Nov. 16, 1948. R. FLANAGAN 2,454,048

ROTARY AIR COMPRESSOR

Filed July 30, 1943

Fig. 1.

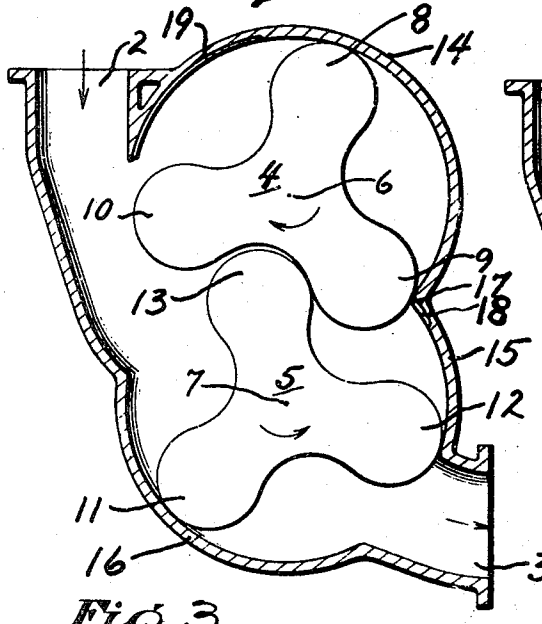


Fig. 2.

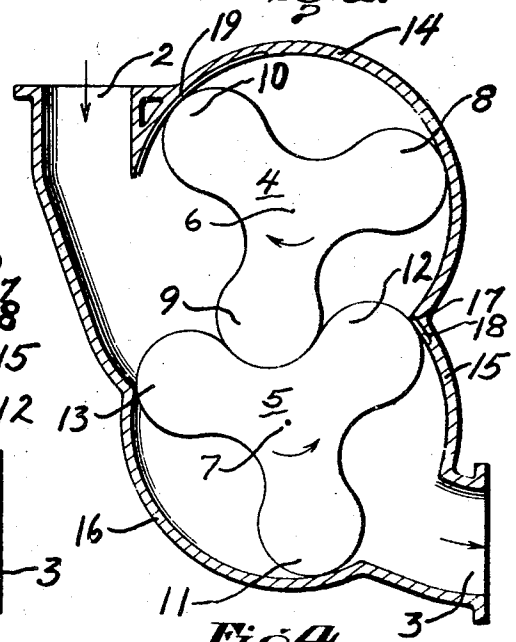


Fig. 3.

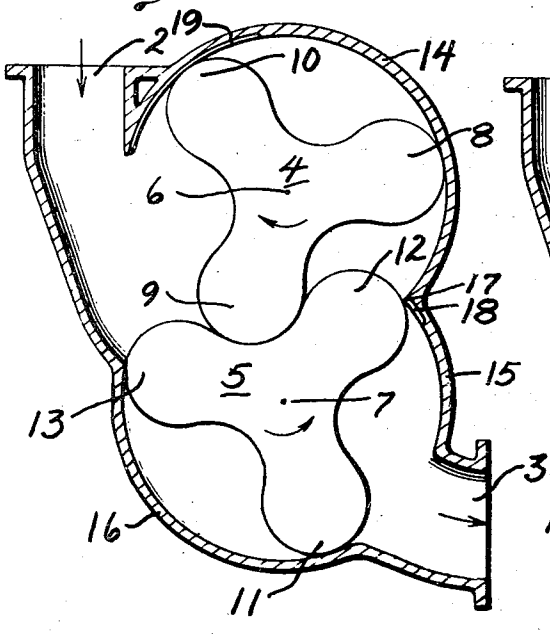
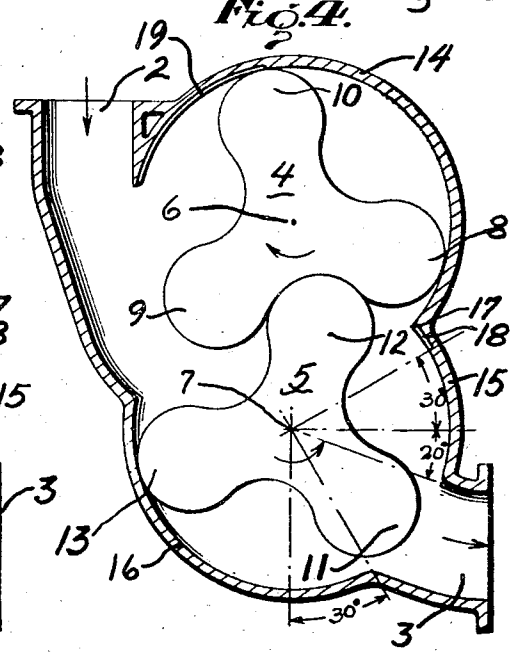


Fig. 4.



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ROTARY AIR COMPRESSOR

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2 Claims. (Cl. 230—141)

1

This invention relates to an improved rotary air compressor or supercharger and more particularly to a blower of the Root's type including novel means for compressing fluid air prior to its discharge through an outlet conduit.

The conventional type of Root's blower has provided no means for compressing fluid air between the rotors immediately prior to the transfer thereof to an outlet conduit, and thus there is built up at the outlet conduit an increase in pressure tending to cause the fluid air to rush back into the lower pressure space between the rotor and housing, which air under pressure is then carried over into the exhaust conduit by the operation of the rotor. The latter mode of operation, however, is inefficient and noisy due to the back rush of air into the relative low pressure area within the space between the rotor and housing.

An object of my invention, therefore, is to provide a novel arrangement whereby fluid air is adiabatically compressed during the operation of the blower so as to increase the pressure of the fluid air carried between the rotor and the housing for preventing a back rush of air from the outlet conduit.

Another object of my invention is to provide novel means for reducing the impulse loading of a rotary blower, and thereby increase the efficiency of the operation thereof.

Another object of my invention is to provide novel means for reducing the noise due to the back rush of air which accompanies the operation of the conventional type of Root's blower.

Another object of my invention is to provide a novel rotary pump comprising a pair of intermeshing impeller rotors arranged in such a manner that a fluid medium such as air may be compressed between intermeshing lobes thereof immediately prior to the transfer of such air to an outlet conduit.

Another object of my invention is to provide simple, efficient and novel means whereby fluid air may be drawn into a rotary pump and adiabatically compressed between rotating blades thereof immediately prior to its release through an outlet conduit. Thus by my novel arrangement an increased pressure is provided for preventing a back rush of air into said pump.

Another object of my invention is to provide a novel rotary blower comprising a pair of rotary impeller blades for drawing into said blower a supply of fluid air, compressing said supply of fluid air between said impeller blades and including means for exhausting said compressed air at predetermined intervals.

2

Another object of my invention is to provide a novel rotary impeller blade arrangement whereby a supply of air may be compressed between oppositely rotating impeller blades and released under pressure through an outlet conduit.

Another object of my invention is to provide a novel rotary impeller blade arrangement for adiabatically compressing a fluid medium and controlling the release of said compressed fluid medium through an exhaust conduit without the use of spring biased valve means having wearing parts which may readily become worn in operation.

A further object of my invention is to provide a compact air compressor and blower of great efficiency in comparison to its size and of such simplicity in construction as to adapt it for manufacture and installation at low cost.

Other objects and advantages of this invention are set forth in the following description, taken with the accompanying drawings; and the novel features thereof are pointed out in the appended claims. The disclosure, however, is illustrative only and we may make changes in detail, especially in matters of shape, size and arrangement of parts within the principle of the invention to the full extent indicated by the broad and general meanings of the terms in which the appended claims are expressed.

In the accompanying drawings which form a part of this specification like characters of reference indicate like parts in the several views wherein:

Figure 1 is a diagrammatic sectional view of a rotary blower embodying my invention with the impeller lobes or blades in position for starting compression of a fluid air medium;

Figure 2 is a similar view illustrating the impeller lobes or blades moved to a position for compressing said fluid air medium;

Figure 3 is a similar view illustrating the impeller lobes or blades moved to a position for compressing said fluid air medium to its highest degree;

Figure 4 is a similar view showing the impeller lobes or blades moved to a position for releasing said compressed fluid air medium to an exhaust conduit.

Referring more particularly to the drawings it will be seen that the pump comprises a main housing 1 having an intake port 2 and a discharge port 3. The housing encloses a pump of the opposed impeller rotor type, which pump is pro-

vided with two impeller rotors 4 and 5. The impeller rotors 4 and 5 having the center points 6 and 7 are rotatably mounted within the housing 1 at the ends of suitable drive shafts not shown. The said shafts are concentrically affixed at the ends thereof to the rotors 4 and 5 and journalled in the housing 1 in a manner well known in the art. The shafts are preferably mechanically connected exteriorly of the housing 1 by suitable piloting gears not shown, but which may be of any suitable type well known in the art. The said gears may be in turn driven by suitable power means not shown so as to rotate the impeller rotor 4 in a clockwise direction and the impeller rotor 5 in a counter-clockwise direction as indicated by the arrows in the Figures 1, 2, 3 and 4.

The impeller rotor 4 has provided the impeller blades or lobes 8, 9 and 10 while the impeller rotor 5 has similarly provided the impeller blades or lobes 11, 12 and 13 intermeshing with the blades or lobes 8, 9 and 10 as shown in Figures 1, 2, 3 and 4, so as to form a seal between themselves against the flow of fluid between each other.

While the rotors 4 and 5 may operate in contacting relation, however, in order to eliminate rubbing friction, the rotors of blowers of this type are preferably so dimensioned as to provide a small clearance of a few thousandths of an inch between themselves and between themselves and their housing and the same may be driven in proper registry with one another by the pilot gearing previously noted or in any other convenient manner so that the rotor lobes or teeth are relieved of any driving duty and the small clearance of a few thousandths of an inch insures that the surfaces of the rotors themselves do not touch either each other or their housing at any point in their operation. The said clearance of a few thousandths of an inch is, however, sufficiently small so that a substantial seal is formed between the rotors and housing against the flow of a fluid medium such as air between the rotors or between the rotors and their housing.

Although the rotors are referred to as forming a "seal" between themselves and their housing against the flow of the fluid medium between each other or between themselves and their housing, it will be readily understood that there may be a small clearance and that the rotors and the housing may not actually touch each other at any point in their operation.

The rotor housing 1 has provided the side wall 14 which partially encircles the rotor 4 along an arch formed by the tips of the lobes 8, 9 and 10 of the rotor 4. There is further provided by the housing 1 the side walls 15 and 16 which partially encircle the rotor 5 along an arc formed by the tips of lobes 11, 12 and 13 of the rotor 5.

The inlet port 2 opens into the interior of the casing 1 at a point between an end of the side wall 14 and an end of the side wall 16, while the outlet port 3 leads from the interior of the casing 1 at a point between another end of the side wall 16 and an end of the side wall 15. The side walls 14 and 15 are connected at the other ends thereof at a point 17.

The tips of the lobes 8, 9 and 10, as shown in Figures 1, 2, 3 and 4, are arranged to move in sealing relation along the arc like inner surface of the wall 14 in a clockwise direction from the inlet port 2 toward the point 17 at which the wall 15 is connected, so as to draw a supply of air from the inlet conduit 2 into the housing 1.

The tips of the lobes 11, 12 and 13 are likewise arranged to move along the arc like inner surface of the wall 16 in sealing relation therewith in a counterclockwise direction from the inlet port 2 toward the outlet port 3 and thus forcing a supply of air at a relatively low pressure from the inlet conduit 2 through the housing 1 and out the outlet 3. The tips of the lobes 11, 12 and 13 are likewise arranged to move in sealing relation along the arc like inner surface of the wall 15 in a counterclockwise direction from the outlet port 3 toward the point 17 at which the wall 14 is connected.

As may readily be seen from Figures 1, 2 and 3 as the lobes 11, 12 and 13 move along the arc like inner surface of the wall 15 any fluid medium such as air carried between such lobe of the rotor 5 and a lobe of the rotor 4 will be compressed as the lobe of the rotor 5 moves from the exhaust port end of the wall 15 toward the point 17. The fluid medium is released through exhaust port 3 at a relatively high pressure, upon the said lobe being rotated past said point 17, as shown in Figure 4. The compression operation is, of course repeated upon the next succeeding lobe of the rotor 5 passing along the arc like surface of the wall 15. Thus the lobes 11, 12 and 13 of the rotor 5 will alternately open and close the outlet 3 to the passage of the compressed fluid medium.

Further extending from the point 17 along a portion of the inner arc like surface of the wall 15 there may be provided a relief channel 18 to prevent the overcompression of the said fluid medium carried between the rotors 4 and 5.

As may be readily seen by varying the length of relief channel 18 the compression ratio may be varied. However, if the maximum compression be desired the relief channel 18 may not be provided.

In operation it will be seen that the compression cycle described will cause a rise in the temperature of the wall 14 nearest the point 17, while that portion of the wall 14 nearest the inlet 2 will be kept at a relatively lower temperature due to the difference in temperatures of the fluid medium or air at the inlet and compression points. Such rise in temperature will tend to cause expansion of that portion of the wall 14 adjacent the point 17, whereupon that portion of the wall 14 adjacent the inlet and kept at a lower temperature will tend to flex inward and toward the impeller rotor 4.

In order to compensate for such inward flexing of the wall 14 at the inlet point, I have provided the wall 14 with a channel 19 extending along a portion of the inner surface of the wall 14 so that under normal temperature conditions the inlet end of the wall 14 at the channel 19 may be slightly spaced apart from the outer ends of the rotor 4. However, upon an extreme temperature differential between the opposite points of the wall 14, the wall 14 may flex slightly inward along the channel 19 without impeding the operation of the rotor 4. Such means will thus provide for the more efficient operation of my device.

As previously explained the conventional type of rotary compressor of the Root's blower type operates under a constant pressure cycle, that is a pressure is built up at the outlet which tends to rush back into the lower pressure space between rotor and housing. This air is then swept into or carried over into the exhaust port which operation requires greater mechanical work than under my present invention. Moreover the back rush of air into the lower pressure space is accompanied with objectionable noise.

Under my present invention, however, the air is squeezed or compressed between opposite lobes of

the rotors prior to discharge of the air to the exhaust. This is shown by Figures 2 and 3 wherein the air between the lobes 8 and 12 of the rotors 4 and 5, respectively, is shown in the process of being compressed. Prior to release the pressure of the air compressed through the above means is increased to such a degree that upon release of the same as shown in Figure 4, there is no backing up or in-rush of air, but rather the compressed air carried in the space separating the lobes 8 and 11 of the rotors 4 and 5, passes directly out the exhaust conduit 3 under the compression force thereof. Such action thereby reduces noise or the popping effect due to a back-rush of air. Further through my novel arrangement the impulse loading of the compressor is reduced, thereby increasing the efficiency thereof.

Moreover, I have provided simple and efficient means for adiabatically compressing a fluid medium without use of spring biased valve means having wearing parts which may become worn in operation.

Although only one embodiment of the invention has been illustrated and described, various changes in the form and relative arrangement of the parts, which will now appear to those skilled in the art, may be made without departing from the scope of the invention. Reference is, therefore, to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A rotary air compressor comprising, in combination, a first rotor, a second rotor, first impeller lobes formed on said first rotor, second impeller lobes formed on said second rotor, said first and second impeller lobes intermeshing in sealing relation, a first wall partially encircling the first rotor and forming a compression chamber, a second wall and a third wall partially encircling the second rotor and forming another compression chamber, an air inlet conduit from atmosphere opening between the first and second walls and into the compression chambers, and an air outlet conduit to atmosphere opening from said other compression chamber and between the second and third walls only, said first lobes moving in sealing relation along the first wall toward said third wall,

said second lobes moving in sealing relation along said second wall toward said outlet conduit for forcing a supply of air at a relatively low pressure to said outlet conduit, and said second lobes moving in sealing relation along the third wall toward said first wall and cooperating in sealing engagement with said first lobes in such a manner as to compress between said first and third walls and said first and second lobes a supply of air at a relatively high pressure, said first and second lobes so arranged as to release said high pressure air supply to said outlet conduit after said low pressure air supply and in such a manner as to prevent a back rush of air into said compressor.

2. In a pump comprising a housing having an air inlet and outlet, a first movable member mounted within said housing and arranged in such a manner as to draw air into said housing through said inlet and force such air out said outlet at a relatively low pressure, a second movable member mounted within said housing and arranged in such a manner as to draw air into said housing through said inlet, said second movable member cooperating in sealing engagement with said first movable member so as to compress the latter air between said first and second members to a relatively high pressure, and said first movable member controlling the supply of said air at said relatively high pressure to said outlet conduit so as to prevent a back rush of air into said housing through said outlet conduit.

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