

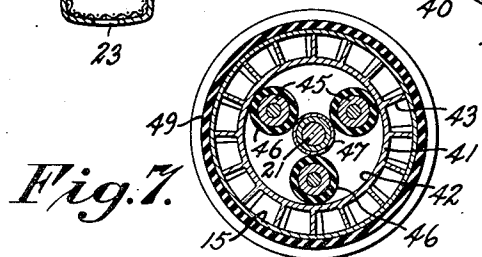
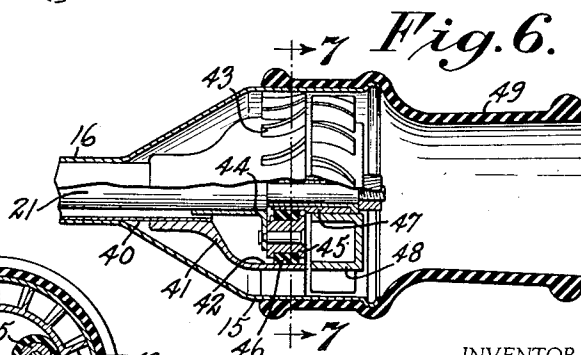
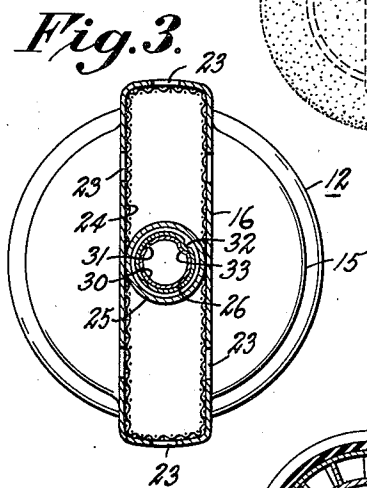
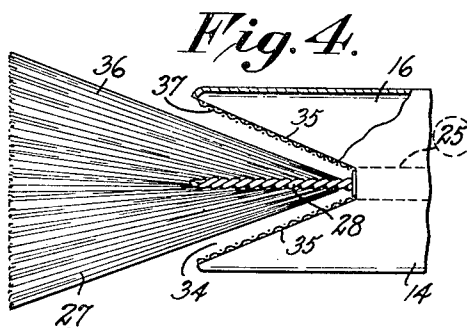
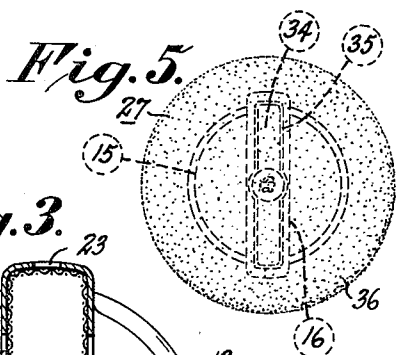
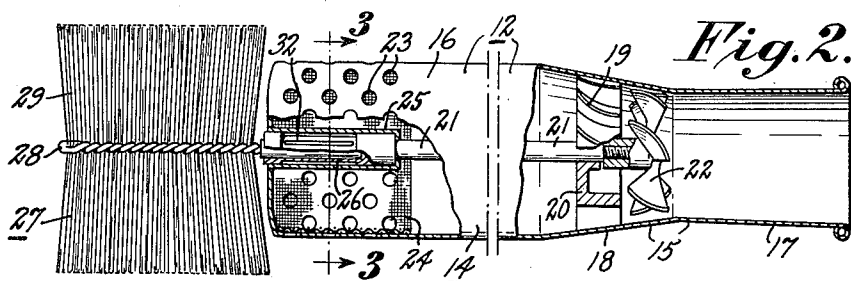
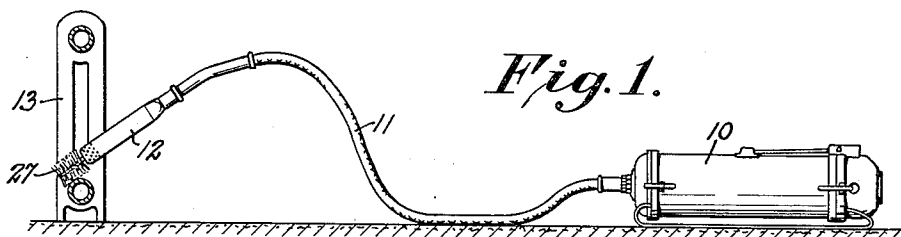
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NOZZLE

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UNITED STATES PATENT OFFICE

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NOZZLE

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9 Claims. (Cl. 15—158)

The present invention relates to vacuum cleaners and more particularly to an improved cleaning tool or nozzle for use in connection with a vacuum cleaner unit.

Still more particularly the invention relates to an improved cleaning tool provided with a rotary brush member driven by the air stream passing through the tool. Such a tool is intended primarily for cleaning within narrow spaces, such as for instance between the sections of steam radiators or the like, but obviously may be used for cleaning other objects.

The objects and advantages of the invention will be apparent from the following description considered in connection with the accompanying drawing which forms a part of this specification and of which:

Fig. 1 is a view of a vacuum cleaner unit to which a nozzle in accordance with the present invention is connected by means of a hose;

Fig. 2 is a view, chiefly in cross-section, of one embodiment of the invention;

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

Fig. 4 is a view, partly in cross-section, of another embodiment of the invention;

Fig. 5 is an end view of the device shown in Fig. 4;

Fig. 6 is a cross-sectional view of a still further embodiment of the invention; and

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 6.

Referring to the drawing, reference character 10 designates generally a vacuum cleaner unit of well known type, which is provided with a casing having therein a dust separating member and a motor-fan unit for producing flow of air therethrough. The air is drawn into the cleaner through a flexible hose 11, to the other end of which various types of cleaning nozzles may be attached. Reference character 12 designates generally a cleaning nozzle in accordance with the present invention, which is attached to hose 11. Reference character 13 designates a room heating radiator which, as is well known, comprises a plurality of spaced sections. The nozzle 12 is adapted to be inserted between the sections to remove dirt which has there collected.

Referring more particularly to Figs. 2 and 3, reference character 14 designates a hollow body member formed with a generally cylindrical portion 15 and a flattened portion 16. Portion 15 comprises a slightly tapered part 17, which is adapted to frictionally receive the connecting member on the end of hose 11, and a conical

portion 18 in which are rigidly secured turbine guide vanes 19, which are integral with a hub member 20. Obviously, part 18 need not be conical, but could be cylindrical, for instance. Member 20 forms a bearing for a rotatably mounted shaft 21, to one end of which a rotor 22 is secured adjacent to guide vanes 19. As is shown, the guide vanes are a part of a casting, while the rotor is a stamping.

Flattened portion 16 is formed with a plurality of suction inlet openings 23. A wire screen or the like 24 may be placed within flattened portion 16, so as to prevent the entrance of particles substantially larger than dust particles, which might interfere with the turbine. Screen 24 also prevents the drawing in of threads and the like, which might become entangled in the turbine rotor.

Flattened portion 16 is formed with cylindrical bearing support 25 for rotatably supporting a sleeve 26 secured to, or integral with, shaft 21. A brush 27, comprising a central member 28 made of twisted wire and bristles 29 extending at right angles thereto, is removably secured within sleeve 26 of shaft 21. For this purpose, twisted wire 28 is secured to a split sleeve 30, split at 31, which is made of resilient material. Sleeve 30 is adapted to frictionally engage within sleeve 26. To assure the prevention of rotation between these two parts, sleeves 26 and 30 are formed with engageable beads 32 and 33, respectively.

The operation of the above described device is as follows:

When the nozzle 12 is connected to a vacuum cleaner unit, as is shown in Fig. 1, and the motor-fan unit of the cleaner is operated, air is drawn in through the inlet openings 23 in the nozzle and passes through the turbine guide vanes 19, where it is directed so as to act most efficiently upon the turbine rotor 22, thereby imparting rotation to the latter. This air then passes through the hose 11 to the cleaner unit, from which it is discharged through an outlet opening. Rotation of the rotor 22 causes similar rotation of shaft 21 and the brush 27 secured to the end thereof. If the brush is placed in contact with a dusty surface, such as the surfaces of the sections of radiator 13, the rotation of the brush dislodges dirt which is drawn into the nozzle through the openings 23, from whence it is carried to the cleaner unit 10 and separated from the air stream by the dust separating member. Due to the narrowness of the space between sections of a radiator, it is impossible to manipulate a nozzle therein so as to pass the

suction opening or openings thereof directly over the surface to be cleaned. However, brush 27 stirs up the dust and it is immediately drawn into openings 23.

5 By arranging the bristles at right angles to the axis of rotation of the brush, their greatest striking effect is obtained. That is to say, the bristles are at right angles to the surfaces being cleaned and hence more force is required to deflect them than if they are at an inclined angle to the surface. Moreover, the length of the bristles necessary to form a brush of a given diameter is less if the bristles extend straight out at right angles to the axis of the brush than if they extend at an inclined angle thereto, and, inasmuch as shorter bristles offer more resistance to bending, a brush so constructed is stiffer than one with inclined bristles, and when rotated, the bristles strike the surface with greater force.

20 If it is desired to use the nozzle without the rotating brush, the latter may be readily removed by simply pulling it to the left, as viewed in Fig. 2, whereupon split sleeve 30 may be pulled out of sleeve 26 and the brush disconnected from shaft 21. Thereafter, the shaft will of course be rotated by the rotor 22, but this will have no effect upon the cleaning action of the tool.

In the embodiment shown in Figs. 4 and 5, flattened portion 16 is formed with a single opening 30 34 bounded by diverging lips 35. Brush 27 comprises a central wire member 28 and bristles 36 which are secured to wire 28 at an angle thereto, so as to be substantially parallel to diverging lips 35. The lips extend close enough to the brush so that air passing therebetween attains a comparatively high velocity. As is clearly shown in Fig. 4, brush 27 is located partly within opening 34. This opening may be protected by means of a wire screen or the like 37, which may be removable, although the rotation of the outer end of brush 27 tends to impart sufficient centrifugal force to heavy objects so as to throw them away from opening 34 and thus prevent their admission into the nozzle.

45 The turbine arrangement of the embodiment shown in Figs. 4 and 5 may be similar to that shown in Fig. 2, and hence has not been illustrated. The brush end of the shaft is supported in sleeve 26 rotatably mounted in bearing support 25 and the brush may be removable in the same manner as illustrated in Fig. 2.

The operation of this embodiment is similar to that previously described, except that the full benefit of having the bristles extending at right angles to the axis of rotation is not obtained.

In the embodiment shown in Figs. 6 and 7, a planetary reduction gearing is employed between the rotor and the shaft 21, in order to obtain more power for rotating the brush. In this embodiment a sleeve 40 is secured within the flattened portion 16 and serves to support a member 41 having a circular internal race 42. Stationary turbine guide vanes 43 are integral with member 41 and serve to aid in supporting member 41 within cylindrical portion 15. A spider 44 is secured to shaft 21 within race 42 and has rotatably mounted thereon a plurality of rollers 45. These rollers are preferably faced with a friction material 46, such as rubber. These rollers engage 70 and roll around within race 42. Rollers 45 also engage a sleeve 47, rotatably mounted on shaft 21. A turbine rotor 48 is rigidly secured to sleeve 47. A flexible coupling member 49, of rubber or the like, is employed to connect the nozzle to the 75 end of hose 11 and replaces conical part 17 of

the embodiment shown in Fig. 2. The left hand end, as viewed in Fig. 6, of the nozzle may be constructed in accordance with the embodiment shown in either Fig. 2 or Fig. 4.

The operation of the embodiment shown in Figs. 6 and 7 is as follows:

Air drawn into the nozzles is directed by stationary guide vanes 43, so as to strike the guide vanes of rotor 48 and impart rotation thereto. Sleeve 47 is rigidly secured to rotor 48, and hence 10 rotates therewith. The rotation of sleeve 47, which engages rollers 45, causes the latter to rotate about their axes, and also to roll around within race 42. This latter motion causes spider 44 to be driven in rotation and hence to rotate 15 shaft 21. Due to the difference in diameter between sleeve 47 and race 42, a substantial reduction in speed occurs between the turbine rotor and the shaft. The arrangement constitutes a planetary reduction gearing between the rotor 20 and the shaft, and also constitutes a roller bearing for supporting the turbine end of shaft 21.

While there have been shown three more or less specific embodiments of the invention, it is to be understood that this has been done for purposes of illustration only, and that the scope of the invention is to be limited only by the appended claims when viewed in the light of the prior art.

What is claimed is:

1. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened portion being formed with a suction inlet opening whereby cleaning may be accomplished in 25 narrow spaces, a shaft rotatably mounted within said member, a turbine within the cylindrical portion of said member for rotating said shaft, and a brush connected to said shaft adjacent to said inlet opening and having flexible bristles 40 extending laterally beyond said flattened portion.

2. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened portion being formed with a suction inlet opening whereby cleaning may be accomplished in narrow spaces, a shaft rotatably mounted within said member, a turbine within the cylindrical portion of said member for rotating said 50 shaft, and a brush connected to said shaft, said brush being located wholly outside said member and adjacent to said inlet opening and having flexible bristles extending laterally beyond said flattened portion.

3. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened portion being formed with a suction inlet opening whereby cleaning may be accomplished in narrow 60 spaces, a shaft rotatably mounted within said member, a turbine within the cylindrical portion of said member for rotating said shaft, and a brush connected to said shaft, said brush being located wholly outside said member and adjacent to said inlet opening and including flexible bristles mounted at right angles to the axis of revolution of said shaft, said bristles extending laterally beyond said flattened portion.

4. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened portion being formed with a suction inlet opening bounded by diverging lips whereby cleaning may be accomplished in narrow spaces, a shaft rota- 75

ably mounted in said member, a turbine within the cylindrical portion of said member for rotating said shaft, and a brush connected to said shaft within said opening and having flexible
5 bristles extending laterally beyond said flattened portion.

5. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened
10 portion being formed with a suction inlet opening bounded by diverging lips whereby cleaning may be accomplished in narrow spaces, a shaft rotatably mounted in said member, a turbine within the cylindrical portion of said member for rotating
15 said shaft, and a brush connected to said shaft within said opening, said brush comprising flexible bristles arranged in the form of a cone the side of which is substantially parallel to said diverging lips, said bristles extending laterally beyond
20 said flattened portion.

6. A suction nozzle for a vacuum cleaner including a hollow body member having a cylindrical portion and a flattened portion, said flattened
25 portion being formed with a suction inlet opening whereby cleaning may be accomplished in narrow spaces, a shaft rotatably mounted within said member, a turbine within the cylindrical portion of said member for rotating said shaft, a brush connected to said shaft adjacent to said
30 inlet opening and having flexible bristles extending laterally beyond said flattened portion, and screening over said inlet opening, said brush being outside of said screening and said turbine being inside thereof.

35 7. A suction nozzle for a vacuum cleaner including a hollow body member formed with a suction inlet opening adjacent to one end thereof, a cylindrical race mounted within said member, a rotatable shaft, a spider secured to said shaft
40 within said race, planetary members rotatably

mounted on said spider and engaging said race, a sleeve rotatably mounted on said shaft and having torque transmitting engagement with said planetary members, a turbine rotor secured to said sleeve, stationary turbine guide vanes mounted
5 in said hollow member adjacent to said rotor, and a brush connected to said shaft adjacent to said inlet opening.

8. A suction nozzle for a vacuum cleaner including a hollow body member formed with a
10 suction inlet opening adjacent to one end thereof, a cylindrical race mounted within said member, a rotatable shaft, a spider secured to said shaft within said race, planetary members rotatably mounted on said spider and engaging said race, a
15 sleeve rotatably mounted on said shaft and having torque transmitting engagement with said planetary members, a turbine rotor secured to said sleeve, stationary turbine guide vanes secured to said race adjacent to said rotor, and a brush connected to said shaft adjacent to said inlet opening.
20

9. A suction nozzle for a vacuum cleaner including a hollow body having a cylindrical portion and a flattened portion, said cylindrical portion
25 being adapted to be connected to a source of suction, said flattened portion being formed with a suction inlet opening whereby cleaning may be accomplished in narrow spaces, a shaft rotatably mounted in said member and extending within
30 both said cylindrical and hollow portions, a turbine within said cylindrical portion for rotating said shaft, and a brush connected to said shaft adjacent to said inlet opening, said brush including a central rigid portion having a diameter not
35 greater than the thickness of said flattened portion and flexible bristles carried by said central portion and having a lateral extent greater than the thickness of said flattened portion.

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