Nov. 12, 1935. B. C. BECKEF 2,020,600

SUCTION CLEANER

Filed Dec. 23, 1933 3 Sheets-Sheet 1

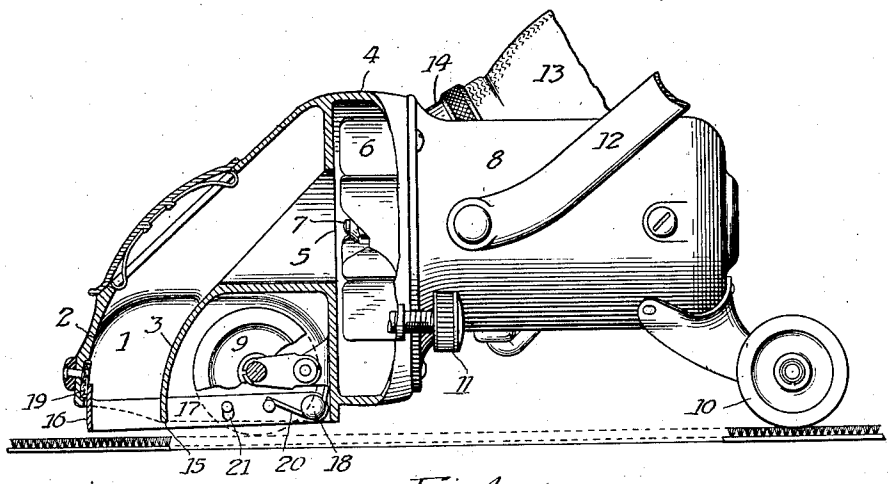


Fig. 1.

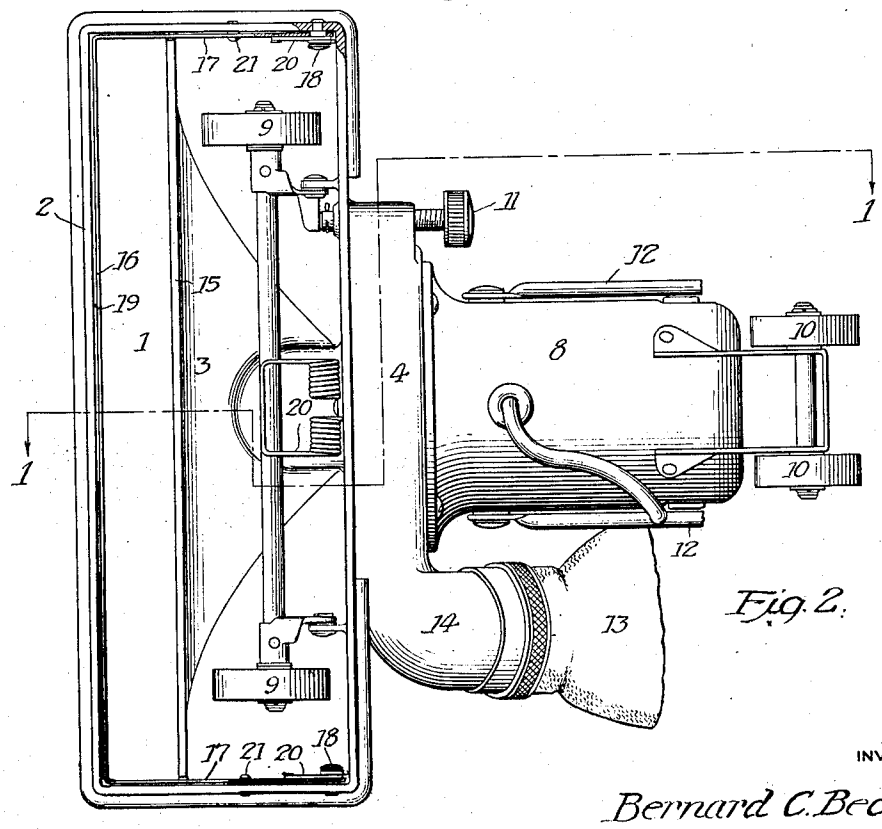


Fig. 2.

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SUCTION CLEANER

Filed Dec. 23, 1933 3 Sheets-Sheet 2

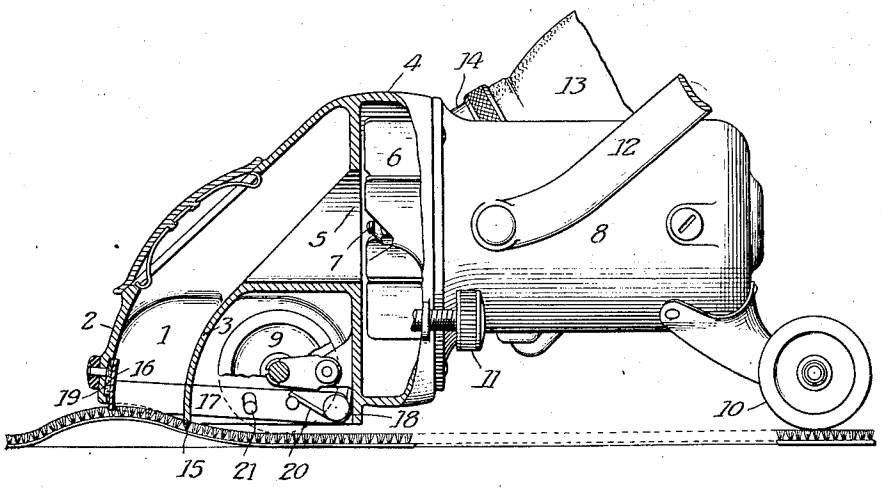


Fig. 3.

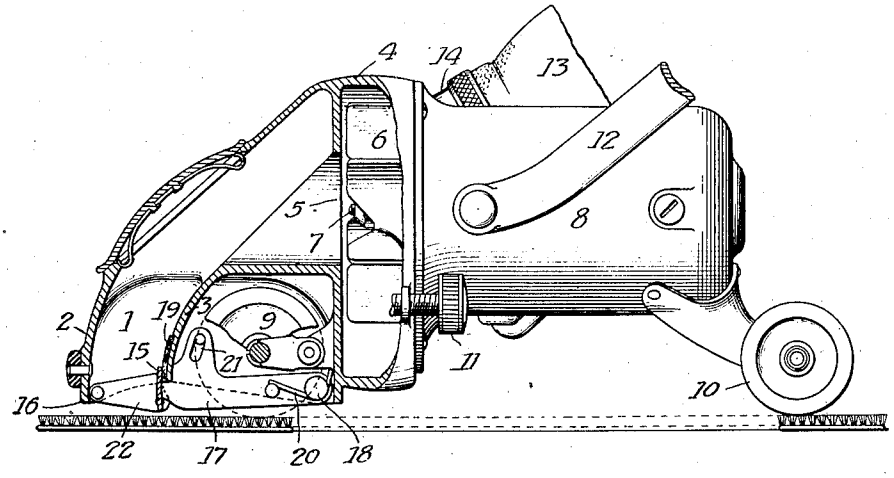


Fig. 4.

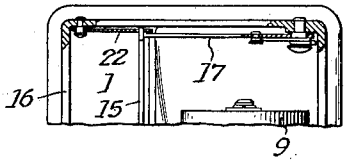


Fig. 5.

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SUCTION CLEANER

Filed Dec. 23, 1933 3 Sheets-Sheet 3

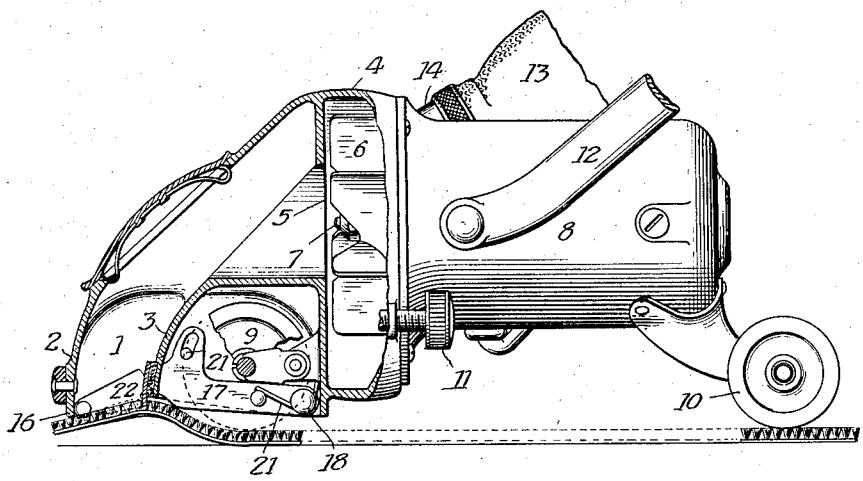


Fig. 6.

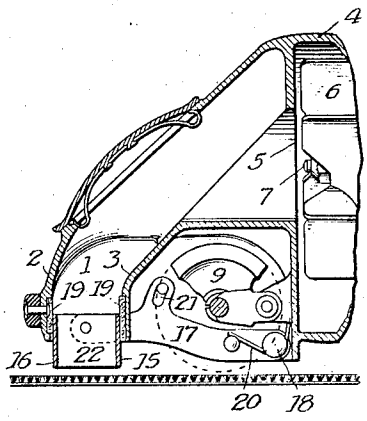


Fig. 7.

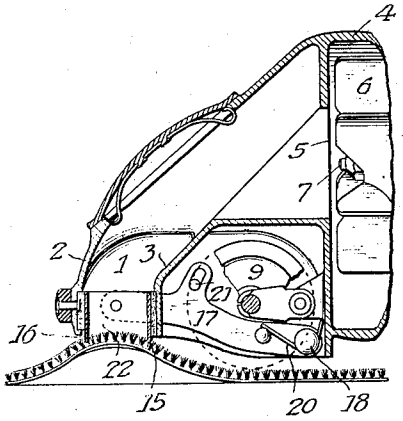


Fig. 8.

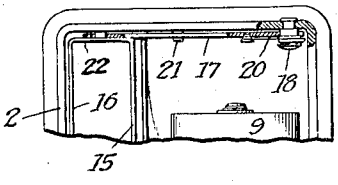


Fig. 9.

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UNITED STATES PATENT OFFICE

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SUCTION CLEANER

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Application December 23, 1933, Serial No. 703,711

9 Claims. (Cl. 15—16)

The present invention relates to suction cleaners in general and particularly to the construction of a suction cleaner nozzle. More specifically the invention comprises the provision of a suction cleaner nozzle which is provided with a resiliently mounted pile penetrating lip.

It is an object of the invention to provide a new and improved suction cleaner. It is another object of the invention to provide a suction cleaner which includes an improved nozzle construction. A still further object is the provision of a suction cleaner nozzle having pile penetrating lips which are mounted for vertical movement. A still further object is the provision of a suction cleaner in which the nozzle is provided with surface-contacting pile penetrating lips which are resiliently urged into contact with the surface covering undergoing cleaning. 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.

In the drawings in which the same reference character refers to the same parts in the various views:

Figure 1 is a side elevation, partly in section upon the line 1—1 of Figure 2, of a suction cleaner embodying a surface-contacting nozzle lip construction in accordance with the present invention;

Figure 2 is a bottom view of the cleaner shown in Figure 1;

Figure 3 is a view similar to Figure 1 showing the lip position with the cleaner in operation;

Figure 4 is a view similar to Figure 1 through a second preferred embodiment of the invention in which the rear lip is resiliently mounted;

Figure 5 is a partial bottom view of the nozzle of the cleaner shown in Figure 4 showing the lip-supporting means;

Figure 6 is a view similar to Figure 4 showing the rear lip in the raised position;

Figure 7 is a partial cross-section through a cleaner constructed in accordance with a third embodiment of the invention in which both nozzle lips are resiliently mounted and showing the lips in the inoperative relationship;

Figure 8 is a view similar to Figure 7 with the lips in the operative position;

Figure 9 is a partial bottom view of the nozzle of the cleaner shown in Figures 7 and 8 and shows the lip-supporting means.

In the operation of the modern suction cleaner the nozzle is spaced above the normal plane of the surface covering a slight distance. The suction-creating means of the cleaner effects a reduction of pressure in the nozzle resulting in the lifting of the surface covering undergoing cleaning upwardly into contact with the nozzle lips. If both the nozzle lips, the front and the rear, are rigidly mounted on the nozzle the surface covering will be bowed into the nozzle mouth between the lips, the general curvature of the bowed part depending upon the distance separating the lips and upon the flexibility of the covering. The cleaning air which is drawn into the nozzle by the suction-creating means rushes between the nozzle lips and the surface covering and functions to remove the foreign matter embedded in the latter. As the upwardly extending pile of the surface covering is spread apart across the bowed section of the covering, it would obviously be desirable if the cleaning air could pass between the nozzle lip and the surface covering at that point as it would be possible for greater penetration of the covering by the air. To accomplish this desirable result the cleaner constructed in accordance with the present invention is provided with a movable lip which moves vertically upward resulting in a greater lifting of the surface covering, a greater length of bow, and resulting in the positioning of the nozzle lip at an intermediate part of the bow at which the covering pile is spread apart. To aid and assist in the penetration of the covering by the air the nozzle lips are made of the pile penetrating type which naturally extend into the pile of the surface covering and between adjacent tufts of the pile, and in fact between adjacent fibers of a single tuft of pile, as distinguished from the normal suction cleaner nozzle lip which is relatively wide and which rides upon the top of the surface covering matting the pile and penetrating therein to no appreciable extent. The accomplishment of the invention is through the use of either the front nozzle lip resiliently mounted, the rear lip resiliently mounted, or both lips so mounted.

Referring again to the drawings and Figures 1, 2 and 3, in particular, a suction cleaner embodying the present invention is disclosed. The cleaner proper is seen to comprise a nozzle 1 having front and rear nozzle walls 2 and 3, respectively. A fan chamber 4 is interiorly connected to the nozzle 1 by means of an eye 5 and houses a rotating suction-creating fan 6 which is carried upon the extended end of the motor shaft 7. The motor casing 8 is positioned immediately adjacent the fan chamber 4 and houses an unshown driving motor of an ordinary type

which functions to rotate the fan 6. Front and rear pairs of supporting wheels 9, 9 and 10, 10 support the cleaner for movement over the surface covering undergoing cleaning, the front lips being provided with manual adjusting means, indicated generally by the reference character 11, by which they may be raised or lowered relative to the cleaner for the purpose of raising and lowering the nozzle 1 relative to the surface covering. A pivoted handle 12 provides means by which the operator can propel the cleaner about and over the surface covering and functions, in an ordinary manner which is not shown, to support the upper end of the dust bag 13 which is removably secured at its lower end to the exhaust outlet 14 of the fan chamber 4.

The parts heretofore described are those found in the usual suction cleaner and no invention is claimed in their general arrangement, they forming merely the structure on which the present invention is incorporated and in connection with which it finds its usefulness.

Referring now to the modification shown in Figures 1 to 3 inclusive, the nozzle 1 of the cleaner is normally supported above the surface covering undergoing cleaning at a height dependent upon the position of the front supporting wheels 9, 9. The rear nozzle lip 15 is of an ordinary type being rigidly carried by, or formed integrally on, the rear nozzle wall 3. The front nozzle lip, indicated by the reference character 16, is, however, carried by arms 17, 17 at the ends of the nozzle which extend across the nozzle mouth and are pivoted upon pins 18, 18 at the rear of the nozzle casing. The movement of the lip 16, within its range of movement, is substantially vertical. As is clearly seen in the drawings, lip 16 is positioned closely adjacent the wall 2 and there is provided a seal 19 which is seated upon the interior face of the wall and which is contacted by the lip 16 to prevent the leakage of air into the nozzle between the lip and the wall. The lip in effect forms a continuation of the front nozzle wall and functions as its surface-contacting surface.

The lip 16 is resiliently urged downwardly by springs 20, 20 carried by the pins 18, 18 and contacting the arms 17, 17, the limiting positions of the lip 16 relative to the wall 2 being determined by a pin and slot relationship between each arm 17 and the adjacent nozzle wall, as indicated at 21, 21.

The relationship of the lip 16 to the nozzle with the cleaner inoperative is shown clearly in Figure 1. The lip is in its lowest position permitted by the pin and slot relationship 21. Upon the operator closing an unshown switch, causing current to pass through the cleaner motor, the fan 6 is caused to rotate and the suction thereof creates a reduced pressure in the nozzle 1 which functions to lift the surface covering upwardly into contact with the nozzle lips. The rear nozzle lip 15 being rigid maintains its original position. The front nozzle lip 16, being resiliently mounted, as described, moves upwardly, as clearly shown in Figure 3, and permits the bowed portion of the lifted surface covering to be extended an appreciable distance upon the outside of the nozzle adjacent the front wall thereof. This places the lip 16 in substantially the middle of the bowed portion and at a part thereof at which the pile of the surface covering is flexed or spread apart. The lip 16 being of the pile penetrating type extends into the pile and the cleaning air which enters the nozzle of necessity passes under the lip and through the pile of the surface covering removing the foreign matter embedded therein. Obviously, the force exerted by the lip 16 upon the covering is less than that exerted by the rigidly mounted lip 15. It is also clear that the arms 17, 17 function, across the nozzle mouth where their lower edges lie in the plane of the lip 16, as movable end wall extensions of the nozzle end walls. If the end wall surface contacting portions did not move up and down with the movable lip there would clearly be considerable undesirable air leakage at those points in certain positions of the lip.

Referring now to Figures 4 and 6, inclusive, a second preferred embodiment of the invention is disclosed. The cleaner in its general outlines is identical with that described in connection with the first embodiment. In this embodiment, however, the front nozzle lip 16 is formed rigidly upon the front wall 2 while the rear lip 15 is of the pile penetrating type and is vertically movable relative to the rear wall 3, the seal 19 being carried by the rear wall and between that wall and the movable lip. The lip 15 is carried by the rearwardly extending arms 17, 17 in this embodiment. Those arms are again pivotally mounted and spring-pressed downwardly as in the first embodiment. In the first embodiment the arms 17, 17 extended across the nozzle mouth and moved up and down with the lip 16, thereby providing a movable side wall for the nozzle mouth. In the present embodiment, as the arm 17 does not extend across the nozzle mouth, it is necessary to provide at each end of the nozzle a side wall member 22 which is pivotally mounted adjacent the front lip 16 and which extends across the mouth of the nozzle to the movable rear lip 15, being carried thereby, as by a loose pin and seat relationship which permits of the relative movement therebetween. As the lip 15 moves up and down the member 22 is pivoted and as its lower edge is substantially a straight line between the lip 16 and the bottom edge of the lip 15, and as the member 22 is positioned in substantially sealed relationship to the end wall of the nozzle, it is apparent that a movable nozzle end wall member is provided which prevents leakage of air into the nozzle with variations in the height of the movable lip.

The second embodiment of the invention functions much in the manner of the first, with the exception that the rear lip is the lip which moves upon the surface covering being lifted by the nozzle suction.

Referring now to Figures 7 to 9, inclusive, a third preferred embodiment of the invention is disclosed in which both front and rear nozzle lips 16 and 15 are movably mounted relative to the nozzle. Seals 19, 19 are carried by each nozzle wall adjacent their movable lips. The lips are connected by the movable end members 22, 22 in the present embodiment and move integrally therewith in a vertical direction. The movable nozzle mouth, comprising the movable lips 15 and 16 and their connecting end members 22, 22, is carried upon the forward extension of the side arms 17, 17, the arms being pivotally mounted at their rear ends and spring pressed downwardly as in the previous embodiments.

In the operation of this embodiment of the invention both lips move upwardly, as indicated in Figure 8, and accordingly both lips contact the surface covering adjacent a part of that

covering which is bowed and therefore at a point at which the pile is spread apart permitting greater pile penetration and greater dirt removal.

I claim:

1. In a suction cleaner, suction-creating means, a nozzle connected to said means, means movably supporting said nozzle above the plane of a surface covering undergoing cleaning, a surface-contacting pile penetrating lip sufficiently thin to extend between adjacent tufts of pile of said covering defining a side of the mouth of said nozzle, and resilient means urging said lip in the direction of the surface covering.

2. The construction recited by claim 1 characterized in that said lip is the front lip.

3. The construction recited in claim 1 characterized in that said lip is the front lip and in that the rear lip is rigidly mounted.

4. The construction recited by claim 1 characterized in that said lip is the rear lip.

5. The construction recited by claim 1 characterized in that said lip is the rear lip and in that the front lip is rigidly mounted.

6. In a suction cleaner, suction-creating means, a nozzle connected to said means, means movably supporting said nozzle above the plane of a surface covering undergoing cleaning, surface-contacting pile penetrating lips sufficiently thin to extend between adjacent tufts of pile of said covering defining the sides of the mouth of said nozzle, means resiliently mounting said lips so that they move upwardly with the surface covering as that covering is lifted by the suction in the nozzle in the operation of the cleaner.

7. The construction recited by claim 6 characterized in that said lips are connected at their ends by members which extend downwardly into the surface-contacting plane of said lips and which are movable therewith to prevent air leakage at the ends of the nozzle.

8. In a suction cleaner, suction-creating means, a nozzle connected to said means, means movably supporting said nozzle above the plane of a surface covering undergoing cleaning, a surface-contacting lip defining a side of the mouth of said nozzle rigidly carried thereby, a second surface-contacting lip defining the opposite side of said nozzle and mounted for vertical movement relative thereto and adapted to be raised by a force exerted by said covering when lifted by the nozzle suction created by said suction-creating means.

9. The construction recited in claim 8 characterized in that the side walls of said nozzle between said rigid and said movable lip include a movable surface-contacting portion extended between said lips which is pivoted adjacent said rigid lip and is connected to and movable with said movable lip, thereby providing a surface-contacting seal at the ends of said nozzle regardless of the relative positions of said lips.

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