

Jan. 10, 1939.

S. FAGERBERG

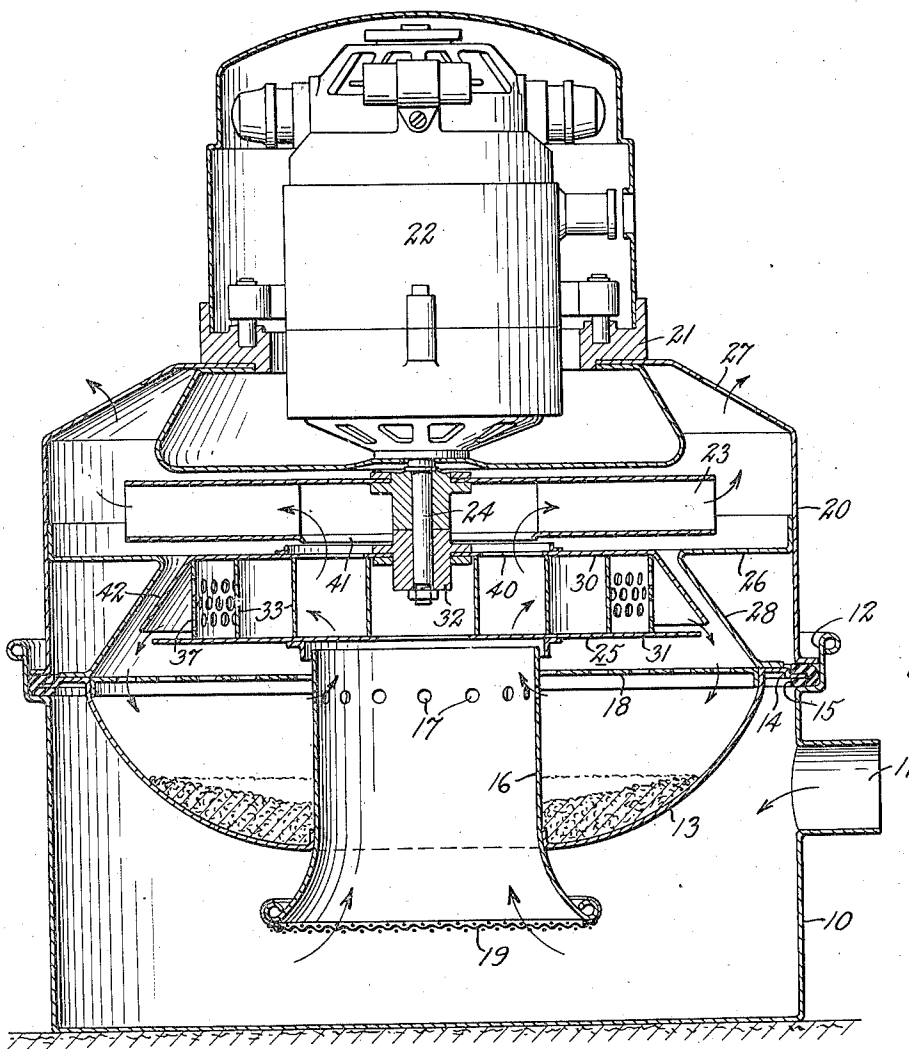
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VACUUM CLEANER

Filed Nov. 5, 1936

2 Sheets-Sheet 1

Fig. 1.



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2,143,144

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2 Sheets-Sheet 2

Fig. 2.

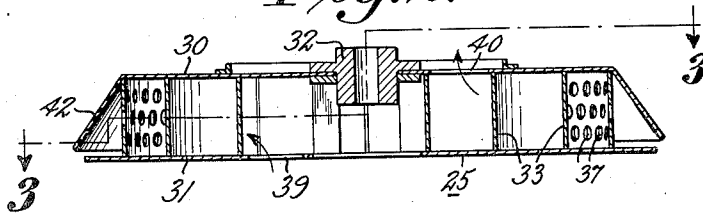


Fig. 3.

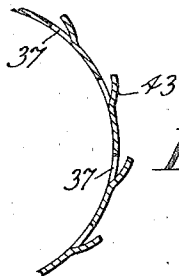
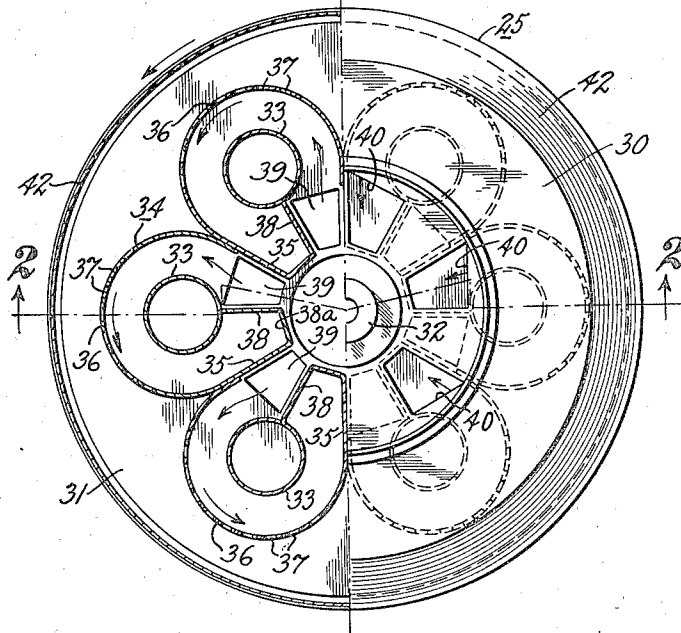


Fig. 4.

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UNITED STATES PATENT OFFICE

2,143,144

VACUUM CLEANER

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6 Claims. (Cl. 183—77)

My invention relates to vacuum cleaners and more particularly to an improved method, and means for carrying out the method of separating dust from the air.

5 So-called centrifugal separators, which rely upon the greater centrifugal force being exerted on particles of dirt than on air molecules due to the greater mass of the former, are known and the present invention is an improvement over
10 these known devices.

In accordance with my invention the air and dirt is acted upon by centrifugal forces arising both from causing the air and dirt to flow in a curved channel and from causing the channel
15 itself to rotate about a point eccentric with respect to center of curvature of the channel.

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

Fig. 1 is a cross-sectional view of one embodiment of my invention;

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

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

30 Fig. 4 is a cross-sectional view showing the details of the device illustrated in the preceding figure.

Referring more particularly to Fig. 1, reference character 10 designates a rigid, preferably metallic container. Container 10 is provided with an inlet opening 11 to which may be secured a flexible
35 hose or the like leading to a suitable suction nozzle. The container is formed with a bell-mouth 12 within which may be removably positioned a bowl-shaped member 13 having a circular rim 14 carrying a packing ring 15. The central
40 part of member 13 carries a tubular member 16 which is provided with a plurality of openings 17 near its upper end which communicate with the space within member 13. A perforated cover member 18 may be removably positioned within
45 member 13, as shown. A coarse screen 19 is secured in any suitable manner across the lower open end of tubular member 16 which communicates with the interior of container 10.

A housing 20 is removably positioned on packing ring 15 and suitable clamping means may be provided for connecting housing 20 with container 10, the packing ring 15 being compressed between the two. Housing 20 carries a ring 21, preferably of electrical insulating material, from which is
55 supported in any suitable manner an electric

motor 22. A fan rotor 23 is fixed to the shaft 24 of the electric motor and a dust separating wheel 25 is secured to shaft 24 below fan 23. An annular partition 26 is secured within casing 20, fan 23 being arranged to rotate within the space above
5 the partition. The casing is provided with one or more outlet openings 27. A conical member 28 is secured to or integral with partition 26 and is formed with a lower flange which bears against rim 14 on member 13 when the parts are assembled.
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The construction of the dust separating wheel 25 is shown more in detail in Figs. 2, 3 and 4. The wheel includes two parallel circular discs 30 and 31. A hub 32 is secured to disc 30 and is adapted
15 to be fixed to shaft 24 of the motor. A plurality of cylinders 33, six in the embodiment shown, extend between discs 30 and 31. Extending around each cylinder 33 is a partition 34 having end portions 35 extending substantially radially with respect to the center of the wheel and a middle portion 36 which is substantially cylindrical and concentric with the center of cylinder 33. Middle portion 36 is provided with a plurality of perforations 37. A partition 38 extends from
25 each cylindrical member 33 toward the center of the dust separating wheel and midway between end portions 35. Disc 31 is provided with an inlet opening 39 on one side of each partition 38, and disc 30 is provided with an outlet opening 40 on
30 the opposite side of each partition 38. Members 33, 34 and 38 thus define between discs 30 and 31 a curved path of flow extending first outwardly from inlet 39 and then inwardly to outlet 40. An extension 38a of partition 33 connects the inner
35 end of the partition with that end portion 35 which is adjacent to outlet 40. The other end of the curved path, adjacent to inlet 39 may be open to the center space of the wheel below hub 32. Openings 39 are in alignment with the upper open
40 end of tubular member 16 while openings 40 are in alignment with the inlet 41 of fan 23. There are thus provided a plurality of curved paths of flow from tubular member 16 through openings 39, the channel formed between members 33 and 34,
45 and openings 40 to the inlet 41 of the fan. Disc 30 is formed with an outer conical flange 42 which is parallel with, and closely adjacent to conical wall 28.

As shown in Fig. 4, the perforations 37 in member 34 may be formed by stamping out the material of the member, the stamped portions 43 serving as tangential guide vanes.

If the direction of air flow through the chan-
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nels in the dust separating wheel 25 is counter-clockwise, as is shown in Fig. 3, the direction of rotation of the wheel itself should also be counter-clockwise. Obviously, both directions of rotation might be clockwise.

The above described device operates as follows:

The rotation of fan rotor 23 causes air to be drawn in through inlet 11 to within container 10 from where it passes through tubular member 16 to the inlet openings 39 of the dust separator wheel 25. This air flows in six parallel paths through the six curved channels formed in the wheel and is discharged through openings 40 to the inlet 41 of the fan. The air is discharged from the fan into the space above partition 26 in housing 20 and passes therefrom to the atmosphere through outlet openings 27.

If inlet 11 is connected to a suction nozzle which is passed over a dusty surface, small particles of dust and dirt will be entrained with the air and carried into container 10. Also large particles such as pins, matches and threads or the like will be drawn in with the air. Due to the sudden increase in cross-section of container 10 as compared with that of inlet 11 there will be a sudden reduction in the velocity of flow when the air and entrained particles enter the container and some of the heavier particles may be precipitated therein. In any event, the aforesaid large particles will be stopped by screen 19 and prevented from reaching dust separator wheel 25.

The air and dirt passing into the channels in the dust separator wheel through openings 29 are forced to travel in a curved path through these channels. Consequently, centrifugal force acts on both the air molecules and the particles of dirt. At the same time, the channels themselves are rotated at a high speed and an additional centrifugal force is caused to act on both the particles and air molecules. Due to the much greater mass of the particles than of the air molecules, the action of the centrifugal force on the former is much greater than on the latter and the particles are thrown upwardly in the channels within the wheel and pass through the perforations 37. A small percentage of the air will also pass through these perforations, but the greater percentage of the air is drawn by the fan through the opening 40 to the inlet of the fan.

The dust particles and the aforesaid small percentage of air are guided by conical flange 42 downwardly and through the perforations in cover member 18. Within bowl-shaped member 13 substantially all of these particles are precipitated, while the small percentage of air and some of the lighter particles which do not settle out, pass to the opening 17 and are again passed through the dust separator 25.

The air flowing from the dust separator through opening 40 to the fan is substantially free of solid particles and may be discharged to the atmosphere through openings 27 without further treatment.

When it is desired to empty the accumulated dust, housing 20 is released from container 10, cover 18 is removed from bowl-shaped member 13 and the latter is removed and emptied in any convenient place. Also, any particles which have collected in container 10 may be disposed of in a similar manner.

While I have shown one more or less specific embodiment of my invention, it is to be understood that this has been done for purposes of illustration only and that further embodiments are possible. For instance, the fan motor 23 may

be placed ahead of the dust separator wheel 25 with respect to the direction of flow of air. Also, the dust separator wheel may itself constitute the air moving means if the outlet openings 40 are placed nearer to the periphery of the wheel than are the inlet openings 39. The scope of my invention is to be limited only by the appended claims viewed in the light of the prior art.

What I claim is:

1. In a vacuum cleaner, means for producing flow of air and entrained solid particles, means providing a curved path of flow for said air and particles, the curvature of said path being continuously smooth, said means being formed with a radial opening, and means for rotating the first mentioned means about a center eccentric with respect to the center of curvature of said curved path.

2. In a vacuum cleaner, a rotatably mounted member, means for rotating said member, said member being formed with a channel extending in the form of a continuously smooth curve from near the center of the member towards the periphery and back towards the center thereof, said member also being formed with an opening extending radially outwardly from said channel, and means for producing flow of air and entrained solid particles into said channel.

3. In a vacuum cleaner, a rotatably mounted member, means for rotating said member, said member being formed with a curved channel extending from near the center of the member towards the periphery and back towards the center thereof, said member also being formed with an opening extending radially outwardly from said channel, means for producing flow of air and entrained solid particles into said channel, means defining a settling chamber communicating with said opening, and means for conveying air from said chamber to the air flowing into said channel.

4. In a vacuum cleaner, a rotatably mounted wheel having a plurality of curved channels therein, each channel having an inlet opening and an outlet opening near the center of the wheel and each channel having a central portion disposed near the periphery of the wheel, means defining a settling chamber, said wheel being formed with radially extending openings connecting the central portions of said channels with said settling chamber, means for supplying air and entrained solid particles to the inlet openings of said channels, means for conveying air from said settling chamber to said inlet openings, and means for rotating said wheel.

5. In a vacuum cleaner, a rotatably mounted wheel having a plurality of curved channels therein, each channel having an inlet opening and an outlet opening near the center of the wheel and each channel having a central portion disposed near the periphery of the wheel, means defining a settling chamber, said wheel being formed with radially extending openings connecting the central portions of said channels with said settling chamber, a fan impeller having an inlet communicating with said outlet openings, means for conveying air and entrained solid particles to the inlet openings of said channels, means for conveying air from said settling chamber to said inlet openings, and means for rotating said wheel and said impeller.

6. A dust separating wheel for use in a vacuum cleaner including spaced circular parallel plates and curved partition means forming a plurality of arcuate channels between said plates, the

5 curvature of said plates and channels being continuously smooth, one of said plates having openings communicating with one end of said channels, the other plate having openings communicating with the opposite ends of the respective channels, all of said openings being near to the

center of said wheel, said channels having intermediate portions adjacent to the periphery of said wheel, said partition means being formed with radial openings communicating with the intermediate portions of said channels.

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5