

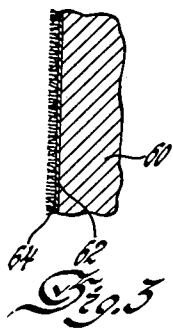
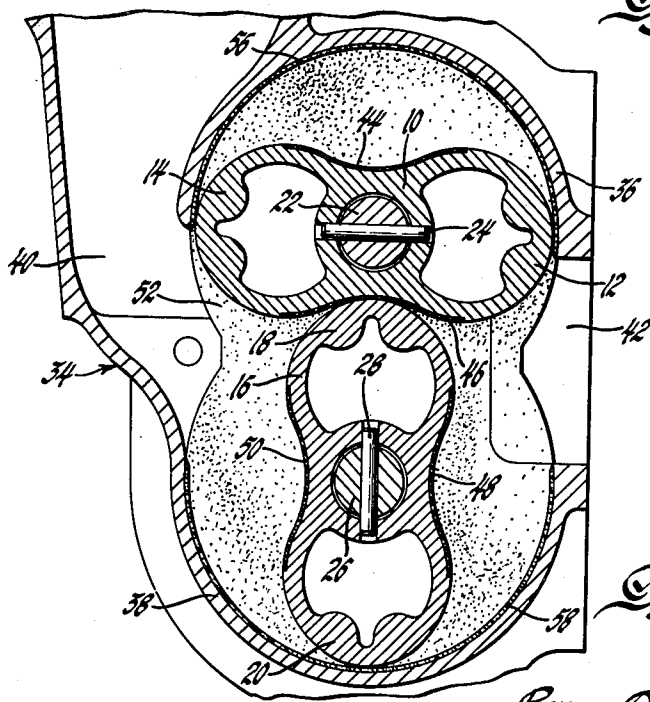
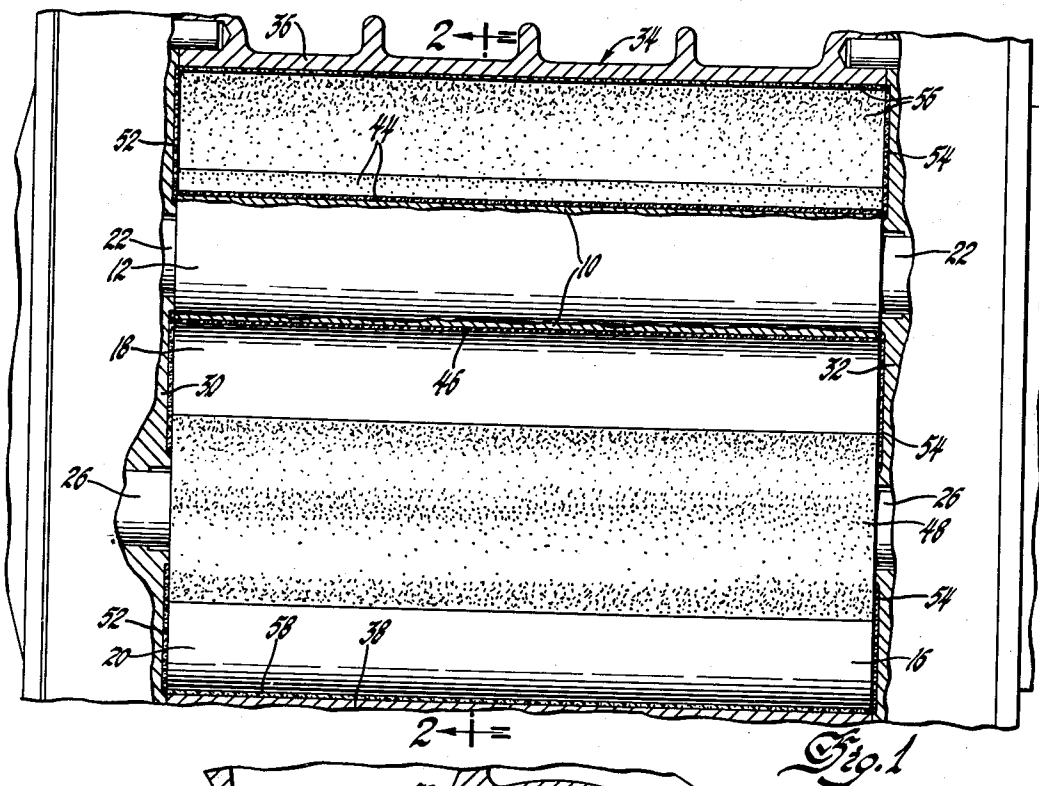
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ROTARY BLOWER

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2,754,050

ROTARY BLOWER

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This invention relates to rotary blowers or pumps of the positive displacement type, and to a method and means of increasing their volumetric efficiency.

It is well-known that in order to obtain maximum volumetric efficiency, the clearance between the rotors and between the rotors and their housing should be a minimum. On the other hand, the clearances must be sufficiently large that there will be no actual contact between these parts, since otherwise the high relative rubbing velocity of the usual metal-to-metal surfaces, especially if of similar metals, will develop high temperatures followed by seizure, by welding, and galling of the surfaces. Moreover, it is difficult to maintain the clearances at the desired minimum in service, because of differential expansion of the various blower parts, elastic deformations from various causes, wear of the driving gear and bearings, and manufacturing and assembly errors. Blowers with metal-to-metal relatively moving surfaces are therefore designed with clearances sufficiently large to assure that there will be no actual contact made under all the foregoing conditions. Expensive machining operations have been required in order to obtain the necessary accuracy of the parts such that the clearances are large enough that no actual metal-to-metal contact takes place and at the same time no clearances are too large.

Among the objects of the invention are the following: to provide a relatively simple rotary blower having high volumetric efficiency and in a relatively inexpensive manner, to provide a rotary blower having minimum clearance between the relatively moving parts, to provide a rotary blower having metal surfaces to which is adhesively bonded a coating of flock or fibers, to provide a blower having adjacent surfaces of its relatively moving parts of different materials, one of which is of metal and the other is a non-metallic coating consisting of an adhesive and fine flock or fiber particles, to provide a blower having a coating on surface portions consisting of an adhesive and fine rayon or similar fibers, a substantial proportion of which project outwardly from the surface; to provide a blower having minimum clearance between relatively moving parts and in which a coating consisting of adhesive and fine rayon, nylon or other flock is applied only to such parts that there will be no rubbing contact between two coated surfaces; and to provide a blower having surface portions thereof consisting of adhesive and flock particles of rayon or the like on only stationary surfaces or surfaces having relatively low velocities. Other objects and advantages of the invention will become more apparent as the description proceeds.

In accordance with the invention the clearance space between cooperating parts of the blower is maintained at a desired minimum by adhesively bonding to cooperating parts of the blower a multiplicity of fine, relatively short length fibers or flock of rayon, nylon, cotton, etc., in such manner that a substantial proportion of the fibers project outwardly from the surface of the part to give somewhat the appearance of a short pile velvet or velour.

The flock may be adhesively bonded to the parts by

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means of any desired adhesive. Known synthetic adhesive materials related to lacquers have been found highly satisfactory. The adhesive materials may be clear, pigmented, or colored and may be air drying or baking grade. Synthetic rubber adhesives or high temperature adhesives are examples of other suitable types. The adhesives employed preferably should offer high resistance to solvent or softening effect to oils encountered in service. The adhesive may be applied by spraying, brushing, etc.

The flock may be sprayed onto the surface coated with the adhesive by a flock gun until no more fibers will be accepted by the adhesive. In practice, flock consisting of rayon fibers or particles about $\frac{1}{32}$ " long and about .0002" in diameter have proven highly satisfactory. Under the microscope these particles appear as short, hair-like particles and are of much smaller diameter than that of ordinary human hair which has a diameter on the order of .001 to .003". While rayon flock particles having the dimensions described above have proven especially advantageous in practice, it is contemplated that shorter and longer fibers also may be used and that the diameter of the fibers may be of greater or lesser dimensions. In some cases it is contemplated that mixtures of mixtures of flock particles of different diameters and/or lengths may be used. It is also contemplated that flock particles of nylon, cotton, wool, etc. may be employed in place of rayon. Mixtures of different materials may be employed.

Presently preferred procedure in treating the metal parts and applying the coating is to thoroughly clean the metal parts such as aluminum as by a degreasing operation or the equivalent. Masks are applied as required. Tape or metal masks may be used. The adhesive is sprayed on the metal to give a wet coating of adhesive on the parts to be flocked. The flock is applied by blowing the flock onto the adhesively coated areas until the same are filled and will accept no more fibers. When applied by a flock gun the fibers stand pretty much on end, giving the surface a finish like a short pile velvet. The time interval between application of the adhesive and the flock must be no greater than the "open" time of the adhesive. After the flock is applied the masks are removed if masks have been used. The flocked parts then may be heated for a short time on the order of $\frac{1}{2}$ hour in an oven at 275° F.

Reference is herewith made to the accompanying drawing showing a Root's type blower having two lobed rotors and constructed in accordance with a preferred embodiment of the invention.

In the drawing:

Figure 1 is an elevational view of the blower with parts cut away and in section.

Fig. 2 is a sectional view substantially on line 2—2 of Figure 1.

Figure 3 is a fragmentary and somewhat diagrammatic, sectional view on an enlarged scale showing an adhesively bonded flock coating on a metal surface of a blower part.

In Figures 1 and 2 of the drawing, 10 represents one rotor having two lobes 12 and 14, while 16 represents a cooperating rotor having two lobes 18 and 20. Rotor 10 is fixed to a shaft 22 by means of pins 24 so as to be rotated with the shaft, while rotor 16 is similarly fixed to a shaft 26 by pins 28. The shafts are supported in suitable bearings formed in end plates 30 and 32 of a rotor housing indicated in its entirety by 34. The rotors are driven in proper registry with one another by gearing (not shown), so that the rotor lobes are relieved of any driving duty. The rotor housing has a portion 36 encircling 180° of rotor 10 and a portion 38 encircling 180° of rotor 16. The rotor housing also has an inlet port 40 and an outlet port 42. Aluminum is especially advan-

tageous as the metal from which the rotors and other parts of the blower are made.

As indicated in Figures 1 and 2 of the drawing, the "valleys" between the arcuate tips of the rotor lobes each has an adhesively bonded flock coating thereon. This is shown at 44 and 46 on rotor 10 and at 48 and 50 on rotor 16. The end plates 30 and 32 have adhesively bonded flock coatings 52 and 54, respectively, while the portions 36 and 38 of the rotor housing have adhesively bonded flock coatings 56 and 58 respectively. The adhesively bonded flock coatings are represented in Figures 1 and 2 of the drawings as of a greater thickness relative to the metal parts than is actually the case in order to illustrate the construction more clearly. As shown in the drawings the rotors and end plates are undercut a small amount at those portions which receive the adhesively bonded flock coatings. In the form illustrated the peripheral length of each uncoated arcuate lobe of each rotor is the same as the peripheral length of the cooperating "valley" which has the adhesively bonded flock coating thereon. During rotation of the rotors, therefore, there is at all times a condition in which one of the mating surfaces is of metal and the other is an adhesively bonded flock coating. The arcuate uncoated tips of the rotor lobes are the only portions thereof that move over the adhesively bonded flock coatings 56 and 58 on the rotor housing so that there is never a metal-to-metal, or flock-to-flock contact between relatively moving parts. The end surfaces of the rotors are uncoated and these portions move over or past the flock surfaces on the end plates 30 and 32. In the form of the invention illustrated it will be seen that the flock coating is applied only to stationary surfaces or, where applied to the rotors, to the "valley" portions thereof which have relatively lower speeds than do the tips of the lobes. Thus there is little or no tendency for the adhesively bonded flock coating to be thrown off from the several parts.

Figure 3 illustrates somewhat diagrammatically the adhesively bonded flock coating on the metal surfaces of the blower parts. In this figure, 60 represents the metal surface having thereon an adhesive 62 and a multiplicity of fine flock particles 64 projecting outwardly from the metal surface and adhesive to give the coated surfaces the general appearance of a short pile velvet or velour. In Figure 3 the several parts are shown greatly enlarged to illustrate the construction more clearly.

A blower in accordance with the invention has numerous advantages over conventional designs. It is more efficient due to minimum air leakage, it is less expensive to build because larger tolerances are permissible in machining and assembly, and damage due to accidental rubs which wreck blowers of conventional design is eliminated.

Various changes and modifications of the embodiments of my invention described herein may be made without departing from the principles and spirit of the invention.

I claim:

1. A rotary blower comprising an inlet, an outlet, a plurality of rotors, and a housing for said rotors, said rotors and housing having surfaces on which are adhesively bonded flock coatings, said flock coatings consisting of a multiplicity of fine, short, hair-like flexible fibers with a substantial proportion of the same projecting outwardly from said surfaces to give somewhat the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts.

2. A positive displacement type of rotary blower comprising an inlet, an outlet, a pair of cooperating two lobed rotors, the "valleys" between each of the two lobes of each rotor having thereon an adhesively bonded flock coating, and a rotor housing having adhesively bonded flock coatings adjacent the paths of movement of said rotor lobes and adjacent the ends of the rotors, said flock coatings consisting of a multiplicity of fine, short, hair-like flexible fibers with a substantial proportion of the same

projecting outwardly from said surfaces to give somewhat the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts.

3. A positive displacement type of rotary blower comprising an inlet, an outlet, a pair of intermeshing two-lobed rotors, the "valleys" between each of the two lobes of each rotor having thereon an adhesively bonded flock coating, and a stationary rotor housing having bores cooperating with said rotor lobes, on which bores are adhesively bonded flock coatings, said housing having also end plates on which are adhesively bonded flock coatings, said flock coatings consisting of a multiplicity of fine, short, hair-like flexible fibers with a substantial proportion of the same projecting outwardly from said surfaces to give somewhat the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts.

4. In a positive displacement type of blower having an inlet, an outlet, a stationary rotor housing having substantially semi-cylindrical bores and having end plates, said bores and end plates having thereon an adhesively bonded coating of a multiplicity of fine, short, hair-like, rayon fibers, and metal rotors in said rotor housing having intermeshing lobes, the "valleys" between the lobes having an adhesively bonded coating of a multiplicity of fine, short, hair like, rayon fibers, said rayon fibers being flexible and a substantial proportion of the same projecting outwardly from the coated surfaces to present somewhat the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts.

5. A blower as in claim 4 in which the rayon fibers have a length on the order of one-thirty-secondth of an inch and a diameter on the order of .0002".

6. A blower having an inlet, an outlet, impeller means and a housing for said impeller means, said impeller means having an adhesively bonded flock coating, said flock coating consisting of a multiplicity of fine, short, hair-like flexible fibers with a substantial proportion of the same projecting outwardly from the surface of said impeller so as to have the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts.

7. A blower having an inlet, an outlet, impeller means and a housing for said impeller means, said impeller means having an adhesively bonded flock coating, said flock coating consisting of a multiplicity of fine, short, hair-like flexible fibers with a substantial proportion of the same projecting outwardly from the surface of said impeller to give somewhat the appearance of a short pile velvet and said fibers capable of being bent to effect sealing between relatively moving parts, said adhesively bonded coating being applied to such portions of the metal surfaces that there is no metal-to-metal or flock-to-flock contact between relatively movable parts.

References Cited in the file of this patent

UNITED STATES PATENTS

1,002,176	Raclot et al.	Aug. 29, 1911
1,053,677	Sutton	Feb. 18, 1913
1,652,323	Pettersson	Dec. 13, 1927
2,069,470	Ariotti	Feb. 2, 1937
2,220,588	Thompson	Nov. 5, 1940
2,393,116	McCulloch et al.	Jan. 15, 1946
2,491,677	McCulloch	Dec. 20, 1949
2,491,678	McCulloch et al.	Dec. 20, 1949
2,492,935	McCulloch et al.	Dec. 27, 1949
2,496,070	Selsky	Jan. 31, 1950
2,505,197	McCulloch et al.	Apr. 25, 1950
2,519,588	McCulloch	Aug. 22, 1950

FOREIGN PATENTS

535,554	Great Britain	Apr. 11, 1941
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