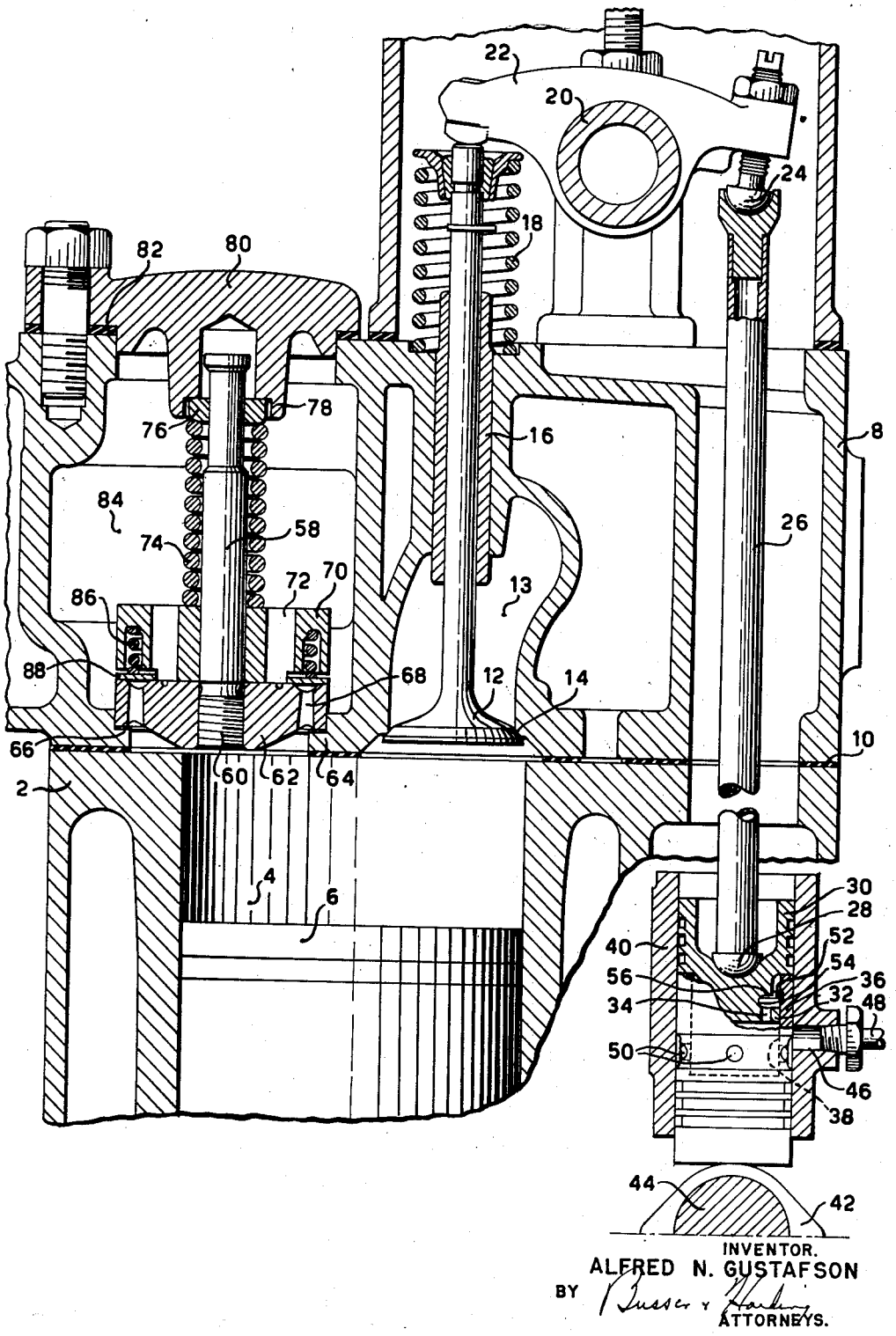
Jan. 26, 1954 A. N. GUSTAFSON 2,667,299

COMPRESSOR INLET VALVE ACTUATING MECHANISM

Filed April 14, 1950



INVENTOR.
ALFRED N. GUSTAFSON
BY Fuesser & Hanley
ATTORNEYS.

Patented Jan. 26, 1954

2,667,299

UNITED STATES PATENT OFFICE

2,667,299

COMPRESSOR INLET VALVE ACTUATING MECHANISM

Alfred N. Gustafson, West Chester, Pa., assignor to Schramm, Inc., West Chester, Pa., a corporation of Pennsylvania

Application April 14, 1950, Serial No. 155,968

3 Claims. (Cl. 230—30)

1

This invention relates to valve assemblies for compressors and particularly to valve assemblies for such compressors as are provided by the conversion of the parts of an internal combustion engine.

Compressors of reciprocating piston type may be provided by the conversion of the valve arrangement of what may be basically considered an internal combustion engine. In some cases all of the cylinders of an engine may be so converted to compressor cylinders, in which case the resulting compressor is driven by another engine or motor, or alternatively, only some of the cylinders of a multi-cylinder engine may be so converted so that a combination engine-compressor results. In any event, the conversion is advantageous to the manufacturer in that the major parts of compressors and engines may be substantially identical with the compressor differing from the engine only in the matter of the valve assemblies.

In my Patent 2,160,860, dated June 6, 1939, there is illustrated a conversion for an L-head type of engine to a compressor, the conversion being possible for all of the cylinders or only some of them as just indicated. This patent shows the arrangement of both inlet and discharge valves and shows also the provisions for unloading by maintaining the inlet valve continuously open when the pressure in the receiver reaches some predetermined set value. Considering first the inlet valve assembly of the patent, the inlet valve, opening upwardly, may be limited in its opening movement quite readily by engagement with a part of the housing. Such an arrangement, however, is not practical in a valve-in-head type of compressor in that the clearance between the inlet valve and its corresponding piston is maintained at a minimum. In accordance with the present invention provision is made for the proper unloading control of an inlet valve in a valve-in-head type of engine. During the unloading period the cam continues to reciprocate the inlet valve but its range of movement is changed so that it reciprocates in a continuously open position. During the unloaded period air flows inwardly and outwardly past the inlet valve without the production of any substantial compression in the cylinder. To attain this result the cam follower for the inlet valve is, in effect, elongated.

The invention also relates to improvements in the discharge valve assembly. In my patent the

2

discharge valve assembly is held in position by a set screw, which arrangement has various disadvantages, particularly in that it is difficult for an unskilled operator to set the set screw properly to insure a proper operating position of the discharge valve assembly. In accordance with the present invention an improved arrangement is provided which permits the valve assembly to adjust itself to a seat above the cylinder and, furthermore, the cap gasket over the discharge chamber serves to seal the entire discharge valve assembly without the necessity for any special gasket under a set screw lock nut.

The general objects of the invention will be apparent from the foregoing. These and other objects particularly relating to details of construction and operation, will become apparent from the following description read in conjunction with the accompanying drawing, in which the figure illustrates in fragmentary vertical section the valve assemblies associated with a single cylinder of the compressor, together with the control arrangements for unloading the inlet valve.

For simplicity of description the invention will be described as applied to a single cylinder, it being understood, of course, that duplicate arrangements of the valve assemblies will be provided in conjunction with all of the cylinders if all of the cylinders of a particular unit are compressor cylinders, or will be applied to some of the cylinders which are utilized for compression in a unit which is in part engine and in part compressor.

The cylinder block 2 is provided with a cylinder 4 in which reciprocates the piston 6. The cylinder is closed by the cylinder head 8 which is secured to the block with interposition of the usual gasket 10. An inlet valve 12 seats at 14 and is guided through a stem guide 16 being urged upwardly toward seated position by a spring 18. The inlet air passage is indicated at 13. The shaft 20 carries a rocker arm 22 which engages the upper end of the valve stem, and is provided with an adjustable screw 24 engaging the upper end of the push rod 26, the lower end 28 of which is received in a socket in a piston 30 slidable in a cylinder 40. The piston 30 is provided with a skirt 32 having openings 34 therein. This skirt 32 slides in the bore 38 in a lower piston 36 which is also mounted in the cylinder 40. As indicated in dotted lines the lower end of the bore 38 is closed. The lower piston 36 is

acted upon by the cam 42 corresponding thereto on the cam shaft 44. Under operating conditions the upper end of the piston 36 engages the piston 30 so that they operate as a unit under the action of corresponding cam 42 to produce normal opening movements of the inlet valve 12. A port 46 in the cylinder 40 communicates with a groove in the piston 36 from which there extend openings 50 to the interior of the bore 38. The port 46 is connected through the pipe 48 to a conventional unloader such as illustrated in my patent referred to above, compressed air being furnished through the pipe 48 when unloading is to take place. As will be evident from the construction illustrated the introduction of compressed air through the port 46 will force the pistons 30 and 36 apart. Their relative movement is limited by the presence of a split ring 52 located in a groove 54 in the interior wall of the bore 38, the ring 52 being engageable by the skirt 32 upon its upward movement. It may be noted that when the skirt 32 engages the ring 52 the compressed air between the pistons is ineffective to produce any longitudinal movements of the two pistons considered together, i. e., the two pistons are free to assume any positions in the cylinder 40 dictated by the spring 18 and the cam 42. The result accordingly is merely that of elongation of the connections between the cam 42 and the valve 12, with the result that the valve continues to reciprocate under the action of the cam but its range of movement is lowered below its normal operating range so that it remains open at all times during the period of unloading.

The location of the split ring 52 in position is effected by the action of an annular shoulder 56 on the piston 30. The ring 52 is compressed in the space below the shoulder 56 and it and piston 30 are then entered into the bore 38 in the piston 36. As insertion takes place the ring is pushed inwardly in the bore 38 and eventually will snap into the groove 54. A permanent assembly is thus produced with the ring acting as a limiting stop for relative outward movements of the two pistons as just described.

The discharge valve assembly comprises a pin 58 threaded at its lower end 60 in a member 62 which is seated, with interposition of a gasket 66, on a seat in the cylinder head above the piston 6. An annular series of openings 68 are provided in the member 62. Slidably mounted on the pin 58 is a member 70 provided with axially extending openings 72. A spring 74 forces the member 70 downwardly and is backed up by a horseshoe-shaped member 76 which is received in a socket 78 in the cap 80 which is bolted to the top of the cylinder head with interposition of a gasket 82 to form a closure for the discharge chamber 84. A spring 86 received in an annular groove in the member 70 holds downwardly a valve ring 88 to cover the openings 68 which communicate with the cylinder space above the piston. The spring 86 is effectively weaker than the strong spring 74 so that compression of air in the upper end of the cylinder will lift the valve ring 88 rather than the member 62.

The discharge valve assembly just described has various advantages. It will be evident that due to the mounting through the pin 58 the member 62 is free to adjust itself accurately to its seat. Furthermore, the entire discharge valve assembly is enclosed below the cap 80 with no projecting set screw or the like requiring special sealing against leakage of compressed air. The spring 74 may be so initially chosen as to exert a proper seating pressure on the member 62 with the result that an inexperienced person cannot damage the assembly in putting it in place after its removal.

It may be noted that except in starting up the compressor the chamber 84 will have a pressure which is not substantially less than the pressure in the cylinder 4. Accordingly, even if the valve ring 88 did not function properly it is quite unlikely that the member 62 would be raised from its seat. The spring 74, of course, will be a quite strong one in any event to insure against accidental unseating of member 62.

The operations of the valve assemblies will already be clear from the foregoing. As stated, unloading is effected by the maintenance of the inlet valve 12 in open position after the pressure in the receiver exceeds a predetermined value, and this unloading results even though the valve 12 is continuously reciprocated in its lower range by the action of the cam 42.

The discharge valve ring 88, of course, opens, whenever the pressure in the cylinder exceeds by some predetermined amount, depending on the spring 86, the pressure in the chamber 84 which is connected to the air receiver.

What is claimed is:

1. In a compressor including a piston reciprocating in a cylinder and an exhaust valve assembly for said cylinder, an inlet valve operatively associated with said cylinder, a seat for the inlet valve, a spring acting on said inlet valve to seat said valve, a cam shaft, a cam carried by said shaft, and means operatively connecting said cam and said inlet valve to produce unseating motion of said inlet valve in response to rotation of said cam, said connecting means including means providing a cylinder, a pair of relatively movable pistons within the cylinder provided with interengaging means to limit separation thereof, and means for introducing compressed fluid between said pistons to separate them and so effectively to elongate said connecting means between said cam and said inlet valve to produce unseating motion of the valve by the cam in which the valve remains unseated throughout the range of movement of the cam.

2. In a compressor of the valve-in-head type including a piston reciprocating in a cylinder and an exhaust valve assembly for said cylinder, an inlet valve operatively associated with said cylinder, a seat for the inlet valve, a spring acting on said inlet valve to seat said valve, a cam shaft, a cam carried by said shaft, and means operatively connecting said cam and said inlet valve to produce unseating motion of said inlet valve in response to rotation of said cam, said connecting means including a rocker arm and means providing a cylinder, a pair of relatively movable pistons within the cylinder provided with interengaging means to limit separation thereof, and means for introducing compressed fluid between said pistons to separate them and so effectively to elongate said connecting means between said cam and said inlet valve to produce unseating motion of the valve by the cam in which the valve remains unseated throughout the range of movement of the cam.

3. In a compressor including a piston reciprocating in a cylinder and an exhaust valve assembly for said cylinder, an inlet valve operatively associated with said cylinder, a seat for the inlet valve, a spring acting on said inlet valve to seat said valve, a cam shaft, a cam carried by said shaft, and means operatively connecting said

cam and said inlet valve to produce unseating motion of said inlet valve in response to rotation of said cam, said connecting means including means providing a cylinder, a pair of relatively movable pistons within the cylinder provided with interengaging means to limit separation thereof, said interengaging means including a skirt on one piston and a ring located in an interior groove in the other and engageable by said skirt, and means for introducing compressed fluid between said pistons to separate them and so effectively to elongate said connecting means between said cam and said inlet valve to produce

unseating motion of the valve by the cam in which the valve remains unseated throughout the range of movement of the cam.

ALFRED N. GUSTAFSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,649,897	Halvorsen	Nov. 22, 1927
1,939,801	Wells	Dec. 19, 1933
2,161,828	Lamberton	June 13, 1939
2,192,538	Christensen	Mar. 5, 1940