

Feb. 13, 1934.

T. C. BIETH

1,946,665

DUST SEPARATOR

Filed Feb. 20, 1932

2 Sheets-Sheet 1

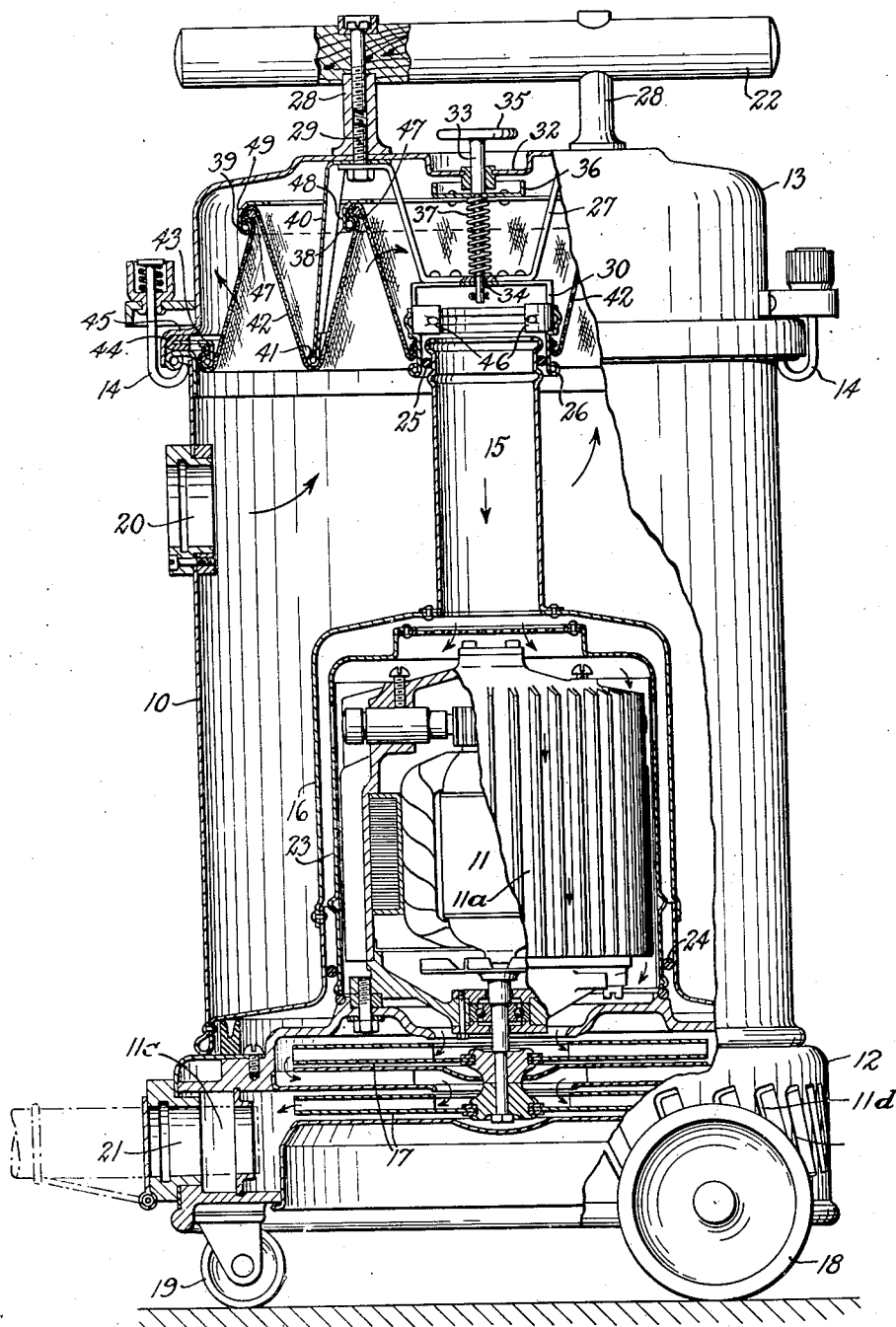


Fig. 1.

INVENTOR
Tom Conrad Bieth
BY
his *Spencer H. H. H.* ATTORNEY

Feb. 13, 1934.

T. C. BIETH

1,946,665

DUST SEPARATOR

Filed Feb. 20, 1932

2 Sheets-Sheet 2

Fig. 2.

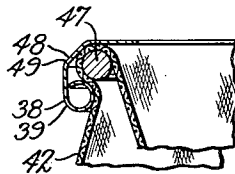


Fig. 4.

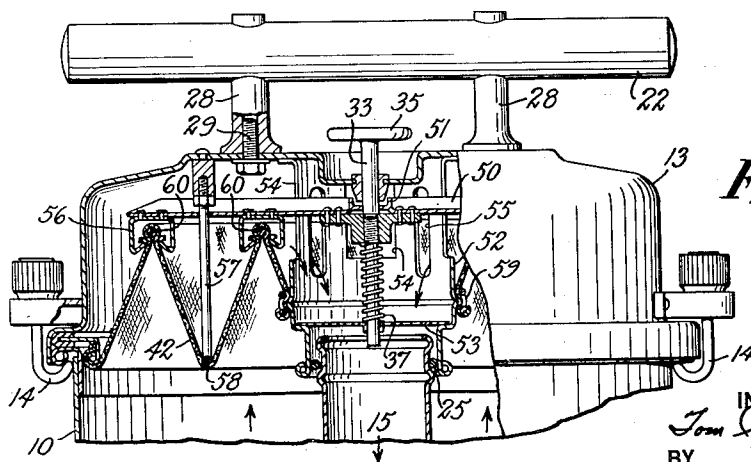
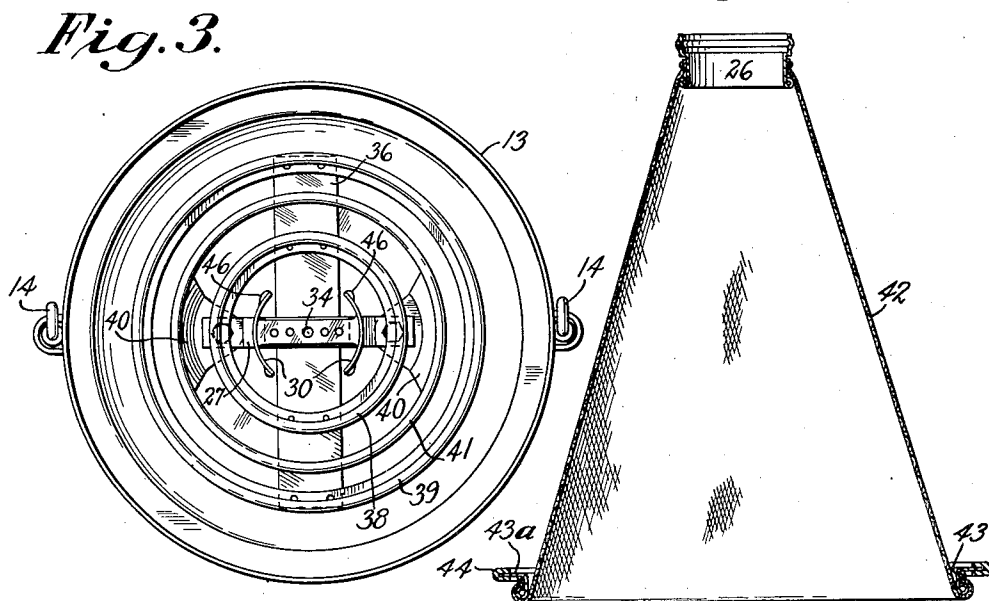


Fig. 5.

INVENTOR
Tom Conrad Bieth
BY
Wm. J. McElwaine
ATTORNEY

UNITED STATES PATENT OFFICE

1,946,665

DUST SEPARATOR

Tom Conrad Bl  th, Alsten, Sweden, assignor to
Electrolux Corporation, Dover, Del., a corpora-
tion of Delaware

Application February 20, 1932, Serial No. 594,181,
and in Germany February 27, 1931

11 Claims. (Cl. 183—58)

This invention relates to dust separators for vacuum cleaners.

In accordance with the present invention, a frusto-conical dust separation member, preferably of cloth, is employed, which is folded to zigzag form, and is mounted on supports, certain of which are movable for shaking the dust separation member and removing dust or the like therefrom. The invention also provides means associated with the dust separation member adapted to cause a reverse air current there-through for assisting in the removal of dust or the like.

Various other features of the invention will be apparent from the following description taken in connection with the accompanying drawings, of which:

Fig. 1 is a side elevation, partly in section, of a vacuum cleaner having a dust separation member constructed in accordance with the present invention;

Fig. 2 is an enlarged cross-sectional view of a detail;

Fig. 3 is a view looking into the cover of the vacuum cleaner with the dust separation cloth removed;

Fig. 4 is a sectional view showing the dust separation member in expanded position; and

Fig. 5 is a side elevation partly in section showing a modified form of apparatus embodying the invention.

In the various figures, similar parts have been identified by like reference characters. Although certain specific terms are used for convenience in the present specification and claims, it is to be understood that they are to be given as broad an interpretation as the state of the art will permit.

The vacuum cleaner illustrated includes a cylindrical barrel 10, of metal or other air impermeable material, which is removably supported, with its axis vertical, on a lower frame member 12. A motor 11 is supported on frame 12, also on a vertical axis. The motor is provided with a housing 11a, having a plurality of heat radiating fins formed thereon, over which the main air current of the cleaner is adapted to pass. A multi-stage centrifugal fan or blower 17 is mounted on the motor shaft for drawing air over said motor and forcing the air to a discharge chamber 11c, from which air is discharged through a plurality of louvers 11d or through a blower opening 21, suitable valve mechanism being provided for this purpose.

The motor is enclosed in a shield 23 having

a perforated top and which is spaced from housing 11a.

A central air tube 15 is mounted within barrel 10 in alignment with said motor and is provided with an enlarged section 16 which is adapted to pass over shield 23. The parts 10 and 15 are joined at the bottom and together form a dust collector. A roll packing 24 is located between shield 23 and the enlarged section 16 to provide an air and dust seal. The arrangement is such that the dust collector 10, 15, 16 may be removed from the frame 12 in order to be emptied without disturbing or exposing the motor. Frame 12 is mounted on wheels 18 and 19, by which the entire cleaner is supported and may be readily moved over a surface, such as the floor.

A removable cover 13 is supported on barrel 10, and is attached thereto by suitable means such as locking members 14 which are carried on the cover and engage a suitable flange on the barrel 10.

A suction opening 20 is formed in the barrel 10, and is adapted to receive the suction hose. A handle 22 is mounted on cover 13, and is secured thereto by spacing members 28 and bolts 29, which parts are sufficiently rigid in construction to permit the entire cleaner to be moved thereby.

Secured within cover 13 by means of the bolts 29 is a bracket 27. Bracket 27 serves as a mounting for a support 30 for holding an inner end retaining ring or annular member 26 of a dust separation unit presently to be described. Parts 27 and 30 may be secured together by rivets. A roll packing 25 is provided between tube 15 and annular member 26 to provide an air and dust seal and at the same time to permit said member 26 to be readily applied to or removed from said tube.

The cover is formed with a depressed portion 32, centrally arranged therein, centrally of which there is slidably mounted an agitator stem 33. The lower end of stem 33 passes through an opening 34 in bracket 27, and in support 30 connected thereto. A disc-like cap 35 is carried on the upper end of stem 33 and is adapted to enter the recess formed by the depressed portion 32.

A transverse horizontal bar 36, which is preferably slightly resilient, is carried on stem 33 and extends at right angles to frame 27. A compression spring 37 surrounds stem 33 and extends between bracket 27 and bar 36 for maintaining bar 36 in an elevated position. Bar 36

carries two concentric rings 38 and 39 having portions of circular cross-section and flanges 48 and 49, respectively, as shown more in detail in Fig. 2, which are adapted to support portions of the dust separation member to be described. A pair of holding members 40 are also mounted on the cover 13 as by the bolts 29, and carry a ring 41 which is supported thereby in a fixed position. Rings 38, 39 and 41 are preferably formed of metal strips which are bent in circular form without sharp edges which would injure the separator cloth.

The dust separation unit comprises a cloth dust separation member 42 which is made in the form of a truncated cone as illustrated in Fig. 4 and is secured to annular member or inner ring 26 and an outer end retaining ring 43 by any suitable means, such as string or riveting or the like. Ring 43 is provided with a lateral flange 43a, which carries a packing member 44 of rubber or similar elastic material. Packing member 44 is adapted to engage a ring-shaped flange or offset portion 45 on cover 13, and is secured between said flange and the upper part of the dust collector 10. Annular member 26 with the dust separation member 42 attached thereto is adapted to slide over support 30 into the position shown in Fig. 1. Support 30 is provided with spring portions 46, which are adapted to engage or snap into depressions in ring 26 for maintaining the same in assembled position. Said spring portions 46, however, may be omitted, if desired, and annular member 26 may loosely engage the support 30.

Cloth member 42 may be secured to rings 38 and 39 by split clamping rings 47 which are preferably so dimensioned that the rings may be applied by causing the ends to overlap and may be locked by extending the same to bring their ends into mutual engagement, and to thereby clamp the cloth member 42 between said rings and the annular flanges 48 and 49, respectively, of rings 38 and 39.

In the above described device, member 42 is positioned by first removing cover 13 and then mounting outer end ring 43 with its flange 43a against the corresponding portion 45 of the cover. Thereafter the inner annular member or end ring 26 is snapped over support 30. The attaching of the dust separation unit to rings 38 and 39 is facilitated by depressing the stem 33. This may be accomplished manually, and a block of suitable size inserted between cap 35 and handle 22 for maintaining stem 33 in depressed condition. The split rings 47 are then inserted in the position illustrated in Fig. 2 for firmly securing filter 42 to rings 38 and 39. Thereafter, the block may be removed from between cap 35 and handle 22 for permitting stem 33 and rings 38 and 39 to snap back into the position illustrated in Fig. 1, in which the dust separation chamber is tightly stretched. It is to be noted that the tension of the dust separating chamber will tend to maintain annular member 26 in engagement with support 30, so that said parts will be held in engaging position, regardless of the action of members 46.

It will be seen that in this process the cloth is folded or plaited so that it has a zigzag cross-section, as shown. The edges of folding are circular. The upper edges are in the same plane; likewise the lower edges are in the same plane.

With the dust separation member in position, cover 13 may be applied to barrel 10, so that packing 44 is clamped between the barrel and

the cover, ring 26 at the same time being inserted over roll packing 25 which surrounds tubular member 15. The cover may then be secured by locking members 14 above described.

In the operation of the above device, air is drawn through suction opening 20 into the dust collector, and is then passed upwardly through dust separation member 42 and into the chamber above the dust separation member and between the dust separation member and the cover. Thence the air passes downwardly through dust tube 15, through the top of shield 23 over the motor housing 11a, and is expelled by means of fan 17 into exhaust chamber 11c. As the air passes through the cleaner in the manner above described the dust is removed therefrom by the dust separation member 42 and is caused to fall into the dust collector 10. The enlarged area of the dust collector with respect to the area of the air inlet also assists the separation of the dust by slowing the air stream and permitting the larger particles to fall directly into the dust collector.

During continued use of the machine, the lower surface of the dust separation member may tend to become clogged with dust or other material which would eventually interrupt the operation of the machine if it were allowed to accumulate thereon. Such materials, however, may be readily removed by alternately pressing and releasing cap 35 (preferably quickly so as to give a snap action), whereby rings 38 and 39 are moved and vibrated and cause a corresponding movement and vibration of the cloth surface. It is to be noted that when said rings are depressed, the portions of dust separation member 42 which engage the same are moved downwardly with respect to the cover 13, and the size of the air chamber within the cover is increased. When the cap 35 is quickly released, spring 37 causes the above members to snap back into their original position and thereby compress the air within said chamber and cause a flow of air through the dust separation member in the direction opposite to the normal flow during operation of the machine. This air current assists in removing the dust particles from said dust separation member. The above action is in part accomplished due to the fact that the air resistance of the motor enclosure and fan 17 is greater than the air resistance of the dust separation cloth. The dust separation member may be vibrated so as to provide pulsations of air therethrough.

When the dust separation member is intermittently cleaned by the above described means, the vacuum cleaner may be operated for indefinite periods of time without requiring removal or replacement of the dust separation member, the operation being interrupted when necessary to remove the cover and empty the dust collector.

It is to be noted that when the cover is thus removed, the tension of the dust separation cloth serves to maintain annular member or inner ring 26 and outer ring 43 in position against support 30 and against cover 13, respectively.

In the modified form of support illustrated in Fig. 5, stem 33 is shown as carrying a pair of cross-bars 50 and 51. Said bars extend through a tube 52 which is secured to cover 13 and is provided with slits 54 in which said bars are adapted to slide. The lower part of tube 52 carries a cross-member 53 through which rod 33 is

guided. Between cross-members 50 and 51 and cross-members 53, spring 37 is seated and serves a purpose similar to that described in Figs. 1 to 4. Tube 52 is also provided with slits 55, which permit the free passage of air there-through. Resilient clamping means 56 are mounted on members 50, and are adapted to receive the cloth member 42. Supports 57 are also carried by cover 13 and support a ring 58 which engages the dust separation cloth in a manner similar to ring 41 above described. Dust separation cloth 42 may be secured to tube 52 by detachable clamping means 59, in which case the lower part of said tube is extended over packing 25 and, in this respect, replaces annular member 26 of Fig. 1. The cloth member may be held within flexible clamps 56 by means of annular clamping rings 60, which snap within said clamps and normally maintain the cloth in engagement therewith. The operation of the above described form of the invention is similar to that described in connection with Figs. 1 to 4.

Although certain preferred forms of the invention have been illustrated for purposes of disclosure, it is obvious that various substitutions and modifications may be made by those skilled in the art, without departing from the broader aspects of the invention, which is to be limited only in accordance with the scope of the following claims.

What I claim is:

1. In a vacuum cleaner, a support for a folded, conical dust separation member comprising end retaining rings, movable rings supporting intermediate folds of said member, and split clamping rings for clamping said member to said movable rings.

2. A support for a dust separation member comprising an annular member comprising an annular ring portion having an annular flange secured thereto and a clamping ring engaging said flange and ring portion for clamping a cloth member therebetween.

3. In a vacuum cleaner of the vertical type having an annular dust collector and an internal, axially extending air pipe, a cover for said dust collector, and a dust separation member mounted between said dust collector and said cover, said member being folded into zigzag form, means to normally produce flow of air through said dust separation member to said air pipe, a plurality of means for supporting the folds of said member, certain of said means being movable for shaking said member and compressible means adapted to be quickly released for causing a counter-current of air to pass through the dust separation member due to expansion of the compressible means during the shaking operation.

4. In a vacuum cleaner of the vertical type having a casing member, a cover secured to said casing member, a dust separation member mounted within said cover and bent back upon itself into zigzag form, means for normally passing dust-laden air upwardly through said dust separation member to deposit dust on the under surface thereof, said dust separation member having a plurality of upper and lower supporting points, stationary means for mounting said lower points with respect to said cover, a movable support for said upper points, and means for normally maintaining said upper supports in elevated position whereby said dust separation member is held under tension.

5. In a vacuum cleaner of the vertical type, a

casing member, a cover mounted thereon, a plurality of lower concentric supporting rings and a plurality of upper concentric supporting rings mounted in said cover, said upper rings being movably mounted, a dust separation member folded back and forth between said upper and lower rings, means for normally passing dust-laden air upwardly through said dust separation member to deposit dust on the under side thereof, and resilient means associated with said upper rings for normally maintaining said dust separation member under tension.

6. In a vacuum cleaner, a vertical casing member providing a dust collector, an air tube located centrally thereof, a cover associated with said casing member, an outer ring clamped between said cover and said casing member, an inner annular member engaging said air tube, a support for said annular member mounted on said cover, a movable support mounted on said cover, a dust separation member connected to said outer ring and said inner member, resilient means associated with said movable support for normally holding said dust separation member under tension, and means extending through said cover to compress said resilient means and to permit the tension therein to be released for shaking said dust separation member for cleaning purposes.

7. In a vacuum cleaner having a casing member, a cover mounted thereon, a dust separation member, concentric end retaining rings carrying said dust separation member, means associated with said cover for supporting said rings, an intermediate movable ring engaging said dust separation member, and means to maintain said movable ring and thereby said dust separation member under tension, the tension being in such direction that said end retaining rings are held within said cover thereby.

8. In a vacuum cleaner having a casing member, a cover therefor, a frusto-conical dust separation unit, means for clamping a portion of said unit between said cover and said casing member, supporting means carried by said cover for supporting another portion of said unit, intermediate supporting means carried by said cover, means to normally maintain said intermediate supporting means and thereby said unit under tension, and means for releasing said intermediate supporting means for shaking said unit for cleaning purposes, the tension of said unit serving to maintain the same in engagement with said cover and with said first mentioned supporting means when said cover is removed from said casing.

9. In a vacuum cleaner, a casing, a zigzag dust separation member mounted therein and providing a dust collecting space on one side thereof and an air chamber on the other side thereof, means for supplying dust-laden air to said dust collecting space, means for withdrawing air from said air chamber, means for manually moving alternate bends of said dust separation member to decrease the dust collecting space and increase the size of said air chamber, and spring means adapted to be released to snap said alternate bends back to decrease the size of the air chamber and cause flow of air from the air chamber to the dust collecting chamber to shake and blow dust off the dust separation member.

10. In a vacuum cleaner, a casing having an outer wall and a central passage and a cover, said central passage having an enlarged portion,

a motor in said enlarged portion, a fan driven by said motor, a zigzag dust separation member mounted in said casing and providing a dust collecting space on one side thereof around said central passage and an air chamber on the other side thereof communicating with said central passage, means to supply dust-laden air to said space, means for manually moving said dust separation member to decrease the size of the dust collecting space and increase the size of the air chamber, and spring means adapted to be released to snap said dust separation member to decrease the size of the air chamber and cause flow of air from the air chamber to the dust collecting chamber to shake and blow dust off the dust separation member.

11. The combination in a vacuum cleaner with a dust separation member of flexible material adapted to allow passage of air but not dust therethrough, of retaining means therefor comprising a circular member having a groove and adapted to contact said dust separation member on one side thereof and a split clamping ring adapted to be inserted in said groove by overlapping the ends of the ring and thereafter aligning the ends whereby the dust separation member can be secured between the circular member and the ring without penetration of the dust separation member.

TOM CONRAD BIETH. 90

20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150