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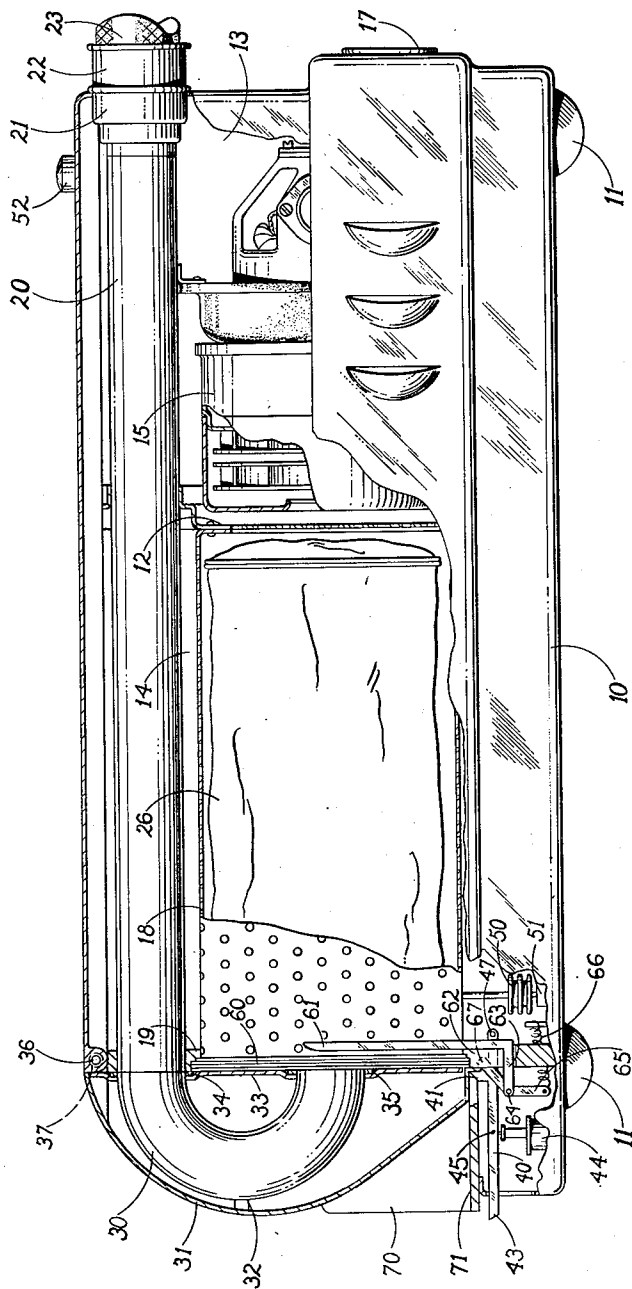
G. E. LOFGREN
SUCTION CLEANER

2,567,221

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3 Sheets-Sheet 1

Fig. 1



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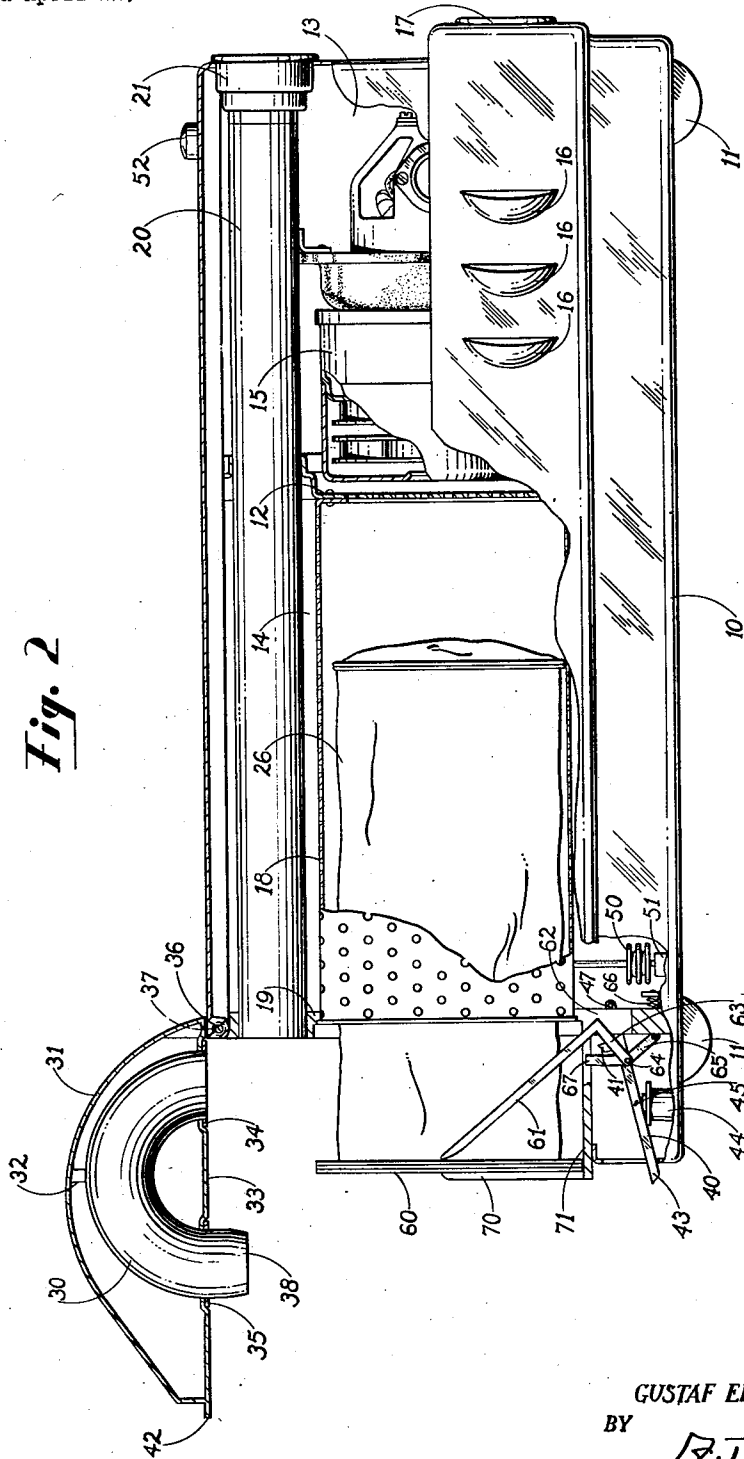
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Fig. 2



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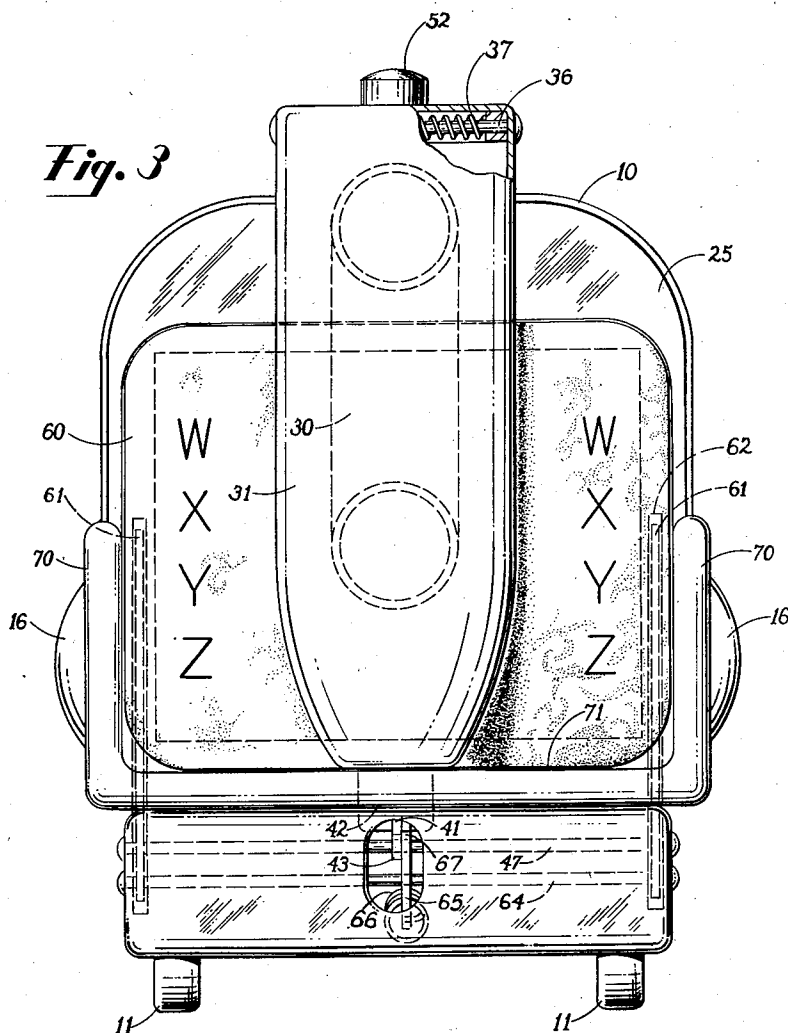
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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SUCTION CLEANER

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12 Claims. (Cl. 183—44)

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This invention relates to suction cleaners and is particularly concerned with the problems of dirt disposal, in connection with cleaners in which the dirt is accumulated in receptacles positioned within the cleaner casing.

It is among the general objects of the invention to provide a novel, simple and improved cleaner in which the structural features cooperate to provide a device of compact structure, economically manufactured and of improved simplicity in operation.

A further object of this invention is to provide a suction cleaner having a dust receptacle comprising a porous bag provided with a substantially rigid end structure or closure disk, the latter forming a complete seal for the open end of the cleaner and being held in position by a closure member which only partially covers the disk, the closure member simultaneously upon its being closed inserting a dust conveying tube through an opening in the disk whereby airborne dust is introduced directly into the porous bag portion of the dust receptacle.

A further important object of the invention is to provide a device of the character set forth in which automatic means are provided which function in response to variations in cleaning efficiency of the device for automatically initiating an operating cycle by which the dirt receptacle is disposed for convenient removal and replacement by a clean receptacle.

Other objects and features of the present invention will be apparent from the accompanying drawings, in which:

Fig. 1 is a side elevation partly broken away showing one form of the invention in a normal operating position;

Fig. 2 is a similar view showing the device in receptacle disposal position; and,

Fig. 3 is a front elevation of the device in the position shown in Fig. 1.

Reference to the accompanying drawings may be had for a consideration of the specific structure here shown by way of illustrating the inventive concept involved. In the drawings numeral 10 indicates the cleaner housing which is of substantially cylindrical form and is adapted to be horizontally supported on the floor, rug or suitable surface by spacing means such as casters 11 or their equivalent. The housing 10 is provided with a vertically disposed apertured bulkhead 12 which divides the housing into a forward motor-fan unit chamber 13 and a rearward dirt separating and accumulating receptacle chamber 14. Within the chamber 13 there is

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mounted a motor-fan unit 15 which may be of conventional design and by which air flow forwardly through the housing 10 and through the bulkhead 12 is induced. Air thus induced through the housing may be conveniently discharged through the sides of the compartment 13 through louvers 16. If, however, it is desired to make use of the air pressure produced by the motor-fan unit the air may be discharged through a hose receptacle 17 at the forward end of the compartment 13 to which a hose may be applied for directing such air pressure if desired.

The housing 10 is provided with a longitudinally extending air conduit 20, the forward end of which terminates in a hose receptacle 21 to which may be applied the connector element 22 of the cleaning hose 23. The conduit 20 may extend longitudinally through the housing either as a dividing baffle between the external walls of the housing 10 and the compartments 13 and 14 or as a tube extending through these compartments and through the bulkhead 12.

The rear end of the compartment 14 has an open end fitted with a rabbeted circumferential seat member 25 which is adapted to receive, seat and seal the edge flanges of a dirt separating and accumulating receptacle 26, the structure of which will be hereinafter described.

Mounted within the compartment 14 there is provided an apertured receptacle guiding and supporting shell 18, the forward end of which is secured to the bulkhead 12, while the opposite end is secured as by a flange 19 to the seat member 25.

For delivering dust-laden air from the tube 20 to the receptacle 26 there is provided a U-shaped tube 30 which is mounted within a housing 31 and is supported from the external wall of the housing as at 32 and from the internal wall 33 of the housing through which it extends. Suitable packing is provided as at 34 and 35 for sealing the tube for its connection with the conduit 20 and with respect to the receptacle 26, respectively. The housing 31 is pivotally connected with the casing 10 as by means of a pintle 36, a spring 37 being provided to normally bias the housing and tube to the upward opened position shown in Fig. 2. The tube 30 is provided with a lower terminal end 38 which extends inwardly from the wall 33 so as to be inserted within the receptacle 26 when the housing is in its closed position shown in Fig. 1.

For securing the housing in its lower or closed position with the end 38 of the tube 30 inserted within the receptacle 26 there is provided a latch

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40, a latching tongue 41 of which is adapted to engage a centrally disposed depending lip 42 of the housing 31. The latch 40 may be under the control of the operator who may release the housing 31 by depressing the forward end 43 thereof. However, it is preferable to provide for automatic actuation of the latch. Such automatic actuation is accomplished by means of the solenoid 44 which engages the latch as at 45 whereby energization of the solenoid will cause the latch to pivot about its pivotal point 47 centrally of the casing 10, thus depressing the tongue 41 and releasing the lip 42 permitting the spring 37 to raise the housing 31 and the tube 30 to the opened position shown in Fig. 2.

For automatically energizing the solenoid so as to release the tube 30 when the receptacle has retained such quantities of dirt as to reduce the air flow therethrough, thus diminishing the efficiency of the cleaning action, there is provided a Sylphon bellows 50 which is subjected to the pressure conditions within the chamber 14 exteriorly of the receptacle 26. A switch 51 is provided, the arrangement being such that as air flow is diminished due to clogging of the receptacle and suction is thus increased externally of the receptacle, the Sylphon 50 will respond to close the switch 51, thus energizing the solenoid 44 whereby the tongue 41 will release the housing and the tube 30 will be withdrawn. If desired, the solenoid may also cause de-energization of the motor-fan unit 15 and if desired, time delay means may be provided so that the release by energization of the solenoid 44 may be subsequent to a de-energization of the motor-fan unit. It will be understood that such an arrangement bypasses the normal control of the motor-fan unit by the switch 52. For further consideration of the possible operating arrangements which may be used for releasing the housing 31 reference may be had to the copending application of Ferman C. Doughman, Serial No. 676,318, filed June 12, 1946 which discusses the theory of such actuating devices in detail.

The receptacle 26 is preferably of the type set forth in the copending application of Leon P. Borkoski, Serial No. 641,992 filed January 18, 1945 and comprises a body of flexible porous material and a substantially rigid front end 60, the edges of which extend in flange fashion beyond the walls of the body and are adapted to be seated within the rabbeted recess of the member 25, thus sealing compartment 14. The end 60 is provided with a central aperture through which the end 38 of the tube 30 projects when the cover is closed, thus insuring the passage of all the air taken in through the hose 23 through the receptacle 26. The aperture of the end 60 of the receptacle is preferably provided with a self-closing means in the form of flexible sheets which are pushed apart and separated when the end 38 of the tube 30 is inserted and which re-close when the end is withdrawn so as to provide a self-closing receptacle. It is preferable that the receptacle including its end members be made of inexpensive material, such as paper so that the bag may be disposed of when filled without materially increasing the cost of the operation of the device.

It is desirable in the structure of the type set forth to provide means for automatically unseating the end 60 of the receptacle 26 from the rabbeted aperture in the member 25 when the tube 30 is withdrawn therefrom and to this end there is provided a pair of upstanding actuator arms

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61 which are adapted to move through recess 62 in the member 25. The lower ends of the arms 61 are turned abruptly forward as at 63 and are mounted on and for rotation with a transversely extending rod 64 to the center of which there is mounted and fixed thereto an arm 65 having a depending portion which is engaged by a tension spring 66 normally urging the rod 64 towards counter-clockwise rotation. The arm 65 also includes an upwardly extending projection 67 which is adapted to be engaged by the lip 42 of the housing 31 in such manner that when the housing is closed the rod 64 is rocked in clockwise direction against the tension of spring 66 and is retained in that position with the arms 61 extending vertically in slightly spaced relation with respect to the end 60 of the receptacle 26. It will thus be seen that with this arrangement when the housing 31 is released, the lip 42 will move under the tension of spring 37 outwardly from the end 67 of the arms 65, whereupon the spring 66 will cause counter-clockwise rotation of rod 64 and thus the arms 61 will be moved to engage the end 60 of the receptacle 26 to move the receptacle forwardly so as to disengage it from its seat in the member 25, thus breaking the seal established thereby and presenting the receptacle for convenient disposal.

An important feature of the present invention is the arrangement of the side walls of the casing 10 which extend forwardly of the member 25 to form guide surfaces 70 and the lower portion of the casing 10 is extended forwardly to form a similar guide surface 71. The surfaces 70 and 71 are contiguous with the rabbet of the member 25 so that, when the housing 31 is raised, the side surfaces 70 and the lower surface 71 form a guide channel which receives the rigid end member 60 of the receptacle 26, guiding it into a secure sealing fit within the rabbet of the member 25, thus eliminating the difficulties which might be otherwise encountered in securely seating the rigid member 60. This arrangement permits the receptacle 26 to be only partially inserted within the member 25 and thereafter upon pivotal movement of the tube 30 and its housing, the end 38 will enter the receptacle and a further movement thereof will push the end 60 into its seat it being guided in this movement by the surfaces 70 and 71.

Another advantageous feature of the present arrangement lies in the fact that while the tube 30 is down, the arms 61 do not bear against the end member 60 because of the engagement of the lip 42 with the arm 67, thus relieving tension applied by the spring 66. When the tube is released and raised, the arms 61 pivotally move at once to engage and thrust against the end 60 of the receptacle. However, no time delay device permitting full opening of the tube 30 to position shown in Fig. 2 before thrust is applied to the member 60 is required since, even though the motor is de-energized with the energization of solenoid 44, the receptacle will not move until a diminution of suction as gradually results from cessation of fan operation, permits the energy of spring 66 to overcome the suction.

In the operation of the device with the receptacle inserted and the tube lowered as shown in Fig. 1, energization of the motor-fan unit 15 by actuation of the switch 52 will cause air to be drawn through the hose 23, conduit 20 and tube 30 to be discharged into the receptacle 26 from which clean air may be discharged through the louvers 16 or the outlet 17. When the receptacle

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is so charged with dust, dirt or other foreign matter as to build up a resistance to air flow that endangers the efficiency of the cleaning operation the Siphon 50 will be actuated, thus closing switch 51 and releasing the tube and its housing 5 which will move under the tension of spring 37 to the raised position shown in Fig. 2. Such movement of the housing 31 also releases the end 67 of the arm 65 which will be moved by spring 66 to rock the rod 64 which will cause the arms 61 to move forwardly from their vertical positions behind and in spaced relation to the end 60 of the receptacle 25 to engage the end 60 and move it forwardly between the guide surfaces 70 and upon the guide surface 71 to a position where it may be readily grasped.

When it is desired to again use the device a new receptacle is inserted, its rigid end 60 being loosely positioned between the guide surfaces 70 and upon the guide surface 71 whereupon the tube 30 and its housing 31 is lowered and the tube end 38 is thus inserted through the end 60 which, together with the member 33 of the housing will push the end 60 for guided movement by the guide surfaces 70 and 71 to insert the end 60 securely within the rabbet 25 whereupon the device is ready for a further cycle of cleaning operation.

It will be understood from the foregoing description and the drawings that the housing 31 of the U-shaped tube 30 is of much lesser width than the width of the rigid end of the dust bag which in turn is of the size and configuration of the mouth of the receptacle compartment. Thus with the receptacle in position its front face constitutes an exposed surface of the cleaner combination and may thus bear indicia or conforming decorative matter combining with the casing to form a cooperating design. Another feature of this arrangement is that the front surface of the receptacle may be held by hand in seated relation with the member 25, while the tube 30 is lowered. No danger of catching the fingers while thus holding the front of the receptacle is involved. The rigidity of the front of the receptacle is such as to permit its use as a sealing closure for the mouth of the compartment and avoids the necessity of the full width sealing cover member heretofore used.

It will be understood, of course, that numerous changes and modifications of the structural embodiment herein presented may be resorted to without departure from the invention as outlined by the appended claims.

What I claim is:

1. In a suction cleaner, a casing having an opening at one end thereof, a dust receptacle chamber in said casing adjacent said opening, a dust receptacle comprising a porous bag portion insertable and removable from said chamber through said opening and a rigid end structure permanently secured to said porous bag portion and adapted to close and seal the opening of said casing, a hose connection at the opposite end of said casing from said opening, conduit means extending from said connection to the end of said casing adjacent the opening, means for retaining the rigid end structure in closing and sealing position comprising a member of substantially less width than the rigid end structure, and a U-shaped tube carried by said member for connecting said conduit means with the interior of said receptacle.

2. In a suction cleaner, a casing having an opening at one end thereof, a dust receptacle

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chamber in said casing adjacent said opening, a dust receptacle comprising a porous bag portion insertable and removable from said chamber through said opening and a rigid end structure permanently secured to said porous bag portion and adapted to close and seal the opening of said casing, a hose connection at the opposite end of said casing from said opening, conduit means extending from said connection to the end of said casing adjacent the opening, means for retaining the rigid end structure in closing and sealing position comprising a member of substantially less width than the rigid end structure, a U-shaped tube carried by said member for connecting said conduit means with the interior of said receptacle, and means operable upon releasing the end structure retaining means to move said receptacle outwardly of said chamber.

3. In a suction cleaner, a casing having an opening at one end thereof, a dust receptacle chamber in said casing adjacent said opening, a dust receptacle comprising a porous bag portion insertable and removable from said chamber through said opening and a rigid end structure permanently secured to said porous bag portion and adapted to close and seal the opening of said casing, a hose connection at the opposite end of said casing from said opening, conduit means extending from said connection to the end of said casing adjacent the opening, means for retaining the rigid end structure in closing and sealing position comprising a member of substantially less width than the rigid end structure, a U-shaped tube carried by said member for connecting said conduit means with the interior of said receptacle, guide surfaces extending outwardly from said opening and in line with portions of the periphery thereof, and means operable upon releasing the end structure retaining means to move said receptacle outwardly of said chamber and along said guide surfaces.

4. In a suction cleaner, a casing having an opening at one end thereof, a dust receptacle chamber in said casing adjacent said opening, a dust receptacle comprising a porous bag portion insertable and removable from said chamber through said opening and a rigid end structure permanently secured to said porous bag portion and adapted to close and seal the opening of said casing, a hose connection at the opposite end of said casing from said opening, conduit means extending from said connection to the end of said casing adjacent the opening, means for retaining the rigid end structure in closing and sealing position comprising a member of substantially less width than the rigid end structure, a U-shaped tube carried by said member for connecting said conduit means with the interior of said receptacle, means adapted to contact said rigid end structure and operable to eject said receptacle outwardly of said chamber, and means operable to restrain said receptacle ejecting means from contacting said rigid end structure while the device is in cleaning position, and additional means operable upon releasing the end structure for releasing the restraining means whereby the ejecting means contacts said end structure and moves the receptacle outwardly of said chamber.

5. In a suction cleaner, a casing having an opening at one end thereof, a dust receptacle chamber in said casing adjacent said opening, a dust receptacle comprising a porous bag portion insertable and removable from said chamber through said opening and a rigid end structure permanently secured to said porous bag portion

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and adapted to close and seal the opening of said casing, a hose connection at the opposite end of said casing from said opening, a conduit means extending from said connection to the end of said casing adjacent the opening, means for retaining the rigid end structure in closing and sealing position comprising a member of substantially less width than the rigid end structure, a U-shaped tube carried by said member for connecting said conduit means with the interior of said receptacle, means adapted to contact said rigid end structure and operable to eject said receptacle outwardly of said chamber, and means operable to restrain said receptacle ejecting means from contacting said rigid end structure while the device is in cleaning position, and additional means operable upon releasing the end structure for releasing the restraining means whereby the ejecting means contacts said end structure and moves the receptacle outwardly of said chamber, and means for releasing the end structure retaining means operable in response to an increase in the amount of dirt in said receptacle.

6. In a suction cleaner, a rigid casing forming a dust receptacle chamber and having an access opening to said chamber, a porous dust separating and retaining receptacle comprising a porous bag portion insertable into said chamber through said opening and a substantially rigid end structure permanently secured to the bag portion and serving as a closure for said opening, said structure having an inlet opening into said bag portion, a member pivotally mounted with respect to said casing and pivotal to a position covering a portion of said opening for clamping said end structure in position to close said opening, said member being smaller than said opening to thereby expose a portion of said end structure, and a conduit carried by said member for delivering dirt-laden air through said inlet into said receptacle when said member is in clamping position.

7. In a suction cleaner, a rigid casing forming a dust receptacle chamber and having an access opening to said chamber, a porous dust separating and retaining receptacle comprising a porous bag portion insertable into said chamber through said opening and a substantially rigid end structure permanently secured to the bag portion and serving as a closure for said opening, said structure having an inlet opening into said bag portion, a member pivotally mounted with respect to said casing and pivotal to a position covering a portion of said opening for clamping said end structure in position to close said opening, said member being smaller than said opening to thereby expose a portion of said end structure, means for moving said member away from said opening, releasable means for maintaining said member in clamping position, and a conduit carried by said member for delivering dirt-laden air through said inlet into said receptacle when said member is in clamping position.

8. In a suction cleaner, a rigid casing forming a dust receptacle chamber and having an access opening to said chamber, a porous dust separating and retaining receptacle comprising a porous bag portion insertable into said chamber through said opening and a substantially rigid end structure permanently secured to the bag portion and serving as a closure for said opening, said structure having an inlet opening into said bag portion, a member pivotally mounted with respect to said casing and pivotal to a position covering a portion of said opening for clamping said end

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structure in position to close said opening, said member being smaller than said opening to thereby expose a portion of said end structure, means for moving said member away from said opening, releasable means for maintaining said member in clamping position, a conduit carried by said member for delivering dirt-laden air through said inlet into said receptacle when said member is in clamping position, and means responsive to an increase in the amount of dirt in said receptacle for releasing said releasable means.

9. In a suction cleaner, a rigid casing forming a dust receptacle chamber and having an access opening to said chamber, a porous dust separating and retaining receptacle comprising a porous bag portion insertable into said chamber through said opening and a substantially rigid end structure permanently secured to the bag portion and serving as a closure for said opening, said structure having an inlet opening into said bag portion, a member pivotally mounted with respect to said casing and pivotal to a position covering a portion of said opening for clamping said end structure in position to close said opening, said member being smaller than said opening to thereby expose a portion of said end structure, means for moving said member away from said opening, releasable means for maintaining said member in clamping position, a conduit carried by said member for delivering dirt-laden air through said inlet into said receptacle when said member is in clamping position, means for moving said receptacle outwardly through said opening, and means responsive to an increase in the amount of dirt in said receptacle for releasing said releasable means and for actuating said means for moving said receptacle.

10. In a suction cleaner, a casing having an opening in a substantially vertical plane, a dust receiving receptacle comprising a flexible porous bag portion and a substantially rigid end structure secured thereto, said end structure extending laterally beyond said bag portion to provide a flange, said receptacle being movable in a substantially horizontal inwardly direction for inserting said bag portion into said casing through said opening and for seating said flange against the exterior of the portion of said casing bounding said opening, and means for guiding said movement of the receptacle comprising a lower horizontal surface and a pair of vertical side surfaces extending from said casing below and on either side, respectively, of said opening to form a guide channel open at the top and outer end thereof.

11. In a suction cleaner, a casing having an opening in a substantially vertical plane, a dust receiving receptacle comprising a flexible porous bag portion and a substantially rigid end structure secured thereto, said end structure extending laterally beyond said bag portion to provide a flange, said receptacle being movable in a substantially horizontal inwardly direction for inserting said bag portion into said casing through said opening and for seating said flange against the exterior of the portion of said casing bounding said opening, a member hinged to said casing and pivotal towards said opening for engaging said end structure to seat and maintain the flange thereof against said exterior portion of the casing, and means for guiding said movement of the receptacle comprising a lower horizontal surface and a pair of vertical side surfaces extending from said casing below and on either side.

respectively, of said opening to form a guide channel open at the top and outer end thereof.

12. In a suction cleaner, a casing having an opening in a substantially vertical plane, a dust receiving receptacle comprising a flexible porous bag portion and a substantially rigid end structure secured thereto, said end structure extending laterally beyond said bag portion to provide a flange, said receptacle being movable in a substantially horizontal inwardly direction for inserting said bag portion into said casing through said opening and for seating said flange against the exterior of the portion of said casing bounding said opening, spring biased means engageable with said end structure for moving said receptacle in the opposite direction, said spring being stressable by the inward movement of said receptacle, a member hinged to said casing and pivotal towards said opening for engaging said end structure to seat and maintain the flange thereof against said exterior portion of said casing and to stress said spring, and means for guiding the inward movement of the receptacle comprising a lower horizontal surface and a pair of vertical side surfaces extending from said casing below and on either side, respectively, of said open-

ing to form a guide channel open at the top and outer end thereof.

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