United States Patent Office
3,354,496
Patented Nov. 28, 1967

3,354,496
SUCTION CLEANER NOZZLE OF THE AGITATOR TYPE
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Filed May 27, 1965, Ser. No. 459,178
Claims priority, application Sweden, May 28, 1964,
6,523/64
8 Claims. (Cl. 15—377)

ABSTRACT OF THE DISCLOSURE

A suction nozzle having an agitator which is at a suction opening and driven by an electric motor, a hollow body for the motor and agitator through which flow of air is ejected from the suction opening to an air outlet socket, the body having top and bottom sections which, when detachably connected together, function to mount the motor and provide a pivotal mount for a second hollow cross arm of the air outlet socket which has a first hollow arm perpendicular thereto angularly movable about the axis of the second arm, and the motor being connected to a source of electrical supply by conductors which extend through passages formed in the first and second hollow arms and project from the second cross arm of the air outlet socket lengthwise of the axis about which the first arm is angularly movable.

My invention relates to suction cleaner nozzles of the agitator type.

It is an object of my invention to provide an improved suction cleaner nozzle of a type which is adapted to be connected to a source of suction and provided with an agitator driven by an electric motor.

Another object of my invention is to provide a suction cleaner nozzle of the type indicated which is of simple and compact construction, reliable in operation and adapted for economical manufacture.

Further objects and advantages of the invention will become more apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a suction cleaner nozzle incorporating the novel features of the present invention;

FIG. 2 is a bottom plan view, partly broken away and in section, of the suction cleaner nozzle illustrated in FIG. 1;

FIG. 3 is a transverse sectional view taken at line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken at line 4—4 of FIG. 3 with certain parts omitted to illustrate details more clearly;

FIG. 5 is a fragmentary sectional view taken at line 5—5 of FIG. 1;

FIGS. 6 and 7 are fragmentary vertical sectional views taken at lines 6—6 and 7—7, respectively, of FIG. 2;

FIG. 8 is an elevational view of suitable connections for the outlet socket shown in FIGS. 1 and 3;

FIG. 9 is a sectional view taken at line 9—9 of FIG. 8.

Referring to the drawings, in FIGS. 1 to 3 I have shown a suction cleaner nozzle embodying my invention which comprises a hollow body 10 to the narrow rear portion of which is connected a tubular air outlet mem-

ber 11. The tubular member 11 serves as an air outlet socket adapted to be connected to a suction line or conduit of a suction cleaner through which air is drawn when the suction cleaner is being operated. The hollow interior of the body 10 provides a passage through which air is drawn toward the outlet socket 11 from the region of an elongated inlet opening 12.

The hollow body 10 comprises top and bottom sections 14 and 15, respectively, and a bottom plate 16 which functions as a base member adapted to slide and move over a surface to be cleaned. The top and bottom sections 14 and 15 are detachably connected together by screws 17 which are accessible at the bottom of the nozzle body 10 after the bottom plate 16 is removed. A major portion of the body 10 is defined by the top body section 14 and the bottom plate 16, as best shown in FIGS. 1 and 3. The top section 14 and bottom plate 16 are formed with outwardly extending flanges 18 and 19, respectively, which extend about the entire periphery of the body 10 and are detachably held together by a member 20 which is formed of resilient material and is U-shaped in section, as shown in FIG. 3.

The flanges 18 and 19 snugly fit in the U grooves in the member 20 which holds them tightly together. Thus, the resilient member 20 functions as a detachable connection for the top section 14 and bottom plate 16 to provide an airtight seal between these parts and also serves as a bumper to protect objects against which the suction nozzle may strike when being moved back and forth over a surface being cleaned. In addition, the bottom plate 16 may be detachably connected to the top section by screws 21 accessible at the bottom of the body 10, as shown in FIG. 2.

The bottom plate is formed with a plurality of elongated slots which are in end-to-end relation and define the suction inlet 12. Two of such slots 12a and 12b are shown in FIG. 2 at the vicinity of which is rotatably mounted an agitator 22 having bristles 23 which are arranged to project radially outward through the suction inlet 12 and frictionally contact the surface being cleaned, such as a rug, for example, during movement of the nozzle body 10 over the surface. At each end of the suction inlet 12, the bottom plate 16 is formed with flat depressed zones 16a, as seen in FIG. 7, which are at a lower level than the rest of the bottom plate 16 and serve as skids to facilitate movement of the body 10 over a surface being cleaned.

As shown in FIGS. 2 and 7, the agitator 22 is provided at its opposite ends with stub shafts 24 which are journaled in bearings 25 held in cup-shaped members 26 formed of resilient material, such as rubber, for example. The resilient cup-shaped members 26 are movably held in grooves 27 formed in the top body section 14 by shoulders 28 formed on the bottom plate 16. The hollow resilient members 26 receive cup-shaped cages 29 having outer enlarged portions 30 formed with inwardly turned lips or flanges 31.

The stub shafts 24 are journaled in bushings 32 held in the cup-shaped cages 29. Suitable washers 33 impregnated with lubricant are disposed in the enlarged portions 30 of the cages 29 and formed with openings through which the bushings 32 extend. Sealing diaphragms 34 are held about the stub shafts 24 by the turned lips 31 of the cages 29. The sealing diaphragms 34 bear against the washers 33 and prevent flow of lubricant from the outer enlarged portions 30 of the cages 29.

The agitator 22 is driven by an electric motor 35 having a shaft 36 provided with a roller 37 at one end thereof. An endless belt 38 is disposed about the roller 37 and a portion of the agitator 22 which is between the slots
3,354,496

3. The electric motor 35 is housed in a space 39 defined by partitions or wall sections formed in the top and bottom body sections 14 and 15, respectively. As shown in FIGS. 3 and 4, the bottom body section 15 includes a bottom 40 and upstanding sides 41 and 41a which respectively coact with downwardly extending sides 42 and 42a of the top body section 14. Hence, the space 39 is defined by portions of the top and bottom body sections 14 and 15 and the sides 41 and 42 and the sides 41a and 42a of these body sections. As seen in FIG. 3, the rear wall of the space 39 includes the portions 14b and 15b of the sides 42a and 41a of the top and bottom body sections 14 and 15, respectively. The end walls 43 and 44 of the space 39 are defined by portions of the top and bottom body sections 14 and 15, respectively, which coact with one another in a manner similar to the portions 14c and 15c which define the front wall of the space 39. The end walls 43 and 44 are formed with openings 45, as shown in FIG. 4. The electric motor 35 includes an outer shell 46 having end headers 46a which are fastened to the outer shell 46 by the fasteners 47 which are fixed at 48, as best shown in FIG. 3. The resilient blocks 47 are clamped at the openings 45 between the top and bottom body sections 14 and 15 by the screws 17 which detachably connect the body sections together.

The part of the motor shell 46 between the end headers 46a is enveloped by a ring-shaped body 49 which is formed of resilient material, such as foamed plastic, for example. The ring-shaped body 49 snugly fits about the outer shell 46 of the motor 35 and is held in the space 39 by parts 50 projecting inward from parts of the top and bottom body sections 14 and 15 defining the front and rear walls of the space 39, as shown in FIGS. 3 and 4.

The ring-shaped body 49 functions to prevent turning of the motor 35 about its axis and the resilient blocks 47 function to absorb and take up tangential and axial load imparted to the motor 35. A fan 51 is provided on the motor shaft 36 for circulating air through the motor 35 to effect cooling thereof. In the preferred embodiment being described, the ring-shaped body 49 enveloping the motor 35 functions to block off flow of air past the exterior of the motor. The top body section 14 is formed with outwardly sloping side walls at opposite sides of its center line which are formed with slits or apertures 52. The two groups of slits 52 are directly above openings 46" in the end shells 46' of the motor shell.

The fan 51 draws ambient air through one group of slits 52 into the interior of the body 10. Such air flows through the openings 46" at one end of the motor shell 46 and is forced through the motor 35 by the fan 51 and discharged through the openings 46" at the other end of the motor shell 46 and the group of slits 52 at the opposite side of the body 10. With this arrangement, the motor 35 is effectively cooled by circulating cooling air in a path of flow which is independent of and separated from the path of flow of dust laden air drawn into the body 10 through the suction inlet 12, as will be explained presently.

As shown in FIGS. 2 and 6, the top body section 14 is provided with partitions or walls 33, 34, 35, and 36 which extend downward from the underside of the top body section 14 to the bottom plate 16 and define a space 56. Within the space 56 is positioned a switch 57 connected in an electrical circuit for connecting and disconnecting the electric motor 35 to and from a source of electrical supply. The electrical circuit includes conductors 58 and 59 which are connected to the switch 57 and extend through the interior of the body 10 to the rear thereof, as will be explained presently. The switch 57 is provided with an operating member 60 which projects upward through an opening 60a in the top body section 14 and is accessible at the top of the body 10, as seen in FIG. 1.

A body 61 of resilient material is disposed in the space 56 which rests against the bottom plate 16 and resiliently biases the switch 57 against the underside of the top body section 14. The resilient body 61 yields when excessive force is applied to the operating member 60 and in this way protects the switch 57 from being injured or damaged. Further, the bottom of the resilient body 61 bears against the joint formed by the walls of the top body section 14 and the bottom plate 16 to provide an air tight seal which prevents dust laden air drawn into the interior of the body 10 through the suction inlet 12 from passing into the switch space 56.

It will be noted that the walls or partitions 53, 54, 55 and 14c extend downward from the underside of the top body section 14 to the bottom plate 16. If desired, the motor space 39 may be formed in a similar manner by providing walls at the underside of the top body section 14 which extend to the bottom plate 16. In such case, the motor 35 may be supported by the resilient blocks 47 in slots formed in certain of the walls and the entire assembly, including the ring-shaped body 49 enveloping the motor shell 46, may be clamped between the top body section 14 and bottom plate 16 by the connecting screws 21.

The outlet socket 11 is formed with a hollow sleeve 62 which is closed at its opposite ends and embracing between parts of the top and bottom body sections 14 and 15 when they are secured together by the screws 17. As best shown in FIG. 1, the top body section 14 is formed with a U-shaped recess 53 at the narrow rear end thereof having spaced arms 64 formed with parts which receive the ends of the hollow sleeve 62, as will be explained presently.

The bottom body section 15 is formed with a curved seat 65 provided with an opening 66, as best shown in FIGS. 3 and 4. The spaced arms 64 of the top body section 14 are formed with wall parts 67 having flanges 68 which extend toward one another and have inner peripheral surfaces 69 which are of arcuate form. The flanges 68 of the wall parts 67 and the curved seat 65, respectively, of the top and bottom body sections 14 and 15 cooperate with one another to provide a female socket 11 for mounting the outlet socket 11 for angular movement on the body 10 when the top and bottom body sections 14 and 15 are brought together and secured to one another by the screws 17, the ends of the curved seat 65 bearing against the similarly curved wall parts 67. The flanged wall parts 67 of the top body section 14 form flanged end walls A and B, respectively, between the recessed ends 70 of which the hollow sleeve 62 is disposed, thereby preventing axial movement thereof in the body 10.

The top and bottom body sections 14 and 15 are provided with walls or partitions which define air passageways through which air drawn into the suction inlet 12 flows toward the outlet socket 11. The air drawn into the suction inlet 12 passes into a space 22 extending across the front of the nozzle body 10 in front of the electric motor 35. The interior of the body 10 includes a partition 71 which is U-shaped and includes a closed end formed by a partition 15c of the bottom body section 14 and spaced apart side arms formed by walls 14a and partitions 14d extending outward from the front ends of the arms 14c to the sides of the hollow body 10.

The end walls 43 and 44 of the space 39 for the electric motor 35 and spaced side arms 14c define air passageways 72 at both sides of the motor 35. The air drawn into the front space 22a flows rearward through the passageways 72 at each side of the electric motor 35. The air passing through the passageways 72 merge in the passageway 73 at the rear of the electric motor 35.

The upwardly extending portion 74 of the outlet socket
which may be referred to as a first part, is perpendicular to the hollow sleeve or second part 62 of the outlet socket. An elongated tubular member 75, the lower end of which is illustrated in FIGS. 8 and 9, is connected to the outlet socket 11 and serves as a handle for manipulating the nozzle body 10 over a surface being cleaned. The upper end of the tubular member 75 may be connected to one end of a suction inlet of a suction cleaner having a motor-fan unit for producing a partial vacuum to cause air to be drawn into the suction inlet 12 of the nozzle body 10.

As shown in FIGS. 8 and 9, the portion 74 of the outlet socket 11 is tapered and receives the lower tapered end of the tubular member 75 to provide a telescopic fit between these parts. The lower end of the tubular member 75 is secured to the outlet socket 11 by a rivet 76. The outlet socket 11, which preferably is formed of electrically insulating material, is provided with a terminal board 77 of insulating material which is fixed to the outer surface of the portion 74 of the outlet socket 11 by the rivet 76. An electrical cord 78, having conductors 79 and 80, is frictionally held on the outlet socket 11 at 81 by a cover 82 for the terminal board 77. The rivet 76 is internally threaded at 76a to threadedly receive a cap screw 83 for detachably connecting the cover 82 to the outlet socket 11.

The conductors 79 and 80 are connected to the top terminals of the terminal board 77, and the conductors 58 and 59 are connected to the bottom terminals of the terminal board.

The conductors 58 and 59 extend through the outlet socket 11 to the switch 57 through passage means formed in the walls of the outlet socket 11. The upper portion 74 of the outlet socket is formed with elongated openings 84 and 85 and the sleeve portion 63 thereof is formed with an axially extending opening 86. The conductors 58 and 59 extend through the elongated openings 84 and 85, respectively, and then pass together through the opening 86 in the sleeve 63 of the outlet socket 11. The conductors 58 and 59 extend from the sleeve 62 through a central opening 87 in the end wall B at one end of the sleeve. Between the sleeve 62 of the outlet socket 11 and the switch 57 the conductors 58 and 59 are enveloped by a covering of an electrical cord 88, as best shown in FIG. 2. With this arrangement the conductors 58 and 59 can readily be rotated when the outlet socket 11 is angularly moved up and down by the handle 75 without subjecting the conductors to bending in the direction of their length which would have a tendency to break the conductors. Further, in the arrangement shown and described above, the electrical conductors 58 and 59 are out of the path of flow of dirt laden air flowing from the suction inlet 12 through the interior of the nozzle body 10 into the outlet socket 11. As explained above, the conductors 58 and 59 and the switch 57 form part of an electrical circuit which includes connections (not shown) to the motor 35 whereby the switch 57 can be operated to connect and disconnect the motor 35 to and from the source of electrical supply.

While a single embodiment of the invention is herein illustrated and described, it will be understood that changes may be made in the construction and arrangement of elements without departing from the spirit or scope of the invention. Therefore, without limitation in this respect, the invention is defined by the following claims:

1 claim:

A suction nozzle comprising a hollow body having a suction inlet and an air outlet socket adapted to be connected to a source of supply of air at a partial vacuum and means providing a path of flow for air therebetween, an agitator mounted for rotation at the vicinity of the suction inlet, means including an electric motor for driving the agitator, the body comprising top and bottom body sections, means for detachably connecting the body sections, and structure including the body sections for mounting the motor in the hollow body and for pivotally mounting the outlet socket for angular movement on the body when the body sections are detachably connected together, the air outlet socket comprising a first part normal to the axis about which it is angularly movable and a second part perpendicular to the first part, the axis of the second part coinciding with the axis about which the outlet socket is angularly movable, the top and bottom body sections having complementary parts receiving and holding the ends of the second part of the outlet socket and the part of the bottom body section providing a seat for the second part of the air outlet socket, the seat and the second part of the outlet socket having openings which are in alignment and enable air to flow in the path of flow from the interior of the body to the air outlet socket, the air outlet socket being formed with passage means in the first and seconds parts thereof, and means including electrical conductors for connecting the motor to the source of electrical supply, the electrical conductors extending through the passage means and projecting from the second part of the air outlet socket substantially parallel to the axis about which the air outlet socket is angularly movable.

2. A suction nozzle as set forth in claim 1 in which the air outlet socket includes piping, a terminal board mounted on the piping, an electrical cord fixed to the piping and connected to the terminal board, and the electrical conductors in the passage means of the outlet socket being connected to the terminal board.

3. A suction nozzle as set forth in claim 2 in which the passage means in the outlet socket for the electrical conductors is in the wall of the socket and out of the path of flow of air through the outlet socket.

4. A suction nozzle as set forth in claim 2 in which the piping serves as a handle for manipulating the nozzle over a surface being cleaned, a cover for the terminal board, and means for fastening the cover on the terminal board connecting the piping to the outlet socket.

5. A suction nozzle as set forth in claim 4 in which the fastening means includes a first part for permanently connecting the piping to the outlet socket and a second part operatively associated with the first part for detachably connecting the cover on the terminal board.

6. A suction nozzle as set forth in claim 1 in which the second part of the air outlet socket is closed at its ends and formed with an opening in the wall thereof through which air discharged from the path of flow in the nozzle body is introduced into the outlet socket, one closed end of the second part of the outlet socket being apertured and through which the electrical conductors extend for connecting the motor to the source of electrical supply.

7. A suction nozzle comprising

(a) a housing having a suction inlet and an angularly movable hollow air outlet socket adapted to be connected to a source of supply of air at a partial vacuum and means providing a path of flow for air therebetween, the air outlet socket having a first hollow arm angularly movable about an axis and a second hollow cross arm intersecting the first arm and disposed at the axis,

(b) an agitator mounted for rotation at the vicinity of the suction inlet,

(c) means including an electric motor for rotating the agitator, the motor being disposed between and removed from the suction inlet and the axis of the air outlet socket,

(d) the housing comprising a first section functioning as the top part thereof and a bottom plate functioning as the bottom part thereof and a second section between the first section and the bottom plate, the bottom plate being apertured to provide the suction inlet,

(e) structure for detachably connecting the first and second sections and bottom plate together,
7

(f) the bottom plate, when the latter and first and second sections are detachably connected together, bearing against the second section and the latter in turn bearing against the first section,

(g) the first and second sections, when they are detachably connected together, forming a compartment for the motor, and

(h) the connecting structure comprising first means including the first section and second means including the second section which, when the first and second sections are detachably connected together, function

1. to clamp and mount the motor in the compartment and

2. provide two pairs of spaced apart top and bottom coacting portions of a pivotal mount for the ends of the second cross arm of the air outlet socket about which the latter is angularly movable.

8. A suction nozzle as set forth in claim 7 in which

(a) the two pairs of spaced apart top and bottom coacting portions of the first and second sections,

when the first and second sections are detachably connected together, receive and hold the ends of the second arm of the air outlet socket to form the pivotal mount,

(b) the second section having a portion functioning as a seat for the second cross arm, and

(c) the seat and second cross arm having openings which are in alignment for air to flow in the path of flow from the housing to the air outlet socket.

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