MULTIPURPOSE SUCTION CLEANER NOZZLE

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The present invention relates to vacuum cleaners and more particularly to a multi-purpose nozzle for a vacuum cleaner adapted to perform different types of cleaning operations.

One of the objects of the present invention is to provide a multi-purpose vacuum cleaner nozzle of improved construction which may be easily and quickly adjusted to selectively perform different cleaning operations by merely turning the nozzle on a supporting element projecting therefrom.

Another object is to provide a multi-purpose nozzle of the type indicated in which the nozzle may be conveniently turned by the operators foot while the nozzle is held above the surface to be cleaned by a handle extending from the supporting element.

Another object is to provide a multi-purpose nozzle of the type indicated in which a plurality of cleaning implements on the nozzle are moved alternately into and out of engagement with the surface to be cleaned upon successive rotations of the nozzle on the supporting element.

Another object is to provide a multi-purpose nozzle of the type indicated in which a single complete revolution of the nozzle on its supporting element will relatively move each of the separate cleaning implements through one half of its cycle of movement through operative and inoperative positions.

Another object is to provide a multi-purpose vacuum cleaner nozzle of the type indicated which is of simple, compact and lightweight construction and one which is dependable in operation.

These and other objects will become more apparent from the following description and drawings in which like reference characters denote like parts throughout the several views. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings:

FIGURE 1 is a longitudinal sectional view of a vacuum cleaner nozzle incorporating the novel features of the present invention and taken on line 1—1 of FIGURE 2 to show the relationship of the relatively movable suction head and brush in one operative position.

FIGURE 2 is a plan view of the nozzle with the cover removed to show the suction head located in an opening in the nozzle frame on which the brush is mounted;

FIGURE 3 is a plan view of the suction head partly in section to show the eccentric bushing rotatable in an eccentric portion 12 forming a journal 13a on which the nozzle 10 is mounted to rotate freely as a unit. The nozzle 10 has a plurality of relatively movable implements for different cleaning operations which are selectively actuated to operative position by rotating the nozzle on the air outlet tube 11. As shown most clearly in FIGURES 4 and 5, the air outlet tube 11 comprises a straight cylindrical portion 12 forming a journal 13a on which the nozzle 10 is mounted to rotate and another cylindrical portion 13 projecting upwardly to an angle at the nozzle for connection with the handle. A strut 14 depends from the top of the tube portion 12 to provide a support for an axial boss 15 projecting from the end thereof. The lower half of the tube portion 12 is cut away outwardly from the journal 13a and an annular disk 16 surrounds the axial boss 15 and cooperates with the end of the tube and cut out portion to define the semi-circular air inlet opening 17. Projecting outwardly from the end of boss 15 is a shouldered screw 18 having a threaded end screwed into a tapped hole 19 in the end of boss 15. The shouldered portion of the screw adjacent the screw head provides a second journal 20 in axial alignment with the journal 13a formed by the outer periphery of the cylindrical portion 12 of the air outlet tube 11.

In the illustrated embodiment, the nozzle 10 comprises a generally rectangular frame 24, see FIGURES 1 and 2, having a centrally located rectangular opening 25 therein. A suction head 26 is located in the central opening 25 of frame 24 and depending from the central opening 25, see FIGURES 1 and 2, with raised bridge straps 30 extending across the opening between the rails. Centrally located bearing hubs 31 and 32 project upwardly from the side rails of frame 24 at opposite sides of the opening 25. As shown most clearly in FIGURES 4 and 5, bearing hub 31 closely fits a cylindrical bushing 33 on the journal 13a of the air outlet tube 11 while the bearing
hub 32 closely fits the journal 28 on the screw 18. Thus, the rectangular frame 24 is supported by and mounted to freely rotate on the cylindrical portion 12 on the air outlet tube 11.

Brush 27 comprises a rectangular metal frame 36 of generally U-shaped form in cross-section in which rows of bristles 37 are clamped, see FIGURES 4, 5 and 7. Brush frame 36, in turn, is clamped to the rectangular frame 24 with a gasket 38 therebetween by means of clips 39, which are attached to the bottom of the side rails of the frame 24 by screws 40 and have fingers engaging the bottom of the brush frame at spaced points. Gasket 38 is of generally T-shaped form in cross-section and composed of a resilient material such as natural or synthetic rubber. One leg of the T-shaped gasket 38 is positioned between the supporting frame 24 and brush frame 36 so that a flange 41 projecting from opposite sides of the clamped leg surrounds the outer periphery of the rectangular frame 24 to provide a resilient bumper for the sides and ends of the nozzle. Flange 41 of gasket 38 also depends on the bristles 37 to provide a depending skirt for limiting the area to cause air to flow to the suction head 26 at high velocity.

The suction head 26 also is of generally rectangular form, see FIGURES 3 and 7 having an open bottom 44 with a peripheral flange 45 projecting laterally therefrom. Overlapping the peripheral flange 45 is projecting laterally from the sides of the open bottom 44 is a rectangular sheet 47 of a smooth sheet material such as stainless steel. The sheet 47 is attached to the bottom of the suction head 26 as by crimping the upper edges over the top of the peripheral flange 45 and the sides taper downwardly from the edges toward the open bottom as shown in FIGURES 4 and 5.

As shown in FIGURE 1, the walls of the suction head 26 taper upwardly from the ends toward the center and are formed to provide a bearing hub 46. Bearing hub 46 projects laterally from one side to the edge of the peripheral flanges 45 as illustrated in FIGURE 24. As stated above the suction head 26 is located in the opening 25 in the rectangular frame 24 and its bearing hub 46 is located between the bearing hubs 31 and 32 of the rectangular frame 24. Bearing hub 46 surrounds the journal 12a on the straight cylindrical portion 12 of the air outlet 11, but is of considerably larger diameter than the journal to provide a space therebetween.

The eccentric bushing 28 of the actuating mechanism is positioned between the journal 12a of the air outlet tube 11 and the bearing hub 46 of the suction head 26. As shown in FIGURES 1, 8, and 9, eccentric bushing 28 is of hollow construction comprising spaced disks 29 and 51 with peripheral segments 52 and 53 extending between the disks at opposite sides thereof. One of the disks 50 is bored to provide a bearing 54 of a diameter to closely fit the journal 12a of the air outlet tube 11, see FIGURE 4, and the disk 51 has an axial metallic bushing 56 of a size closely fit the axial boss 15 at the end of the air outlet tube. The bearing 54 and bushing 56 are in axial alignment, but arranged eccentrically to the center of the disks 50 and 51. Thus, the hollow eccentric bushing 28 is mounted to rotate on the air outlet tube 11 and activate the suction head 26 from a raised position illustrated in FIGURE 4 to a lowered position engaging the surface to be cleaned as illustrated in FIGURE 5. In either of the two positions illustrated in FIGURES 4 and 5, one or the other of the peripheral openings 57 and 58 between the segments 52 and 53 of bushing 28 will align with the air outlet opening 17 in the tube 11.

Eccentric bushing 28 is held in alignment with the bearing hub 46 of the suction head 26 by means of a plate 59, see FIGURES 1 and 4, attached to the outside face of disk 50 by screws and having a radially projecting edge projecting into a slot 60 in the bearing hub. The plate and slot connection 59 and 60 prevents axial movement of the eccentric bushing 28 and suction head 26 while permitting relative rotation therebetween. A packing ring 61, see FIGURE 4, is clamped between the bushing 56 and disk 54 for engaging the disk 16 at the end of portion 12 of the air outlet tube 11 to seal the joint therebetween.

The reduction gearing 29 for rotating the eccentric bushing 28 relative to the air outlet tube 11 comprises a spur gear 62 surrounding the shoulder screw 18 and is driven to the end of the hub 31 of the air outlet tube. Spur gear 62 meshes with one set of teeth 63 of a compound gear 63 having a second set of teeth 63b meshing with a spur gear 64 mounted fast on the outer end of bushing 56 projecting from the disk 50 of the eccentric bushing 28. As illustrated in FIGURES 2 and 4, the wall of the bearing hub 32 is extended to provide a housing 65 surrounding an annular boss 66 projecting from the eccentric bushing 28 adjacent the spur gear 64 and enclosing the reduction gearing 26. Compound gear 63 is mounted to rotate on a pin 67 extending between the walls of the housing 65 on the frame 24. The number of teeth on the spur gears 62 and 64 and compound gear 63 is such as to produce a 2 to 1 ratio. Thus, one complete 360° revolution of the nozzle 10 on the air outlet tube 11 around the spur gear 62 transmits motion through the compound gear 63 and spur gear 64 to rotate the eccentric bushing 28 through a half revolution and thereby raise or lower the suction head 26 relative to the rectangular frame 24.

As shown in FIGURES 6 and 7, the nozzle frame 24 has spaced flanges 70 projecting inwardly from one side rail while the suction head 26 has outwardly directed flanges 45 and 71 overlying the flanges on the frame and spaced therefrom a distance substantially equal to the movement of the suction head 26 relative to the frame. Thus, when the suction head 26 is moved downwardly to engage the surface to be cleaned as illustrated in FIGURE 5, the flanges 71 projecting laterally therefrom will engage the inner edge projecting flanges 70 on the rectangular frame 24 to stabilize the plate and prevent relative rotation. On the other hand, when the suction head 26 is raised to engage the brush 27 with the surface to be cleaned, the peripheral flange 45 on the suction head 26 will engage the bottom of the flanges 70 and hold the suction head 26 at a distance equal to the movement relative to the frame 24.

The top of nozzle 10 is closed by a cover 72 which conforms to the contour of the parts. Cover 72 may be formed of a suitable material and overlies the bridge strips 30 on nozzle frame 24 and is attached thereto by screws 73. The cover 72 is provided with a central peep hole 74 which overlies the top of the bearing hub 46 of the suction head 26. Peep hole 74 provides a visual indication of the position of the suction head, either raised or lowered, and the hub 46 may have a colored spot which is visible when the suction head is raised and not visible when lowered. The open bottom of bearing housing 65, see FIGURES 5 and 6, is also closed by a cover 75 clamped to frame 24 by two of the clips 39 for attaching the brush 27 thereto. One form of the invention having now been described in detail, the mode of operation is explained below.

The parts of the nozzle 10 are assembled by attaching the brush frame 26 to the nozzle frame 24 with the gasket 38 therebetween. This is accomplished by applying the clamping clips 39 by means of screws 46. The hollow eccentric bushing 28 is then mounted in the bearing hub 46 of the suction head 26, as shown in FIGURE 3, with the upper edge of plate 59 engaging the slot 60 in the bushing. Suction head 26 with bushing 28 therein is then inserted into the rectangular opening 25 of the nozzle frame 24 through the bottom thereof until its bearing hub 46 is in substantial alignment with the bearing hubs 31 and 32 of the frame 24. The straight cylindrical portion 12 of the air outlet tube 11 is then inserted through the aligned bearing hubs 31, 32 and 46.
of the frame 24 and suction head 26, respectively. When air outlet tube 11 is inserted, the angular portion 13 of the air outlet tube 11 should be positioned in substantial alignment with the lobe axis 12 of the eccentric bushing 28 to properly engage the eccentric teeth of the spur gear 62 with the teeth of the compound gear 63. The shouldered screw stud 18 is then inserted through the opening in bearing hub 32 and its threaded end screwed into the tapped hole 19 in the axial boss 15 projecting from the end of the air outlet tube 11. Preferably, a lock washer is provided between the shouldered screw 18 and gear 62 to lock the screw against movement relative to the air outlet tube 11. The spaced bearing hubs 31 and 32 of the frame 24 then bear on the journals 12a and 12b on the air outlet tube 11 to mount the frame for rotation on the tube. The hollow eccentric bushing 28 bears on the journal 12a and boss 15 on the air outlet tube 11 between the bearing bosses 31 and 32 of the frame 24. With the parts assembled in the relationship illustrated in FIGURES 1 and 4, the eccentric bushing 28 supports the centrally positioned suction head 26 above the bristles 37 of brush 27. Furthermore, the flange 45 on the suction head 26 engages the spaced flanges 70 on frame 24 to prevent relative rocking movement.

With the relationship of the parts illustrated in FIGURES 1 and 4, the nozzle is propelled over the surface to be cleaned and the brush loosens dirt from cracks and crevices which is thrown up by the high air stream flowing through the open bottom 44 of the suction head 26. During a cleaning operation, the flange 41 of peripheral gasket 38 acts as a bumper guide and restricts the air opening to the suction head 26 to cause air to flow thereto at high velocity. The air with dirt entrained therein is directed through the hollow handle (not shown) to a tank where the dirt is separated from the air. The nozzle 10 can be shifted back and forth from one type of cleaning operation to the other type of cleaning operation by rotating the bushing air outlet tube 11 in either direction. Thus, the nozzle 10 for turning the bushing through one half a revolution 67. Such rotation of the compound gear 63 is transmitted to the spur gear 64 at the end of the eccentric bushing 28 to turn the bushing relative to the air outlet tube 11 and suction head 26 from the position illustrated in FIGURE 4 to that illustrated in FIGURE 5. As gears 62, 63 and 64 have a reduction ratio of 2 to 1, the eccentric bushing 28 is turned through one half a revolution during each complete 360° revolution of the nozzle 10 on the air outlet tube 11. Thus, with this relationship of parts the other opening 77 in eccentric bushing 28 aligns with air inlet opening 17 in the air outlet tube 11 and the suction head 26 is moved from its raised position illustrated in FIGURE 4 to its lowered position illustrated in FIGURE 5. The nozzle 10 then projects beyond brush 27 and directly engages the surface to be cleaned over a greater area of the surface.

The engagement of flanges 71 on the suction head 26 with flanges 70 on frame 24 holds the latter from rocking on the suction head. When it is desired to again shift from a direct cleaning operation to a brushing operation, the nozzle 10 again is rotated through one complete 360° revolution on the air outlet tube 11 in either direction. Thus, the nozzle 10 can be shifted back and forth from one type of cleaning operation to the other type of cleaning operation by rotating it in the same direction on the air outlet tube through complete 360° revolutions. Such rotation of the nozzle operating through the reduction gearing 29 and eccentric bushing 28 will raise the suction head 26 out of engagement with the surface to be cleaned and engage the brush 27 with the surface. Thus, the separate suction head and brush elements 26 are automatically actuated to operative positions by successive 360° rotations of the nozzle 10 on the air outlet tube 11. Furthermore, it will be observed that one complete 360° revolution of the nozzle 10 on the air outlet tube 11 moves the suction head 26 through one half of its cycle of movement relative to the brush 27. It will now be observed that the present invention provides a multi-purpose vacuum cleaner nozzle of improved construction which may be easily and quickly adjusted to selectively perform different cleaning operations by merely turning the nozzle on a supporting element projecting therefrom. It will further be observed that the present invention provides a multi-purpose nozzle having a plurality of cleaning implements which are moved alternately into and out of engagement with the surface to be cleaned by the operator turning the nozzle on its supporting element with his foot. It will further be observed that the present invention provides a vacuum cleaner nozzle which is of simple, compact and lightweight construction and one which is dependable in operation.

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. A nozzle for a vacuum cleaner having separate relatively movable parts for engaging the surface to be cleaned, an element for supporting the nozzle, means for mounting the nozzle to rotate on its supporting element, and mechanism connecting the relatively movable parts of the nozzle and operated by successive 360° rotations of the nozzle in the same direction on its supporting element to alternately project the separate parts into engagement with the parts 11 to be cleaned.

2. A multi-purpose nozzle for a vacuum cleaner comprising relatively movable parts for engaging the surface to be cleaned, an air outlet tube formed to provide a journal, means for mounting said nozzle to rotate as a unit on the journal of the air outlet tube, and mechanism operated by the rotation of the nozzle on the air outlet tube and connected to relatively move one of the parts into engagement with and the other part out of engagement from the surface to be cleaned during one 360° revolution of the nozzle in one direction on the air outlet tube and to relatively move the other part into engagement with and the one part out of engagement from the surface to be cleaned during another 360° revolution of the nozzle in the same one direction on the air outlet tube.

3. A multi-purpose nozzle for a vacuum cleaner having separate relatively movable parts for engaging the surface to be cleaned, an element for supporting the nozzle, means for mounting the nozzle to rotate on the supporting element as a unit, an eccentric bushing between the supporting element and one of the relatively movable parts of the nozzle, and reduction gearing connected between the supporting element and bushing for turning the bushing through one half a revolution
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during each complete revolution of the nozzle on its supporting element to move said one part into engagement or withdraw said one part from engagement with the surface to be cleaned.

4. A multi-purpose nozzle for a vacuum cleaner having a suction head and a brush surrounding the suction head, a supporting element, means for mounting the nozzle for rotation on the supporting element as a unit, the suction head and brush being mounted for relative movement toward and away from the surface to be cleaned, and cooperating means connected with the supporting element and at least one of the movable suction head and brush elements to move the connected element in one direction relative to the other element during one complete revolution of the nozzle in one direction on the supporting element and move the connected element in the opposite direction relative to the other element during the next complete revolution of the nozzle in the same one direction on the supporting element.

5. A multi-purpose nozzle for a vacuum cleaner having a suction head and brush, a supporting element providing a journal, said suction head and brush having bearings surrounding the journal to prevent the nozzle from rotating as a unit on the supporting element, an eccentric bushing between the journal on the supporting element and one of the suction head and brush elements, and means operated by rotation of the nozzle on the supporting element to turn the bushing through one-half revolution for each revolution of the nozzle whereby to move the element mounted on the eccentric bushing in opposite direction relative to the other element during successive rotations of the nozzle on the supporting element.

6. A multi-purpose nozzle for a vacuum cleaner having an elongated open frame, a brush mounted on the frame, having depending bristles, a supporting element having coaxial journals, said frame having bearings to mount it for rotation on the journals of the supporting element, a suction head located within the open frame and having a bearing hub surrounding a journal on the supporting element between the bearings on the frame, an eccentric bushing mounted to rotate between the journal of the supporting element and bearing hub of the suction head, and reduction gearing connected between the supporting element and eccentric bushing to turn the latter through one-half of a revolution during each complete revolution of the nozzle on the supporting element to alter the radius of suction head relative to the frame during successive revolutions of the nozzle.

7. A multi-purpose nozzle for a vacuum cleaner comprising relatively movable parts for engaging the surface to be cleaned, an air outlet tube formed to provide a journal, means for mounting said nozzle to rotate as a unit on the journal of the air outlet tube, and mechanism operated by the rotation of the nozzle on the air outlet tube and connected to relatively move one of the parts into engagement with and the other part out of engagement from the surface to be cleaned during one 360° revolution of the nozzle on the air outlet tube, one of the relatively movable parts comprising an elongated frame having a central opening, bristles depending from said frame around the opening to provide a brush, another of said relatively movable parts comprising an elongated suction head having bearings mounted on the journal of the air outlet tube, and the mechanism operated by rotation of the nozzle on the air outlet member comprising an eccentric bushing between the journal on the air outlet tube and bearing on the suction head, and said frame and suction head having bearings mounted on the journal of the air outlet tube, the mechanism operated by rotation of the nozzle on the air outlet member comprising an eccentric bushing between the journal on the air outlet tube and bearing on the suction head, said open frame having inwardly directed flanges, and the suction head having spaced outwardly projecting flanges for engaging the inwardly directed flanges on the frame at the end of its vertical movement relative to the frame in each direction.

10. A multi-purpose nozzle for a vacuum cleaner comprising relatively movable parts for engaging the surface to be cleaned, an air outlet tube formed to provide a journal, means for mounting said nozzle to rotate as a unit on the journal of the air outlet tube and mechanism operated by the rotation of the nozzle on the air outlet tube and connected to relatively move one of the parts into engagement with and the other part out of engagement from the surface to be cleaned during one 360° revolution of the nozzle on the air outlet tube, the mechanism operated by the rotation of the nozzle and air outlet member comprising a hollow eccentric bushing between one of the relatively movable parts and the journal of the air outlet tube and the hollow bushing and tube having cooperating peripheral openings to permit the flow of air therethrough.

11. A multi-purpose nozzle for a vacuum cleaner in accordance with claim 10 in which the eccentric bushing and member which it engages have an interengaging slot and dent connection for holding the bushing member and part in alignment while permitting relative rotation.

12. A multi-purpose nozzle for a vacuum cleaner in accordance with claim 10 in which a packing ring is provided between the hollow eccentric bushing and air outlet tube.

13. A multi-purpose nozzle for a vacuum cleaner comprising relatively movable parts for engaging the surface to be cleaned, an air outlet tube formed to provide a journal, means for mounting said nozzle to rotate as a unit on the journal of the air outlet tube, and mechanism operated by the rotation of the nozzle on the air outlet tube and connected to relatively move one of the parts into engagement with and the other part out of engagement from the surface to be cleaned during one 360° revolution of the nozzle on the air outlet tube, the air outlet tube having an axial boss extending from its end, one of the relatively movable parts comprising an open frame having spaced sides, bearing hubs projecting from the spaced sides to the frame, said frame having one bearing hub surrounding the air outlet tube, a stud projecting through the other bearing hub and having a threaded end screwed into the axially disposed bearing hub on the air outlet tube to mount the frame for rotation on the tube, said other part being mounted to rotate on the air outlet tube between the bearing rings of the frame, and the mechanism operated by rotation of the nozzle on the air outlet tube comprising an eccentric bushing between the tube and other part.

14. A multi-purpose nozzle for a vacuum cleaner in accordance with claim 13 in which the mechanism operated by the rotation of the nozzle on the air outlet tube comprises a gear on the boss, a gear on the bushing, and a compound gear on the frame meshing with the gears on the boss and bushing, respectively.

15. A multi-purpose nozzle for a vacuum cleaner in accordance with claim 14 in which the bearing hub on
the side of the frame adjacent gearing being formed to provide an enclosing housing.

17. A multi-purpose nozzle for a vacuum cleaner having a suction head and a brush surrounding the suction head, a supporting element, means for mounting the nozzle for rotation on the supporting element as a unit, the suction head and brush being mounted for relative movement toward and away from the surface to be cleaned, and operating means connected between the supporting element and at least one of the movable suction head and brush elements to move the connected element in one direction relative to the other element during one complete revolution of the nozzle and move the connected element in the opposite direction during the next complete revolution of the nozzle, the brush surrounding the suction head comprising an elongated open frame having depending bristles, a second elongated open frame, a resilient gasket between said frames, means for clamping the frames to each other with the gasket therebetween in an integral unit, and said gasket having a flange surrounding the frames to provide a bumper guard for the nozzle and a skirt overlying the bristles to control the flow of air to the nozzle.

18. A multi-purpose nozzle for a vacuum cleaner in accordance with claim 3 having indicating means on said one part actuated by the eccentric bushing to indicate which of the parts is in operative position to engage the surface to be cleaned.

19. A multi-purpose nozzle in accordance with claim 18 in which the nozzle is enclosed by a detachable cover, an opening in the top of the cover overlying said one part actuated by the eccentric bushing, and a visual indicator on said one part actuated by the eccentric bushing and underlying the opening in the cover to show the relationship of said one part relative to the other part.

20. A nozzle member for a vacuum cleaner having first and second parts for engaging the surface to be cleaned, a member for supporting the nozzle member, means for mounting said nozzle member to rotate on its supporting member, said nozzle member being so constructed and arranged that each of said parts is bodily movable vertically with respect to the other when said nozzle member is positioned upon the surface to be cleaned, and means to raise said first part vertically with respect to said second part and from the surface to be cleaned responsive to relative rotation of said supporting member and said nozzle member in a first range of 360° in which one of said members rotates in one direction with respect to the other of said members, and to raise said second part vertically with respect to said first part and from the surface to be cleaned responsive to further relative rotation of said supporting member and said nozzle member in a second range of 360° in which said one member rotates in the same one direction with respect to said other member.

21. A nozzle member as set forth in claim 20 in which said supporting member comprises an air outlet tube.

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