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COMPRESSOR UNLOADER

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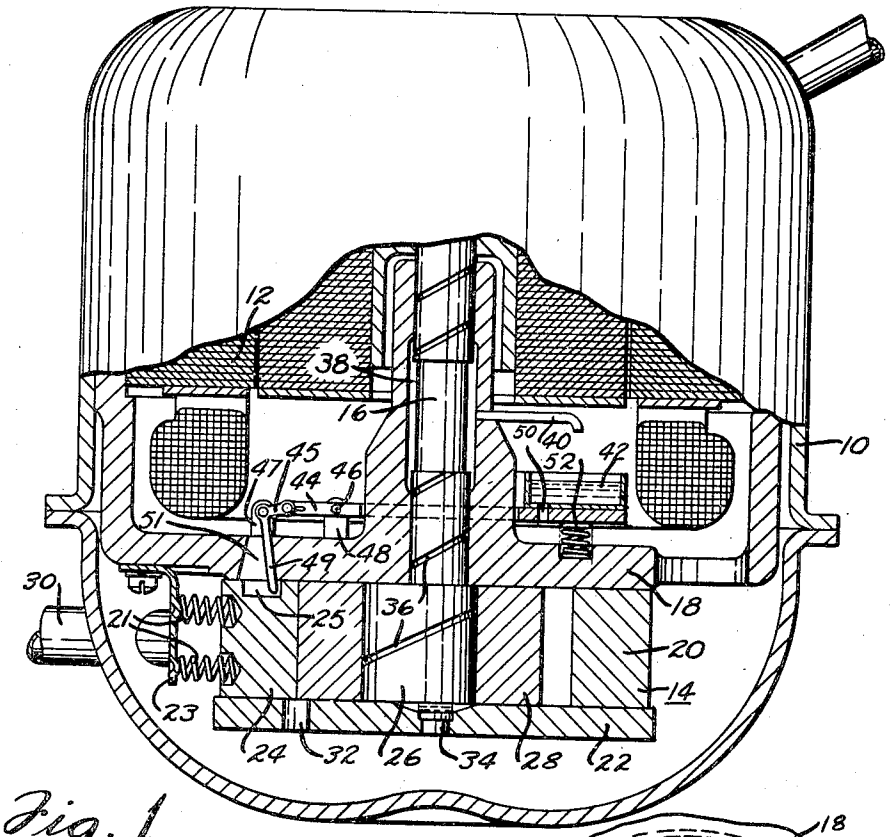


Fig. 1

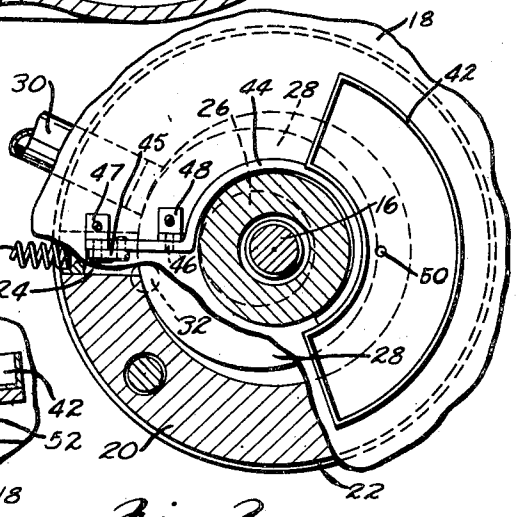


Fig. 2

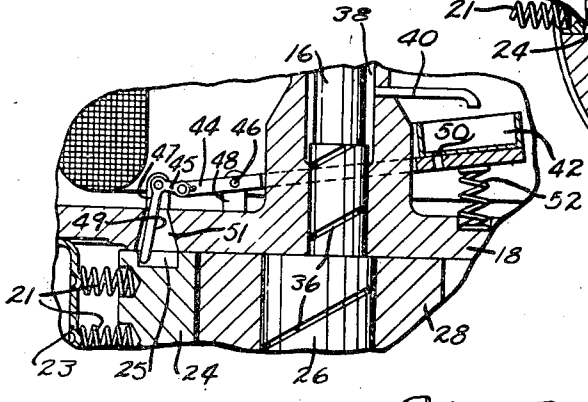


Fig. 3

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COMPRESSOR UNLOADER

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13 Claims. (Cl. 230—138)

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This invention relates to refrigerating apparatus and more particularly to an improved mechanism for unloading a refrigerant compressor.

This application is a continuation of my copending application S. N. 654,606, filed March 15, 1946, now abandoned.

One object of this invention is to provide a simple and inexpensive means for unloading a refrigerant compressor.

More particularly it is an object of this invention to provide an improved mechanism for holding the divider block of a rotary compressor out of engagement with the rotor so as to unload the compressor.

A further object of this invention is to provide an improved arrangement in which the unloading mechanism of a compressor is operated by lubricant supplied to the compressor bearings.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a fragmentary sectional view of a sealed motor-compressor unit embodying my improved compressor unloading mechanism;

Fig. 2 is a fragmentary sectional view with parts broken away showing the relationship of the compressor unloading mechanism to the compressor; and

Fig. 3 is a fragmentary sectional view similar to Fig. 1 showing the compressor unloading mechanism holding the divider block or blade in the retracted position so as to unload the compressor.

Referring now to the drawing wherein I have shown a preferred embodiment of my invention, reference numeral 10 designates a conventional sealed casing which encloses a motor 12 and a rotary compressor 14. The motor drives the compressor through the central drive shaft 16 which is journaled in a stationary support or bearing element 18. The rotary compressor comprises the usual cylindrical element 20 which is disposed between the support 18 and the bottom end plate 22. A divider block or blade 24 is slidably supported by the element 20 and serves the usual purpose of compressing refrigerant within the cylinder 20. The blade 24 is biased inwardly by the springs 21 which abut against the bracket 23 carried by the support 18 as shown. A slot 25 is provided in the upper end of the blade 24 for a purpose explained hereinafter. The shaft 16 is provided with the usual eccentric portion 26 which cooperates with the impeller 28 to produce a pumping action. The compressor is provided with an inlet 30 and an outlet 32 in accordance with the usual practice.

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The lower portion of the casing 10 serves as an oil reservoir from which oil is supplied to the bearing surfaces. The end plate 22 is provided with an oil inlet passage 34 from whence lubricant is pumped to the bearing surfaces by the spiral oil feed grooves 36 provided in the outer surfaces of the eccentric 26 and the shaft 16, as shown. A portion of the bearing 18 is cut away as at 38 so as to form an oil pocket from whence the excess oil discharges through the outlet pipe 40 which conveys the excess oil into the oil collecting cup or receptacle 42. The cup 42 is mounted on one end of the lever 44 which in turn is supported on the pivot 46 carried by the bracket 48. The lubricant collecting cup 42 is provided with a leak port 50 which permits oil to drain from the cup at a given rate which is less than the rate at which oil is fed into the cup during normal operation of the compressor. A spring 52 serves to bias one end of lever 44 upwardly. The cup 42 is made large enough so that when it is substantially filled with lubricant it will cause the spring 52 to be compressed, as shown in Fig. 1. Excess lubricant overflows the cup and returns to the bottom of the casing 10.

When the motor stops and the flow of oil through the line 40 discontinues, the level of lubricant within the cup 40 will gradually decrease due to the leakage of lubricant through the port 50 until the weight of the lubricant in the cup 42 is no longer sufficient to overcome the force of the spring 52. The short end of the lever 44 is connected to the bell crank 45 by means of a conventional pin and slot connection. The bell crank 45 is pivotally carried by the stationary bracket 47 which is secured to the upper side of the sationary support 18 as shown. The downwardly projecting arm 49 of the bell crank 45 projects through a slot 51 in the main support 18 and into the slot 25 in the upper surface of the divider block 24.

So long as there is an adequate supply of lubricant within the cup 42, the downwardly projecting arm 49 of the bell crank 45 will not interfere with the normal operation of the divider block 24, but when the motor stops and no oil feeds into the cup 42 and that oil which is in the cup drains out of the receptacle 42, the spring 52 will force the long end of the lever 44 upwardly with the result that the depending arm 49 of the bell crank 45 will move to engage the outer end wall of the slot 25 and thereby retain the di-

vider block 24 out of sealing engagement with the impeller 28. This results in complete unloading of the compressor and the compressor will remain unloaded until the motor has been brought up to speed and has operated long enough to replenish the supply of lubricant within the lubricant collecting cup 42.

By virtue of the above described arrangement, the spring 52 supplies the necessary force to unload the compressor by holding the divider block out of engagement with the rotor when the cup 42 is empty. The weight of the oil which collects in the cup 42 during normal operation of the compressor serves to overcome the force of the spring 52, whereby the divider block is free to reciprocate without interference from the arm 49.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A fluid compressor including a stationary member having a compression chamber therein and inlet and outlet ports communicating with said chamber, a rotatable member arranged within said compression chamber, means including a blade slidably mounted in one of said members and cooperating with both of said members for compressing fluid in said chamber, first means for biasing said blade inwardly to load said compressor, second means for biasing said blade outwardly to unload said compressor, means for supplying lubricant to moving parts of said compressor during operation thereof, means including a receptacle for receiving lubricant from said lubricant supply means, and said last named means being dependent upon the weight of a body of lubricant collected therein for counteracting the bias of said second biasing means.

2. A fluid compressor including a cylinder block having a compression chamber therein and inlet and outlet ports communicating with said chamber, a rotor arranged within said compression chamber, a motor for driving said rotor, means including a blade slidably mounted in said cylinder block and adapted to contact said rotor to cause fluid to be compressed in said chamber, means for biasing said blade to a position out of contact with said rotor to unload said compressor, means for biasing said blade into contact with said rotor to load said compressor, means effective during operation of said compressor for supplying lubricant to moving parts thereof, said first named biasing means including a receptacle portion for receiving and collecting some of the lubricant supplied to said compressor parts whereby lubricant accumulated therein renders the same ineffective and renders said second named biasing means effective, and said lubricant receptacle portion of said first named biasing means being provided with a restricted opening permitting lubricant to drain therefrom during periods of inoperation of said compressor whereby said first named biasing means is rendered effective to overcome the biasing of said second named biasing means.

3. A sealed unit containing a fluid compressor and a motor for operating said compressor, said compressor including a stationary member having a compression chamber therein and inlet and outlet ports communicating with said chamber, a member arranged within said compression chamber and rotatable therein by said motor, means

adapted to cause fluid to be compressed between said members including a blade slidably mounted in one of said members and cooperating with both of said members, means for supplying lubricant to operating parts of said unit, means including a spring for retaining said blade in a retracted position in one of said members to unload said compressor, means cooperating with said spring for collecting a portion of the lubricant circulated within said unit by said lubricant supplying means upon operation of said compressor, and said last named means being dependent upon the weight of the body of lubricant collected therein for overcoming the force of said spring to permit movement of said blade from its said retracted position into a position to render the compressor effective for compressing fluid.

4. A sealed unit containing a fluid compressor and a motor for operating said compressor, said compressor including a stationary member having a compression chamber therein and inlet and outlet ports communicating with said chamber, a member arranged within said compression chamber and rotatable therein by said motor, means adapted to cause fluid to be compressed between said members including a blade slidably mounted in one of said members and cooperating with both of said members, means for supplying lubricant to operating parts of said unit, means including a spring for retaining said blade in a retracted position in one of said members to unload said compressor, means cooperating with said spring for collecting a portion of the lubricant circulated within said unit by said lubricant supplying means upon operation of said compressor, and said last named means being dependent upon the weight of the body of lubricant collected therein for overcoming the force of said spring to permit movement of said blade from its said retracted position into a position to render the compressor effective for compressing fluid, said lubricant collecting means being provided with a restricted opening permitting lubricant accumulated therein to drain therefrom during periods of inoperation of said compressor whereby said spring moves said blade into its retracted position for unloading the compressor.

5. A fluid compressor including a cylinder block having a compression chamber therein and inlet and outlet ports communicating with said chamber, a rotor arranged within said compression chamber, a motor for driving said rotor, means including a blade slidably mounted in said block and movable into contact with said rotor for compressing fluid in said chamber, first spring means for retaining said blade in a retracted position within said block for unloading said compressor, means effective during operation of said motor and said compressor for supplying lubricant to operating parts thereof, second spring means for holding said blade in contact with said rotor for loading said compressor, mechanism associated with said first spring means including a movable lubricant collecting receptacle for receiving some of the lubricant supplied to said compressor and motor parts, and said mechanism being responsive to a predetermined accumulation of lubricant in said receptacle for rendering said first spring means ineffective and for rendering said second spring means effective.

6. A fluid compressor including a cylinder block having a compression chamber therein and inlet and outlet ports communicating with said chamber, a rotor arranged within said com-

pression chamber, a motor for driving said rotor, means including a blade slidably mounted in said block and movable into contact with said rotor for compressing fluid in said chamber, first spring means for retaining said blade in a retracted position within said block for unloading said compressor, means effective during operation of said motor and said compressor for supplying lubricant to operating parts thereof, second spring means for holding said blade in contact with said rotor for loading said compressor, mechanism associated with said first spring means including a movable lubricant collecting receptacle for receiving some of the lubricant supplied to said compressor and motor parts, and said mechanism being responsive to a predetermined accumulation of lubricant in said receptacle for rendering said first spring means ineffective and for rendering said second spring means effective, said lubricant collecting receptacle being provided with a restricted opening permitting lubricant accumulated therein to drain therefrom during periods of inoperation of said motor for rendering said first spring means effective and said second spring means ineffective.

7. A fluid compressor including a cylinder block having a compression chamber therein and inlet and outlet ports communicating with said chamber, a rotor arranged within said compression chamber, a motor for driving said rotor, means including a blade slidably mounted in said cylinder block and adapted to contact said rotor to cause fluid to be compressed in said chamber, means for biasing said blade to a position out of contact with said rotor to unload said compressor, means for biasing said blade into contact with said rotor to load said compressor, means effective during operation of said compressor for supplying lubricant to moving parts thereof, said first named biasing means including a receptacle portion for receiving and collecting some of the lubricant supplied to said compressor parts whereby lubricant accumulated therein renders the same ineffective and renders said second named biasing means effective, and means for removing lubricant from said receptacle portion of said first named biasing means during periods of inoperation of said compressor whereby said first named biasing means is rendered effective to overcome the biasing of said second named biasing means.

8. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a direction tending to move said blade toward said rotor, a pump effective during operation of said compressor for circulating oil to operating parts thereof, a second biasing means rendered effective in response to stopping the operation of said compressor and arranged for exerting a force to said blade biasing means in a direction opposed to and of greater intensity than the force exerted thereby to overcome the biasing effect thereof and move said blade out of engagement with said rotor to unload said compressor, and said second biasing means being rendered ineffective by the flow of oil from said pump during operation of said compressor to render said first biasing means effective to move said blade into engagement with said rotor for causing fluid to be compressed in said chamber..

9. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a direction tending to hold said blade in contact with said rotor for causing fluid to be compressed in said chamber, a pump effective during operation of said compressor for circulating oil to operating parts thereof, a second biasing means stronger than the first biasing means and arranged with its biasing effect opposed to that of the first biasing means, the second biasing means being rendered effective in response to stopping the operation of said compressor for moving said blade against the biasing effect of said first biasing means and out of contact with said rotor to unload said compressor, and said second biasing means being rendered ineffective by the flow of oil from said pump.

10. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a direction tending to hold said blade in contact with said rotor for causing fluid to be compressed in said chamber, a pump effective during operation of said compressor for circulating oil to operating parts thereof, and a second biasing means stronger than the first biasing means and adapted to oppose and overcome the biasing effect of said first biasing means and to push said blade out of contact with said rotor for unloading said compressor, said second biasing means being rendered effective in response to stopping the operation of said compressor and rendered ineffective by the flow of oil from said pump.

11. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a direction tending to move said blade toward said rotor, a pump effective during operation of said compressor for circulating oil to operating parts thereof, and a second biasing means stronger than the first biasing means and arranged with its biasing effect opposed to that of the first biasing means, the second biasing means comprising a biasing element and means biased and movable thereby, the bias of the last named means being overcome by oil circulated by the pump during operation of the compressor and the last named means being movable in opposition to the first biasing means, whereby the first biasing means is effective to move the blade into engagement with the rotor and to maintain it in engagement therewith during operation of the compressor while at other times the second biasing means is effective to overcome the first biasing means and thereby unload the compressor.

12. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a

direction tending to move said blade toward said rotor, a pump effective during operation of said compressor for circulating oil to operating parts thereof, a second biasing means stronger than the first biasing means and arranged with its biasing effect opposed to that of the first biasing means, the second biasing means comprising a biased movable element the bias of which is overcome by oil circulated by the pump during operation of the compressor, and a lost-motion connection between the first and second biasing means, whereby the first biasing means is effective to move the blade into engagement with the rotor and to maintain it in engagement therewith during operation of the compressor while at other times the second biasing means is effective to move at least a part of and thereby overcome the first biasing means to unload the compressor.

13. A compressor including a member having a compression chamber therein and provided with inlet and outlet ports communicating with said chamber, a rotor within said chamber, a motor for driving said rotor, a blade slidably mounted in said member intermediate said ports, a first biasing means exerting at all times a force in a direction tending to move said blade toward said rotor, a pump effective during operation of said compressor for circulating oil to operating parts thereof, a second biasing means stronger than the first biasing means and arranged with its biasing effect opposed to that of the first biasing means, the second biasing means comprising a biased movable element the bias of which is overcome by oil circulated by the pump during operation of the compressor, and a lost-motion connection between the blade and second biasing means, whereby the first biasing means moves the blade into engagement with the rotor and maintains it in engagement therewith during operation of the compressor while at other times the second biasing means disengages and moves the blade from the rotor and thereby unloads the compressor.

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