

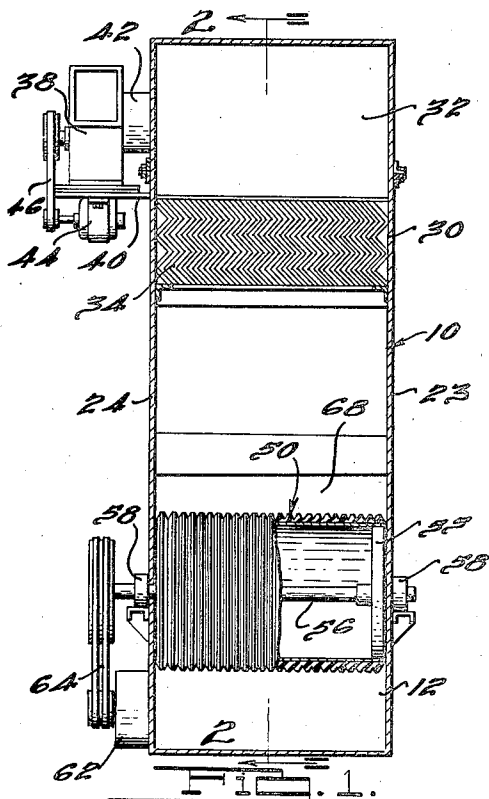
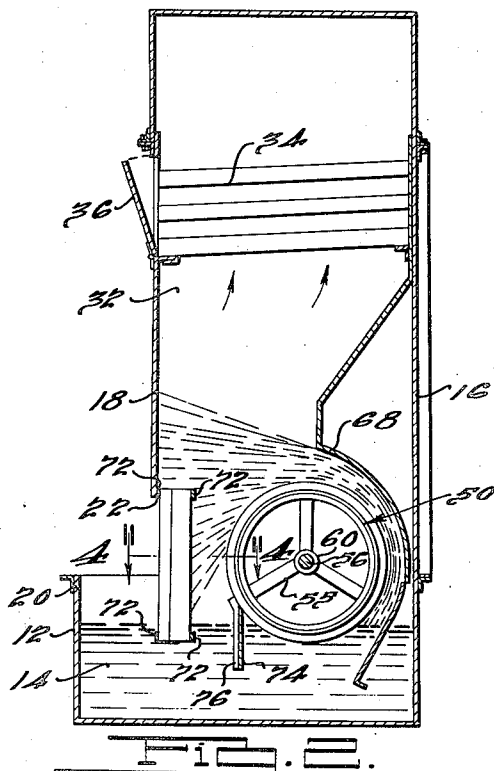
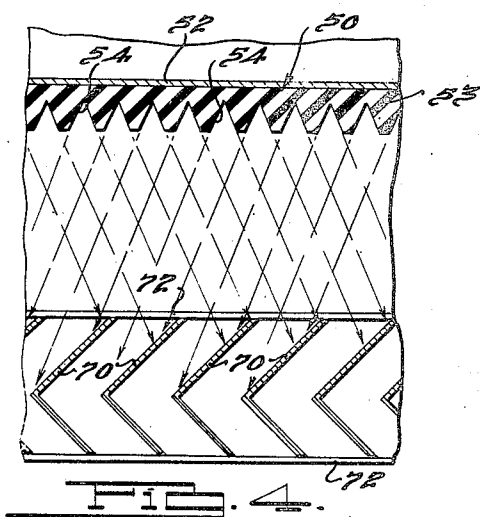
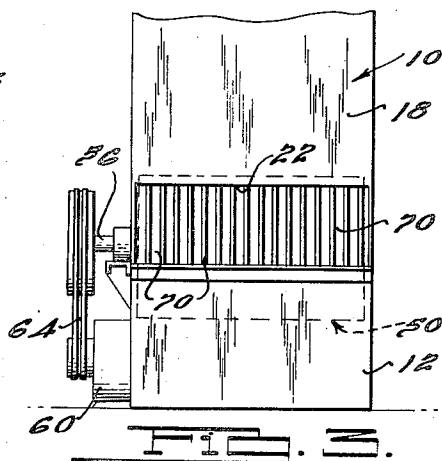
March 5, 1940.

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2,192,332

APPARATUS FOR REMOVING FOREIGN MATERIAL FROM AIR

Filed April 18, 1938



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2,192,332

APPARATUS FOR REMOVING FOREIGN
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Application April 18, 1938, Serial No. 202,688

4 Claims. (Cl. 261—92)

This invention relates to an improved apparatus for removing foreign material, such as paint, lacquer, enamel, and dust, or the like, from air.

The main object of the present invention is to effectively and completely clean air laden with foreign material in suspension by completely arresting and removing foreign material from the air.

Another object of the invention is to provide a moving mass of liquid, such as water, of a novel character, and having a high speed of movement so that foreign material suspended in air will be completely removed therefrom as it is passed through the moving mass of liquid. Liquids, other than water, which are capable of use with the present invention, are oils, caustics, and acids, or the like; and the reference to water is to be considered as illustrative only.

A further object of the invention is to provide an apparatus in which the entering air laden with foreign material in suspension is first caused to pass through baffle members which are constantly washed with water to thereby provide a first stage of air cleaning, and thereafter pass the air upwardly through a moving mass of free liquid to complete the cleaning of the air.

A further object of the invention is to provide a novel wheel construction by which a moving mass of liquid of novel character is created.

A further object of the invention is to provide a novel type of wheel which is more economical to operate than prior wheels.

Other objects of the invention will become apparent from the following specification, the drawing relating thereto and from the claims hereinafter set forth.

In the drawing, in which like numerals are used to designate like parts in the several views throughout:

Figure 1 is a front vertical cross-sectional view, showing parts in elevation, of an apparatus illustrating an embodiment of the present invention;

Fig. 2 is a vertical cross-sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary front elevational view of the structure illustrated in Figs. 1 and 2; and,

Fig. 4 is a fragmentary cross-sectional view, on an enlarged scale, taken substantially along the line 4—4 of Fig. 2.

The present invention has utility in removing foreign material, such as paint, acid fumes, dust, sand, fly ash, and the like, from air in which the foreign material is held in suspension.

In the embodiment of the invention illustrated in the drawing, a cabinet 10, preferably formed

of sheet metal material, is provided in which a lower portion 12 provides a receptacle for a bath of liquid, such as water 14. The rear outer wall 16 of the cabinet is substantially straight; and the front wall 18 of the cabinet is preferably spaced inwardly from the front edge 20 of the receptacle 12 and preferably terminates above the upper edge of the receptacle and above the normal level of the liquid 14 to provide an air inlet opening 22 across the front face of the cabinet or receptacle. Although in the present illustration, the opening 22 is illustrated as communicating directly with the room or space within which the unit is mounted, it is to be understood that conduits may be provided over the inlet opening 22 which may be extended therefrom to another point such as the interior of a paint spray booth, or other quarters, within which the air laden with foreign material is located. Side, or end, walls 23 and 24 connect the front and rear walls to substantially enclose the cabinet.

The upper portion 30 of the cabinet 10 forms an exhaust conduit 32 communicating with the lower portion of the receptacle and through which the clean air is exhausted to the outside. The exhaust conduit 32 is preferably provided with vertically extending zig-zag baffles 34 at spaced intervals across the exhaust conduit 32 and sloping downwardly to one of the front or rear walls for rapidly changing the direction of travel of the exhausted air and removing any moisture included in the air which may have been carried into the exhaust conduit. It has been found as a result of tests over an extended period that the air within the exhaust conduit 32 is completely cleaned; and any water entrained within the exhausted air is removed from the air within the baffles and returned to the bath. A door 36 is provided in the front face of the cabinet adjacent the zig-zag baffles, so that upon opening the door the baffles are readily accessible for removal or repair.

A blower 38 of conventional construction is mounted on a bracket or platform 40 suitably secured to the cabinet adjacent the top of one end of the cabinet and is in communication with the interior of the cabinet and with the exhaust conduit 32 by means of a communication conduit member 42. The blower 38 is driven by a suitable variable speed motor 44 suitably mounted on the platform 40 and operatively connected to the blower 38 by means of a conventional belt and pulley arrangement 46.

In order to create a moving mass of liquid having novel characteristics, through which the air

laden with foreign material is passed, thereby cleaning the air and removing the foreign material therefrom, a rotatable member generally indicated at 50 is mounted within the lower portion of the cabinet 10. The member 50 comprises a substantially cylindrical member 52 which is preferably formed of relatively light sheet metal. The outer surface of the cylindrical member 52 is covered with another member 53, which is preferably rubber. The member 53 is formed with circumferentially extending grooves 54 which are spaced from each other and extend along the length of the cylindrical member. While the preferred manner is to make the member 50 in the manner just described, it is to be understood that according to the broader aspects of the present invention the member 50 could be made in other ways. For example, it could be made of a single metal member having the grooves 54 cut in the outer surface thereof.

The cylindrical portion 52 is mounted on pulleys 55, one pulley being provided at each end of the cylindrical portion 52 and the pulleys being suitably secured to the inner surface of the portion 52 adjacent its end. The rotatable member 50 is mounted within the cabinet 10 by means of a shaft 56 which is preferably arranged substantially horizontally and extends through openings in the sides of the cabinet 10 and is mounted for rotation in bearings 58 which are suitably secured to the outer surfaces of the ends of the cabinet in alignment with the openings in the ends. The shaft 56 extends through hubs 60 of the pulleys 55, the pulleys 55 being suitably keyed to the shaft for rotation therewith. The shaft 56 is driven by a variable speed motor 62 which is connected to the shaft 56 by means of a conventional belt and pulley mechanism 64.

The rotatable member 50 is preferably longitudinally located within the receptacle with the ends of the member adjacent the sides 23 and 24 of the receptacle 10.

In order to provide a moving mass of liquid, such as water, of the desired characteristics, the liquid 14 within the receptacle 12 is maintained at such a level that the top surface of the liquid extends above the lower edge of the rotatable member 50 for a distance substantially equal to the depth of the member 53 so that the water is within the grooves 54 as the member 50 is rotated. Upon rapid rotation of the cylindrical member 50 a fast moving sheet-like free mass of liquid is created in that portion of the cabinet surrounding the rotatable member 52. A member 68 forms a rear wall portion within the cabinet extending from one side wall to the other and is suitably secured to the rear wall 16 of the cabinet. A portion of the wall member 68 extends inwardly within the cabinet and extends longitudinally of the rear wall of the cabinet in spaced relation to the peripheral surface of the member 50. The moving free mass of liquid created by the rotation of the member 50 is guided by the wall portion 68 and thrown forwardly of the receptacle against the wall member 18 above the inlet opening 22.

As the water leaves the member 50 it is thrown from the sides of the groove 54 cross-wise, substantially as shown by the arrows in Fig. 4. As the water is thrown from the sides of the grooves 54 it is caused to cross so that a substantially continuous sheet of cross-currents is provided, so that as the air is passed through the mass of water there are no blind spots through which

the foreign material carried by the air may pass. The greater portion of the mass of water is thrown against the front wall 18 and dropped down across the inlet opening 22.

In order to provide a first wash of the air and an effective cleaning of the heavier particles out of the air a plurality of zig-zag baffle members 70 are positioned vertically within the opening 22 in transversely spaced relation across the opening. The zig-zag baffle members may be fixed to frame member 72 at the top and bottom thereof for holding the baffle members 70 in proper spaced relationship to each other. The frame members 72 may be suitably fixed to the end walls and to the lower edge of the wall 18 for positioning the baffle in the inlet opening. The baffles are preferably of such a length that the lower ends thereof extend slightly beneath the surface of the liquid bath 14 so that all of the entering air is caused to pass through the baffles for entrance into the interior of the receptacle.

The baffle members 70 are preferably angled, as shown in Fig. 4, and are preferably so positioned or spaced relative to each other that there is no direct straight line into the interior of the receptacle so that the entering air must abruptly change its direction in passing into the interior of the receptacle, which serves to effectively clean the entering air. The water thrown against the front wall 18 passes down over the baffle so that they are not only kept clean by the wash of water thereover, but the space between the baffles is substantially filled with the splash from the water passing therethrough so that the air is forced into contact with the water which passes down over the inlet opening.

The operation of the structure so far described is as follows:

Motors 44 and 62 are started and start operation of the blowers 38 and rotation of the cylindrical member 50, respectively. The operation of the blower 38 creates a suction or low pressure within the cabinet 10 and causes air laden with foreign material in suspension to pass through the inlet opening 22, past the zig-zag baffles 70 into the interior of the receptacle 10. Rotation of the cylindrical member 52 in the direction indicated by the arrow in Fig. 2 creates the moving mass of liquid and throws this moving mass of liquid against the front wall portion 18 as indicated in Fig. 2. The liquid thrown against the front wall 18 is caused to drop downwardly into the bath through the spaces between the baffle members 70, so that the air passing through the baffle members receives a first or preliminary wash. The air then enters the interior of the cabinet and is drawn upwardly between the inner edges of the baffles and the front of the member 50 through the substantially horizontal mass of liquid which is constantly being thrown against the wall 18. As the air is thus passed transversely in the direction of movement of this moving mass of water, and, as the moving mass of water is moved at a relatively high rate of speed and is of such a character that cross-streams, as shown in Fig. 4, are formed, any foreign material carried by the air is completely removed therefrom and the air passed out through the exhaust conduit 32 is in a cleaned condition.

The foreign material removed from the air is caused to drop downwardly into the bath from which it may be readily removed. A longitudinally extending baffle member 74 is mounted within the receptacle 10 and is suitably secured

to the side walls thereof by means of end flanges 76. The baffle member 74 is preferably mounted adjacent the front portion of the rotatable member 50 and extends downwardly within the bath below the surface thereof. This baffle 74 serves to prevent the entry of any foreign material collected on the surface of the bath adjacent the front edge of the receptacle 10 from passing to a position adjacent the under-surface of the rotatable member 52 within the receptacle. Substantially clean liquid is, therefore, utilized for creating the moving mass of liquid. It is to be understood that when materials which are heavier than water are being removed from the air, the baffle 74 may be located adjacent the bottom of the receptacle 12, and the clean water thereby permitted to flow over the top of the baffle 74 to a position adjacent the lower portion of the rotatable member 50.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit and substance of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. Apparatus for removing foreign material, such as paint, dust, or the like, from air laden with foreign material in suspension comprising a receptacle containing a bath of liquid, an elongated, rotatable member mounted within said receptacle longitudinally thereof and with a portion of said member extending into said bath, said receptacle having an upstanding wall portion to one side of said member, said wall portion forming an air inlet opening above the normal level of the liquid in said receptacle directed toward the longitudinal surface of said rotatable member, the upper edge of said inlet opening being at substantially the same level as the top of said rotatable member, louvre-like baffle members disposed in and across said inlet opening in the path of the incoming air, means for rotating said rotatable member to create a moving mass of liquid and to throw the liquid against said wall portion above said inlet opening, an exhaust conduit communicating with said receptacle above said mass of liquid and above said inlet opening, and means for drawing said air through the inlet opening past said baffles, through said mass of liquid, and upwardly through said exhaust conduit.

2. Apparatus for removing foreign material, such as paint, dust, or the like, from air laden with foreign material in suspension comprising a receptacle containing a bath of liquid, an elongated rotatable member mounted within said receptacle with a portion of said member extending into said bath, said receptacle having an upstanding wall portion to one side of said member, said wall portion forming an air inlet opening above the normal level of the liquid in said receptacle directed toward said rotatable member, the upper edge of said inlet opening being at substantially the same level as the top of said rotatable member, vertically extending louvre-

like spaced baffle members mounted in and across said inlet opening in the path of the incoming air, means for rotating said rotatable member to create a moving mass of liquid and to throw the liquid against said wall portion above said inlet opening, an exhaust conduit communicating with said receptacle above said mass of liquid and above said inlet opening, and means for drawing said air through said inlet opening past said baffles, through said mass of liquid, and upwardly through said exhaust conduit.

3. Apparatus for removing foreign material, such as paint, dust, or the like, from air laden with foreign material in suspension comprising a receptacle containing a bath of liquid, an elongated rotatable member mounted within said receptacle with a portion of said member extending into said bath, said receptacle having an upstanding wall portion to one side of said member, said wall portion forming an air inlet opening above the normal level of the liquid in said receptacle directed toward said rotatable member, the upper edge of said inlet opening being at substantially the same level as the top of said rotatable member, a plurality of vertically extending zig-zag baffle members disposed in and across said inlet opening in the path of the incoming air, means for rotating said rotatable member to create a moving mass of liquid and to throw the liquid against said wall portion above said inlet opening, an exhaust conduit communicating with said receptacle above said mass of liquid and above said inlet opening, and means for drawing said air through said inlet opening past said baffles, through said mass of liquid, and upwardly through said exhaust conduit.

4. Apparatus for removing foreign material, such as paint, dust, or the like, from air laden with foreign material in suspension comprising a receptacle containing a bath of liquid, an elongated rotatable substantially cylindrical member mounted within said receptacle with a portion thereof extending into said bath, said cylindrical member being formed with spaced, circumferentially extending grooves in the outer surface thereof, said receptacle having an upstanding wall portion to one side of said member, said wall portion forming an air inlet opening above the normal level of the liquid in said receptacle directed toward said rotatable member, the upper edge of said inlet opening being at substantially the same level as the top of said rotatable member, a plurality of vertically extending zig-zag baffle members disposed within said inlet opening, means for rotating said rotatable member to create a moving mass of liquid and to throw the liquid against said wall portion above said inlet opening, an exhaust conduit communicating with said receptacle above said mass of liquid and above said inlet opening, and means for drawing said air through said inlet opening past said baffles, through said mass of liquid, and upwardly through said exhaust conduit.

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