Jan. 14, 1964 C. E. STEVENS 3,117,338

SUCTION NOZZLE

Original Filed June 11, 1956 2 Sheets-Sheet 1

FIG. 1.

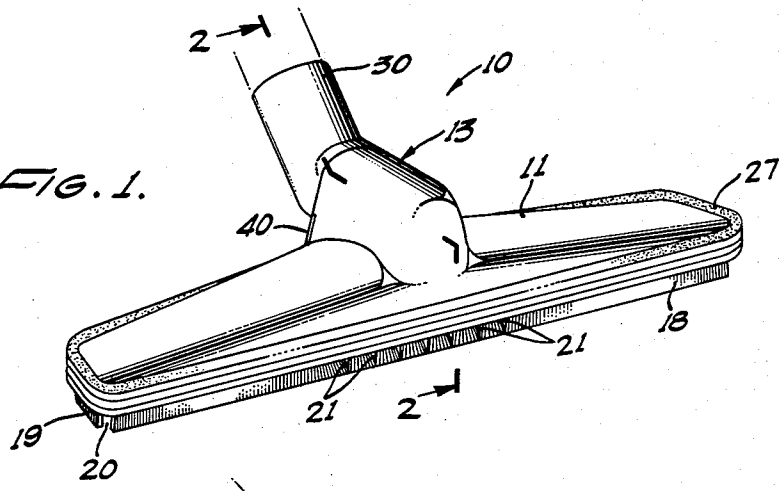


FIG. 2.

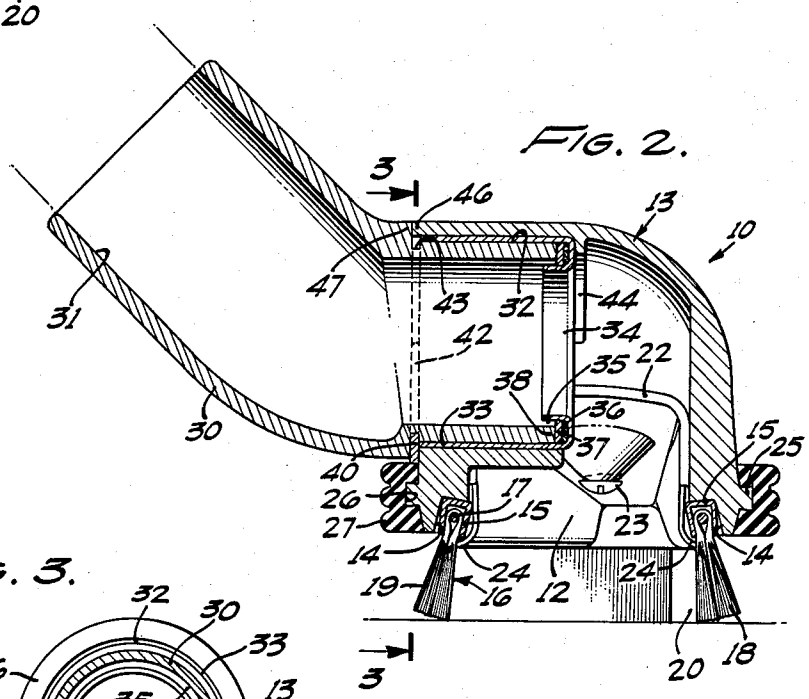
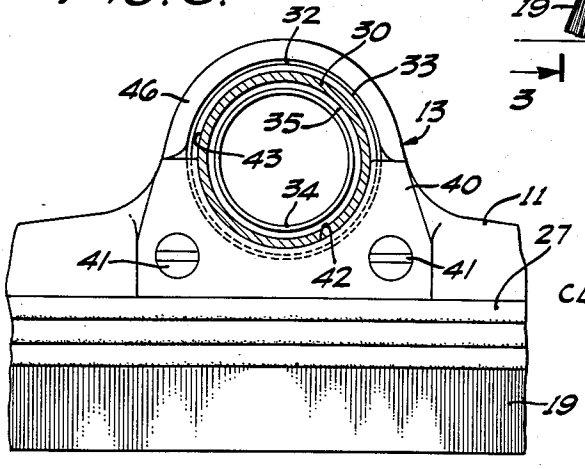


FIG. 3.



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FIG. 4.

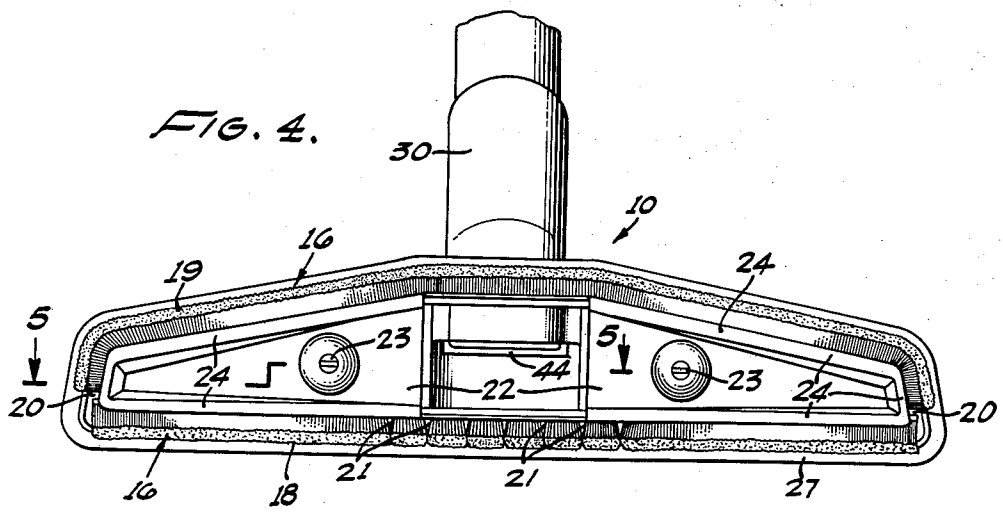
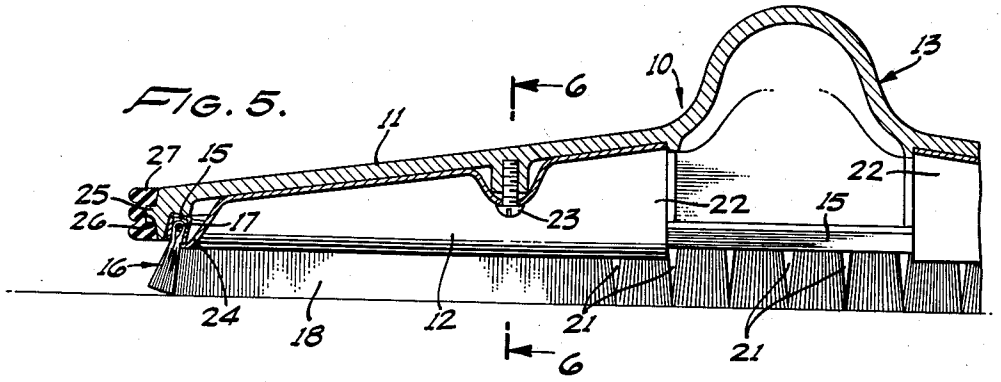


FIG. 5.



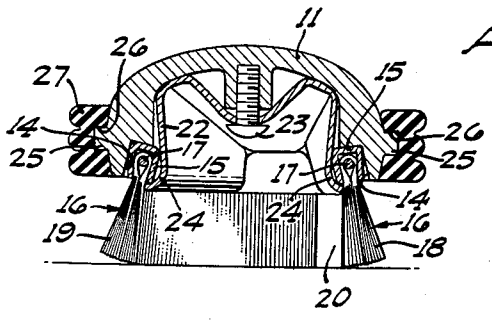


FIG. 6.

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3,117,338

SUCTION NOZZLE

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Original application June 11, 1956, Ser. No. 590,492, now Patent No. 3,069,186, dated Dec. 18, 1962. Divided and this application Mar. 12, 1962, Ser. No. 178,817

3 Claims. (Cl. 15—400)

This invention relates to suction nozzles for suction cleaners, and more particularly to a new nozzle construction provided with an improved arrangement of dirt dislodging bristles about the periphery of its inlet, and various other features to be described in detail below.

This application is a division of my application for United States Letters Patent Serial No. 590,492, filed June 11, 1956, for Suction Nozzle, now Patent No. 3,069,186.

The function of a suction cleaning nozzle is to effect a rapid flow of air over a dirt-laden surface in a manner to remove the dirt and transport it to a filtering and dirt collecting chamber. Only free dirt or dirt which can be easily dislodged from the surface will be carried away in the suction air stream. If the surface being cleaned is a carpet the dirt tends to adhere to the pile with a tenacity frequently greater than the dislodging effect of the air stream.

In the nozzle design provided by this invention the commonly used metal nozzle lip supported in closely spaced relation to the carpet or resting thereon is replaced by a resilient and flexible lip structure comprising brush bristles arranged to bear directly on the carpet pile and to open the pile progressively as the air flow takes place thereover. The bristles are arranged in a substantially continuous manner about the periphery of the nozzle inlet in a manner to support the nozzle body and to direct the air flow at high velocity beneath the ends of the bristles and across the surface being cleaned. So positioned the brush bristles serve to dislodge dirt into the suction air stream on bare and carpeted surfaces.

Another feature of the invention is the mounting of the bristles on the nozzle mouth in a manner such that they offer minimum resistance to the movement of the nozzle over carpeted surfaces and at the same time direct the flow of air through the body of the carpet pile and across the pile in jets located to clean areas difficult to reach with nozzles as heretofore designed.

Another object of the invention is the provision of a suction nozzle having improved means for directing a major portion of the inflowing air downwardly into the carpet pile while passing a minor portion in restricted jets across the surface in a manner to facilitate the cleaning of corners and the junctions of baseboards with the floor.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which a preferred embodiment of the invention is illustrated:

FIGURE 1 is a perspective view of the suction nozzle incorporating the present invention;

FIGURE 2 is a transverse sectional view through the nozzle and the swivelling elbow taken along line 2—2 on FIGURE 1;

FIGURE 3 is a sectional view through the swivelling coupling upon the line 3—3 on FIGURE 2;

FIGURE 4 is a bottom plan view of the nozzle looking into the suction inlet;

FIGURE 5 is a partial longitudinal section on the broken line 5—5 on FIGURE 4; and

FIGURE 6 is a cross-sectional view through the nozzle body taken at the line 6—6 on FIGURE 5.

Referring again to the drawings, 10 indicates generally a suction nozzle having a hollow main body 11 formed in any suitable manner as by die casting. Body 11 is formed as an elongated downwardly facing air inlet opening 12 and a central tubular air outlet housing 13 opening rearwardly and in a direction at right angles to major dimensions of the suction air inlet 12. As best shown in FIGURES 2, 5 and 6, the inlet rim of the suction nozzle is provided with a continuous seat 14 having side and top walls which lie at right angles to one another, the side wall flaring outwardly relative to a median plane normal to the nozzle inlet. Seat 14 seats a pair of brushes or bristle strips 18 and 19, each having a U-shaped metal strip 15 holding bristles 16 clamped about a rigid core member 17. As will be observed in FIGURE 4, straight bristle strip 18 extends the full length of the forward straight edge of the nozzle inlet, whereas strip 19 is bent into a generally U-shaped configuration dimensioned to nest snugly against the similarly shaped portions of seat 14 extending along the curvate rear edge and ends of the nozzle inlet. By reference to FIGURES 2, 4 and 6, it will be noted that the adjacent ends of brushes or bristle strips 18 and 19 are slightly spaced to provide narrow openings 20 at the opposite forward corners of the nozzle, the size of these openings being reduced somewhat under operating conditions by the tendency of the bristles to flare toward one another across the opening. However, this flaring is insufficient to close the opening and with the nozzle connected to a source of suction a high velocity jet of air flows inwardly through each opening 20.

As shown in FIGURES 1, 4 and 5 the central portion of brush 18 is provided with a plurality of spaced openings 21 formed by cutting away or omitting bristles at the points indicated. These openings are positioned centrally of the front of the nozzle and through them high velocity air jets flow like the jets flowing through openings 20 at the forward corners of the nozzle.

It will be understood that bristle strips 18 and 19 may initially form part of the same continuous strip, each strip being cut to appropriate length and then separately processed for mounting against shoulder 14. This processing includes cutting or punching bristles from strip 18 to form openings 21, and placing strip 19 in a forming die to shape its back to conform to the seat 14 along the rear edges and the end of the nozzle body. These strips are secured in the nozzle by placing them in the seat 14 and tightening the two clamping plates 22, 22 in place against the interior walls of the nozzle by means of screws 23. Clamping plates 22 are stamped from sheet metal and shaped to fit against the inner surface of the nozzle body with their outturned peripheral edges 24 resiliently engaging the adjacent edges of the U-shaped backing 15 of the bristle strips. In this manner, the adjacent ends of both strips are locked in assembled position by a common clamping plate.

Surrounding the lower perimeter of nozzle body 11 is a continuous integral flange 25 having outwardly flaring opposite side walls adapted to interlock with a similarly shaped groove 26 formed in a continuous encircling strip of resilient material 27. Strip 27 may be extruded or molded from rubber, plastic or like resilient material and provides a furniture guard to protect furniture from direct contact with the metal nozzle body.

Referring now to FIGURES 1 to 3, it will be seen that the swivelling coupling by which the nozzle is adapted to be connected to the suction hose or wand of a suction cleaner comprises a hollow elbow member 30 having the shape illustrated in FIGURE 2. The upwardly extending discharge end 31 is adapted to receive telescopically the

end of a wand or other coupling member for a suction hose, while the cylindrical exterior surface 32 at its lower end has a close rotating fit with the interior cylindrical wall of a bearing insert 33 preferably formed from stamped sheet metal. The exterior surface of insert 33 has a press fit with the inner wall of annular outlet housing 13 and includes a return bend portion 34 at its inner end shaped to form an annular channel 35 to seat a resilient sealing gasket 36 formed of felt, cork, rubber or the like. Overlying gasket 36 with at least one peripheral edge frictionally engaging a side wall of channel 35 is a flat metal ring 37 retaining the gasket in assembled position and providing a wear plate for it. In the latter connection it will be understood that the inner end 38 of the elbow 30 bears against the wear plate 37 in a manner to compress gasket 36 slightly assuring the maintenance of an air-tight seal between elbow 30 and the nozzle body.

Holding elbow 30 assembled to the nozzle and within the bearing insert 33 is a keeper plate 40 secured to the nozzle body 11 by screws 41 as shown in FIGURE 3. The arcuate edge 42 of keeper 40 seats within an annular groove 43 in elbow 30 formed at the junction of its bearing surface 32 with its larger diameter main body portion 31. During assembly bearing insert 33 is pressed into housing 13 until it abuts the integral stop 44 projecting from the inner wall of the nozzle body, its outer end then lying flush with the seating surface for the keeper 40. Since the position of the annular groove in elbow 30 is accurately positioned with respect to its inner end 38 and with respect to the axial length of the bearing insert the inner end of the elbow will bear against wear plate 37 and compress gasket 36 sufficiently to prevent air leakage between the elbow and the nozzle body. It will also be understood that the housing 13 of the nozzle is formed with a semi-circular overhanging portion 46 overlying keeper plate 40 and having an end surface flush with the outer surface of this keeper plate to provide a continuous end bearing surface between the nozzle body and the adjacent radial surface 47 of elbow 30.

The method of assembling the swivelling elbow coupling will be apparent from the foregoing. Following assembly of gasket 36 and wear ring 37 within groove 35 of bearing insert 33, the latter is pressed into the air discharge housing 13 until its inner end abuts stop 44 and its outer end lies flush with the bottom of the mounting recess for keeper plate 40. The arcuate edge 42 of keeper 40 is inserted in groove 43 of the elbow and the latter is telescoped into the bearing insert after which screws 41 are assembled to lock the keeper in place. As the screws are tightened its edge 42 bears against the inner side of groove 43 to hold end 38 of the elbow pressed against wear plate 37. The pressure so applied to the wear plate, although providing assurance against air leakage around the end of the elbow does not interfere objectionably with the free swivelling of the elbow with respect to the nozzle body. Additionally, the lower edge of the clip may, if desired, compress the adjacent edge of the bumper 14 to aid in retaining it in place. When assembled as described, the suction nozzle is in readiness for connection to a suction cleaner in the usual manner.

In operation, the nozzle is placed on the surface to be cleaned, the weight of the nozzle being borne by the bristles of strips 18 and 19, and primarily by those on the interior sides of the strips owing to the angle of flare and the trim of their free ends. Due to the outward inclination of bristle mounting seat 14, the bristle tufts incline outwardly and the inner bristles contact the surface being cleaned. The forward and backward movement of the nozzle across the floor will, of course, deflect the bristles in a manner tending to bring a greater part of the bristle ends into contact with the surface at one side of the nozzle. This will not be true of the ends of the bristles along the other side of the nozzle with

the result that these bristles will flex outwardly and offer a minimum resistance to the flow of air directly across the floor surface and beneath the ends of those bristles into the nozzle inlet. The high velocity air flow into the nozzle takes place not only across the surface of the carpet but also downwardly and through the carpet pile as the pile is progressively opened by the passage of the bristle ends thereover. This air entrains dirt from the pile and carries it upwardly into the nozzle and to the cleaner. Reversal of the direction of nozzle movement across the floor reverses the direction of flexing of the bristles and causes the greater inflow of air to take place beneath the bristles on the opposite side of the nozzle. Owing to the large number of bristles and their compact arrangement the air flow through the bristles is restricted and the major part of the air flows beneath their ends and through the inlet openings, 20, 21.

The provision of openings 20, 20 between the ends of the bristle strips at the forward corners of the nozzle provides high velocity air jets useful in cleaning dirt from corners. The action of these inlets is increased by positioning one end of the nozzle in the corner to be cleaned and pressing downwardly on the bristles to minimize the inflow of air therebeneath. In consequence, an increased flow of air takes place through openings 20 thereby entraining dirt lodged in the corner being cleaned. Openings 21 along the central portion of forward strip 18 may be employed similarly to entrain dirt from adjacent baseboards and furniture.

Should either bristle strip become damaged or worn excessively it may be quickly replaced by loosening retainer screws 23, removing clamping plates 22 and replacing the damaged strip or strips with a new one. Thereafter the clamping plates 22 and screws 23 are replaced.

Another feature of the present nozzle design is the action of inturned lip 34 of the bearing insert 33 in providing a streamlined flow of dirt laden air past the junction of the nozzle body with swivelling elbow 30. Additionally, it will be apparent that lip 34 serves as a dirt guard preventing dirt from collecting in gasket 36 and interfering with its air sealing action.

While the particular suction nozzle herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A suction-operated floor sweeping brush having an elongated main body nozzle adapted to open upwardly and rearwardly of its midportion into a suction wand, the lower side of said main body opening downwardly throughout the length thereof and having recess means extending along its curvate rear rim edge and along its short ends and along its straight forward rim edge for seating bristle strips therein, a generally C-shaped strip of short length bristles supported in the portion of said recess means extending along said curvate rear edge and along both narrow ends of said nozzle rim, a straight strip of short length bristles extending along the full length of said straight front rim edge, plate means detachably secured to the interior of said nozzle having its rim edges clamped against said bristle strips for rigidly clamping the same in place in said recess means with the bristles thereof flaring outwardly and downwardly at an acute angle to the vertical when said nozzle is supported in floor-sweeping position, the lower free ends of said bristles being trimmed to lie in planes inclined outwardly and upwardly at an acute angle to the plane of the floor when said sweeping brush is supported in a proper floor sweeping position whereby the weight of said sweeping brush is supported by the row of innermost bristles ex-

tending along the interior edge of said straight and C-shaped strips and whereby the major portion of said bristle ends do not interfere with the flow of air past the lower ends thereof and into said nozzle, the adjacent ends of said straight and C-shaped bristle strips being slightly spaced from one another at the forward end corners of said nozzle to admit relatively high velocity jets of air effective in removing dust and foreign matter from corners, and said straight strip of bristles along the front rim edge of said nozzle having a plurality of vertically disposed slit-like openings therethrough confined to the midportion of said straight bristle strip and functioning to admit a flow of dust-laden air into said nozzle from the zone in front of said nozzle as the latter is propelled to and fro across a floor undergoing sweeping.

2. A suction-operated floor sweeping brush having an elongated narrow main body nozzle provided at its midportion with a swivelling coupling for a suction wand projecting upwardly at an angle from the rear side wall of the nozzle, the lower side of said nozzle opening downwardly and having a rim edge lying in a single plane and including a long curvate rear wall and short end walls merging with a straight wall along the front of said nozzle, said rim edge being formed with recess means for seating a single row of bristle mounting strips about the perimeter of said nozzle opening, a single set of bristle strips mounted in said recess means including a C-shaped bristle strip extending along said curvate rear wall and across said short end walls with its ends terminating at the forward corners of said straight front wall and a straight bristle strip extending along said front wall with its ends cooperating with the ends of said C-shaped bristle strip to provide a narrow air inlet restricted to each forward corner of said nozzle, the bristles along the inner sides of said strips being substantially vertically disposed and effective to support the weight of said nozzle during floor sweeping, the ends of the bristles exteriorly of said inner row being cut off at an acute angle to the floor so as normally to be out of contact with the floor and permitting air to flow therebeneath without interference and into said nozzle along with entrained dirt and foreign matter, and plate-like clamping means attached to the interior of said nozzle engageable with said single set of bristle strips to hold the same detachably clamped to said nozzle.

3. A floor sweeping brush as defined in claim 2 characterized in that said straight bristle strip is provided with a plurality of unobstructed narrow air inlets along the midsection thereof and spaced above the lower ends of said bristles, said narrow air inlets opening into the interior of said nozzle in proximity to said swivelling coupling and the lower end of said suction wand and being highly effective in admitting dust-laden air into the nozzle from in front of the nozzle.

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