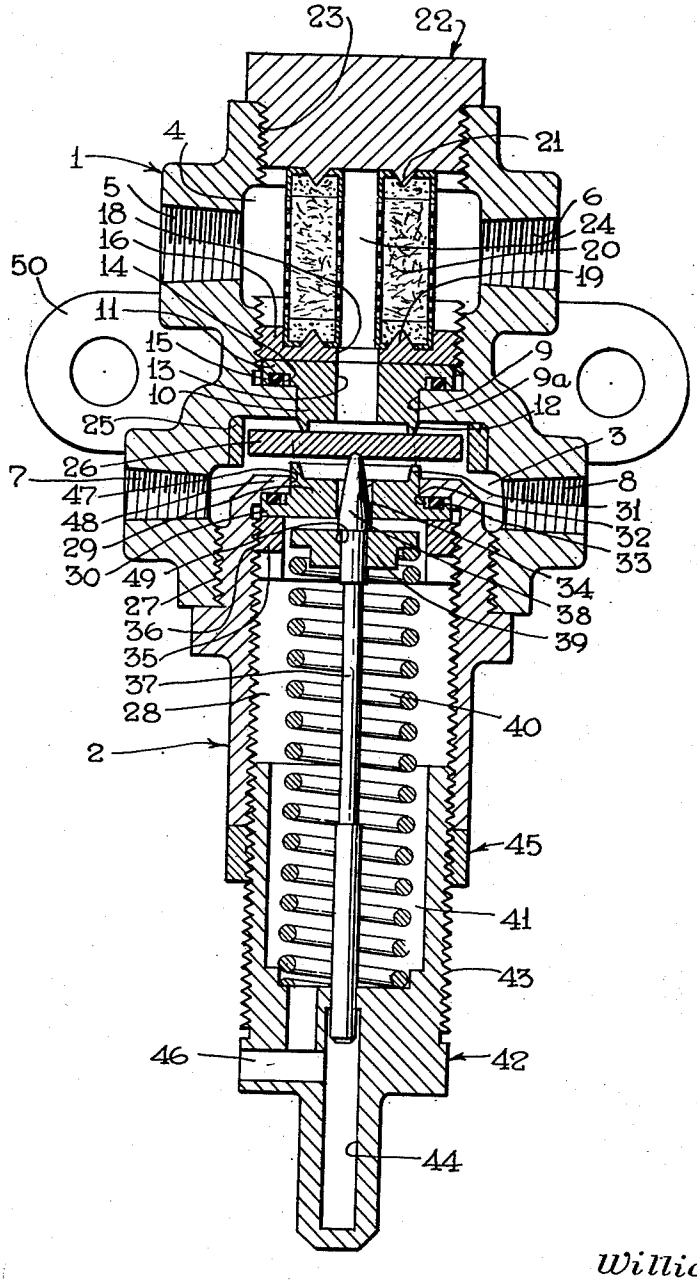
Dec. 24, 1957 W. H. GLASS ET AL 2,817,356

COMPRESSOR GOVERNOR

Filed May 29, 1953



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United States Patent Office 2,817,356
Patented Dec. 24, 1957

2,817,356

COMPRESSOR GOVERNOR

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Application May 29, 1953, Serial No. 358,358

1 Claim. (Cl. 137—469)

This invention relates to governors and, more particularly, to the fluid pressure controlled type for regulating the amount of fluid under pressure delivered by air and gas compressors or the like.

The principal object of the invention is to provide an improved governor that is relatively simple in construction, efficient in operation and low in cost of manufacture.

Other objects and advantages of the invention will appear in the following, more detailed description thereof.

In the accompanying drawing, the single figure is an elevational view, partly in section and partly in outline, of a compressor governor embodying the invention.

Description

As shown in the drawing, the improved governor comprises two body sections 1, 2; section 1 of which is provided with fluid pressure inlet chamber 4 and a fluid pressure outlet chamber 3 separated by a partition wall 9*a*. Body section 1 has two oppositely arranged pipe connections, or ports 5, 6 leading from chamber 4 to the exterior of said body section. Either one of the connections 5, 6 may be connected to a reservoir, or receiver (not shown), in which fluid is compressed by a compressor (not shown), while the other connection may be plugged. Body section 1 is also provided with two oppositely arranged pipe connections or ports 7, 8 leading from the chamber 3 to the exterior of said body section. One of the connections 7, 8 is adapted to be connected to a compressor unloader device (not shown) associated with the compressor while the other is adapted to be plugged.

The unloader device is adapted to be controlled by the improved governor, in well-known manner, to cause the air compressor to maintain a pressure in a receiver between a predetermined minimum pressure and a predetermined maximum pressure. When the pressure of fluid in the receiver has been reduced to the predetermined minimum, the governor will respond to such pressure to cause the unloader device to cut the compressor into productive operation until the pressure in the receiver has been increased to the predetermined maximum, to which the governor will respond to cause the unloader device to cut the compressor out of productive operation and permit the compressor to operate freely without compressing further fluid into the receiver.

The wall 9*a* is provided with a bore 9 connecting chambers 3 and 4 and slidably mounted in said bore is a cylindrical valve seat member 10 having at one end a shoulder 11 abutting said wall at the side adjacent chamber 4 and having at the opposite end an annular seat rib 12 projecting into chamber 3. The valve seat member 10 is provided with an axial bore 13 to establish communication between chambers 3 and 4. A sealing gasket 15 is disposed in an annular recess in shoulder 11 of valve seat member 10 in sealing contact with said seat member and wall 9*a* to effect an airtight seal therebetween. The valve seat member 10 is retained in a fixed position in

wall 9, in which it is shown in the drawing, by a nut 16, which may be slotted across its outer face to receive a screw driver for screwing it into the casing section 1 into abutting engagement with said valve seat member, said nut having a central, through bore 18 in direct communication with bore 13. The nut 16 is provided at the side adjacent chamber 4 with a coaxially arranged annular seat rib 19 with which one end of a cylindrical air strainer 20, disposed in chamber 4, makes sealing engagement, the other end of said strainer making sealing engagement with an annular seat rib 21 formed integral with a closure cap 22 secured by screw threads 23 in the end of body section 1 opposite valve seat member 10. Formed in the strainer 20 is a passageway 24 in direct communication and axial alignment with bores 18 and 13.

An annular valve guide or bushing 25 is pressed into a bore in the casing into contact with the wall 9*a*, the interior of said bushing being open to chamber 3 and said bushing encircling and being disposed in coaxial relation to the seat rib 12. A disc valve 26 adapted for making sealing engagement with seat rib 12 in a normal position of said valve, in which position said valve is shown in the drawing, is operatively disposed in bushing 25, said valve being of smaller diameter than the internal diameter of the valve guide 25 to provide a clearance space between said valve and said guide of chosen flow capacity through which fluid under pressure may flow at a relatively restricted rate when said valve is unseated from seat rib 12.

The body section 2 is connected, by screw threads 27 to the end of body section 1 opposite closure cap 22 and is provided with an atmospheric chamber 28 extending from its outer end to an end wall 48 at its inner end. The end wall 48 is disposed in and forms one side of chamber 3 and has a bore 47 of smaller diameter than chamber 28 and in coaxial relation with said chamber and valve guide 25 and also opening said chamber to chamber 3.

A valve seat member 29 is inserted in opening 47 in end wall 48 and is provided at one end with a shoulder 30 in abutting engagement with said end wall at the side adjacent chamber 28, while on the other end of said valve seat member there is provided an annular seat rib 31 disposed in chamber 3 of body section 1 in coaxial relation with seat rib 12 but arranged oppositely thereto. The seat rib 31 is adapted for making sealing engagement with valve 26 on the side opposite from valve seat member 10 in a certain position of said valve which will be hereinafter described, said seat rib 31 being of slightly greater diameter than the seat rib 12 of valve seat member 10; it being noted that the valve 26 is disposed between the two seat ribs 12 and 31 and that said seat ribs are spaced apart a distance somewhat greater than the thickness of said valve. An annular recess 32 opening to the end of the shoulder 30 abutting the end-wall 48 has disposed therein a sealing gasket 33 having sealing engagement with said shoulder and said end wall. The valve seat member 29 is further provided with a bore 34 arranged in coaxial relation to seat rib 31 and connecting chamber 28 to the portion of chamber 3 encircled by said rib and is retained in the position in which it is shown in the drawing by a retaining nut 35 which may be slotted to receive a screw driver for screwing said nut along screw threads 36 in the wall of chamber 28 into abutting engagement with said valve seat member.

A plunger 37 disposed in chamber 28 in coaxial relation to bore 34, has at one end a tapered head 38 which projects through the bore 34 with the smaller end of said tapered head bearing against and engaging the disc valve 26 in a center depression for preventing lateral movement of said disc valve. The maximum diameter of the tapered

head 38 is slightly smaller than the diameter of bore 34 to permit free sliding action of said head in said bore and to also permit passage of fluid under pressure from chamber 3 past said plunger head into chamber 28. The main body of the plunger 37 is smaller in diameter than the maximum diameter of the plunger head 38 so as to form a shoulder 49 adjacent said head against which an annular spring seat 39, encircling said plunger, rests. A spring 40 encircling the plunger 37, and biasing valve 26 toward its normal position, bears at one end against the spring seat 39, while the other end extends into and bears against the base of a recess 41 formed in an adjusting nut 42, said recess opening into chamber 28 of body section 2. The adjusting nut 42 is adjustably connected to body section 2 by screw threads 43 engaging those in the wall of chamber 28 for regulating the pressure of spring 40 against the seat 39 and plunger 37. The portion of plunger 37 opposite head 38 is slidably mounted, for purpose of guiding, in a bore 44 in nut 42, said bore and chambers 41 and 28 being open to atmosphere via vent 46 in said nut. A locking nut 45 is screwed on threads 43 to engage the end of casing section 2 for locking the adjusting nut 42 to said casing in an adjusted position.

A mounting bracket 50 may be formed integrally with the body section 1 for mounting the governor at any convenient location.

Operation

Let it be assumed that the several parts of the compressor governor embodying the invention are in the respective positions in which they are shown in the drawing; that port 5 is connected to a reservoir (not shown) for receiving fluid under pressure from a compressor (not shown) while port 6 is closed off by a plug (not shown); that one of the ports 7 and 8 is plugged while the other is connected to an unloader device (not shown) associated with said compressor; and that said compressor is operating to compress fluid into said reservoir. Let it also be assumed that the compression of spring 40 has been adjusted by the adjusting nut 42, in the manner described above, so as to act through the plunger 37 and the tapered head 38 to exert a force on valve 26 which will hold it in its normal position in contact with seat rib 12 against all pressures of fluid less than a chosen predetermined maximum acting on the area of the opposite side of valve 26 enclosed by said seat rib.

As fluid under pressure is compressed into the reservoir such fluid will flow through port 5 into chamber 4 and pass through the strainer 20, passageway 24 and bores 18 and 13 to the area of valve 26 enclosed by the seat rib 12 wherein it will exert a force on said valve opposing that of the regulating spring 40. When the pressure of fluid in the reservoir has reached the predetermined maximum above mentioned, such pressure acting on the area of valve 26 enclosed by seat rib 12 will overcome the opposing force of spring 40 and actuate valve 26 out of its normal position and thus out of seating contact with seat rib 12. Unseating of valve 26 from seat rib 12 will expose the entire adjacent area of said valve to the fluid at reservoir pressure from within the seat rib 12, and due to the restricting effect of the clearance space between said valve and guide 25, the force on the upper side of said valve resulting from such fluid will be so increased over that of spring 40 as to cause said valve to move promptly to an unloading position seated against seat rib 31. With valve 26 in its unloading position, chamber 3, which was previously open to atmosphere by way of bore 34, chamber 28, recess 41 and passageway 46, will be closed to atmosphere, and supplied with fluid under pressure from the seat rib 12 side of said valve through the clearance between said valve and the valve guide 25, and the entire surface of said valve, except that portion enclosed by seat rib 31 will be exposed to fluid pressure at said predetermined maximum. Since the seat 31 encloses a greater area of valve 26 than was enclosed by seat rib 12, a greater fluid force is exerted on said valve upon movement into contact with seat rib 31 to oppose action of spring 40 than was exerted with said valve in contact with seat rib 12 whereby the valve 26 will positively remain in its unloading position until pressure of fluid in the reservoir and chamber 3 is subsequently reduced to a predetermined degree lower than the maximum above mentioned, as will be hereinafter described.

With valve 26 in its unloading position fluid at reservoir pressure will flow from chamber 3 through port 7 to the compressor unloader device and actuate same to terminate operation of the compressor to compress air into the reservoir, in the well-known manner.

As noted above, the diameter of seat rib 31 is slightly greater than the diameter of seat rib 12, and the entire surface of valve 26, except that portion enclosed by seat rib 31, is exposed to fluid at reservoir pressure when said valve is in its unloading position. Consequently, the area of valve 26 affected by fluid at reservoir pressure, when said valve is in its unloading position, will be equivalent to that area enclosed by seat rib 31 which is greater than the area enclosed by seat rib 12 and affected by fluid at reservoir pressure when said valve is in its normal position. Hence, the pressure of fluid in the reservoir and acting on the surface of valve 26 outside of the area enclosed by seat rib 31, when said valve is in its unloading position, must be reduced to a certain predetermined minimum, depending in part upon the area enclosed by seat rib 31, before the force of spring 40 will become effective to return said valve to its normal position against the opposing pressure of fluid.

Let it now be assumed that the pressure of fluid in the reservoir has been reduced to the predetermined minimum. Such a reduction will result in a similar reduction in chamber 3 and, consequently, will render the force of spring 40 acting on valve 26 effective to unseat said valve from seat rib 31. The clearance between the wall of bore 34 and the head 38 disposed in said bore is such that when valve 26 unseats from rib 31, the pressure of fluid in chamber 3 and the unloader pipe connected to port 7 will promptly, momentarily and substantially equalize over the opposite sides of said valve, and permit spring 40 to snap said valve to its normal position in seating engagement with seat rib 12 which cuts off further supply of fluid under pressure from the reservoir to chamber 3. With chamber 3 cut off from the reservoir, pressure of fluid in said chamber and the unloader device will be dissipated to atmosphere past the head 38 in bore 34, thereby permitting said unloader device to operate to cause the compressor to again compress fluid into the reservoir. At the instant the valve 26 is moved out of contact with rib 31 and into contact with rib 12 and pressure in chamber 3 becomes reduced to that of atmosphere, it will be noted that the force resulting from pressure of fluid acting on the valve 26 within rib 12 and opposing that of spring 40 is less than that which opposes said spring when the valve was in contact with seat 31, whereby the valve 26 will positively remain in contact with seat rib 12 until the pressure of fluid in the reservoir is again built up by operation of the compressor to the predetermined maximum at which the governor will again operate to terminate compressing operation of the compressor, as hereinbefore described.

In the manner just described, the compressor governor will automatically operate to control the operation of the compressor for maintaining the pressure of fluid in the reservoir between predetermined minimum and maximum operating pressures.

Summary

It should now be apparent that the invention disclosed herein provides a novel, relatively simple and inexpensive governor for, through the medium of an unloader device, automatically controlling the operation of a compressor and thereby pressure of fluid in a reservoir and for retaining said pressure between predetermined maximum and minimum operating pressures.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

A governor device comprising a first casing section having a fluid pressure inlet chamber and comprising a partition wall at one end of said chamber, a removable closure element closing an opening in said casing section and axially aligned with a bore through said partition wall, a first valve seat element insertable through said opening into said chamber and comprising a portion disposed in said bore and further comprising an annular shoulder in sealing engagement with the side of said wall adjacent said chamber, a nut insertable through said opening into said chamber and cooperative with screw-threads in said casing section and engaging said shoulder urging said seat element against said partition wall; a second casing section removably secured to said first casing section with one end cooperative with the opposite side of said partition wall to form a fluid pressure outlet chamber adaptable for connection to a fluid pressure operable device, said second casing section having at said one end an annular, internal shoulder encircling a second opening open to said fluid pressure outlet chamber and having a screw-threaded bore extending from said casing shoulder to an opposite end of said second casing section and constantly open to atmosphere, said second opening and screw-threaded bore being arranged in coaxial relation to said bore in said partition wall, a second valve seat element comprising a portion disposed in said second opening and an annular shoulder engaging said casing shoulder, a nut disposed in and cooperative with the screw-threads in said screw-threaded bore engaging said shoulder of said second valve seat element urging same against the shoulder of said second casing section, said first valve seat element comprising an annular seat rib disposed in said fluid pressure outlet chamber and encircling a bore through the respective seat element connecting said fluid pressure outlet chamber to said fluid pressure inlet chamber, said second valve seat element comprising in said fluid pressure outlet chamber an annular seat rib of greater diameter than, spaced axially from and disposed oppositely to said first seat rib in coaxial relation therewith and having an axial bore opening said fluid pressure outlet chamber to said screw-threaded bore, said first casing section having in said fluid pressure outlet chamber a bore of greater diameter than and encircling said seat ribs, a relatively thin disc valve of less thickness than the axial distance between said seat ribs disposed therebetween in the last named bore, a plunger engaging said disc valve extending through said bore in said second valve seat element into said screw-threaded bore in said second casing section, a spring in said screw-threaded bore urging said plunger against said valve, and a nut acting on said spring and cooperative with the screw-threads in said screw-threaded bore for varying the pressure of said spring on said plunger, said disc valve cooperating with the wall of the bore encircling said seat ribs to provide therebetween a first communication between said inlet chamber and said outlet chamber, upon unseating of said disc valve from said seat rib of said first valve seat element, of less flow capacity than that of said bore through said first valve seat element, and said plunger cooperating with the wall of the bore through said second seat element to provide a second communication of less flow capacity than that of said first communication, whereby upon initial unseating of said disc valve from the seat rib on said first valve seat in response to fluid pressure in said inlet chamber in excess of a certain high degree for overcoming the opposing force of said spring, a pressure will be obtained over the full adjacent side of said disc valve greater than that acting on the opposite side while upon initial unseating of said valve from said seat rib on said second valve seat element upon reduction of fluid pressure in said inlet chamber to a certain low degree, the same pressure of fluid will become active over the full opposite sides of said valve.

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