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ROTARY BLOWER WITH ABRADING CASING END WALLS
AND ABRADABLE ROTOR END PLATES
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2,491,678

Fig. 1

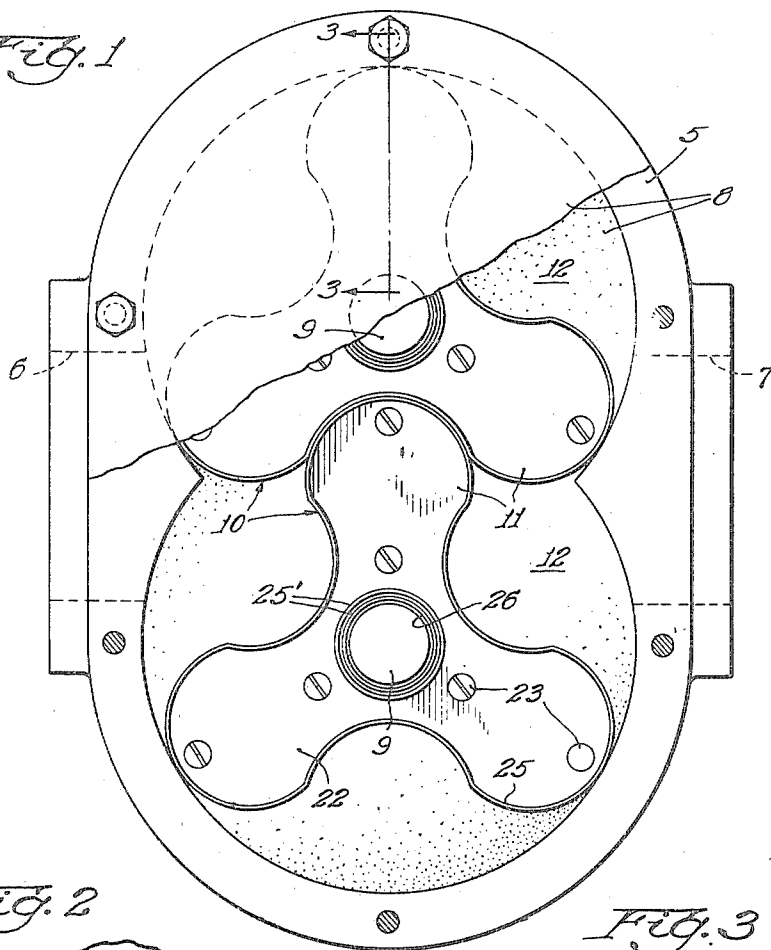


Fig. 2

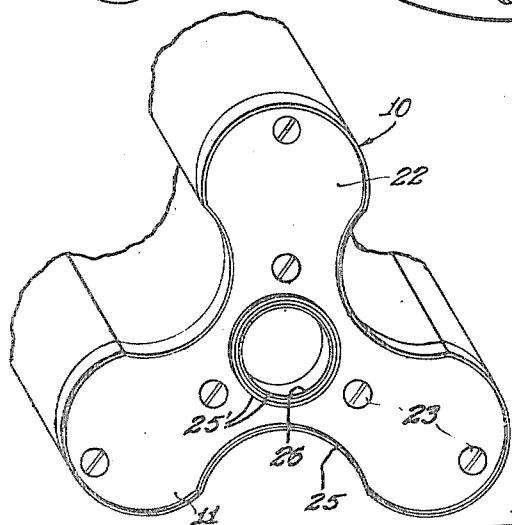
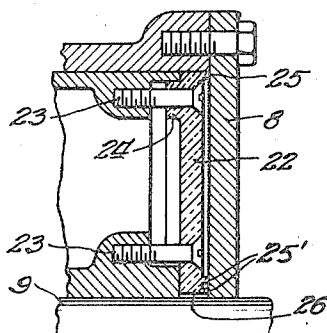


Fig. 3



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UNITED STATES PATENT OFFICE

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ROTARY BLOWER WITH ABRADING CASING
END WALLS AND ABRADABLE ROTOR END
PLATES

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Application December 9, 1943, Serial No. 514,150

5 Claims. (Cl. 230-141)

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This application is a continuation-in-part of the co-pending original application of Robert P. McCulloch and John L. Ryde for a Rotary blower, filed March 20, 1942, Serial No. 435,506 now issued as Patent No. 2,393,116, dated January 15, 1946.

This invention relates to rotary or positive displacement blowers or superchargers of the type used on Diesel engines to provide forced air induction and scavenging.

Such blowers comprise a pair of rotors having intermeshing lobes rotating in an appropriate housing or casing. The air or other fluid being pumped is trapped in the pockets between the lobes and the side walls of the casing and advanced from the inlet to the outlet. Consequently a pressure differential obtains between the inlet and outlet.

This pressure differential tends to cause leakage around the ends of the rotors, and notwithstanding the various refinements which have been incorporated in the design of these blowers, the leakage past the ends of the rotors constituted a serious limitation to their efficiency.

Heretofore this leakage was accepted as inherent and inevitable, for although the machining of the parts was conducted with the greatest accuracy, production tolerances had to be maintained. In addition, expansion clearance had to be provided. This follows from the fact that while the rotors and castings may be made of metal having the same coefficients of expansion and contraction, a load suddenly applied on a cold blower would result in rapid expansion of the rotors well in advance of any equivalent expansion on the part of the casing or housing.

Thus, unless adequate clearance existed between the ends of the rotors and the adjacent end walls of the casing or housing the rotors would bind and ruin the machine.

Prior to this invention, nothing was done to reduce this clearance for as stated hereinbefore, its presence was regarded as an inherent and inevitable characteristic of this type of machine. The present invention, however, does contemplate the provision of means to reduce the leakage past the ends of the rotors to an inappreciable minimum.

To this end, it is an object of this invention to provide sealing means so designed and constructed that it may be incorporated in blowers of this type without danger of having the rotors bind and without danger of pitting or scoring the surfaces of the end walls or the ends of the rotors.

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Another object of this invention resides in the provision of novel sealing means carried by the rotor and so designed and constructed as to accommodate itself to the particular installation and automatically maintain a close but smooth-running fit between the ends of the rotors and the adjacent end walls. In this connection, the most feasible arrangement is to provide the end plates or end walls of the housing with a grit blasted or abrading surface whereby any contact between the sealing means carried by the rotor and the end plates of the housing quickly abrade away the rotor sealing means whereby clearance is automatically provided for continued operation of the rotor.

Another object of this invention is to provide sealing means for the purpose described which may be quickly and easily replaced.

A further object of this invention is to provide sealing means for the purpose described which are carried by end walls or plates on the rotors and which present a thin edge or multiplicity of edges to the end walls of the housing or casing to automatically accommodate the seal to the installation without danger of scoring, pitting or otherwise injuring the rotors or any part of the blower.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate a complete example of a physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Fig. 1 is an end view of a blower embodying this invention, the end wall or cover plate thereof being broken away;

Fig. 2 is a perspective view of an end portion of a rotor illustrating the application of the sealing means thereto; and

Fig. 3 is a transverse sectional view through an end portion of the blower, taken on the plane of line 3-3 on Fig. 1.

Referring now particularly to the accompanying drawings, in which like numerals indicate like parts, the numeral 5 designates the casing or housing of a rotary or positive displacement

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type blower, the opposite side walls of which have an inlet 6 and an outlet 7 therein. The ends of the casing are closed by flat end walls 8 bolted or otherwise secured thereto. The inside face of each of the end walls 8 of the housing is deliberately roughened, as clearly indicated in Figs. 1 and 3, to provide an abrading surface. These end walls carry bearings not shown in which the shafts 9 of the rotors 10 rotate.

The rotors 10 are geared together by suitable gears (not shown) fixed to their shafts, and have intermeshing lobes 11 which sweep across the inner surfaces of the casing side walls and coact therewith to form pockets 12 in which the air or other fluid being pumped is entrapped and carried from the inlet to the outlet. Obviously, therefore, during the operation of the blower a pressure differential obtains between the inlet and outlet.

The pressure differential causes leakage around the ends of the rotors, that is, between the ends of the rotors and the adjacent flat inner surfaces of the end walls 8.

This indicates that a close fit between the lateral ends of the rotor lobes 11 and the housing end walls or closure plates 22 would materially reduce the leakage and for this reason the construction contemplated herein may be used to advantage.

A substantial seal having a minimum clearance between the rotor means and the end plate or plates is effected by means of the instrumentalities shown herein. In this construction, the rotor lobes are preferably hollow and an end plate 22, generally similar in configuration to the end of the rotor, is secured to each end of each rotor, thus providing end walls for the lobes 11 and the central or hub portions of the rotors.

These end plates 22 may be made in any suitable manner, but are preferably molded. They may have exactly the same contour as the rotors 10 and are readily removably secured thereto by screws 23.

To properly locate the end plates 22 on the ends of the rotors 10, dowel or pilot projections 24 extend from the inner surface of the plates to engage in accurately machined sockets in the ends of the rotors.

Around the perimeter of each end plate 22 is a thin ridge or rim 25. An equivalent ridge or plurality of ridges 25' also encircle the hole 26 which accommodates the rotor shaft 9. These ridges 25 and 25' are the only portions of the end plates which may contact the inner abrading surfaces of the housing end walls 8.

The end plates 22 are formed of material which will wear away without danger of scoring or pitting the surfaces of the end walls 8. A phenolic condensation product has been found admirably suited for this purpose as this material chars rather than flows under the influence of excessive heat so that the ridges 25 and 25' can be worn away during expansion of the rotor 10 without charring and danger of scoring or pitting the surfaces of the end walls 8. As stated hereinbefore, the inside surfaces of the end walls 8 are deliberately roughened to provide effective abrading surfaces. This roughness is necessary in order to insure rapid and uniform removal of the requisite amount of the surfaces of the end plates 22 of the rotor 10, as the rotor expands lengthwise, to provide working clearance and prevent binding of the rotor in the housing while maintaining a satisfactory seal between the end plates

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22 of the rotor and the end walls 8 of the housing.

As is clearly apparent from the above construction, the end plates 22 on the rotors 10 will be readily replaceable in the event they are worn sufficiently to detract from the efficiency of the blower. Thus, if the blower is operated at greater than normal speeds long enough for the heat to cause expansion of the rotors 10, wearing away the end edges of the plates 22 thereon, it is easy to replace these end plates with new ones so that the blower will have its desired efficiency at normal operating speeds. At the same time the blower has been prevented from seizing and locking or from damaging the parts thereof.

The material available for these end plates 22 varies but as in the case of "Bakelite," it is easily molded to form an inexpensive construction.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention materially improves the efficiency of rotary blowers by reducing the amount of leakage around the ends of the rotors to an inappreciable minimum and that the incorporation of the means employed to effect this result is practical and in nowise complicates the design of such blowers.

We claim:

1. A rotary blower including a housing having an end wall, a rotor journaled in said housing and having an end adjacent said end wall, and means for maintaining an optimum sealing relationship between said end wall of the housing and said adjacent end of the rotor, said means comprising a deliberately roughened metallic surface on said end wall of the housing providing an effective abrading area at least equal to the sweep of said adjacent end of the rotor, and an end plate attached to said adjacent end of the rotor and formed of a relatively readily abrading phenolic material such that, upon rotating contact of said end plate with said roughened surface on said end wall of the housing, the surface of said end plate engaged with said roughened surface is rapidly worn away to provide working clearance while maintaining an optimum sealing effect.

2. A rotary blower including a housing having an end wall, a rotor journaled in said housing and having an end adjacent said end wall, and means for maintaining an optimum sealing relationship between said end wall of the housing and said adjacent end of the rotor, said means comprising a deliberately roughened metallic surface on said end wall of the housing providing an effective abrading area at least equal to the sweep of said adjacent end of the rotor, and an end plate attached to said adjacent end of the rotor, said end plate having a configuration substantially corresponding to that of the end of the rotor and being provided with a continuous marginal ridge forming a rim at its outer periphery and on the side thereof confronting said roughened surface on said end wall of said housing, said end plate being formed of a relatively readily abrading phenolic material such that, upon rotating contact of said marginal ridge with said roughened surface, the marginal ridge on said end plate is rapidly abraded to provide working clearance while maintaining an optimum sealing effect.

3. A rotary blower including a housing having an end wall, a rotor journaled in said housing and having an end adjacent said end wall, and

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means for maintaining an optimum sealing relationship between said end wall of the housing and said adjacent end of the rotor, said means comprising a grit-blasted metallic surface on said end wall of the housing providing an effective abrading area at least equal to the sweep of said adjacent end of the rotor, and an end plate attached to said adjacent end of the rotor and formed of a relatively readily abradable phenolic material such that, upon rotating contact of said end plate with said grit-blasted surface on said end wall of the housing, the surface of said end plate engaged with said grit-blasted surface is rapidly abraded to provide working clearance while maintaining an optimum sealing effect.

4. A rotary blower including a housing having an end wall, a rotor journaled in said housing and having an end adjacent said end wall, and means for maintaining an optimum sealing relationship between said end wall of the housing and said adjacent end of the rotor, said means comprising a deliberately roughened metallic surface on said end wall of the housing providing an effective abrading area at least equal to the sweep of said adjacent end of the rotor, an end plate having a configuration substantially conforming to said adjacent end of the rotor, a plurality of dowels carried by said end plate, the rotor having a plurality of sockets formed therein receiving said dowels for positioning said end plate in predetermined relation to the rotor, and means securing said end plate to the rotor in said predetermined relation, said end plate being formed of a relatively readily abradable phenolic material such that, upon rotating contact of said end plate with said roughened surface on said end wall of the housing, the surface of said end plate engaged with said roughened surface is rapidly worn away to provide working clearance while maintaining an optimum sealing effect.

5. A rotary blower including a housing comprising a pair of end walls, a rotor journaled in said housing and disposed between said end walls

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and having the ends thereof adjacent said end walls, and means for maintaining an optimum sealing relationship between the end walls of the housing and the adjacent ends of the rotor, said means comprising a deliberately roughened metallic surface on the end walls of the housing providing effective abrading areas each of which is at least equal to the sweep of the end of the rotor, and an end plate attached to each end of the rotor and formed of a relatively readily abradable material of less hardness than the metallic abrading surfaces, so that upon rotating contact of the end plates with the abrading surfaces on the end walls of the housing the surfaces of the end plates of the rotor engaged with the abrading surfaces are rapidly worn away to provide working clearance while maintaining an optimum sealing effect.

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