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ELECTRIC MOTOR

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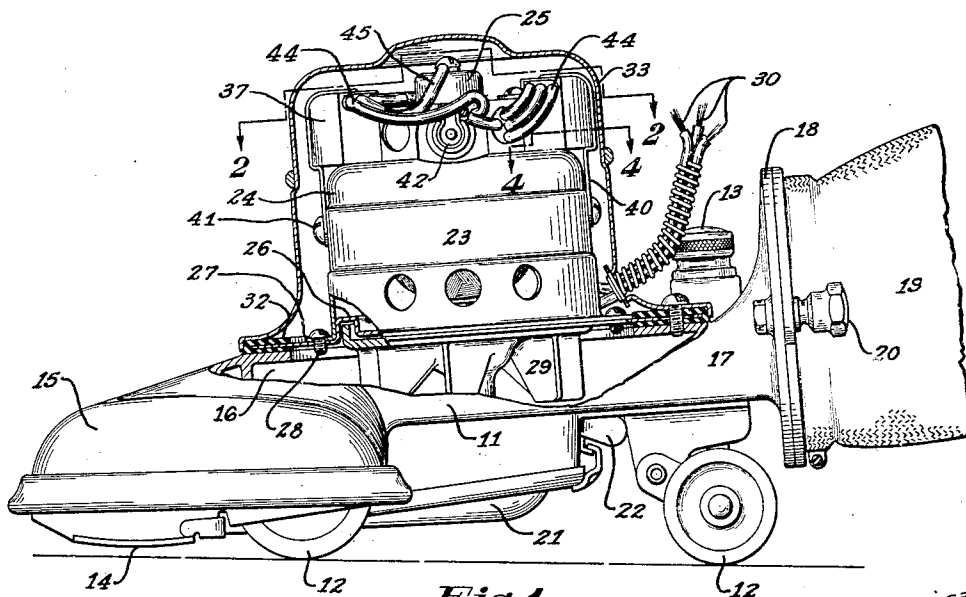


Fig. 1

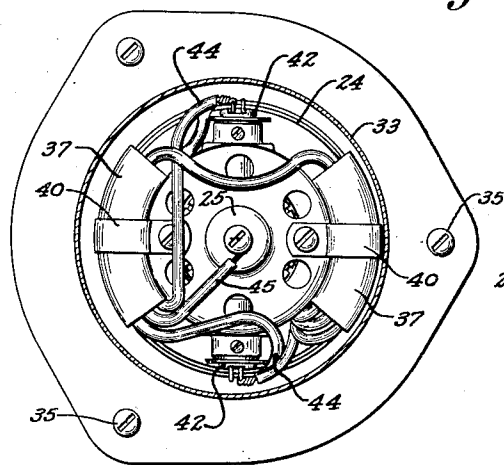


Fig. 2

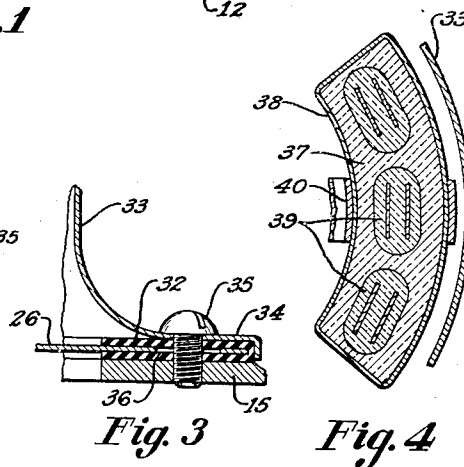


Fig. 3

Fig. 4

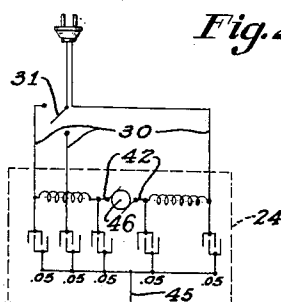


Fig. 6

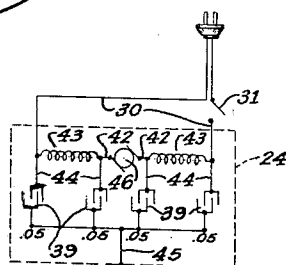


Fig. 5

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ELECTRIC MOTOR

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6 Claims. (Cl. 172-36)

This invention relates to suction cleaners, and particularly to construction thereof, and circuits therefor, for eliminating the interference to radio receiving apparatus due to the operation of the suction cleaner in the vicinity of such apparatus. Interference of this nature caused by the operation of a suction cleaner is almost entirely due to arcing at the brushes of the suction cleaner motor which causes radiation from the motor and its associated wiring and, particularly where the suction cleaner and the radio receiving apparatus are closely associated by being connected to the same house wiring circuit, such interference in some instances is so great as to drown out the radio reception.

It has been proposed heretofore to reduce this interference arising at the brushes of an electric motor by placing condensers in series in a cross connection from one brush to the other, with a tap from a point between such condensers connected to the grounded frame of the machine which is operated by the motor. It has likewise been proposed to reduce interference by the motor of a suction cleaner by connecting a condenser across the main leads to such motor. These, and similar, expedients have been found to be comparatively inefficient, however, because of radiation by the body of the suction cleaner, or other machine and by the field windings of the motor.

In accordance with the present invention, the motor is insulated from the body of the suction cleaner, such insulating means preferably constituting a resilient mounting which lessens noise by absorbing mechanical vibrations, and a system of condensers is used to eliminate the interfering currents, such condensers being physically mounted on the motor, in order to shorten the leads, and being interposed between the ends of the field coils and the frame of the motor, which is not only insulated from, but also completely enclosed by, an outer metallic motor casing and the rest of the body portion of the cleaner.

The primary object of the invention is to eliminate interference with radio apparatus due to the operation of the motor of any apparatus in its vicinity. A further object of the invention is to eliminate such interference and at the same time to lessen the noise by damping the mechanical vibrations originating in the rotating parts, and a still further object is to eliminate such interference in a portable device which, by reason of its portability, cannot be connected to ground by a simple, practical connection. Still another object is to provide such a device which will be

5 durable and efficient and which will be safe to employ in ordinary household use, without danger of harm or fright to the user by reason of accidental discharge of the condensers.

Further objects of the invention and various features of novelty will be apparent from the following specification, when read in conjunction with the accompanying drawing, in which:

Figure 1 is a view in side elevation of a suction cleaner embodying the invention, a portion of the motor casing being broken away and certain of the parts being shown in section, to disclose more clearly the details of structure;

Figure 2 is a plan view of the motor shown in Figure 1, with the motor casing illustrated in transverse section on the line 2-2 of Figure 1;

Figure 3 is an enlarged fragmentary view in vertical section, illustrating the mounting of the bottom plate of the motor and of the motor casing upon the main body portion of the cleaner as shown in the right hand portion of Figure 1;

Figure 4 is an enlarged view in horizontal section of one of the condenser units, taken on line 4-4 of Figure 1; and

Figures 5 and 6 are wiring diagrams illustrating the electrical connections of the parts, for a one-speed motor and a two-speed motor, respectively.

As shown in the drawing, the invention is embodied in a suction cleaner of the type in which the axis of the motor is substantially vertical, but it will be appreciated that the invention is in no way limited to such a machine, or to such arrangement of the motor shaft.

In the present embodiment, a suction cleaner body 11 is supported by floor wheels 12, the rear wheels being mounted for vertical adjustment by manually operable means 13, whereby a downwardly opening nozzle 14 located in front of the forward wheels may be adjusted toward and from the surface of the floor covering above which it is normally suspended. The nozzle opening 14 is formed in a main body casting 15, and is comparatively wide, and such casting likewise comprises a fan chamber 16 connected to the nozzle 14 and discharging rearwardly through an outlet 17 which terminates with a thickened flange 18, substantially in a vertical plane. A dust filtering bag 19 is removably attached to the outlet flange 18 by suitable securing means 20, and a rotary agitator member is preferably mounted in the nozzle and driven by a belt from a pulley on the bottom of the motor shaft, the agitator, belt and pulley being not shown here-

in because such construction is well known and embodies no novel features which constitute a part of the present invention. In accordance with the usual construction, the bottom of the main body portion below the fan chamber is preferably formed with an opening, which opening is closed by a removable cover plate 21 held in place by a latch 22, to provide access to the agitator driving belt and to the eye of the fan chamber immediately underneath the fan.

The motor 23 is preferably of the "universal" type and has an external frame formed of a main, substantially cylindrical, inverted cup-shaped member 24 in which the field coils are mounted and which has a cup-like projection 25 at its upper end to receive the bearing for the upper end of the motor shaft, and a substantially flat motor bottom plate 26, to which an outwardly extending annular flange 27, at the lower edge of the main frame 24, is secured by screws 28. It will be understood that the motor bottom plate 26 carries the lower bearing for the motor shaft, and that the motor shaft extends therethrough, a fan 29 and the pulley for driving the agitator being mounted on the motor shaft below such motor bottom plate.

It will be understood that, in accordance with usual practice, the cleaner as a whole is adapted to be moved about over the floor covering by a handle, not shown, which is pivotally connected to the cleaner body and normally supported thereby to extend upwardly and rearwardly therefrom, such handle supporting the upper end of the bag 19 and being provided with wires 30 for supplying current to the motor, and a switch 31 by which operation of the motor may be controlled. It will also be understood that the details of structure of the parts so far described are not of particular importance as to the present invention, which relates to the resilient and insulated mounting of the motor on the main body of the cleaner and to the electrical devices and connections associated with the motor.

As shown in Figure 1, the external frame of the motor, formed by the member 24 and the bottom plate 26, is resiliently mounted upon, and insulated from, the main body casting or member 15, an annular double gasket 32 of soft rubber, or similar material, which is preferably U-shaped in cross section, being engaged upon the peripheral portion of the motor bottom plate 26. A metal motor housing 33 encloses, and is everywhere spaced from, the motor frame 24 and has a flat, outwardly directed flange 34 at its base, and screws 35 are provided to secure the flange 34 to the main body casting and clamp the double gasket 32 and the peripheral portion of the motor bottom plate 26 between them. Openings 36 are formed in the motor bottom plate 26 to receive the screws 35 and are large enough to insure that there will be no electrical contact therewith. Two arcuate condenser units 37, each preferably comprising a metal cover 38 which contains condensers 39 embedded in wax or other suitable medium, are mounted upon straps 40 which are secured by screws 41 to the motor frame 24, such condenser units extending about the upper portion of the motor frame 24 and spaced from the motor housing 33, as shown in Figures 1, 2 and 4. The condenser units are thus conveniently located in the annular space outside of the motor frame about the commutator and spaced circumferentially between the brush holders 42.

The wiring connections for a single-speed motor are shown diagrammatically in Figure 5. The

field coil windings 43 are connected in series, with the armature 46 between them, across the power wires 30, and each end of each field coil winding is connected by a lead 44, having a condenser 39 therein, to a common lead 45 which is connected to the frame 24 of the motor. As previously pointed out, the frame 24 is insulated from, and enclosed and protected by, the motor housing 33. The condensers 39 are preferably of equal capacity, it having been found that condensers having a capacity of .05 microfarad provide an efficient system for the purpose.

The wiring connections, illustrated in Figure 6, for the two-speed motor 23, illustrated in Figure 1, are the same as those for a single-speed motor, shown in Figure 5, except that the switch 31 is a three-position switch, and a third lead 30 is connected from the switch to an intermediate point of one of the field coil windings 43 to provide for the higher motor speed. From such intermediate point of the field coil winding another lead 44, having a condenser 39 therein similar to the other condensers of the system, is connected to the common wire 45 which is connected to the motor frame 24. If desired, each condenser unit may contain three condensers, so that the units will be identical and an extra condenser will be available if needed.

It will be evident, that, in the structure disclosed, the condenser units may be economically manufactured and installed, and that they are so located as not to detract from the appearance of the cleaner as a whole. The connections to the condensers are protected from accidental loosening, and the length of the leads thereto is minimized. The condensers, the leads thereto, and the entire motor, are protected by the housing 33 and the main body of the cleaner which enclose them and act as a shield, so that there is no danger of fright or injury to the operator by accidental contact with the motor frame or any part electrically connected thereto. It will also be apparent that vibrations arising in the motor or fan will be damped, by reason of the resilient mounting of the motor, and that the housing 33 may be readily removed to permit inspection or repair of the motor or the condenser units.

While two embodiments of the invention have been described, it will be understood that many changes therefrom may be made in the details and arrangement of parts within the scope of the invention, which is defined in the following claims.

What is claimed is:—

1. The combination, with a portable machine including an electric motor having terminals connected to a source of electric current, of means for minimizing interference with radio signals by said motor comprising circuits having capacitance therein and connecting the motor terminals to the frame of said motor, and a metal housing enclosing and electrically insulated from said motor frame.

2. The combination, with a portable machine including an electric motor having field coil windings connected in series with an intermediate armature across a power circuit, of means for minimizing interference with radio signals by said motor comprising a plurality of circuits each containing capacitance and connecting, respectively, each end of each field coil winding to the frame of the motor, and a metal housing enclosing and electrically insulated from said motor frame.

3. In a suction cleaner, the combination of a

main body portion, an electric motor carried by said main body portion, resilient and electrically insulating means interposed between said motor and said main body portion, and means for minimizing interference with radio signals by said motor comprising circuits having capacitance therein and connecting the motor terminals to the frame of said motor, and a metal housing enclosing and electrically insulated from said motor frame.

4. In a suction cleaner, the combination of a main body portion, an electric motor resiliently mounted upon, and electrically insulated from, said main body portion, and means for minimizing interference with radio signals by said motor comprising circuits having capacitance therein separately connecting the ends of the field winding of said motor to the motor frame, and a metal housing carried by said main body portion enclosing and electrically insulated from said motor frame.

5. In a suction cleaner, the combination of a main body portion, an electric motor having a field winding, an armature, a commutator, and a base plate, and a motor frame secured to said base plate, said base plate being supported by, and electrically insulated from, said main body

portion, and means for minimizing interference with radio signals by said motor comprising condensers carried by said motor frame and located about the commutator of said motor, separate leads each including one of said condensers respectively connecting the ends of the field winding of said motor to the motor frame, and a metal housing carried by said main body portion and enclosing, and electrically insulated from, said motor frame.

6. In a suction cleaner, the combination of a main body portion, an electric motor having a field winding, an armature, a frame and a flanged base plate, means for minimizing interference with radio signals by said motor comprising circuits having capacitance therein separately connecting the ends of the field winding of said motor to said motor frame, a housing enclosing said motor frame and having a flange thereon, means for clamping the flange of said base plate of said motor between said flange on said housing and said main body portion, and resilient insulating material interposed between the flange on said base plate and the flange on said housing and said main body portion.

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