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(54) Improvements relating to gas compressors.

(57) A piston and cylinder air compressor has unloader valve signalled to overcome a spring bias by air pressure at a port 27, indicative that a desired charge pressure has been attained in a reservoir, to open a path between the compression chamber 6 and the inlet chamber 12, the unloader valve having a pressure responsive area subject to compression chamber pressure and acting in a sense to enhance the spring bias.

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Improvements relating to Gas Compressors

This invention relates to gas compressors and relates more especially to air compressors fitted with unloader valves which when signalled operate to connect a compression chamber to atmosphere.

In air compressors of a type fitted to and driven by heavy vehicle engines for supplying compressed air to reservoirs of compressed air braking systems, it is common to fit an unloader valve signalled in response to a desired reservoir pressure being attained for connecting the compression chamber to atmosphere. Typically, such a valve is fitted in the cylinder head of a piston and cylinder compressor and arranged to open when signalled to connect the compression chamber to the inlet chamber so as to interrupt supply of compressed air to a delivery port and the reservoirs. In such compressors it has been found that undue heating has occurred and the object of the present invention is to reduce such heating.

According to the present invention there is provided a gas compressor comprising a reciprocating member forming a movable wall of a compression chamber for cyclicly increasing and decreasing the volume thereof to induce and deliver compressed gas to a delivery port, an unloader valve having a biassed valve member acting in a sense to close a vent passage communicating with said chamber said unloader valve being operable by a fluid pressure signal acting on a pressure responsive area in a sense to counteract the bias and characterised by a further area subject to the pressure in said chamber acting in a sense to enhance the bias.

In a preferred embodiment of the invention said further pressure area is at least as large as the area presented to the pressure in said chamber by the valve member in the closed position thereof.

In order that the invention may be more clearly understood and readily carried into effect the same will be further described by way of example with reference to the accompanying drawing of which,

Fig. 1 illustrates a part sectional perspective view of a single cylinder piston air compressor and,

Fig. 2 illustrates an unloader valve on an enlarged scale.

Referring to Fig. 1, this illustrates the upper part of a single cylinder piston-type air compressor, with the crankcase and crankshaft assembly now shown. The crankshaft is conmmunicated via a connecting rod, the upper end of which is indicated by reference 1, pivotally connected to a piston 2 via a gudgeon pin 3. The piston 2 is thereby reciprocable in a bore 4 of a cylinder 5 alternatively to increase and decrease the volume of a compression chamber6 of which the piston 2 forms one wall. The compressor is also conveniently provided with a valve plate 7 carrying a delivery reed valve 8 and an inlet reed valve 9. The delivery reed valve 8 provides one way communication from the compression chamber 6 through the valve plate to a delivery port 10 of a cylinder head 11 and the inlet valve 9 provides one way communication between a induction or inlet chamber 12 through a passage 13 in the valve plate. The cylinder head and valve plate are assembled to the cylinder by conventional bolts denoted by ref. 14. The cylinder head is further provided with an unloader valve illustrated on a larger scale in Fig. 2 and comprising a valve member 15 sealingly slideable in a bore 16 to open and close a passage 17 between the compression chamber 6 and the inlet chamber 12. This valve member has an annular pressure responsive area 23 wubject to control pressure at a control port 27 acting in a sense to overcome the bias of a spring 18 when a desired reservoir pressure is attained. Additionally, the pressure responsive member is provided with an internal passage-way 19 which communicates with a further area 20 located to act in a sense to enhance the bias of spring 18 in the presence of pressure in the chamber 6. The whole assembly of the unloader valve is held together by a vented closure member 21 located in the cylinder head by an internal circlip 22. The closure member 21 being provided with a spigot 25 having an annular seal 23 upon which the valve member is sealingly slideable.

Considering the operation of the compressor and the included unloader valve, when the pressure in the reservoir or reservoirs being supplied via the delivery port 10 has attained a desired pressure value, this pressure applied to the control port 27 and acting on the pressure responsive annular control area 24 of the unloader valve, is sufficient to lift the valve member 15 against the bias of spring 18. The vent passage 17 is therefore uncovered and the compression chamber 6 is connected to the inlet chamber 12 which is at approximately atmospheric pressure. On a downward stroke of the piston 2, whilst air induced via the inlet valve on the next compression stroke of the piston 2 this air is expelled with minimum energy absorption via the open passage 17.

Ignoring for the present the inner area 20 which assists the bias by being connected to the compression chamber, and assuming a small control signal pressure drop occurs at the control port 27, the unloader valve tends to close during induction strokes but to partially open on compression strokes, such opening being caused by recovering reservoir pressure enhanced by compression

chamber pressure acting on the valve closure area of 17. The result of this partial opening can be substantial energy dissipation and over heating. By including the additional area subject to the compression chamber pressure and effective in a sense to enhance the bias on the unloader valve, such over heating can be appreciably reduced or prevented. Preferably the additional area 20 is at least as large as the area of the valve member covering the vent passage 17 which is subject to compression chamber pressure in the closed position thereof.

Claims

1. A gas compressor comprising a reciprocating member (2) forming a movable wall of a compression chamber for cyclicly increasing and decreasing the volume thereof to induce and deliver compressed gas to a delivery port (10) an unloader valve having a biassed valve member (15) acting in a sense to close a vent passage (17) communicating with said chamber said unloader valve being operable by a fluid pressure signal acting on a pressure responsive area (24) in a sense to counteract the bias and characterised by a further area (20) subject to the pressure in said chaber acting in a sense to enhance the bias.

2. A gas compressor as claimed in claim 1 characterised in that said further area (20) is at least as large as the area presented by the valve member to the pressure in said chamber in the closed position thereof.

3. A gas compressor as claimed in claim 1 or 2, reciprocating member comprising piston (2) in a cylinder (4) and characterised in that the unloader valve (15) is integral with the head (11) of the cylinder.

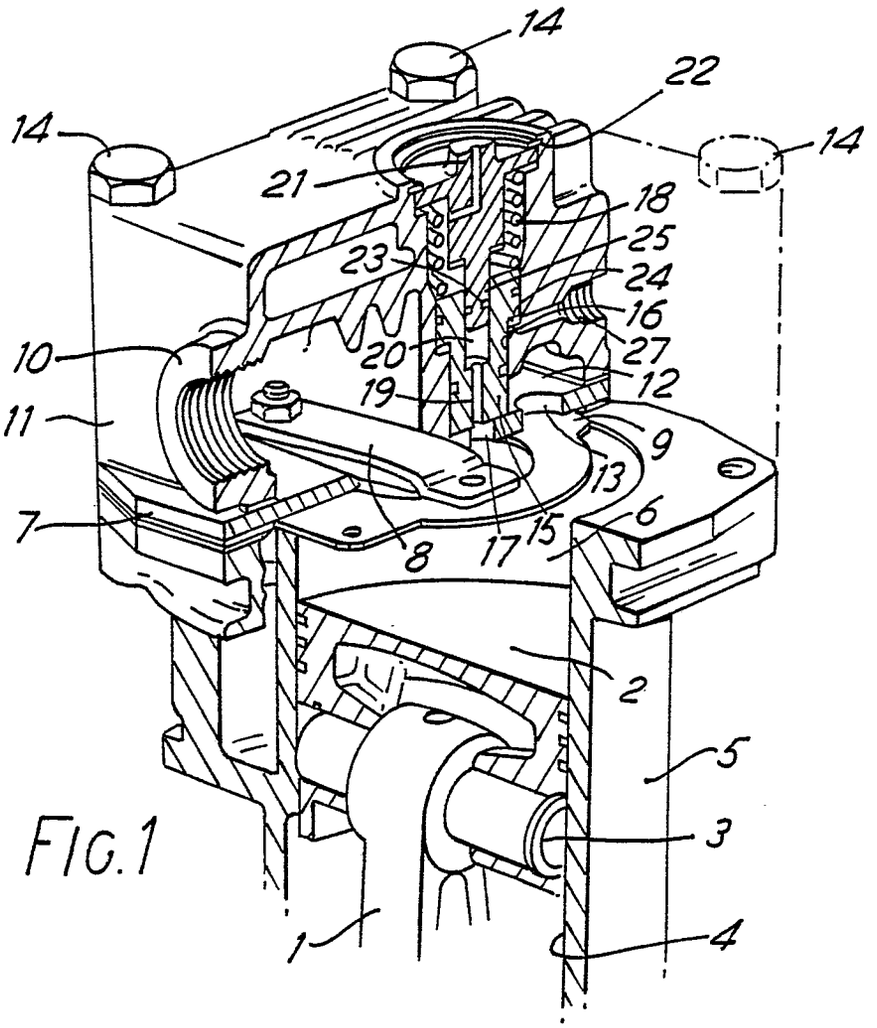
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FIG.1

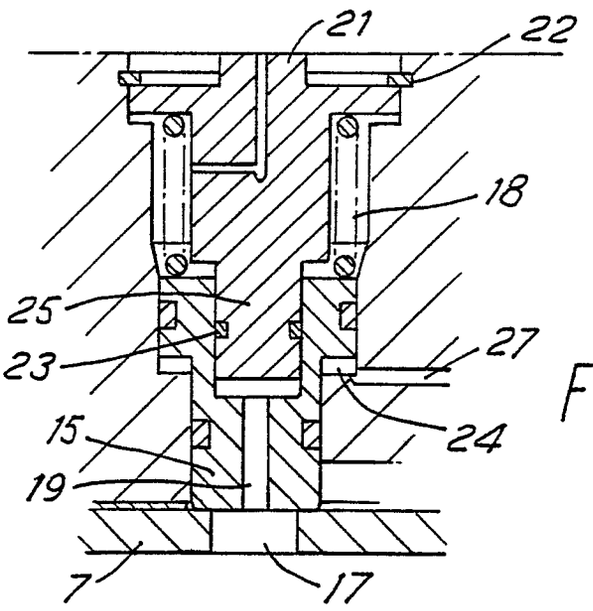
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FIG.2