June 13, 1961 C. E. MEYERHOEFER 2,987,751

VACUUM CLEANER ASSEMBLY

Filed Dec. 12, 1957 2 Sheets-Sheet 1

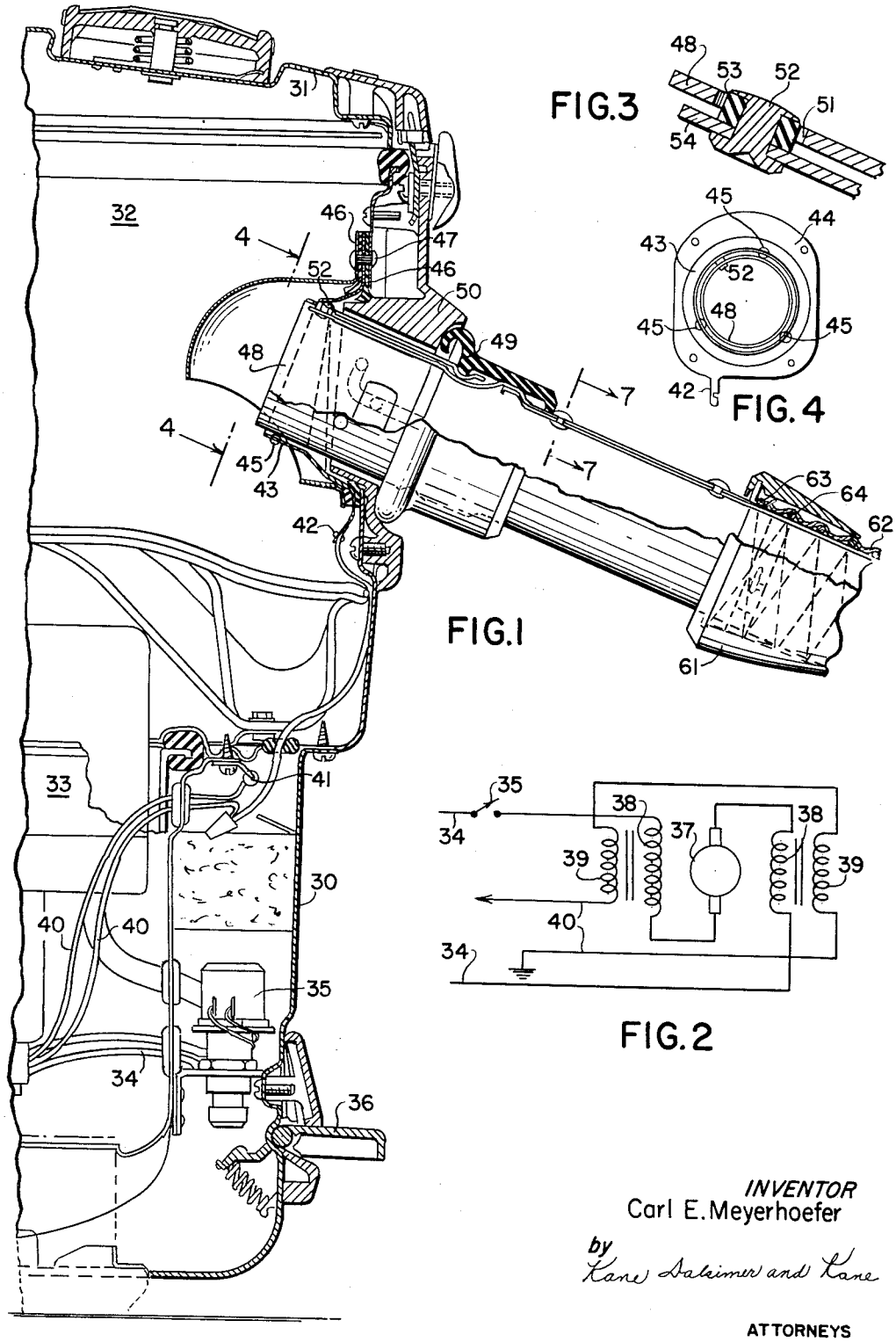

FIG. 1

FIG. 3

FIG. 4

FIG. 2

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2 Sheets-Sheet 2

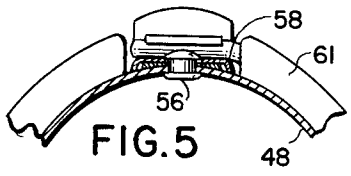

FIG.5

FIG.6

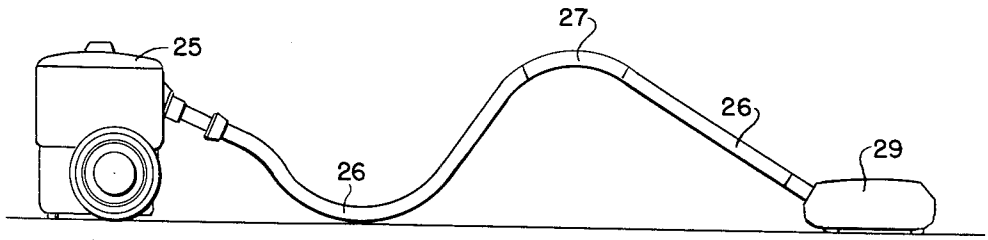

FIG.8

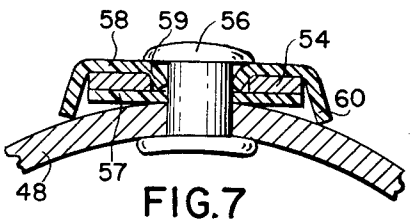

FIG.7

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VACUUM CLEANER ASSEMBLY

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2 Claims. (Cl. 15—327)

This invention relates to a structurally and functionally improved vacuum cleaner assembly, and in its more specific aspects aims to provide a structure whereby rugs and other materials may be agitated, beaten or brushed by a power mechanism simultaneously with the traversal thereover of a cleaning nozzle which by hose, wand sections or otherwise is connected with a remotely located suction-producing apparatus to draw dust-laden air through the nozzle or its equivalent.

As is well understood by those conversant with the art, it has been quite customary to connect the motors of certain types of vacuum cleaners with a rotary brush or equivalent unit associated with the nozzles of those cleaners, so that in a traversal of the nozzle over—for example—a rug, dust particles and other foreign materials are loosened from the material fibers and drawn into the cleaner by the inrush of air through the nozzle. The types of cleaners to which reference is made embrace assemblies where the motor-blower unit is located adjacent the nozzle. Therefore it is apparent that little if any difficulty is experienced in connecting a rotary brush by belt or similar drive with the adjacent motor.

However, in the case of vacuum cleaners embracing a suction mechanism disposed in a casing remotely located from the cleaning nozzle, considerable difficulty has been encountered in attempting to provide a power drive for a rotary brush or similar unit associated with the nozzle. In this connection it will be understood that aside from the difficulties of assembly, the mechanical losses involved in, for example, a torque cable drive would be excessive. This is true because the drive would have to extend between the motor of the blower unit and the nozzle. Therefore, it would extend throughout the length of the intervening hose or its equivalent and would involve excessive losses. Where attempts were made to have the inrushing air drive an air turbine or wheel disposed adjacent the nozzle, it was found that aside from the reduction in suction involved, inadequate power was produced to effectively drive a brush or similar element adjacent the covering-contacting surface of the nozzle to produce a proper agitating, beating or brushing system.

In both of the latter examples it is, of course, to be understood that there are definite weight and bulk factors which may not be commercially exceeded at the nozzle end of an assembly. Also, the size and power output of a motor-blower unit may not, for obvious reasons, be exceeded. If a solution were attempted involving the use of a motor-driven brush or its equivalent in a vacuum cleaner assembly of the type in question, with the motor located within the area of the nozzle and supplied by ordinary electrical leads, dangerous conditions would be presented, aside from the fact that the usual housewife does not possess the necessary skills to group together in operative association the various components of such an assembly.

By means of the present teachings a vacuum cleaner assembly is provided in which the nozzle is connected by a hose or other conduit in an improved manner with a remotely located motor-blower unit and with which nozzle there may be associated a motor-driven brush or agitator of ample power to assure a manipulation of the material being cleaned and without impairment of the suction

produced by the apparatus within the body of the cleaner casing, or at the nozzle.

A further object is that of furnishing an assembly embodying the foregoing advantage and which assembly will be automatically established without any skill or conscious effort on the part of the user. Moreover, there will be no danger to the user or to the elements of the assembly during the operation of the mechanism.

An additional object is that of designing an assembly including relatively few parts, each individually simply and rugged in construction and all capable of being readily connected in operative association with each other and of being economically produced, and all functioning efficiently over long periods of time with freedom from all difficulty.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating practical embodiment of the invention and in which:

FIG. 1 is a fragmentary sectional side view of the main casing of the assembly, showing the structures of several of the improved units.

FIG. 2 is a diagrammatic view of the motor and current-supplying components of the present assembly.

FIG. 3 is a fragmentary sectional view of a contact member included in the assembly;

FIG. 4 is a sectional end view of the inner end of the hose unit taken along the line **4—4** in the direction of the arrows as indicated in FIG. 1;

FIG. 5 is a fragmentary transverse sectional view taken in somewhat enlarged scale along the line **5—5** in the direction of the arrows as indicated in FIG. 6;

FIG. 6 is a fragmentary side view of the inner end of the hose assembly with certain of the parts broken away to disclose underlying structures;

FIG. 7 is a fragmentary transverse sectional view taken along line **7—7** in the direction of the arrows as indicated in FIG. 1; and

FIG. 8 is a somewhat schematic side elevation of a complete assembly such as may be provided within the scope of the present teachings.

Referring primarily to FIG. 8 as illustrative of the type of assembly herein contemplated, it will be noted that the numeral **25** designates a casing within which there is contained a suction-producing apparatus and which is formed with an intake opening to which one end of a hose unit **26** is detachably connected. This hose unit conveniently terminates in a tubular metallic sleeve **27**, which may take the form of an elbow and is conveniently gripped by the hand of the operator. In accordance with conventional techniques the hand piece **27** may be directly connected to a nozzle or brush to traverse a surface to be cleaned. Otherwise, and as shown, wand sections **28** may be coupled to each other and to the hand piece to connect the latter with a cleaning nozzle or unit **29** suitable for contact with a floor covering or surface.

The casing **25** and its contained mechanism may correspond to the disclosure of United States Patent 2,716,465 of August 30, 1955, as may also the coupling existing between that casing and the inner end of a hose unit. However, the detailed structures of the parts adjacent this end of the assembly will be modified in the manner shown in FIG. 1 to achieve the results herein contemplated.

Thus, referring to that figure, the numeral **30** indicates a housing, and the numeral **32** an upper casing, which conveniently receives an air-porous paper bag for the infiltration of dust from incoming air. The upper end of the casing is normally maintained in closed condition by a lid **31**. Within the housing and preferably below the casing **32** is a motor-blower unit **33**. Current is supplied to the latter by leads **34**, and the flow of current therethrough may be controlled by a switch **35** and actu-

ator 36, all as described in detail in the afore-identified United States patent.

Referring to FIG. 2, in which the reference numeral 37 indicates the motor of the unit, it will be understood that this motor is preferably of the universal type. In other words, it will operate when supplied with either alternating or direct current. The usual field coils 38 are wound on the stator laminations of the stack in the ordinary manner. In addition, coils 39 are provided. These latter coils use the iron stator laminations and the field coils 38 of the motor to induce a low voltage current flow within them, and which flow continues through leads 40. In this manner there is produced a source of current completely isolated from the motor input current.

In the case of leads 34 being coupled to direct current, then, of course, no induced low voltage current will flow through leads 40. However, as is well understood, most vacuum cleaner installations are supplied from sources of alternating current. Under those conditions this flow will occur. A suitable value with 115 volt A.C. input through leads 34 will result in an output of, for example, 12 volts A.C. through leads 40. An amperage on the order of 4 amperes is conveniently developed.

Thus, as shown in FIG. 2, an isolation type of transformer structure is provided in which the field coils 38 of the motor 37 are wound in the usual manner on the stator laminations. These field coils also serve as the primary winding for the stepdown transformer, which additionally uses the iron stator laminations to induce low voltage current flow in the secondary coils 39 and the output leads 40. According to the preferred construction, as shown in both FIGS. 1 and 2, one of the output leads 40 is grounded to the frame of the machine as at 41. The second lead is continued to a point adjacent the inlet opening of the casing.

At that inlet opening it is preferred that an assembly of parts generally corresponding to the disclosure in FIG. 2 of my earlier Patent 2,716,465 be employed. In addition, a member is mounted at this station, which member is similar in configuration to a cup the base of which has been removed, but which includes side walls 43 terminating in a flange 44, with the axis of the cup inclined upwardly, if the hose to be connected thereto is to incline downwardly. The cup is formed of metal and is provided with a connecting portion 42 to which the adjacent end of the extended lead 40 is suitably coupled. This cup carries inwardly extending guiding elements adjacent its free edge zone as at 45. The guiding elements are formed of insulating material and preferably are spaced from each other 120°, so that only three of these elements are necessary. Obviously a greater number of the same might be employed and serve to center within the cup bore the inner end of the hose assembly. The cup is maintained in position by, for example, applying to the mounting flange 44 of the same, layers of insulating material 46 which will overlie and underlie the flange surface. These layers, together with the cup member, will be retained in position by, for example, rivets 47, which clear the edge of the cup to thus retain the latter electrically isolated from the frame of the machine.

The inner end of the hose assembly may, as in my prior grant, embrace a metallic tube 48, which at a point intermediate its ends carries a sealing member 49 preferably formed of rubber and engageable with the fitting 50 mounted by the casing and defining the inlet opening of the latter. It is apparent that as shown in FIG. 4, if tube 48 is introduced into that inlet opening and as the sealing member 49 reaches the position shown, the inner end of the tube will be guided by the insulating buttons 45 or their equivalent to be spaced from the surface of cup 43. In accordance with my earlier design, it is preferred that the exterior of the tube 48 carry a pair of pins which cooperate selectively with pairs of bayonet grooves or slots (not shown in the present drawings), in order that the tube may be introduced wtihout difficulty through the inlet opening and retained in position at any one of four 90° displaced stations.

As shown especially in FIGS. 3 and 6, tube 48 is formed with an opening 51 adjacent its inner end. Supported within this opening is a contact 52 conveniently surrounded by an insulating member 53 which prevents the contact from engaging with the edge of tube 48. That contact is carried by a spring arm 54 which normally maintains it in a position projected beyond the outer surface of tube 48. Arm or strip 54 passes through and is insulated from the edges of an opening 55 in the sleeve at a point substantially removed from its inner end. Beyond this opening it is secured to the outer face of the tube, as shown, for example, in FIG. 7, in which a rivet 56 or other suitable securing element passes through openings formed in both strip 54 and the tube and is insulated from contact with the strip. Such insulation, as especially shown in FIG. 7, conveniently includes a base layer 57 interposed between the strip and the outer tube surface, and a second strip 58 which has the edge zones defining the opening for the fastener inclined inwardly as at 59 and its outer edge zones similarly inclined inwardly as at 60. Thus, strip 54 is housed in a manner such that it cannot ground against the tube. An identical or functionally similar insulating structure may be employed adjacent the base end of that portion of strip 54 which extends within the bore of tube 48. Thus it is apparent that electrical contact will be established between element 52 and the surface of cup 43 as the tube is rammed home to its fully seated position.

As especially shown in FIG. 1, the outer end of tube 48 extends into the bore of a hose such as has been generally heretofore designated by the reference numeral 26. In accordance with conventional technique, the hose and tube are secured against detachment by, for example, a fitting assembly as generally indicated at 61. The hose body embraces a tubular sheath 62 formed preferably of dielectric material. This sheath is reinforced and maintained in distended position by means of a pair of wires 63 and 64. Wire 63 will be covered with suitable insulation, whereas wire 64 may be bare. The wires are disposed spirally with their courses parallel to each other. As especially illustrated in FIGS. 1, 5 and 6, the end of wire 63 has its insulation stripped from it and is connected as at 65 to the end of contact strip or lead 54. The inner end of tube 48 directly engages with several courses of wire 64. Therefore it is apparent that these two wires 63 and 64 provide for a current flow from one lead 40 through the ground 41 and from the other lead 40 through cup 43, contact 52 and lead 54 through to unit 29.

Briefly considering the present assembly, it will be understood that it includes a casing provided with a motor-blower unit operated by electrical current and which serves to draw air through the inlet opening of the casing, through the filtering element disposed within the latter, and to discharge the air through the outlet opening. Connected to the inlet opening are the accessory parts of the assembly which may embrace a hose unit, wand sections and a cleaning tool or nozzle, all to be connected to each other and providing a tubular structure for air flow. The assembly will therefore be of the type in which the nozzle is not located adjacent the casing containing the motor-blower unit, but rather will be connected by accessory units to be disposed and operate at a point relatively remote from that casing. The transformer structure should in all events be of the electrically isolated type. Accordingly, a user having a hand or other part contacting current-supply leads or contacts of the accessory devices and grasping a water pipe or other ordinarily grounded unit will be in no danger of receiving a shock.

The voltage output by the transformer should preferably be sufficiently low so that the current thus supplied will be incapable of shocking a user who carelessly

grasps an exposed and live contact or contacts of the assembly. In the interests of economy and compactness the field coils of the motor may serve as the primary winding for the transformer; the stator stack or equivalent part of the motor assembly receiving in the usual manner the field coils of the motor supplied with 110 volt current. As afore brought out, the iron stator laminations, together with the field coils, serve to induce low voltage current in the secondary of the transformer. The motor being preferably of the universal type, will of course operate with both alternating and direct current supply. With the former the transformer will have the desired output. With direct current, the transformer will in effect be inoperative. Therefore only with alternating current will the accessory tool or nozzle **29** have its motor functioning. It would be feasible to embody in the casing assembly a structure with which current of low voltage but adequate amperage would be supplied, using a source of direct current. Such an expedient is definitely not preferred, in that it always offers the increased possibility of a shock being imparted to the user when the latter is in contact with a ground such as a water pipe, radiator or otherwise.

With regard to the accessory parts extending from the casing **25**, it will be understood that as the inner end of the hose assembly is coupled to the inlet opening of the casing, not alone is a proper air-conductive path provided, but also an electrical circuit may be furnished for useful work up to the outer end of the hose assembly. If that outer end is not directly connected with a tool or nozzle, but rather wand sections are coupled to it, the mechanical connections which are created as the parts are coupled will also extend the potential electric circuit through to the outermost of the sections. In all events, where a motor or other current-consuming device is included as part of the unit **29**, that device will be supplied with current through the other accessory units of the assembly as those units are connected to the casing, to each other and to the nozzle or tool. If desired, a suitable manually operable switch (not shown) might be interposed anywhere within the leads forming parts of the accessory units; a preferable location for such a switch being on the elbow member **27** at the outer end of the hose assembly. If the tool or nozzle does not include a driving motor or other current-consuming unit, then the assembly will still function as an ordinary vacuum cleaner mechanism. The transformer being of the isolation type, it is apparent that under all circumstances, even if the current-supplying lead or leads were directly grounded, no damage would be done either to the transformer or to the structure of the accessories.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. Obviously numerous changes in structure and rearrangements of the parts may be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A vacuum cleaner assembly including in combination a metallic casing structure formed with an inlet opening, a motor-blower unit within said casing for drawing air through said inlet opening, a transformer connected to the motor of said unit, output leads extending from said transformer, a metallic tube having an inner end disposed within said inlet opening, a contact electrically insulated from said tube, means for supporting said contact adjacent the inner end of said tube and for movement radially beyond the outer surface thereof, a metallic cup within and insulated from said casing in line with the inlet opening thereof, one of the output leads being grounded to the casing structure, the other lead being connected to said cup, said contact moving radially of the tube axis into engagement with said cup to provide an electrical continuation of one output lead, and the body of said tube electrically connecting with said casing to provide a current-conductive path as a continuation of the second output lead.

2. In an assembly as defined in claim 1, the contact-supporting means comprising a resilient conductive strip mounting at its outer end said contact, said strip being insulated from said tube, the latter being formed with an opening at its outer end, said strip being supported within the bore of said tube and said contact passing through said opening and outwardly beyond the tube surface to engage with the face of the cup.

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