May 8, 1962 E. ANDERSON 3,032,800

VACUUM CLEANER SUCTION NOZZLE

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Fig. 1

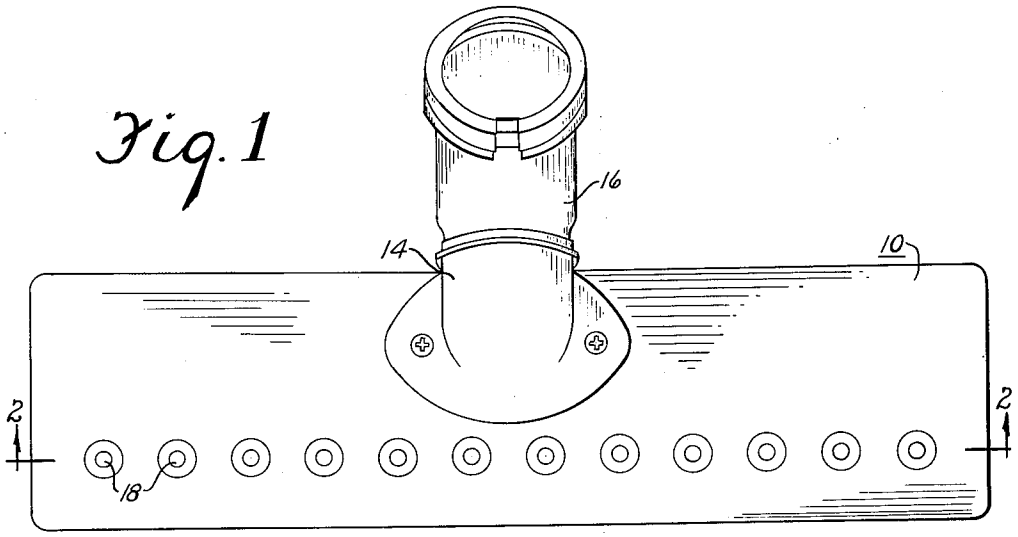


Fig. 2

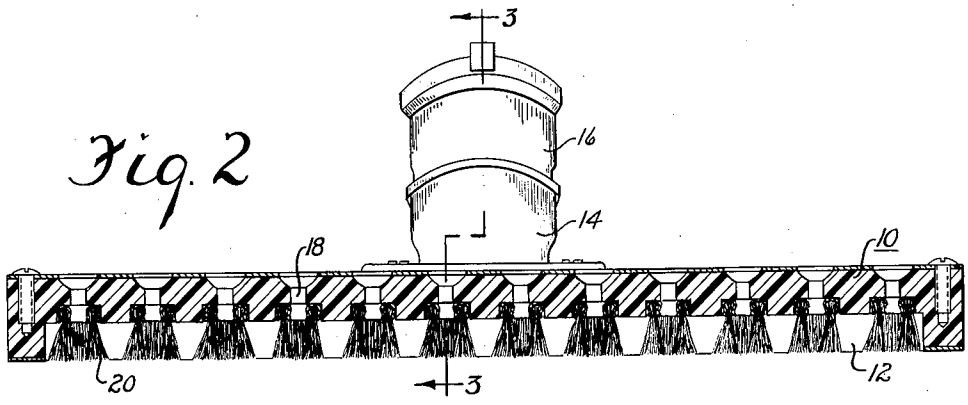
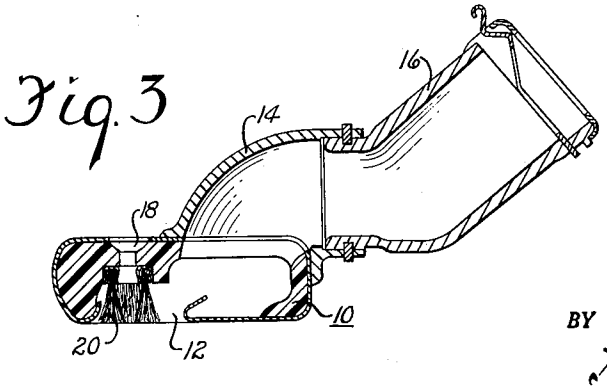


Fig. 3



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VACUUM CLEANER SUCTION NOZZLE

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Fig. 4

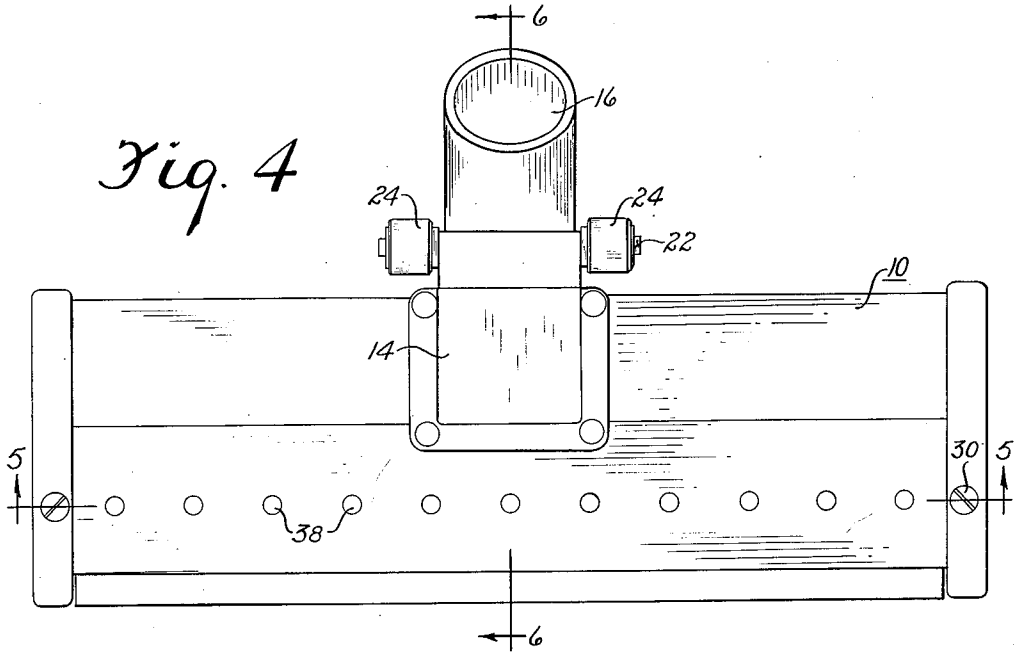


Fig. 5

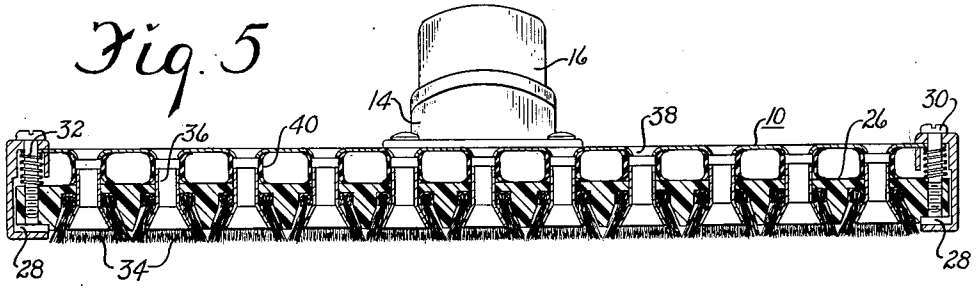
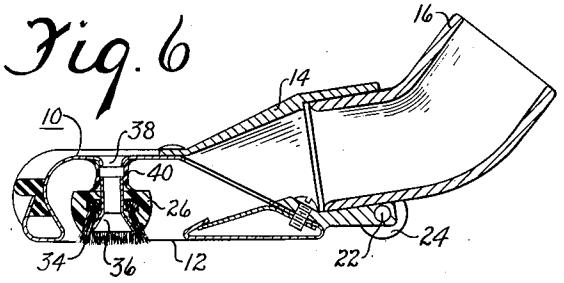


Fig. 6



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VACUUM CLEANER SUCTION NOZZLE

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Fig. 7

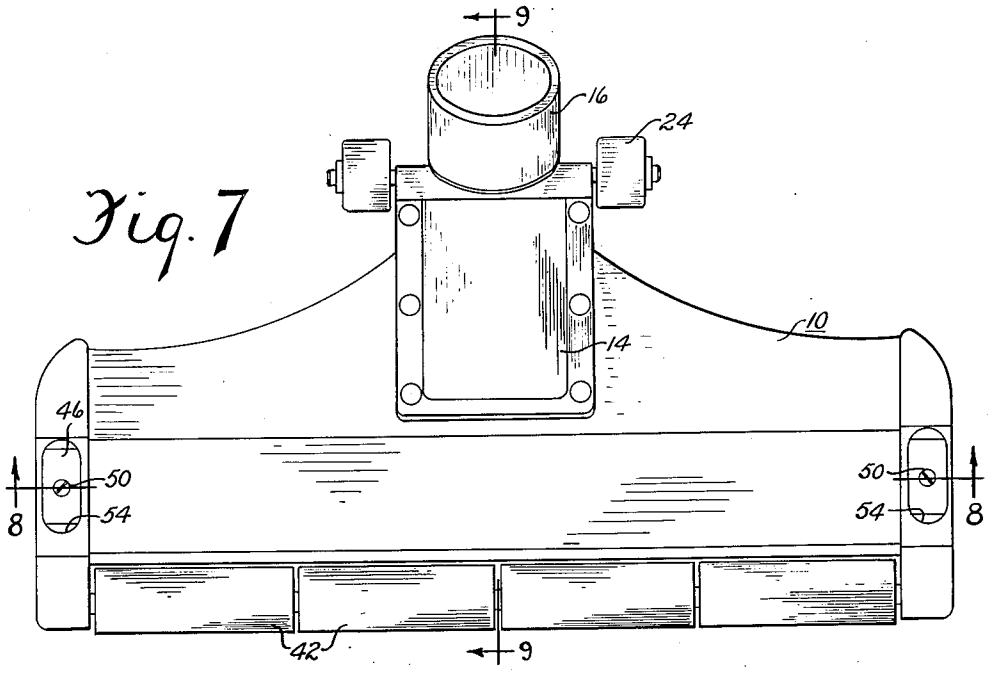
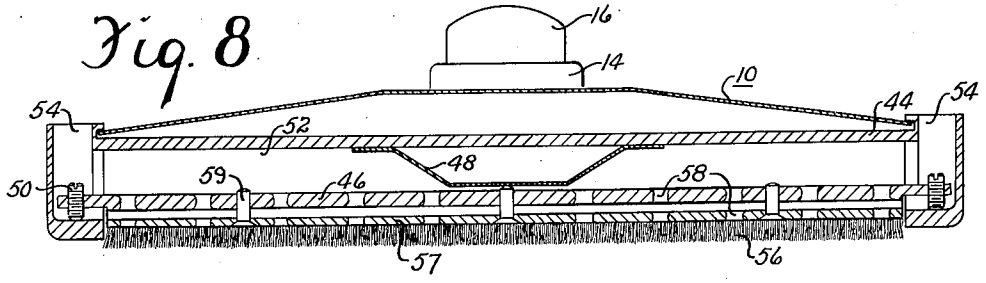


Fig. 8



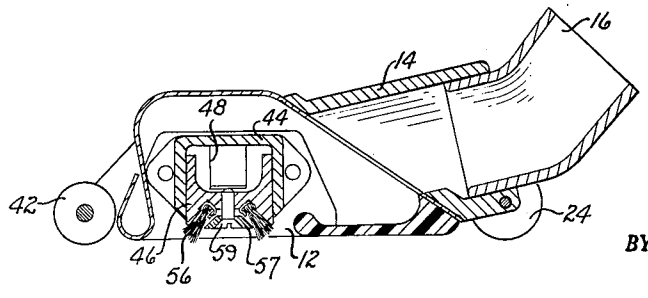


Fig. 9

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Fig. 13

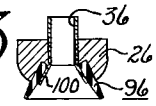


Fig. 14



Fig. 15

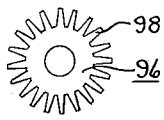
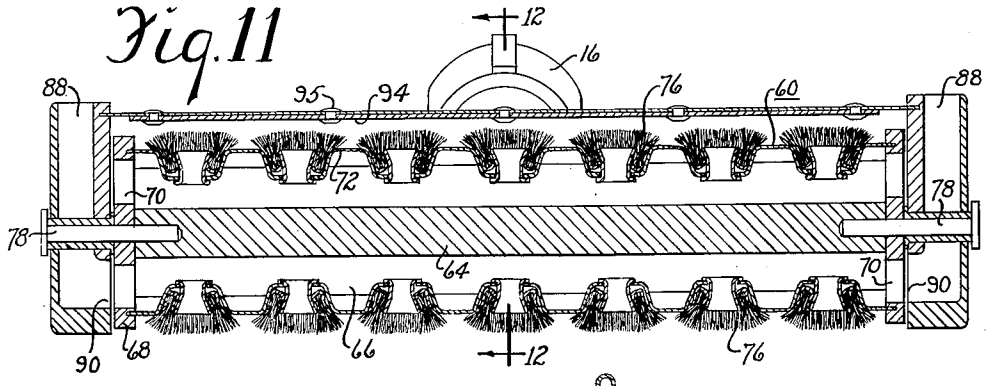


Fig. 10

Fig. 11



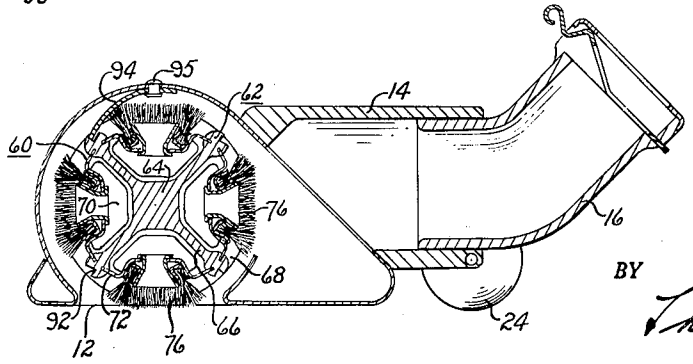


Fig. 12

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United States Patent Office 3,032,800 Patented May 8, 1962

3,032,800
VACUUM CLEANER SUCTION NOZZLE

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Filed Mar. 5, 1958, Ser. No. 719,404
19 Claims. (Cl. 15—371)

My invention relates to suction nozzles for vacuum cleaners and more particularly to rug nozzles provided with surface agitating means such as flexible bristles for aiding in dislodging dirt from the rug.

In accordance with my invention the bristles are mounted in the interior of the hollow nozzle body with their ends disposed substantially in the plane of the suction opening. The bristles are arranged so as to enclose one or more spaces and means are provided for admitting air to such space or spaces through a path other than that provided by the inlet opening. With this arrangement, when suction is applied to the interior of the nozzle body, a substantial portion of the air passes into the body by flowing through the space or spaces bounded by the bristles. One advantage of this is that the air flowing in this manner tends to maintain the bristles clean and prevents the accumulation thereon of dirt which is dislodged from the rug.

In accordance with one embodiment of my invention the bristles are arranged in a plurality of circular groups, while in accordance with another embodiment parallel rows of bristles bound an elongated space within the nozzle body.

If desired the bristles, either in circular groups or straight rows, may be mounted in a fixed position within the nozzle, or they may be mounted on a resiliently supported member which tends to urge them towards the suction opening, but which permits them to move inwardly as a result of contact with the rug.

Also, the bristles may be mounted on a rotor which is preferably provided with valve means so that atmospheric air may enter only those spaces bounded by the bristles which at any moment extend downwardly into contact with the rug.

Further objects and advantages of my invention will be apparent from the following description when taken in connection with the accompanying drawings which form part of this specification and of which;

FIG. 1 is a top view of a nozzle in accordance with my invention;

FIG. 2 is a cross-sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a top view of a nozzle embodying another form of my invention;

FIG. 5 is a cross-sectional view taken on the line 5—5 of FIG. 4;

FIG. 6 is a cross-sectional view taken on the line 6—6 of FIG. 4;

FIG. 7 is a top view of a nozzle embodying still another form of my invention;

FIG. 8 is a cross-sectional view taken on the line 8—8 of FIG. 7;

FIG. 9 is a cross-sectional view taken on the line 9—9 of FIG. 7;

FIG. 10 is a top view of a nozzle embodying a still further form of my invention;

FIG. 11 is a cross-sectional view taken on the line 11—11 of FIG. 10;

FIG. 12 is a cross-sectional view taken on the line 12—12 of FIG. 11;

FIG. 13 is a cross-sectional view of a different type of flexible bristles which may replace the brush bristles shown in certain of the preceding figures;

FIG. 14 is a cross-sectional view of one of the elements shown in FIG. 13 in flat form before assembly; and

FIG. 15 is an end view of the element shown in FIG. 14.

Referring to the drawings, and more particularly to FIGS. 1 through 3, reference character **10** designates generally a hollow nozzle body formed with an elongated suction opening **12**. Secured to the upper part of the body **10** is a conduit member **14** to which is pivotally connected an elbow **16** by means of which the interior of the body **10** may be connected to a source of suction by means of a suitable conduit, preferably including a flexible hose.

The top wall of the nozzle body **10** is formed with a plurality of openings or ports **18**, the upper ends of which communicate with the atmosphere. The lower end of each port or opening **18** communicates with a space formed within a circular group of bristles **20**, the several circular groups being suitably secured to the lower surface of the top wall of the nozzle body. The length of the bristles is such that their lower ends are disposed substantially in the plane of the suction opening **12**.

In operation, when the elbow **16** is connected to a source of suction a reduced pressure is caused to exist within the nozzle body. This results in air flowing into the nozzle through the opening **12**, such air passing through the pile of the rug in order to find its way underneath the lips which bound the suction opening **12**. This air serves to remove dust and dirt from within the pile of the rug. However, a substantial volume of air also flows into the nozzle through the several ports **18**. This air passes through the spaces bounded by the circular groups of bristles and flows into the hollow nozzle body between the individual bristles making up these groups. As the nozzle is moved back and forth over the rug, the bristles remove dirt from the rug and this has a tendency to adhere to the bristles. However, the flow of air outwardly between the bristles serves to continuously remove this dirt, which is carried by the air stream out of the nozzle through the elbow **16**.

In the embodiment illustrated in FIGS. 4 through 6 similar parts are designated by like reference characters. Secured to the lower part of the conduit member **14** is a shaft **22** which carries a pair of wheels **24** which serve to make it easier to move the nozzle back and forth over a rug.

Disposed lengthwise within the nozzle above the elongated suction opening **12** is a movable member **26** which is spaced from all of the nozzle walls except the end walls. Opposite ends of this member are received within pockets **28** formed in the ends of the nozzle body. A screw **30** is threaded into each end of the member **26** and extends upwardly through an opening in the top of the nozzle. A spring **32** surrounds each of these pins and is compressed between the top surface of the member **26** and the top of the nozzle, the springs thus tending to urge the member **26** downwardly so as to hold the heads of the screws **30** against the upper surface of the nozzle body. The distance the springs may force the member **26** downwardly may be adjusted by turning the screws further into or out of the member **26**.

A plurality of circular groups of bristles **34** are carried by the lower surface of the member **26** and have their lower ends disposed within or slightly below the plane of the opening **12** when the member **26** is in its lowermost position. Short tubes **36** extend through the member **26**, the lower end of each tube communicating with the space bounded by a circular group of bristles. The top wall of the nozzle body **10** is formed with a plurality of ports **38** and a short piece of flexible tubing **40** is connected around the upper end of each tube **36** and bears against the inner surface of the nozzle body around each port **38**.

Thus, as the nozzle is moved back and forth over a rug, the springs **32** hold the bristles **34** down in contact with the rug, but permit them to move vertically as a result of this contact, whereby the bristles may accommodate themselves to rugs of different thickness. Such movement of the member **26** is permitted by virtue of the flexible connection provided by the short pieces of tubing **40**. The application of suction to the interior of the nozzle body causes the air to flow inwardly through the ports **38** and the tubes **40** and **36** to the spaces bounded by the bristles, and as was described in connection with the first embodiment, this tends to maintain the bristles clean. The air passing between the bristles may flow either directly towards the outlet conduit **14**, or it may flow over the top of member **26** and between the several pieces of tubing **40**.

In the embodiment illustrated in FIGS. 7 through 9, the nozzle body is not only provided with small wheels **24** at the rear, but in addition is provided with a plurality of rollers **42** in the front. Fixed within the nozzle body **10** and extending parallel to the suction opening **12** is an upper channel member **44** opening in a downward direction. Slidably mounted within the opening of upper channel member **44** is a lower channel member **46** which has an upwardly directed opening, the two channel members constituting a hollow structure which is spaced from all except the end walls of the nozzle. A spring member **48** resiliently urges the lower channel member **46** downwardly, the extent of the downward movement being adjustable by set screws **50** at each end of the channel **46**.

As will be seen more particularly in FIG. 8, the space **52** within the channel member is connected at each end to the atmosphere through passages **54** formed in the nozzle body **10**. Extending downwardly from the face of the lower channel **46** are parallel strips of bristles **56**, the lower ends of which terminate approximately in the plane of the nozzle opening **12**. These strips are retained in place by a plate **57** secured to the channel **46** by screws **59**. Lower channel member **46** and plate **57** are formed with a plurality of aligned openings **58** extending therethrough which establish communication between the hollow interior **52** and the elongated space bounded by the bristles **56**.

In operation, the lower channel member **46** and the bristles **56** may move up and down as the nozzle is moved back and forth over a rug in a manner similar to that described in connection with FIGS. 4 through 6. The low pressure maintained with the nozzle body causes air to flow through the channels **54** into the space **52** and thence through the openings **58** into the space between the rows of bristles **56**, from where it passes between the bristles to the interior of the nozzle. The air which passes through the bristles in the forward row flows over the top of the hollow structure on its way to the outlet **14**.

In the embodiment illustrated in FIGS. 10 through 12 a rotor, designated generally by reference character **60**, is mounted within the nozzle body **10**. The rotor includes a member **62** which has a central hub portion **64** and four radially extending webs **66**. The ends of the rotor are formed by circular discs **68**, each of which is provided with four openings **70** therethrough. Extending between the discs **68** and between adjacent webs **62** is a sheet metal wall member **72**. Each wall member is formed with a plurality of openings around each of which is secured circular group of bristles **76**. The rotor **60** is supported within the nozzle member by means of pins **78** at opposite ends.

The ends of the nozzle body are formed with passageways **88** which terminate in ports **90** so arranged that they are in alignment with the openings **70** in the discs **68** which communicate with the opposite ends of the space within the rotor which is in the lowermost position. Thus, the discs **68** with the ports **70**, together with the ports **90**, form a rotary valve which establishes communication sequentially with the different axially extending spaces within the rotor as each space reaches the lowermost position.

The ends of the webs **62** are formed with notches **92** which may be engaged by the edge of a leaf spring **94** secured to the top of the nozzle body by rivets **95**. The arrangement is such that the rotor **60** may roll on the floor during forward movement of the nozzle, but upon rearward movement the edge of the spring **94** will engage one of the notches **92**, thus holding the roller against further rotation and in a position such that one of the lines of groups of bristles **76** will contact the rug. This of course is the line of bristles in the lowermost position and the suction within the nozzle body **10** serves to draw air inwardly through these bristles, the air passing through the passageway **88**, the ports **90** and **70** to the lowermost space within the rotor. No air will enter the other three spaces because their ports **70** are not in alignment with the ports **90**.

In operation as the nozzle is moved back and forth over the rug, the rotor turns during the forward stroke of the nozzle, but is held stationary during the rearward stroke and consequently the bristles **76** brush the surface of the rug so as to dislodge dirt therefrom. At the same time, air passes through the bristles which are in the dirt removing position, thus tending to keep the bristles clean by removing dirt therefrom.

In the embodiments heretofore described the surface agitating means has been illustrated as comprised of bristles of the usual type. However, my invention is not limited to such bristles, and in FIGS. 13 through 15 there is shown an alternative form. Here the resiliently mounted member **26** of the nozzle shown in FIGS. 4 through 6, is provided with a surface agitating member in the form of a conical shaped flexible member **96** having a plurality of fingers **98**. This member may be formed from an originally flat sheet of material, as is shown in FIGS. 14 and 15, and due to its resilient nature may be formed into the conical shape shown in FIG. 13 by being secured between the wall a conical opening in member **26** and a conical flange **100** formed at the lower end of the tube **36**. Obviously, a surface agitating member of this type could be used in any of the other embodiments and the term "bristles" is intended to include such an arrangement.

While I have shown and described several more or less specific forms of my invention, this has been done for the purpose of illustration only and the scope of my invention is not to be limited thereby, but is to be determined from the appended claims.

What I claim is:

1. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, bristles within said body having their ends disposed substantially in the plane of said opening, said bristles bounding a space within said body, means providing a path other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

2. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, groups of bristles within said body having their ends disposed substantially in the plane of said opening, each group of bristles bounding a space within said body, means providing paths other than said opening for conducting atmospheric air from outside said body to within said spaces, said paths communicating with said spaces at points therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

3. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, parallel rows of bristles within said body having their ends disposed substantially in the plane of said opening, said rows of bristles bounding a space within said body, means providing a path

other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

4. In a suction nozzle for a vacuum cleaner, a hollow body having an elongated suction opening, a supporting member within said body and spaced from a wall thereof and extending parallel to and above said opening, parallel rows of bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said rows of bristles bounding an elongated space within said body, means providing a path other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

5. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a supporting member within said body above said opening and spaced from a wall of said body, bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said bristles bounding a space within said body, means providing a path other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

6. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a supporting member within said body above said opening and spaced from a wall of said body, groups of bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, each group of bristles bounding a space within said body, means other than said opening providing paths for conducting atmospheric air from outside said body to within said spaces, said paths communicating with said spaces at points therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

7. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a supporting member within said body above said opening and spaced from a wall of said body, means for mounting said member for movement towards and away from said opening, resilient means for urging said member towards said opening, bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said bristles bounding a space within said body, means providing a path other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

8. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a supporting member within said body above said opening and spaced from a wall of said body, means for mounting said member for movement towards and away from said opening, resilient means for urging said member towards said opening, groups of bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, each group of bristles bounding a space within said body, resilient conduit means for connecting each of said spaces with the atmosphere, said conduit means communicating with said spaces at points therein spaced from said ends and means for connecting the interior of said body to a source of suction.

9. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a supporting member within said body above said opening and spaced from a wall of said body, means for mounting said member for movement towards and away from said opening, resilient means for urging said member towards said opening, parallel rows of bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said rows of bristles bounding a space within said body, means providing a path other than said opening for conducting atmospheric air from outside said body to within said space, said path communicating with said space at a point therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

10. In a suction nozzle for a vacuum cleaner, a hollow body having a top wall opposite a bottom suction opening, said top wall being formed with a plurality of ports open to the atmosphere, a group of bristles depending from said wall around each of said ports, the lower ends of said bristles being disposed substantially in the plane of said opening, and means for connecting the interior of said body to a source of suction.

11. In a suction nozzle for a vacuum cleaner, a hollow body having a top wall opposite a bottom suction opening, said top wall being formed with a plurality of ports open to the atmosphere, a supporting member within said body above said opening and spaced below said top wall, a plurality of passageways extending vertically through said member, a group of bristles depending from said member around the lower end of each of said passageways, the lower ends of said bristles being disposed substantially in the plane of said openings, a plurality of tubular members connecting the upper ends of said passageways with said ports, and means for connecting the interior of said body to a source of suction.

12. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, hollow supporting structure within said body above said opening and spaced from a wall of said body, means connecting the interior of said structure to atmosphere at the exterior of said body, bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said bristles bounding a space within said nozzle, port means through said structure for connecting the interior thereof with said space, said port means communicating with said space at a point therein spaced from said ends and means for connecting the interior of said body to a source of suction.

13. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, hollow supporting structure within said body above said opening and spaced from a wall of said body, means connecting the interior of said structure to atmosphere at the exterior of said body, parallel rows of bristles extending downwardly from said member and having their ends disposed substantially in the plane of said opening, said rows of bristles bounding an elongated space within said body, port means through said structure for connecting the interior thereof with said space, said port means communicating with said space at a point therein spaced from said ends and means for connecting the interior of said body to a source of suction.

14. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, hollow supporting structure within said body above said opening and spaced from a wall of said body, said structure comprising a first downwardly opening channel member fixed to said body and a second upwardly opening channel member telescopically received within said first channel member for vertical movement with respect thereto, resilient means urging said second member downwardly, means connecting the interior of said structure at at least one end to atmosphere at the exterior of said body, bristles extending downwardly from said second channel member and having their ends disposed substantially in the plane of said opening, said bristles bounding a space within said nozzle, port means through said second channel member for connecting the interior of said structure with said space, said port means communicating with said space at a point

therein spaced from said ends and means for connecting the interior of said body to a source of suction.

15. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, hollow supporting structure within said body above said opening and spaced from a wall of said body, said structure comprising a first downwardly opening channel member fixed to said body and a second upwardly opening channel member telescopically received within said first channel member for vertical movement with respect thereto, resilient means urging said second member downwardly, means connecting the interior of said structure at at least one end to atmosphere at the exterior of said body, parallel rows of bristles extending downwardly from said second channel member and having their ends disposed substantially in the plane of said opening, said rows of bristles bounding an elongated space within said nozzle, port means through said second channel member for connecting the interior of said structure with said space, said port means communicating with said space at a point therein spaced from said ends and means for connecting the interior of said body to a source of suction.

16. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a hollow rotor mounted in said nozzle, means for connecting the interior of said rotor to atmosphere at the exterior of said body, bristles extending radially outwardly from said rotor a distance such that their ends terminate substantially in the plane of said opening when the bristles extend downwardly, said bristles bounding a space within said body, port means through said rotor for connecting the interior thereof with said space, said port means communicating with said space at a point therein spaced from said ends means for interrupting communication between said port means and the means for connecting the interior of said rotor to the exterior of said body when said bristles extend in other than a generally downwardly direction, and means for connecting the interior of said body to a source of suction.

17. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a hollow rotor mounted in said nozzle, means for connecting the interior of said rotor to atmosphere at the exterior of said body, bristles extending radially outwardly from said rotor a distance such that their ends terminate substantially in the plane of said opening when the bristles extend downwardly, said bristles bounding a plurality of spaces disposed circumferentially around said roller, separate port means through said rotor for connecting the interior thereof with the respective spaces, said port means communicating with said spaces at points therein spaced from said ends

means for interrupting communication between the means for connecting the interior of said rotor to the exterior of said body and the port means connected to spaces which extend in other than a generally downwardly direction, and means for connecting the interior of said body to a source of suction.

18. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a hollow rotor mounted in said nozzle, partition means dividing the interior of said rotor into a plurality of axially extending chambers, valve means operable by rotation of said rotor to connect the chamber in the lowermost position to the atmosphere, bristles extending radially outwardly from said rotor a distance such that their ends terminate substantially in the plane of said opening when the bristles extend downwardly, said bristles bounding a plurality of spaces disposed circumferentially around said rotor, there being at least as many spaces as there are chambers, separate port means through said rotor for connecting the respective chambers and spaces, said port means communicating with said spaces at points therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

19. In a suction nozzle for a vacuum cleaner, a hollow body having a suction opening, a hollow rotor mounted in said nozzle, partition means dividing the interior of said rotor into a plurality of axially extending chambers, valve means operable by rotation of said rotor to connect the chamber in the lowermost position to the atmosphere, bristles extending radially outwardly from said rotor a distance such that their ends terminate substantially in the plane of said opening when the bristles extend downwardly, said bristles being arranged in groups, each group bounding a space, and the groups being disposed in axially extending lines equal in number to said chambers, separate port means through said rotor for connecting the respective chambers and the spaces in each line, said port means communicating with said spaces at points therein spaced from said ends, and means for connecting the interior of said body to a source of suction.

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