Dec. 15, 1936. F. CARLSTEDT 2,064,587

VACUUM CLEANER

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Fig. 2

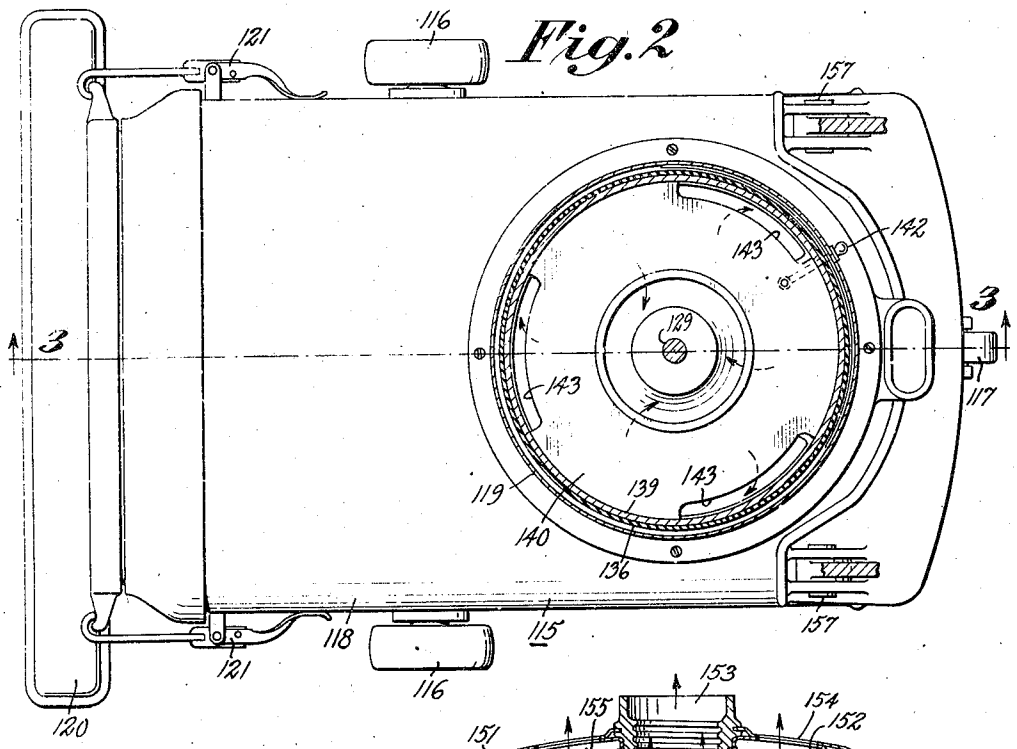


Fig. 1.

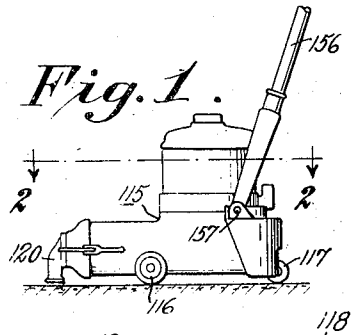





Fig. 3

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Fig. 5

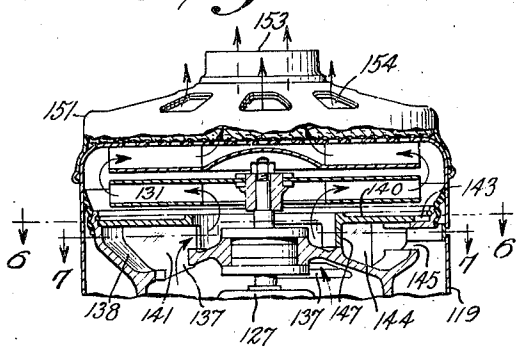



Fig. 4

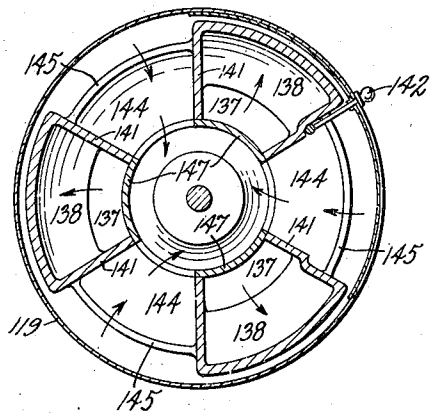



Fig. 6

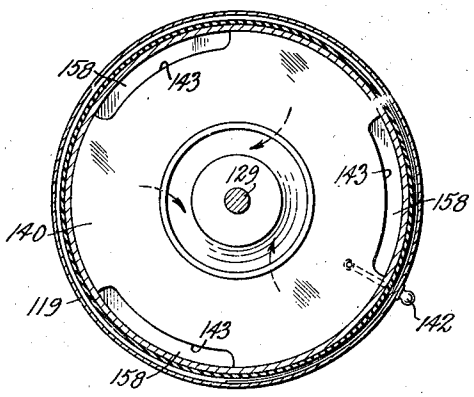



Fig. 8

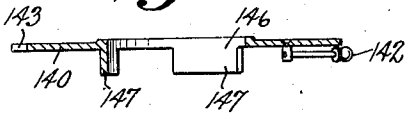



Fig. 9

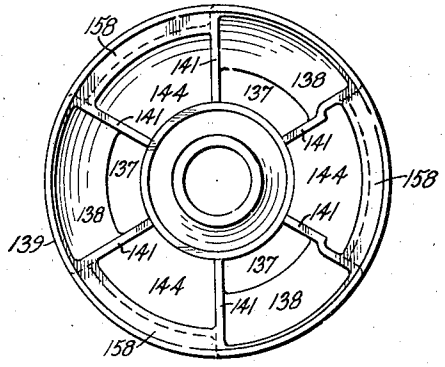
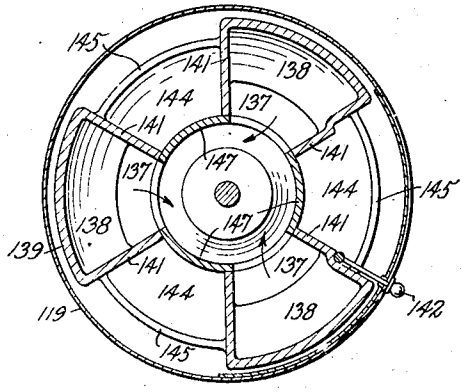



Fig. 7

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Patented Dec. 15, 1936 2,064,587

# UNITED STATES PATENT OFFICE

2,064,587

## VACUUM CLEANER

Fredrik Carlstedt, Stockholm, Sweden, assignor to Electrolux Corporation, Dover, Del., a corporation of Delaware

Application June 28, 1934, Serial No. 732,911
In Germany July 8, 1933

7 Claims. (Cl. 183—37)

In my application, Serial No. 710,421, filed on February 9, 1934, Patent No. 2,044,830, issued June 23, 1936, there is disclosed and claimed a vacuum cleaner characterized chiefly by the fact that a plurality of air impellers are provided which may be connected either in series, in order to produce a high suction, or they may be connected in parallel in order to produce a large volume of air flow.

In the use of vacuum cleaners, different conditions of cleaning make it desirable to have different conditions of vacuum cleaner action. For example, in cleaning heavy fabrics, such as rugs, a high vacuum is desirable in order to draw air through the cloth or the like for the purpose of removing embedded dirt, as well as for removing dirt adhering to the surface of the cloth. On the other hand, when cleaning a smooth surface, such as a hardwood floor, a high vacuum is not necessary, but a large air quantity at lower pressure differential suffices and permits cleaning a given area in a quicker time.

The present invention relates to a vacuum cleaner of this general type and has for its object to provide an electrically driven vacuum cleaner, having at least one of the air impellers mounted on one end of the motor shaft and at least one other of the impellers mounted on the other end of the motor shaft.

Further objects and advantages will be apparent from the following description considered in connection with the accompanying drawings, which form a part of the specification and of which:

Fig. 1 is a side view of one embodiment of the invention;

Fig. 2 is a cross-sectional view, on an enlarged scale, taken on the line 2—2 of Fig. 1, or on line 2—2 of Fig. 3;

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a cross-sectional view, similar to Fig. 3, of a portion of the device but with the valve member in a different position;

Fig. 6 is a cross-sectional view taken on the line 6—6 of Fig. 5;

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 5;

Fig. 8 is a cross-sectional view of a valve member employed in the embodiment illustrated in Figs. 1 through 7; and

Fig. 9 is a top view of the motor housing shown in Fig. 3, the parts above the housing having been removed.

Referring more particularly to Figs. 1 through 3 reference character 115 designates an air-tight casing mounted on a pair of wheels 116 and a caster 117. Casing 115 comprises a horizontal, preferably oval, portion 118 and a cylindrical portion 119 having a substantially vertical axis. A nozzle 120 is secured to one end of horizontal portion 118 by means of spring clips 121. An annular flange 122 on a cylindrical mouthpiece 123 is clamped between the nozzle and the end of the casing. Secured to mouthpiece 123 is a dust-bag 124 of suitable material, which is impervious with respect to dust, but allows the passage therethrough of air. The shape of this bag is preferably that shown in Fig. 3. If desired, a flap valve 125 may be provided in the nozzle 120 in order to prevent the escape through the nozzle, when the vacuum cleaner is idle, of dirt previously collected within the bag. Flap valve 125 may be pivotally mounted by means of a well known type of hinge having a spring tending to hold the valve in closed position, and valve 125 is held open during operation of the cleaner by the passage of air through the nozzle. The nozzle is so dimensioned that its suction mouth 126 is held a short distance above the surface on which the cleaner is supported by means of the wheels 116 and the caster 117. A handle 156, pivoted to the cleaner at 157, is provided for moving the latter over the surface to be cleaned.

Mounted within the vertical cylindrical portion 119 of the casing is an electric motor 127. The motor includes a housing 128 and an armature shaft 129. The shaft 129 extends through both ends of the motor housing and is provided at either end with fan impellers 130 and 131. Impeller 130 is surrounded by a fan housing 132 supported by the motor housing and having an inlet opening 133 which is permanently in communication with the interior of casing 115. Motor housing 128 is provided with openings 134 which establish communication between the interior of the motor housing and the interior of fan housing 132. Openings 134 constitute outlet openings for the lower impeller.

The lower end of the motor and fan housing 132 are surrounded by a guard 135, which may consist of perforated sheet metal or a reinforced wire screen. The purpose of guard 135 is to prevent the dust bag 124 from being drawn into the inlet opening 133.

Fan impeller 131 is arranged to be rotated

within a fan housing comprising the upper part of cylindrical portion 119 and an annular packing member 136. The upper end of motor housing 128 is provided with apertures 137, which open into the spaces 138 bounded by an extension wall 139 of the motor housing, a rotatable valve member 140 and radially extending walls 141 preferably cast integral with the motor housing. The shape of valve member 140 is shown in Fig. 8. The valve member is rotatably mounted within the extension wall 139 of the motor housing and is provided with an operating handle 142, which extends through a slot in the casing.

Adjacent to its periphery the valve member 140 is provided with a number of openings 143 which correspond in number to the number of spaces 138. In the embodiment illustrated there are three spaces 138 and three openings 143. Alternating with the spaces 138 are spaces 144 which are in communication with the interior of the casing 119 by virtue of openings 145. The center of valve member 140 is provided with an opening 146 which constitutes the inlet opening for the upper fan impeller. Valve member 140 is provided around opening 146 with sections 147 of a circular wall. The number of sections 147 is equal to the number of spaces 138 or 144, which, as previously pointed out, in the present embodiment is three. The lower ends of sections 147 contact a circular shoulder 148 formed on the motor housing. Arcuate webs 158 are formed between radial walls 141 over spaces 144. These webs are of greater extent than openings 143 in valve member 140, so as to close the openings when the latter are turned into alignment therewith.

The upper end of the cylindrical portion 119 of the casing is formed as a perforated plate 149. A filter 150 of cloth or other suitable material impregnated, if desired, with a disinfectant or deodorant, is held in place on the upper side of plate 149 by means of a cap 151, which may be adapted to frictionally engage the upper end of casing 119. A perforated plate 152 is fixed within cap 151 so as to hold the filter 150 in place, and to prevent the filter from being blown up against the outlet opening 153. Opening 153 is formed with a threaded interior so that a hose or the like may be attached for blowing purposes. Cap 151 is also provided with a plurality of outlet openings 154, which may be closed by means of a rotatable valve member 155, which is provided with openings which may be aligned with openings 154 in the cap, or the valve member may be turned so that the openings are not in alignment and all of the air must pass through opening 153. The purpose of these auxiliary openings 154 is to reduce the resistance to air flow when the device is being used as a suction cleaner, while making it possible to exhaust all the air through the hose or the like attached to opening 153 when it is desired to use the cleaner as a blower.

With valve member 140 in the position shown in Figs. 3 and 4, the fan impellers 130 and 131 are connected for parallel flow of air. Rotation of impeller 130 causes air to be drawn in through nozzle 120, through the dust bag and through inlet opening 133 in the fan housing 132. From here the air is ejected through openings 134 into the motor housing, where it serves to cool the motor. From the motor housing the air passes through openings 137 into the spaces 138. With the valve member 140 in the position shown, the openings 143 at the periphery thereof are in alignment with the spaces 138, and consequently the air passes into the housing of impeller 131 at the outer periphery thereof, which is, in effect, the outlet of this impeller. The rotation of impeller 131 draws air from the interior of casing 115 through the openings 145 into the space 144. With the valve member 140 in the position assumed, the vertical sections 147 are in alignment with the spaces 138, as clearly appears from Fig. 4, and hence there is communication between spaces 144 and the center opening 146 in the valve member. Hence the air is drawn through space 144 into the inlet of impeller 131 and is discharged by the impeller into the outer periphery of the housing, where it joins the air discharged from impeller 130. The air from both of the impellers thence passes through perforated plate 149, filter 150, perforated plate 152 and through opening 153 and also openings 154, if these latter openings are open.

In the event that it is desired to operate the fan impellers in series, handle 142 is moved to the other end of the slot whereby valve member 140 is turned to the position shown in Figs. 5 and 6. Impeller 130 supplies air to spaces 138 in the same manner as previously described. However, openings 143 in valve member 140 are no longer in alignment with spaces 138, and the vertical walls 147 have also been moved out of alignment with these spaces, so that the air is free to flow through the central opening 146 into the valve member, as is clearly shown in Fig. 5. This air is acted upon by impeller 131 and is discharged from the cleaner in the same manner as previously described. With the valve member 140 in this position, vertical walls 147 are in alignment with the spaces 144, and hence prevent the upper impeller 131 from drawing air directly from the interior of the casing through openings 145. Openings 143 in valve member 140 are closed due to the fact that they are in alignment with webs 158, thus assuring against recirculation of air discharged from impeller 131 back into the interior of the casing.

It will be seen that, for either position of the valve member, at least one of the impellers circulates air through the motor housing. With the impellers connected in series, both of them aid in this circulation. The lower impeller 130 discharges air into one end of the motor housing, while the upper impeller 131 withdraws air from the other end of the housing.

While a more or less specific embodiment of the invention has been disclosed, it will be obvious that other embodiments of the invention may be made. For example, more than two fan impellers may be provided and connected in series or in parallel. The greater the number of impellers the greater the difference in effect between series and parallel connection. The scope of the present invention is to be limited only by the appended claims viewed in the light of the prior art.

What I claim is:

1. A vacuum cleaner including a motor having a housing, a fan impeller mounted at each end of said motor to be driven thereby, and means for alternatively connecting said impellers for series or parallel flow of air therethrough, one of said impellers being arranged to circulate air through said housing during both series and parallel flow.

2. A vacuum cleaner including a motor having a housing, a fan impeller mounted at each end of said motor to be driven thereby, and means for alternatively connecting said impellers for

series or parallel flow of air therethrough, one of said impellers being arranged to circulate air through said housing during parallel flow and both of said impellers being arranged to circulate air through said housing during series flow.

3. A vacuum cleaner including a motor having a housing, a fan impeller mounted at each end of said motor to be driven thereby, the interior of said housing forming a discharge passageway for one of said impellers, said housing being formed with an opening adjacent to the other impeller, and movable valve means associated with said opening for alternatively establishing communication between said opening and the inlet of said other impeller or the outlet of said other impeller.

4. A vacuum cleaner including a casing, a dust bag in said casing, a plurality of impeller fans in said casing including fan housings having inlets and outlets, the inlet of one of said housings being permanently in communication with the interior of said casing, means providing a passageway permanently in communication with the outlet of said one of said housings, a motor for driving said impellers located in said passageway, and movable valve means for establishing communication between said passageway and the inlet of the other of said housings and alternatively for establishing communication between said passageway and the outlet of said other housing and between the interior of said casing and inlet of said other housing.

5. A vacuum cleaner including a casing, a dust bag in said casing, a plurality of impeller fans in said casing including fan housings having inlets and outlets, the inlet of one of said housings being permanently in communication with the interior of said casing, a filter member, the outlet of the other of said housings being arranged in permanent communication with said filter member, means providing a passageway permanently in communication with the outlet of said one of said housings, a motor for driving said impellers located in said passageway, and movable valve means for establishing communication between said passageway and the inlet of the other of said housings and alternatively for establishing communication between said passageway and the outlet of said other housing and between the casing and the inlet of said other housing.

6. A vacuum cleaner including a casing, a motor having a housing mounted within said casing, a fan impeller mounted at each end of said motor to be driven thereby, and means for alternatively connecting said impellers for series or parallel flow therethrough, one of said impellers being arranged to circulate air through said housing during parallel flow, the other of said impellers being arranged to circulate air between said casing and said housing during parallel flow and both of said impellers being arranged to circulate air through said housing during series flow.

7. A vacuum cleaner including a motor having a shaft, a fan impeller mounted at each end of said shaft to be driven thereby, and valve means for selectively connecting said impellers for series or parallel flow of air therethrough, said valve means being disposed between said motor and one of said impellers and formed with an opening through which said shaft extends.

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