March 3, 1936. F. J. R. KARLSTRÖM 2,032,756

SUCTION NOZZLE

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Fig.1.

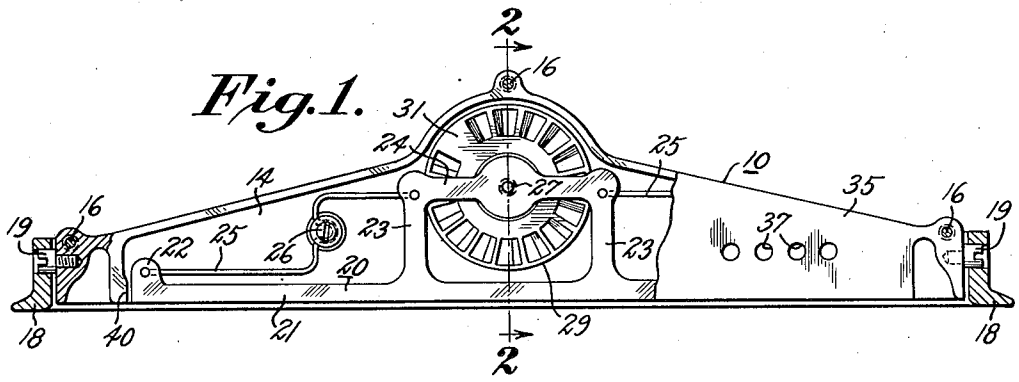


Fig.3.

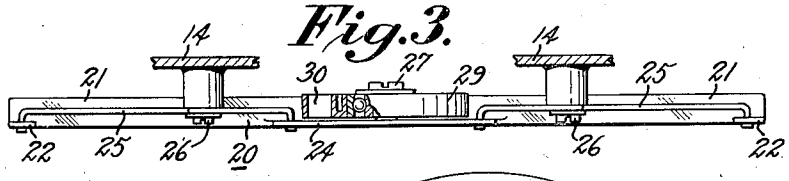


Fig.2.

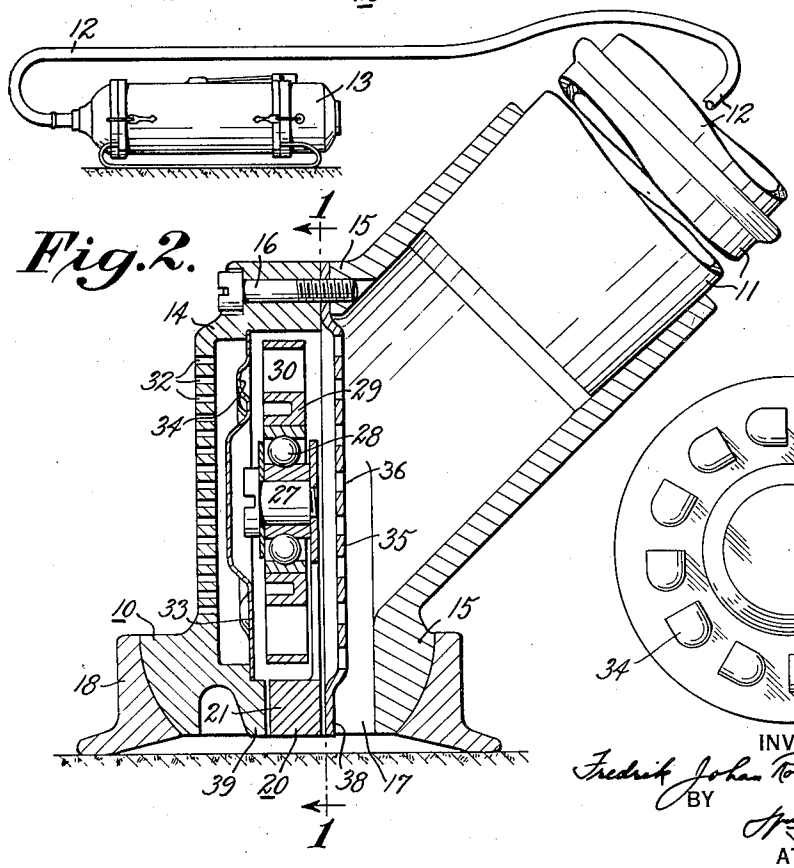
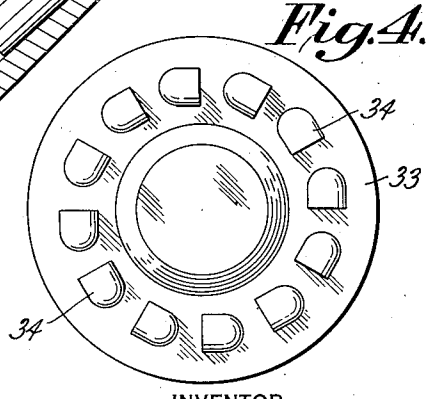


Fig.4.



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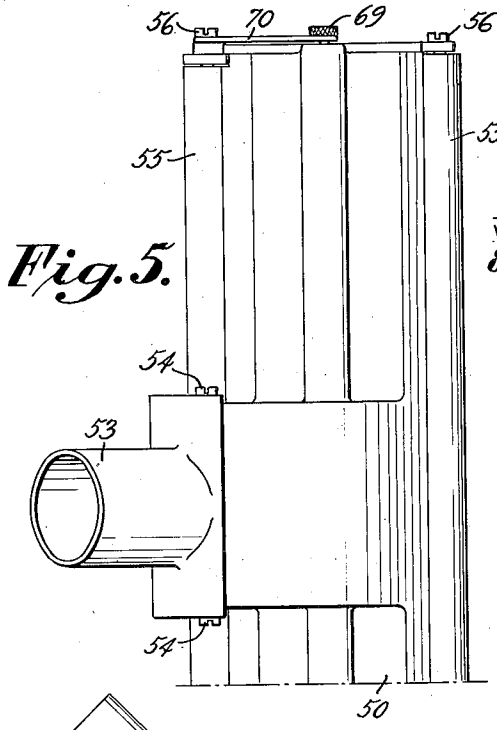


Fig. 5.

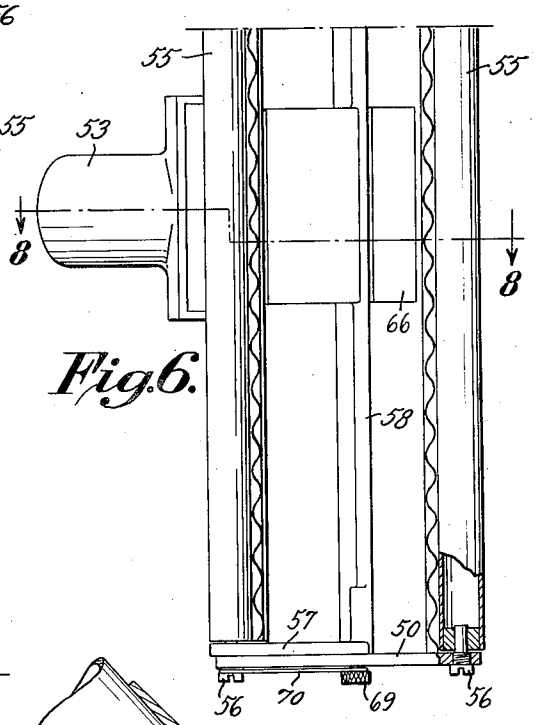


Fig. 6.

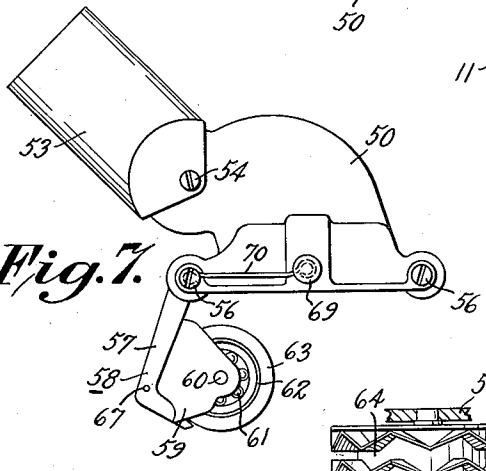


Fig. 7.

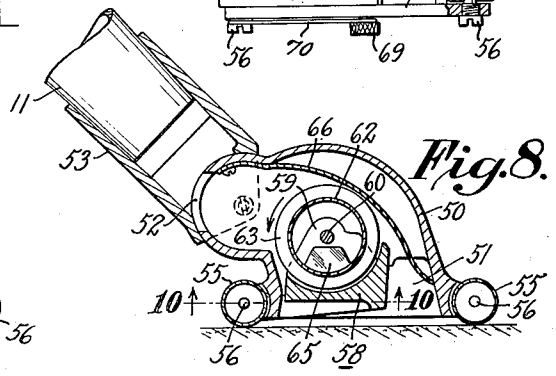


Fig. 8.

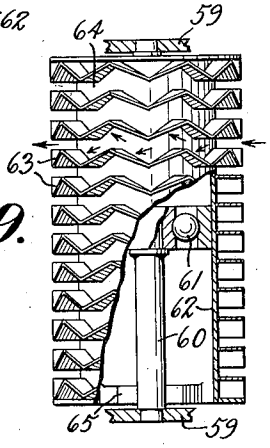


Fig. 9.

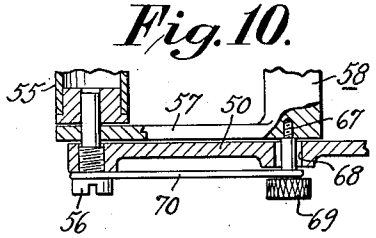


Fig. 10.

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UNITED STATES PATENT OFFICE

2,032,756

SUCTION NOZZLE

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Application March 25, 1933, Serial No. 662,679
In Germany April 15, 1932

14 Claims. (Cl. 15—13)

My invention relates to the vacuum cleaner art and particularly to an improved suction nozzle for use in this art.

One of the objects of my invention is to provide a suction nozzle having an agitator member therein for striking the carpet or other material being cleaned in order to dislodge dirt therefrom, the agitator member being actuated by vibrations set up by an unbalanced rotary member, for instance a turbine, which is operated by the air drawn through the nozzle. A nozzle of this type may be used in connection with a vacuum cleaner unit to which it is connected by a flexible hose or the like, as well as in a vacuum cleaner in which the nozzle is integral with or rigidly secured to, the rest of the cleaner. Due to the fact that there is no mechanical connection between the agitator member and the motor of the cleaner, the motor cannot be injured if foreign material gets caught in the agitator. Likewise, the agitator will not injure such material inasmuch as it will be stopped thereby.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawings, which form a part of this specification and of which:

Fig. 1 is a rear elevational view, partially in cross-section along the line 1—1 of Fig. 2, showing one embodiment of my invention;

Fig. 2 is a cross-sectional view on the line 2—2 of Fig. 1, and also showing a vacuum cleaner unit in smaller scale;

Fig. 3 is a top view of part of the structure of Fig. 1;

Fig. 4 is a front view of a portion of the device shown in Figs. 1 through 3;

Fig. 5 is a top view of a nozzle in accordance with a second embodiment of my invention;

Fig. 6 is a bottom view of the nozzle shown in Fig. 5;

Fig. 7 is an end view of the same nozzle;

Fig. 8 is a cross-sectional view taken on the line 8—8 of Fig. 6;

Fig. 9 is a view, partially in cross-section, of a portion of the device shown in Figs. 6 through 8; and

Fig. 10 is across-sectional view taken on the line 10—10 of Fig. 8.

Referring more particularly to Figs. 1 through 4, reference character 10 designates generally a suction nozzle having an upper outlet opening adapted to be connected by suitable means, such as a rigid hollow handle member 11 and a flexible tube 12 with a vacuum cleaner unit 13. Vacuum cleaner unit 13 is of known type and comprises a casing enclosing a motor-driven fan for producing a suction, and hence flow of air through tube 12. See for example, U. S. Patent No. 1,860,885 to Bilde dated May 31, 1932. A suitable dust separating member is mounted within the vacuum cleaner casing and the air drawn into the casing is passed through this member in order to separate entrained dust therefrom.

Nozzle 10 comprises an elongated casing formed of two parts 14 and 15 divided along a longitudinal line. The part 14 may be referred to as a forward part and the part 15 as a rear part. The two parts are suitably secured together by means of bolts 16. The lower edges of the two parts define a mouth piece or suction or inlet opening 17. These two parts, together with the member 18 form a mouth piece. The opening 17 is the primary inlet opening. The lower outer sides of parts 14 and 15 are made with cylindrical surfaces. The inner side walls of member 18 are made with a similar cylindrical surface and the member is secured to part 14 by means of bolts 19 which are located at the center of the aforesaid cylindrical surfaces. Thus, the parts 14 and 15 may be tilted by the handle 11 while the member 18 remains flat on the surface being cleaned.

Arranged within the nozzle 10 is an agitator member 20 which comprises an elongated bar 21 extending substantially the entire length of opening 17. Bar 21 is provided at either end with upstanding projections 22, while adjacent to, and on either side of, its center there are vertically extending arms 23 joined together at their upper ends by a horizontal member or part 24. To each of members 22 is suitably secured one end of similar spring members 25. These spring members extend horizontally from projections 22 for a substantial distance and then vertically for a short distance and then horizontally again to engage the upper ends of arms 23. At the points where the spring members extend vertically they are suitably secured to the forward part 14 of the casing by means of bolts 26. These spring members thus resiliently support the agitator member 20 and permit limited motion thereof in a vertical direction.

Secured to the central point of arm 24 is a stud bolt 27 upon which is journalled by means of ball bearings 28 a turbine rotor 29. Rotor 29 is formed with inclined blades 30 around substantially all of its periphery. At one point however the rotor is made solid or heavier, as is shown at 31, whereby it is unbalanced and hence tends to set up vibrations when rotated. It will

be noted that the turbine rotor is mounted directly on the resiliently supported agitator member and hence vibrations of the turbine rotor will be communicated directly to the agitator.

A portion of forward part 14, which is directly in front of rotor 29 is provided with auxiliary clean air inlet openings 32. Suitably secured within the forward part 14 between the openings 32 and the rotor 29 is a plate 33 formed with guide vanes 34 for suitably directing the air against the inclined blades 30 of the rotor to cause the latter to rotate. A plate 35 is clamped between parts 14 and 15 behind the turbine rotor and extends the entire length of the nozzle. Directly behind the rotor, plate 35 is provided with apertures 36 through which the air discharged from the rotor passes. Plate 35 may also be provided with apertures 37 laterally disposed with respect to the turbine, which apertures also serve to discharge air, and thus prevent the formation of dead air pockets where dust would be apt to settle.

The lower edges 38 of plate 35 serves as a rear guide member for bar 21. Forward part 14 of the casing is formed with a forward guide member 39 and with end guide members 40. Guide members 38, 39 and 40 in conjunction with springs 25 constrain the movement of agitator member 20 to a vertical direction.

The operation of the above described device is as follows:

The fan in the vacuum cleaner unit 13 serves to draw air through the nozzle and through hollow handle 11 and tube 12. A portion of this air enters the nozzle through the inlet opening 17 and carries with it dust and dirt from the rug or other surface over which the nozzle is passed. Another portion of the air enters the nozzle through clean air inlet openings 32 and is directed by guide vanes 34 against the blades 30, thereby causing rotation of the turbine rotor 29. Inasmuch as this rotor is unbalanced, it vibrates, which vibrations are communicated directly to the agitator member 20, on which the rotor is mounted. Inasmuch as agitator member 20 is resiliently supported by springs 25 it in turn is caused to vibrate. These vibrations are constrained to a vertical direction by the guide members 38, 39 and 40 and by the construction of springs 25. Springs 25 are so designed as to support the bar 21 of the agitator member above the plane of the lower edges of member 18 when the device is at rest, and to prevent the bar 21 from vibrating with sufficient amplitude to reach this plane. However, the suction serves to draw the carpet or other material being cleaned upwardly above this plane so that it is struck repeatedly by the agitator member. This serves to dislodge dirt from the carpet, which dirt is then readily picked up by the air and carried to the vacuum cleaner unit 13. The springs 25 store up energy when they are stressed and move the agitator member in the opposite direction in becoming unstressed.

Due to the fact that the bar 21 of the agitator member does not move as far as the plane of the lower edges of member 18, the nozzle may be used for cleaning hardwood floors or the like, which should not be struck by the agitator.

In Figs. 5 through 10 there is shown a somewhat modified embodiment of my invention wherein all of the air drawn through the nozzle is used to actuate the unbalanced rotary member. Likewise, all of the air is used for cleaning purposes.

In this modification reference character 50 designates a nozzle casing formed with an elongated mouth piece or inlet opening 51 and an outlet opening 52 which communicates with a coupling member 53. Coupling member 53 may be pivoted to casing 50, as at 54 in order that the rigid handle 11 may be pivoted without tilting the nozzle. At each end of the nozzle the casing 50 is provided with projections to which are secured rollers 55 by means of bolts 56. These rollers, two in number, serve to support the mouth piece opening a suitable distance above the surface to be cleaned. Pivoted to the casing 50 by means of the bolts 56 at the rear corners thereof is a frame 57. Frame 57 carries an agitator member 58 which, when hinged into the casing 50, serves to substantially block off the rear portion of the mouth piece opening 51. Member 58 is provided at each end with a plate 59 which supports a stationary shaft 60. Journalled on the shaft 60 at the center thereof by means of a suitable bearing 61 is a cylindrical member 62. The outer surface of cylinder 62 is provided with a plurality of undulated or zigzag strips 63 extending generally circumferentially around the cylinder. These strips thus provide zigzag passageways 64 between them. At each end cylinder 62 is provided with a weight 65, which weights are all on one side of the cylinder and thus cause it to be unbalanced.

A resilient member 66 is secured along its rear edge to the upper part of casing 50 and bears with its forward edge against the lower forward part of the casing. The central part of member 66 is formed as a cylindrical surface of greater radius than the cylinder 62. Member 66 lies close to the outer edges of member 63 and thus causes the air drawn into the nozzle to pass through the zigzag passageways 64 between the member 63. In case a comparatively large article is drawn in by the suction, it can deform the member 66 sufficiently to pass the cylindrical member 62.

Frame 57 at each end is provided with a threaded aperture 67 while each end of casing 50 is provided with an aperture 68. Apertures 68 and 67 are in alignment when frame 57 is pivoted to within casing 50. A bolt 69 is adapted to pass through aperture 68 and to have threaded engagement with aperture 67. A spring 70 is secured at one end to bolt 56 and at the other end to bolt 69. The diameter of aperture 68 is larger than the diameter of bolt 69 whereby the bolt may have movement therein. Inasmuch as the rear end of spring 70 is held stationary by bolt 56, movement of bolt 69, and hence of agitator member 58, takes place against the action of the spring, which is thus stressed.

The operation of this modification is as follows:

When the coupling member 53 is connected to a suitable source of suction, such as the vacuum cleaner unit 13 shown in Fig. 2, air is drawn in through the inlet opening 51. This air is caused to pass through the zigzag passageway 64 because of the presence of member 66. The air passing through the passageway 64 strikes the inclined walls of members 63 and imparts rotation to them and to the cylindrical member 62. Inasmuch as member 62 is unbalanced by the weights 65, its rotation results in the setting up of vibrations. These vibrations are communicated to the shaft 60 and the plates 59 to the agitator member 58. This member is supported by frame 57, which may turn about bolts 56 an amount limited by the play of bolts 69 in openings 68. This movement is also restrained by springs 70 which, when

stressed by movement of the agitator member 58 in one direction, tend to return the agitator member to its original position.

The article being cleaned is drawn by the suction up into the mouth piece or inlet opening 51 where it is struck by the vibrating agitator member 58. This loosens dirt adhering to the material, which dirt is readily picked up by the air and carried to the nozzle and to coupling member 53 to the vacuum cleaner.

While I have shown and described two more or less specific embodiments of my invention, it is to be understood that they are for purposes of illustration only and in no manner limit the scope of my invention, which is to be determined by the appended claims viewed in the light of the prior art.

What I claim is:

1. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member movably supported in said casing adjacent to said inlet opening so as to be movable only in a constrained path toward and from said inlet opening, and an unbalanced rotary member mounted on said agitator member and rotatable due to flow of air to said source of suction.

2. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member resiliently supported in said casing adjacent to said inlet opening so as to be movable only in a constrained path toward and from said inlet opening, and an unbalanced rotary member mounted on said agitator member and adapted to be rotated by the flow of air to said source of suction.

3. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member, means for resiliently supporting said member in said casing adjacent to said inlet opening comprising spring members each secured at its ends to said agitator member and intermediately to said casing, and an unbalanced rotary member rotatable due to flow of air to said source of suction, said rotary member being mechanically connected to said agitator member to impart vibratory motion thereto.

4. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member, means for resiliently supporting said agitator member in said casing adjacent to said inlet opening comprising spring members each secured at its ends to said agitator member and at an intermediate point to said casing, and an unbalanced rotary member mounted on said agitator member and adapted to be rotated by the flow of air to said source of suction.

5. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member, means for resiliently supporting said agitator member in said casing adjacent to said inlet opening comprising spring members each secured at its ends to said agitator member and at an intermediate point to said casing, substantially all of each spring member extending in horizontal direction whereby said agitator member is capable of movement in vertical direction, and an unbalanced rotary member adapted to be rotated by flow of air to said source of suction, said rotary member being mechanically connected to said agitator member to impart vibratory motion thereto.

6. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member resiliently supported in said casing adjacent to said inlet opening, guide means for constraining movement of said agitator member to a path toward and from said inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air to said source of suction, said rotary member being connected to said agitator member to impart a vibratory motion thereto.

7. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member resiliently supported in said casing adjacent to said inlet opening, guide means for constraining movement of said agitator member to a path toward and from said inlet opening, and an unbalanced rotary member mounted on said agitator member and adapted to be rotated by air flowing to said source of suction.

8. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member movably supported in said casing, an unbalanced cylindrical member rotatably mounted on said agitator member, undulated strips forming undulated passages therebetween extending circumferentially of the surface of said cylindrical member, and means for directing the air drawn in through said inlet opening to pass tangentially to said cylindrical member through said passages on one side thereof so as to impart rotation to said cylindrical member.

9. In a suction nozzle, a casing having an inlet opening and having an outlet opening adapted to be connected to a source of suction, an agitator member movably supported in said casing, an unbalanced cylindrical member rotatably mounted on said agitator member, undulated strips forming undulated passages therebetween extending circumferentially of the surface of said cylindrical member, and a flexible diaphragm secured to said casing and being tangent to the radial outer edges of said strips for directing the air drawn in through said inlet opening to pass tangentially to said cylindrical member through said passages on one side thereof so as to impart rotation to said cylindrical member.

10. In a suction nozzle, a casing having an inlet opening and an outlet opening adapted to be connected to a source of suction, an agitator member movably supported in said casing adjacent to said inlet opening so as to be movable only in a constrained path toward and from said inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air to said source of suction, said rotary member being mechanically connected to impart vibratory motion to said agitator member.

11. In a suction nozzle, a casing having a suction inlet opening adapted to be passed over a surface to be cleaned and an outlet opening adapted to be connected to a source of suction, an agitator member movably supported with respect to said casing adjacent to said inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air which has passed through said inlet opening, said rotary member being connected to impart vibratory motion to said agitator member.

12. In a suction nozzle, a casing having a suction inlet opening adapted to be passed over

a surface to be cleaned and an outlet opening adapted to be connected to a source of suction, an agitator member movably supported with respect to said casing adjacent to said inlet opening, and an unbalanced vibratory rotary member mounted on said agitator member and rotatable due to flow of air which has passed through said inlet opening.

13. In a suction nozzle, a casing having a suction inlet opening adapted to be passed over a surface to be cleaned and an outlet opening adapted to be connected to a source of suction, an agitator member resiliently supported in said casing adjacent to said inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air which has passed through said inlet opening, said rotary member being connected to impart vibratory motion to said agitator member.

14. In a suction nozzle, a casing having a suction inlet opening adapted to be passed over a surface to be cleaned and an outlet opening adapted to be connected to a source of suction, an agitator member resiliently supported in said casing adjacent to said inlet opening, and an unbalanced vibratory rotary member mounted on said agitator member and rotatable due to the flow of air which has passed through said inlet opening.

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