

Aug. 14, 1951

G. H. CRANMER

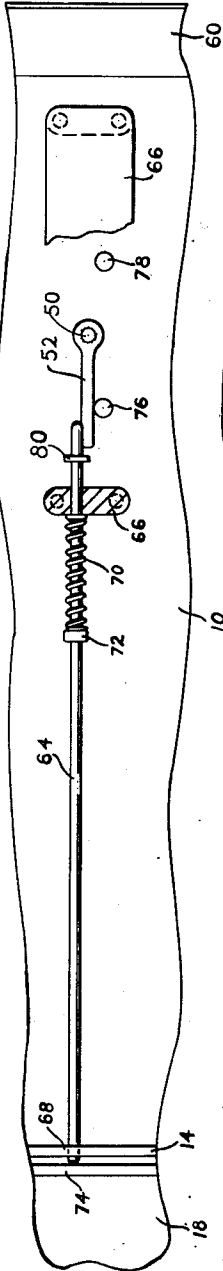
2,564,467

VACUUM CLEANER

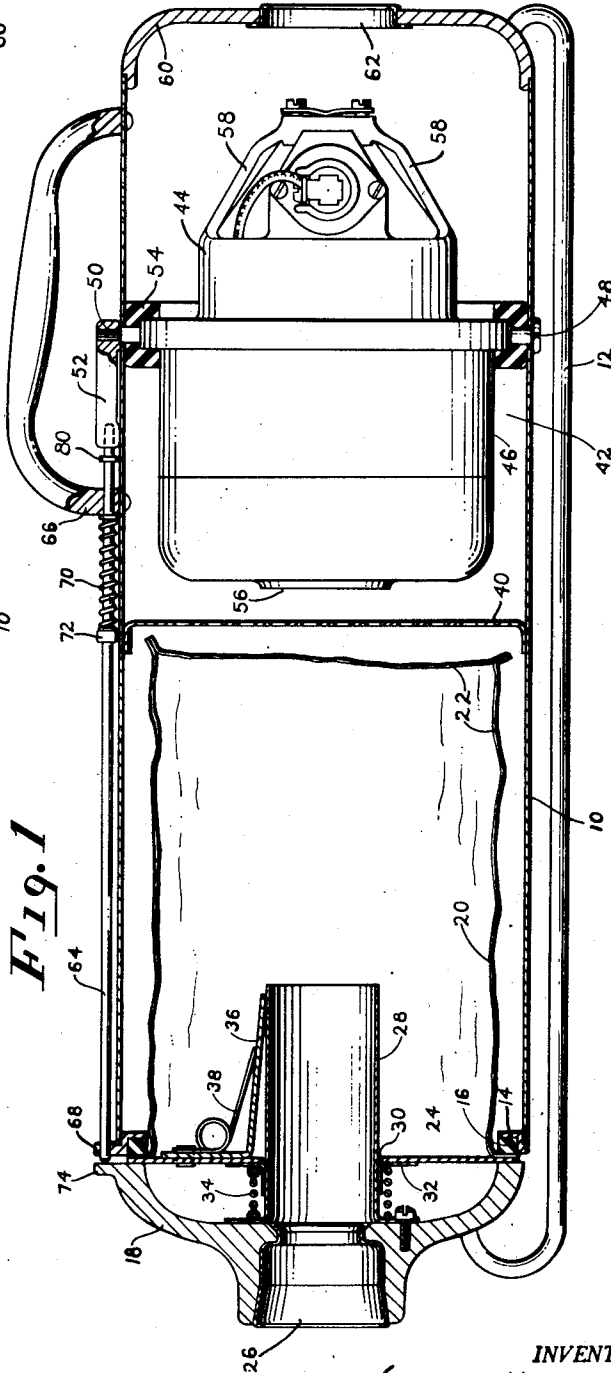
Filed Sept. 22, 1945

4 Sheets-Sheet 1

F'19.2



F'19.1



INVENTOR.

George H. Cranmer
BY
Thomas C. Beth
ATTORNEY.

Aug. 14, 1951

G. H. CRANMER

2,564,467

VACUUM CLEANER

Filed Sept. 22, 1945

4 Sheets-Sheet 2

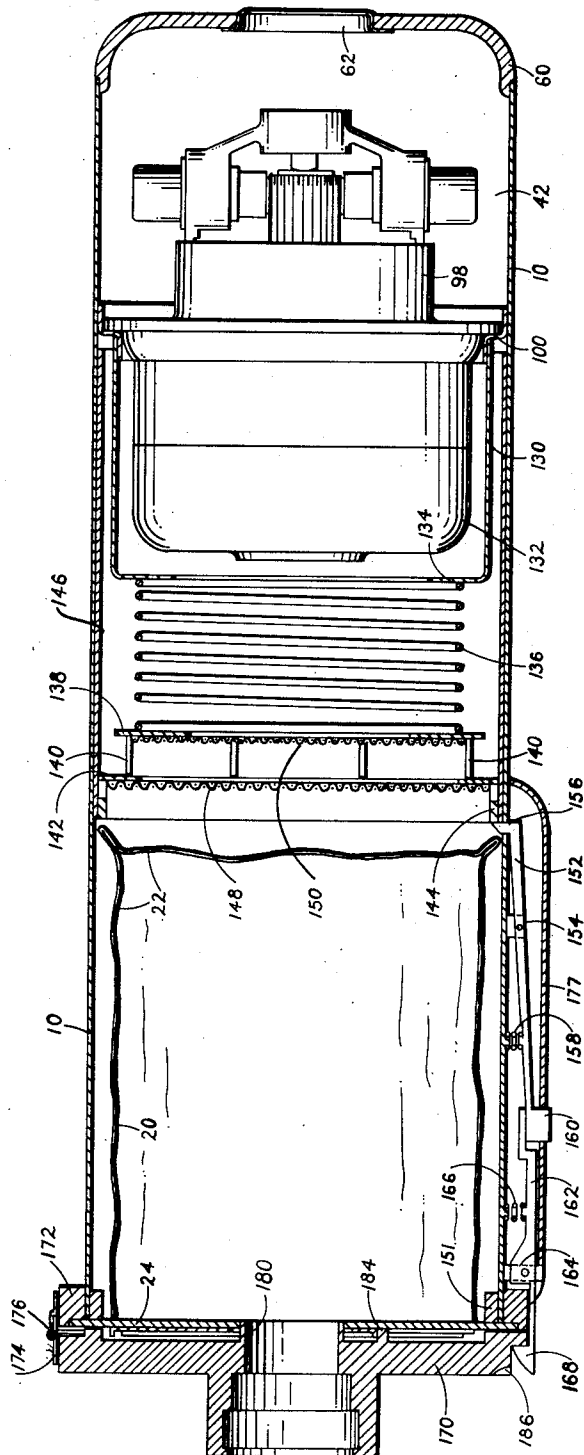


Fig. 3

INVENTOR.

George H. Cranmer
BY
Thomas C. Betts
ATTORNEY.

Aug. 14, 1951

G. H. CRANMER
VACUUM CLEANER

2,564,467

Filed Sept. 22, 1945

4 Sheets-Sheet 3

Fig. 4

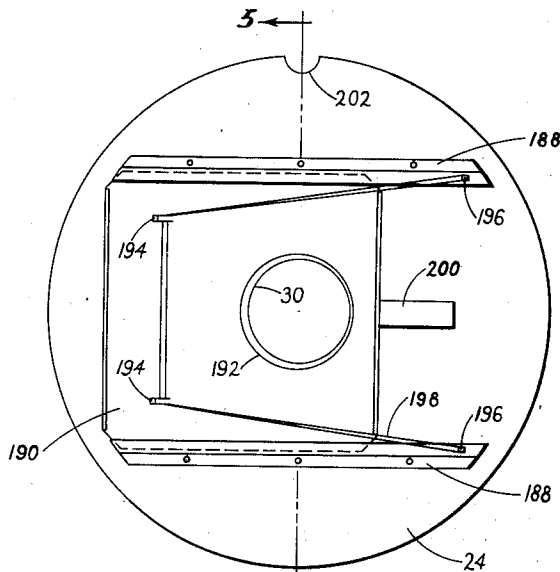


Fig. 6

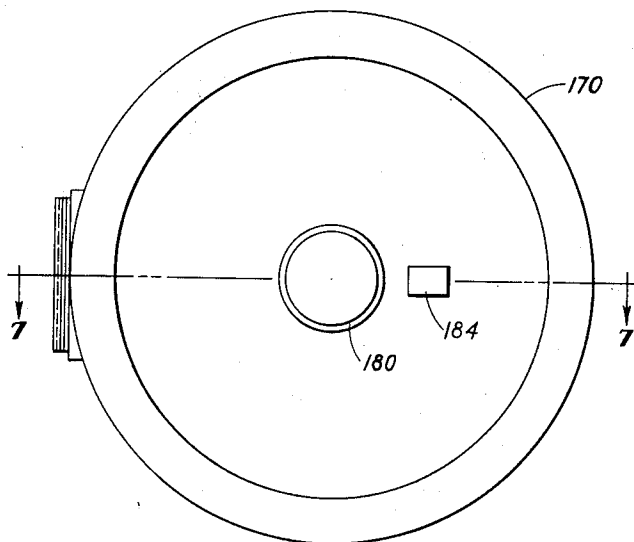


Fig. 5

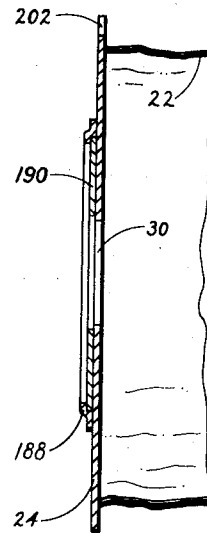
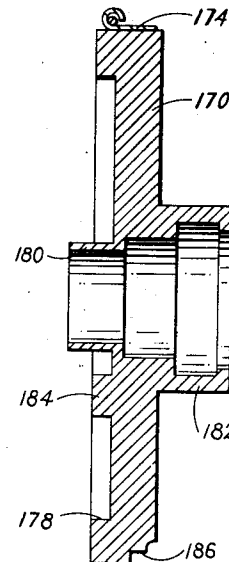


Fig. 7



INVENTOR.

George H. Cranmer
BY
Thomas C. Betts
ATTORNEY

Aug. 14, 1951

G. H. CRANMER
VACUUM CLEANER

2,564,467

Filed Sept. 22, 1945

4 Sheets-Sheet 4

Fig. 8

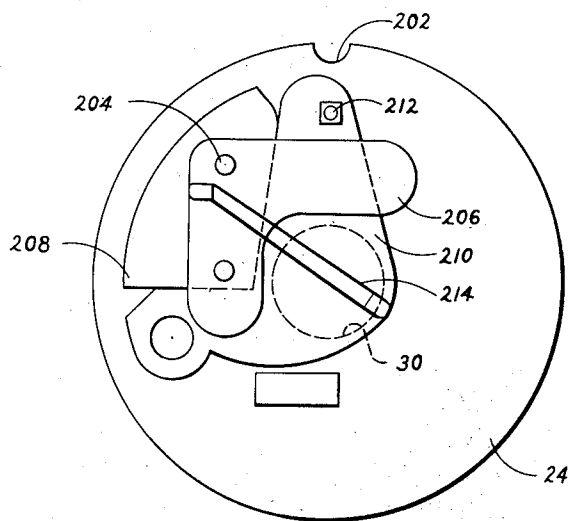
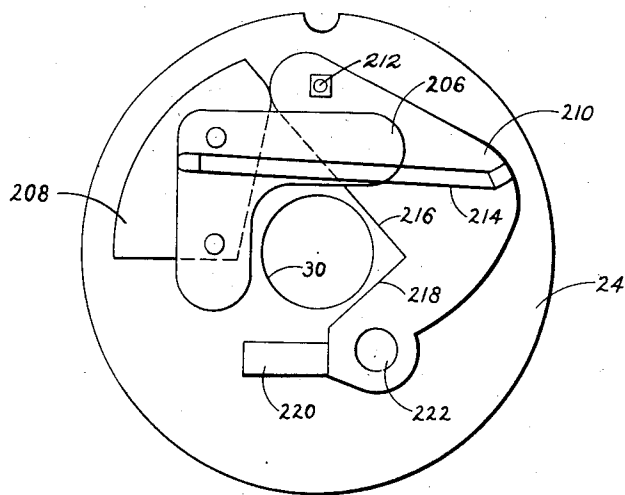


Fig. 9



INVENTOR.
George H. Cranmer
BY
Thomas C. Betts
ATTORNEY.

UNITED STATES PATENT OFFICE

2,564,467

VACUUM CLEANER

George H. Cranmer, Philadelphia, Pa., assignor
to Electrolux Corporation, New York, N. Y., a
corporation of Delaware

Application September 22, 1945, Serial No. 618,022

26 Claims. (Cl. 183—37)

1

My invention relates to vacuum cleaners, and more particularly to improved means for disposing of dirt accumulated in a cleaner.

One of the objects of my invention is to provide a vacuum cleaner having a disposable container for the dirt separated from the air, in combination with means for automatically ejecting this container in sealed condition from the cleaner, whereby disposal of the dirt contained therein may be accomplished, without it ever coming in contact with the hands of the operator, by merely throwing away the container and its contents.

In accordance with one embodiment of my invention the means for separating the dirt from the air and the means for containing the dirt so separated may constitute a bag, preferably made of porous paper, which may be ejected from the cleaner by reversing the flow of air in the neighborhood of the bag so that the latter with the dirt contained therein will be blown out of the cleaner casing. The reversal of air flow may be obtained by either reversing the position of the motor-fan unit within the casing, or by means of properly located valves.

In accordance with another embodiment of my invention a spring is employed to eject the dirt containing member and means are provided for stressing this spring so as to store up the energy required for ejecting the member.

Further objects and features of my invention will be apparent from the following description considered in connection with the accompanying drawings, of which:

Fig. 1 is a cross-sectional view of one embodiment of my invention wherein the dust containing unit is ejected from the casing by means of reversed air flow produced by reversing the position of the motor-fan unit;

Fig. 2 is a top view of a portion of the apparatus shown in Fig. 1;

Fig. 3 is a cross-sectional view of a second embodiment of my invention in which a spring is provided for ejecting the dust container;

Fig. 4 is a front view of the dust container shown in Fig. 3;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is an end view of the inside of a cover member forming part of the cleaner shown in Fig. 3;

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a front view showing an alternative form of dust container which may be used with the cleaner shown in Fig. 3; and

2

Fig. 9 is a view similar to Fig. 8, but with the valve member in open position.

Referring more particularly to Figs. 1 and 2, reference character 10 designates a hollow casing which is movably supported by means of a pair of runners, one of which is shown at 12. The suction end of the casing is provided with a ring 14 which carries a suitable packing ring 16. A cover member 18 is adapted to be removably secured to the casing 10 by any suitable means. Received within this end of the casing is a dust separating and containing member designated generally by reference character 20. This member comprises a bag portion 22, the mouth of which is secured to the periphery of a disc 24. The bag portion is made of a material which is pervious with respect to air, but which is impervious with respect to dust, while the disc is made of material impervious with respect to both air and dust. Inasmuch as the member 20 is intended to be thrown away each time it is filled with dust, it is desirable to make it of as cheap material as possible, and consequently the bag portion may be made of unglued porous paper while the disc portion may be made of cardboard, although other materials, such as cloth for the bag and metal for the disc clearly fall within the scope of my invention.

The diameter of the disc 24 is such that it will be clamped between the cover 18 and the packing ring 16 when the cover is secured to the casing 10. The cover is formed with an inlet opening 26 which is adapted to receive the end of a hose, to the opposite end of which may be connected any suitable suction nozzle or other cleaning tool. Secured to the inner side of the cover 18 and in alignment with the opening 26 is a tubular member 28 which is adapted to pass through a central opening 30 formed in the disc 24. A flange member 32 is slidably mounted on the exterior of the tubular member 28 and is urged into contact with the disc 24 by means of a coil spring 34. One end of this spring is anchored to tubular member 28, while the opposite end is anchored to the flange member 32 in order to prevent the latter from sliding all the way off the former when the cover 18 is removed.

A valve flap 36 is secured to the inner side of disc 24 and is provided with a spring 38 which tends to pivot the valve to a position closing the opening 30 in the disc, as is shown in Fig. 3. However, when the cover 18 is in place, the tubular member 28 maintains the valve in open position as shown in Fig. 1 and in this position the valve imposes no resistance whatsoever to the flow of air into the bag. The flap valve may be made

3

of cardboard, and the pivoting thereof obtained by flexure of the cardboard itself, inasmuch as normally the valve need be opened and closed only once during the life of the container.

A perforated partition 40 may be provided within the casing 10 between the compartment which receives the container 20 and a motor fan compartment 42. Mounted within the latter compartment is a motor-fan unit comprising an electric motor 44 and a fan 46. This unit is pivotally mounted within the casing by means of a lower pin 48 and an upper pin 50, the overall dimensions of this unit being such with respect to the dimensions of the interior of the casing, that the unit may be swung through 180° from the position shown, to thereby occupy a reversed position in the casing. A lever 52 is secured to the end of pin 50 which extends through the casing 10 and hence is accessible for manipulation to pivot the motor-fan unit within the casing. A sealing ring 54 is carried by the motor-fan unit and makes sealing contact with the interior of the casing 10 when the unit is in either the position shown in Fig. 1, or when it is rotated 180° from this position.

The fan 46 is provided with an inlet 56, and the air discharged from the fan passes through the housing of motor 44 and out through openings 58 in this housing. This end of the casing 10 is closed by means of a suitable end cap 60 which may be semi-permanently secured in place and is provided with an opening 62.

A rod 64 is slidably mounted in a member 66 and in a projection 68 on the ring 14, which member 66 may also conveniently consist of a carrying handle. A spring 70 is disposed between the member 66 and a collar 72 fixed to the rod, and hence tends to urge the rod to the left as viewed in Fig. 1. The left hand end of the rod is engaged by a projection 74 on the front cover 18 when the latter is in place, thus displacing the rod to the right against the force of the spring 70. With the rod thus displaced, its right end overlaps lever 52, as is more clearly shown in Fig. 2, thus preventing rotation of the lever in a clockwise direction. Rotation in the opposite direction is prevented by means of a stop 76, and an additional stop 78 is provided in order to limit rotation of the lever to 180°. The rod 64 may be provided with a collar 80 which contacts member 68 so as to limit displacement of the rod to the left when the cover is removed.

The above described device operates as follows:

To place the dust separating and containing member 20 within the casing, the cover 18 is removed and the member 20 is inserted until the periphery of the disc 24 seats against the packing ring 16. If desired, the motor-fan unit may be started in order that the flow of air thus produced may be utilized to draw the bag into the casing. Thereafter the cover 18 is secured in place with the tubular member 28 extending through the opening 30 in the disc 24. As above described, this pivots the valve 36 to open position. The spring 34 urges the flanged member 32 tightly against the disc, thus providing a substantial air tight seal between the tubular member 28 and the opening in the disc. If desired, member 32 may be omitted as there is no pronounced tendency for air and dirt to leak between the opening 30 and member 28, but its provision makes it certain that no dust will find its way into the space between the cover 18 and the disc 24.

If a suction nozzle or the like is connected to

4

the opening 26 by means of a suitable flexible hose, air will be caused to flow in through the nozzle and the hose to within the member 20, and if the nozzle is passed over a dusty surface, dust will be intrained with this air. The air is able to pass through the porous material of the bag portion 22, but the dust is filtered from the air and retained in the bag.

When it is desired to dispose of the dust thus collected, the cover 18 is removed. This permits spring 38 to pivot the valve 36 towards closed position, but it will not be entirely closed due to the fact that the flow of air through the opening 30 will keep the valve partially open.

However, the presence of the tubular member 28 within the bag during the introduction of dust prevents the dust from piling up in the forward end of the bag in a manner which might interfere with the eventual closing of the valve 36. Upon the removal of the cover 18 the spring 70 displaces the rod 64 towards the left a sufficient distance to clear the end of the lever 52. Thereupon, this lever is pivoted by hand through 180° until it strikes the stop 78. This reverses the position of the motor-fan unit within the casing so that the inlet 56 draws air from the atmosphere through the opening 62. This air is expelled under substantial pressure through the openings 58 in the motor housing and passes through the perforated partition 40, thus exerting a pressure on the exterior of the dust container 20, which pressure is ample to eject the container from the open end of the casing 10. As soon as the motor-fan unit is pivoted far enough to break the suction on the dust container, the spring 38 completely closes the valve 36, so that when the container is ejected from the casing it is completely sealed and no dirt is able to escape therefrom.

The sealed bag may be picked up and thrown away without the dirt contained therein ever coming in contact with the operator's hands. Thereafter, the lever 52 is pivoted counter-clockwise, as viewed in Fig. 2, until arrested by the stop 76, whereupon a new dust container may be inserted. The provision of the rod 64 is desirable in order to prevent accidental pivoting of the motor-fan unit while the cover 18 is in place. If this should take place, the reversed flow of air would blow a substantial percentage of the contents of the bag out through the tubular member 28 and the hose, inasmuch as the tubular member 28 prevents the closure of valve 36.

In the embodiment illustrated in Figs. 3 through 7, a compression spring is employed for ejecting the dust container from the cleaner casing. The casing is again designated by reference character 10 and at the exhaust end is provided with a cap 60 having an exhaust opening 62. A motor fan unit 98 is fixed within the casing by means of a suitable support 100 which provides an air tight seal between the casing and the motor fan unit.

A cylindrical member 130 is arranged to extend between the fan housing 132 and the casing 10 with its right end bearing against and being centered by the support 100. The opposite end of this cylindrical member is formed with an inwardly extending flange 134 which bounds an opening which is preferably larger than the inlet to the fan housing. A compression spring 136 has one end secured to flange 134 in any suitable manner, while the other end of the spring is secured to an annular disc 138. This disc is con-

5

connected by spaced members 140 to another disc 142 which is secured to a ring 144. The ring is secured within the open end of a cylinder 146, the outer diameter of this cylinder being slightly less than the inner diameter of casing 10 so that the former may easily slide within the latter. The length of the cylinder should be sufficient to prevent it from tilting and binding within the casing. If desired a wire mesh screen or the like 148 may be carried by the annular disc 142 and a similar screen 150, but preferably of finer mesh may be carried by the disc 138. A ring 151 is removably secured within the left end of casing 10 and acts as a stop for cylinder 146 when the latter is moved to the left by spring 136.

A lever 152 is pivotally mounted on a suitable bracket 154 extending outwardly from one side of the casing 10. One end of the lever is formed with a latch 156 which extends through an opening formed in the side of casing 10. The right edge of latch 156 is normal to the casing wall while the end edge of the latch is beveled. A compression spring 158 is disposed between the lever 152 and the casing so as to tend to pivot the lever in counterclockwise direction to thus move the latch 156 into the casing. The opposite end of the lever is provided with a manually engageable portion such as the button 160. This end of the lever overlies one end of a lever 162 which is pivoted on a suitable bracket 164. A compression spring 166 is disposed between the side of the casing and lever 162, while the opposite end of this lever is provided with a latch 168 which serves to retain a front end cover 170 in closed position. A ring 172 is secured to the outside of casing 10 and the cover 170 is pivotally connected to this ring by means of a hinge 174. Included in the hinge structure is a spring 176 which tends to pivot the cover to open position. A cover plate 177 is provided for concealing the major portions of levers 152 and 162.

The construction of the inner face of the cover 170 is shown more in detail in Figs. 6 and 7. As there shown, the cover is formed with an annular ring 178 at its periphery and with a tubular projection 180 extending inwardly from the hose coupling 182. A small projection 184 is provided a short distance radially outwardly from the tubular projection 180. Opposite the hinge 174 the outer face of the cover is formed with a recess 186 which is engaged by the latch 168.

The dust container 20 includes a bag portion 22, preferably of porous paper, secured to a circular disc 24, the outer diameter of which is such that it will be received in an annular seat formed in the ring 172 and clamped in place by the annular projection 178 on the cover 170 when the latter is closed. The disc 24 is formed with a central aperture 20 into which the tubular extension 180 extends.

The arrangement for closing the opening 30 when the bag is to be ejected from the cleaner is shown more particularly in Figs. 4 and 5. Suitably secured to the outer face of the disc 24 is a pair of parallel guide rails 188. A generally rectangular plate 190 is slidably supported by the guide rails and is formed with an aperture 192 therethrough at least as large, and preferably a little larger, than the aperture 30 in the disc 24. Plate 190 is provided with projections 194, while similar projections 196 extend upwardly from the guide rails 188. A rubber band or the like 198 is looped around the projections 194

6

and 196 and consequently tends to move the plate 190 to the right, as viewed in Fig. 4. Prior to the introduction of the bag into the casing the plate 190 is retained in the position shown in Fig. 4 by means of a projection 200 struck up from the material of the disc 24. This projection is so positioned as to be contacted by the projection 184 on the front cover when the latter is closed so as to force the projection 200 out of the path of travel of the plate 190. In order to assure that the dust container will be placed in the casing in the proper position so that these two projections will be in alignment, the disc 24 is preferably formed with a notch 202 into which extends a similar shaped projection formed in the annular seat of ring 172. The distance from the left end edge of the plate 190 to the aperture 192 is greater than the diameter of the aperture 30 in the disc 24 so that, when the plate 190 is moved to the right under the action of the rubber band 198 the aperture 30 will completely closed.

The above described device operates as follows:

After a dust container has been ejected from the cleaner in a manner to be described hereinafter, the spring 136 has moved the cylinder 146 to the left, as viewed in Fig. 3, until the left end of the cylinder strikes the internal ring 151 at the end of the casing 10. When it is desired to insert a new dust container, the operator most conveniently stands the cleaner on end and presses against the screen 148 so as to force the cylinder 146 towards the exhaust end of the cleaner, thus compressing spring 136. As soon as the left end of the cylinder 146 passes the latch 156, the spring 158 pivots the lever 152 in counterclockwise direction so as to project the latch 156 inwardly to thus retain the cylinder in this position. Thereafter, the dust container 20 is introduced into the open end of the casing and the notch 202 in the periphery of the disc 24 is lined up with the corresponding projection on the ring 172. Thereupon, the cover 170 is pivoted to closed position. During closure of the cover the edge thereof strikes the beveled surface of the latch 168 pivots the arms 162 in counterclockwise direction so that the latch may snap into the recess 186 in the cover to hold the cover closed. However, this pivoting of the lever 162 does not cause any pivoting of the lever 152 and hence, the cylinder 146 is not released. When the cover is closed the projection 184 thereon strikes the projection 200 on the disc 24 so as to force the projection 200 out of the path of travel of the valve plate 190. However, the plate cannot be moved to closed position by the rubber band 198 because the tubular extension 180 on the front end cover extends through the aperture 192 in the valve plate, and also because the projection 184 on the cover is now located in the path of travel of the plate.

During cleaning, dust laden air is drawn in through the hose coupling 182 and passes through the tubular extension 180 to the interior of the dust container 20. The air passes through the porous material of the bag portion 22 to the inlet of the fan and is finally discharged through the exhaust opening 62, the dust being retained in the dust container.

When it is desired to remove the bag the motor is shut off and pressure is applied to the button 160. This causes the lever 152 to pivot in a clockwise direction, which in turn causes the lever 162 to pivot in a counterclockwise direction. The

relative lengths of the lever arms and the location of their pivot points are such that the latch 163 releases the cover 170 before the latch 156 releases the cylinder 146. As soon as the cover is released, the spring 176 pivots it to open position. When the tubular projection 180 has been withdrawn from the opening 192 in the valve plate 190 and the projection 184 has been moved out of the path of travel of this plate by the opening of the cover, the rubber band 198 quickly moves the plate to the right as viewed in Fig. 4, so as to seal the aperture 30 in the disc 24. An instant after the cover is opened the latch 156 releases the cylinder 146, whereupon the latter is moved suddenly to the left by the energy stored in the compressed spring 136 so as to force the sealed dust container out of casing 10.

If desired, the guide rails 183 and the valve disc 190 may be made of metal, but due to the fact that it is necessary for this valve to operate only once, these parts may be made of cardboard or any other relatively cheap and fairly stiff material so as to maintain the cost of the disposable dust container at a minimum.

If it is desired to open the cover 170 without having the bag ejected, this may be done by inserting a finger into the recess 186 and exerting force against the latch 168 to pivot the lever 162 counter-clockwise. This does not cause pivoting of the lever 152 and hence the cylinder 146 is not released.

In Figs. 8 and 9 there is shown a dust container, suitable for use in the vacuum cleaner illustrated in Fig. 3, and differing from the container shown in Figs. 4 and 5 in the construction of the valve for closing the inlet 30 to the container. This dust container includes a circular disc 24 preferably made of cardboard and formed with a centrally located aperture 30. Fixed to the front of the disc 24 by means of rivets or the like 204, or by adhesive, is a valve guide member 206 which is spaced from the disc by the thickness of a flat member 208. A valve plate 210 is pivotally mounted on the disc 24 at 212 and has the configuration best illustrated in Fig. 9. The thickness of the plate 210 is preferably slightly less than that of the member 208 so that the valve plate may move without binding between the disc 24 and the guide 206. A spring member, such as the rubber band 214, is connected between the pivotal valve plate and the fixed guide member, or any other fixed point on the disc 24, and tends to pivot the plate in clockwise direction from the open position shown in Fig. 9 to the closed position illustrated in Fig. 8. In the latter position the edges 216 and 218 of the valve plate abut against the edges of the member 208 so as to limit movement of the plate under the action of the action of the rubber band.

A displaceable abutment 220, which may be similar to the projection or abutment 200 shown in Fig. 4, is struck up from the surface of the disc 24 and serves to retain the valve plate in open position prior to placing the dust container in the vacuum cleaner. As was described in connection with Figs. 4 through 7, when the front end cover 170 is closed, a projection 184 thereon strikes the struck up projection 220 and forces it down flush with the surface of the disc 24. The valve plate 210 is still retained in open position, however, by its striking either the tubular extension 180 or the projection 184 on the front end cover as long as the cover remains closed. When the cover is opened, the valve plate is free to pivot clockwise under the action of the rub-

ber band and consequently closes the aperture 20. It will be noted that the lower end of the valve member passes under the lower end of the guide 206 and hence is prevented from accidentally bending away from the disc 24.

If desired, the valve plate may be provided with a finger hole 222 whereby it may be initially pivoted to the open position. However, this will ordinarily be done at the time the bag is manufactured and the valve plate will remain open prior to its introduction into the cleaner and during the use of the container in the cleaner and will be opened only when the front cover is closed. Particularly in view of the fact that normally this valve has to operate only once, all of the parts may be made of cardboard or other relatively cheap material.

This bag is used in the cleaner shown in Fig. 3 in the same manner as is the bag illustrated in Figs. 4 and 5, and therefore a detailed description of the operation of the cleaner in conjunction with this bag is unnecessary.

While I have shown and described more or less specific embodiments of my invention it is to be understood that this has been done for purposes of illustration only, and that the spirit or scope of my invention is not to be limited thereby but is to be determined from the appended claims.

Certain subject matter, disclosed but not claimed herein, constitutes the claimed subject matter of my copending divisional applications Serial No. 197,443, filed November 24, 1950, and Serial No. 223,420, filed April 27, 1951.

What I claim is:

1. In a vacuum cleaner, a casing, means for producing flow of air through said casing, a dust bag, a member hinged to said casing for removably securing said bag in said casing in the path of the air for separating dirt therefrom and for containing the separated dirt, a compressable spring for moving said dust bag outwardly from said casing, means for restraining said spring from exerting force on said bag, and means releasing said spring to exert force against said bag to move the latter outwardly from said casing.

2. In a vacuum cleaner, a casing, means for producing flow of air through said casing, a dust bag removably secured in said casing in the path of the air for separating dirt therefrom and for containing the separated dirt, said dust bag having an opening through which the air and dirt enter the bag, a compressable spring for moving said dust bag outwardly from said casing, means for restraining said spring from exerting force on said dust bag, means for closing said opening to seal the dirt in the bag, and means releasing said spring to exert force against said bag to move the latter outwardly in sealed condition from said casing.

3. In a vacuum cleaner, a casing having an opening, a cover for closing said opening, means biasing said cover to open position, holding means for maintaining said cover closed, a dust bag insertable into and removable from said container through said opening, means for producing flow of air through said casing and through the dust bag therein, means independent of said cover biasing means to move said dust bag outwardly, and means operable to release said holding means for opening said cover and to operate the means for moving said bag.

4. In a vacuum cleaner, a casing having an opening, a dust bag of flexible material inserta-

ble into said casing through said opening, means for producing flow of air through said casing and through the dust bag therein, means connected to said casing and operable to exert force against the inner end of said bag to move the latter outwardly through said opening, means for restraining the last mentioned means from exerting force against said dust bag, and means for releasing said restraining means.

5. In a vacuum cleaner, a casing having an opening, a cover for said opening hinged to said casing, a dust bag of flexible material insertable into said casing through said opening, means for producing flow of air through said casing and through the dust bag therein, means connected to said casing and operable to exert force against the inner end of said bag to move the latter outwardly through said opening, means for restraining the last mentioned means from exerting force against said dust bag, means for opening said cover, and means for releasing said restraining means.

6. In a vacuum cleaner, a casing having an opening, a dust separating and containing member comprising an elongated bag portion of flexible material secured at one end to a transverse plate portion of relatively stiff material, said member being insertable into said casing through said opening with said plate seating in said opening, a member hinged to said casing adjacent to said opening and movable to secure said plate in seated position, means operable to exert force against the end of said bag portion opposite said one end to move said dust containing member outwardly through said opening, means for restraining the last mentioned means from exerting force against said bag portion, and means for moving said hinged member away from said opening and for releasing said restraining means.

7. In a vacuum cleaner, a casing having an opening, a dust separating and containing member comprising an elongated bag portion of flexible material secured at one end to a transverse plate portion of relatively stiff material, said member being insertable into said casing through said opening with said plate seating in said opening, a member hinged to said casing adjacent to said opening and movable towards said opening to secure said plate in seated position, a first latch member for holding said hinged member in plate securing position, means biasing said hinged member away from said opening, spring means for exerting force against the end of said bag portion opposite said one end to move said dust containing member outwardly through said opening, a second latch member for retaining said spring in stressed condition and for restraining the spring from exerting force against said bag portion, and means for releasing both of said latch members.

8. In a vacuum cleaner, a casing having an opening, a movable cover for closing said opening, a releasable latch for maintaining said cover closed, a dust bag insertable into and removable from said casing through said opening, means for producing flow of air through said casing and through the dust bag therein, means operable to exert force against said dust bag to move the latter outwardly through said opening, a second latch for restraining the last mentioned means from exerting force against said dust bag when said cover is closed, means for releasing the first latch, means for releasing the second latch, and means precluding release of the second latch prior to the first.

9. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a collapsible dust bag insertable into said compartment, a member movable through said compartment towards said opening for displacing said bag outwardly through said opening, means connected to said housing and operable to effect movement of said member, and releasable means for restraining movement of said member.

10. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a collapsible dust bag insertable into said compartment, a member movable through said compartment towards said opening for displacing said bag outwardly through said opening, spring means connected at one end to said housing and operable to effect movement of said member, a movable closure for said opening, releasable means for restraining movement of said member, and means for opening said closure and for releasing said releasable means.

11. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a collapsible dust bag insertable into said compartment, a member separate from said dust bag and movable through said compartment toward said opening for displacing said bag outwardly through said opening, spring means operable to effect movement of said member, a movable closure for said opening, releasable means for restraining movement of said member while said closure is closed, means for opening said closure, and means operable when said closure is open for releasing said releasable means.

12. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a collapsible dust bag insertable into said compartment, a member movable through said compartment towards said opening for displacing said bag outwardly through said opening, resilient means connected to said housing for moving said member towards said opening, said means being stressable by manual movement of said member in the opposite direction, and releasable means for retaining said resilient means in stressed condition and restraining movement of said member.

13. In a vacuum cleaner, a casing having an opening, a dust separating and containing member comprising a bag portion of flexible material secured to a plate portion of relatively stiff material, said bag portion being insertable into said casing through said opening with said plate seating in said opening, structure movably mounted with respect to said casing adjacent to said opening and movable towards said opening to secure said plate in seated position, means movable to exert force against said member to move the latter outwardly through said opening, said means being inoperative to exert force against said member when said structure is in plate securing position, and means for moving said structure away from said opening and for moving the first-mentioned means to exert force against said member.

14. In a vacuum cleaner, a casing having an opening, a dust separating and containing element comprising a bag portion of flexible material secured to a plate portion of relatively stiff material, said bag portion being insertable into said casing through said opening with said plate seating in said opening, structure movably mounted with respect to said casing adjacent to said opening and movable towards said opening to secure said plate in seated position, a member

11

movable within said casing towards said opening to move said element outwardly through said opening, releasable means for restraining movement of said member, and means for moving said structure away from said opening and for releasing said releasable means.

15. A casing having an opening, a disposable dust bag insertable in and removable from said casing through said opening and having a self-sealing opening, a releasable member for said casing opening to hold said bag in said casing, an air duct through said member in disconnectable, sealed communication with the inside of said bag through said bag opening, means for restraining said member in closed position, force exerting means for moving said bag outwardly, means for restraining operation of said force exerting means, and control means for releasing each of said restraining means to permit the opening of said member and the outward movement of said bag.

16. A casing having an opening, a disposable dust bag insertable in and removable from said casing through said opening and having a self-sealing opening, a releasable member for said casing opening to hold said bag in said casing, means biasing said releasable member towards open position, an air duct through said member in disconnectable, sealed communication with the inside of said bag through said bag opening, means for restraining said member in closed position, force exerting means for moving said bag outwardly, means for restraining operation of said force exerting means, and control means for releasing each of said restraining means to permit the opening of said member and the outward movement of said bag.

17. In a vacuum cleaner a rigid casing, a dust bag within said casing, said bag having a self-closing inlet aperture at one end thereof, suction means within said casing arranged to draw dirt-laden air into said bag and dirt-free air from said bag, said casing having an opening for insertion and removal of said bag, movable means for said opening to hold the inlet end of said bag, and an air duct through said movable means connected by a detachable but substantially airtight union with said bag and arranged to maintain said bag inlet open when so attached, said movable means when moved to open position releasing said bag for removal from said casing and detachment from said air duct.

18. In a vacuum cleaner, a rigid casing for air flow therethrough having an opening for insertion and removal of a dust bag, a disposable dust bag in said casing to filter air therethrough, means within said casing for producing air flow into and through said bag and out of said casing, said dust bag having a self-closable aperture at one end thereof for admitting air therinto, and a removable member for said opening to clamp said end of said bag against said casing, and means effective when said member is in clamping position to prevent self-closing of said bag aperture and when said member is in open position to permit self-closing of said bag aperture.

19. In a vacuum cleaner, a rigid casing having an opening, a disposable dust bag insertable into and removable from said casing through said opening, said dust bag being made of flexible material and having a relatively rigid member secured to its open end, means forming a self-closing air inlet through said member, means movably securable to said casing at the opening therein to clamp said member against said casing

12

and to open said self-closing opening, means including a motor-fan unit in said casing for drawing air through said bag, and means in said casing operable to expel a dust laden bag outwardly of said casing.

20. In a vacuum cleaner, a casing forming a dust bag compartment having an opening, a member movably mounted over said opening, a dust bag removably disposed in said compartment and retained therein by said member, means in said casing to exert force toward said opening against said bag to move said bag outwardly, a first element carried by said casing and operable to permit opening movement of said member, a second element carried by said casing operable to permit outward movement of said bag by said force exerting means, and means precluding operation of said second element prior to operation of said first element.

21. In a vacuum cleaner, a casing having an opening for the reception of a dust bag, means for producing flow of air through said casing, a dust bag removably mounted in said casing through said opening in the path of the air for separating dirt therefrom and for containing the separated dirt, said dust bag having a self-closing opening for admitting the air therinto, and a member mounted to be movably applied to said casing opening, said member having a connection for an external hose and an air entry passage including a conduit portion adapted when said member is applied to project through said bag opening and to maintain it in open position and direct the inflowing air into said bag, said bag opening acting to close itself upon withdrawal of said conduit portion when said member is retracted.

22. In a vacuum cleaner, a casing having an opening for the reception of a dust bag, means for producing flow of air through said casing, a dust bag removably mounted in said casing through said opening in the path of the air for separating dirt therefrom and for containing the separated dirt, said dust bag having a self-closing opening for admitting the air therinto, a member adapted to be movably applied to said casing opening, said member having a connection for an external hose and an air entry passage therethrough including a conduit portion adapted when said member is applied to said opening to project through said bag opening and to maintain it in open position and direct the inflowing air into said bag, means biasing said member to a retracted position, means for releasably restraining said member in applied position, means for releasing said restraining means whereby said member is moved to retracted position thereby withdrawing said conduit portion and permitting the bag opening to close, and means for moving the sealed bag outwardly.

23. In a vacuum cleaner, a casing having an opening, a dust separating and containing element comprising a bag portion of flexible material secured to a plate portion of relatively stiff material, said bag portion being insertable into said casing through said opening with said plate seating in said opening, structure movably mounted with respect to said casing adjacent to said opening and movable towards said opening to secure said plate in seated position, a member movable within said casing towards said opening to move said element outwardly through said opening, resilient means for moving said member towards said opening, said resilient means being stressable by manual movement of

13

said member in the opposite direction, releasable means for restraining movement of said member towards said opening, and means for moving said structure away from said opening and for releasing said releasable means.

24. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a dust bag insertable into and removable from said compartment, an element hinged to said housing and movable towards said opening for retaining said dust bag in place in said housing, releasable means for holding said element in bag retaining position, a member movable through said compartment towards said opening for displacing said bag outwardly, resilient means for moving said member towards said opening, said means being stressable by manual movement of said member in the opposite direction, and releasable means for retaining said resilient means in stressed condition and restraining movement of said member.

25. In a vacuum cleaner, a housing forming a dust bag compartment having an opening, a dust bag insertable into and removable from said compartment, an element hinged to said housing and movable towards said opening for retaining said dust bag in place in said housing, a first latch for holding said element in bag retaining position, a member movable through said compartment towards said opening for displacing said bag outwardly, resilient means for moving said member towards said opening, said means being stressable by manual movement of said member in the opposite direction, a second latch for retaining said resilient means in stressed condition and restraining movement of said member, and means for releasing said first latch and for subsequently releasing said second latch.

14

26. In a vacuum cleaner, a casing having an opening, a cover for closing said opening, means biasing said cover to open position, holding means for maintaining said cover closed, a dust bag insertable into and removable from said casing through said opening, means for producing flow of air through said casing and through the dust bag therein, means independent of said cover biasing means to move said bag outwardly, and means operable to release said holding means for opening said cover and to operate the means for moving said bag and selectively operable to release said holding means without operating said means for moving the bag.

GEORGE H. CRANMER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,233,408	Shanahan	July 17, 1917
1,402,559	Wright	Jan. 2, 1922
1,797,409	Farmer	Mar. 24, 1931
2,022,249	Lofgren	Nov. 26, 1935
2,070,674	Muentener	Feb. 16, 1937
2,218,169	Hudson	Oct. 15, 1940
2,290,597	Leathers	July 21, 1942
2,325,820	White	Aug. 3, 1943

FOREIGN PATENTS

Number	Country	Date
469,379	Great Britain	July 23, 1937
515,927	Germany	Oct. 31, 1929