

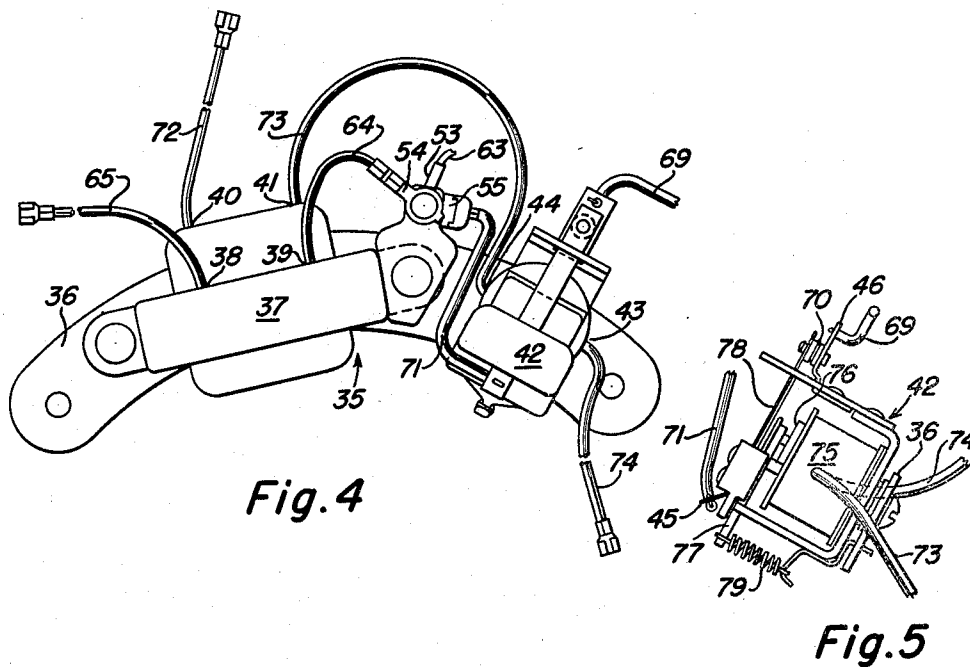
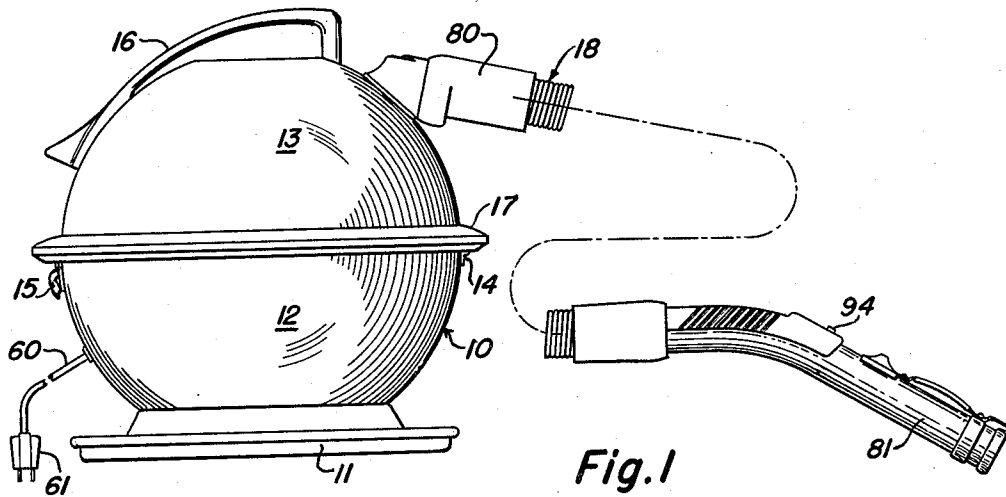
Nov. 8, 1960

G. F. CARABET
SUCTION CLEANERS

2,958,894

Filed Sept. 29, 1958

3 Sheets-Sheet 1



Nov. 8, 1960

G. F. CARABET
SUCTION CLEANERS

2,958,894

Filed Sept. 29, 1958

3 Sheets-Sheet 2

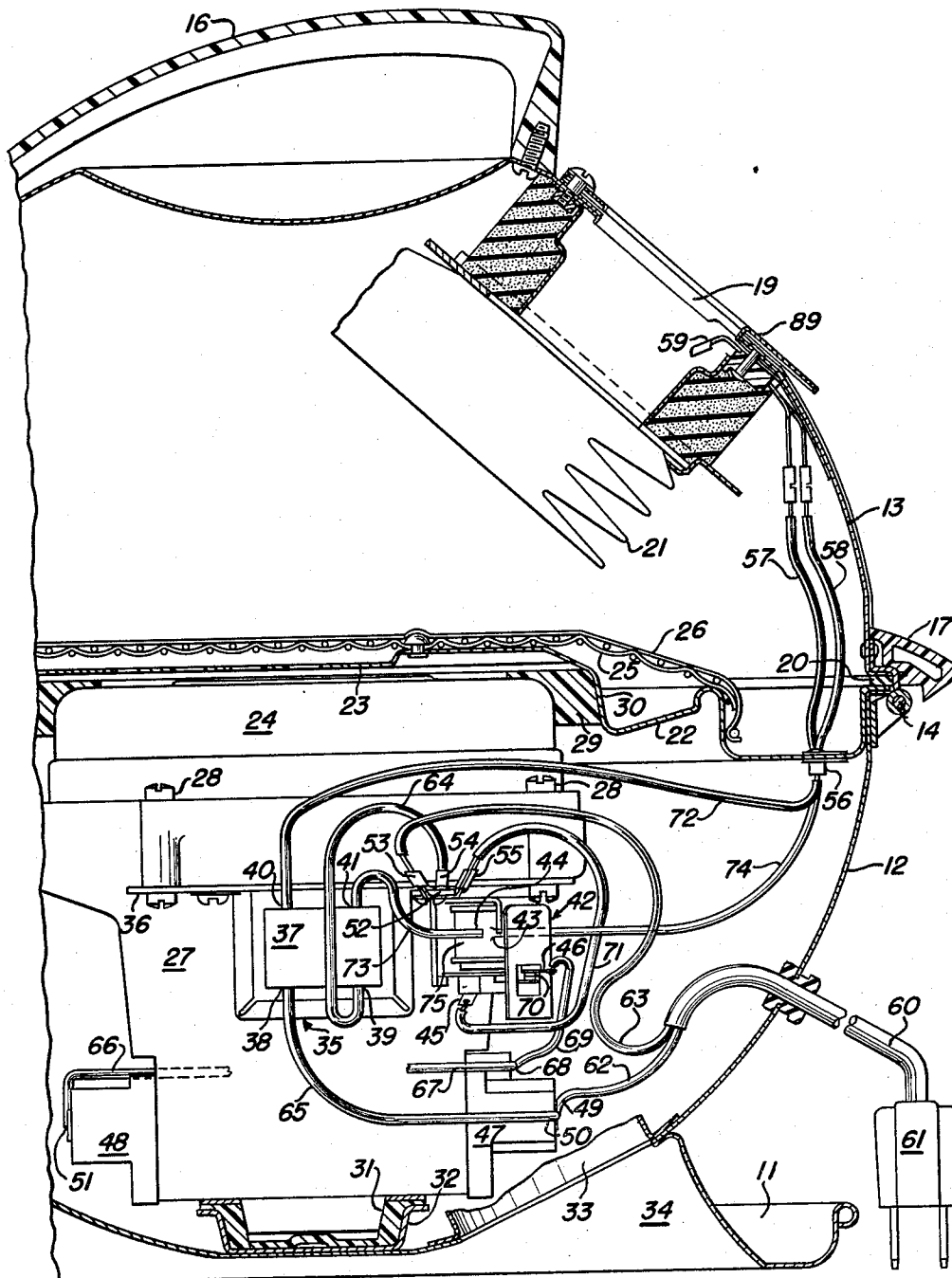


Fig. 2

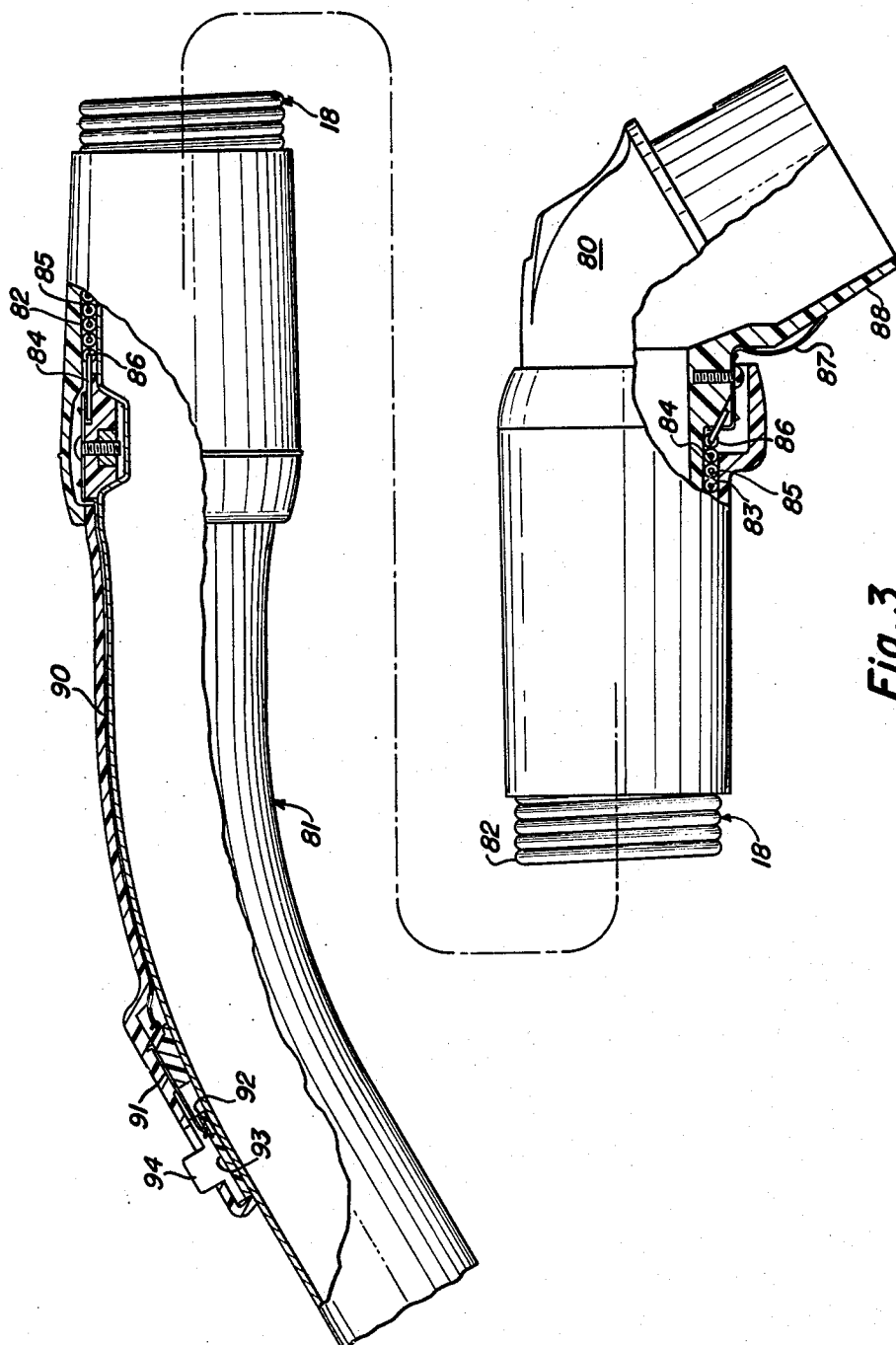
Nov. 8, 1960

G. F. CARABET
SUCTION CLEANERS

2,958,894

Filed Sept. 29, 1958

3 Sheets-Sheet 3



1

2,958,894

SUCTION CLEANERS

George F. Carabet, North Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Filed Sept. 29, 1958, Ser. No. 764,026

12 Claims. (Cl. 15—327)

The present invention relates to suction cleaners and more particularly to a control therefor.

Specifically the present invention relates to a suction cleaner of the canister type wherein the cleaning operation is done by means of a suction nozzle attached to the end of a long and extensible flexible hose in which the cleaner may be controlled by means of a switch at the end of the hose.

According to the present invention a transformer-relay unit is mounted within the cleaner casing and a low voltage circuit is provided extending lengthwise through the hose wall to a manually actuated switch at the end of the hose. Actuating the switch to closed position energizes the coil of the relay to close a switch to the motor of the cleaner. In other words the primary or high voltage circuitry includes the motor windings, the primary coil of the transformer and the switch which is actuated by the relay and the secondary or low voltage circuitry includes the secondary windings of the transformer, the coil of the relay, the conductors which extend lengthwise through the wall of the flexible and extensible hose and the switch at the end of the hose. The hose is detachably connected to the suction inlet of the cleaner casing and has electrical connections for completing the secondary circuit when the hose fitting is inserted into the suction inlet opening.

The remote control of a device by means of a secondary low voltage circuit from a transformer is not broadly new, but such control systems are usually a fixed permanent installation and not readily adaptable to a portable device such as a suction cleaner where special consideration such as shock hazard, frequent servicing etc. is of prime importance.

Controlling the power unit of a suction cleaner from the end of a suction cleaner hose is not broadly new. However, with the advent of cleaners which float on an air cushion or are otherwise constructed to follow the operator about and with the advent of the use of hose which may be extended from two to four times its static contracted length, the problem of controlling the power unit from the end of the hose became more of a problem.

In prior constructions access to the interior of the cleaner was usually impossible by the untrained user and the hose used were of the thick braided type in which conductors could be easily embedded so that the use of a 110 volt circuit extending to the end of the hose just simply was no problem.

The situation is changed as to both the above prior practices. In present day cleaners easy access may be had to the interior of the cleaner for the removal of the filter bag so that the shock hazard must be taken into consideration. The hose now used are of single thickness thermoplastic and corrugated so as to be both very flexible and extensible. It would take some doing to apply a 110 volt circuit to such a hose without running into the shock hazard.

2

Again, when conductors are arranged lengthwise of a corrugated extensible hose, it is necessary to provide an electrically conductive joint between the hose connection and the connection through the suction inlet of the cleaner. In such a case when the hose is removed, which may be frequent, it is necessary to guard against shock hazard to the operator or a child placing his fingers into the suction opening when the hose is detached.

According to the present invention all of the high voltage circuits are in the bottom of the cleaner beneath a bulkhead which separates the high and suction sides of the cleaner while the low voltage circuit extends through a metallic bulkhead and is the only circuit which can possibly come into contact with the hands of children or others.

According to the present invention the transformer-relay unit is attached to the motor housing which is easily removed by a mere removal of the bulkhead so that easy access may be had by the serviceman to the transformer-relay unit in case servicing should be necessary.

An object of the present invention is to mount a transformer-relay unit within a suction cleaner casing in such a manner as to be cooled by the air flowing through the cleaner.

Another object of the present invention is to mount a transformer-relay unit on the motor housing of a unitary removable power unit for a suction cleaner having only low voltage connections to the controlling switch and to the suction inlet connection.

Another object of the present invention is to removably mount the power unit of a suction cleaner beneath a removable bulkhead and to provide a low voltage control circuit extending through the bulkhead in order to reduce shock hazards.

Another object of the present invention is to provide a portable suction cleaner having a high voltage power unit and a low voltage control system wired so that the power unit may be controlled by a low voltage switch at the end of an extensible hose.

Other objects and advantages of the present invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which:

Fig. 1 is a side view of a canister type suction cleaner to which the present invention relates,

Fig. 2 is a vertical cross-sectional view of the cleaner of the present invention showing the transformer-relay unit mounted on the motor housing,

Fig. 3 shows one type of hose which may be used with a cleaner of the present invention,

Fig. 4 shows the transformer-relay unit of the present invention ready for mounting on the motor-housing, and

Fig. 5 is a side view of the relay showing the motor switch in closed position.

Referring to Fig. 1 of the drawings the cleaner 10 may be of the air float type disclosed and claimed in United States Patent Coons et al. 2,780,826. The cleaner 10 includes a base 11, a lower semispherical section 12 and an upper semispherical section 13. The upper and lower sections 12 and 13 are hinged together at 14 and held in closed position by a clamp 15. The upper section 13 is provided with a handle 16 by which the cleaner may be carried about and an annular bumper 17 of rubber or other plastic material is secured to the upper section 13 and extends downwardly over the seam between the two sections. A gasket 20 provides an internal seal between the sections 12 and 13.

A flexible and extensible hose generally indicated by the reference numeral 18 is detachably secured to the

suction inlet 19 which is formed in the upper casing section 13. The hose may be of the general type disclosed and claimed in United States patent to Duff 2,719,636 except that it is modified to incorporate a pair of electrical conductors as is disclosed and claimed in a co-pending application by Mary C. Pavlic, Serial No. 764,025, filed concurrently herewith.

A throw-away filter bag 21 is secured to the suction inlet 19 in any suitable manner.

A metallic bulkhead 22 is detachably secured to the interior of the lower section 12 and separates the interior of the upper section 13 from the interior of the lower section 12 except for openings 23 immediately above the suction eye of the fan 24. A final filter for removing fine dust which may pass the filter bag 21, in the form of a wire screen 25 and fine filter cloth 26 overlies the openings 23, the screen 25 preventing the cloth 26 from being drawn downwardly against the openings 23.

A motor 27 is secured to the fan 24 by means of bolts 28 and forms with the fan a removable unit which is detachably supported within the lower casing section 12 by means of a ring 29 of rubber or the like wedged between the casing of fan 24 and an inclined annular wall 30 formed in the bulkhead 22 and a cup 31 of rubber or like material positioned in a metallic cup 32 secured to the interior bottom wall of the lower section 12.

An outlet opening 33 is formed in the lower wall of the lower section which communicates with a plenum chamber or recess 34 formed in the base 11 so that exhaust air may escape and perform its air lift function as described in the Coons et al. patent previously referred to.

A transformer-relay unit generally indicated by the reference numeral 35 is secured to the motor-fan unit by the bolts 28 which secure the fan casing to the motor housing. For that purpose an arc shaped sheet metal bracket 36 is provided as shown in Figs. 2 and 4.

A step down transformer 37 is suitably mounted on the bracket 36. The terminal wires of the primary coil are designated by the reference numerals 38 and 39 while the terminal wires of the secondary coil are designated by the reference numerals 40 and 41.

A relay switch generally designated by the reference numeral 42 is also mounted on the bracket 36. The terminals of the relay coil are shown at 43 and 44 while the switch contacts 70 are connected to the terminals 45 and 46.

The motor 27 is provided with commutator brush holders 47 and 48, the former being provided with two terminals 49 and 50 and the latter with a single terminal 51.

A pad 52 of insulating material is mounted on bracket 36 between the transformer 37 and the relay 42 and is provided with three terminals 53, 54 and 55. The bulkhead 22 is provided with a pair of terminals 56 which form the terminus of conductors 57 and 58 which are also provided with terminals in the form of a pair of spaced contacts 59 which extend outwardly into the opening of the suction fitting 19 for a purpose which will presently appear.

High voltage energy (110 v.) is supplied to the cleaner by an ordinary two wire service cord 60 provided with a plug 61 and adapted to be plugged into any suitable 110 volt outlet.

One line 62 of cord 60 is connected to the terminal 49 of the commutator brush holder 47 while the other line 63 is connected to the terminal 53 of the insulating pad 52. The terminal 54 of terminal pad 52 is connected by conductor 64 to the terminal 39 of the primary winding of the transformer 37. The other terminal 38 of the primary winding is connected by conductor 65 to the terminal 50 of the commutator brush holder 47. The terminal 51 of the other commutator holder 48 is connected by conductor 66 to the field coils (not shown). The other side of the field coils is connected by conductor 67 to a connector 68 mounted on a pad on the commutator holder 47. Connector 68 is connected by conductor 69

to the switch terminal 46 which is connected to one of the switch contacts 70. The terminal 45 which is connected to the other of the switch contacts 70 is connected by conductor 71 to the terminal 55 of pad 52 thus completing the high voltage circuit.

The high voltage circuitry is a parallel circuit and may be traced as follows:

(1) Plug 61, line 62, terminals 49 and 50, conductor 65, terminal 38, primary coil, terminal 39, conductor 64, terminal 54, terminal 53, line 63 and plug 61.

(2) Plug 61, line 62, terminal 49, the armature including commutator and brushes, terminal 51, conductor 66, field coils, conductor 67, connector 68, conductor 69, switch terminal 46, switch contacts 70, switch terminal 45, conductor 71, terminals 55 and 53, line 63 and plug 61.

Thus the primary coil of transformer 37 is connected in circuit at all times when the plug 61 is inserted into a suitable outlet while the motor 27 is energized only when the switch contacts 70 are closed. It is also to be noted that the entire 110 volt circuitry is located in the lower compartment beneath the bulkhead 22.

The secondary or low voltage circuitry is a series circuit and may be traced as follows:

One of the contacts 59, conductor 57, one of the bulkhead terminals 56, conductor 72, terminal 40, secondary coil, terminal 41, conductor 73, terminal 44, coil 75 of relay 42, terminal 43, conductor 74, the other of the bulkhead terminals 56 and conductor 58 to the other of the contacts 59.

The conductors 72 and 74 are detachably connected to terminals 56 and the lines 62 and 63 are detachable from terminals 49 and 53 so that the entire motor-fan unit including the transformer-relay 35 may be lifted upwardly out of the lower casing section 12 when the bulkhead 22 is raised.

The relay switch 42 is shown in more detail in Fig. 5 and includes the coil 75 having a magnetic core 76 adapted, when energized, to attract a movable armature 77 which carries one of the switch contacts 70 on the end of the spring arm 78. The other or fixed contact 70 is carried by the switch terminal 46. The contacts 70 are normally held open by a spring 79 but when the coil 75 is energized the armature is attracted to close contacts 70.

The hose 18 shown in Figure 3 includes a male connector fitting 80 for insertion into the suction opening 19 and a hand piece 81 to which suitable cleaning tools may be attached.

The body of the hose 18 is formed of a deeply corrugated tube 82 enclosing a reinforcing coil 83 which includes a spring wire 84 and a small magnet wire 85 encased within a rigid polyvinyl sheath 86.

At the fitting 80, the spring wire 84 is electrically connected to one of two spaced contacts 87 and the magnet wire 85 is electrically connected to the other. The contacts 87 extend downwardly along the lower side of the end 88 of fitting 80 and mate with the spaced contacts 59 in the suction inlet opening 19 when the fitting is inserted into that opening. A suitable clamp 89 (Fig. 2) is provided to hold the fitting 80 in place and against rotation in the opening 19 so that the contacts 59 and 87 will always be in alignment and in contact when the connection is made.

At the hand piece 81, the spring wire 84 is electrically connected to one of a pair of conductors 90 and the magnet wire 85 is electrically connected to the other. The wires 90 are electrically connected to a pair of spaced spring terminals 91 which ride on a bridging contact 92 mounted upon a slide 93 having an actuating knob 94 as clearly shown in Fig. 3.

Operation

The end 88 of fitting 80 is inserted into the suction opening 19 to bring the contacts 59 and 87 into registry and the clamp 89 actuated to lock the fitting 80 in place.

Forward movement of the slide 94 to the position shown

5

in Fig. 3 will close the secondary circuit to energize coil 75 and cause the contacts 70 to close as previously explained. That will energize the motor 27 and draw a suction on the cleaning tool which may be attached to the end of the hand piece 81.

The dirt laden air will enter the upper section 13 through suction opening 19 and enter filter bag 21 where the dirt will be separated from the moving air stream and the cleaned air will pass through the walls of filter bag 21 and enter the interior of the upper section 13. The cleaned air will pass through openings 23 in bulkhead 22 and enter the fan 24 where it will be placed under pressure and enter the interior of the lower chamber 12 through the fan exhaust which is downwardly through the motor 27. The air under pressure within the chamber 12 will serve to keep the transformer-relay cool and it will then pass through opening 33 and into recess 34 to perform its air lift function as described in the aforementioned Coons et al. patent.

Thus, the operator may control the energization of the cleaner from the end of the hose while it is being propelled about on a cushion of air by means of hose 18.

When it is desired to remove the motor-fan unit and the attached transformer-relay 35 for servicing, it is only necessary to unlatch the latch 15, raise the upper section 13 upwardly about the hinge 14, release the bulkhead 22 and tip it upwardly against the upper section 13. The cords 72 and 74 and line wires 62 and 63 may then be pulled loose from terminals 56, 49 and 53 whereby the motor-fan unit and the attached transformer-relay may be lifted bodily from the interior of the lower section 12.

From the foregoing it can be seen that the present invention provides a portable suction cleaning apparatus having a high voltage power unit which may be controlled from the end of the suction hose by means of a low voltage secondary circuit of a transformer-relay unit in which all of the high voltage circuits are positioned beneath the bulkhead of the cleaner and only low voltage circuits extend above the bulkhead to thus remove all shock hazards to the user and to facilitate the extension of the conductors lengthwise through the walls of the hose, and in which the transformer-relay is mounted on the power unit and both may be removed as a unit for servicing, etc.

While I have shown and described but a single embodiment of my invention it is to be understood that that embodiment is to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the specific structure shown and described but wish to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. In combination, a portable suction cleaner including a high voltage motor, a step down transformer, a low voltage relay coil connected to the secondary of said transformer for actuating a high voltage switch which controls said motor, a flexible hose attached to said cleaner, low voltage switch means attached to the free end of said hose and electrically connected to said low voltage relay coil for opening and closing said high voltage switch to control said motor and means for supplying high voltage current to said high voltage switch and to the primary of said transformer.

2. In combination in a suction cleaner, a suction fan, a high voltage motor for driving said fan, a flexible hose connected to the suction side of said fan, a transformer-relay including high voltage circuitry and low voltage circuitry, said relay including a high voltage switch connected in circuit with said motor and an operating coil for said switch connected in said low voltage circuitry, a low voltage switch at the end of said hose, low voltage conductors extending along the length of said hose and connecting said low voltage switch into said low voltage circuitry in series with said operating coil whereby actuation of said low voltage switch will energize said operating coil to open and close said high voltage switch and stop or start said motor.

6

3. In combination, a portable suction cleaner including a portable casing, a suction inlet formed in said casing; a motor-fan unit including a fan for creating a suction at said suction inlet and an electric motor for driving said fan mounted within said casing; a transformer-relay unit having a high voltage primary coil, a low voltage secondary coil, an electromagnetically actuated high voltage switch for controlling the flow of current to said motor and a low voltage coil for actuating said high voltage switch mounted within said casing; a pair of low voltage electrical contacts positioned within said suction inlet and electrically connected in circuit with said low voltage coils; a flexible and extensible hose having a fitting for detachable insertion into said suction inlet and a free end; a low voltage electric switch mounted on the free end of said hose; low voltage electric contacts on said fitting for contact with the contacts in said suction inlet when said fitting is inserted thereinto; low voltage electric conductors extending lengthwise through the wall of said hose and connecting the contacts of said low voltage switch with the electric contacts of said fitting and means for supplying a high voltage current to said high voltage switch and said primary coil.

4. In combination in a portable suction cleaner; a portable casing; a suction inlet formed in said casing; a flexible hose attached to said suction inlet; a fan for drawing a suction on said suction inlet and hose; a motor for driving said fan; a transformer-relay; said relay including a high voltage switch for controlling said motor and a low voltage coil for opening and closing said high voltage switch; a low voltage switch at the free end of said hose; high voltage circuitry including said motor, the primary of said transformer and said high voltage switch; low voltage circuitry including the secondary of said transformer, said relay coil and said low voltage switch and means for leading high voltage current to said high voltage circuitry whereby said motor may be controlled from the end of said hose.

5. In combination in a portable suction cleaner, a portable casing, a suction inlet formed in said casing, a flexible hose attached to said suction inlet, a motor-fan unit mounted within said casing including a fan for creating a suction at said suction inlet and at the free end of said hose and a high voltage motor for driving said fan, a transformer having a low voltage secondary circuit mounted within said casing, a relay switch for controlling the flow of high voltage current to said motor, said relay switch including a coil connected in said secondary circuit for opening and closing the contacts of said relay switch, means for supplying high voltage current to said transformer, to said motor and to the contacts of said relay switch, a low voltage switch mounted at the free end of said hose, and low voltage conductors extending lengthwise through the walls of said hose and connecting said low voltage switch into said secondary circuit, whereby closing of said low voltage switch at the end of said hose will close said relay switch to energize said motor.

6. The combination as in claim 5 in which said transformer and said relay switch are mounted within said casing within the path of air flow therethrough.

7. The combination as in claim 5 including a bulkhead dividing said casing into upper and lower chambers with said motor-fan unit, transformer and relay switch mounted within the lower chamber whereby all of the high voltage circuitry is positioned within the lower chamber beneath said bulkhead.

8. The combination as in claim 7 in which said transformer and said relay switch are mounted as a unit on the side of said motor-fan unit so as to be in the path of air flow through the unit.

9. The combination as in claim 5 including a base for said casing, said base being formed with an open bottomed upwardly extending plenum chamber of substantial area surrounded by a peripheral floor contacting rim

7

and an outlet for exhaust air from said casing and entering said chamber whereby exhaust air from said fan will exert a lifting action on said casing and said cleaner may be controlled from the end of said hose while it is being propelled about on a cushion of air.

10. In combination in a suction cleaner; a portable casing; a motor-fan unit removably mounted within said casing; said unit including a suction fan and a motor for driving said fan; a suction hose having one of its ends attached to said casing and in communication with the suction side of said fan and having a free end to which suction tools may be attached; a transformer-relay unit mounted on said motor-fan unit; said relay including a high voltage switch and a magnet coil for actuating said switch; said transformer including a high voltage primary coil and a low voltage secondary coil; a low voltage switch attached to the free end of said hose; a high voltage circuitry connecting said motor, said primary coil and said high voltage switch; a low voltage circuitry connecting said secondary coil, said magnet coil and said low voltage switch in series circuit and means for leading a high voltage current to said high voltage circuitry whereby said motor may be controlled by actuation of said low voltage switch at the free end of said hose.

11. The combination as in claim 10 including a removable bulkhead dividing said casing into an upper suction chamber and a lower chamber, said upper chamber being normally accessible to the user and said lower

8

chamber being normally inaccessible to the user, said motor-fan unit and said high voltage circuitry being located in said lower chamber so as to be normally inaccessible to the operator.

12. The combination as in claim 11 in which a part of said low voltage circuitry passes through said bulkhead and said high voltage supply means passes through said casing from said lower chamber to the outside and detachable connections within said lower chamber for disconnecting said high voltage supply means from said high voltage circuitry and for disconnecting that part of said low voltage circuitry which passes through said bulkhead whereby said motor-fan unit, said transformer-relay unit, said high voltage circuitry and that portion of said low voltage circuitry within said lower chamber may be removed from said casing as a unit.

References Cited in the file of this patent

UNITED STATES PATENTS

2,072,690	Smellie	Mar. 2, 1937
2,769,997	Sheahan	Nov. 13, 1956
2,780,826	Coons et al.	Feb. 12, 1957
2,781,103	Daiger et al.	Feb. 12, 1957
2,825,921	Wright	Mar. 11, 1958

FOREIGN PATENTS

15,695	Great Britain	of 1910
--------	---------------	---------