

March 3, 1942.

W. S. GAINES

2,275,357

VACUUM CLEANER NOZZLE

Filed Feb. 17, 1939

3 Sheets-Sheet 1

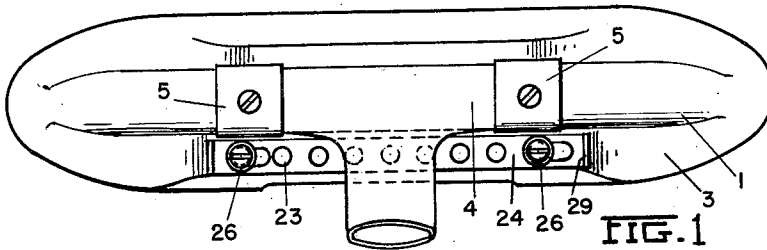


FIG. 1

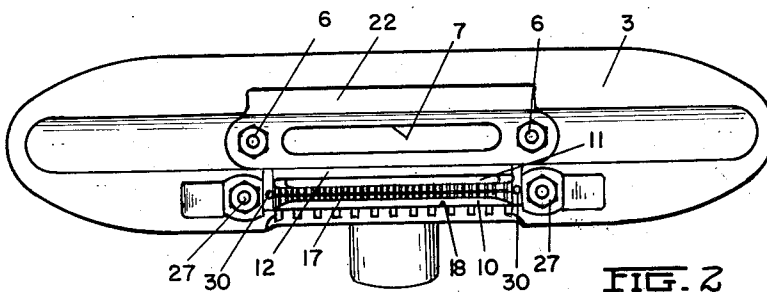


FIG. 2

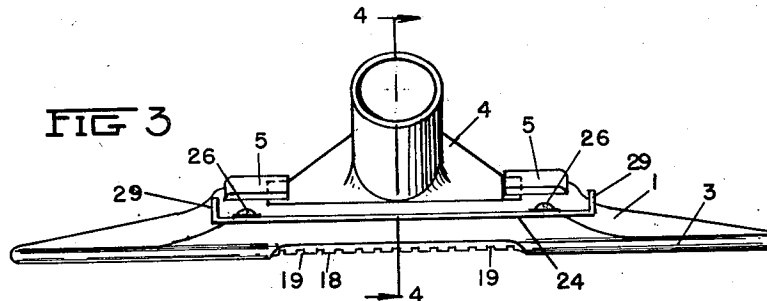


FIG. 3

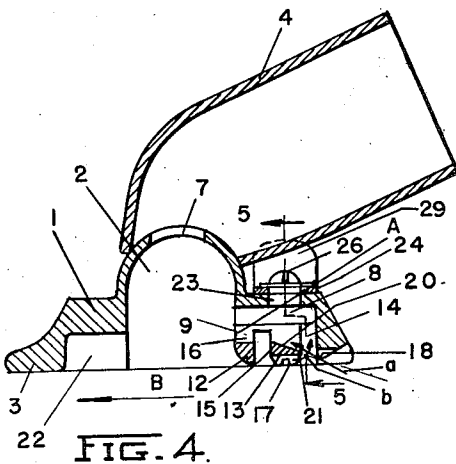


FIG. 4

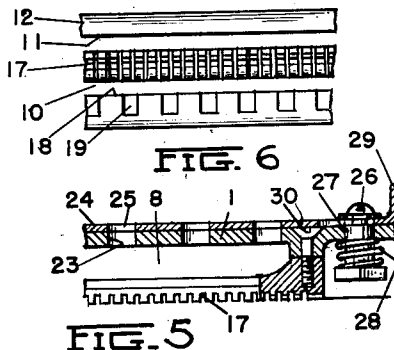


FIG. 6

FIG. 5

INVENTOR.

WALTER S. GAINES

BY *Oberlin Limbach & Day*
ATTORNEYS

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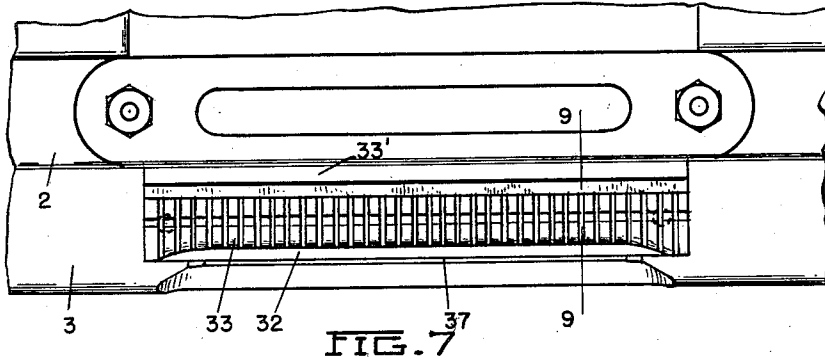


FIG. 7

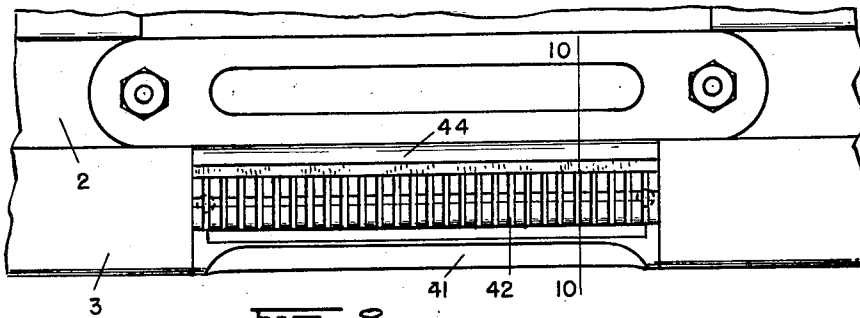


FIG. 8

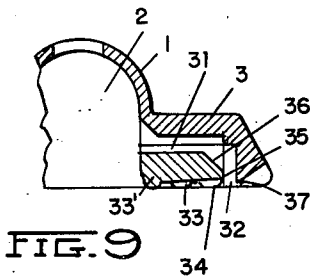


FIG. 9

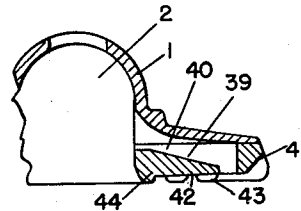


FIG. 10

INVENTOR.
WALTER S. GAINES

BY *Oberlin, Limbach & Day*
ATTORNEYS

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W. S. GAINES

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3 Sheets-Sheet 3

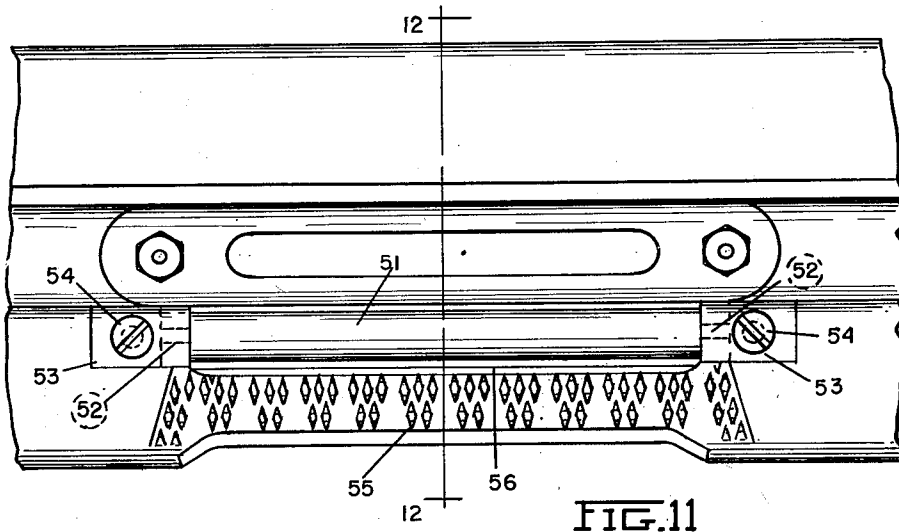


FIG. 11

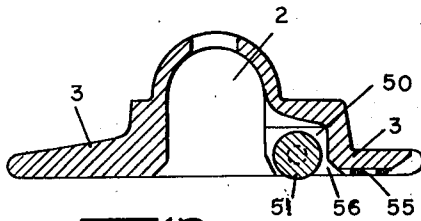


FIG. 12

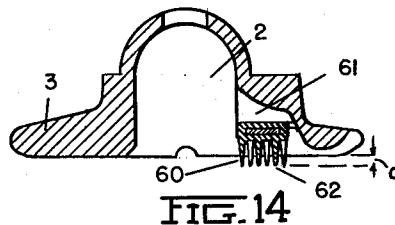


FIG. 14

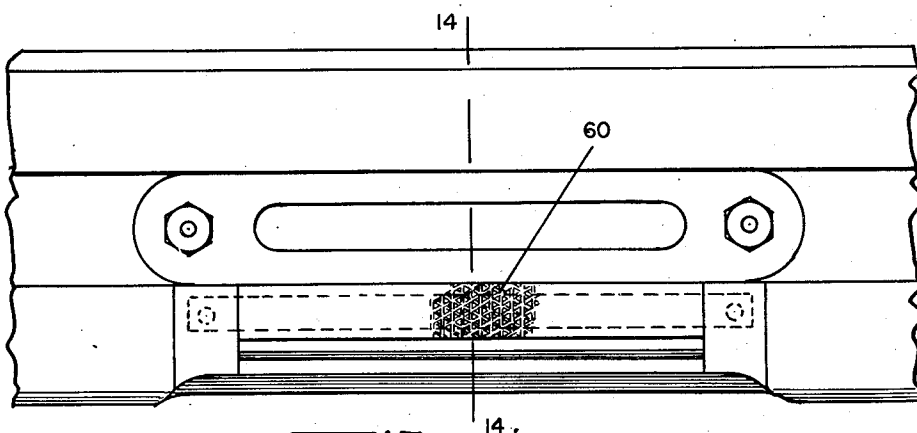


FIG. 13

INVENTOR.
WALTER S. GAINES
BY *Oberlin, Limbach + Day*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,275,357

VACUUM CLEANER NOZZLE

Walter S. Gaines, Chagrin Falls, Ohio

Application February 17, 1939, Serial No. 256,951

1 Claim. (Cl. 15—157)

The present invention relates to improvements in vacuum cleaner nozzles and has for its general object and purpose the production of a more efficient and satisfactory removal of dirt particles in the form of fibers, hairs, threads, lint, etc. from the rugs, carpets, floor coverings, fabrics, or other surfaces to be cleaned. The efficient removal and entrainment of such particles has heretofore been a substantial problem in the vacuum cleaner art due, first, to the tendency of fibers, threads, hair, lint and the like to cling to the surface which is to be cleaned; secondly, due to the tendency of such particles to become matted and entangled in the vacuum cleaner passages; and thirdly, due to the inability of vacuum cleaner nozzles to properly lift and entrain such fibrous dirt particles once they have been loosened from the surface and introduced into the intake or upstream end of the vacuum cleaner nozzle.

To overcome such difficulties and to accomplish the general object indicated, my invention provides differential velocity intake passages in the vacuum cleaner nozzle whose upstream or intake ends are separate from each other and which merge at a downstream point or at a point removed from the surface to be cleaned. My invention also provides a novel form of construction for the high velocity intake passage whereby the dirt removal action of the latter is greatly improved. Another object of my invention is to provide a surface combing element of such characteristics and so located adjacent the inlet end of the high velocity intake passage as to enhance the dirt removal and entrainment action of the latter.

Another object of the invention is to provide adjustable means for varying the pressure or velocity in the high velocity intake passage. Additional objects and advantages of the invention shall become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various structural forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a top plan view of a vacuum cleaner nozzle embodying the principle of my invention; Fig. 2 is a bottom plan view of the same; Fig. 3

is a side elevational view taken from the rear side; Fig. 4 is a vertical sectional view taken substantially along line 4—4 of Fig. 3; Fig. 5 is an enlarged, detailed sectional view taken substantially along line 5—5 of Fig. 4; Fig. 6 is an enlarged detail of the bottom of the high velocity intake passage opening; Fig. 7 is an enlarged, fragmentary bottom view showing a modified form of construction of the high velocity intake passage and combing element; Fig. 8 is a similar view of another form of construction of the same; Fig. 9 is a vertical, detailed sectional view taken substantially along line 9—9 of Fig. 7; Fig. 10 is a detailed sectional view taken substantially along line 10—10 of Fig. 8; Fig. 11 is an enlarged fragmentary bottom plan view of another form of construction; Fig. 12 is a vertical sectional view taken substantially along line 12—12 of Fig. 11; Fig. 13 is an enlarged fragmentary bottom plan view of the construction in which a rubber bristled brush is employed as a combing element; and Fig. 14 is a vertical sectional view taken substantially along line 14—14 of Fig. 13.

Now referring more particularly to the drawings, and especially Figs. 1 to 6 inclusive thereof, there is shown therein a nozzle body 1 having a main or low velocity intake chamber or passage 2 therein. The bottom face of the body 1 is surrounded by a floor or surface contacting flange 3. An adapter 4 is pivotally mounted on the top of the body 1 by means of the clamps 5 and spring loaded nuts and bolts 6. The opening 7 communicates with the interior of the adapter 4 which in turn is connected to a tube, hose, or tubular handle connecting the nozzle to the vacuum cleaner or suction mechanism (not shown).

A high velocity passage 8 communicates with the low velocity passage 2 at a downstream point 9. The other end of the high velocity passage 8 opens into the bottom surface of the flange 3 at the points 10 and 11. A vertical partition or wall 12 separates the intake openings of the passage 8 from the intake opening of the low velocity passage 2.

Referring to Fig. 4, it will be seen that the intake ends 10 and 11 of the high velocity passage 8 are joined by a horizontal wall portion 13 which is parallel to the floor or surface to be cleaned and spaced slightly therefrom. The wall portion 13 is thus perpendicularly located to the contiguous and adjacent wall portions 14, 15 and 16 of the passage 8. In this manner the air stream immediately entering the high velocity passage 8 from the floor or surface to be cleaned must make an abrupt right angle turn. I have found that

this expedient is particularly advantageous and efficient in the picking up and loosening of the hair, fibers, threads, etc. A combing element 17 consisting of a plurality of rounded edge projections, is mounted on the wall 13 and the tips of such projections extend to the plane of the bottom face of the flange 3.

A depending lip 18 is located on the outer edge of the flange 3 and coextensive with the intake openings 10 and 11. The lip 18 may be in a castellated form, being interrupted by a series of transverse slots 19. As will best be seen from Fig. 4, the lower extremity of the lip 18 terminates just short of the plane of the bottom face of the flange 3; and the bottom wall 20 of the high velocity passage 8, which is disposed at an acute angle to the horizontal as indicated by the line A, terminates at its lower end 21 at a point substantially in horizontal alignment with the oppositely disposed lip 18. This latter construction has also been found to be of particular advantage and efficiency in the picking up and cleaning properties of the nozzle. Although I am not at present prepared to ascribe any particular principle of operation leading to such increased efficiency, it is possible that the above described construction produces cross currents, particularly at the opening 10 and such as indicated by the arrows *a* and *b* which effect a unique agitating and turbulent action immediately adjacent the floor or surface which results in the loosening and picking up of clinging particles therefrom.

The low velocity intake passage 2 has an auxiliary chamber 22 which has the effect of enlarging its floor contacting area, and also since the chamber 22 is laterally coextensive with the high velocity intake passage openings 10 and 11, serves to increase the relative period of time with which the low velocity air stream is in contact with the floor or surface to be cleaned as compared to that of the high velocity passage. Preferably, the area of contact of the high velocity passage 8 with the floor or surface to be cleaned is only a fraction of that of the low velocity passage 2, such as, for example, 1 to 4%. What is meant by the area of contact of the respective passages 8 and 2 is that the volume of air withdrawn through such passages shall be so proportioned that such passages will be operative to perform their intended function. Since the passages 2 and 8 have been described as open at their downstream point 9, it is obvious that the air drawn through the high velocity passage 8 should not be of sufficient quantity to reduce the vacuum in the passage 2 to a point where the low velocity air stream will be ineffective to draw air through the surface of the fabric being operated upon. The reduced effective area of contact of the passage 8 together with the position of the lip 18 thus enables air to be taken through the passage 8 at a high velocity and in such manner that such air will pick up threads, or like material, clinging to the surface of the fabric, although such air will be insufficient to substantially interfere with or render ineffective the vacuum cleaning action of the low velocity air stream. In this way the low velocity stream first removes loose particles of dirt by drawing air through the fabric, and the high velocity stream subsequently removes clinging material, such as thread and lint, by drawing a stream of air over the surface of the fabric. The partition wall 12 separating the two streams effects a combing action on the surface which aids the "pick-up" action of the high velocity stream.

Furthermore, it will be noted that the floor contacting area of the low velocity passage 2 is in advance of that of the high velocity passage 8, with respect to the direction of travel of the nozzle, indicated by the arrow B, so that whatever loosening effect is imparted by the action of the low velocity passage upon clinging particles such as hair, fibers, threads, etc., is taken advantage of by the subsequent action of the high velocity passage 8. This arrangement eliminates the necessity for making repeat "passes."

Adjustable means are provided for varying the velocity of the air stream in the high velocity passage 8, it being sometimes desirable to decrease such velocity when the nozzle is used upon surfaces such as high pile rugs or surfaces having such characteristics as to make the nozzle "cling" or "stick" to the surface due to the increased sealing action of the vacuum pressure. This adjustable means comprises a series of openings 23 through the body 1 at a point above the high velocity passage 8 and removed from the floor surface. A perforated plate 24 having a similar series of openings 25 adapted to register with the openings 23 is movably mounted on top of the body 1 and retained in position by means of the screws 26. The screws 26 are in turn held in position by a sleeve nut 27 carrying the coil spring 28, so that the fastening screws 26 are spring loaded. The plate 24 has upturned ends 29 which serve as manipulating handles. Thus by sliding the plate 24 back and forth, the amount of opening of the openings 23 can be varied from fully closed to fully open position.

It will be noted, that in order to facilitate assembly and construction of the high velocity passage and its related parts, that the partition 12, the walls 13, 15 and 16, and the combing element 17 are made in an integral casting or unit which is assembled into the nozzle in the form of an insert and retained by means of the fastening screws 30. In this manner, such insert can be made of different material than that of the nozzle body 1, such as of molded fiber, plastic or hard or soft rubber.

In the alternative forms of construction shown in Figs. 7 to 10 inclusive, only one inlet opening into the high velocity intake passage is provided. Thus in the construction shown in Figs. 7 and 9, the high velocity passage 31 leads to the single intake opening 32 and the bottom, substantially horizontal wall portion 33 upon which the combing element 34 is mounted. Here again, the contact opening of the high velocity passage 31 with the floor surface is isolated from the corresponding opening of the low velocity passage 2 by means of the partition portion 33'. Again it will be noted that the lower terminal end 35 of the angularly inclined bottom wall 36 of the passage 31 is in substantial horizontal alignment with the oppositely disposed end of the outer depending lip 37. An insert assembly, similar to that described in connection with the construction of Figs. 1 to 6 inclusive is also employed in the construction of Figs. 7 and 9.

In the construction of Figs. 8 and 10, the insert assembly is made to include the bottom, horizontally inclined wall 39 of the high velocity passage 40, the outer, depending lip 41, the substantially horizontal bottom wall 42, the combing element 43 and the partition 44.

In the form of construction shown in Figs. 11 and 12, the partition separating the high velocity passage 50 from the low velocity passage 2 is in

the form of a roller 51 having spindles 52 which are journaled at each end in removable bearing blocks 53, the latter being held in position by means of fastening screws 54. A slightly different form of combing element 55 is also shown as mounted on the outer bottom edge of the flange 3 and adjacent the intake opening 56 of the high velocity passage 50.

In the construction of Figs. 13 and 14, a rubber bristled brush 60 is employed as the combined 10 combing element and separating partition between the high velocity passage 61 and low velocity passage 2. Referring to Fig. 14, it will be seen that the tips 62 of the bristles of the rubber brush 60 extend a slight distance below the plane 15 of the bottom face of the flange 3. I have discovered that the action of the rubber brush 60 having the relatively long, flexible bristles, is particularly advantageous and efficient in the removal of dirt particles such as hair, lint, thread, 20 fibers, etc., since as the bristles are forced into contact with the floor surface, they tend to bend longitudinally, haphazardly and in all directions, and thus have a sort of finger action working into a rug or textile fabric which aids in the loosening of the more tenacious and clinging particles. Furthermore, since the bristles of the brush 60 are composed of a relatively soft, flexible rubber, they will not scratch, tear, disrupt or injure 25 the surface over which they are moved.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mech-

anism herein disclosed, provided the means stated by the following claim or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly 5 claim as my invention:

A vacuum cleaning tool of the character described, comprising, in combination, a vacuum cleaning device having a flange defining a nozzle opening and presenting a surface for operative 10 engagement with the surface of the material to be cleaned, said surface when in such operative engagement being adapted to prevent the admission of air to said nozzle opening other than through the material being cleaned, and a material surface cleaning device comprising a body member having a relatively smaller nozzle opening, a flange defining such opening, and a passage 15 including a pair of spaced vertical passages connected to said smaller nozzle opening and a horizontal passage leading from said vertical passages, said vacuum cleaning device having an opening spaced from its nozzle opening and in constant communication with said horizontal passage, and a portion of said last-named flange being slightly 20 spaced from such surface to be cleaned, said passage, said flange portion and smaller nozzle opening being adapted to draw air at high velocity over the surface of the material being cleaned in an amount insufficient to substantially interfere 30 with the cleaning action of said vacuum cleaning device.

WALTER S. GAINES.