Jan. 1, 1963 R. J. HACKBART 3,071,309

COMPRESSOR CYLINDER AND UNLOADER APPARATUS

Filed May 11, 1959 2 Sheets-Sheet 1

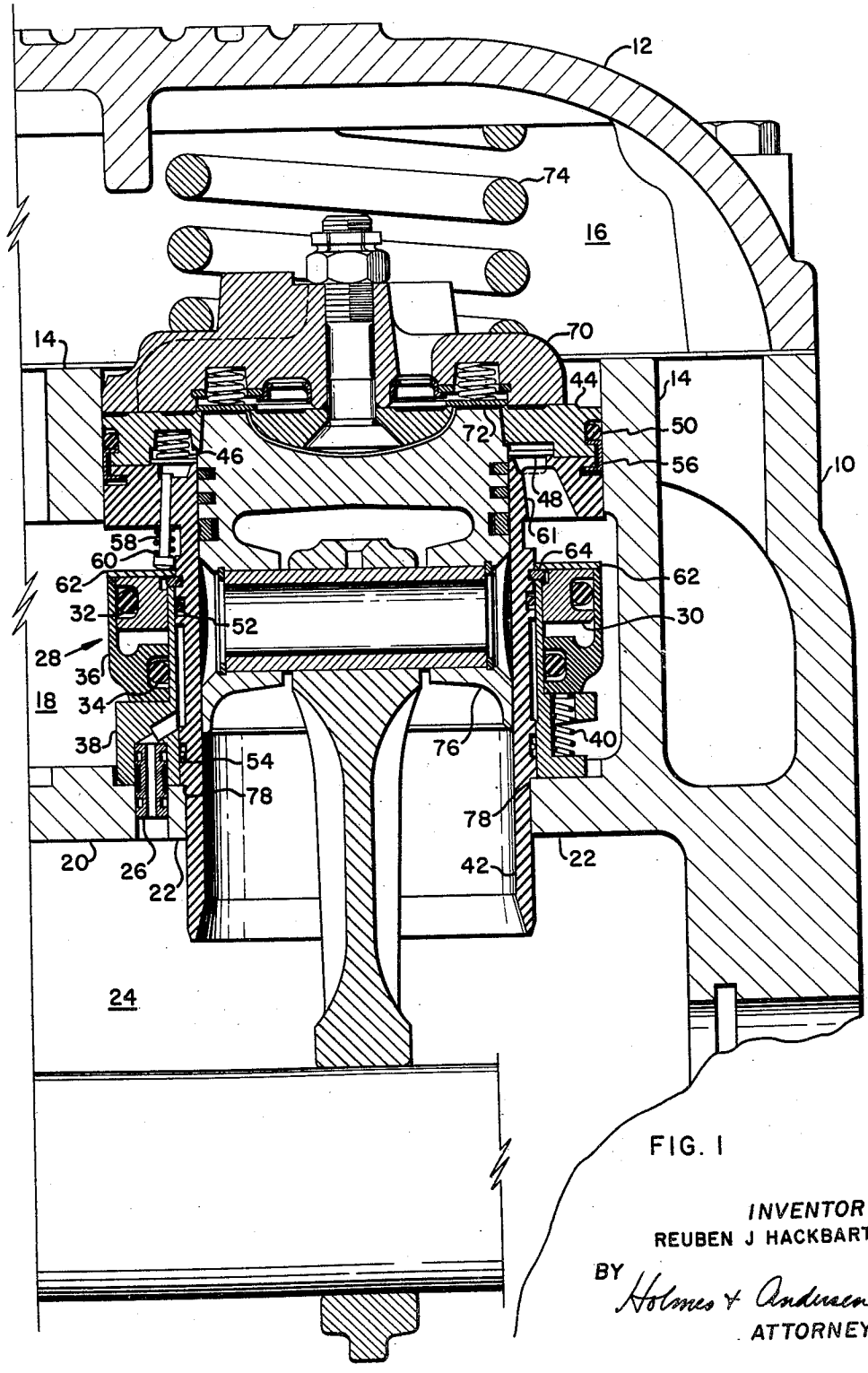


FIG. 1

INVENTOR
REUBEN J HACKBART

BY Holmes & Anderson
ATTORNEYS

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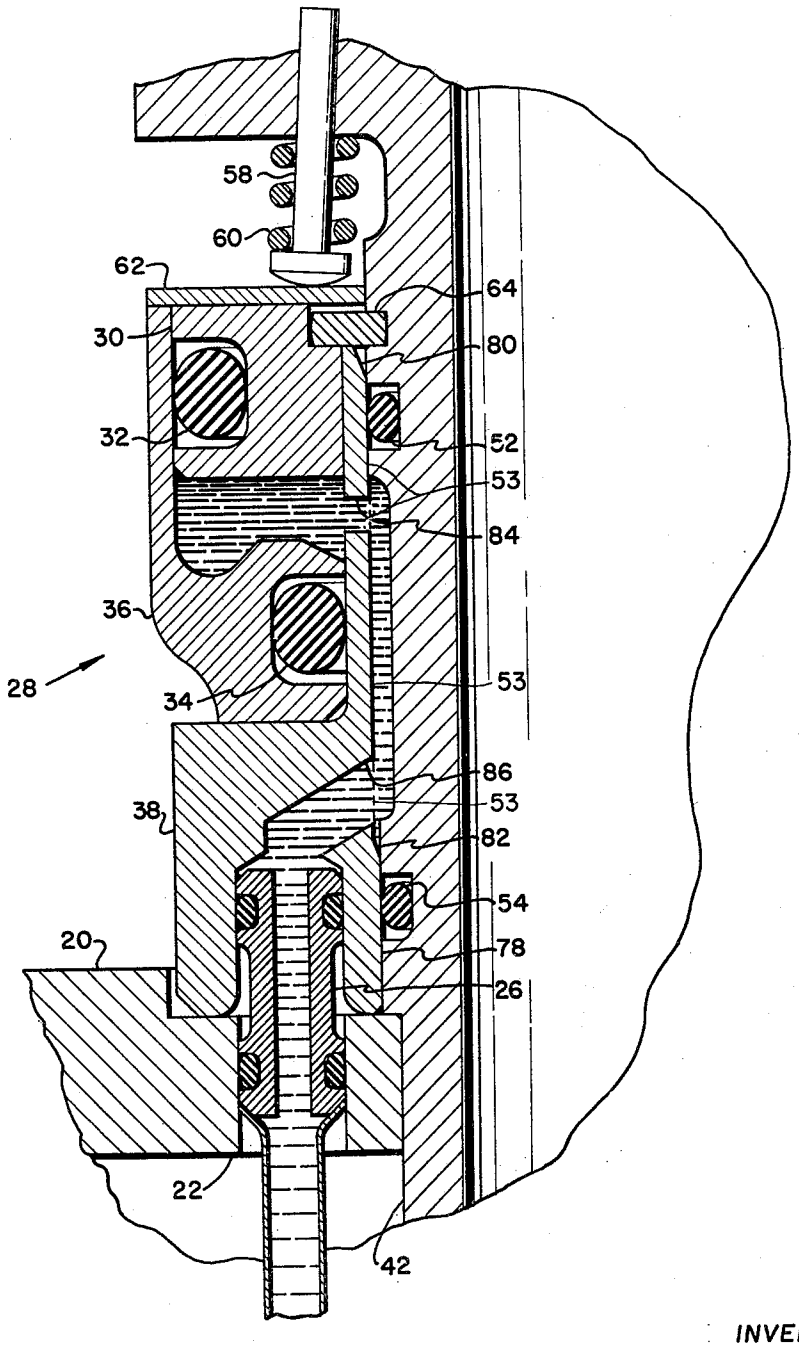


FIG. 2

INVENTOR
REUBEN J HACKBART

BY Holmes & Andersen
ATTORNEYS

United States Patent Office

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COMPRESSOR CYLINDER AND UNLOADER APPARATUS

Reuben J. Hackbart, La Crosse, Wis., assignor to The Trane Company, La Crosse, Wis., a corporation of Wisconsin

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2 Claims. (Cl. 230—30)

This invention relates generally to reciprocating compressors and more particularly to a new and novel cylinder and unloader construction for refrigeration compressors.

An object of the present invention is to provide a cylinder and unloader construction which is inexpensive to manufacture and is easily assembled.

Another object of the present invention is to provide a cylinder and unloader construction which can be readily assembled without damage to the sealing members.

A third object of the invention is to provide a refrigeration compressor in which the cylinder liner is located and supported by the casting between the crankcase and the suction chamber and the unloading cylinder is located around the cylinder liner.

Another object of the invention is to provide a refrigeration compressor which may readily be serviced in the field in case of damage to the compressor.

Other objects and advantages of my invention will be clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a compressor cylinder and unloader constructed in accordance with my invention; and

FIG. 2 is a partial section view of the unloader assembly, cylinder liner, and oil pin blown up in detail to show the particulars of my invention.

Referring now to the drawings, reference number 10 represents a compressor housing in which a multiplicity of operating cylinders are located. The number of cylinders within the housing is optional and not considered to be within the scope of the invention.

The compressor housing is closed at the top by cylinder heads 12. Casting or wall 14 separates the discharge chamber 16 from the suction chamber 18. Casting or wall 20 with integral flange wall 22 separates suction chamber 18 from the crankcase chamber 24. An oil pin 26 is located within flange wall 22 to provide a connection for passage of oil from the unloader control valve (not shown) to the unloading assembly 28.

Unloading assembly 28 consists of seal ring 30, O-rings 32 and 34 of neoprene or other suitable material, piston 36, cylinder 38, and unloader springs 40. The above mentioned unloader assembly is pre-assembled before installation within the compressor.

Located within the unloader assembly 28 and abutting the flange wall 22 is the cylinder liner assembly consisting of a liner 42, suction valve plate 44, suction valve springs 46, suction valve 48, O-rings 50, 52, and 64 of neoprene or other suitable material, retaining ring 56, lift pins 58, lift pin springs 60, suction valve lift ring 62, and snap ring 64.

Discharge valve cage 70 containing discharge valve 72 within is held into engagement with the cylinder liner assembly by spring means 74. Spring means 74 further provides a safeguard against damage to the compressor if a slug of liquid refrigerant should pass into the compression chamber.

In operation, gaseous refrigerant passes from the suction chamber 18, thru suction valve 48 via suction port 61 and into the cylinder liner 42 on the downstroke of piston 76. On the compression or upstroke of piston 76 the gaseous refrigerant is compressed until the refrigerant

pressure overcomes the tension of the discharge valve springs and then the compressed refrigerant passes thru dischrage valve 72 into discharge chamber 16. The compressed refrigerant from a multiplicity of discharge chambers is then manifolded and discharged from the compressor.

The unloading piston assembly 28 surrounding the cylinder liner 42 is oil pressure actuated in a manner shown and described in the patent of Otto A. Labus et al., No. 2,673,025.

Looking now more particularly at the internal compressor construction, it is seen that casting 20 is provided with a flange 22 integral therewith which supports both the unloader assembly 28 and the cylinder liner assembly. In assembly, the unloader assembly is first located on the oil pin 26 and then projected towards the casting 20 until the unloader assembly abutts flange wall 22. After the unloader assembly has been positioned, the cylinder liner assembly is positioned in the unloader assembly and moved forward towards the casting 20 until the flange 78 on the cylinder liner 42 abutts the flange wall 22 adjacent the base of the unloader assembly. It can readily be seen that the flange wall 22 provides a supporting surface for both the unloader assembly and the cylinder liner assembly.

It should be noted that the inner diameter of the cylinder 38 adjacent the O-ring 52 is greater than the inner diameter of cylinder 38 adjacent the O-ring 54 since the inner surface 53 of cylinder 38 between the chamfers 80 and 82 forms a cylinder of constant radius. Therefore, the outer-diameter of the cylinder liner 42 adjacent the O-ring 52 is greater than the outer diameter of the cylinder liner 42 adjacent O-ring 54. This construction in conjunction with the chamfers 80 and 82 on the cylinder 38 prevents destruction of the O-rings 52 and 54 upon assembly of the compressor.

The basic problem solved by the above construction was that the O-rings as they pass an opening upon assembly tend to bulge outwardly and are broken as the cylinder liner passes the particular opening. Looking at FIG. 2, it is seen that O-ring 54 attached to the cylinder liner must pass openings 84 and 86 in the cylinder 38 before the cylinder liner 42 abutts the flange wall 22. Since the outer diameter of the liner 42 adjacent the O-ring 54 is less than the inner diameter of the cylinder 38 adjacent the O-ring 52, it is obvious that O-ring 54 will pass opening 84 without being broken. Further, since the inner diameter of the cylinder 38 adjacent opening 86 is the same as the diameter adjacent opening 84, it is also obvious that O-ring 54 will also pass opening 86 without damage. Chamfer 82 is provided to guide the O-ring into final position without damage. Chamfer 80 is provided to lead O-ring 54 upon initial insertion of the liner 42 into the unloader assembly and also to guide the O-ring 52 into position without damage. If chamfers 80 and 82 were not provided, the O-rings 52 and 54 would be cut by the sharp edge of the casting. Snap ring 64 in conjunction with spring 74 prevents the unloader assembly from lifting off the oil pin.

My invention provides obvious advantages and eliminates several problem areas found in compressors. My construction allows the unloader assembly to be assembled and placed in position before the liner assembly is inserted therein. Previous to this time, the unloader assembly and the cylinder liner assembly were assembled as a unit and then placed in position in the compressor. Obviously, this type of construction would make it very difficult to correctly position the unit on the oil pin.

Further, the construction of the unloader assembly has virtually eliminated breakage of O-rings upon assembly. Constant breakage of O-rings upon assembly causes a

serious labor loss which may cause an increase in the market price of the compressor.

Although I have described in detail the preferred embodiments of my invention, I contemplate that many changes may be made without departing from the scope or spirit of my invention, and I desire to be limited only by the claims.

I claim:

1. A compressor comprising; a housing, a common suction chamber and a common discharge chamber in said housing, first wall means separating said suction chamber from said discharge chamber, a crankcase chamber in said housing, second wall means separating said suction chamber from said crankcase chamber, means forming openings for a cylinder liner assembly in said first and in said second wall means, oil conducting means in said second wall means, an annular unloading assembly means connected to said oil conducting means and abutting said second wall means around said opening in said second wall means, a cylinder liner assembly positioned in said opening in said first wall means and extending through said annular unloading assembly means and abutting said second wall, said cylinder liner assembly including a cylinder liner, said cylinder liner having a first annular sealing member in and surrounding the outer lower diameter portion of said cylinder liner and a second annular sealing member in and surrounding the outer upper diameter portion of said cylinder liner, said unloading assembly means including a cylinder adjacent and surrounding said cylinder liner, said cylinder being in direct contact with said sealing members in said cylinder liner, said cylinder having an inner diameter portion adjacent said second sealing member greater than the inner diameter portion adjacent said first sealing member, and piston means slidably mounted in said cylinder assembly means to draw gaseous refrigerant into said cylinder liner assembly means from said suction chamber and discharge compressed gaseous refrigerant into said discharge chamber.

2. The structure of claim 1 wherein said cylinder has means forming an opening therethrough for passage of oil into said unloader assembly, said cylinder being chamfered on the inner diameter below said opening to lead the first sealing member into sealing relationship between said unloader assembly and said cylinder liner assembly.

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