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GOVERNOR FOR BRAKE AIR COMPRESSOR

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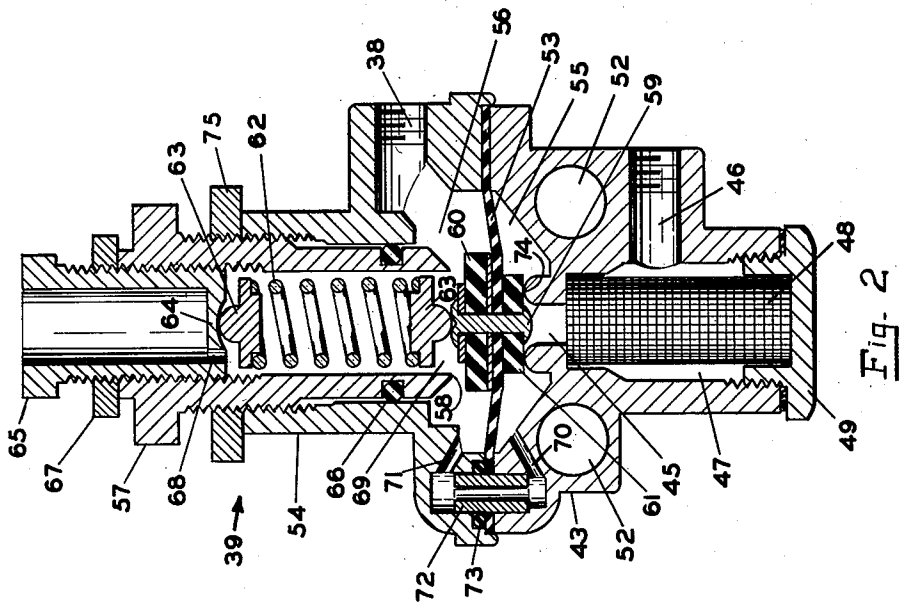

Fig. 2

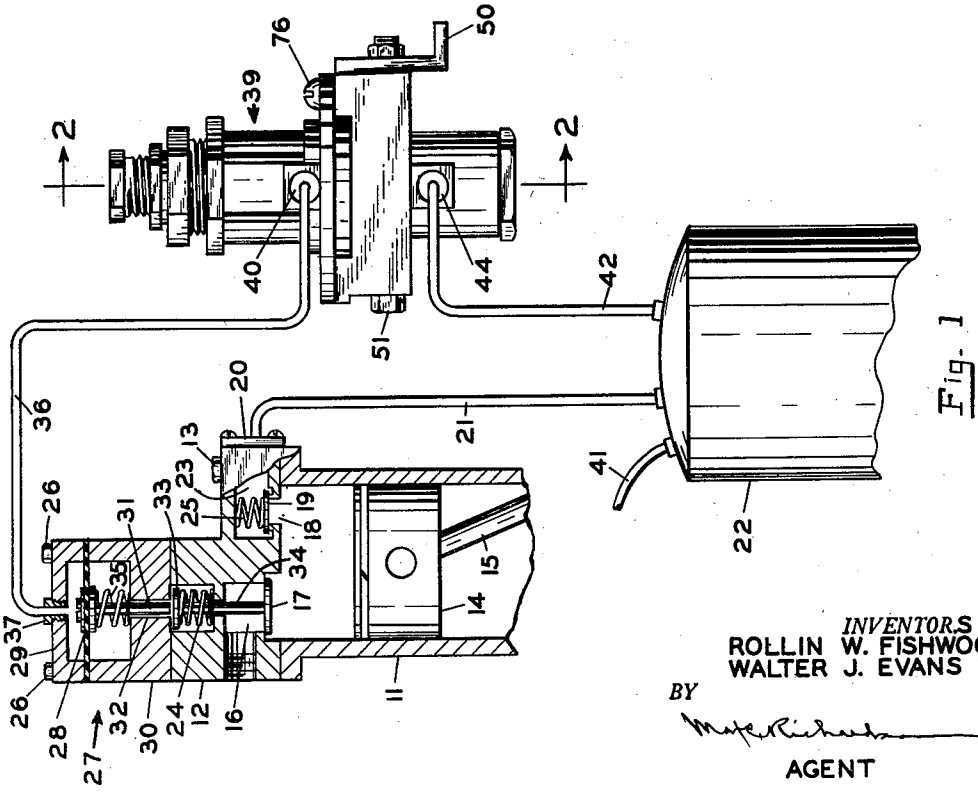

Fig. 1

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GOVERNOR FOR BRAKE AIR COMPRESSOR

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3 Claims. (Cl. 137—102)

This invention relates generally to air brake equipment adapted for use with automotive transportation equipment. More particularly this invention provides an improved governor adapted to control the operation of an unloader for an air compressor used to supply activating air for such brake equipment.

Air compressors for this use are usually connected to run continuously while the motive power engine of the equipment is running. The air from the compressor is discharged to an air accumulator or storage tank the air pressure within which is normally held within preset limits by the compressor governor and unloader.

A simple means, and one for which the present invention is adapted, to govern the air supplied by a continuously running compressor to a storage tank, is to hold the inlet valve or valves of the compressor open when no air is required from the compressor and to allow the valves to operate normally when air is required.

It is therefore a principal object of this invention to provide such a governor with an improved means adapted to be pressure controlled and at and above a higher preset air pressure at the outlet of an air compressor to operate the unloader to open and hold open respectively an inlet valve of the compressor and thereafter at a lower preset air pressure at the outlet of the air compressor to operate the unloader to restore the inlet valve to its proper function.

It is a second object to provide such a governor which is simple in construction, low in first cost, easy to adjust and easy to service.

It is a third object to provide such a governor in which the air pressure responsive means has a normal position of rest from which it is adapted to be moved at a higher preset air pressure to energize the unloader and a limit position of movement adjustable to vary the air pressure difference between the higher preset air pressure and a lower preset air pressure at which the air responsive means is adapted to de-energise the unloader and to return to its normal position.

It is a fourth object to provide such a governor with means adapting the air responsive means to be biased towards its normal position of rest by a resilient means adjustable to determine the pre-set high air pressure.

It is a fifth object to provide such a governor with means adapting the air responsive means at any pressure of the air at the outlet of the compressor to be urged away from its normal position with a smaller force while at its normal position and with a larger force after movement away from its normal position has started.

It is a sixth object to provide such a governor in which all adjustments of the preset air pressures can be made from outside the body of governor without removing any parts, connections or covers.

How these and other objects are attained is explained in the following description referring to the attached drawing of a preferred form of the governor of this invention.

Like reference numerals refer to like parts in the two figures of the drawing.

Referring now to the drawing, Fig. 1 is a side elevation and partial sectional view of the governor of this invention schematically arranged for use with an air compressor having an unloader and an air storage tank, while Fig. 2 is a vertical sectional view taken along the line 2—2 of Fig. 1.

In Fig. 1 is shown schematically and fragmentally an air compressor cylinder **11** with a cylinder head **12** secured thereto by capscrews **13**. Piston **14** is understood to be continuously reciprocated in cylinder **11** by piston rod **15** connected through a crank and crank shaft to the engine of an automotive vehicle on which the compressor is mounted for the purpose of taking in air from the atmosphere through inlet port **16**, past inlet valve **17** to the interior of cylinder **11** and forcing the air at high pressure from cylinder **11** out through outlet port **18** past valve **19**, through valve chamber **23**, cover **20**, and tubing **21**, to receiver or storage tank **22**. Valves **17** and **19** are biased towards their respective seats at ports **16** and **18** by springs **24** and **25**.

Mounted on cylinder head **12** and secured thereto by bolts **26** is unloader **27** shown as including a flexible diaphragm **28** clamped at its outer edge between upper body part **29** and lower body part **30**. Rod **31** secured to diaphragm **28** and guided in bearing **32** in body part **30** is adapted when the center of diaphragm **28** is depressed to contact disk **33** secured to compressor inlet valve stem **34** and hold inlet valve **17** in open position away from its seat at inlet port **16**. Spring **35** biases diaphragm **28** upwards towards a normal position at which rod **31** is retracted not to interfere with the normal operation of valve **17**.

Tube **36** secured into upper body part **29** by hollow plug **37** connects the hollow interior of body part **29** with outlet port **38** of governor **39** into which it is sealed by hollow plug **40**.

Tube **41** sealed into tank **22** is for the purpose of supplying air under pressure as required to the air brake system of the vehicle on which it is mounted.

Tube **42** sealed at one end into tank **22** and at its other end into governor lower body part **43** by plug **44** connects the interior of tank **22** with inlet valve port **45** of governor **39** through air entrance channel **46**, screen chamber **47** and screen **48** secured into screen chamber **47** by plug cap **49**.

Governor **39** is secured by bolts **51** through holes **52** in lower body **43** to bracket **50** conveniently secured on the vehicle chassis.

Flexible diaphragm **53** secured by cap screw **76** between mating surfaces of upper body part **54** and lower body part **43** divides the interior cavity of the governor into a first compartment **55** and a second compartment **56**.

Hollow cylindrical range adjusting screw **57** threadedly engaged in upper body **54** and secured by lock-nut **75** terminates at its lower end in exhaust valve seat **58** surrounding exhaust port **69**.

Secured to diaphragm **53** by central rivet **59** is exhaust valve disk **60** in compartment **56** and inlet valve disk **61** in compartment **55**. Pressure control spring **62** with terminal retainers **63** is movably retained within adjusting screw **57** between diaphragm rivet **59** and abutment **64** formed at the lower end of pressure adjusting screw **62** threadedly engaged within the hollow interior of adjusting screw **57**.

O-ring **66** seals the outer surface of adjusting screw **57** slidably in upper body **54**. Lock-nut **67** secures adjusting screw **65** longitudinally in adjusting screw **57**.

Exhaust port **69** connects the interior of compartment **56** with the atmosphere through the interior of adjusting

screw 57, orifice 68 in end 64 of adjusting screw 65, and the interior of adjusting screw 65.

First compartment 55 is connected with second compartment 56 by passage 70 in lower body 43, passage 71 in upper body 54 and the carefully-sized bore of tube 72 pressed into lower body 43 as shown and sealed into upper body 54 by O-ring 73.

It should be noted that adjusting spring 62 normally biases diaphragm 53 downward and with valve disk 61 seated on its seat 74 about inlet port 45 the vertical adjustment of screw 65 relative to seat 74 determines the pressure at which air from tank 22 can unseat valve 61 from its seat 74.

Again it should be noted that the threads on the inner and outer surfaces of adjusting screw 57 are of equal pitch and of the same right-hand form so that by holding screw 65 stationary and turning screw 57 the vertical position of screw 65 will not be changed but the position of exhaust valve seat 58 with respect to screw 65 can be varied to vary the biasing force of spring 62 on diaphragm 53 when exhaust valve 60 is seated on its seat 58.

The operation of the governor is as follows. When the compressor is running to build up air pressure in tank 22 the compressor valves are in normal operation, the bias of spring 62 holds inlet valve 61 of governor 39 seated on inlet valve seat 74, exhaust valve 60 is away from its seat 58, compartment 56 is open to atmosphere, the interior of upper body part 29 of unloader 27 is at atmospheric pressure and spring 35 biases unloader diaphragm upward with rod 31 out of interference with compressor inlet valve stem 34.

When the pressure in tank 22 builds up to a value preset by the adjustment of pressure screw 65, the tank air pressure acting on the small exposed area of governor inlet valve 61 lifts valve 61 off its seat 74 and the inrush of air under pressure into compartment 55 bounded by diaphragm 53 quickly overcomes the bias of spring 62 and completes the throw of diaphragm 53 to further lift valve 61 from its seat 74 and close exhaust valve 60 onto its seat 58. The restriction of passages 70, 71, and 72 is sufficient to complete the described valve operation before the air pressure in compartment 56 is equalized through passages 70, 71, and 72 with the pressure in compartment 55 after which the full tank pressure is exerted on the top of unloader diaphragm 28 to push rod 31 downward and hold inlet valve 16 of the compressor open so that compressor outlet valve 19 remains on its seat and the compressor is inoperative although still in motion.

When this operation of the governor has been completed the pressure in both compartments 55 and 56 will be equalized with the tank pressure and the exhaust valve will be held closed against the bias of spring 62 by the tank pressure operating on the diaphragm 53 and exhaust valve 60 over the area of the exhaust port 69 which is greater than the area of the inlet port 45.

It should particularly be noted that the biasing force exerted by spring 62 towards movement of exhaust valve 60 away from its seat 58 is adjustable by upward or downward adjustment of range adjusting screw 57 while the position of pressure adjusting screw 65 is unchanged for it is seen that the compression of spring 62 when valve 60 is seated on seat 58 of port 69 will be decreased as the vertical distance between abutment 64 of pressure screw 65 and seat 58 is increased. As the pressure of spring 62 on the diaphragm rivet 59 is decreased the lower the tank pressure must fall before spring 62 can unseat exhaust valve 60.

Therefore, when it is required to de-activate the unloader and put the compressor again into effective operation because air for brake operation has been discharged through tube 41 and the pressure in tank 22 has lowered to the value pre-set by the position of range adjusting screw 57, spring 62 quickly will move diaphragm 53 to move exhaust valve 60 from its seat 58 and move inlet

valve 61 onto its seat 74. With this diaphragm action the cycle of governor operation is completed. Compressed air from tank 22 is blocked at the governor inlet port 45, the interior of the governor has been opened to atmosphere, the unloader is de-activated and the compressor is restored to its useful operation of supplying air under pressure to tank 22.

It is a particular feature of this invention that the sudden or snap action of diaphragm 53 in either of its direction of operation to open one valve and close the other is made possible by the method shown of taking advantage of the relative port and diaphragm areas disclosed and taking advantage of the instantaneous air pressure drops through lines and restricted passages as indicated.

Having thus recited some of the objects of our invention, illustrated and defined a preferred form in which the invention may be practiced and described the operation thereof, we claim:

1. An air pressure controller adapted to activate at a pre-set lower pressure an air pressure increasing means and at a pre-set higher pressure to de-activate said air pressure increasing means, said controller comprising means forming a first compartment having an inlet port communicating with the air whose pressure is to be controlled, means forming a second compartment having an exhaust duct, movable wall means separating said first and second compartments, restricted flow air conduit means connecting said first and second compartments, said wall including means adapted at a first position to close said inlet port, a hollow range adjusting screw axially adjustably positioned in said exhaust duct, one end of said range adjusting screw being adapted to form an exhaust port, a hollow pressure adjusting screw axially adjustably positioned in said hollow range adjusting screw, said second compartment being adapted to communicate with the atmosphere through said exhaust port and said adjusting screws, said pressure screw having an abutment formed therein, a pressure spring within said pressure screw axially thereof and strained between said abutment and said wall to bias said wall towards said first position, said wall including means adapted at a second position to close said exhaust port, all of said means adapting said wall at an inlet air pressure determined by the position of said pressure adjusting screw to move with a snap action from said first position to said second position and at a reduced inlet air pressure determined by the position of said range adjusting screw to move with a snap action from said second position to said first position.

2. A pneumatically controlled and operated governor valve for an air compressor adapted to supply air to a storage tank and equipped with pneumatically operated unloading means for holding open an inlet valve of said air compressor, said governor valve comprising a hollow body divided interiorly into an inlet chamber and an outlet chamber by a flexible diaphragm carrying an inlet valve axially aligned thereon in said inlet chamber and an exhaust valve axially aligned thereon in said outlet chamber, orifice means adapting said inlet chamber to be connected to said storage tank, means adapting said outlet chamber to be connected to said unloading means, said hollow body being formed with a hollow cylindrical open ended extension of said outlet chamber formed axially of said diaphragm, a hollow cylindrical axially positionable sleeve movably sealed in said extension, the inner end of said sleeve forming an exhaust valve seat for said exhaust valve, a restricted opening connecting the interior of said sleeve with the atmosphere, an adjustment plug axially positionable in said sleeve, cooperating means formed on said extension said sleeve and said plug for relatively axially positioning said extension said sleeve and said plug as desired from outside said body, a partition formed in said inlet chamber between said diaphragm and said orifice, an inlet valve seat formed on said parti-

tion axially of said inlet valve, an inlet port formed through said partition within said inlet valve seat, a restricted flow conduit connecting said inlet chamber and said outlet chamber and coil spring means within said sleeve between said plug and said exhaust valve adapted to bias said exhaust valve towards its open position and said inlet valve towards its closed position.

3. The valve of claim 2 in which the effective diameter of said inlet valve seat is less than the effective diameter of said exhaust valve seat and the effective diameter of said exhaust valve seat is less than the effective diameter of said diaphragm whereby when said inlet valve is closed on its seat and the pressure in said inlet chamber from said tank is great enough to overcome the bias of said spring on said diaphragm said inlet valve will begin to rise from its seat and air pressure through said inlet valve will be applied over the effective diameter of said diaphragm to snap said inlet valve open and said exhaust valve closed, air through said restricted flow conduit will equalize the pressures on the two sides of said diaphragm, said air compressor will be unloaded and when the air pressure on the two sides of the diaphragm exerts less effective pressure over said exhaust valve than the bias of said spring on said diaphragm said diaphragm will snap to the open position of said exhaust valve and the closed position of said inlet valve and said air compressor will be effectively activated.

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