June 24, 1941. B. C. BECKER 2,246,832

SUCTION CLEANER

Filed Sept. 24, 1937 4 Sheets-Sheet 1

Fig. 1

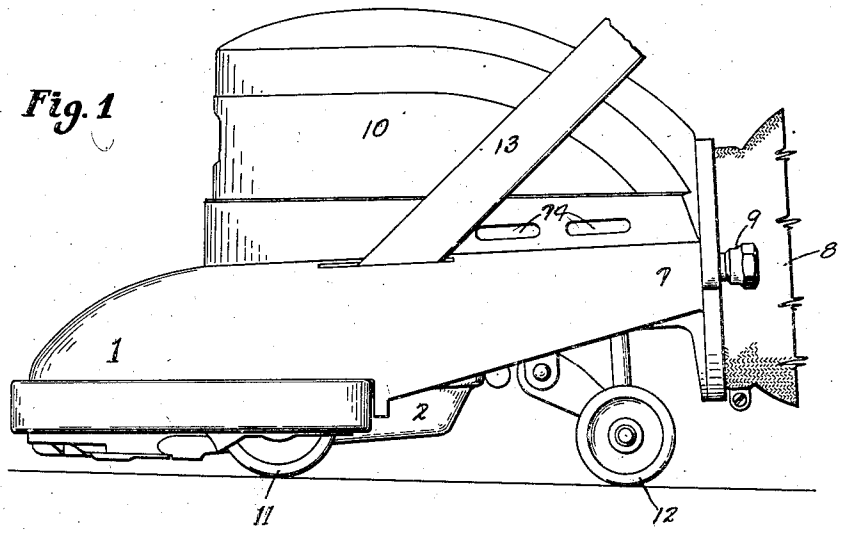
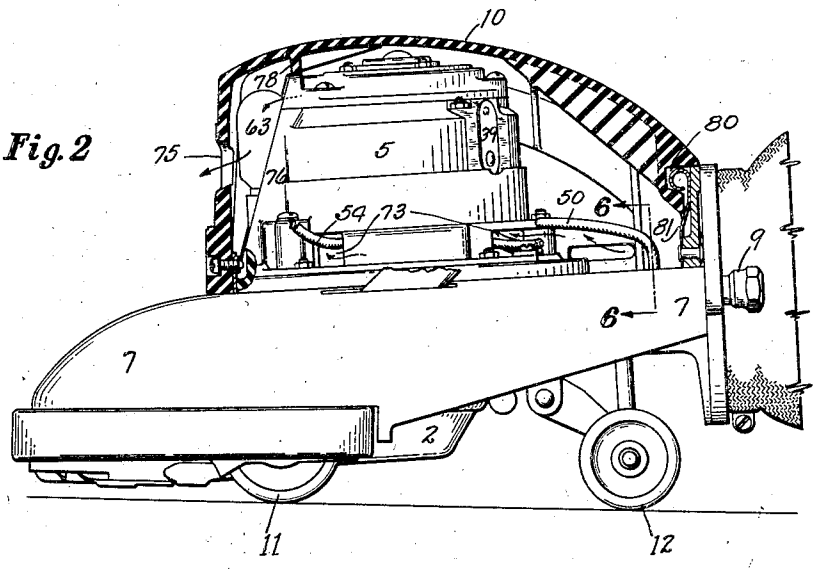


Fig. 2



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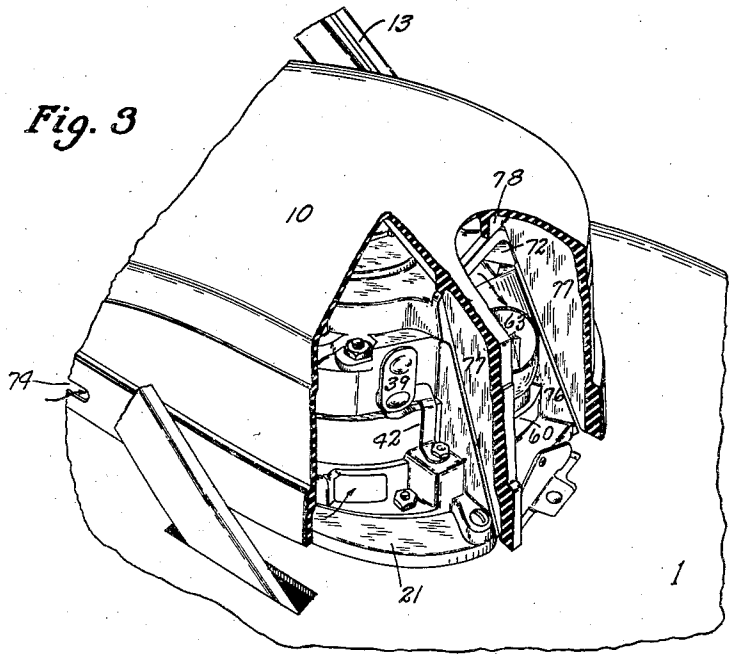
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SUCTION CLEANER

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Fig. 3



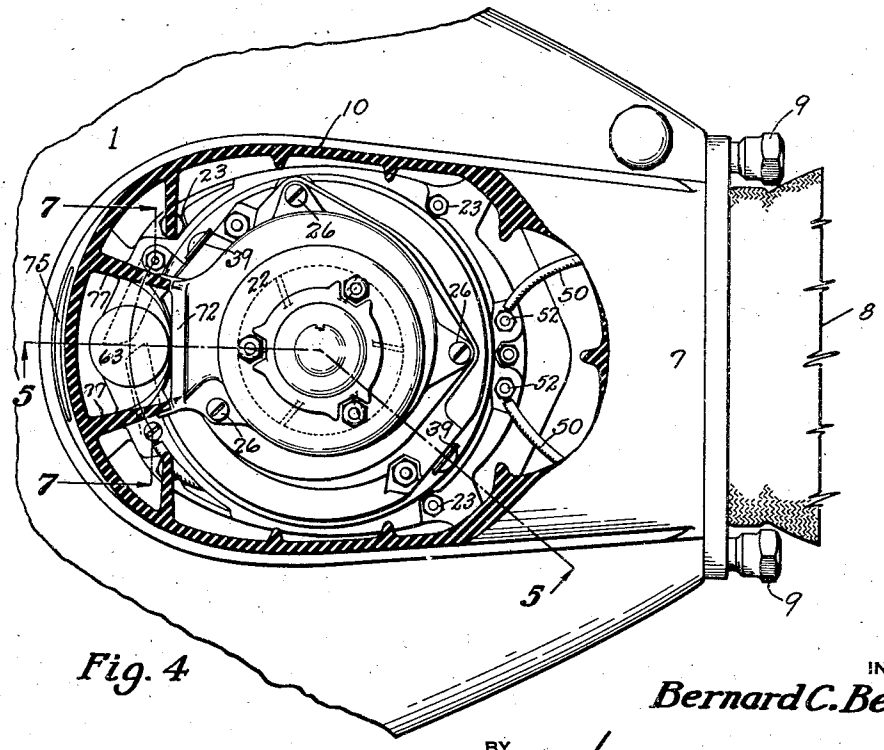


Fig. 4

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SUCTION CLEANER

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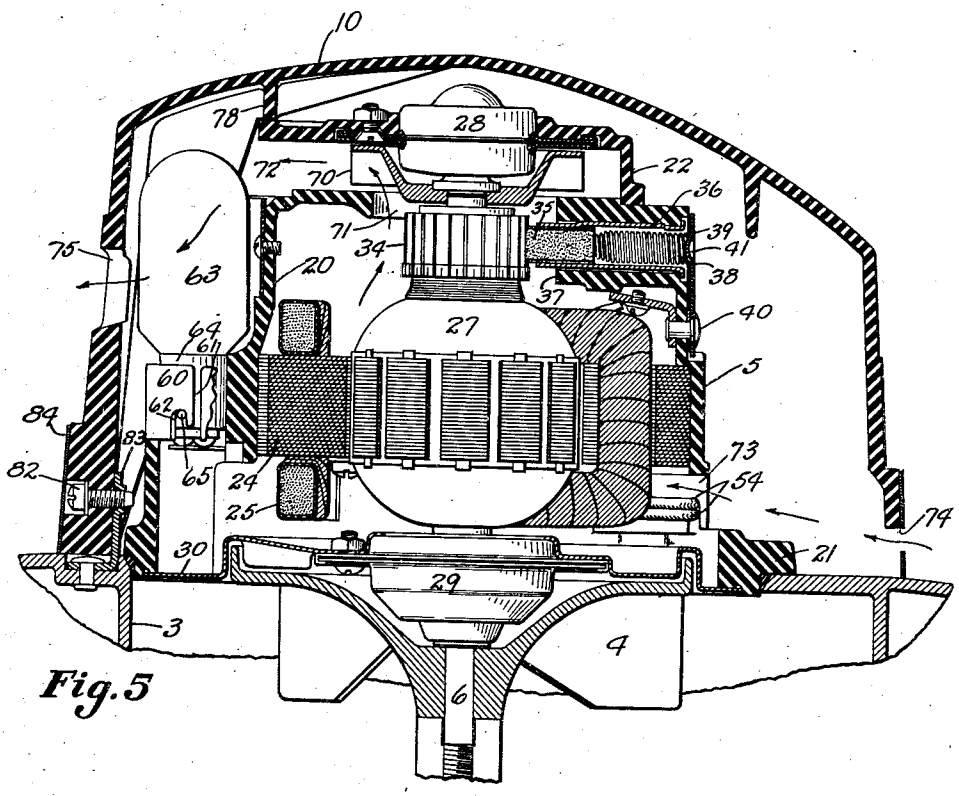


Fig. 5

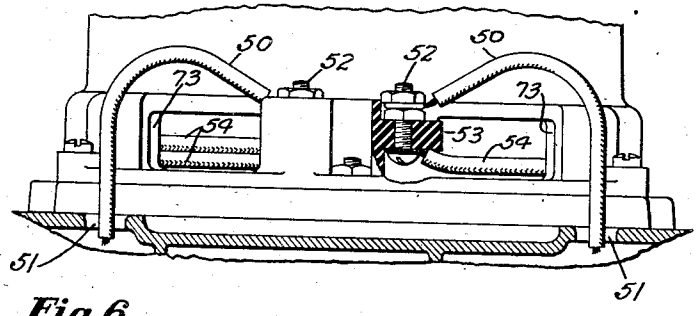


Fig. 6

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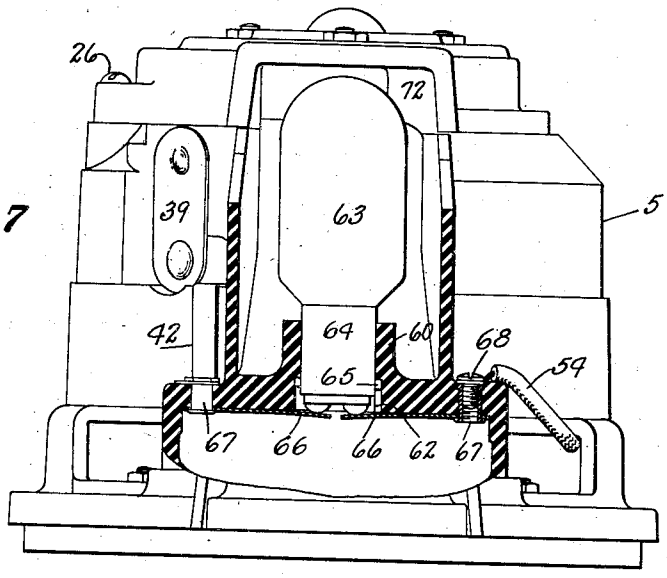
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June 24, 1941. B. C. BECKER 2,246,832

SUCTION CLEANER

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Fig. 7



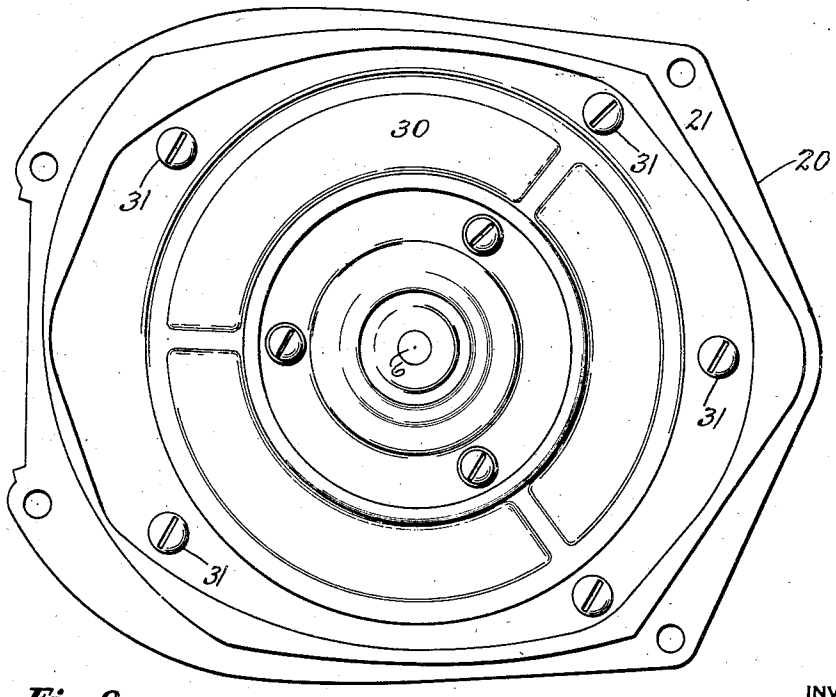


Fig. 8

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2,246,832

UNITED STATES PATENT OFFICE

2,246,832

SUCTION CLEANER

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Application September 24, 1937, Serial No. 165,477

2 Claims. (Cl. 15—16)

The present invention relates to suction cleaners in general and particularly to new and novel improvements in the mounting and the insulating structure of the electrical units of the suction cleaner. More specifically the invention comprises a suction cleaner in which the electric motor is formed with a casing of insulating material which supports the entire motor upon the metallic body of the cleaner and which serves as the insulation mounting means for the various electrical current-carrying elements within the suction cleaner.

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 suction cleaner embodying a new and improved motor construction. A still further object of the invention is to provide a suction cleaner in which the motor casing is formed entirely of insulation material. A still further object of the invention is to provide a suction cleaner in which the field and armature of the driving motor are entirely supported upon the metallic cleaner casing by the motor casing which is formed of insulation material. Another object of the invention is to provide a suction cleaner in which the casing of the electric motor is formed of insulation material, such as "Bakelite," which casing serves as the carrying and insulating means for the conductor terminals, the motor brush seat and its retaining means, and for the cleaner headlight. A further object of the invention is to provide a suction cleaner in which the casing of the motor is formed of insulation material, carries the current-carrying units of the cleaner, and cooperates with a surrounding and spaced hood to completely insulate and protect the electrical units. A still further object is to provide a suction cleaner having a motor casing of insulation material which is so molded and shaped as to cooperate with the enclosing hood of insulation material, and which is spaced therefrom so as to form a channel for the motor cooling air. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which a preferred embodiment of the present invention is disclosed:

Figure 1 is a side elevation of a suction cleaner embodying the present invention;

Figure 2 is a view similar to Figure 1 but with the enclosing motor hood cut away to disclose the driving motor positioned therein;

Figure 3 is a half front perspective view of the machine with the enclosing hood partially broken away to show the cooperation of the hood with the motor casing;

Figure 4 is a partial top view of the machine with the top of the motor hood broken away;

Figure 5 is a section through the motor and its enclosing hood upon the line 5—5 of Figure 4;

Figure 6 is an enlarged view of the incoming power lead terminals on the motor casing, being a section taken upon the line 6—6 of Figure 2, but with one of the terminals being shown in section;

Figure 7 is a vertical section through the headlight mounting and motor-cooling air channel, being taken upon the line 7—7 of Figure 4;

Figure 8 is a bottom view of the motor unit per se with the suction-creating fan removed and showing the motor bottom plate seated upon the supporting peripheral flange formed on the motor casing.

In the preferred suction cleaners heretofore known, the source of driving power of the cleaner has comprised an electrical motor which has included the usual rotor and stator, the latter being mounted in a casing or frame by which the motor was supported upon the remainder of the cleaner, and the rotor being suitably carried thereby. This supporting frame-casing being formed of metal, and therefore a current conductor, was necessarily insulated from the current-carrying parts of the motor and the incoming current-carrying leads, as well as the motor brushes and the motor terminals, were all necessarily insulated therefrom. In addition, the entire motor including the frame-casing, was preferably insulated from the remainder of the cleaner to protect completely the operator from possible electrical shocks. If a headlight unit for the suction cleaner were provided, and mounted upon the motor, as was commonly done, it was necessary to connect this headlight to a source of current in the motor through means insulated from the frame-casing and to insulate the headlight itself from the motor.

In the preferred construction of modern suction cleaners the motor unit has preferably been enclosed and concealed by a motor hood formed of metal. This hood was preferably spaced from the frame-casing of the enclosed electrical motor, or at least was adequately insulated therefrom, and expensive and necessary precautions were taken to prevent the transference of any current

from the motor to the enclosing metallic hood. Insulation mountings and protective devices were necessary at all points at which any possible contact could take place and in addition thereto the entire motor unit was insulated, in many cleaners, from the supporting cleaner body and from the enclosing metallic hood.

In the suction cleaner constructed in accordance with the present invention, the motor frame-casing, hereinafter called the motor casing, is formed of insulation material such as a phenolic condensation product, commonly known as "Bakelite". The casing is preferably molded and in this molding process the necessary seats, sockets, walls, flanges and recesses are formed which result in the elimination of the separate insulation mountings and protective devices required in the earlier cleaner constructions. Cooperating with this insulating motor casing is an enclosing motor hood of insulating material which is also preferably molded and so shaped and contoured as to cooperate therewith to provide an electrical motor unit within the cleaner which is absolutely safe to the user. The resulting construction requires fewer parts than known cleaner constructions and consequently is more economical to construct. These results accrue from the construction hereinafter fully described.

Referring again to the drawings, a modern suction cleaner embodying a preferred form of the invention is disclosed. The cleaner main casing comprises a nozzle 1 which is interiorly connected through an air passageway 2 to the interior of a fan chamber 3 which is shown in Figure 5. A suction-creating fan 4 is positioned within fan chamber 3 and is driven by an electric motor, indicated generally by 5, which is positioned immediately thereabove, the fan being carried upon the extended lower end of the motor shaft 6. In operation the air drawn through the nozzle 1 and over the surface covering undergoing cleaning, enters the fan chamber 3 via the passageway 2 to be exhausted therefrom by the fan 4 through the exhaust outlet 7 into the dust bag 8 which, as in the usual cleaner construction, is removably secured to the exhaust outlet by suitable manually operable means 9. The motor 5 is housed within and concealed by an enclosing motor hood 10 which with the main casing of the cleaner which supports it forms the visible exterior cleaner body. Hood 10 is constructed in a definite manner as will be hereinafter fully set forth.

The entire cleaner is movably supported by front and rear wheels, one of each being shown in the drawings and being indicated by the reference characters 11 and 12, respectively. Completing the general suction cleaner arrangement is a pivoted handle 13, the lower portions of the bail arms of which are shown broken away in Figures 1 and 3. The handle is of a common and well known type pivoted at its lower end to the cleaner body and by its use the operator can readily propel the machine over the surface covering undergoing cleaning.

The driving motor for the suction-creating fan 4 comprises, in the cleaner constructed in accordance with the present invention, a supporting casing 20 of insulation material such as "Bakelite," which is formed at its bottom with a peripheral flange 21 seating directly upon the top wall of the fan chamber 3 of the main casing of the cleaner and secured there by bolts 23. Casing 20 is formed of two parts, a main part and a cap section 22 which is secured to the top thereof by screws 26, 26 etc. The motor stator comprising the field laminations 24 and windings 25, are mounted directly upon the main part of casing 20.

The cleaner rotor includes the armature 27, the shaft 6 of which is rotatably mounted in a top bearing 28, carried by the casing cap 22, and in a lower bearing 29, carried by the metallic bottom plate 30 of the motor. Plate 30 is itself carried by the bottom supporting flange 21 of casing 20 it being secured thereto by removable screws 31, 31 etc.

The motor commutator 34 is carried by the shaft 6 immediately above the armature 27 and is there contacted by the current-carrying brush 35, of carbon or other suitable brush material. Each brush 35, there being two, is slidingly mounted within the metallic brush seat 36 positioned within a radial bore 37 formed in a thickened portion of the top wall of the casing 20. The brush 35 is spring-urged against the rotatable commutator 34 by a coil spring 38 which contacts at its outer end a pivoted current-carrying latch element 39. Element 39 is pivoted below the brush seat upon a rivet 40 and is adapted to be rotated to cover or uncover the bore 37. In the closing position a depressed surface 41 in element 39 serves to seat and center the outer end of the spring 38 and also serves to prevent the unintentional rotation of the latch element through making it necessary to deflect that element slightly outward so that the inner side of the depressed portion 41 will clear the rim of the bore 37.

Incoming current to the brush enters the conducting latch element 39 via the rivet 40 which is connected to a current conductor or bar 42 upon the exterior surface of insulating casing 20 and which is itself suitably connected at its opposite end to a source of current in the machine. The brush seat 36 is only frictionally retained within the surrounding bore 37 and the spring latch 39 is of sufficient strength to prevent its outward displacement thereby eliminating the necessity of providing additional seat-securing means. There are, of course, at least two of the brush units, a pair of the securing latch elements 39, 39 being shown in Figure 4.

The incoming current-conducting leads to the motor are indicated by the reference character 50 and are shown in Figure 6 as passing upwardly through openings 51, 51 and connecting to terminal posts 52, 52 which are mounted directly in the casing 20 through extending through vertical bores formed in horizontal flanges 53, as illustrated in Figure 6. From the lower end of the terminal posts 52 additional conductors 54, etc. convey the current to other parts of the motor, such as the above described motor brushes, the stator, and the headlight hereinafter to be described.

On the front or nozzle side of the motor casing 20, as is clearly illustrated in Figures 5 and 7 in particular, a vertical socket 60 is molded integrally therein. The casing wall is vertically offset above and below this socket portion 60 so that in the molding of the casing the die may be drawn in a straight line. A vertical groove or slot 61 is formed in the socket 60 which opens on its underside into an offset seat or recess 62 the relationship being such that the base 64 of a headlight 63 can be inserted into the socket with its positioning pin 65 passing downwardly through the slot or groove 61 until the lower end

thereof has been reached at which time a slight rotational movement of the lamp positions the pin 65 below the recess 62. It is there secured against accidental displacement by the upward vertical force exerted upon the lamp base by the current-carrying contact springs 66, 66 which contact the bottom of the base 64.

These contact springs 66, 66 are secured directly to the casing wall by means of metallic rivets 67, 67, one of said rivets being internally threaded, as shown in Figure 7, and adapted to receive a conductor-securing screw 68 to which one of the aforementioned conductors 54 connects. From the opposite rivet 67 the above mentioned conductor bar 42 extends to a brush spring latch 39. The relationship is such that the headlight 63 is in series with one of the brushes 35.

To remove the heat generated by the motor proper and by the headlight carried thereby there is provided at the upper end of the motor shaft 6, and between the upper motor bearing 28 and the commutator 34, a small fan 70. The top wall of the main part of the motor casing 20 is formed with a central opening 71 immediately above the commutator 34 so that it functions as an eye for the fan chamber formed by the casing cap 22 which encloses the fan 70. At its forward side this cap 22 is provided with a port 72 to permit of the air drawn through the motor by the fan 70 to be exhausted therefrom. Similarly, intake ports 73, 73 are formed at spaced points in the periphery of the motor casing 20 near its bottom and through these ports air enters the motor to pass upwardly therethrough and to be exhausted therefrom by the action of the suction-creating fan 70 through the exhaust port 72. This air, of course, in passing through the motor removes the heat generated thereby.

As the exhaust port 72 is immediately in the rear of and adjacent the top of the headlight 63 the air exhausted from the motor casing passes over that element and thereby additionally removes the heat generated therein.

The motor and headlight unit are normally enclosed with the motor hood 10 and it is necessary to provide in that element means to permit of the entrance and exit of the motor-cooling air as well as a port for the headlight. For this purpose air intake ports 74, 74 etc. are formed therein near its bottom closely adjacent the intake ports 73, 73 in the motor casing 20. Similarly, an exhaust port is provided at the front of the motor hood immediately forward of the headlight 63, as indicated at 75 in such a position that it functions not only as an exhaust port for the motor-cooling air exhausted from the motor casing but also as the opening of the headlight 63.

The exhaust outlet 72 of the motor casing is spaced an appreciable distance from the exhaust outlet 75 in the motor hood and to insure that the motor-cooling air after passing over the headlight 63 will pass directly from the motor hood it is necessary to provide means to prevent the circulation of that air between the hood and the casing. For this purpose cooperating vertical wall sections 76, 76 and 77, 77 are formed upon the motor casing 20 and the motor hood 10, respectively. As is clearly illustrated in Figure 3 these abutting walls are spaced at the sides of the headlight 63 and, in cooperation with a vertical wall 78, formed on the hood 10 and which contacts the upper surface of the exhaust port 72 of the casing, form a closed chamber which houses the headlight and which is open exteriorly only through the exhaust port 75 of the hood. Any air exhausted from the cleaner through the exhaust port 72 must, after passing the headlight 63, pass from the chamber formed by the cooperating side walls from the hood 10 via the exhaust outlet 75.

The motor hood is an entirely separate member from the motor casing and in order to reach the motor proper it is necessary that the hood be removed. As it is sometimes necessary to replace the headlight 63 or to make some adjustment upon the motor, the hood 10 is made easily removable through providing at its rear a recess 80 the bottom of which is formed with a cam surface which is contacted by a spring 81 mounted on the cleaner main casing and which urges the rear of the motor hood downwardly. At the front of the hood a screw 82 extends through the hood wall into screw threaded relationship with a fixed bracket 83 mounted on the main casing of the cleaner. This screw is normally concealed by an overlying plate 84 which is readily displaceable upwardly to permit of access to the screw. With the screw 82 removed the hood is readily pivoted upwardly at its forward end to permit of the withdrawal of the cammed undersurface of recess 80 from contact with its locking spring 81.

The motor hood 10 and the motor casing 20 are, according to this invention, formed of insulation material such as a phenolic condensation product. Neither element of itself is capable of conducting current at the normal voltages at which suction cleaners operate. With the motor hood in place and enclosing the motor casing a space is provided therebetween which absolutely insulates the current-carrying parts of the motor from the user. Because of the fact the casing 20 is of insulation each of the current-conducting elements is directly mounted thereon and in some cases upon its exterior. The entire assembly is greatly simplified as well as greatly reduced in cost. The entire motor and headlight unit is insulated from the metallic main casing of the cleaner through the provision of the supporting flange 21 on the casing 20 which is the sole connection and support of the motor.

I claim:

1. In a suction cleaner, a metallic main casing including a nozzle, suction-creating means including a motor supported on said casing, said motor including an enclosing casing-frame extended above said casing and formed with ventilating ports at its ends and a pair of downwardly and outwardly sloping walls upon the sides of one of said ports, a light unit positioned between said walls, and a vertically displaceable hood seated on said casing and enclosing said motor, said hood being formed with a plurality of openings through which ventilating air to and from said motor can pass and with a pair of upwardly and inwardly sloping walls arranged to abut said sloping walls on said frame-casing and to form therewith the sides of a cavity closed from the remainder of the hood interior, characterized in that one of said openings in said hood is positioned and arranged between said sloping wall portions as to permit the passage of motor-and-light-cooling air between said cavity and atmosphere and to permit light rays from said light unit to pass outwardly from said hood and forwardly of said casing across said nozzle.

2. In a suction cleaner, a metallic main casing including an open-topped fan chamber and a nozzle positioned forwardly thereof, suction-creating means including a fan in said chamber

and an electric motor, said motor being mounted on said casing and including a frame-casing of insulating material formed with a surrounding supporting flange at its bottom seated directly on said casing at the open top of said fan chamber, a metallic bottom plate forming the top wall of said fan chamber and entirely insulated therefrom by said frame-casing, a rotor supported at its lower end in said bottom plate, and a field carried by said frame-casing adjacent said rotor.

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