May 12, 1942. E. J. BEACH 2,283,033

ROTARY VACUUM PUMP

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Fig. 1.

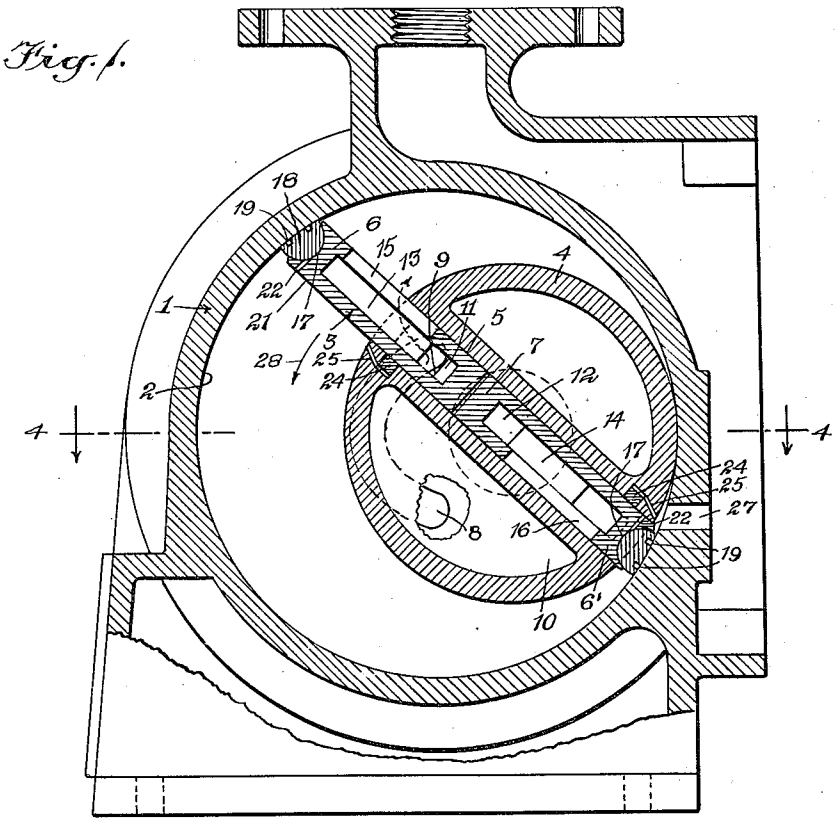


Fig. 2.

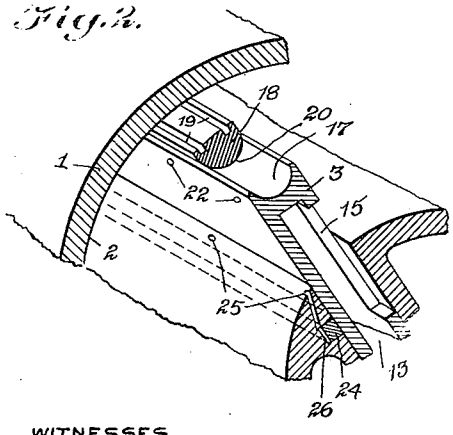
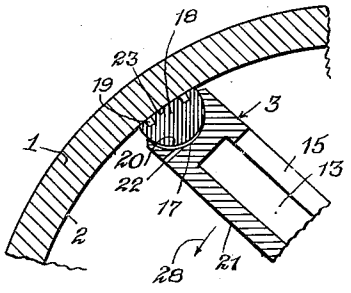


Fig. 3.



WITNESSES

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Fig. 4.

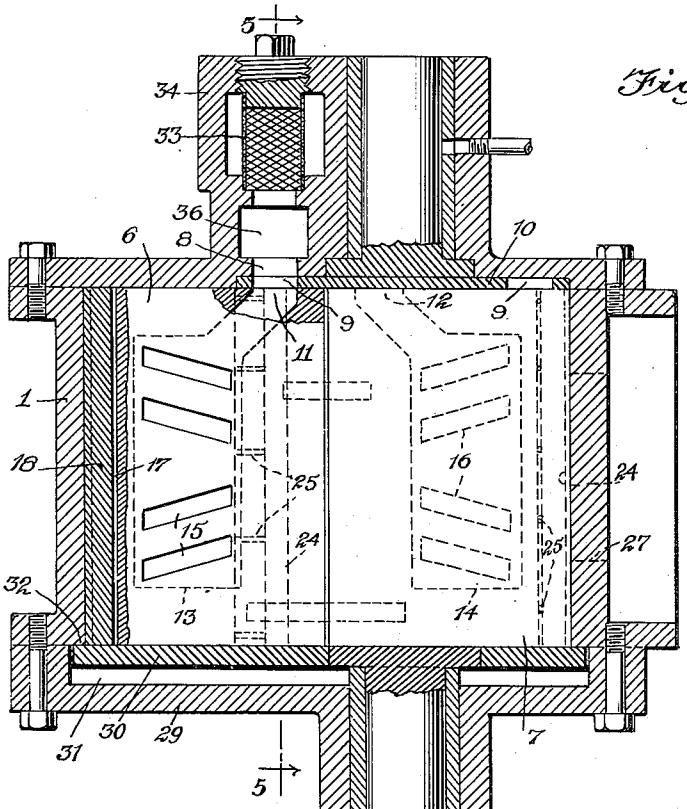
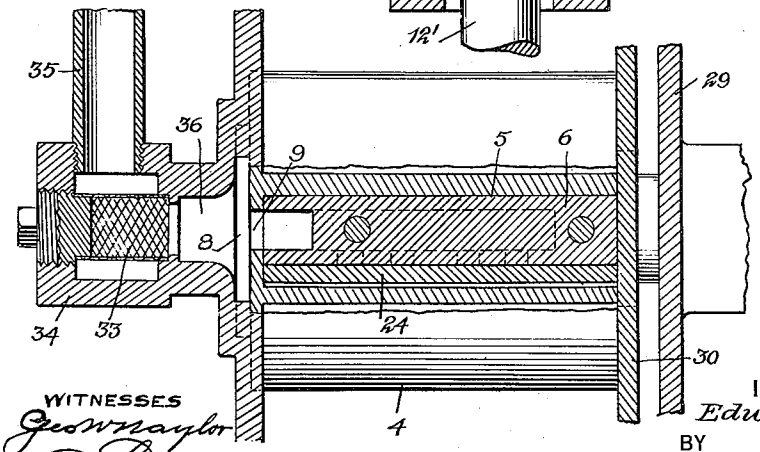


Fig. 5.



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Patented May 12, 1942 2,283,033

UNITED STATES PATENT OFFICE

2,283,033

ROTARY VACUUM PUMP

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Application April 6, 1940, Serial No. 328,255

1 Claim. (Cl. 230—153)

This invention relates to rotary pumps and particularly to an improved rotary vacuum pump, an object being to provide a construction wherein a high rarefaction may be secured from a rotary pump.

Another object of the invention is to provide a rotary vacuum pump wherein pressure actuated packing strips are used to maintain a tight connection between the sliding parts of the pump even after considerable wear on the same.

A further object of the invention is to provide a rotary pump of the kind disclosed in my Patent No. 2,200,198 wherein the contact edges of the blades are provided with rockable packing strips and the rotor is provided with movable packing strips actuated by pressure from the pressure side of the blades.

In the accompanying drawings—

Fig. 1 is a vertical sectional view through a pump disclosing an embodiment of the invention;

Fig. 2 is a sectional perspective view of a portion of the pump shown in Fig. 1 and illustrating the arrangement of the respective packing strips;

Fig. 3 is an enlarged fragmentary sectional view showing one of the contacting strips and how the pressure from the pressure side of the piston swings the strip into full functioning position at all times regardless of wear;

Fig. 4 is a sectional view through Fig. 1 approximately on the line 4—4;

Fig. 5 is a fragmentary sectional view through Fig. 2 approximately on the line 5—5.

Referring to the accompanying drawings by numerals, 1 indicates a cylinder having a surface 2 against which the blade 3 contacts as the same functions. Arranged in the cylinder 1 is a rotor 4, having a passageway 5 extending therethrough for accommodating the blade 3. This blade is divided into parts 6 and 7 which are identical. The cylinder or casing 1 is provided with an inlet opening 8 which is arc-shaped and which at various times registers with the openings 9 in the end or head 10 of rotor 4. The respective parts 6 and 7 are provided with ports 11 and 12 which are brought into register with opening 9 and which are in continuous communication with the chambers 13 and 14. It will be observed from Fig. 1 that chamber 13 has an openings 15 facing in one direction, while chamber 14 has an openings 16 facing in the opposite direction. The parts just described are all set forth in Patent No. 2,200,198 above referred to and, therefore, form no part of the present invention except in combination.

The outer edge of each of the parts 6 and 7 is provided with a groove 17 the wall of which is substantially semi-circular or concave and in each groove is arranged a packing strip 18. This packing strip is provided with a plurality of longitudinally extending oil grooves 19 and a convex lower surface 20 which may snugly fit the groove 17. However, as the parts are used there will be a certain amount of wear and when this takes place pressure on the pressure side 21 of the blade 3 will enter through the various vents 22 into the groove 17 and move radially outwardly, or swing or tilt the strips 18 so that the outer surface 23 thereof will bear tightly against the surface 2. In this way the strips 18 are kept pressed tightly against the surface 2 so that there will be no leakage from the pressure side to the suction side. To maintain the rarefaction in the suction side properly supported there is also provided a packing member 24, which is shown rectangular in cross section but which could be made of some other shape without departing from the spirit of the invention. A packing member 24 is provided for each of the parts 6 and 7 of the blade 3 and a description of one will apply to both.

As shown in Figs. 1 and 2, the packing member 24 presses tightly against the pressure side of the blade 3 by reason of the fact that air or other fluid pressure may enter through the respective vents 25 into the socket 26 and force the member 24 into tight sliding connection with the blade 3. As all parts are well lubricated, the tight sliding connection will not produce an undesirable friction but will maintain the contact with the blade sufficiently tight to prevent the escape of air or other fluid matter past the blade into the suction side.

It will be understood, of course, that the port 8 may be connected to a tank or other device where rarefaction is desired. Air and oil are adapted to be forced out through the outlet 27 and may be discharged through suitable valves into an oil separator. As shown in Fig. 1, the piston consisting of rotor 4 and blade 3 moves in the direction of the arrow 28 and may be operated at varying speed but preferably at a comparatively low speed.

As shown in Fig. 4, the cylinder 1 has a permanent head or end 29 and a false head or disk 30. A chamber or space 31 is arranged between these two heads and this space is usually maintained substantially filled with oil to reduce wear.

This construction is desirable as the floating head or disk 30 provides an automatic by-pass that is useful under certain circumstances. For instance, when the pump is connected with a tank filled with air at atmospheric pressure and the pump started, the pressure on the outlet side of the pump will be appreciably higher than the atmosphere and, consequently, what air does not escape through the outlet port 27 will press against the disk 30 and move the same longitudinally of the cylinder 1 and allow the air to by-pass or leak past the ends of the sections 6 and 7. This will allow the pump to work in an easy manner when working under atmospheric pressure. As the tank or other device begins to be evacuated the atmospheric pressure acting in the space will cause the false head or disk 30 to rest firmly against the annular shoulder 32. This will result in the pump functioning in the desired manner to quickly raise the rarefaction in the tank to a high point and to maintain the same at a high point. When the pump is functioning fully and normally there is a comparatively small amount of air drawn in and, consequently, a comparatively small amount of air discharged through the outlet 27. This will readily be evident when it is realized that the tank being maintained evacuated has already a rather high rarefaction. In case all inlets to the tank were closed the pump would continue to function to secure the highest possible vacuum in the tank and would then rotate freely as it would be functioning in an almost perfect vacuum. As soon as air was admitted into the tank the strain on the pump would begin and increase in proportion to the amount of air admitted to the tank.

As shown in Fig. 5, a screen 33 is provided in the fitting 34 to which the pipe 35 is connected. In this way all air entering the pump must pass through the screen 33 which will exclude most, if not all, of the dirt. The fitting 34 is provided with a hollow enlargement 36 which fits over the inlet opening 8.

The rotor 4 is provided with a closed end 10, as shown in Figs. 1 and 4, said closed end having openings 9 which are positioned to register with the opening 8 in the end of cylinder 1 at different times as illustrated more particularly in Figs. 1 and 4. When the parts are positioned as shown in Fig. 1, the opening 11 will be in register with opening 9 of part 6 and the opening 9 will be in register with opening 8, but when the piston makes a half revolution the opening 12 of part 7 will be in register with the other opening 9 and said other opening 9 will be in register with the arc-shaped opening 8 and the opening 11 will be out of register. Therefore, it will be seen that during what may be termed the suction stroke of either section or part that particular section will have its opening in register with the opening 8 but during its compression stroke its opening will be out of register with the arc-shaped opening 8.

When the pump is first started a considerable volume of air is discharged but as the vacuum increases less and less air will be discharged. In Fig. 4 the shaft 12' indicates that power from any desired source may be applied to the rotor as this shaft is connected readily to or formed integral with the rotor 4. During the normal functioning of the pump the rotor 4 is adapted to rotate at a constant speed which is comparatively slow.

I claim:

In a vacuum pump, a circular casing, an eccentrically arranged rotor operating in said casing, said casing having an arc-shaped inlet in one end concentric to the axis of said rotor, and an outlet in the circular wall thereof, said rotor having a diametrical passageway extending therethrough and opening through one end thereof, said rotor having ports in one end thereof on opposite sides of said axis which are registrable with said arc-shaped inlet for a part of the rotation of said rotor and which open to said passageway, blade members slidable in said passageway, said blade members being hollow and the interiors thereof communicating with the interior of said casing by virtue of openings in the rear walls of said blade members respectively, said blade members having ports therein respectively which communicate with the interiors thereof and which also are registrable with the ports respectively in said rotor during the movement of said blade members, the end of the casing opposite that having the inlet therein being provided with a circular space, a fluid pressure resisted disk loosely surrounding a portion of said rotor and arranged within said space normally in contact with one end of the rotor and the adjacent surfaces of the blade members, and fluid in the space between the disk and the adjacent end of the casing, whereby the disk may move longitudinally of the casing to by-pass sufficient air to make starting of the pump easy.

EDWARD J. BEACH.