

Aug. 6, 1940.

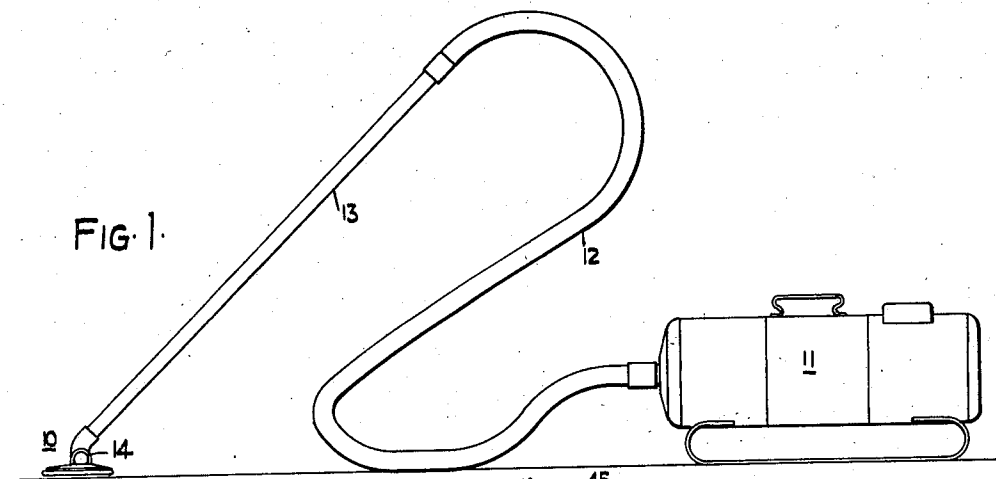
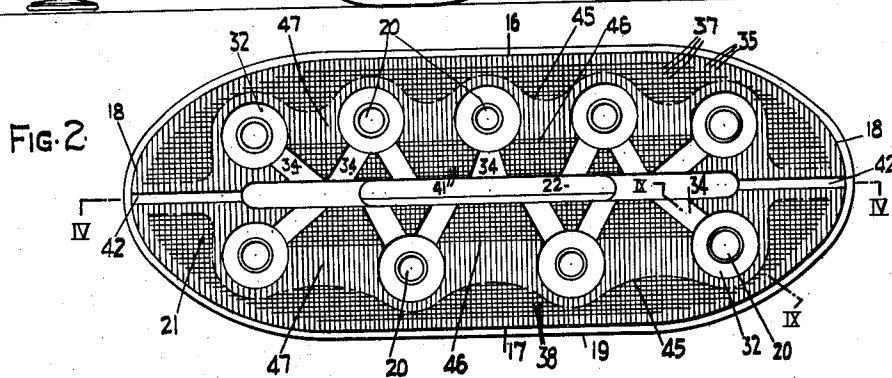
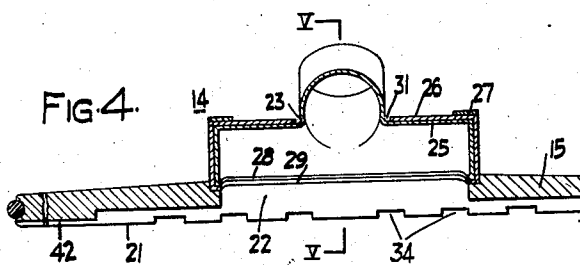
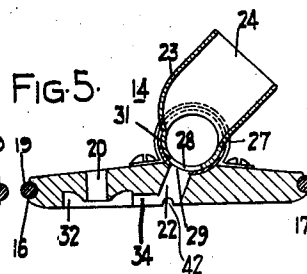
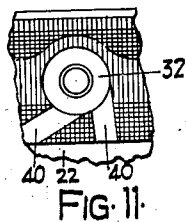
P. B. ELLIS

2,210,030

SUCTION CLEANER

Original Filed March 5, 1935

2 Sheets-Sheet 1



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SUCTION CLEANER

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2 Sheets-Sheet 2

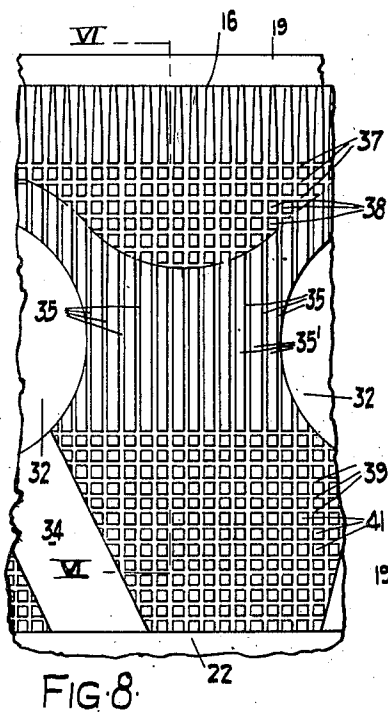


FIG. 8.

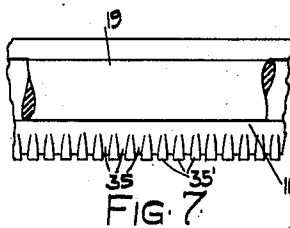


FIG. 7.

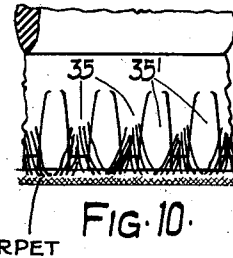


FIG. 10.

CARPET

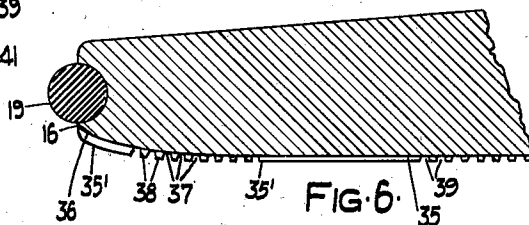


FIG. 6.

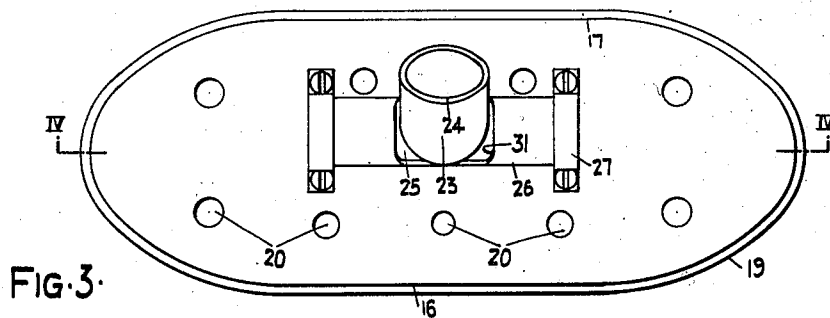


FIG. 3.

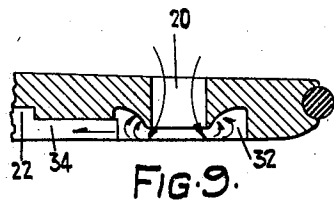


FIG. 9.

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UNITED STATES PATENT OFFICE

2,210,030

SUCTION CLEANER

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tion of Delaware

Application March 5, 1935, Serial No. 9,360
Renewed December 17, 1937

12 Claims. (Cl. 15—157)

My invention relates to suction cleaning apparatus and particularly to nozzle structures therefor and it has for an object to provide an improved structure of this kind.

A further object of my invention is to provide an improved nozzle which will effectively agitate the nap of an article being cleaned for dislodging dust therein and which will gather the nap into an advantageous position for removing the dust by the sweeping action of a body of air.

A still further object of my invention is to provide an improved nozzle structure which will always remain in an effective position when reciprocated across an article being cleaned without requiring the operator to be highly skilled in its use.

These and other objects are effected by my invention, as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a view showing my improved nozzle applied to a suction cleaner of conventional design;

Fig. 2 is a bottom view of the nozzle;

Fig. 3 is a plan view of the nozzle;

Fig. 4 is a sectional view taken along the line IV—IV of Figs. 2 or 3;

Fig. 5 is a sectional view taken along the line V—V of Fig. 4;

Fig. 6 is an enlarged sectional view taken on the line VI—VI of Fig. 8.

Fig. 7 is a front elevation of Fig. VI;

Fig. 8 is an enlarged bottom view of a portion of the nozzle shown in Fig. 2;

Fig. 9 is a sectional view taken along the line IX—IX of Fig. 2;

Fig. 10 is an enlarged view of a detail of Fig. 7 and showing the nap of a carpet being combed and gathered by my improved nozzle; and,

Fig. 11 is a view illustrating a modification of a detail of my improved nozzle.

Referring now, particularly to Fig. 1, my improved nozzle structure indicated generally by the numeral 10, is shown applied to a conventional portable cleaner which may include a blower unit 11, a flexible conduit 12 and a rigid conduit or handle 13 for pivotal connection at 14, to the nozzle 10. The apparatus illustrated operates in a well-known manner in that air, laden with the dirt removed from the article being cleaned such as, for example, a carpet, is drawn through the nozzle 10 and conduits 13 and 12 by the blower unit 11 in which separation of the dirt from the air is effected before the

latter is returned to the ambient atmosphere. The nozzle may be moved over the surface of the carpet by the operator by means of the rigid conduit or handle 13. It will be apparent that the nozzle 10 will always be maintained in engagement with the carpet over its entire surface, regardless of the elevation of the operator's hand or the angularity between the conduit 13 and the carpet, due to the provision of the pivotal connection 14. The pivotal connection 14 permits the handle 13 to be lowered without disturbing the engagement of the nozzle with the carpet and, therefore, the nozzle may be admitted beneath furniture or other objects where low head room is encountered.

Reference will now be had to Figs. 2 to 8, inclusive, in which my improved nozzle is shown in detail. It includes a relatively flat body portion 15, having edges 16 and 17 which are, alternately, leading and trailing edges as the nozzle is reciprocated over a floor or other surface to be cleaned. The sides of the nozzle are preferably rounded or ovalled as shown at 18. The periphery of the nozzle may be provided with a soft protecting member 19 such as, for example, a rubber strip, for preventing the metallic nozzle from marring furniture or the like.

A relatively flat surface 21 is provided on the bottom of the nozzle, which surface 21 engages the carpet or article to be cleaned. The nozzle further includes an elongated air outlet passage 22 adjacent the center thereof, which passage extends from the surface 21 through the nozzle and communicates with the rigid conduit 13 through the pivotal connection 14.

As shown in Figs. 4 and 5, the pivotal connection 14 embodies an angularly displaceable fitting 23, into one end of which, as at 24, the conduit or handle 13 is readily insertable. The fitting 23 is provided with transversely-extending hollow trunnions 25, which are preferably closed at their ends and which may be journaled in the body 15 in any convenient manner. This journaled connection may include a sleeve 26 secured, for example, by means of clips 27, to the body 15. The fitting 23 has an opening 28 formed in the bottom thereof which registers with an opening 29 formed in the sleeve 26, these openings 28 and 29 providing communication at all times between the air discharge passage 22 and the interior of the fitting 23. The upper side of the sleeve 26 is cut away at 31, (Fig. 3) to provide clearance for the end portion 24 of the fitting 23 as the latter is angularly moved in the sleeve. It will be apparent from the foregoing that the

pivotal connection 14 is so attached to the body portion 15 that freedom of relative angular movement in a vertical plane between the handle 13 and the body portion 15 of the nozzle is afforded while, at the same time, relative movement in other directions is restrained. In this connection it will be observed that communication between the air discharge passage 22 and the interior of the fitting 23 is maintained for different positions of the latter as the opening 28 is of sufficient width to prevent closing or throttling of the passages.

Disposed about and spaced from the elongated air outlet passage 22 is a series of air inlet passages 20 providing communication between the atmosphere and the surface 21 adjacent the article being cleaned. Each of the air inlet passages 20 is preferably provided, at its lower end, with a whirl chamber 32 and, as shown in Fig. 2, the inlet passages are preferably of smaller diameter near the center of the nozzle than near the ends. The lower end of each passage 23 preferably projects into its whirl chamber, terminating in spaced relation with respect to the surface 21. This latter feature is best shown in Fig. 5. The whirl chambers 32 are connected to the air discharge passage 22 by means of ducts or grooves 34 which conduct the air taken in through the passages 20 to the discharge passage 22 as hereinafter described.

The surface 21 of the nozzle is provided with a plurality of serrated grooves 35 extending between the edges 16 and 17 or in the normal direction of movement of the nozzle as it is reciprocated across a fabric to be cleaned. As shown in Fig. 8, these grooves 35 preferably become progressively wider as they approach the edges 16 and 17. The grooves 35 form teeth 35' which are effective to comb the fabric so as to facilitate removal of dirt therefrom. At the same time, the grooves 35 facilitate movement of the nozzle over the surface to be cleaned.

While the surface 21 may be made flat over its entirety, I prefer, as indicated at 36, in Fig. 6, to curve or bevel it upwardly adjacent the edges 16 and 17 so as to facilitate movement of the nozzle and the combing process incident thereto. With respect to the depths of the grooves 35, these preferably decrease in depth from the edges 16 and 17 inwardly to a boundary line 45 shown in Fig. 2. Within the boundary line 45, the grooves are relatively shallow and of uniform depth.

Adjacent the edges 16 and 17 of the nozzle and outside of the boundary line 45, I provide a group of serrated grooves 37 extending transversely of the grooves 35 and intersecting the latter. The depth of the grooves 37, like the grooves 35, preferably decreases in depth in a direction from the edges 16 and 17 inwardly to the boundary 45, the depths of the transverse grooves 37 being substantially the same as the depths of the grooves 35 at their points of intersection. The crossed grooves 35 and 37 provide a multiplicity of checkered projections 38 between the edges 16 and 17 of the nozzle and the boundary line 45. A third group of transversely-arranged serrated grooves 39 are arranged adjacent the air discharge opening 22 on each side thereof and extend outwardly to a boundary line 46. The latter are relatively shallow and substantially of the same depth as the grooves 35 which they intersect. They define, with the grooves 35, a group of checkered projections 41 adjacent the air discharge opening 22. The

area intervening between the outer boundary line 45 and the inner boundary line 46 is, what I term, a sealing area 47 which area, as will be apparent from Fig. 2, extends outwardly of the whirl chambers 32 and, as it embodies only shallow grooves extending in a single direction only, provides a sealing surface about the whirl chambers 32.

In order to facilitate the removal of dust contiguous to an obstruction such as the leg of a piece of furniture or the like, grooves or ducts 42, extending from the rounded edges 18 to the air discharge passage 22, are formed in the surface 21. By moving the ends of the rounded portions 18 of the nozzle adjacent to the obstruction, dust, which may be present there, is drawn through the grooves 42 to the air discharge passage 22 for removal to the unit 11.

Operation

The nozzle 10 is reciprocated across the carpet or other material to be cleaned by means of the handle 13 in a well-known manner. As the nozzle moves forwardly or backwardly, the nap of the carpet is agitated or combed by the projections 38 whereby the nap of the carpet is separated and the dust and dirt contained therein is exposed to the down-draft of air circulating at high velocity through the inlet passages 20. This air dislodges the dust and dirt and carries the same from the whirl chambers through the ducts 34 to the air discharge opening 22 for removal to the unit 11. During movement of the nozzle 10, the checkered projections 38 and 41 are both effective to agitate the surface of the nap and dislodge hair or other stringy material from the surface so as to facilitate the removal of such material.

In Fig. 11 I show another embodiment of my invention which is similar to the embodiment previously described except that ducts or grooves 40 are arranged tangentially with respect to their associated whirl chambers 32.

While I have shown my improved nozzle as applied to a type of suction cleaner wherein the nozzle is movable relative to the blower unit, it is to be understood that my invention is equally applicable to other types of suction cleaners.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or are specifically set forth in the appended claims.

What I claim is:

1. A surface engaging inlet fitting for a suction cleaner having a bottom face for direct gravitational engagement with a surface to be cleaned, air outlet means embodied in the fitting and including an opening located in an intermediate portion of said engaging face, and a series of passageways extending downwardly through the fitting for directing air against the surface to be cleaned, said passageways communicating at their lower ends with said outlet means and said passageways being spaced from the perimeter of the engaging face so that the portion of the engaging face located outwardly of the passageways cooperates with the surface to be cleaned to retard flow of air inwardly under the engaging face of the fitting.

2. A surface-engaging inlet fitting for a suc-

tion cleaner having a bottom face for engaging the surface to be cleaned, an elongated outlet located in an intermediate portion of said engaging face, three or more openings extending vertically through the fitting, said openings being spaced from each other and from the elongated outlet, and passages provided in said engaging face for affording communication between the elongated outlet and the lower ends of the respective openings.

3. A surface-engaging inlet fitting for a suction cleaner having a bottom face for engaging the surface to be cleaned, outlet means located in an intermediate portion of said engaging face, and a plurality of separate passages extending through the fitting to the engaging face and communicating with said outlet means, said passages being composed of an upper small flow-area portion and a lower relatively large flow-area portion and said small flow-area portion projecting into the large flow-area portion and terminating therein in spaced relation with respect to said engaging face.

4. A surface-engaging inlet fitting for a suction cleaner having a bottom face for engaging the surface to be cleaned, an elongated outlet located in an intermediate portion of said engaging face, a plurality of passages extending through the fitting to the engaging face, said passages being spaced from and located on opposite sides of said elongated outlet, and a plurality of ducts diverging from each of said passages and communicating with said elongated outlet.

5. A surface engaging inlet fitting for a suction cleaner having an elongated bottom face for engagement with carpets and the like to be cleaned, outlet means located in an intermediate portion of said bottom face, projections provided on said bottom face for separating the nap of the carpet, and a plurality of passageways extending through the fitting to the bottom face and communicating with said outlet means for circulating air through the separated nap of the carpet.

6. A surface engaging inlet fitting as claimed in claim 5 wherein the projections embody teeth extending in a transverse direction with respect to the major axis of the bottom face.

7. A surface-engaging inlet fitting for a suction cleaner having a bottom face for engaging the surface to be cleaned, an elongated outlet located in an intermediate portion of said engaging face, a series of openings extending through the fitting for conveying air from the atmosphere to the engaging face, means embodied in the engaging face at the ends of the respective openings for receiving air deflected from the surface to be cleaned, said latter means being located on the sides of the elongated outlet and in spaced relation with respect to both the outlet and the perimeter of the engaging face, and ducts connecting said air receiving means and said elongated outlet.

8. A surface-engaging inlet fitting for a suction cleaner having a bottom face for engaging a surface to be cleaned, an elongated outlet located in an intermediate portion of said engaging face, a series of openings disposed in spaced relation with respect to each other about the outlet for conveying air from the atmosphere in a down-draft direction against the surface to be cleaned, said openings communicating with the engaging face intermediate of the outlet and the perimeter of the engaging face and said open-

ings being located opposite the sides of said elongated outlet, means connecting each opening with said outlet and communicating means provided in the engaging face and extending between said outlet and the perimeter of the fitting.

9. A nozzle structure for suction cleaners adapted for reciprocation across an article to be cleaned and embodying a substantially flat surface for engagement with the article, an elongated air discharge passage arranged adjacent the center of the nozzle and extending from said surface through the nozzle, a plurality of air inlet openings spaced outwardly from said passage and extending from the surface through the nozzle for impinging air against the surface to be cleaned, a plurality of grooves formed in the surface connecting said air inlet openings with the air discharge passage, a plurality of shallow serrations in said surface extending generally in the direction of normal movement of the nozzle and a plurality of transversely-extending serrations intersecting said first-mentioned serrations and formed in at least a part of said surface, whereby a plurality of checkered projections are defined in at least a part of said surface.

10. A nozzle structure for suction cleaners adapted for reciprocation across an article to be cleaned and embodying a substantially flat surface for engagement with the article, an elongated air discharge passage arranged adjacent the center of the nozzle and extending from said surface through the nozzle, a plurality of air inlet openings spaced outwardly from said passage and extending from the surface through the nozzle, a plurality of grooves formed in the surface connecting said air inlet openings with the air discharge passage, a plurality of shallow serrations in said surface extending generally in the direction of normal movement of the nozzle and a plurality of transversely-extending serrations intersecting said first-mentioned serrations, said latter serrations being disposed in spaced relation with respect to said inlet openings.

11. A nozzle for suction cleaning apparatus adapted for reciprocation across an article to be cleaned and embodying an elongated surface for engagement with the article, said surface being substantially flat at its inner portions and curved upwardly at its leading and trailing edges, an elongated air discharge passage arranged adjacent the center of the nozzle and extending therethrough from said surface, a plurality of air inlet openings extending through said nozzle to said surface and spaced outwardly from the air discharge passage, a plurality of grooves formed in the surface and providing communication between said air inlet openings and the air discharge passage, side entry grooves formed in the end portions of the elongated engaging surface for conveying air from the ends of the nozzle to the air discharge passage, a plurality of serrations in said surface extending from adjacent the leading edge of the surface to the trailing edge thereof, said serrations being shallow adjacent the center of the surface and progressively increasing in depth toward the leading and trailing edges thereof, and a plurality of transversely-extending serrations in at least a part of the surface and intersecting the first-mentioned serrations.

12. In a suction nozzle adapted to be moved back and forth over a surface to be cleaned, a

nozzle body formed with a suction opening elongated in a direction normal to the direction of movement, lips associated with said body on both sides of said opening, each lip having a width throughout substantially its entire length which is at least equal to the width of the opening, and a plurality of narrow, straight, parallel disposed ribs projecting downwardly from said

lips and extending parallel to said direction of movement to form narrow, shallow passages extending from the outer edges of said lips to said opening, said ribs being interrupted to provide narrow passages extending at right angles to the first-mentioned passages.

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