

Dec. 30, 1941.

C. L. SHANK

2,268,429

SUCTION CLEANER

Filed Sept. 1, 1937

3 Sheets-Sheet 1

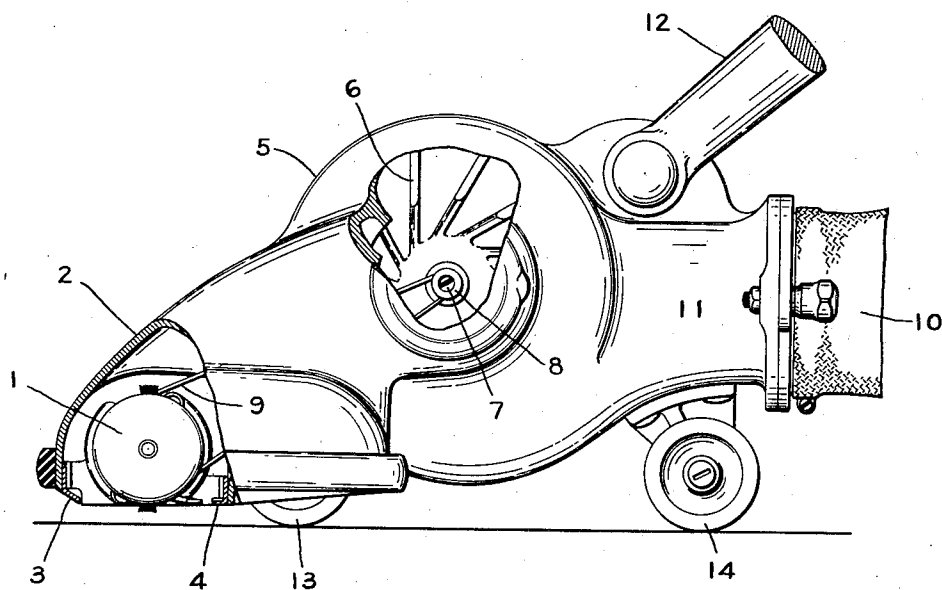


Fig. 1

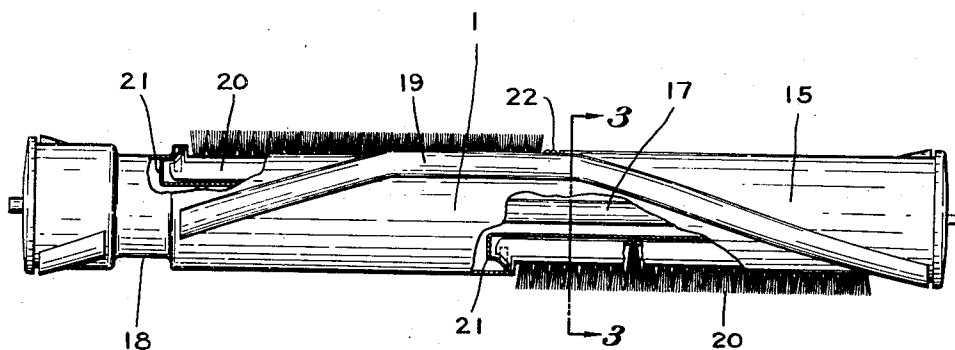


Fig. 2

INVENTOR

Charles L. Shank

BY

W. P. Shank

ATTORNEY

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C. L. SHANK

2,268,429

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3 Sheets-Sheet 2

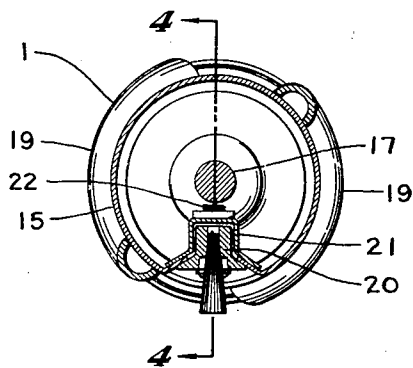


Fig. 3

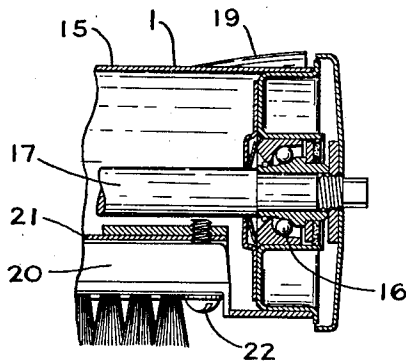


Fig. 4

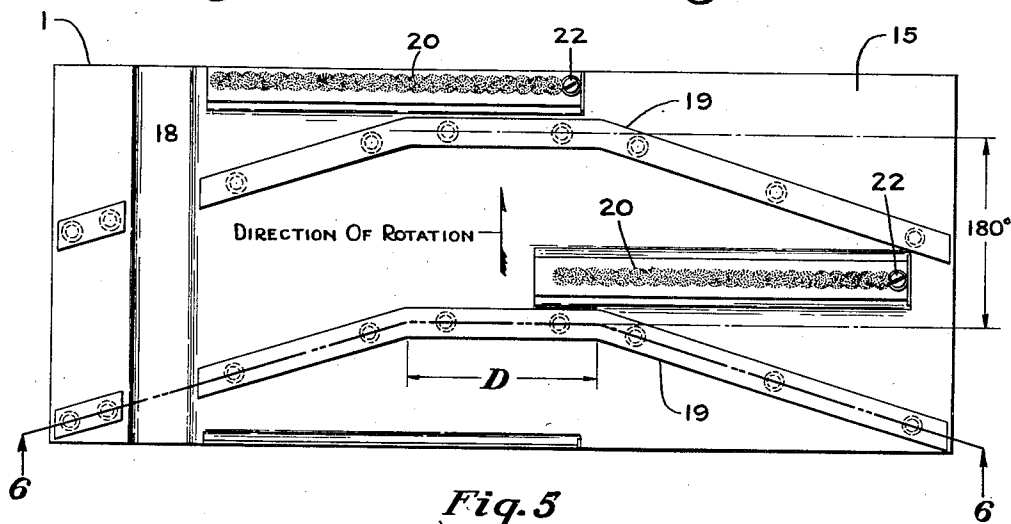


Fig. 5

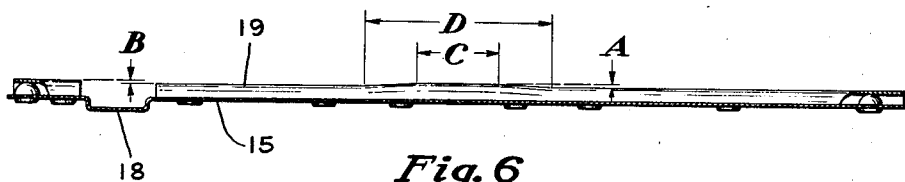


Fig. 6

INVENTOR
Charles L. Shank

BY

W. A. Seamus
ATTORNEY

Dec. 30, 1941.

C. L. SHANK

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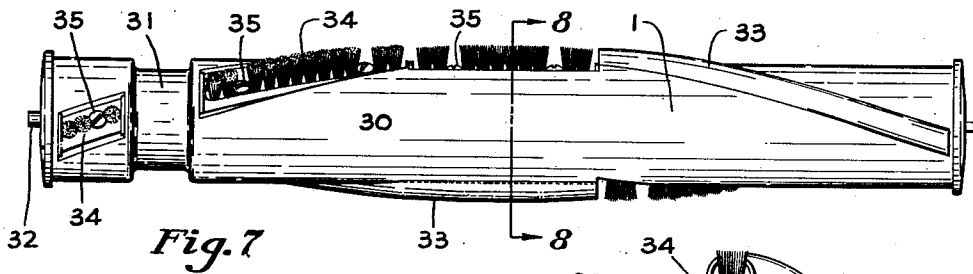


Fig. 7

Fig. 8

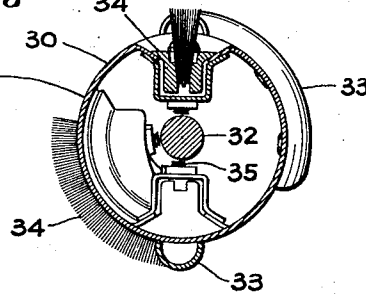


Fig. 9

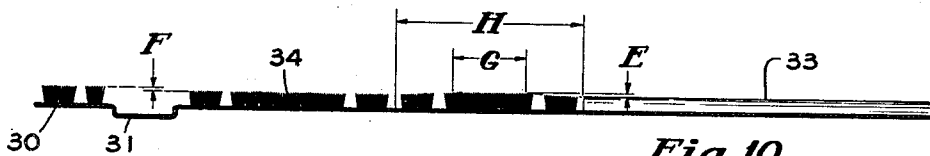
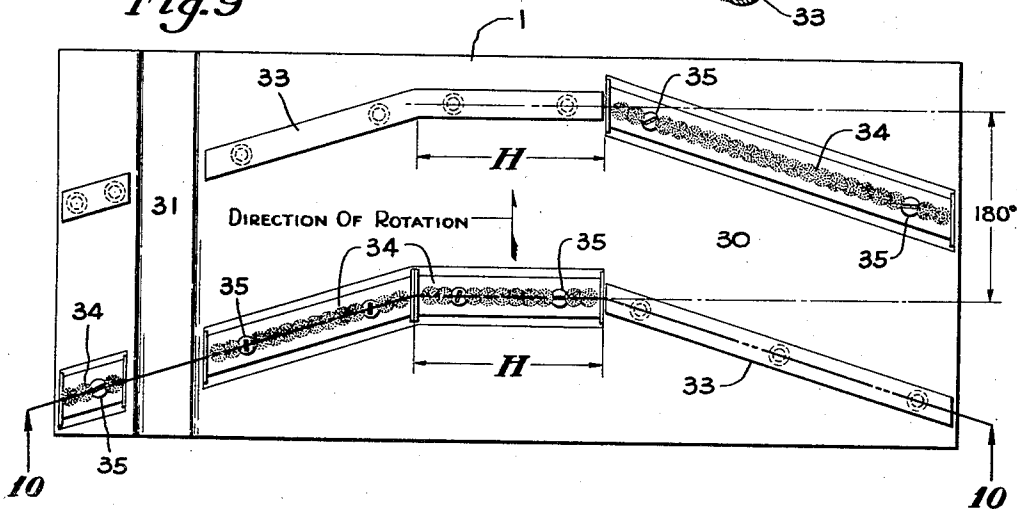


Fig. 10

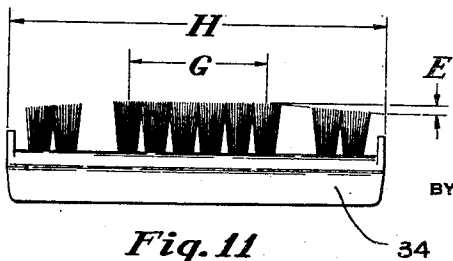


Fig. 11

INVENTOR
Charles L. Shank

BY
W. J. Seamus
ATTORNEY

UNITED STATES PATENT OFFICE

2,268,429

SUCTION CLEANER

Charles L. Shank, North Canton, Ohio, assignor
to The Hoover Company, North Canton, Ohio,
a corporation of Ohio

Application September 1, 1937, Serial No. 161,917

14 Claims. (Cl. 15—13)

The present invention relates to suction cleaners in general and particularly to new and novel surface-agitating means for suction cleaners. More particularly the invention comprises an improved rotary agitator for a suction cleaner in which the beater elements upon the rotary body of the agitator are so arranged and are of such height that the beating action imparted to the surface covering undergoing cleaning is of maximum effectiveness.

It is an object of the present invention to provide a new and improved suction cleaner agitator. Another object of the invention is to provide an improved rotary agitator for a suction cleaner in which the surface-contacting agitating elements are so constructed and arranged as to impart to the surface covering undergoing cleaning an agitating effect which is desirable from the standpoint of cleaning effectiveness and quietness. A still further object of the invention is to provide a rotary agitator for a suction cleaner in which the surface-contacting agitating elements extend to various radial distances. A still further object of the invention is to provide a rotary agitator for a suction cleaner in which elongated agitating elements extend to various radial distances or heights above the agitator body. Still another object of the invention is to provide a rotary agitator in which the arrangement of the beating elements and brushing elements is such that maximum cleaning effectiveness with a minimum of noise is obtained. 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 preferred embodiments of the present invention are disclosed:

Figure 1 is a side elevation of a modern suction cleaner with part of its casing broken away to show an agitator constructed in accordance with the present invention embodied therein;

Figure 2 is a side view of an agitator constructed in accordance with the first embodiment of the present invention, certain parts being broken away and shown in section;

Figure 3 is a section upon the line 3—3 of Figure 2;

Figure 4 is a partial section at the end of the agitator upon the line 4—4 of Figure 3 and shows the bearing-supporting means of the agitator;

Figure 5 is a development of the agitator body;

Figure 6 is a section upon the line 6—6 of Figure 5 and illustrates the variations in height of

the beating element along the length of the agitator body;

Figure 7 is a side elevation of a second preferred embodiment of the invention;

Figure 8 is a section upon the line 8—8 of Figure 7;

Figure 9 is a development of the agitator illustrated in Figures 7 and 8;

Figure 10 is a section upon the line 10—10 of Figure 9 and illustrates the height of the surface-contacting agitating brushing element along the length of the agitator body;

Figure 11 is a side elevation of the central brush element of the agitator of Figures 7 to 10, inclusive, removed from the agitator.

In the modern efficient suction cleaner use is made of surface agitating means to dislodge embedded foreign material from the surface covering undergoing cleaning, and of cleaning air to remove that dislodged foreign matter and to carry it to the point of deposition. The most efficient agitating means comprises a rotary agitator which is positioned within the cleaner nozzle and is rotated at high speed so that the rigid agitating element and the flexible brushing elements carried thereby contact the surface covering lifted against the nozzle lips. The flow of air into the cleaner nozzle, caused by the cleaner suction-creating means comprising a rotating fan driven by an electric motor, is not uniform along the entire length of the cleaner nozzle. Also, it has been found that the use of helical agitating elements upon the surface of the rotating cylindrical agitator body results in certain beneficial beating characteristics not present when the agitating beating elements extend axially of the agitator body.

Referring now to Figures 1 to 6, inclusive, the first preferred embodiment of the present invention is illustrated. In Figure 1 the agitator 1 is shown positioned within the nozzle casing 2 of a modern suction cleaner in such position that it is adapted to contact the lifted surface covering when that covering is lifted into contact with the front and rear lips 3 and 4, respectively. A suction-creating fan chamber 5 houses a suction creating fan 6 which is driven by an unshown motor the shaft 7 which extends through the fan chamber to be formed with a pulley 8 which drives the power-transmitting belt 9 connected to agitator 1. A removable dust bag 10 is secured to the exhaust outlet 11 of the cleaner and receives the dirt-laden air from the fan chamber 5. As in the usual suction cleaner a pivoted handle 12 is provided by which the operator can propel

the machine over the surface covering on the front and rear supporting wheels 13 and 14, respectively.

Referring now to Figures 2 to 6, inclusive, in particular, the first embodiment of the agitator 1 is illustrated in greater detail and is seen to comprise a hollow cylindrical body 15 which is rotatably mounted at each end by a bearing 16 upon a stationary through-supporting shaft 17 which is adapted to seat in the end walls of the nozzle 2 of the cleaner illustrated in Figure 1. Substantially off center, and therefore much nearer one end of the agitator than the other, the body 15 is formed with a circumferential groove 18 which functions as the pulley surface of the agitator and upon which seats the power-transmitting belt 9 from the driving motor.

The beating elements comprise rigid protrusions which extend above the surface of the agitator body 15, and are preferably formed of semi-cylindrical hard polished metallic members fixedly secured as by riveting. These elements, of which there are two, although more might be provided, are indicated by the reference characters 19, 19 and in each instance comprise a central axially extending portion, which is the first to contact the surface covering undergoing cleaning, as is indicated by the direction of rotation arrow in Figure 5; and by helically extending and oppositely directed circumferentially trailing side portions. The central axial portion is clearly evident in Figure 5 and its length is indicated in Figure 6 by the line D. The portions upon the two sides of the portion D comprise the trailing portions which make contact with the surface covering undergoing cleaning following the initial contact by the portion D.

The beating elements 19, 19 are identical and portions thereof lying in common transverse planes are spaced 180 degrees circumferentially.

Along its length each beater element 19 extends above the normal surface of the agitator body in a very definite arrangement. The central portion D includes a smaller central portion C which has a maximum height above the agitator body, that is, it has a maximum radius from the center of rotation, which height or radius is greater than the height or radius of the trailing portions of the element at the sides of the portion D. This increment of radius is indicated by the distance A in Figure 6. Between the extremities of this portion C of maximum height and the ends of the central portion D that element decreases gradually in radial extension, as is clearly indicated in Figure 6.

Between the pulley 18 and the end of the agitator the element 19 is given a greater extension than the normal height of the trailing end of the beater element which increment of height is indicated by the letter B in Figure 6. B is somewhat less than A. An example of the relative heights can be given as .040 inch for the trailing end of the beater element, .070 inch extension for the portion C, and .060 inch extension for the end of the beater which is separated from the remainder thereof by the pulley 18. The absence of any beating contacts across the width of the pulley surface 18 makes necessary the greater beater element height at the separated end portion as that portion is in effect a second point of initial contact, the presence of the pulley surface causing a lapse in the agitation.

Removable brush elements 20, 20 are carried by the agitator body 15 just forwardly of the foremost portions D, D of each beating element

19. These brush elements 20, 20 extend axially and are removably secured within recesses 21, 21 in body 15 by manually operable screws 22, 22 and cooperating means in a common and well known manner. The elements 20, 20 are arranged in staggered relationship so that the surface covering is contacted by both beating and brushing elements from the pulley surface 18 to the opposite end of the agitator.

In the operation of a cleaner embodying an agitator constructed in accordance with this first embodiment of the invention the surface covering is lifted against the cleaner nozzle lips 3 and 4 by the suction and is contacted therebetween by the rotating agitator which is driven by the power-transmitting belt 9. The agitator rotates in the direction of the arrow in Figure 5 so that the central portion D of maximum height of each beating element makes the initial contact with surface covering and thereafter the point of contact of the agitating element and the surface covering travels the length of each element in both directions from that central portion D to the end of the agitator. Across the pulley surface 18 there is no contact and accordingly the end of the element on the outside of the pulley surface is in effect a second point of initial contact and, accordingly, its height is slightly greater than the height of the adjacent portion of the element. The brushing elements 20, 20 cooperates with the rigid beating elements to assist in the vibration of the surface covering and the removal therefrom of litter, etc. The vibration imparted to the covering is of substantially uniform amplitude across the length of the agitator and maximum cleaning is effected.

Referring now to Figures 7 to 11, inclusive, the second preferred embodiment of the invention is disclosed. As in the first embodiment the agitator comprises a hollow cylindrical body, here indicated by 30, which is provided with a recessed pulley surface 31 and is rotatably mounted upon a through supporting shaft 32 in the same manner as in the first embodiment. As in the first embodiment the agitator is provided with beating and brushing elements but in this instance the axially extending brushes of the first embodiment have been eliminated and brushing elements have been substituted alternately for opposite sides of the beating element of the first embodiment.

In the development of the agitator body in Figure 9 the complete arrangement of brush and beater elements is disclosed and it is seen that the uppermost agitating element comprises a rigid beater element which is identical with the rigid beater elements of the first embodiment from the pulley end of the agitator through the central axially extending portion which in this instance is indicated by the character H. The opposite trailing end of the first agitating element is seen to comprise a removable brush element 34 which is secured by means of screws 35, 35 in a recess in the agitator body 30 so that it extends as a counterpart of the trailing portion of the agitating element 33 upon the opposite side of the central portion H thereof.

Referring now to the lower agitating element of Figure 9 it is noted that the central portion H of this element is formed by a removable brush section and, as clearly illustrated in Figure 10, this section has the central portion G, which is of maximum height, being greater in height than the trailing portions of the adjacent beater and brush by a distance E. As in the case of the

trailing portion of the brush this central portion H is removably held by screws 35, 35. As in the first modification the agitating element, in this instance a brush, which is seated outside the pulley surface 31 has an extension which is greater, by an increment F, than the height of the adjacent brush portion upon the opposite side of the pulley.

This second embodiment of the invention operates in a suction cleaner to disturb and dislodge effectively the embedded foreign material. The central portions of maximum height which characterizes the central portions H of both the rigid beater element and the flexible brush element causes the agitation of the surface covering to be uniform throughout the agitator length and results in maximum cleaning. The spacing of the brush and beater elements in the two rows functions to insure brushing and beating of the surface covering at all points along the nozzle mouth.

I claim:

1. A rotary agitator for portable suction cleaners comprising a body, a surface-contacting agitating element on the body covering a small part only of the body circumference in any given plane and including a central portion of maximum radial extension from the axis of rotation and circumferentially spaced end portions of lesser radial extension from the axis of rotation.

2. A rotary agitator for suction cleaners comprising a rotatable body, a surface-contacting agitating element on the body including a central portion of maximum radial extension from the axis of rotation and circumferentially trailing end portions of lesser radial extension from the axis of rotation, said portion of maximum extension being adapted first to contact a surface covering undergoing cleaning upon the rotation of said agitator in one direction being positioned circumferentially in advance of said trailing portions.

3. A rotary agitator for suction cleaners comprising an elongated cylindrical body, a surface-contacting agitating element on said body subtending a circumferential arc of less than 180° in a given transverse plane and extended beyond the normal surface thereof a plurality of distances throughout its length, characterized in that said element is of maximum height at a midpoint of said agitator.

4. In a rotary agitator for suction cleaners, agitating means arranged to contact a surface covering undergoing cleaning, means mounting said agitating means for rotation, said agitating means subtending a circumferential arc of less than 180° in a given transverse plane, characterized in that said agitating means extend to various radial distances from the axis of rotation, the point of initial contact leading circumferential and being at a maximum radial distance, and the points of subsequent contact being at a lesser radial distance.

5. In a rotary agitator for suction cleaners, agitating means arranged to contact a surface covering undergoing cleaning, means mounting said agitating means for rotation, said agitating means subtending a circumferential arc of less than 180° in a given transverse plane and extending helically forward around the axis of rotation, and increasing in radial distance from the axis of rotation to a maximum in a central axially extending portion, and then extending helically rearward from said central portion.

6. The construction defined in claim 5 in which said agitating means is formed of rigid beating elements throughout its length.

7. The construction defined by claim 5 in which the part of said agitating means extending helically and forwardly and the part extending axially are formed of flexible brush elements.

8. In a rotary agitator for a suction cleaner, rotatable about its major axis, circumferentially leading rotatable elongated agitating element portions subtending an arc of less than 180° circumferentially in a given transverse plane to depress initially a lifted covering, and circumferentially trailing portions arranged to continue said depression and extend it axially of said agitator, said first mentioned portions extending to a greater radial distance than said second mentioned portions, and means to support said agitating element portions for rotation about said major axis.

9. In a suction cleaner, a suction nozzle, a rotary agitator mounted in said nozzle for rotation about an axis substantially parallel to the plane of a surface covering undergoing cleaning, said agitator including a cylindrical body, an elongated rigid agitating element positioned on the surface of said body and including a forwardly and centrally positioned axially extending portion and a helically extending portion at the side thereof, said axially extending portion having a greater radial extension beyond said body than said helically extending portion and so extending lower with respect to the suction nozzle upon the rotation of the agitator whereby said agitating means is substantially uniformly effective throughout its longitudinal extent on a surface undergoing treatment and said suction nozzle is enabled to remove foreign matter substantially uniformly throughout its intake opening.

10. In a suction cleaner, a suction nozzle, a rotary agitator mounted in said nozzle for rotation about an axis substantially parallel to the plane of a surface covering undergoing cleaning, said agitator including a cylindrical body, an elongated rigid agitating element positioned on the surface of said body and including a forwardly and centrally positioned axial extending portion and a helically extending trailing portion at one side thereof, and a helically extending trailing brush element at the opposite side thereof, said axially extending portion of said element having a greater radial extension beyond said body than said trailing portion or said trailing brush element whereby said agitating means is substantially uniformly effective throughout its longitudinal extent on a surface undergoing treatment and said suction nozzle is enabled to remove foreign matter substantially uniformly throughout its intake opening.

11. A rotary agitator adapted for rotation about an axis substantially parallel to the plane of a surface covering undergoing cleaning, said agitator including a cylindrical body, an elongated rigid agitating element positioned on the surface of said body and including a forwardly positioned axially extending portion and a helically extending portion at the side thereof, said axially extending portion having a greater radial extension beyond said body than said helically extending portion.

12. A suction cleaner, rotary agitator comprising agitating means and means to rotatably support said agitating means for rotation about an horizontal axis, said agitating means being ar-

ranged around the axis of rotation to form a leading centrally positioned means of maximum radial extension and trailing means of lesser radial extensions.

13. In a rotary agitator for a suction cleaner, a brush element adapted to be positioned in the body of a rotary agitator and comprising an elongated, narrow back and flexible surface-contacting elements mounted therein and extending from end to end thereon, said elements varying in height along said back and having a width transverse of the length of the element such that in position in the body of said agitator they will

be enclosed in any transverse plane by an angle not exceeding 60 degrees, and means rotatably to support said element.

14. In a rotary agitator for a suction cleaner, a brush element comprising a straight back and flexible brush bristles mounted therein and extended from end to end thereon, said bristles having a maximum length centrally of said back and gradually decreasing in length towards the ends thereof, and means rotatably to support said element.

CHARLES-L. SHANK.