UNITED STATES PATENT OFFICE

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ROTARY COMPRESSOR LUBRICATION

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2 Claims. (Cl. 230—207)

The present invention relates to improvements in a rotary compressor, and it consists of the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide a rotary compressor in which the pumping unit has two arcuate pistons, each of which has a length less than 180°. Novel means is provided for continuously moving the pistons around an annular cylinder and for moving them at different speeds with respect to each other so that at one point of the cycle, one pair of adjacent piston ends will be spaced from each other to form a pocket that will receive fluid into the inlet passage. During the further movement of the pistons, this pocket will be gradually reduced in size and when the operating mechanism has advanced through a half circle, the pocket will be completely closed for expelling the trapped fluid or gas from the pocket into the outlet passage. As one pocket is slowly closing for discharging fluid or gas into the outlet passage, another pocket formed by the other pair of piston ends will be gradually opening to receive fluid or gas from the inlet passage.

A further object of my invention is to provide a device of the type described in which there are no reciprocating parts and in which the size of the fluid or gas receiving pockets can be altered for varying the capacity of the device for pumping. The device may be reversed in its operation for reversing the flow of fluid or gas in the passages so that what was formerly the inlet passage now becomes the outlet passage and what was formerly the outlet passage now becomes the inlet passage.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which:

Figure 1 is a longitudinal section through the device;
Figure 2 is an end elevation of the device when looking at the right-hand end of Figure 1;
Figure 3 is a horizontal section taken substantially along the line 3—3 of Figure 1 and showing certain of the parts in elevation;
Figure 4 is a transverse section taken along the line 4—4 of Figure 1;
Figure 5 is a section taken substantially along the line 5—5 of Figure 3;

Figure 6 is a transverse section taken along the line 6—6 of Figure 1:

Figure 7 is an end elevation of the pistons showing the piston sealing members received in grooves;

Figure 8 is a longitudinal section through the arcuate pistons and taken along the line 8—8 of Figure 7 for illustrating the piston sealing members; and

Figure 9 is a schematic showing of the piston operating mechanism illustrating how the pistons are alternately accelerated and decelerated in speed.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit and scope of the invention.

In carrying out my invention, I provide a casing indicated generally at A and this casing has a pump or compressor section shown at A1 and a housing shown at A2 for receiving the piston operating mechanism. It is best to describe the pump or compressor unit first and then to describe the operating mechanism.

Compressor unit

In Figure 6 I show a transverse section through the pump or compressor section A1 and it will be noted from this figure and from Figure 1 that a driven shaft 1 is rotatably mounted in a bearing 2, the bearing being secured to the section A1 by screws 3 or other suitable fastening means.

The shaft 1 has an enlarged cylindrical portion 4 that has an arcuate piston B (rectangular in cross section) rigidly secured thereto by screws 5 or other suitable fastening means. The inner periphery 8 of the piston B has the same radius as the shaft portion 4 and fits against this portion. The outer periphery 7 of the piston B is arcuate in shape and has a radius equal to the radius of the inner periphery 8 of the compressor section A1. The length of the piston B is less than 180° while the width of the piston is substantially the same as the width of the annular cylinder C. It will be seen from the construction that a rotation of the shaft 1 will rotate the piston B in the annular continuous cylinder C.

A hollow shaft 9 is rotatably mounted on the reduced portion of the shaft 1 and has an enlarged cylindrical portion 10 of the same size as the portion 4. The portions 4 and 10 have their adjacent ends abutting each other and they ex-
tend from end to end of the compressor section A. A second arcuate piston B' of the same shape and size as the piston B is secured to the portion 10 by screws 11, so that a rotation of the hollow shaft 9 will cause a similar rotation of the piston B'. Reference to Figure 6 shows the compressor section A being provided with a fluid or gas inlet passage 12 and a fluid or gas outlet passage 13, the inlet being disposed about an 180° away from the outlet. A recess 12a formed in the periphery 8 communicates with the inlet 12 and a recess 13a formed in the periphery 8 communicates with the outlet 13. The recess 13a extends from the outlet 13 to a short distance from the inlet 12 and the recess 12a extends from the inlet 12 to a short distance from the outlet 13.

Piston actuating means

I will now describe the means for moving the pistons in the cylinder and for causing them to move relative to each other for forming pockets in the cylinder and between the piston ends, the pockets being at their maximum capacities when they pass the inlet 12 and entirely collapsed when they pass the outlet 13. In Figure 1, I show a drive-shaft 14 that is eccentrically mounted in a bearing 15. The bearing is secured to the housing A2 by cap screws 16 or other suitable fastening means. The shaft 14 has a lever 17 connected thereto so as to rotate therewith. The ends of the lever 17 have links 18 and 19 pivotedly secured thereto at 20 and 21. The link 18 has its free end pivotedly secured through an arm 22 at 23, see Figure 4, while the link 19 has its free end pivotedly secured to an arm 24 at 25. The arm 22 is rigidly secured to the driven shaft 1. It will be noted from Figure 1 that the axis of the shaft 14 is eccentric to the axis of the shaft 1.

A rotation of the drive-shaft 14 will cause the lever 17 to move the links 18 and 19 and the arms 22 and 24 in a pecular manner. This movement will cause the pistons to move relative to one another and the piston ends will form pockets D and D' therebetween that will be at their greatest capacity when disposed opposite the inlet 12 and will be entirely closed when disposed opposite the outlet 13. I show a diagrammatic sketch in Figure 9 in which the eccentric lever 17 (shown by a single line) is moved through an arc of substantially 90° (shown by a broken line) to illustrate two different relative positions of the arms 22 and 24 (shown by single lines and broken lines).

Since the pistons B and B' are directly connected to the arms, they will be moved in the same manner as the arms are moved. Figure 9 corresponds to Figure 4, and shows the parts rotating in a counterclockwise direction when looking at the left hand end of Figure 1, and this is depicted as a clockwise rotation in Figure 6 because these parts are being viewed from the opposite end of the machine; i.e., the opposite end of Figure 1.

During the rotation of the lever 17 through 90°, the point 20 advances one fourth the distance on the circle a, and the point 23 will advance a similar distance on the circle b which will be more than on the circle a because the circle b (which is the path taken by the arms 22 and 24) is smaller in diameter than the circle a (which is the path taken by the ends of the lever 17). In like manner, the point 25 will be advanced more than 90° on the circle b while the point 21 moves through an arc of 90° on the circle a. The two circles a and b are not only of different diameters, but their centers are spaced apart. The centers are so placed that portions of the two circles disposed at the top of Figure 9 will lie closest to each other.

This will cause the arm 24 to swing through a greater arc, during the 90° swing of the lever 17, than the arm 22, and the piston B', connected to the arm 24 through the shaft 1 will move faster than the piston B', and this will close the pocket D.

This faster movement of the piston B over the piston B' will continue while the lever 17 swings through an arc of 180° and at the completion of the swing, the pocket D will be entirely closed and the pocket D' fully opened. The next half circle swing of the lever 17 will reverse the relative movements of the pistons, and while both pistons will continue rotating in a clockwise direction when looking at Figure 6, the piston B' will move faster than the piston B and the pocket D' will be gradually closed while the pocket D will be gradually opened.

Referring to Figure 6, it will be noted that the clockwise rotation of the pistons will cause the pockets to receive the gas or fluid from the inlet 12 and force it out through the outlet 13. The device acts as a compressor in this way. There is no reciprocation of the parts, yet a pumping or compressing action is achieved. This is a great improvement over the usual reciprocating piston compressor or the rotator or planetary piston type of compressor. The compressor can be reversed in operation.

In Figures 7 and 8, I show the arcuate pistons B and B' provided with sets of oil sealing members arranged adjacent to the ends of the pistons. Each set is identical so a description of one will suffice for all. Figure 8 shows a bar 26 extending across the piston B and receivable in a groove 26a. A corrugated spring 26b is placed in the groove and urges the bar against the inner peripheral wall 8. Radially extending bars 27 are placed in grooves 27a and corrugated springs 27b urge the bars into contact with the adjacent walls of the annular cylinder C. Another bar 26c paralleling the bar 26 bears against the cylindrical portion 10 of the hollow shaft 9. The similar bar 26c on the piston B' bears against the enlarged portion 6 of the driven shaft 1. The abutting ends of the bars are formed with half-lap joints so that a continuous sealing member will be provided adjacent to each end of each piston.

It is possible to have the pistons B and B' operate in a dry condition when it is desired to pump a gas. The operating parts contained in the housing A2 are immersed in oil or other lubricant and a bearing 28 prevents the oil from passing into the annular cylinder C. The bearing 28 rotatably supports the hollow shaft 9. Oil or lubricant passageways 29 are provided in the pump or compressor section A1 at points where they will not interfere with the movement of the pistons B and B' along the annular cylinder, see Figure 6.

A cap 30 is placed over the bearing 2 and is secured to the section A1 by cap screws 31. The cap 30 constitutes an oil reservoir and will keep the shaft 1 lubricated at all times. The oil or lubricant can pass from the housing A2 into the interior of the cap 30 and vice versa through all of the parts lubricated. At the same time the bearings 2 and 28 will prevent the oil from entering the annular cylinder C. If desired, oil seals (not shown), may be provided between the bearings 2 and 28 and the pump or compressor section A1.

The housing A2 has a cover plate 32 by means of which oil or lubricant may be added.

I claim:

1. In combination; a valveless rotary compressor comprising an endless annular cylinder...
having an inlet and an outlet; a pair of pistons movable along the cylinder and forming gas or fluid-receiving pockets between their ends; a shaft rigidly connected to one of the pistons for moving it in the cylinder; a hollow shaft enclosing a portion of the first shaft and being rigidly connected to the other piston for moving it; arms for rotating said shafts; links for actuating the arms; an eccentric shaft; a member rotated by the eccentric shaft and being connected to the links for causing the latter to accelerate and decelerate the pistons in a predetermined manner for causing the piston ends to form pockets which will vary in size for drawing the gas or fluid into the inlet and for exhausting it through the outlet; a lubricant-receiving compartment housing the arms, links and member for lubricating these parts constantly; a bearing for the hollow shaft and sealing off the compartment from the cylinder for preventing the lubricant from reaching the cylinder or pistons; a bearing for the first shaft; a second lubricant-receiving compartment housing the last-named bearing for lubricating it constantly; the second bearing sealing off the second compartment from the cylinder; and lubricant-conveying passages placing the compartments in communication with each other and passing around the cylinder so that the lubricant in the first compartment will flow to the second one to keep the parts in each compartment lubricated.

2. In a rotary valveless compressor, a casing having an annular cylinder therein, pistons movable in the cylinder, a pair of shafts rigidly connected to the pistons for moving them, means disposed on one side of said cylinder for rotating said shafts, a lubricant retaining reservoir housing said means and keeping said means lubricated, a bearing for one of said shafts disposed on the other side of the cylinder, a second lubricant retaining reservoir for housing said bearing, said casing having passages lying outside of the annular cylinder and placing the reservoirs in communication with each other for transmission of a lubricant without the lubricant entering the annular cylinder, said first named reservoir having a cover for permitting lubricant to be added as needed.

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