

April 19, 1938.

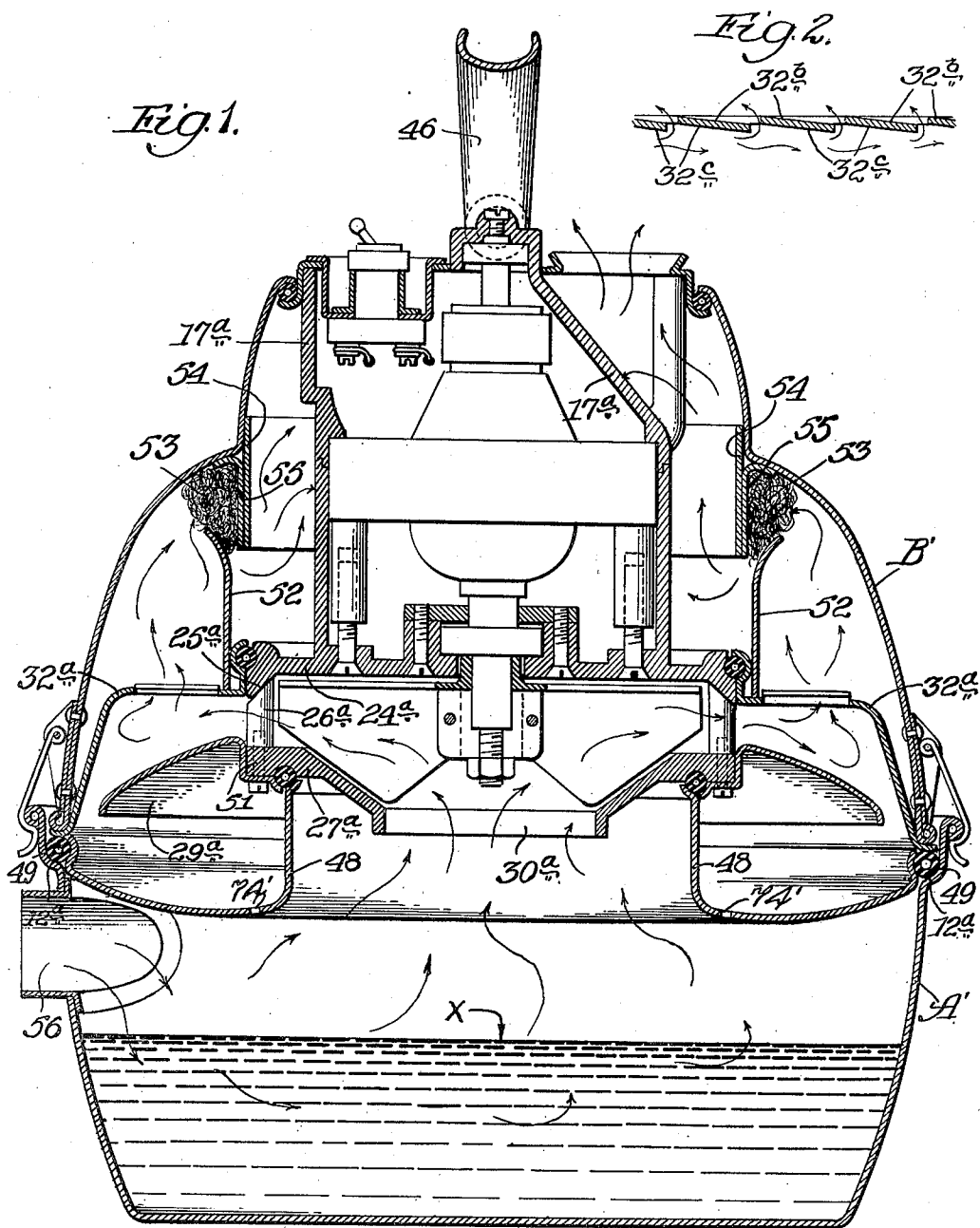
A. JUELSON

2,114,780

SUCTION CLEANER

Filed April 15, 1935

2 Sheets-Sheet 1



Inventor:
Agnes Juelson
By *Dyrenforth, Chittor & Mills*
ATTYS

April 19, 1938.

A. JUELSON

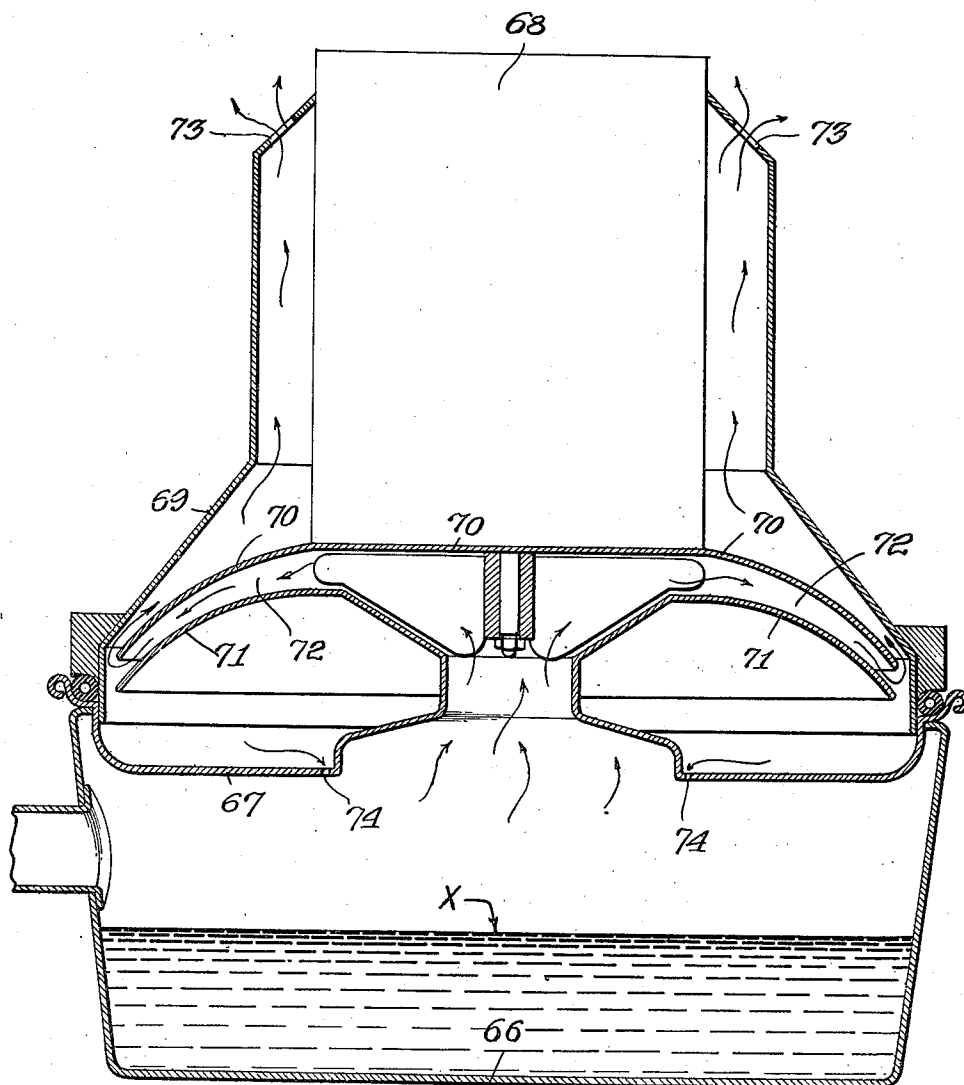
2,114,780

SUCTION CLEANER

Filed April 15, 1935

2 Sheets-Sheet 2

FIG. 3.



Inventor:
Agnes Juelson,
By *Dyrenforth, Lee, Critton & Miles,*
Attys.

UNITED STATES PATENT OFFICE

2,114,780

SUCTION CLEANER

Agnes Juelson, Chicago, Ill.

Application April 15, 1935, Serial No. 16,456

4 Claims. (Cl. 183—24)

This invention relates to a suction cleaner and more particularly to a suction cleaner of the bagless type.

An object of the invention is to provide a suction cleaner which produces a clean separation of the air from dust etc. without the use of fabric bags etc. A further object is to provide a suction cleaner in which water may be drawn from a rug or other object together with the dirt etc. carried by the water. A further object is to provide a suction cleaner in which dust-laden air is brought into contact with a pool of water and agitated therewith, the resulting spray or mist effecting a washing action on the air and aiding particularly the precipitation and removal of the extremely fine dust of the type which usually escapes through the meshes of the conventional bag-type suction cleaner. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated in preferred embodiments, by the accompanying drawings, in which:—

Figure 1 is a vertical sectional view of suction cleaner apparatus embodying my invention; Fig. 2 is a broken sectional detail view illustrating the form of the separator plate; and Fig. 3 is a vertical sectional view of a modified form of cleaner.

The form of device shown in Fig. 1, has a bottom casing as shown at A' and a dust chamber is provided by a tray member 48 which engages the under side of the fan casing 27^a. The outer end of the dust tray 48 engages a cylindrical sealing member 49 received within seat 12^a. The tray 48 may be provided with openings 74' corresponding with the openings 74 shown in Fig. 3.

In the construction shown in Fig. 1, the annular flange 24^a of the casting 17^a is provided with depending integral spaced lugs 26^a to which the fan casting 27^a is secured by small bolts 51. The bolts 51 also secure the deflector plate 29^a in position. The separator plate 32^a is shown provided with slots formed as illustrated more clearly in Fig. 2, the baffles afforded by such slots serving to direct downwardly any dust particles carried by the rotating air annulus, and permitting only the air which has reversed its direction from that of the rotating annulus to escape.

Extending upwardly from the separator plate 32^a is a cylindrical member 52 having an outwardly flared end supporting the filter material 53. A depending cylindrical flange 54 is equipped on its outer side with a filter-engaging member 55 and extends down into the cylindrical member 52.

The inclined surface of deflector ring 25^a provided by the lower flange 24^a of casting 17^a provides an inclined annular face between lugs 26^a which brings about a deflection of the air toward the deflector plate 29^a. It will be noted that the bottom of the deflector ring 25^a is substantially in alignment with the top portion of separator plate 32^a so that there is no tendency for the air which is deflected downwardly to eddy about the deflector ring.

The casing A' of Fig. 1 is provided with a tangential inlet pipe 56 and the pipe does not extend into the chamber. In the operation of the apparatus shown in Fig. 1 air enters through the inlet 56 through which the air is contacted with a liquid within the receptacle, the liquid wetting the foreign matter in the air. The blower and centrifugal separator means operates above the normal surface of the liquid and the centrifugal separating instrumentality for separating the liquid from the air is in open communication with the liquid. The air is discharged through the outlet and the direction of flow of the escaping air when the device is in operation will be understood from the arrows.

In order to separate finely divided matter from a medium such as air, it is necessary to apply forces which will act selectively upon the finely divided matter; that is, forces which will cause the particles of matter to move in a direction different from that taken by the air. The means for producing such selective forces are chiefly related to the fundamental characteristics of matter known as inertia, and gravitational forces, although electrostatic forces may also be employed to advantage if the particles are given an electrical charge.

In the present invention, dynamical conditions are set up in which the inertia characteristic of matter becomes effective in two distinct ways to produce the desired dust separation. The first of these is the result of centrifugal forces caused by rapid rotation of the air and the second is effected by causing sudden changes in the direction of the moving air. The points in the system at which these actions take place will be best explained by tracing the air flow from inlet to outlet.

Referring to the apparatus shown in Fig. 1, the dust-laden air enters through the intake 56. The fine dust or foreign matter and air pass upwardly through the fan intake 30. The rapid rotation of the fan blades impels the dust-laden air outwardly in a horizontal direction, but upon striking the deflector ring 25^a, the air

stream is given a slight downward direction. This rapidly rotating and expanding annulus of air and dust moves out over the deflector plate 29^a until it reaches the periphery of the chamber, where upon striking the wall 32^a its direction is suddenly changed to an upward and inward motion. The greater inertia of the dust particles coupled with the continued action of centrifugal force (since the rapid rotation is sustained before and after this change of direction) impels the particles downward through the air so that the major portion of them falls below the rim of the deflector plate outside the influence of the whirling annulus where they accumulate.

The air stream after executing this first reversal moves upward and inward under the slots of plate 32^a, where the final separating action takes place. It must be kept in mind that during this entire process, the rapid rotation of the annular volume of air and dust continues undiminished. Thus, the air which comes in contact with the slots has a high velocity in the direction shown more clearly in Fig. 2. The angle of the surfaces between the slots is such as to throw the air away from the slots rather than into them. Thus, the air cannot escape through the slots until a relatively high pressure differential is built up between the inside and outside of this surface, the high pressure being on the lower or inside surface. Under these conditions, the air which is directly exposed to the slots executes an extremely rapid change in direction of approximately 90° flowing upward through the opening. The fine dust particles which were dispersed in this layer of escaping air are impelled toward the opening, but their inertia being greater than that of the air, this change of direction is not sufficient to permit them to escape. Instead, they strike the metal surface 32^c (Fig. 2) between the slots and are deflected back into the whirling annulus, this action taking place at each slot. As the air which is not able to escape continues to move inward, it finally reaches the flange 25^a (Fig. 1) and is directed downward where it is caught by the air stream moving out of the fan chamber and the entire process is repeated continuously.

The direction of air flow is indicated by arrows in Fig. 1. It will be observed that a cross-section of the annulus indicates that the annulus is rotating upon itself, in addition to rotating around the fan chamber. It will be observed that the rotating of the annulus upon its own axis constantly brings a surface of air near the slots of the separator plate while at the same time carrying the heavier dust particles back into the downwardly deflected stream which enters the separating chamber. In this manner, the latter air with its entrained dust is again subjected to the sharp reversing action which tends to throw the dust out and downwardly into the chamber below plate 29^a.

If desired, the modification shown in Fig. 3 may be employed. In this construction, the receptacle 66 is provided with a tray 67 preferably of the shape illustrated. A motor 68 is supported in the upper portion of the detachable casing member 69. To the lower portion of the motor casing 68 is secured a curved plate 70 which co-operates with the upper deflector portion 71 of the tray 67 to provide a tapered chamber 72. It will be observed that the tapered chamber directs the air outwardly and downwardly to a point at which the dust particles will be thrown downwardly into the dust tray while the air, freed from dust, may reverse its course and pass upwardly

about the motor casing 68 and out through openings 73. In this construction, a sharp reversal of direction of the air is required just as in the other modifications, before the air may escape.

If desired, the bottom wall of tray 67 may be provided with minute openings 74 which are of sufficient size to induce a small flow of air downwardly and back into the main chamber of casing 66. This reentrant flow of a small stream serves to carry the separated dust well back into the dust tray chamber.

In each of the illustrations given, water may be employed effectively as a cleaning agent. If desired, water may be placed within the entering chamber so that the incoming current of air tends to agitate the water and form a mist or spray which may be carried along with the air stream, aiding in the precipitation and removal of the extremely fine dust. The tangential inlet 56 shown in Fig. 1 is particularly useful for increasing the whirling motion in the pan, and causing the formation of a mist or spray which enters the fan chamber and passes into the separating chamber where it aids in washing the air and carrying the fine dust under the deflector plate. The rotation or whirling of the liquid in the receptacle A' brings the liquid up into the path of the air which enters through the inlet 56 to provide the desired contact of the entering air and the liquid. The use of openings or by-pass ports 74', as shown in Fig. 1 and at 74 in Fig. 3, tends to draw back precipitated dust and water into the main chamber, and thus serves to keep the separating chamber clean. In this connection, it is important that the by-pass be sufficiently small as not to harmfully reduce the useful air-flow. If desired, the chamber may be left free of water at the beginning of the operation, and the water may be sucked into the chamber from a rug or carpet upon which a quantity of water is thrown. This action results in drawing the dust-carrying water from the carpet and confining it within the chamber or chambers in the lower portion of the casing. The water or other fluid in the entering chamber may be mounted at any desired level as indicated schematically in Fig. 1 by the letter X.

If desired, washing fluids other than water may be used to effect cleaning of rugs and the like.

Whether the device be operated with water or with air alone, it will be observed that when the flowing stream reaches the periphery of the fan-chamber, its radial velocity is deflected downwardly, causing most of the dust to precipitate both because of the greater momentum of the dust and because of the continued action of centrifugal force, since the rotational velocity continues after the reversal. In the construction shown in Fig. 3, the air leaving the fan is carried outwardly and downwardly to the peripheral edge of the chamber where the dust particles are discharged downwardly and the air reverses its direction to an upward flow. Much the same effect is accomplished in the construction shown in the other figure where the deflector ring directs the air leaving the fan sharply downwardly toward the outlet of the separating chamber. It will thus be seen that in each of the modifications, there is produced a sharp radial reversal of direction in an expanding rotating annulus of air as a means for precipitating dust or other finely divided matter from the air.

The foregoing detailed description has been given for clearness of understanding only, and no

unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

5 I claim:

1. In a device of the class described, a housing having an inlet and an outlet and including a receptacle having a generally circular wall for containing a bath of liquid, said inlet directing
10 the air entering said receptacle in a direction generally tangential to the wall of the receptacle, blower and centrifugal separator means within said housing above the normal surface of said bath, and means for operating said blower and
15 separator means for drawing air into said housing through said tangential inlet, into contact with the surface of said liquid bath, through said separator, and for discharging the air through said outlet.

2. In a device of the class described, a housing including a receptacle for liquid, said housing having an inlet communicating with said receptacle and through which air is contacted with the liquid in said receptacle, centrifugal blower
20 and separator means within said housing for drawing air in through said inlet and for separating the liquid from said air, the separator means being above the normal surface of said

liquid and in open communication therewith, and means for operating said centrifugal blower and separator means, said housing being also provided with an outlet.

3. In a device of the class described, a housing including a liquid receptacle having a side wall, said housing having an inlet opening into said receptacle adjacent said side wall, centrifugal blower and separator means within said housing for drawing air in through said inlet and for
10 separating the liquid from said air, the separator means being above the normal surface of said liquid and in open communication therewith, and means for operating said centrifugal means, said housing also having an outlet.

4. In a device of the class described, a housing having an air inlet and outlet and including a receptacle having a generally circular wall for containing liquid, centrifugal blower and separator means, said housing being so arranged with respect to said centrifugal means that the flow of air causes rotation of the liquid within said wall, said centrifugal separator means being above the normal surface of the liquid and in open communication therewith, and means for operating
25 said centrifugal blower and separator means.

AGNES JUELSON.