

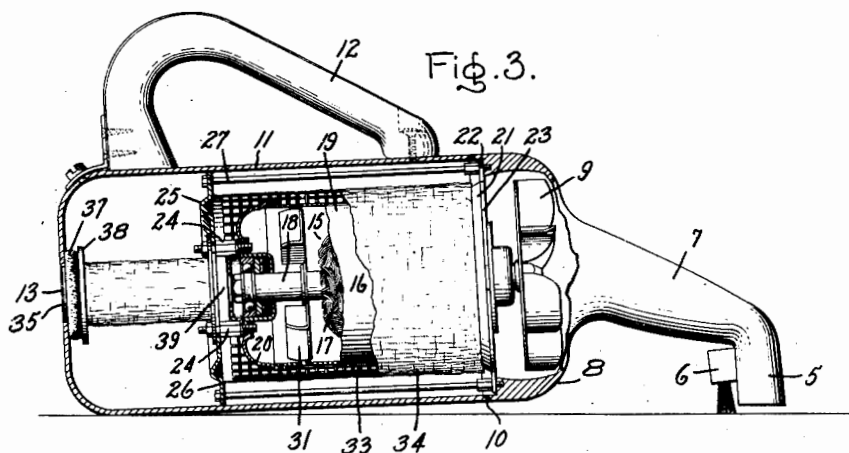
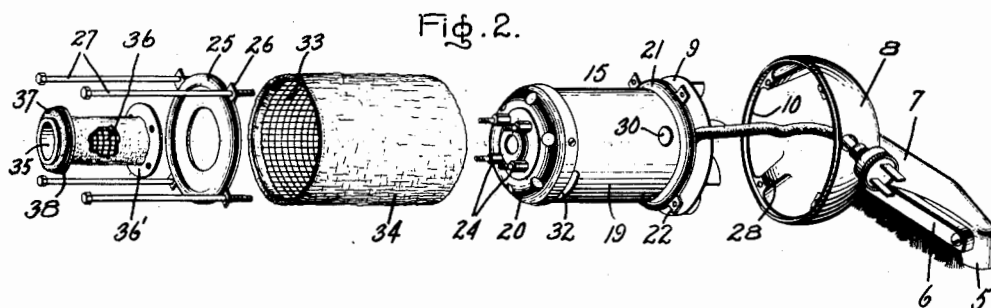
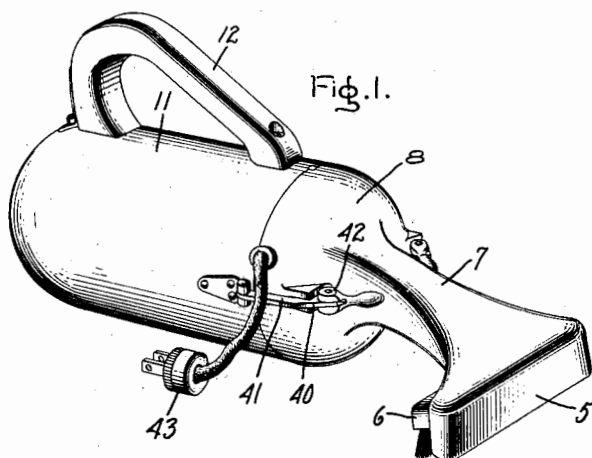
May 31, 1932.

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1,861,261

HAND VACUUM CLEANER

Filed Jan. 25, 1930



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UNITED STATES PATENT OFFICE

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HAND VACUUM CLEANER

Application filed January 25, 1930. Serial No. 423,529.

The present invention relates to small vacuum cleaners of the type having a rigid handle affixed thereto by means of which the cleaner may be moved by the hand of the operator over the surface to be cleaned.

The object of my invention is the provision of an improved small vacuum cleaner for the purpose described, in which the outside dust collecting bag is dispensed with and in its place is substituted a dust filtering means which is located within a metallic casing where it will not interfere with the handling of the cleaner in any way.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawings Fig. 1 is a perspective view of a cleaner illustrative of the invention; Fig. 2 is an exploded view of the parts thereof, and Fig. 3 is an axial section of the same.

5 indicates the nozzle which has the usual rectangular opening to receive the dust laden air. To one of the walls of the nozzle is attached by screws or other suitable means a brush 6 for agitating the dirt in the surface being cleaned and to assist the nozzle in picking up threads, etc. The inlet part of the nozzle is connected by a relatively long neck 7 to the center of the casing 8 of the suction fan, said parts being cast in one piece. The fan casing is annular and concentric with the axis of the fan driving motor, instead of being scroll shaped and having a discharge conduit on one side as is the standard practice. The fan 9 has suitable blades and is wholly within the fan casing, as best shown in Fig. 3. The casing has a shoulder 10 on one side to receive the tubular casing or enclosure 11 which completely encloses all of the driving motor and also the dust filtering or collecting means. To the enclosure is rigidly attached a handle 12, usually of wood to reduce the weight, by any suitable means. The rear wall of the enclosure is provided with a circular opening 13 through which air is discharged after being freed of dust by the separating or filtering means.

15 indicates a small high speed electric motor having a suitable field magnet 16, an

armature 17 and a shaft 18. The motor parts are enclosed in a cylindrical metal casing 19 having heads 20 and 21 which support the ball bearings for the shaft. The front head 21 is smaller in diameter than the inner wall of the fan casing and is supported from the latter by radial lugs 22 of which four are shown. This arrangement affords an annular opening 23, except for the space occupied by the lugs, through which dust laden air from the fan 9 flows into and axially within the enclosure 11. Attached to the rear head 20 of the motor casing as by means of short studs 24 is a head 25 of ring form, Fig. 2, which has radial lugs 26. The heads 21 and 25 are secured to the fan casing by longitudinal bolts 27 of which four are shown. These bolts pass through the lugs in the heads and are seated in bosses 28 formed on the inner wall of the fan casing, as best shown in Fig. 2. The effect of this arrangement is to securely support the electric motor and its driven fan in concentric relation with the fan casing. In addition to receiving the clamping bolts 27 the outer or peripheral ends of the lugs 26 engage the inner wall of the enclosure 11 and center it in the plane thereof.

Located at the front end of the motor casing is a series of ventilating openings 30 through which a limited amount of air is circulated through the motor by means of the ventilating fan 31 carried by the shaft 18 near its rear end. Adjacent the fan and in the same plane are segmental openings 32 in the motor casing through which the air heated in its passage through the motor is discharged. Only one of these openings is shown, the other being on the back side. The particular number or arrangement of these openings is not material so long as they afford sufficient outlet for the cooling air which by reason of the location of the circulating fan 31 acts to flow outwardly and at the same time prevent the inflow of dust laden air in this region. From the description thus far given it will be seen that the dust laden air from the suction fan 9 flows in a relatively thin annular stream from the front toward the rear of the cleaner and that the cooling air from the circulating fan

31 is discharged in a direction perpendicular thereto. It is apparent with the motor totally enclosed by the outer casing that an active circulation of air should be maintained to prevent overheating. This is taken care of in two ways, first by the flow of air through the internal parts of the motor and second by the flow of dust laden air over the peripheral surface of the metal motor casing 19, the arrangement being such that the volume of the dust laden air is much greater than that of the circulating air. The fact that the air inlet openings 30 are close to the front head 21, are in a part of smaller diameter and are protected by the head 21 means that very little dust will pass through them because the stream from the suction fan is moving with relatively high velocity, which carries the dust particles beyond the openings.

Considering now the means for separating or filtering the dust from the air entering through the inlet of the nozzle, an annular perforated support 33 is provided, the diameter of which is somewhat greater than that of the motor casing. As shown, the support is made of coarse mesh wire screening in the form of a tube with the abutting edges soldered or otherwise united. This support is held between the heads 21 and 25, and as before stated these heads are clamped in spaced relation by the bolts 27, all of which makes for simplicity of construction. The tubular support is covered or wrapped with a suitable number of layers of thin porous paper 34 and since the flow of air is inward the paper is amply supported by the wire screening. A variety of papers may be used for this purpose provided they do not unduly restrict the flow of air and provided they effectively screen or filter the dust from the air. As a protecting and retaining means for the paper it is wrapped or wound with a layer of thin porous cloth 34, the whole forming a tubular filter. As there would naturally be a joint in the cloth it may be sewed or cemented at such joint.

At the rear end of the cleaner is a second and smaller filter or separator of the same general construction as the first. It comprises a spool-like support 35, the barrel of which has a large number of perforations 36 a few of which are shown in Fig. 2. The right hand end flange 36' is secured in place by the studs or bolts 24 which are secured in the end head 20 of the motor casing. The flange fits against the end head 25 as best shown in Fig. 3. The head 25 thus serves not only to support and center the motor within the outer casing or enclosure 11 but the two filtering means as well. Because the enclosure has to be readily removable it is undesirable to fasten the support 35 to it but on the other hand a tight joint is needed

at this point to prevent the escape of dust laden air. This is accomplished by mounting a compressible packing ring 37 on the support between the left hand end flange 38 and the rear end wall of the enclosure 11. When the enclosure is fitted in place the ring is held under a light compression. The filtering means is of the same construction as the larger one previously described.

In use the dust laden air flows through the nozzle due to the suction fan 9 and is discharged at the periphery of the fan from which it flows in an annular stream toward the rear. As the only escape for the air is through the opening 13 in the outer casing the air will first flow inwardly through the filtering means and then axially. That portion of the air which flows through the larger filter passes around the left hand end head of the motor into the space 39 between it and the head 25 and thence through the central opening in the spool-like support to the opening 13. The balance of the air is filtered as it flows inwardly through the smaller filter into the central opening where it joins the other stream.

In order to remove the accumulated dirt from the filter the outer casing or enclosure 11 with its handle are separated by a relatively endwise movement of the parts to expose the filters. For this purpose the enclosure and fan casing are united by a pair of releasable latches 40, the details of which are immaterial so long as they operate to securely unite the parts. As shown, each comprises a pivoted link 41 and a clamping cam 42 which is seated on a small boss on the fan casing. After the parts are separated the dust may be shaken from the filters by lightly rapping the same, or a soft brush may be used for the purpose.

Current is supplied to the motor by means of a suitable attachment plug 43 and the usual leads.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, an annular casing for the fan, an electric motor driving the fan, a tubular enclosure for the motor having a discharge opening in its rear end, a means for releasably clamping the front end of the enclosure to the fan casing, a head for supporting the motor in concentric spaced relation to the fan casing and enclosure and around which dust laden air is free to pass to the filter, a second head attached to the rear end of the motor for supporting the enclosure in spaced relation to the motor, said head having an opening through which filtered air passes, a tubular filtering means within the enclosure and in spaced concentric relation to it and the motor which extends longitudinally of the motor, a perforated support for the filter

held at its ends by said heads, and a conduit means located between the rear head and the rear wall of the enclosure for conveying air to the discharge opening of the enclosure after it has passed through the filter.

2. In a vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, an electric motor for driving the fan, a casing for the fan, an enclosure surrounding the motor in spaced relation thereto which has a discharge opening at the rear, a tubular filter inside the enclosure, said filter surrounding the motor and receiving dust ladened air from the fan, a second tubular filter situated between the rear end of the motor and the rear end of the enclosure and fitting over the discharge opening, and supports for the filters through which supports air flows to the discharge opening.

3. In a vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, a casing therefor, an electric motor for driving the fan, a casing for the motor, a tubular enclosure for the motor communicating with the fan casing and having a discharge opening in its rear wall, heads which support the motor and retain it and the enclosure in spaced concentric relation, a tubular filtering means located between the enclosure and the motor casing supported by said heads, and receiving dust ladened air from the fan, a second tubular filtering means located between one of the heads and the rear wall of the enclosure surrounding the discharge opening and through which air received from the filtering means is discharged through said opening.

4. In a vacuum cleaner, the combination of a nozzle, a suction fan, an electric motor for driving the fan, a casing for the motor, a tubular enclosure for the motor in spaced relation thereto having a discharge opening, a casing for the fan in communication with the nozzle, a head fixed to the motor casing, means securing said head to the fan casing, a tubular filter which surrounds the motor and is in spaced relation to the enclosure, the said fan casing opening into the enclosure at a point outside the periphery of the said tubular filter, a head which supports the rear end of the filter and is in spaced relation with the rear end of the motor, and a second tubular filter which is seated on the last named head at one end and at the other end makes a tight fit about the discharge opening of the enclosure.

5. In a vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, a casing therefor, a motor for driving the fan, a cylindrical enclosure one end of which engages the fan casing and is releasably clamped thereto and has a discharge opening in its rear wall, said enclosure surrounding the motor in spaced relation thereto and a pair of tubular filtering means,

one of which surrounds the motor in spaced relation to it and to the enclosure and receiving dust ladened air from the fan, the other being situated between one end of the motor and the rear wall of the enclosure and surrounding the discharge opening for conveying filtered air to said discharge opening.

6. In a vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, a casing therefor, a motor for driving the fan, a cylindrical enclosure, one end of which engages the fan casing and which is releasably clamped thereto and has a discharge opening in its rear wall, said enclosure surrounding the motor in spaced relation thereto and receiving dust ladened air from the fan, and a pair of tubular filtering means arranged end to end, one of which surrounds the motor in spaced relation to it and to the enclosure and receiving dust ladened air from the fan, the other being situated between the rear end of the motor and the rear wall of the enclosure and surrounding the discharge opening for conveying filtered air to said discharge opening, and a packing between the rear end of the second filter and the rear wall of the enclosure to prevent escape of unfiltered air.

7. In a hand vacuum cleaner, the combination of a nozzle, a suction fan communicating with the nozzle, an annular casing for the fan, internal shouldered means on the fan casing, an electric motor, a removable enclosure surrounding the motor in spaced relation thereto and supported at its front end by the fan casing and having a discharge opening in its rear wall, a casing for the motor to protect it from dust-laden air, a pair of disks supporting the motor and its casing, means on the disks for supporting the motor and the casing in spaced relation to the enclosure, the means on one disk being secured to the shouldered means and affording a passage for dust-laden air, and those on the other engaging the inner wall of the enclosure, a filter surrounding the motor casing in spaced relation to it and the enclosure, the outer surface of which is exposed to the dust-laden air from the nozzle and fan, a second tubular filter of smaller diameter than the first located between the rear disk and the rear wall of the enclosure and seated on said wall around the discharge opening therein, and a handle secured to the casing for moving the cleaner.

In witness whereof, I have hereunto set my hand this 18th day of January, 1930.

JESSE F. CARSON.

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