M. FALK.

VACUUM MEMBRANE PUMP.

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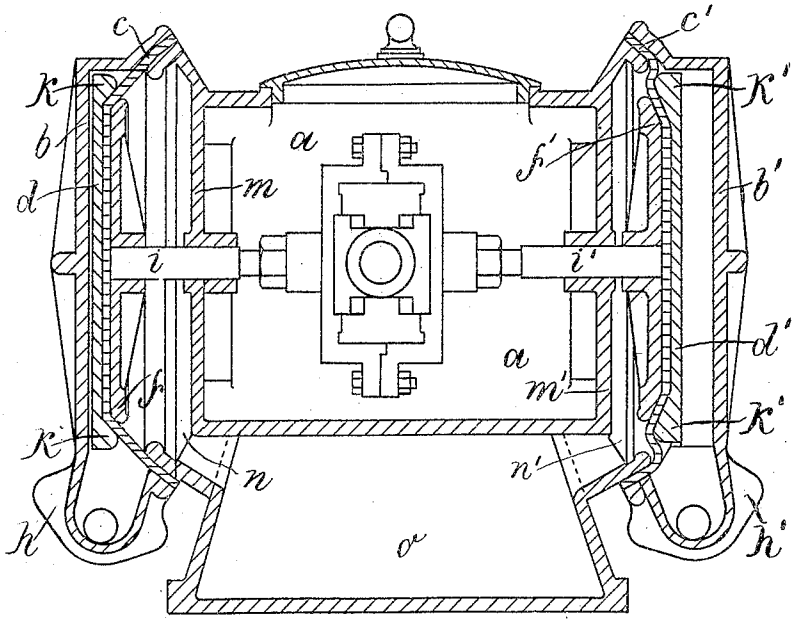
953,945. Patented Apr. 5, 1910.



Witnesses:
Ger. Henniote.
Jacob Spitzman

Inventor
Martin Falk
per
G. Spitzman
Attorney.

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UNITED STATES PATENT OFFICE.

MARTIN FALK, OF COLOGNE, GERMANY.

VACUUM MEMBRANE-PUMP.

953,945. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed August 3, 1908. Serial No. 446,709.

To all whom it may concern:

Be it known that I, MARTIN FALK, a subject of the King of Prussia, German Emperor, residing at Cologne, in the Province of the Rhine, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Vacuum Membrane-Pumps, of which the following is a specification.

This invention relates to an improvement in vacuum membrane pumps, and especially to such pumps as are employed for the removal of dusty air, as for instance in the cleaning of carpets, upholstered furniture and the like. When in pumps of this construction the pump chamber is bounded on the one hand by a fixed partition and on the other hand by the membrane clamped between two plates, the membrane obviously cannot be extended over its entire surface, but there must remain at the periphery an annular portion unextended, which in consequence of its yielding on the pressure stroke causes the formation of an injurious space and by producing folds must have eventually the result of a premature destruction of the membrane.

In order to obviate these drawbacks, the present invention provides bead like projections in the vicinity of the unstretched portion of the membrane which fill up the otherwise existing injurious space during the pressure stroke, and on the other hand compel the membrane to assume inevitably the rounded shape free from folds and crevices.

Further the invention provides means for securing certain further advantages in the use of such membranes as hereinafter set forth.

The drawing shows a vacuum membrane pump constructed according to the present invention.

It is assumed that the pump is a double pump, the driving mechanism whereof needs no further description, and is placed in a closed casing *a*. The pump chambers are bounded on the one hand by the rigid walls *b*, b^1 and on the other hand by the membranes, *c* and c^1, which membranes are partially clamped between plates *d*, *f* and d^1 f^1. The aspiration and pressure valves (not shown) are placed in the valve chambers *h* and h^1. By means of the rods *i* and i^1 an oscillating motion is imparted to the membrane, and it is assumed that the membrane *c* is shown at the end of its pressure stroke and the membrane c^1 at the end of its aspiration stroke. In the vicinity of the parts of the membrane which are not stretched, there are placed the annular beads *k* and k^1, which may be constructed in one piece with the plates *d* and d^1 as illustrated in the drawing.

At the end of the pressure stroke (left side) the injurious space which would otherwise remain, will be almost entirely filled by the bead *k* and the efficiency of the pump is of course thereby increased. At the same time the membrane is prevented from forming folds, which is especially noticeable also at the end of the aspiration stroke (right side.) By this means injuries and the rapid wear of the membrane are effectively prevented. For the further protection of the membrane it is desirable to keep the lubricating oil used for the pump mechanism apart from the membrane. The lubrication can be effected in the illustrated construction most satisfactorily by filling the oil into the space *a*, which oil is thrust out on the motion of the mechanism upon the moving and guided parts. The side walls *m* and m^1 of the casing *a* then prevent the oil from reaching the membranes *c* and c^1. Moreover if no arrangements have been made to prevent it, there would occur an alternate compression and rarefaction of the inclosed air on the movement of the membranes in the spaces between the side walls *m* and m^1 and the membranes *c* and c^1, which action must injuriously affect the working of the pump. This is, however, prevented by providing at the lower part of these spaces openings *n* and n^1, which prevent the otherwise occurring alternations of pressure of the air present in the aforesaid spaces.

In order that noises may not penetrate to the outside, the openings *n* and n^1 terminate in a common hollow space *o* at the foot of the pump frame, so that in a certain sense the inclosed air is driven to and fro. At the same time the membranes are in this manner entirely shut off from the outer atmosphere so that no dust or other dirt can reach them and at the same time injurious compressions and rarefactions of the inclosed air can be avoided. Moreover any oil flowing from the stuffing boxes of the rods *i* and i^1 can escape through the openings *n* and n^1 into the space *o* so that it can collect therein and not injuriously affect the membranes. If the membranes rest free, that is to say, if they are

not inclosed and if moreover the pump mechanism is not in a space filled with oil, the last described precautions are unnecessary.

Having now particularly described and ascertained the nature of my said invention, I declare that what I claim is:

1. In a membrane vacuum pump, the combination of pump chambers bounded on the one side by rigid walls and on the other by membranes, plates between which said membranes are clamped, rods for giving oscillating motions to said membranes, an oil chamber through opposite walls of which said rods pass, annular beads adjacent the outer edges of said membranes, and end plates in position to prevent the oil from reaching the membranes.

2. In a membrane vacuum pump, the combination of pump chambers bounded on the one side by rigid walls and on the other by membranes, plates between which said membranes are clamped, rods for giving oscillating motions to said membranes, an oil chamber through opposite walls of which said rods pass, annular beads adjacent the outer edges of said membranes, and end plates in position to prevent the oil from reaching the membranes, there being openings leading from the spaces between said plates and the membranes.

3. In a membrane vacuum pump, the combination of pump chambers bounded on the one side by rigid walls and on the other by membranes, plates between which said membranes are clamped, rods for giving oscillating motions to said membranes, an oil chamber through opposite walls of which said rods pass, annular beads adjacent the outer edges of said membranes, end plates in position to prevent the oil from reaching the membranes, there being openings leading from the spaces between said plates and the membranes, and a chamber beneath the oil chamber with which said openings communicate.

4. In a double acting pump, the combination of a casing, the pump chambers of which are bounded on one side by rigid walls, membranes on the other side, means for imparting oscillatory motion to said membranes, annular beads adjacent the non-movable portions of said membranes, the side walls of said casing preventing oil from reaching said membranes.

5. In a double acting pump, the combination of a casing, the pump chambers of which are bounded on one side by rigid walls, membranes on the other side, means for imparting oscillatory motion to said membranes, annular beads adjacent the non-movable portions of said membranes, the side walls of said casing preventing oil from reaching said membranes, and means for preventing alternate compression and rarefaction of the inclosed air by the movement of the membranes.

6. In a double acting pump, the combination of a casing, the pump chambers of which are bounded on one side by rigid walls, membranes on the other side, means for imparting oscillatory motion to said membranes, annular beads adjacent the non-movable portions of said membranes, the side walls of said casing preventing oil from reaching said membranes, means for preventing alternate compression and rarefaction of the inclosed air by the movement of the membranes, and means coöperating therewith for preventing noise.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARTIN FALK.

Witnesses:
LOUIS VANDORN,
H. STELZER.