July 3, 1945. O. E. FENN 2,379,795

AIR WASHER

Filed June 28, 1943 2 Sheets-Sheet 1

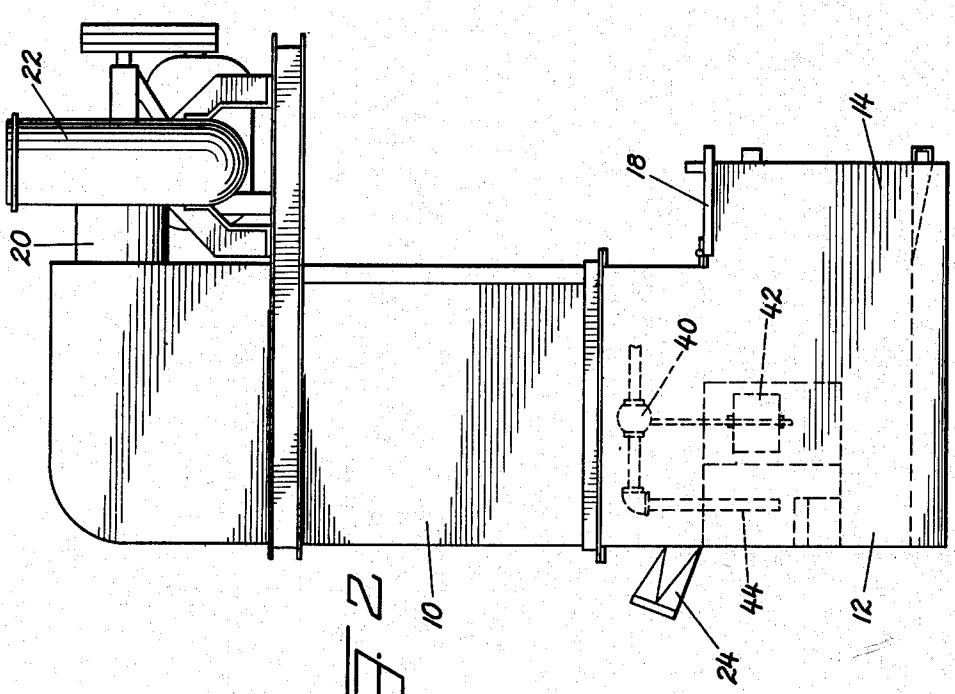


FIG. 2

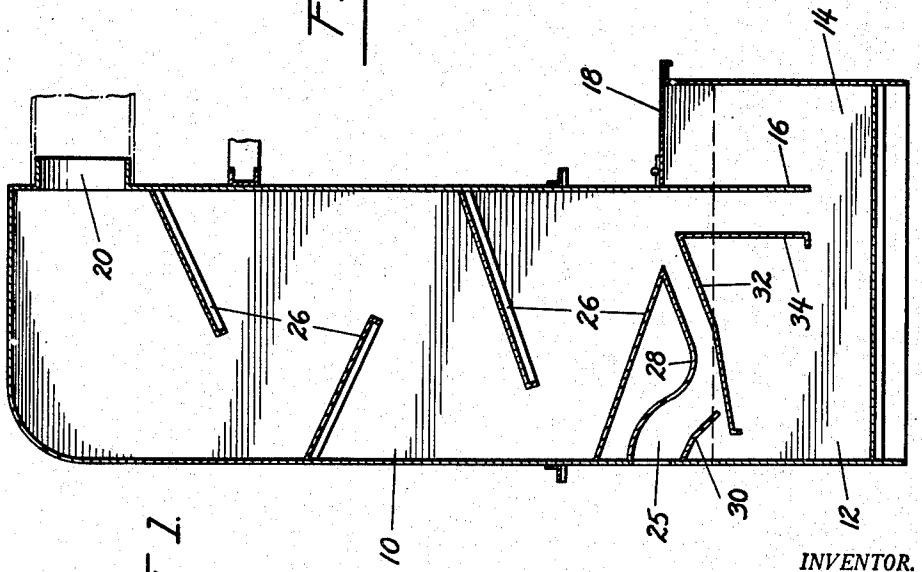


FIG. 1

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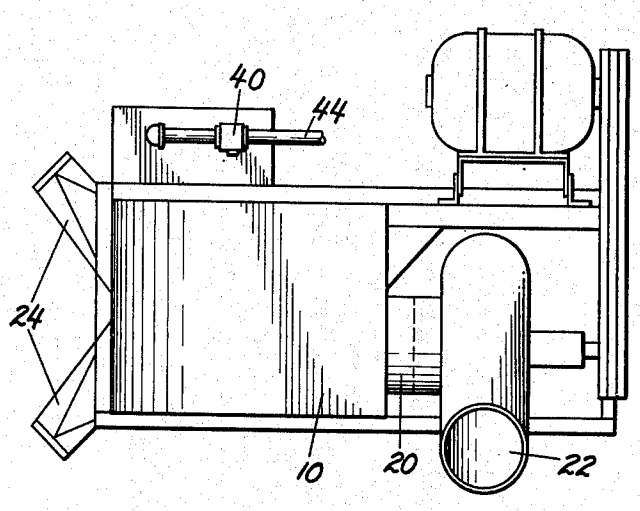


FIG. 3.

FIG. 4.

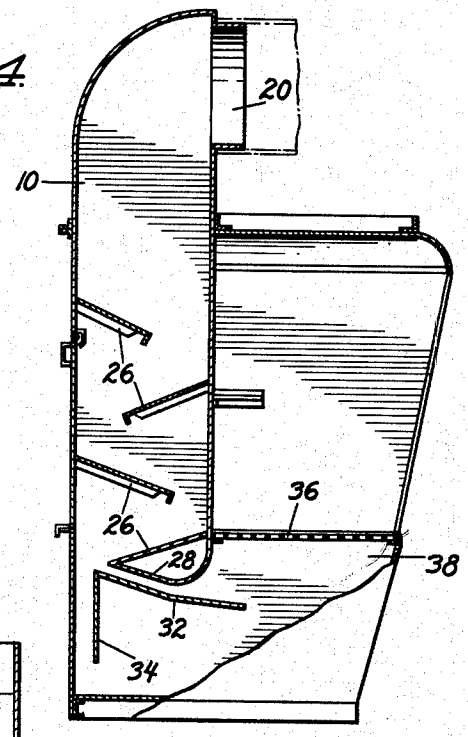
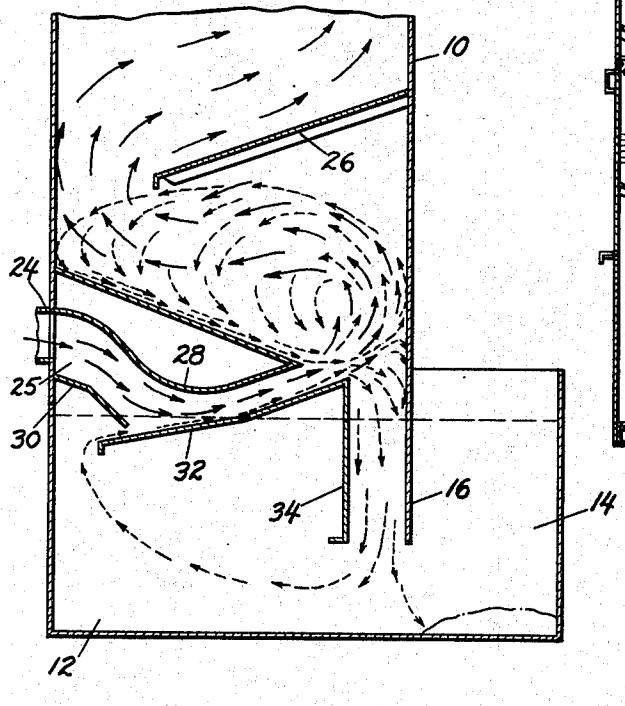


FIG. 5.



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UNITED STATES PATENT OFFICE

2,379,795

AIR WASHER

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Application June 28, 1943, Serial No. 492,510

3 Claims. (Cl. 183—24)

This invention relates to an improved apparatus for removing from air and gas foreign material in suspension therein.

An object is to provide simple and inexpensive apparatus for removing foreign material of all kinds from air. It may be employed to remove foul particles such as are produced in grinding, polishing or buffing operations from the air passed into the hoods over such machines and through the exhaust ducts leading therefrom or for any other uses where it is desired to wash air or gas with liquid such as water to remove foul particles of any kind therefrom.

Another object is to provide apparatus of the character described wherein the water shower or spray within which the air is washed is produced by the movement of the air itself through the machine due to the construction and arrangement of the machine. Such structure therefore does not require any moving wearing parts to produce the water shower.

A further object is to provide apparatus as described wherein the air is directed into a converging washing chamber through a restricted passage made up in part of a partially submerged flow plate over which the air flows at a high velocity and sweeps water up the plate and into the washing chamber where it is swirled around by the air and the foul particles carried in suspension in the air are wetted and washed therefrom. The foul particles washed from the air fall with the water into the collector portion of a water tank which is disposed below the washing chamber. The collector portion of the tank communicates with the main portion thereof for return of water minus the foul particles to the main portion.

A water circulation is thereby established through the water traveling up the plate, under impetus of the air-stream, from the main portion of the tank into the washing chamber from where it falls out of the air stream and returns into the collector portion of the tank.

Other objects, advantages, and meritorious features of my invention will more fully appear from the following description, appended claims and accompanying drawings, wherein:

Fig. 1 is a vertical sectional view through an apparatus embodying the invention.

Fig. 2 is a side elevation of the apparatus shown in Fig. 1.

Fig. 3 is a plan view of the apparatus shown in Fig. 2.

Fig. 4 is a vertical sectional view of a modified form of the apparatus shown in Fig. 1, and embodying the invention.

Fig. 5 is an enlarged fragmentary of the washing section taken on the same line as Fig. 1.

The apparatus shown in Figs. 1, 2 and 3 may be considered representative. It comprises an upright casing 10 having front, back and side walls. A bottom portion serves as a liquid containing tank 12 having a settling tank compartment 14 projecting at one side. The settling tank portion communicates with the main tank 12 below the dividing wall 16 and is provided with a hinged cover 18 for removal of collected foul material.

The casing has an air outlet 20 at the top which may communicate with an exhaust fan 22 as shown in the structure of Fig. 2 to draw air to be cleaned through the casing at the desired rate of speed. The casing has an air inlet through pipes 24 shown in Figs. 2 and 3, which pipes feed into a passageway 25 shown in Fig. 1. This inlet is at one side at the bottom. These inlet pipes 24 may communicate with one or more supply ducts leading from suitable sources of foul air supply not shown such as the hoods of dust producing machines.

The interior arrangement is shown in Fig. 1 and in this figure a plurality of baffles 26 project from opposite walls above the water level within the casing downwardly and inwardly into vertically spaced overlapping relationship terminating spaced from the opposite walls of the casing. These baffles extend from one end wall of the casing to the opposite end wall causing the air to follow a zigzag path upwardly through the casing. The space between the two lower baffles forms a washing chamber as described hereinafter.

An air deflecting plate 28 (Fig. 1) extends from adjacent the upper margin of the air inlets downwardly and inwardly in the same general direction as the lowermost baffle 26 and forms the ceiling of the air passageway 24. This deflector plate 28 extends toward the water level, which level is indicated by the dotted line within the tank. About midway the projection of the lowermost baffle 26 the deflector plate turns upwardly to meet the margin of such baffle. A cooperating plate 30 extends from the lower margin of the inlet opening inwardly and downwardly into submergence within the water in the tank, as shown in Fig. 1, and serves to guide the air and prevent undesired water surging within the tank. This plate 30 forms a part of the bottom wall of the air passageway 25.

The other part of the bottom wall of the passageway 25 is formed by a flow plate 32 which extends from a point of submergence within the tank spaced from the plate 30 upwardly at a small angle to the water surface and emerges above such surface and continues upwardly spaced from plate 28 and substantially parallel thereto and terminates spaced from the margin of baffle 26 and the opposite side wall of the casing. A partition wall 34 depends from the upper margin of the flow plate, as shown in Fig. 1, substantially below the water level within the tank.

In Fig. 4 the construction is similar to that of Fig. 1 except that the air enters downwardly through a grating 36 over a projecting portion 38 of the tank. Baffles 26 are provided within the casing. There are also provided an air deflector plate 28, a flow plate 32 and a wall portion 34, all cooperatively arranged as hereinabove described in connection with the structure of Fig. 1. The structure shown in Fig. 4 is similar to that described in Figs. 1, 2 and 3 except that in Figs. 1, 2 and 3 the air inlet is shown as through two relatively angularly disposed inlet pipes 24 which discharge into the air passageway 25 as shown in Fig. 1.

In Figs. 1, 2 and 3 means in the form of a control valve 40 having a control float 42 is shown to maintain an accurate water level within the tank over a submerged part of the flow plate. This valve 40 is shown in water inlet pipe 44 through which water is supplied to the water tank from a suitable source. This level could of course be maintained by a suitable overflow pipe adjusted to the desired height and cooperating with a feeding inlet pipe. Such construction is conventional.

Air to be cleaned enters through the inlet pipes 24, Fig. 1, or through the grating 36, Fig. 2, and is directed by the deflector plate 28 downwardly toward the water standing above the flow plate 32 as shown in Figs. 1 and 4. In one type of apparatus, as shown in Fig. 1, the restriction between the low point of plate 28 and the flow plate 32 is two inches and the casing which is two feet from front to rear and 1½ feet wide is adapted to handle 1000 cu. feet of air p. m. The air velocity through the orifice between the plate 28 and flow plate 32 would reach 4000 to 5000 ft. p. m. The air velocity is maintained sufficiently high and the water level above the plate 32 is so accurately maintained that water is swept up the plate 32 and at the normal vanishing point of the water level on the plate it leaves the plate and is carried up as a spray or shower by the rapid air movement through the space between the margin of the lowermost baffle 26 and the opposite wall of the casing into the space between the two lower baffles as shown.

The water carried up into the space between the two lower baffles 26 is swirled around within such space creating a heterogeneous swirling spray of coarse and fine spray. A portion of such water falls down on to the lowermost plate 26 and runs off the margin thereof. Some of the spray falls directly down into the tank between the vertical partition wall 34 and the back wall of the casing. Some of the spray runs down the back wall into the tank. Some of the fine spray is thrown up against the second baffle 26 and knocked down from there upon the lowermost baffle 26.

The water being carried up the flow plate by the air and into the washing chamber space between the two converging lower baffles flows back into the tank through the return conduit established between the partition wall 34 and the opposite wall of the tank. A circulation is therefore established from such return settling portion of the tank (Fig. 1) and the main portion wherein the water stands above the submerged portion of the flow plate. The foul material settles out of the water before the same returns to stand over the submerged end of the flow plate 32. Maintenance of the required air velocity and the proper water level feathering out to a line on the low angle flow plate 32 are desired characteristics for proper functioning.

There are no moving water spray creating parts as in the water wheel type of apparatus and no parts to become clogged as in the spray nozzle type and the maintenance cost is low with respect to attained efficiency.

What I claim is:

1. Apparatus for removing foreign material from air comprising an upright casing having an air outlet at the top and having a water reservoir in its bottom portion, a plurality of baffles projecting alternately from opposite side walls of the casing inwardly and downwardly into spaced overlapping relationship above the water level, an air inlet into the casing through the side wall from which the lowermost baffle projects below said lowermost baffle and above the water level, an air deflecting plate extending from the upper margin of the air inlet downwardly and inwardly of the casing toward the water level and turning upwardly from a point spaced above the water level and extending therefrom to the inner margin of the lowermost baffle, a flow plate extending from a point within the casing spaced below the air inlet and below the water level and spaced from the wall of the casing provided with the air inlet upwardly at an angle of less than 45° toward the opposite side wall of the casing and terminating spaced above the water level at a point between said opposite side wall and the margin of the lowermost baffle, means for drawing an air stream into the casing through the inlet and below the deflecting plate and upwardly over the flow plate at such a velocity as to sweep water upwardly over the flow plate across the space between the margin of the lowermost baffle and the opposite side wall of the casing and into the space above the lowermost baffle, and a partition wall extending downwardly from the inner margin of the flow plate spaced from and substantially parallel to that side wall of the casing opposite the air inlet and terminating spaced below the water level above the bottom of the casing.

2. Apparatus for removing foreign material from air comprising an upright casing having an air outlet at the top and a water reservoir in its bottom portion, a plurality of baffles projecting alternately from opposite side walls of the casing inwardly and downwardly into spaced overlapping relationship above the water level, an air inlet through the side wall from which the lowermost baffle projects below said lowermost baffle and above the water level, a flow plate extending from a point spaced below the water level below the air inlet and spaced from the side wall of the casing provided with the inlet upwardly toward the opposite side wall at a slope of less than 45° and terminating spaced above the water level at a point spaced between said opposite side wall of the casing and the inner margin of the lowermost baffle, an air deflecting plate extending from the inner margin of the lowermost baffle downwardly and inwardly spaced from and substantially parallel to that portion of the flow plate which projects above the water level to a point of

maximum downward projection spaced above the water level which extends above the flow plate, said deflecting plate extending upwardly from said point of maximum downward projection to the upper margin of the air inlet and forming with the flow plate a restricted air inlet passageway and a partition wall extending from that margin of the flow plate which terminates spaced between the inner margin of the lowermost baffle and the opposite side wall of the casing downwardly below the water level and terminating spaced above the bottom of the casing.

3. The invention as defined in claim numbered 2 characterized in that the air deflecting plate extends upwardly from the point of maximum downward projection at a sharp angle greater than 45° and terminates at the upper margin of the air inlet, and further characterized in that there is provided a second air deflecting plate which projects inwardly and downwardly from below the lower margin of the air inlet to a point below the water level and spaced slightly above the flow plate.

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