Feb. 4, 1941. H. T. LANG ET AL 2,230,722

VACUUM CLEANER

Filed April 28, 1936

Fig. 1.

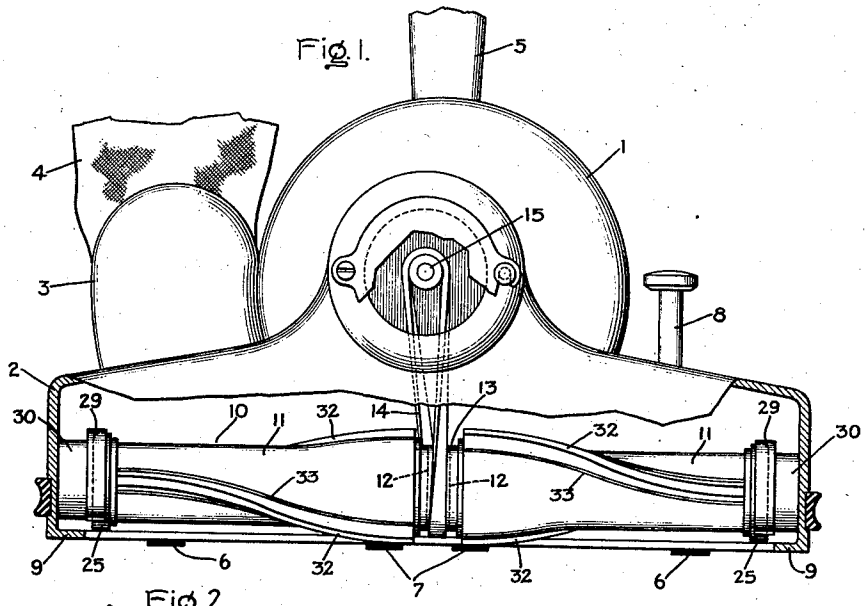


Fig. 2.

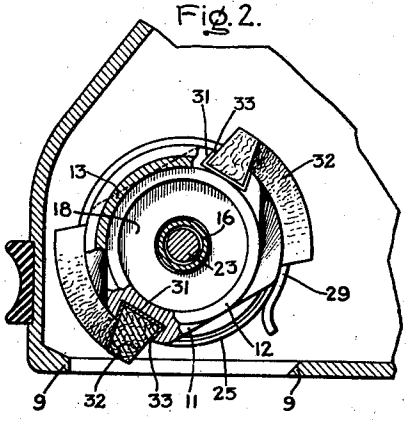


Fig. 3.

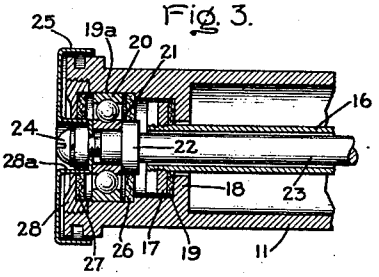
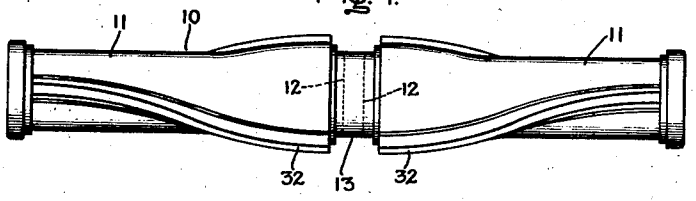


Fig. 4.



Inventors:
Henry T. Lang,
Ralph E. Dunbar,

by Harry E. Dunham
Their Attorney

Patented Feb. 4, 1941

2,230,722

UNITED STATES PATENT OFFICE

2,230,722

VACUUM CLEANER

Henry T. Lang, Cleveland, and Ralph E. Dunbar, East Cleveland, Ohio, assignors to Electric Vacuum Cleaner Company, Inc., Cleveland, Ohio, a corporation of New York

Application April 28, 1936, Serial No. 76,782

2 Claims. (Cl. 15—13)

The present invention relates to vacuum cleaners of the type in which the floor covering or other material being cleaned is drawn toward a suction nozzle by a current of air passing through the nozzle and subjected to a beating or sweeping action by an agitating element arrangement in the suction nozzle.

The object of our invention is to provide an improved agitating element for use in the suction nozzle of a vacuum cleaner and for a consideration of what we believe to be novel and our invention, attention is directed to the accompanying description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a front elevation, partly in section, of a vacuum cleaner embodying our invention; Fig. 2 is a sectional view taken through the suction nozzle at the center at right angles to the length of the suction nozzle; Fig. 3 is a sectional view showing the construction for supporting the agitating element; and Fig. 4 is a view of a modification of the agitating element.

Referring to the drawing, we have shown our invention in connection with a vacuum cleaner having an outer casing 1 which is provided with a suction nozzle 2 and a discharge conduit 3. A suitable bag 4 for receiving dirt is attached to the discharge conduit. A motor driven fan within the casing creates a suction at the nozzle which draws dirt from the surface being cleaned through the suction nozzle and discharges the dirt through the discharge conduit 3 and into the bag 4. A handle 5 is provided at the rear of the casing. The cleaner is supported on front supporting wheels 6 and rear supporting wheels 7. The elevation of the suction nozzle with respect to the surface being cleaned is adjusted by a member 8 having a suitable connection for raising or lowering one of the sets of wheels.

The suction at the nozzle raises the floor covering or other material being cleaned against the bottom edges or lips 9 of the suction nozzle. While held in this position the floor covering is subjected to a beating and sweeping action by a rotatable agitating element or rotor 10 arranged in the suction nozzle. The body of the agitating element comprises two metal parts 11 having cylindrical flanges 12 projecting from the adjacent ends which extend inside a sleeve 13. The sleeve 13 forms a pulley by means of which the agitating element is rotated by a belt 14 passing over the motor shaft 15. The parts 11 are held in assembled relation by a tube 16 having nuts 17 threaded on the ends thereof which cooperate with inwardly extending flanges 18 to clamp the parts 11 together. A suitable sealing washer 19 is placed between the nuts 17 and the flanges 18. In the outer end of each of the parts 11 is a cylindrical recess 19a in which is secured the outer raceway 20 of a ball bearing. The inner raceway 21 of the ball bearing is clamped against a shoulder 22 on a shaft 23 by means of a screw 24. The screw 24 also secures a guard 25 to the shaft 23. A grease sealing washer 26 is arranged between the collar 22 and the recess 19a and another grease sealing washer 27 is arranged between a plug 28 threaded into the end of the casting and a flange 28a on the guard 25. These seals also keep dust from the ball bearing. A steel retaining washer 27a holds the washer 27 in place.

The agitating element or rotor is mounted in the suction nozzle by spring clips 29 which grip the periphery of the guard 25. With this arrangement, the guard 25 and the shaft 23 are held stationary within the suction nozzle and the rotor is rotatably supported on the shaft. The particular construction for supporting the rotor within the suction nozzle is not important and the arrangement for carrying the clips 29 is therefore shown diagrammatically in elevation at 30.

In the outer surface of the rotor are two dovetail grooves 31 which spiral helically along the length of the rotor. These grooves hold strips 32 of felt which project beyond the body of the rotor. The felt strips are flexible so that they may be inserted by sliding lengthwise into the dovetail slots. If necessary, the portion of the felt strips within the slot may be provided with a metal backing 33 which re-enforces the portion of the felt within the dovetail slot.

As shown in Fig. 2, the rotor is mounted so that the felt strips when in their lowest position extend to the plane of the rug contacting surfaces or lips 9 of the suction nozzle. During the use of the cleaner, the floor covering is drawn against the lips 9 of the suction nozzle and the part of the floor covering between the lips is bowed upwardly. As the rotor rotates, successive portions of the felt strips 32 strike the bowed portion of the floor covering and force it downward in opposition to the air flow through the suction nozzle, thereby subjecting the floor covering to a beating and sweeping action. The felt strips 32 do not move the bowed portion of the carpet far enough to break the seal between the floor covering and the lips of the nozzle. The beating and sweeping action of the felt strips therefore does not cause a decrease in the suction at the suction nozzle and the dust which is

loosened is drawn more quickly through the nozzle than would have been the case if the seal between the floor covering and the lips of the nozzle had been broken. The greater suction at the nozzle also causes a greater agitation of the floor covering by the felt strips 32 which effects more rapid removal of dirt.

In cleaners of this type, it has been cutomary to use rotors in the suction nozzle having brushes or smooth metallic projections arranged in the same general way as the felt strips 32. One disadvantage of the brushes is that the bristles tend to dig into the nap of the floor covering and thereby cause increased wear on the floor covering. This is particularly true if the bristles are stiff. Also, the bristles tend to break and when a number of the bristles have broken, the beating and sweeping action is considerably decreased. With the felt, the relatively smooth surface presented by the contacting surface of the felt has no tendency to dig into the nap of the floor covering and the wear on the floor covering is thereby decreased. The felt strips may therefore have an effective stiffness greater than bristles without increasing the wear. Also, due to the homogeneous nature of the felt, the rug contacting surface of the felt does not change in character as the felt wears and any wear can be readily compensated by lowering the rotor in the suction nozzle. This is not as readily done with a rotating brush since the breaking of the bristles changes the character of the rug contacting surface. Also, the stiffness of the bristles depends materially on the length of the bristles whereas the stiffness of the felt is relatively unaffected by the radial length of the felt. Another advantage of the felt over the bristle brush is the greater uniformity of the felt. It is therefore much easier to secure felt of uniform characteristics than to secure brushes of uniform characteristics. Another advantage of the felt over the bristle brush is that hair and lint do not become tangled around the felt. One advantage of the felt strips over the smooth metallic beating elements is that the fibres of the felt will pick up lint from the floor covering whereas the metallic beating elements will not pick up lint. When the metallic beating elements are used it is, therefore, necessary to provide a separate brush arranged to have a sweeping action on the floor covering for picking up the lint and this brush is subject to the same disadvantages present when a brush is used to effect the beating as well as the sweeping action.

The action of the felt strips 32 most nearly resembles the action of the rotating brushes which have previously been used for effecting a beating and sweeping action on the floor covering. The felt can, therefore, be considered as an improved brush which overcomes some of the disadvantages of bristle brushes. The felt is not as similar to the smooth metallic beating elements since it is not rigid and since it does not have a smooth surface contacting the floor covering. In fact, the fibrous nature of the felt which enables the felt to pick up lint is the source of one of the advantages which is not present in the metallic beating elements.

In Fig. 4 is shown a modification on the rotor which effects better cleaning of the floor covering. In this construction the felt strips 32 spiral in opposite directions from the center of the rotor towards each end of the rotor. The angle of the spiral is not particularly important but is illustrated as an angle of about 120°. With this arrangement there is an appreciable interval during which the floor covering is not subjected to any beating or sweeping action. The reasons for the improved action with this construction of the agitating element are not clear but the test results indicate that this arrangement of the beating elements on the surface of the rotor produces improved results.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. In a vacuum cleaner for floor coverings or the like, a suction nozzle having lips presented to the floor covering being cleaned, supporting elements for supporting the nozzle lips above the surface of the floor covering, means creating a suction at the nozzle for raising and suspending the floor covering against the nozzle lips, a rotatable agitator in the nozzle, an electric motor for rotating the agitator, and felt projections on said agitator arranged to engage the floor covering suspended against the nozzle lips intermittently and having sufficient rigidity to move the floor covering away from the nozzle lips against the force of suction, said projections having orbits of travel extending below the plane occupied by the portion of the floor covering suspended by suction against the nozzle lips but not extending to the plane in which said portion of the floor covering rests while not so suspended.

2. In a vacuum cleaner for floor coverings or the like, an elongated suction nozzle having lips presented to the floor covering being cleaned, supporting elements for supporting the nozzle lips above the surface of the floor covering, means creating a suction at the nozzle for raising and suspending the floor covering against the nozzle lips, an agitator in the nozzle having a cylindrical body portion rotatable on a horizontal axis, an electric motor for rotating the agitator, and felt projections extending longitudinally along the body of the agitator and projecting radially therefrom and spaced around the periphery of said body whereby the projections engage the portion of the floor covering suspended against the nozzle lips intermittently, said projections having sufficient rigidity to move the floor covering away from the nozzle lips against the force of suction and having orbits of travel extending below the plane occupied by the portion of the floor covering suspended by suction against the nozzle lips but not extending to the plane in which said portion of the floor covering rests while not so suspended.

HENRY T. LANG.
RALPH E. DUNBAR.