Aug. 16, 1955 M. A. KENT 2,715,452

SUCTION CLEANER

Filed Dec. 6, 1950

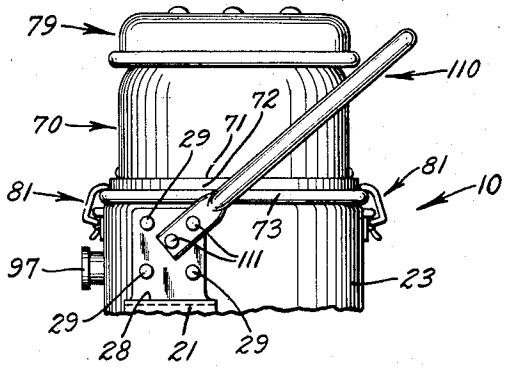


Fig 1

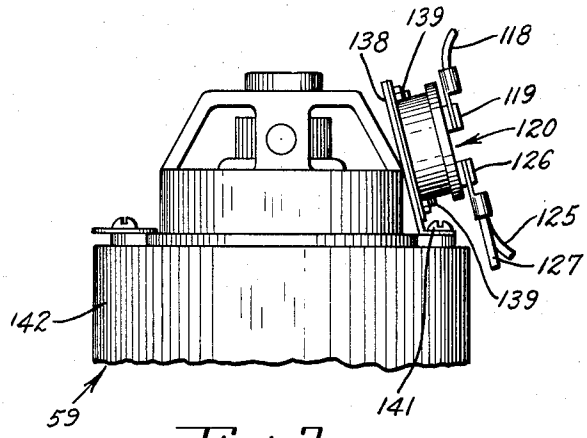


Fig. 2

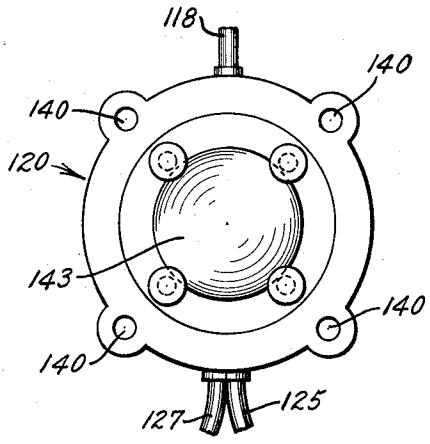


Fig. 3

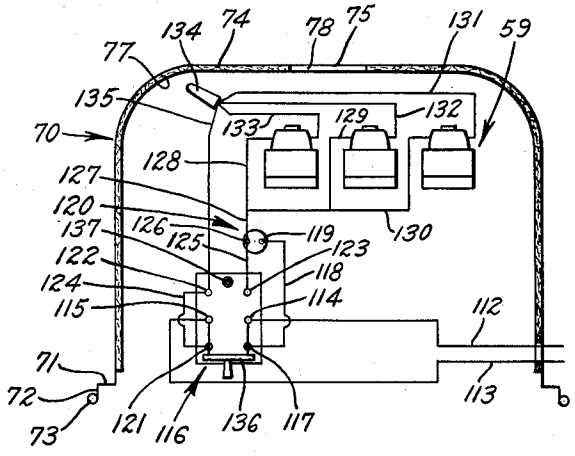


Fig. 4

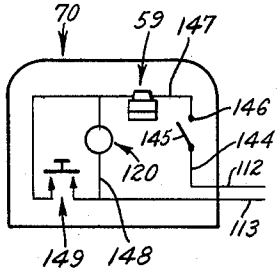


Fig. 5

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SUCTION CLEANER

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1 Claim. (Cl. 183—37)

This invention relates to new and useful improvements in suction cleaners and is applicable both to cleaners for household or domestic use and to commercial types of suction cleaners such as are used in cleaning operations in hotels, apartment houses, office buildings and the like.

An object of the invention is to provide in an electric motor operated suction cleaner wherein the air drawn into the cleaner during use is also employed for cooling of the electric motor or motors, a means whereby on clogging of the machine in such manner that air is not being drawn into the same in sufficient quantity for proper functioning at a predetermined level of efficiency, the circuit to the electric power plant is automatically opened.

Other objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claim.

In the drawing:

Fig. 1 is a side elevational view of the upper portion of the cleaner;

Fig. 2 is a similar view, on a larger scale, showing one of the motor units with a thermostatic switch mounted thereon;

Fig. 3 is a rear elevational view of said thermostatic switch;

Fig. 4 is a schematic view showing the wiring diagram; and

Fig. 5 shows a modified wiring arrangement.

Referring in detail to the drawing, and at first more particularly to Figs. 1–4, in Fig. 1 is shown the upper portion of the cleaner fully disclosed in co-pending application of Kent and Yutzler, Serial number 172,758, filed July 8, 1950, and since the parts are the same as those in said application, the same reference numbers have been employed.

Thus, the cleaner generally designated **10** may include a wheeled platform construction (not shown) and a pair of upright arms of which but the arm **21** is shown. Supported by and located between the upper end portions of said arms or uprights is a housing including an annular shell **23** open through its top and bottom ends. Toward their upper ends the uprights are offset inwardly or toward one another as at **28** whereby their upper end portions are against the outer sides of the shell **23** and such portions are rigidly and permanently secured to said shell as through rivets **29**.

A cover **70** of metal or any other desired material encloses one or more units **59**, as for example, three, and includes at its lower end an outwardly directed annular flange **71** carrying a depending flange **72** having its lower edge portion rolled or formed into a bead **73**. The upper end portion of cover **70** is substantially closed by a wall **74** having a central opening **75** therethrough. Units **59** each include an electric motor and a blower or fan driven by said electric motor.

When the cover **70** is in position on the machine, its depending flange **72** is about the upper edge portion of the shell **23**. Thus, shell **23** and cover **70** together constitute a housing mounting various parts, all as disclosed in the above mentioned application. A lining **77** of sound deadening or absorbing material as, for example, felt, is secured to the inner surface of the cover **70** and such lining is coextensive with said inner surface and has an opening **78** therethrough registering with the opening **75** above mentioned as in the upper wall **74** of the cover.

With all the parts in their proper assembled relation in the shell **23**, the cover **70** and parts mounted thereon are secured in position by draw pull catches **81**, the detailed description of which is not here given. In the use of the present machine, air drawn from the shell **23** by the suction units **59** is exhausted through the aligned holes **75** and **78** above described. A muffler structure is mounted on the upper wall of the cover **70**, the air being discharged passes through such muffler. This muffler structure comprises an assembly generally designated **79** and described in detail in the above identified application.

In the use of the machine, a hose (not shown) having at one end a suitable tool has its other end connected with an intake nipple **97** communicating with the interior of the casing **23**. As the machine is used, dust or dirt laden air is drawn in through the nipple **97**, the dust or dirt separated from the air, and the latter passed upwardly about the units **59** and out through the registering openings **75** and **78** to the muffler. This air serves to maintain the units **59** at operating temperature and against overheating.

A U-shaped handle **110** has the end portions of its side arms suitably secured to the machine as by having them riveted at **111** to the upper portions of the upstanding members or arms **21**. This handle is for use when moving the machine about.

While the foregoing description relates to the particular machine disclosed in the above entitled application, this is a matter of convenience for disclosure purposes. Such machine is herein referred to merely for the purpose of showing one application of the invention and it is to be understood that the invention is applicable to other constructions of both commercial and domestic types of machines. The construction of the machine referred to is herein considered as a type of suction cleaner wherein air is drawn into the machine and therein separated from foreign matter such as dust, dirt, water, etc., and then the air is used to maintain the power units of the machine at operating temperature by cooling such units and preventing their overheating.

Additionally, it will be understood that in the type of machine referred to it is not necessary that the machine be equipped with three units **59** as disclosed herein, since more or less units may be employed, the essential question being that the power means is electric and is located within a closed chamber and is cooled by air drawn into the machine during use of the latter, which air is separated from the dirt or dust, water or other material being collected and then used to prevent overheating of the electric power unit.

According to the present invention, the machine of the type disclosed is equipped with means whereby on the closing of a switch means the power unit of the machine is energized and the machine placed in operation. This is also conventional in the type of machine referred to. However, in the present instance, the machine is further equipped with means whereby should its intake or some other part become clogged so that the machine is not operating at a predetermined level of

efficiency and air in the proper volume to efficiently take up dirt or dust or water is not being drawn into the machine, the power circuit will be automatically opened.

This automatic opening of the power circuit is brought about by a thermostatic switch located within the closure with the power unit, which unit will, of course, become overheated on the failure to move large volumes of air over it. The switch means of the present machine includes means to be manually held closed and establish the circuit to the power unit through by-passing of said thermostatic switch to have the machine operate. This manual operation of the switch means is to take place after the clogging has been removed and it is then only necessary to manually hold the switch means in its by-passing position for a short time since during such time large volumes of air will be taken into the machine and passed over the power units and the thermostatic switch to cool the same. On sufficient cooling, the second mentioned switch means is released and moves to open circuit position and the second mentioned switch means is already closed or is then closed to again energize the power unit or units, and the machine is used as formerly.

Referring to Fig. 4, the cover **70** is there shown as enclosing three of the units **59**. In such figure, the power intake wires are shown at **112** and **113** connected respectively with terminals **114** and **115** of a switch means generally designated **116**. From a switch contact **117**, a wire **118** leads to a terminal **119** of a thermostatic or monitor switch generally designated **120**. Contact **117** is one of a pair including a contact **121** and the latter is permanently connected with contact **122** of a pair also including contact **123** by means of a wire **124**. A wire **125** from contact **123** connects with a terminal **126** of thermostatic switch **120** and a second wire **127**, in effect a continuation of wire **125**, through leads **128**, **129** and **130** is connected with the three units **59**. Then from such units, leads or wires **131**, **132** and **133** are secured in a wire connector **134** from which a lead **135**, electrically connected with all of the wires **131**, **132** and **133**, extends and is at its free end electrically connected with switch contact **122**.

With the blade **136** of switch **116** in the position of Fig. 4, a circuit is completed through the units **59** and they are operating. Such circuit is through the lead **112** to contact **114** to contact **117** through wire **118** to terminal **119** of the thermostatic switch **120**. Such terminal will be at this time electrically connected with terminal **126** and from the wire **127** and its branches the circuit is completed through the units **59** back through the wires **131**, **132** and **133** to the wire **135**, thence to switch terminal **122** and through wire **124** to switch terminal **121** through a blade of the switch **136** to switch terminal **115** and to the return lead **113**.

Should there be a failure of sufficient volume of air moving around and through the units **59**, they will become overheated and cause excessive heating within the cover **70** whereby the thermostatic switch **120** will function opening the circuit between its terminal **119** and its terminal **126**. The mentioned failure of movement of sufficient volume of air occurs when the machine is in some way clogged and is operating below a predetermined level of efficiency as determined by the setting or opening point of the switch **120**. The motor or motors may be operating at full speed and the sound of the machine be substantially as usual but the machine will not be accomplishing its intended purpose.

Under such circumstances, with the machine cut off, the attendant cannot proceed to go over a floor or carpet thinking he or she is really cleaning. Generally, there will be a clogging of the tool or some place between the tool and the machine and this obstruction must be removed. Then the operator throws the switch means **136** to have its blades engage the contact **122** and **123**. This closes a circuit to the units **59**, in effect, by-passing the thermostatic switch **120**.

Such circuit is from lead **122** to contact **114** through the switch blade to contact **123** which through terminal **126** is connected with wire **127** and then through the branches **128**, **129** and **130** of the latter to the respective units. The return from the units is through the branches **131**, **132** and **133** to the lead **135**, contact **122**, the switch blade, to contact **115** and thence through the return wire **113**. When the switch blade is in the last mentioned position it must be held there to maintain electrical engagement with the contacts **122** and **123** since a spring or other means **137** is constantly urging the switch blades away from the contacts **122** and **123**.

However, the operator need only hold the switch means in this closed position for a short time since after all clogging has been removed, large volumes of air are being drawn into the machine, separated from the dirt or dust or water it is carrying into the machine, and then passed upwardly through the cover **70** to be exhausted. However, in moving through the cover **70**, this air moves about and through the units **59** very rapidly cooling them and exhausting heat from within the cover so that the thermostatic switch **120** returns to its normal condition closing a circuit between its terminals **119** and **126**. Then the operator flips the switch handle in the opposite direction, as to the position of Fig. 4, and the machine operates in the normal manner.

The thermoplastic or monitor switch **120** has an L-shaped bracket **138** clamped along one of its edges as through the use of bolts **139** passing through perforations **140** of the switch housing. By means of a screw **141** this bracket is secured to the housing **142** of unit **59** whereby the entire device is sensitive to temperature changes.

Bracket **138** is located at an edge of the rear side of the switch **120** and in such side the switch housing is open exposing the bimetal member **143**. With this construction and location of the switch **120** it is seen that its bimetal part is directly exposed to heat generated within the unit **59** and is located closely adjacent to the unit. Thus, the thermostatic switch is positioned to be directly affected by heating up of the unit **59**, which heating up would occur with particular rapidity on any clogging of the intake of the machine, such as would prevent the flow of a large volume of air through the cover **70** and about the unit.

Additionally, after the clogging has been corrected the machine is started up by the manual maintenance of the switch in hold position, against the tendency of the spring **137**, the thermostatic switch being mounted on one of the units if one or more units is employed, or on the unit if only one unit is employed, will be cooled simultaneously with the cooling of the unit by the large volume of air passed through and about the unit so that the switch will rather quickly automatically close whereupon the manual of the manually operable switch is thrown to "on" or "running" position as suggested in Fig. 4. In this way, cooling of the unit or units and closing of switch **120** is rapid. The parts may be cooled to operating temperature in a matter of 15 or 20 seconds as against a wait of 4 or 5 minutes for the parts to cool of their own accord.

Fig. 5 illustrates the invention wherein the switch means is in two separate parts and this arrangement may be preferable in a cleaner of the type described but constructed especially for domestic use. In such figure, the same reference characters have been used when applying the parts shown in Figs. 1–4. Thus, there is shown a unit **59**, a cover **70** and power lines **112** and **113**.

From power line **112** there is a lead **144** to a switch means **145** shown in open relation to a contact **146** in a line **147** to unit **59**. Then a lead **148** connects motor or unit **59** with the return power line **113**. In such wire **148** is connected the thermostatic switch **120** to function as described in connection with Figs. 1–4. When switch **120** has opened and the machine cleaned of any clogging, switch **120** may be immediately by-passed by closing of

a normally open switch means **149** shown as of the push-button type. Switch means **149** may be located as desired for hand or foot operation but is normally open as is the second part of the switch means **136**.

Thus, in Fig. 5, the switch means **136** of Figs. 1–4 is separated into two parts. The part **149** is a normally open switch. Thus, it may close the circuit in by-passing relation to the thermostatic switch **120** only while it is held closed. Switch means **149** may be a time switch to open after the passage of a predetermined time interval, as 15 or 20 seconds. Where it is not a time switch but a straight manually closed normally open switch, as shown, the operator will preferably hold it closed until he counts up to 15 or 20.

From the foregoing it will be seen that in any embodiment of the invention the power circuit of the cleaner is automatically opened if a careless operator allows the dust filter (not shown) to become clogged, or the hose or cleaning tool to become clogged, or the cleaner to continue to operate after the water shut-off has indicated that the water receptacle is full and should be emptied. The opening of the thermostatic switch 120 depends on its setting. It is set to open when the volume of air passing over the units **59** is in such small volume as to indicate that the machine is being operated below a predetermined efficiency at insufficient suction pressure. Should the shut-off switch **120** open the circuit to the power unit or units, the operator must first locate the cause (plugging, clogging, etc.) and remove it so the air may again move freely in good volume through the cleaner. Thereafter, he may proceed as outlined above.

Having thus set forth the nature of my invention, what I claim is:

In a suction cleaner of the type wherein air is drawn into the cleaner with dust or water or other matter being taken up by the cleaner and is separated from such matter, a housing including a motor housing part having an air outlet opening and a material receiving part in air communication with said motor housing part and having

an air inlet opening, an electric motor suction fan unit in said motor housing part interposed in the path of the air drawn thereby through said housing and whereby the temperature of said unit and of the air within said motor housing part is affected by the volume and velocity of said air drawn therethrough, a circuit including said motor unit, and a normally closed thermostatic switch in said motor housing part so positioned as to be exposed to and operated by temperature changes in said motor housing and connected in said circuit for opening the latter on the temperature within said motor housing part, affected by the temperature of said motor unit, reaching a predetermined point, a normal operation switch means in said circuit and including manual means for opening and closing said circuit through said thermostatic switch, said normal operation switch means adapted when closed to remain in closed position until opened through manual operation of said manual means, a by-pass circuit including said motor unit and by-passing said thermostatic switch, and an auxiliary by-pass switch means in said by-pass circuit manually operable to close said by-pass circuit and including biasing means adapted to normally open said by-pass circuit, whereby upon manual release of said by-pass switch means after closing said by-pass switch means automatically opens said by-pass circuit.

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