPRESSOR UNITS

Filed June 23, 1966 3 Sheets-Sheet 1

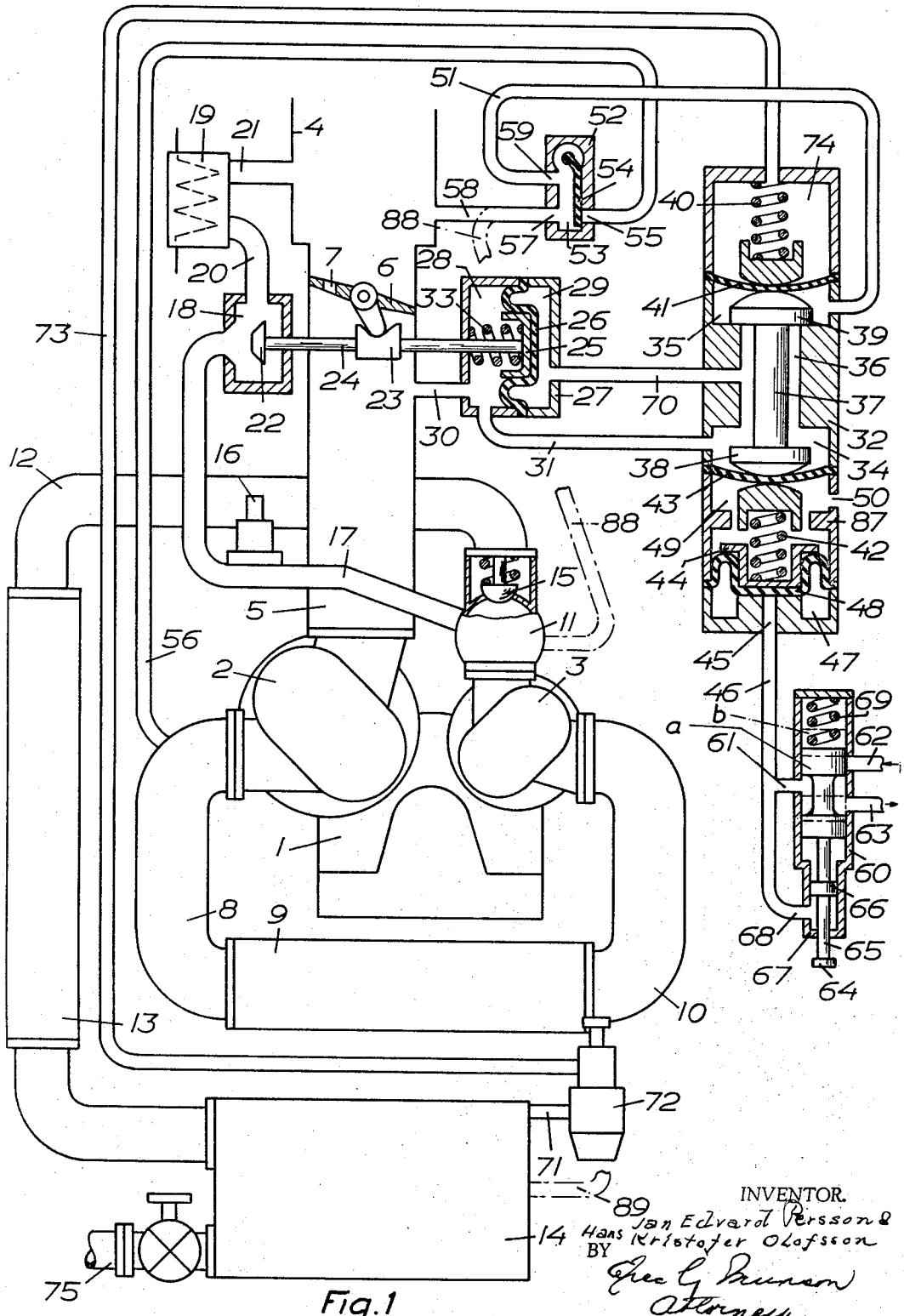


Fig. 1

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Filed June 23, 1966 3 Sheets-Sheet 2

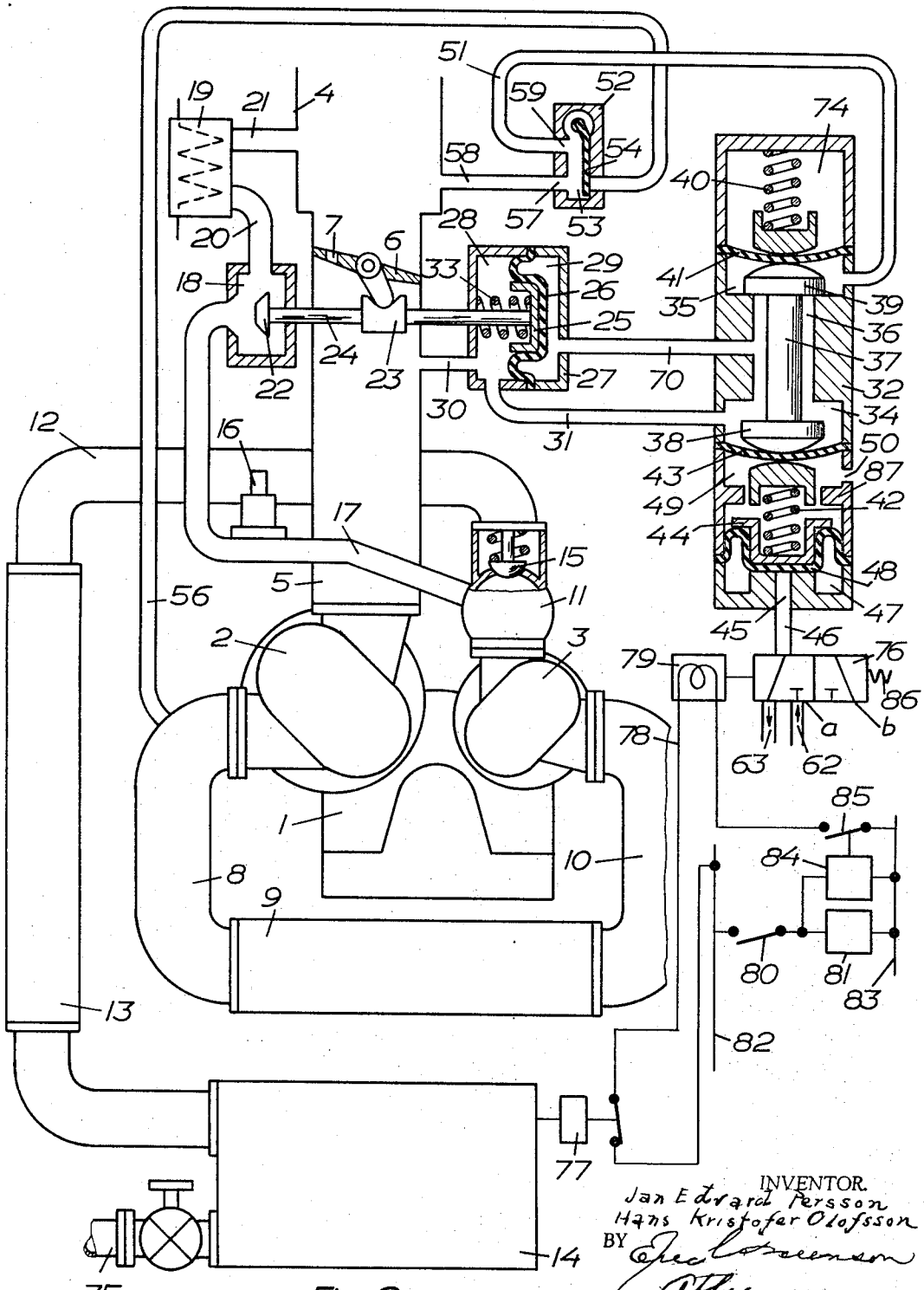


Fig. 2

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3 Sheets-Sheet 3

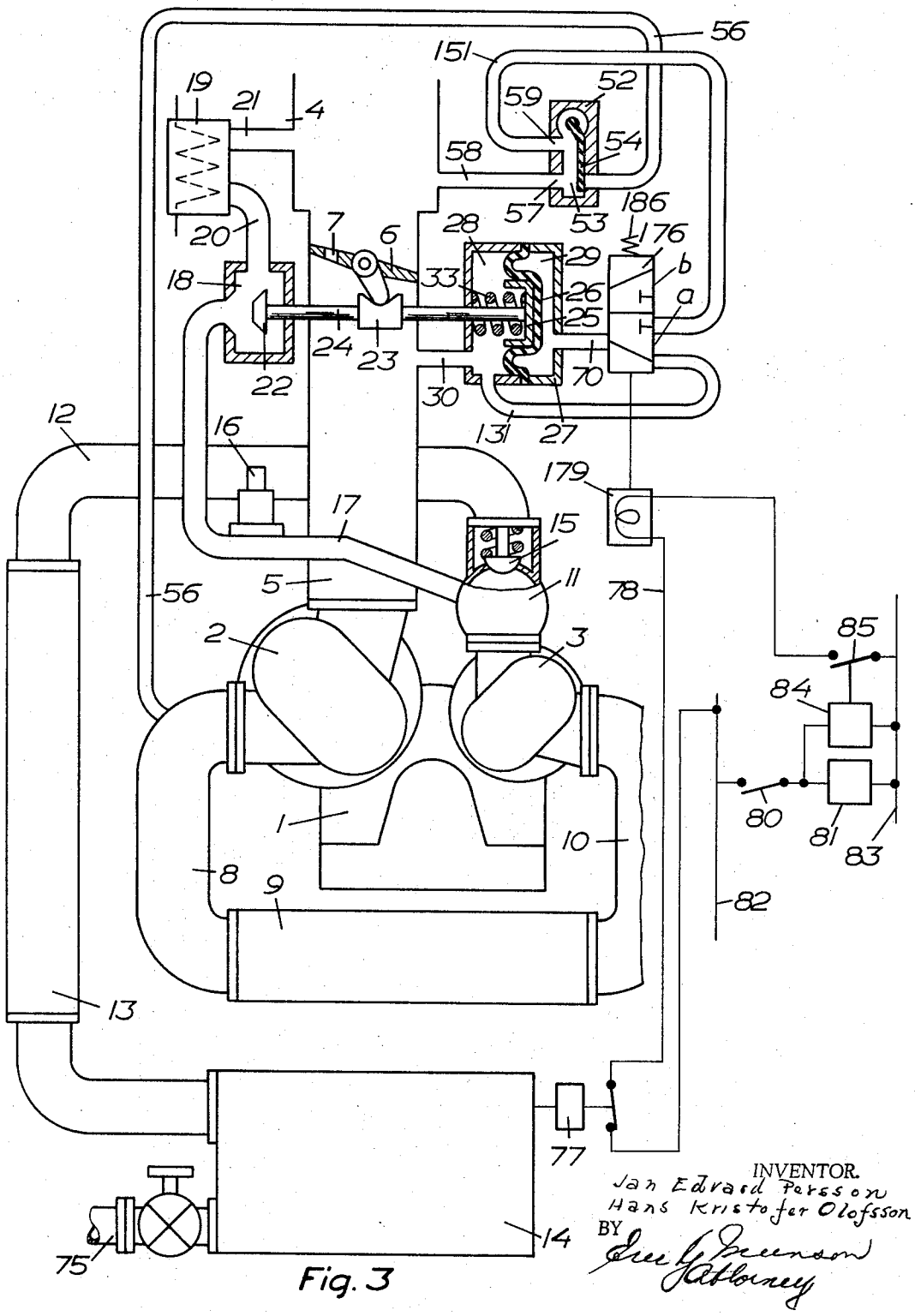


Fig. 3

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3,367,562

MEANS FOR UNLOADING AND CONTROLLING COMPRESSOR UNITS

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This invention relates to compressor units for supplying and maintaining a compressed fluid under predetermined super atmospheric pressure and the invention is particularly related to means for unloading and controlling such a compressor unit. One object of the invention is to provide a simple and reliable unloading and control device which may be used for portable as well as stationary compressors. A further object of the invention is to provide an unloading device which may be used for single stage compressors but which is particularly suitable for two or multiple stage compressors. A still further object is to provide a device in which spring means only are relied upon for maintaining the compressor in unloaded condition. For the above and other purposes we provide a compressor unit for supplying and maintaining a compressed working fluid under predetermined super atmospheric pressure and comprising a compressor, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed working fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means arranged for moving said throttle valve and said vent valve to said first positions for unloading the compressor, and working fluid pressure responsible means arranged for moving the throttle valve and the vent valve to said second position for loading the compressor.

In the enclosed drawings three embodiments of two stages compression compressor units according to the invention are illustrated diagrammatically by way of example. FIG. 1 is a diagrammatic view of a two stage compressor unit according to the invention intended for portable use. FIG. 2 is a similar diagrammatic view illustrating a two stage compressor unit for stationary purposes. FIG. 3 illustrates a modification of FIG. 2.

In FIG. 1 a power transmission casing 1 is illustrated which carries a low pressure compressor 2 and a high pressure compressor 3 which may be screw compressors driven from a common shaft (not illustrated) in the power transmission casing 1. 4 and 5 are different portions of an air intake conduit of the low pressure compressor 2. Naturally the intake conduit may instead be connected to a source of gas if the compressor is operating on gas, but the following description refers to air only, since the necessary modifications for handling gas would be obvious to any one skilled in the art. The air intake conduit portions 4 and 5 are separated by a throttle valve 6 which may take a first throttle position, as illustrated in FIG. 1 in which position the valve permits a limited air flow from the intake conduit portion 4 to the intake conduit portion 5 over the edges of the throttle valve member or through a suitable restricted port 7 in the throttle valve member. The throttle valve member may also take a fully open position in which air or other gas may flow freely from the air intake conduit portion 4 to the portion 5. From the low pressure compressor 2 compressed air or other fluid flows through a conduit 8 to an intercooler 9 from which a conduit 10 leads to the intake of the high pressure compressor 3. From the high pressure compressor 3 the compressed air flows through a delivery conduit 11, 12 to an after cooler 13 and an air receiver 14. The delivery conduit contains a check valve 15 which in closed position separates the conduit portions 11 and 12, and which prevents back flow from the air receiver 14 when the compressors 2 and 3 are stopped or unloaded. 16 is a safety valve communicating with the delivery conduit before the check valve 15. From the delivery conduit 11 a blow off conduit 17 leads to a chamber 18 communicating with a cooler and silencer 19 through a conduit 20. A conduit 21 connects the silencer and cooler 19 to the intake conduit 4, which may be provided with an air intake filter and silencer in conventional manner. A valve member 22 controls the communication between the conduit 17 and the chamber 18.

The valve member 22 and an operating member 23 for the throttle valve 6 are provided on a rod 24 which is connected to a piston 25 operating against a membrane 26 and movable in a cylinder 27 which is separated by said membrane in a first chamber 28 and a second chamber 29. The membrane 26 is preferably a rolling membrane, which is not fixed to the piston 25. The first chamber 28 communicates through a restricted pipe or bore 30 with the intake conduit portion 5 and furthermore through a pipe or bore 31 with an auxiliary valve device 32. A conduit 70 connects the second cylinder chamber 29 with the auxiliary valve device 32.

A spring 33 is provided in the cylinder 27 and gives the piston 25 and membrane 26 a spring bias in such a direction that the spring tends to close the throttle valve 6 and to open the blow-off valve 22.

The auxiliary valve 32 includes a first space 34, a second space 35 and an intermediate space 36 and, furthermore, a double headed valve member 37 having a first head 38 and a second head 39 connected by a stem. A spring 40 disposed in the valve device 32 acts on a membrane 41 to bring the valve member 37 to the position in which the valve head 39 separates the second space 35 from the intermediate space 36. A second spring 42 acts in the opposite direction on a membrane 43 to move the valve member 37 to a position in which the valve head 38 interrupts communication between the intermediate space 36 and the first space 34. The tension of the spring 42 is determined by a piston 44 which has two distinct positions as follows: When there is no pressure supplied through an oil inlet 45 from an oil pipe 46 the piston 44 is in the lower position which is as illustrated in FIG. 1 and the spring 42 then has low tension. The spring 40 then overcomes the spring 42 and keeps the valve member 37 in the lower position as illustrated in FIG. 1. When a suitable oil pressure is supplied through inlet 45 piston 44 moves to the upper position defined by lugs 87. Spring 42 then has enough tension to overcome spring 40 and to push valve member 37 to its upper position provided chamber 74 is under atmospheric pressure. Piston 44 is preferably sealed by a rolling membrane 48 which separates a chamber 47 from a space 49 in which the spring 42 is provided. Said space is preferably connected to the atmosphere through an aperture 50.

The second space 35 in the auxiliary valve device 32 is connected through a conduit 51 to a selector valve 52 which contains a valve chamber 53 in which a flexible rubber valve member 54 is movable from the illustrated position in which it closes the inlet opening 55 of a conduit 56 to a position in which the valve closes an opening 57 of a conduit 58 which connects the valve chamber 53 with the intake conduit 4. The conduit 56 connects the valve chamber 53 with the conduit 8 from the low pressure compressor to the intercooler. The conduit 51 is connected to the valve chamber 53 through an opening

59 which is not affected by the movements of the valve member 54 and is therefore constantly in communication with the valve chamber 53.

The oil pipe 46 is connected to a control valve 60 which is illustrated diagrammatically and is capable of taking two positions *a* and *b*. The valve 60 is connected to the pipe 46 through a pipe 61 and to a source of pressure oil such as the lubricating oil pump of the compressor through a pipe 62, and, furthermore, through a pipe 63 to a not illustrated oil drain chamber. The valve 60 is manipulated by means of a push button 64 provided on a stem 65 carrying a piston 66 movable in a cylinder 67 which through 68 is connected to the oil pipe 46, and the valve member 60 is biased in opposite direction to the pushbutton 64 by a spring 69. 71 is a conduit from the receiver to a conventional pressure control valve 72, which at an air pressure for which the valve is set supplies compressed air from the receiver through a conduit 73 to a space 74 in the auxiliary valve device 32. When the receiver pressure falls below a certain value the valve 72 vents the conduit 73 to the atmosphere.

The above described compressor unloading and control apparatus operates in the following manner: When the compressor is at rest no oil pressure exists in the oil pipe 62 and control valve 60 is in the position *a*, in which the cylinder 67 and the oil inlet 45 are connected to the oil drain pipe 63 through the pipes 46, 68 and 61. The auxiliary valve device 32 is in the position illustrated in FIG. 1, since the tension of spring 40 is higher than the tension of spring 42. The throttle valve operating rod 24 is also in the position illustrated in FIG. 1 due to the action of the spring 33 on the piston 25 and, consequently, throttle valve 6 is in the throttle position in which the air admission from the air intake conduit 4 to the air intake conduit 5 is throttled or restricted as by the port 7. Furthermore, the valve member 22 is in open position so that delivery conduit 11 is connected to the atmosphere. The valve member 54 is in neutral position.

Now, if the compressor motor is started and the compressor starts to rotate the oil pump of the compressor connected to the pipe 62 supplies pressure oil to the pipe 62. As long as the valve 60 is in the illustrated position the oil in the pipe 62 is blocked and cannot enter pipes 61, 46, 68. Since the throttle valve 6 is in throttling position the compressor very soon produces vacuum in the inlet conduit 5 and said vacuum is distributed through the restricted pipe or bore 30 to the first chamber 28 in the cylinder 27 and further through the pipe 31, the first space 34 in the auxilitary valve 32, the intermediate space 36 and the pipe 70 to the second chamber 29 of the cylinder 27. The vacuum in the intake conduit 5 consequently acts on both sides of the membrane 26 in the cylinder 27, so that the spring 33 continues to keep the operating rod 24 in the illustrated position while the compressor is running unloaded. Vacuum is also created in the inter cooler 9 and consequently in the conduit 56 and the rubber valve 54 is therefore moved to the position illustrated in FIG. 1, in which it closes the opening 55 and permits atmospheric air to enter through the pipe 58 to the valve chamber 53 and the pipe 51 leading to the auxiliary valve device 32. The air circulated through the compressor is passed from the delivery conduit 11 through the blow off conduit 17 and the chamber 18 to a cooler and silencer 19 from which the air is returned through the conduit 21 to the air intake conduit 4 so that substantially no external air is drawn into the compressor.

Now, when it is desired to load the compressor, the operator pushes the button 64 and thereby moves the valve 60 against the spring 69 to the position *b*. Pressure oil is then admitted from the pipe 62 through pipe 61 to pipes 46 and 68 and the oil entering through the inlet 45 to the chamber 47 moves the membrane 48 and piston 44 to contact with lugs 87 thereby increasing the tension of the spring 42 so that the spring 42 can move the valve member 37 from the illustrated position to a position in which the first valve head 38 closes the communication between the first space 34 and the intermediate space 36. Simultaneously pressure oil through the pipe 68 enters the cylinder 67 and acts on the piston 66 so that the pushbutton and the valve 60 against action of the spring 69 is held in the position *b*, even when the operator has finished to press the button 64. The movement of the valve member 37 closes the communication between the second chamber 29 and the vacuum in the compressor intake conduit 5 and instead connects the second chamber 29 through intermediate space 36, second space 35 in the valve device 32, conduit 51 and chamber 53 in the selector valve 52, through conduit 58 to the air intake conduit 4 in which atmospheric pressure prevails. Since atmospheric pressure enters the second chamber 29 and intake vacuum is in the first chamber 28, the piston 25 and membrane 26 move the operating rod 24 against the action of spring 33, so that the blow-off valve 22 is closed and the throttle valve 6 is moved to open position. Due to the restricted area of pipe 30 it takes some time before vacuum in 28 is raised to the atmospheric pressure. Pressure starts to build up in the intercooler and the conduit 8 and when said pressure has increased above atmospheric pressure the valve 54 no longer remains in the illustrated position since pressure above atmospheric in 56 moves the valve 54 towards the opening 57 which is now closed so that intercooler pressure enters chamber 53 and pipe 51 and the second space 35 in auxiliary valve device 32. Since the auxiliary valve member 37 is in upper position the inter cooler pressure also enters intermediate space 36, pipe 70 and second chamber 29 in the cylinder 27 in which inter cooler pressure acts to keep the valve control rod in open throttle position and the valve 22 in closed position against the spring 33 and the rising pressure in 17 and in spite of the fact that vacuum in the intake conduit 5 is replaced by atmospheric pressure as soon as the throttle valve 6 opens fully. The compressor unit consequently continues to run loaded and the throttle valve 6 remains in open position and the valve 22 in closed position.

The air receiver 14 is connected through the conduit or pipe 71 to the conventional pressure control or pressure regulator valve 72 which, when the air pressure in the receiver 14 reaches a predetermined maximum value supplies regulating air through conduit 73 to chamber 74 in the auxiliary valve device 32. When pressure air is admitted to the chamber 74 said pressure air together with the spring 40 move the valve member 37 to the position illustrated in FIG. 1 in which the valve head 39 closes the communication between the second space 35 and the intermediate space 36. The movement of the valve member 37 opens communication between the pipe 31 through first space 34, intermediate space 36 and pipe 70 to the second chamber 29 in the cylinder 27. Intake air pressure consequently prevails both in chamber 29 and chamber 28 and the spring 33 together with the high air pressure in blow-off pipe 17 opens the valve 22 and closes the throttle valve 6 so that they take again the position illustrated in FIG. 1 thereby unloading the compressor. As soon as the throttle valve 6 is closed vacuum again builds up in the air intake conduit 5 which vacuum is distributed to first and second cylinder chambers 28 and 29 so that the spring 33 can keep the throttle valve in throttling position and the blow-off valve 22 open. Since vacuum is produced in the inter cooler also pressure is reduced in the conduit 56 and moves valve 54 over to the position illustrated in FIG. 1 so that the pressure in the second space 35 is reduced to atmospheric pressure via opening 59, valve chamber 53, conduit 58 and the air intake conduit 4. The compressor then continues to run unloaded and the valve 60 remains in the position *b* since oil pressure still keeps the valve 60 in the position *b* by actuating the piston 66.

Now, if the air pressure in the receiver 14 due to air

consumption of a consumer connected to the discharge conduit 75 should sink below the low value for which the regulating valve 72 is set, then the regulating air pressure in the pipe 73 is vented to atmosphere in the regulating valve 72 in conventional manner so that air pressure is removed from the chamber 74 and consequently the tension of the spring 42 moves the valve member 37 to the upper position in which the first valve head 38 closes the communication between the first space 34 and the intermediate space 36 and the second valve head 39 opens the communication between the intermediate space 36 and the second space 35. Atmospheric pressure through conduit 58, selector valve chamber 53, pipe 51, second space 35, intermediate space 36 and pipe 70 then reaches into the second cylinder chamber 29 and acts against the vacuum in the first cylinder chamber 28 and the spring 33 to move the operating member 23 and the operating rod 24 to the left in FIG. 1 thereby opening throttle valve 6 and closing blow-off valve 22. The compressor unit is now loaded again and the operation continues as above described.

When the compressor motor is stopped the compressor returns to unloaded condition and since oil pressure then disappears in the oil pipe 62 spring 69 moves the valve 60 to the position *a*, in which oil is drained from cylinder 67 and chamber 47 and the pushbutton 64 takes again the position illustrated in FIG. 1.

The above described regulating device is only an example and may also be used for single stage compressors in which case, however, the pipe 56 is connected to the delivery conduit 11 instead of to the conduit 8 to the inter cooler.

The above described device may also be modified as indicated in chain-dotted lines in FIG. 1 by replacing the conduit 58 by a conduit 88 or 88, 89 which connects opening 57 to the delivery conduit portion 11 or the receiver 14, respectively. This arrangement gives the same general operation but a smaller area on the cylinder 27 and membrane 26 which is of particular advantage in large compressors. As above described the membrane 26 is first operated by vacuum and then by delivery pressure or receiver pressure.

In the embodiment of FIG. 2 which illustrates a stationary compressor unit with electric control all parts equivalent to parts in FIG. 1 have been indicated by the same reference numerals as in FIG. 1 and are therefore not described again. The difference between the arrangements in FIG. 2 and FIG. 1 is that the control valve 60 in FIG. 1 has been replaced by an electromagnetic valve 76 which is interposed between the pressure oil pipe 62 and the oil drain pipe 63 and the oil pipe 46 leading to the auxiliary valve device 32. The solenoid controlled valve 76 can take two positions *a* and *b* and in the position *a* the oil pipe 46 is connected to the drain pipe 63. The compressor may be started by closing a switch 80 for the motor contactors 81 connected between the electric leads 82, 83. A time lag relay 84 having a switch 85 is connected in parallel with the motor contactor 81 and switch 85 is closed with suitable delay after the switch 80 has been closed. A pressure switch 77 is provided on the receiver and is closed as soon as receiver pressure is below a certain minimum value and is opened when receiver pressure rises above a certain maximum pressure. The pressure switch is connected in a circuit 78 including a solenoid 79 for the valve 76. When solenoid 79 is deenergized valve 76 is moved by a spring 86 to position *a* in which chamber 47 through 46 is drained and spring 40 moves valve member 37 to the position illustrated in FIG. 2 in which spring 33 keeps operating rod 24 to the right and throttle valve 6 closed and blow-off valve 22 open.

The operation of the compressor unit in FIG. 2 is as follows:

When the motor and compressor is at rest the valves 6, 15, 22, 37, 48 and 76 and the switches are in the illustrated positions and if no or low air pressure is in the receiver, the switch 77 is closed and solenoid 79 deenergized. The compressor is in unloaded condition. Now, if the motor is started by closing the switch 80 the motor contactors 81 are closed and the motor starts to rotate the compressor. Oil pressure from the oil pump immediately is supplied to pipe 62 which is closed. The compressor immediately produces vacuum in 5, 30, 31, 34, 36, 70, 28, 29 and 9 and selector valve 54 takes the illustrated position. After a predetermined time delay which allows the motor and compressor to reach full speed time lag relay 84 closes switch 85 so that solenoid 79 is energized and moves valve 76 to position *b* thereby supplying pressure oil to chamber 47 and moving 44 to contact lug 87, moving valve member 37 so that 38 interrupts communication between 31 and 70 and 39 admits atmospheric air to 29 so that throttle valve 6 is opened anl blow-off valve 22 is closed as described in connection with FIG. 1. The compressor is now loaded and operates as in FIG. 1.

When maximum pressure is reached in the receiver 14 pressure switch 77 is opened and solenoid 79 deenergized and valve 76 is moved to unloading position *a* by spring 86.

In the embodiment of FIG. 3 which is rather a modification of FIG. 2 the auxiliary valve device 32 has been replaced by a valve 176 operated by a solenoid 179 and a spring 186. The valve 176 is connected to the chamber 28 by a pipe 131 and to the selector valve 52 by a conduit 151. When the solenoid 179 is deenergized valve 176 takes the unloading position *a* in which chamber 29 through 70, 176, 131 communicates with chamber 28 and the intake conduit vacuum. When maximum pressure is reached in receiver 14 pressure switch 77 breaks its contacts and causes solenoid 179 to be deenergized. When pressure in the receiver has dropped to a predetermined value pressure switch 77 closes its contacts and solenoid 179 is energized whereby valve 176 is moved to position *b* and the compressor loaded in the same manner as described in connection with FIG. 2.

The embodiments of the invention above described and illustrated on the drawings are only to be considered as examples and may be modified in various ways within the scope of the claims.

What we claim is:

1. A compressor unit for supplying and maintaining a compressed working fluid under predetermined superatmospheric pressure and comprising a compressor, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed working fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means arranged for moving said throttle valve and said vent valve to said first positions for unloading the compressor, and working fluid pressure responsible means arranged for moving the throttle valve and the vent valve to said second positions for loading the compressor.

2. A compressor unit according to claim 1, in which the working fluid pressure responsible means consists of a control cylinder, a control piston movable in said cylinder, a member coupling said control piston to the throttle valve and to the vent valve, first and second working chambers in the cylinder separated by the piston, working fluid conduit means arranged for interconnecting said chambers for unloading of the compressor and for separating the chambers and subjecting them to a difference in working fluid pressure for loading of the compressor.

3. A compressor unit according to claim 2, in which first and second working fluid conduit means are provided for connecting said first and second chambers to

vacuum in the intake conduit between the throttle valve and the compressor during unloading of the compressor and in which said first working fluid conduit means is arranged for connecting said first chamber to atmosphere upon loading of the compressor, and in which a third conduit means is arranged for supplying compressed working fluid to said second chamber for maintaining the compressor in loaded condition after loading of the compressor.

4. A compressor unit according to claim 3, in which the compressor has at least two compression stages, an intercooler between said two stages, and in which said third conduit means connects the second chamber to the atmosphere or the intercooler selectively depending upon which pressure is highest.

5. A compressor unit for supplying and maintaining a compressed working fluid under predetermined superatmospheric pressure and comprising a compressor, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed working fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means augmented by vent passage pressure arranged for moving said throttle valve and said vent valve from said second positions towards said first positions for unloading the compressor, means responsive to working fluid intake conduit pressure before the throttle valve and vacuum after the throttle valve arranged for moving the throttle valve and vent valve towards said second positions for loading the compressor, and selector valve means arranged to supply compressed working fluid to said intake working fluid pressure responsive means upon loading of the compressor for maintaining said pressure responsive means in said second position for maintaining the compressor in loaded condition.

6. A compressor unit (for supplying and maintaining a compressed working fluid under predetermined superatmospheric pressure and comprising a compressor, a working fluid intake conduit in flow communication with said compressor, a compressor unit) for supplying and maintaining a compressed working fluid under predetermined superatmospheric pressure and comprising a compressor, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed working fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means augmented by vent passage pressure arranged for moving said throttle valve and said vent valve from said second positions towards said first positions for unloading the compressor, means responsive to working fluid delivery pressure and vacuum after the throttle valve arranged for moving the throttle valve and vent valve towards said second positions for loading the compressor, and selector valve means arranged to supply compressed working fluid to said intake working fluid pressure responsive means upon loading of the compressor for maintaining said pressure responsive means in said second position for maintaining the compressor in loaded condition.

7. A compressor unit for supplying and maintaining a compressed fluid under predetermined superatmospheric pressure and comprising a compressor having at least two compression stages, an inter cooler between said compression stages, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means operable to actuate said throttle valve and said vent valve into said first positions, piston means operable to move the throttle valve and the vent into said second positions, a cylinder in which said piston means is disposed, first and second chambers in said cylinder separated by the piston, an auxiliary valve, first and second and intermediate spaces in said auxiliary valve, a double headed auxiliary valve member movable from a position in which said intermediate space communicates with said first space to a position in which the intermediate space communicates with said second space and vice versa, a first communication from said working fluid intake conduit between the throttle valve and the compressor to said first chamber, a second communication between the first chamber and the first space, a third communication between said intermediate space and said second chamber, a pressure control valve in communication with said receiver, a conduit from said pressure control valve to said auxiliary valve for working pressure fluid biasing the auxiliary valve member to a position interconnecting the first and intermediate spaces upon attainment of a certain high working fluid pressure in the pressure control valve to unload the compressor, and a pressure fluid operable means for pressure fluid biasing the auxiliary valve member to a position interconnecting the second and intermediate spaces upon attainment of a certain low working fluid pressure in the pressure control valve to load the compressor.

8. A compressor unit according to claim 7, in which the pressure fluid operable means includes a manually operable piston valve device having a valve cylinder, a piston valve movable in said cylinder, a first drain pipe connection, a second pressure fluid pipe connection, a third operating fluid pipe connection leading to the auxiliary valve, a fourth valve holding pipe connection branched from said third pipe connection for maintaining said piston valve in a position communicating said second and third pipe connections.

9. A compressor unit for supplying and maintaining a compressed fluid under predetermined superatmospheric pressure and comprising a compressor having at least two compression stages, an intercooler between said compression stages, a working fluid intake conduit in flow communication with said compressor, a throttle valve in said intake conduit movable from a first throttle position to a second fully open position and vice versa, a compressed fluid receiver, a compressed working fluid delivery conduit leading from the compressor to said receiver, a check valve in said delivery conduit, a vent passage communicating with the delivery conduit between the compressor and said check valve, a vent valve in said vent passage movable from a first open position to a second closed position and vice versa, spring means operable to actuate said throttle valve and said vent valve into said first positions, piston means operable to move the throttle valve and the vent valve into said second positions, a cylinder in which said piston means is disposed, first and second chambers in said cylinder separated by the piston, an auxiliary valve, a first communication from said working fluid intake conduit between the throttle valve and the compressor to said first chamber, a second comunication between the first chamber and said auxiliary valve, a third communication between said second chamber and said auxiliary valve, a selector valve device, a selector conduit for connecting said auxiliary valve

with said selector valve device and selectively with the atmosphere or the intercooler depending on which has the highest pressure, a working fluid pressure actuated switch operably connected to said compressed fluid receiver, a solenoid operated device for selectively connecting the third communication through said auxiliary valve with the second communication when said switch is closed and the solenoid energized for unloading or with said selector conduit when said switch is open and the solenoid consequently deenergized for loading the compressor.

10. A compressor unit according to claim **9**, in which said auxiliary valve has first and second and intermediate spaces, a double headed auxiliary valve member movable from a position in which said intermediate space communicates with said first space to a position in which the intermediate space communicates with said second space and vice versa, said selector conduit communicating with said second space, a pressure fluid operable means for pressure fluid biasing the auxiliary valve member to a position interconnecting the second space and the intermediate space upon attainment of a certain low working fluid pressure in the receiver causing the pressure switch to close the current through the solenoid and cause the pressure fluid bias of the auxiliary valve member to move said member to compressor loading position.

11. A compressor unit according to claim **9**, in which said auxiliary valve is a solenoid operated valve capable of taking a first position in which the solenoid is energized and the valve connects said second and third communications for unloading the compressor and a second position when the pressure switch is opened by maximum pressure in the receiver and the solenoid is deenergized and the valve connects the third communication to the selector conduit for loading the compressor.

12. A compressor unit according to claim **1**, in which a cooler is provided in said vent passage, and a communication is arranged from said cooler to the intake conduit.

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