

Sept. 29, 1942.

Q. BERG

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SUCTION CLEANER

Filed May 13, 1940

2 Sheets-Sheet 1

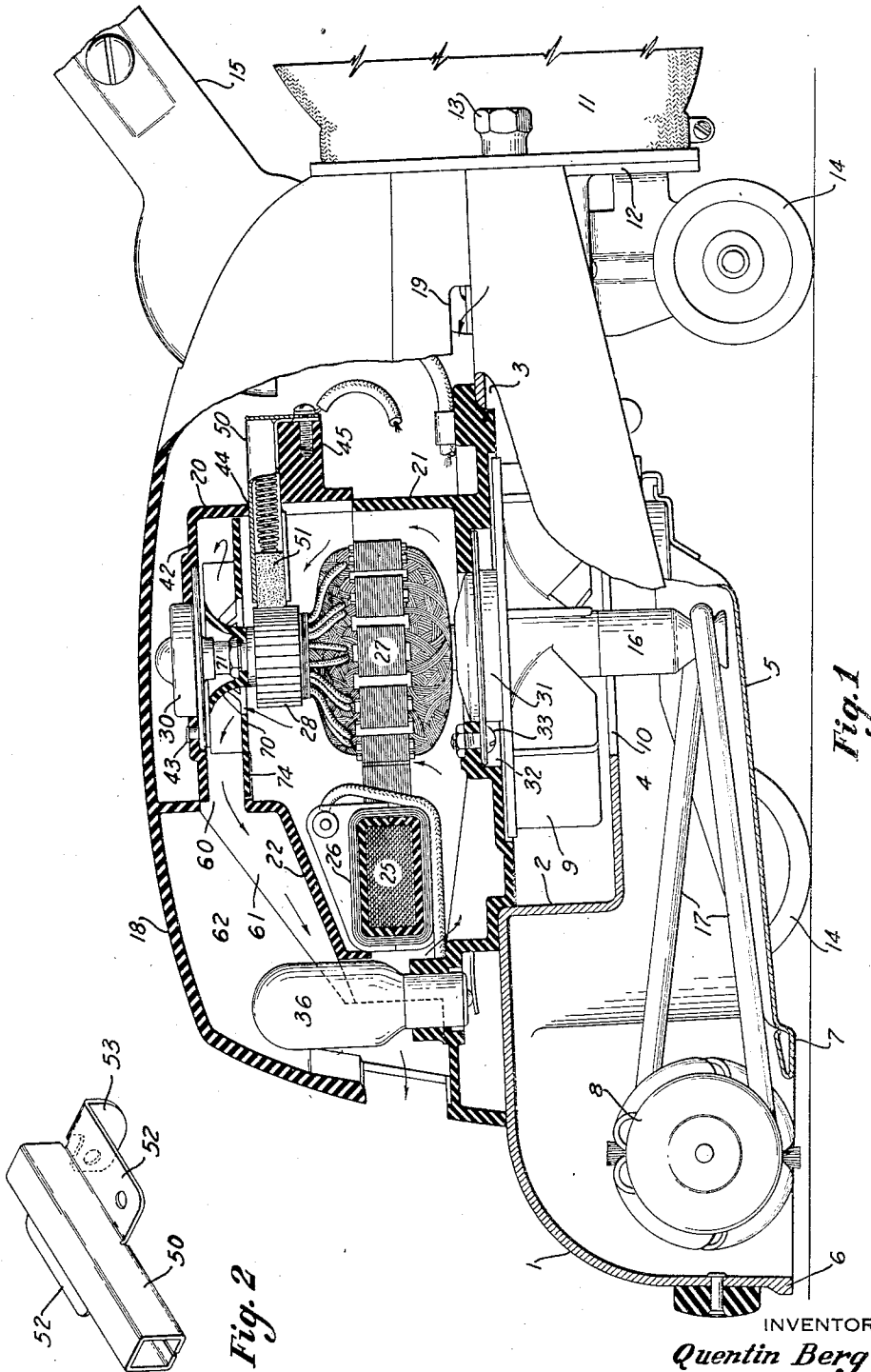


Fig. 1

Fig. 2

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Fig. 4

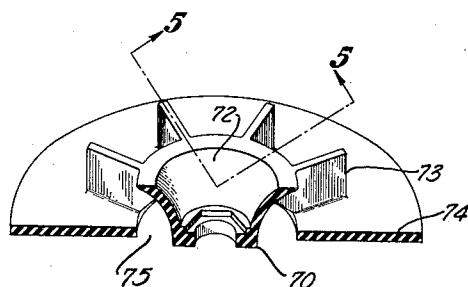
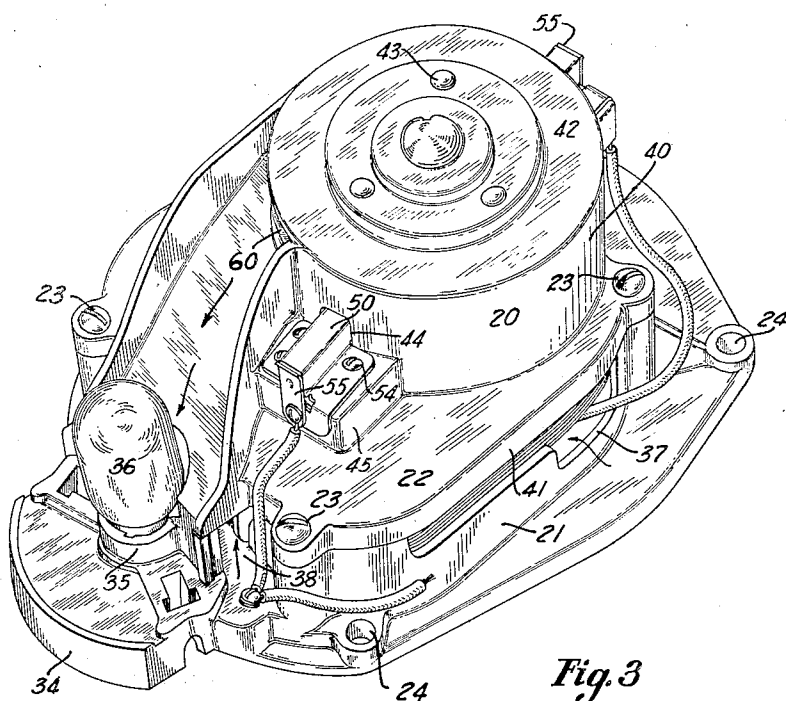


Fig. 3

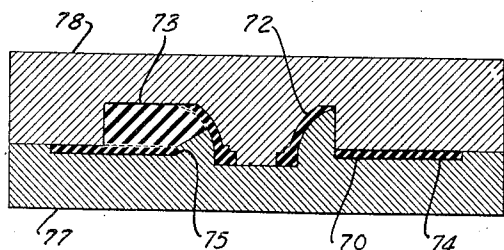


Fig. 5

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SUCTION CLEANER

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3 Claims. (Cl. 230-117)

The present invention relates to suction cleaners in general and particularly to new and novel improvements in the casing structure of the driving motor of the suction cleaner. Specifically, the invention comprises a suction cleaner in which the motor supporting casing is formed in two sections, the one section cooperating with a fan housed therein to provide an efficient means for forcing cooling air through the motor.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide a new and novel motor casing structure in a suction cleaner. Another object of the invention is to provide in a suction cleaner a motor casing formed by two halves, the one half cooperating with a cooling fan to provide an efficient means for forcing cooling air over the motor. Still another object of the invention is to provide a simple and inexpensive suction cleaner motor casing formed by two castings or moldings and so arranged that it is not necessary to employ sliding cores in casting or molding the halves forming the casing. It is still another object of the invention to provide a suction cleaner having a low vertical height so as to permit cleaning under low furniture.

It is another object of the present invention to provide a new and improved motor cooling fan construction. Another object is to provide a motor cooling fan having a single shroud on the inlet side of the fan, the shroud being provided with an inlet opening and forming one side of the chamber for the ventilating fan. These and other objects will appear upon reading the specifications and claims hereinafter set forth.

In describing this invention, reference is made to the attached drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a view in side elevation of a modern suction cleaner with a portion of the cleaner broken away to show the driving motor casing in section.

Figure 2 is an isometric view of the motor brush holder of the present invention.

Figure 3 is a perspective view of the motor casing showing the inlet and outlet for the motor cooling air.

Figure 4 is an isometric view of the cooling fan with half of the fan broken away.

Figure 5 is a view in cross-section taken on the line 5-5 of Figure 4 showing a Bakelite mold used in forming the ventilating fan.

The usual suction cleaner embodies a suction

creating means to produce a flow of air to carry away the dirt dislodged by a rotating brush or agitator. This arrangement is broadly old but an improvement has been made in the arrangement by the present invention in that the casing for the power means can be made simply and with less expense than formerly.

It is likewise well known to provide means for cooling the motor of a vacuum cleaner and such means generally comprise a small fan located inside the motor supporting casing. It has been found that to insure a positive flow of air to cool the motor it is necessary to provide a properly designed fan chamber to enclose a small centrifugal fan. The provision of a fan chamber has necessitated a complicated motor casing structure so as to form the walls for the fan chamber. In addition the provision of a cooling or ventilating fan chamber has added height to the motor casing and in turn the total cleaner height because of the additional horizontal wall and the additional clearance required between that wall and the cooling air fan. The present invention achieves all the advantages of a properly designed cooling air fan chamber simply and inexpensively, and in addition the total height of the cleaner is not increased over that where a ventilating fan is employed without a chamber.

The cleaner main casting is seen to comprise a nozzle 1, bottom and side walls of a fan chamber 2 and an exhaust passageway 3 extending rearwardly from the fan chamber 2. The fan chamber 2 communicates with the nozzle 1 through a suction passageway 4 which is completed by a removable bottom plate 5. The forward nozzle lip 6 is formed integrally with the nozzle 1 and the rear nozzle lip 7 is formed by the removable bottom plate 5. Positioned in the nozzle 1 is a rotary agitator 8 having surface brushing and contacting elements which extend a slight distance beyond the plane of the nozzle lips 6 and 7. Positioned in the fan chamber 2 is a fan 9 which draws the dirt laden air through the fan eye 10, and this air is exhausted through the exhaust passageway 3 into a dust bag 11 which is attached in the usual manner to the vertical flange 12 of the main casting 1 by means of nut 13. The cleaner is supported on front and rear wheels 14, 14 attached to the main casting 1, and there is also pivotally mounted on the main casing 1 a propelling handle 15.

A motor, indicated generally at 20, is mounted on the main casing 1 and drives the fan 9. A threaded extension of the motor shaft is formed

as a pulley 16 which drives the rotary agitator 8 by means of a rubber belt 17. The suction cleaner so far described is of a well known type and operates in a common and usual manner.

The motor casing or housing 20 comprises a lower section 21 and an upper section 22 which are held together by screws 23. The motor casing 20 seats on the top of the main casing 1 and the lower section 21 forms the top wall of the fan chamber 2 as illustrated in Figure 1. The motor casing 20 is attached to the cleaner main casing by screws (not shown) which extend through openings 24 in the lower section 21 into the main casing 1 (see Figure 3). Positioned within the motor casing 20 are the usual elements of a universal motor, namely field stack 25, with a winding 26 and an armature or rotor 27 including a commutator 28.

The armature is positioned for rotation by upper and lower bearing assemblies identified as 30 and 31 respectively. The lower bearing assembly 31 is positioned in a downwardly opening recess 32 formed integrally in the lower section 21 of the motor case by screws 33 one of which appears in Figure 1. The field stack 25 is also positioned in the lower section 21 of the motor case by suitable fastening screws not shown. Formed integrally with the lower section 21 is a forwardly extending portion 34 and having directly molded or cast therein a vertically arranged lamp socket 35 to carry a small lamp 36. Ventilating air openings 37 are formed on each side of the lower section 21, the top of the openings being flush with the top line of the motor section 21 as is clearly shown in Figure 3. In addition a similar opening 38 is formed in the front vertical wall of lower section 21. By bringing the top of openings 37 and 38 flush with the top of the lower section 21 it is not necessary to employ sliding cores to form these openings.

As seen from Figure 3 the upper section 22 comprises generally a unitary cup shaped portion 40 having a forwardly extending flange 41 which extends over and covers the field stack 25 and windings 26. The cup-shaped section 40 is generally circular in shape and is closed across the top by an integral wall member 42. Wall member 42 is provided with a centrally located opening and downwardly facing recess which serves to position the upper bearing assembly 30 which is held in place by rivets 43.

Two openings 44 are provided in the circular portion 40 through which the brush holders 50 extend. These openings are spaced approximately 180 degrees apart and are formed without pulling side cores by making the inside diameter of the cup shaped portion 40 at the bottom of openings 44 as large or larger than the outside diameter of the cup shaped portion at the top of openings 44. In practice the openings 44 are not cleanly formed as a thin flash of the molding material will close the openings but this flash can be easily punched out. Below each opening 44 a rectangular shaped seat 45 is formed which serves as a seat for the brush holders 50.

Brush holder 50 is seen to comprise a stamping generally shaped to provide a guide for the commutating brush 51 and having laterally extending flanges 52, the one flange having a downwardly extending portion 53. The flanges 52 and the downwardly extending portion 53 serve to position the brush holder on the seat 45 by means of the screws 54. The screw which extends through the downwardly extending flange 53 also serves to fasten a small metallic clip 55 which

functions as a retainer for the commutating brush 51 and its attached pressure spring and also as a current carrying member to the pressure spring since the commutator lead wire is secured to this screw.

As viewed in Figure 1, it is seen that a ventilating fan 70 is mounted on the armature shaft immediately above the commutator 28 by means of a nut 71. The ventilating fan will be described in detail hereinafter but for the present it is adequate to say that the fan is of the centrifugal type and operates in an integrally formed chamber which comprises the uppermost portion of the cup shaped portion 44 of the motor casing section 22. The ventilating fan chamber is closed across the bottom by shroud 74 on the fan 70 and which extends radially to the sides of the chamber 44 so as to provide only a running clearance therebetween.

The ventilating air exhaust opening 60 is formed in much the same manner as the brush holder openings 44. The diameter of the top wall segment 42 at the opening 60 is made slightly smaller than the inside diameter of the cup shaped portion 44 at the point where the opening is formed in order that the two halves of the mold or die which forms the casing section 22 will register thereat and thus form the opening 60 in the molded piece.

Completing the description of the upper section 22 it is to be noted that two upstanding spaced apart wall members 61 are formed integrally with the upper section 22 which cooperate with two depending similarly spaced apart wall members 62 formed integrally with the motor hood or cover 18 to form an exhaust passageway for the ventilating air. The ventilating air flows through this exhaust passageway over the lamp 36, thus cooling the same, and is discharged to the atmosphere through the opening formed in the forward portion of the motor hood and through which the light rays are directed onto the floor covering.

Referring specifically to the ventilating fan 70 which is illustrated in Figure 4 it is noted that the fan is made in one piece and comprises a hub 72, blades 73 and a rim or shroud 74. The hub 72 is in the form of a truncated cone from which the blades 73 extend radially.

Integrally formed with the blades 73 is the shroud 74 which extends radially a greater distance than the fan blades. The shroud is provided with a central opening 75 which forms the eye of the fan and through which the air enters to be acted upon by the fan. The construction of the fan 70 is such that it may either be a die casting, as for example die cast aluminum, or a molding, as for example molded phenolic resin. Likewise the construction of the fan is such that it can be made from a die or mold having only two parts and without pulling side cores.

In Figure 5 a simple compression type Bakelite mold is shown in section with the left hand half taken through the blade 73 and with the right hand half showing a section between blades as indicated by the section lines in Figure 4. The lower half of the mold is indicated by reference character 77 and the upper half by character 78. It is readily apparent that by making the diameter of the hub 72 at its largest point equal to or slightly less than the diameter of the eye 75, the fan is formed without pulling side cores. Thus a compact and rigid fan is obtained which is simple and inexpensive to construct.

Referring to Figure 1, the ventilating fan 70

is secured to the armature shaft by a nut 71. It is also to be noted that the hub 72 of the ventilating fan is recessed on the top side in order that bearing assembly 30 may partially fit into the recess or hollowed out portion so that the overall height of the cleaner motor is reduced.

To assemble the motor unit, the bearing assemblies 30 and 31 are first mounted in casing sections 22 and 21 respectively. Field stack 25 with its associated winding 26 is then secured in the lower casing section 21. The armature assembly 27 minus the suction creating fan 9 and pulley 16 is then inserted in the lower bearing 31. Ventilating fan 70 should be secured to the armature shaft at this point, or it may have been previously assembled on the shaft. The upper half or section 22 is secured to the lower half 21 by the screws 23. Motor brush holders 50 are then attached to the casing section 22 and the motor brush and other wiring connections are made. The final step comprises securing the fan 9 and pulley 16 to the armature shaft after which the complete motor unit is secured to the cleaner main casing.

In operation, the motor ventilating air traverses the following path. The air enters the motor hood 18 at ports 19 located near the rear and at each side thereof. The air next flows through port 38 and ports 37 of the motor casing section 21, across the field windings 26 and armature 27 thus cooling the same. The air is admitted to ventilating fan chamber formed by the rotating fan shroud 74 and the upper section 22 of the motor case through the eye 75. Therein the air is placed under pressure and exhausted through exhaust port 60, passing through the channels formed by wall members 61 and 62, past the lamp 36 and exhausted to atmosphere through the opening in the front of the motor hood.

The advantages in applicant's structure lies in the improved construction of the parts of a suction cleaner so that these parts may be simply and inexpensively produced. Likewise the overall height of the cleaner is reduced which permits cleaning under low furniture. By applicant's invention the motor casing is formed by two simple moldings or castings, the one completing the top of the main fan chamber and housing the motor field stack, the other part positioning the motor brushes and cooperating with a ventilating fan to form a centrifugal fan system for motor cooling purposes. This fan system is

highly efficient and furthermore makes use of a simple and inexpensive ventilating fan.

I claim:

1. In a suction cleaner, the combination of suction creating means including a motor, a housing for said motor provided with ports at its opposite ends for the circulation of ventilating air therethrough, said housing formed in two sections, one of said sections positioning the commutating brushes and a rotor bearing and including a raised circular portion forming the top and circular sides of a ventilating fan chamber, a ventilating fan provided with a single shroud of greater radius than the fan blades, said shroud having a central opening adapted to form a fan inlet, said shroud and said raised circular portion of the housing cooperating to form a complete ventilating fan chamber.

2. In a suction cleaner, a motor housing formed in two sections, one of said sections comprising an open bottomed casing part having side and top walls, a ventilating air opening formed in said side wall, commutating brush holder openings formed in said side wall below said air opening, said side wall having each portion spaced radially a lesser distance than any portion therebelow in order that said part may be molded without the use of side acting cores, a motor shaft extended into said part, a motor ventilating fan carried by said shaft adjacent said top wall and said air opening, said ventilating fan including a single shroud having an inlet opening, said shroud being extended closely adjacent said side wall, the said top wall and said shroud forming the end walls of a fan chamber.

3. In a suction cleaner, a motor housing formed in two sections, one of said sections comprising an open bottomed casing part having side and top walls, a ventilating air opening and commutating brush holder openings formed in said side wall, supports for said commutating brush holders positioned exteriorly on said casing part, said side wall having each portion spaced radially a lesser distance than any portion therebelow in order that said casing part may be molded without the use of side acting cores, a motor shaft extended into said part, a motor ventilating fan carried by said shaft adjacent said top wall and said air opening, said ventilating fan including a single shroud having an inlet opening, said shroud being extended closely adjacent said side wall, the said top wall and said shroud forming the end walls of a fan chamber.

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