April 24, 1934. F. R. WEST 1,955,992

SEALED PUMPING APPARATUS

Filed Feb. 24, 1930 3 Sheets-Sheet 1

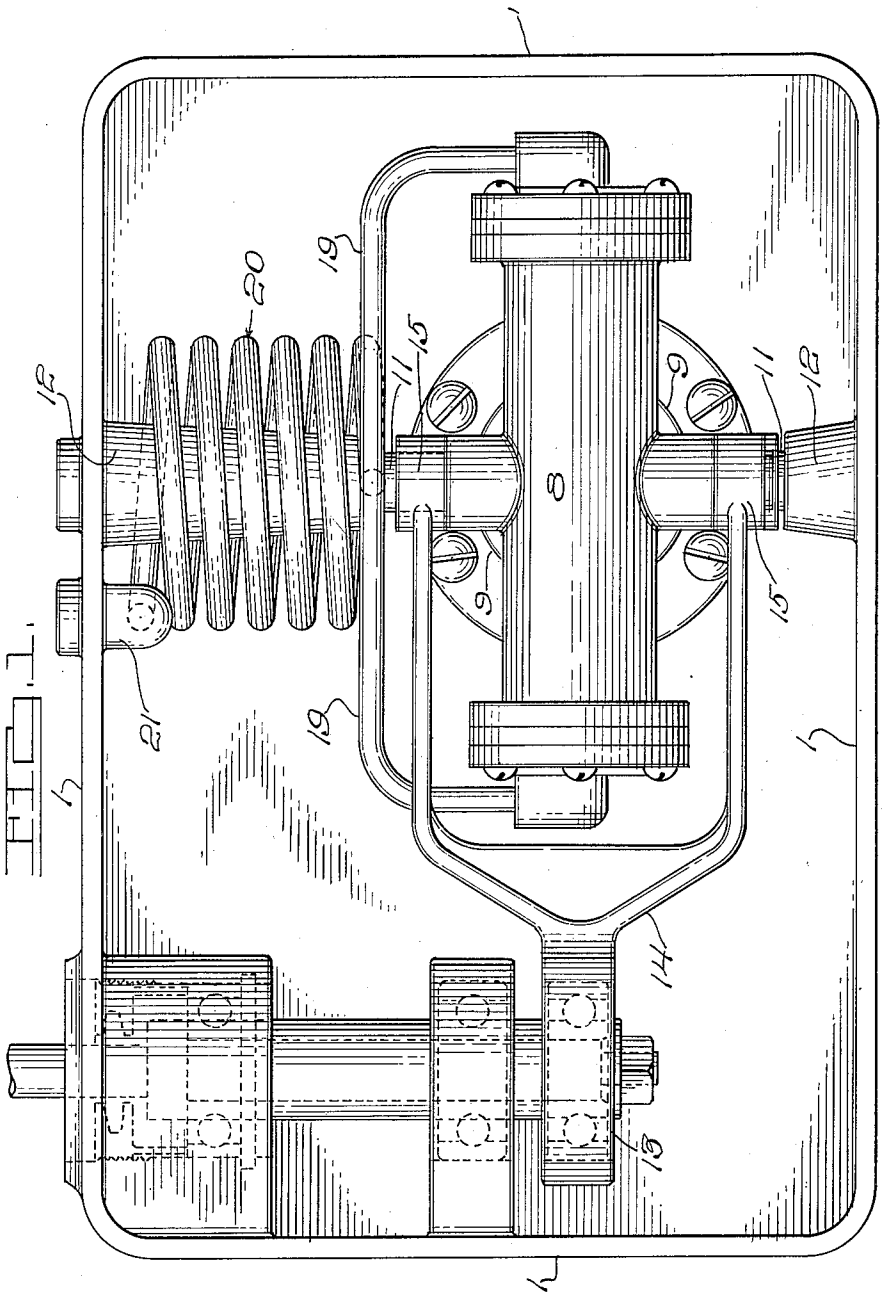


FIG. 1.

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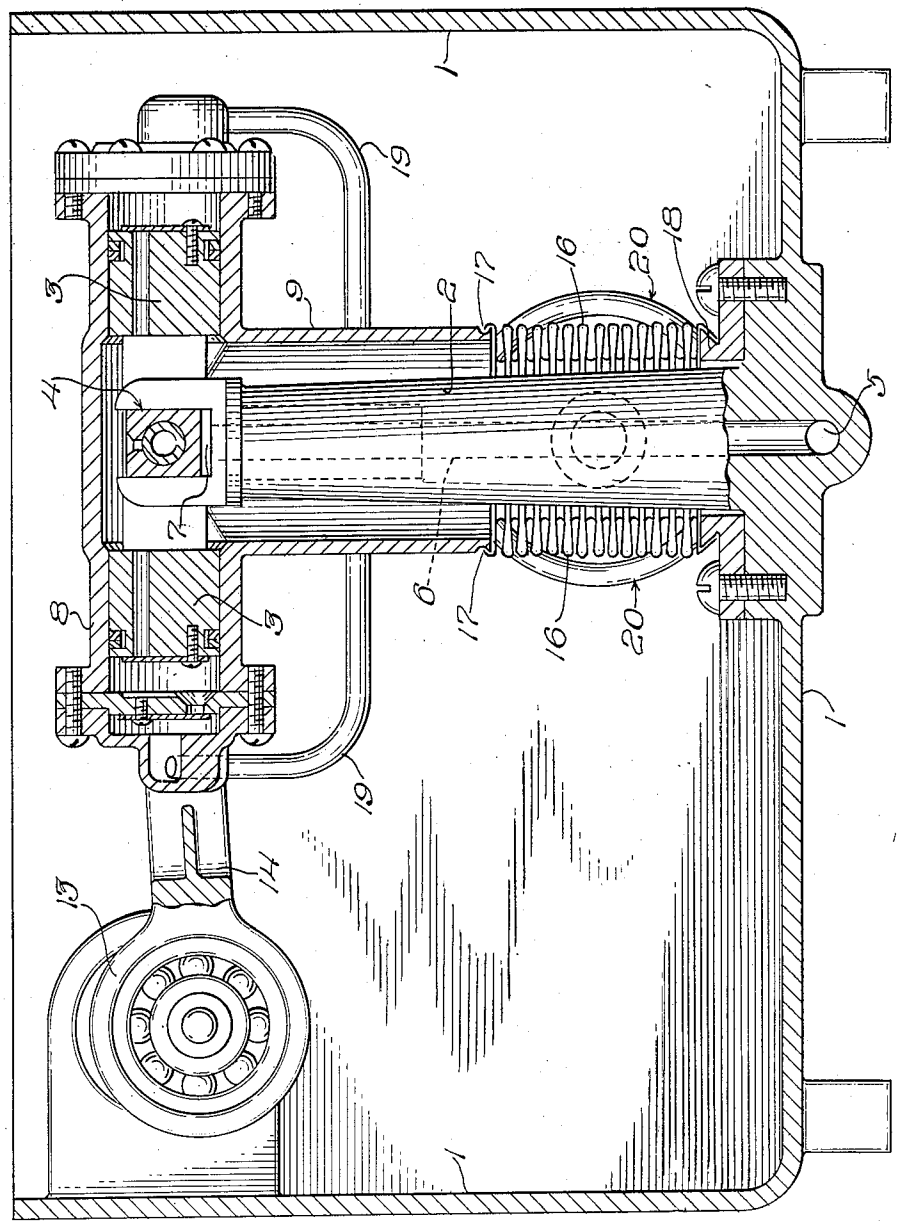


Fig. 2.

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Fig. 3.

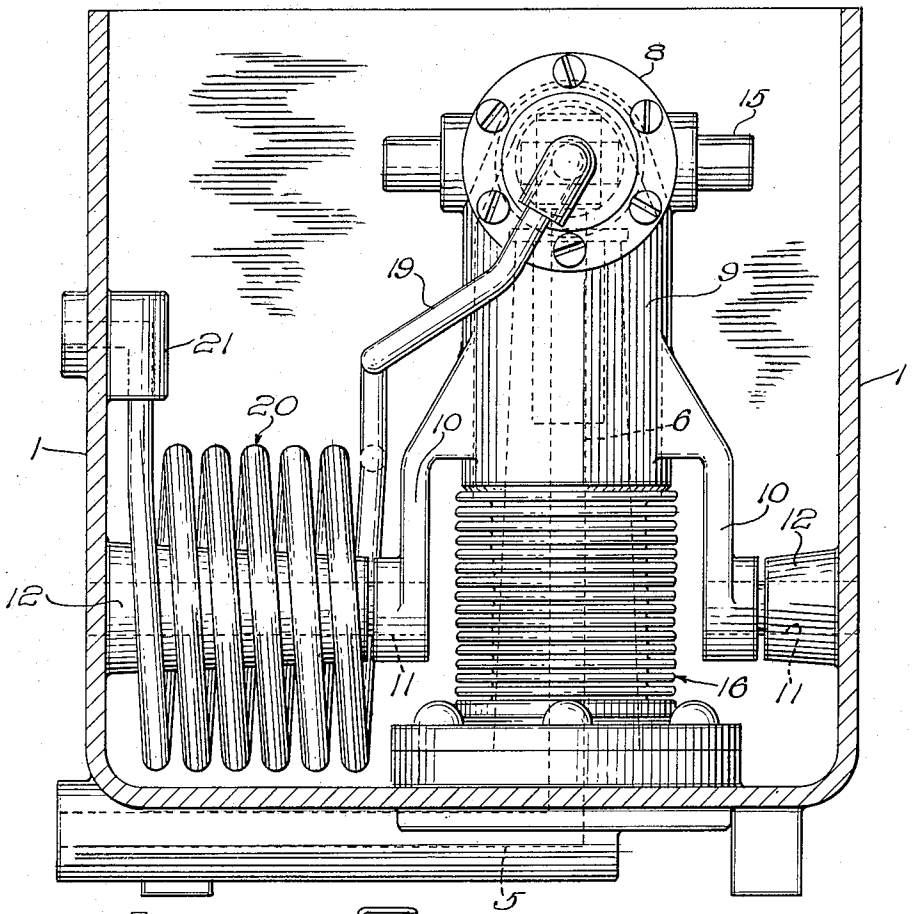
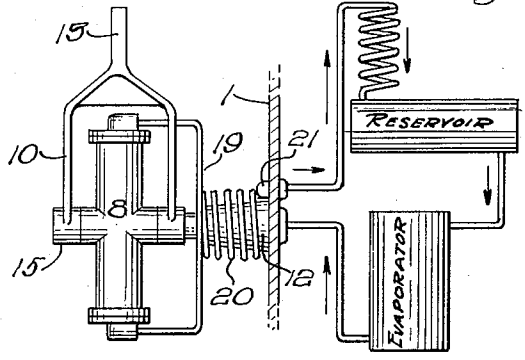


Fig. 4.



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UNITED STATES PATENT OFFICE

1,955,992

SEALED PUMPING APPARATUS

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Application February 24, 1930, Serial No. 430,645

23 Claims. (Cl. 230—192)

This invention relates to sealed refrigerating apparatus, and particularly to an extremely compact and efficacious compressor unit.

The recent trend in mechanical refrigeration has been towards what is known as a sealed unit. Some of these units of the prior art have actually been sealed in construction, but the majority of the commercial units have only been sealed to the extent that a sealed casing has been provided for the normally exposed and moving parts of the unit. Many attempts have heretofore been made to design sealed refrigerating apparatus wherein the piston actuating means of the compressor has been separated from the atmosphere by means of a fixedly positioned but flexible joint. This joint has been positioned intermediate the ends of the power transmitting or actuating means with the result that a relatively great load has been concentrated upon the pivoting or supporting means for the piston actuating lever.

It is the object of the present invention to eliminate the rotating seal or joint in a compressor in an entirely different manner than has heretofore been accomplished and at the same time remove all pressures or strains on the pivot pins. Instead of mounting the piston actuating rod on suitable pivot pins and providing a flexible member such as a metallic bellows around the actuating rod and in alignment with the pivot pins, I have completely reversed the design and operation of the unit by stationarily mounting the pistons on a fixed support or standard and moving the cylinders back and forth relative to the stationary pistons. By means of this construction, it is possible to support the stationary pistons in a manner so as to completely eliminate the use of double ended movable arms which not only removes all weight or excessive load on the pivot pins but also provides for an extremely compact and easily assembled unit.

A further feature of the present invention resides in novel housing structure and the provision of an oil reservoir which serves as a sound deadening means. Other features of design and construction will be more specifically brought out in the specification and claims.

In the drawings:

Fig. 1 is a plan view, substantially full size, of a sealed compressor unit embodying the present invention and illustrating the extreme compactness of the unit.

Fig. 2 is a longitudinal view taken through the cylinder of the compressor unit and illustrating in particular the preferred manner of stationarily mounting the pistons on the center post and sealing the cylinder housing.

Fig. 3 is a front elevation, partly in section, illustrating the manner of pivoting the movable cylinder housing about the pivot points approximately in alignment with the center portion of the flexible sealing means.

Fig. 4 is a diagrammatic view illustrating one manner of connecting up my novel sealed compressor unit with a typical refrigerating system.

It will be understood that the general as well as the detailed design of the structure herein illustrated as embodying the invention may be varied considerably both as to cylinder and piston structure and assembly design.

One of the essential features of the present invention resides in the provision of stationary pistons and in Fig. 2, I have shown a casing which may be generally indicated as at 1, a post 2 forming an integral part of this casing, and a double acting stationary piston element 3 mounted on top of the post 2 by means of a suitable wrist pin and block structure 4. A suitable refrigerant inlet 5 may be formed in the bottom of the casing, which inlet extends upwardly as at 6 through the post 2 and terminates at a point 7 underneath the wrist pin and block. In addition to compactness of design, the purpose of this inlet conduit is to directly return gases and entrapped oil against the wrist pin and block to furnish a surplus amount of lubrication at this movable point.

The method of mounting the movable cylinder is best illustrated in Figs. 1 and 3 wherein such structure is shown as comprising a body portion 8, a downwardly extending cylindrical portion 9 integrally formed therewith, and suitable arms 10 terminating in pivot pins 11 which are supported by means of suitable bearing members 12 preferably formed as an integral part of the housing 1.

Any source of power may be utilized for actuating the movable cylinder housing and I have shown a transmitting element in the form of an eccentric member 13 connected to the cylinder body 8 by means of a suitable yoke 14 terminating in the bearing members 15. The compressor structure is preferably of the high speed direct connected type so that the actual movement of the cylinder casing relative to the stationary pistons is very small.

As best shown in Figs. 2 and 3, the bottom portion of the housing 9 of the cylinder casing is provided with a suitable metal bellows member 16 which is of such design that it may be effectively soldered to the bottom end of the cylindrical extension 9 as at 17 and to a suitable flanged ring 18 rigidly secured to the bottom of the post. The bellows member is preferably positioned centrally of the axis of the pivot pins 11 but not necessarily so. The length of the bellows member 16 and the location of the pivot pins and the design of the cylinder casing is such that when the parts are assembled, as shown in Fig. 3, there will be a slight compression pressure exerted upon the bellows member. By so placing the bellows member

under compression, I have found that oscillation or vibration thereof is made much easier. In other words, by placing the bellows member under endwise compression the effect is apparently to give the various folds of the bellows member inherent resilience.

It will thus be seen that the bellows describes only a very small arc of movement and thus insures an extremely long life in service. Any form of valve structure may be used in admitting and exhausting the refrigerant from the cylinders and in Fig. 2 I have shown conventional valve structure for conducting refrigerant through the pistons and through the cylinder heads. As before mentioned, the gaseous evaporated refrigerant is preferably drawn in through a conduit 5 and up through the post 2. The compressed refrigerant may be conducted through suitable conduits 19 secured to both ends of the cylinder housing, as best shown in Fig. 2, and terminating in a flexibly mounted conduit which may be generally designated 20. The end of this flexible conduit 20 may terminate in a suitable union or mounting 21. It will be understood to those skilled in the art that various methods may be made use of to provide a flexible conduit or flexible conducting means for conducting the compressed gases from the oscillating cylinder casing.

It will thus be seen that by reversing the normal relative movement between the standard cylinder and piston structure that I have not only eliminated one of the greatest difficulties inherent in sealed compressors of the prior art, but I have also provided an extremely compact, easily assembled and efficient unit. It will be noted that in the construction shown in the drawings the load or pressures on the piston do not create or transmit any pressures or strains on or to the pivot pins but that the pivot pins merely become hinge pins or fulcrums for the cylinder casting. Such pivot points will last indefinitely and thus will insure quiet continuous performance.

It will also be seen that the central post structure for supporting the piston is of very heavy and substantial design, the same being true of the piston. This post structure makes it possible to utilize the same as the intake conduit for the refrigerant thus providing means for positively lubricating the wrist pin connection for the piston. It will also be obvious that there is substantially no side thrust against the internal walls of the cylinder by the pistons and there is less mass of weight in the movable portion of the compressor casting than in the ordinary device of this type wherein the pistons are moved back and forth by a movable arm which has to be very heavy and rigid to be structurally strong.

It will be understood that the convolutions of the bellows member are fairly close together so that when pressure is applied inwardly to the bellows member there is no resulting bulging action as one convolution counteracts or reinforces the other.

What I claim is:

1. A compressor unit for a refrigerating system, comprising a non-reciprocably mounted piston, a cylinder structure mounted on and movable about a fixed pivot, flexible means for positively sealing the cylinder structure and permitting pivotal movement, and refrigerant inlet and outlet conduits leading to points within said sealed cylinder structure.

2. A compressor unit for a refrigerating system, comprising a pair of substantially non-reciprocably mounted pistons, a movable pivotally mounted cylinder structure, flexible means for positively sealing the cylinder structure, refrigerant inlet and outlet conduits leading to points within said sealed cylinder structure, the mounting for said pistons extending through said sealing means and assisting in supporting said cylinder structure and absorbing pressures or strains independently of said pivotal mounting.

3. A compressor unit for a refrigerating system, comprising a non-reciprocably mounted piston, movable cylinder structure, flexible means for positively sealing the cylinder structure, refrigerant inlet and outlet conduits leading to points within said sealed cylinder structure, and pivotally mounted arms for supporting said cylinder structure.

4. A compressor unit for a refrigerating system, comprising a non-reciprocably mounted piston, movable cylinder structure, flexible means for positively sealing the cylinder structure, refrigerant inlet and outlet conduits leading to points within said sealed cylinder structure, and a pivotal means outside the cylinder structure for supporting said cylinder structure, said means being pivoted adjacent the extreme end thereof.

5. A compressor unit for a refrigerating system, comprising a relatively movable piston and cylinder housing, a member for positively sealing the housing, power transmitting and actuating means for effecting said relative movement and pivotally mounted means separate from said actuating means for supporting the movable member.

6. A compressor unit for a refrigerating system, comprising elements movable relative to each other for effecting compressing and pumping of the refrigerant, power actuating means for transmitting motion to one of said relatively movable elements, a flexible non-rotatable seal for positively sealing the compressor and means for supporting both of said relatively movable elements independently of said actuating means.

7. A compressor unit for a refrigerating system, comprising in combination a post, piston structure connected to said post, a pivotally mounted cylinder structure for said piston, means for actuating said cylinder structure and a non-rotatable flexible seal between said cylinder structure and said post for positively sealing the unit.

8. A compressor unit for a refrigerating ystem, comprising in combination a post, piston structure connected to said post, a pivotally mounted cylinder structure for said piston and having an extension surrounding said post, means for actuating said cylinder structure and a non-rotatable flexible seal between said extension and said post for positively sealing the unit.

9. A compressor unit for a refrigerating system, comprising in combination a post, piston structure connected to said post, a pivotally mounted cylinder structure for said piston, means for actuating said cylinder structure and a non-rotatable flexible seal between said cylinder structure and said post for positively sealing the unit, and an intake conduit formed in said post and terminating adjacent the connection between the post and piston whereby to direct any entrapped oil in the incoming gaseous refrigerant against said connection.

10. A compressor unit for a refrigerating system, comprising a cylinder structure mounted to have oscillating movement, means for actuating

said cylinder structure, fixed means for positively sealing the cylinder casting, a relatively stationary piston, and means within said sealing means and positioned at an angle relative to said piston for supporting the same.

11. A compressor unit for a refrigerating system, comprising elements movable relative to each other for effecting compressing and pumping of the refrigerant, power actuating means for transmitting motion to one of said relatively movable elements, a flexible fixed seal for positively sealing the compressor, a fixed means for supporting one of said relatively movable elements and pivoted means for supporting the other of said relatively movable elements.

12. A compressor unit for a refrigerating system, comprising elements movable relative to each other for effecting compressing and pumping of the refrigerant, power actuating means for transmitting motion to one of said relatively movable elements, a flexible fixed seal for positively sealing the compressor, a fixed means connected to one of said relatively movable elements and pivoted means for supporting the other of said relatively movable elements, both of said means being independent of said actuating means.

13. A compressor unit for a refrigerating system, comprising an integral base formed as a container, a post rigidly mounted in said base and carrying piston structure, a pivotally mounted cylinder housing for said piston structure, a flexible seal between said cylinder housing and post for positively sealing the unit, and means separate from the pivotal mounting for actuating said cylinder housing on its mounting, all of said parts being immersed in a body of liquid within said container.

14. A compressor unit for a refrigerating system, comprising an integral base formed as a container, a post rigidly mounted in said base and carrying piston structure, a pivotally mounted cylinder housing for said piston structure, a flexible seal between said cylinder housing and post for positively sealing the unit, and means for rocking said cylinder housing on its mounting, intake and exhaust conduits leading to points within said sealed unit and a flexibly mounted conduit for conducting the compressed gases from said unit, all of said parts being immersed in a body of liquid within said container.

15. A compressor unit for a refrigerating system, comprising in combination a post for oscillatably supporting piston structure, a cylinder housing pivotally mounted upon pivots located adjacent the bottom of said post and a flexible seal positioned in alignment with said pivots and connecting said cylinder housing with the base of said post for sealing the unit, and means for actuating said cylinder housing.

16. A compressor unit for a refrigerating system, comprising in combination a post for stationarily supporting piston structure, a cylinder housing pivotally mounted upon pivots located adjacent the bottom of said post and a flexible seal connecting said cylinder housing with the base of said post for sealing the unit, and means for actuating said cylinder housing relative to said piston structure.

17. A compressor unit for a refrigerating system, comprising in combination a post for stationarily controlling piston structure, a cylinder housing pivotally mounted upon pivots located adjacent the bottom of said post and a flexible seal connecting said cylinder housing with the base of said post for sealing the unit, and means for actuating said cylinder housing relative to said piston structure, all of said parts being immersed in a body of lubricant for lubricating the exposed movable parts outside of said sealed unit and for deadening any noises or vibrations.

18. A compressor unit for a refrigerating system, comprising in combination a base member formed as a container, a post and oppositely positioned pivot bearings formed as a part of said container, piston structure pivotally mounted on said post, a movable cylinder housing having arms pivotally mounted in said bearings formed in said container and a bellows member connecting the bottom of said cylinder housing with the base of said post and positioned intermediate the axis of said pivots for carrying said cylinder housing.

19. A compressor unit for a refrigerating system, comprising in combination a base member formed as a container, a post and oppositely positioned pivot bearings formed as a part of said container, piston structure pivotally mounted on said post, a movable cylinder housing having arms pivotally mounted in said bearings formed in said container and a bellows member connecting the bottom of said cylinder housing with the base of said post and positioned intermediate the axis of said pivots for carrying said cylinder housing, an intake conduit extending within said bellows member and a flexibly mounted outlet conduit connected with said movable cylinder casing.

20. A compressor unit for a refrigerating system, comprising relatively movable elements for effecting compressing and pumping of the refrigerant, power actuating means for transmitting motion to one of said relatively movable elements, pivotal means for supporting one of said elements, a base, and a bellows members connected to a movable element of said relatively movable elements and to said base, bellows positioned in substantial alignment with said pivot of the means for supporting said movable element the distance between said movable element and said pivot being fixed to hold said bellows member constantly under compression.

21. A compressor unit for a refrigerating system comprising a cylinder mounted for reciprocation and having an opening laterally of its direction of reciprocation, a piston in said cylinder, a support for said piston extending through said opening, flexible sealing means sealing said opening around said support, and means for reciprocating said cylinder.

22. A compressor unit for a refrigerating system comprising a cylinder having an opening in one side, a mounting on which said cylinder rocks longitudinally, extended from said side of said cylinder, a piston in said cylinder, a support for said piston, extending through said opening, flexible sealing means sealing said opening around said support, and means for rocking said cylinder.

23. A compressor unit for a refrigerating system comprising a cylinder having an opening in its side, a mounting on which said cylinder rocks longitudinally, extended from said side of said cylinder, a piston in said cylinder, a support for said piston, extending through said opening, a flexible tube surrounding and connected to said support and connected to said cylinder around said opening, and extending through the plane of the axis of rocking of the cylinder, and means for rocking said cylinder.

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