June 2, 1970 R. J. FLEBU 3,514,924

DUST ARRESTOR

Original Filed April 3, 1968

FIG. 1.

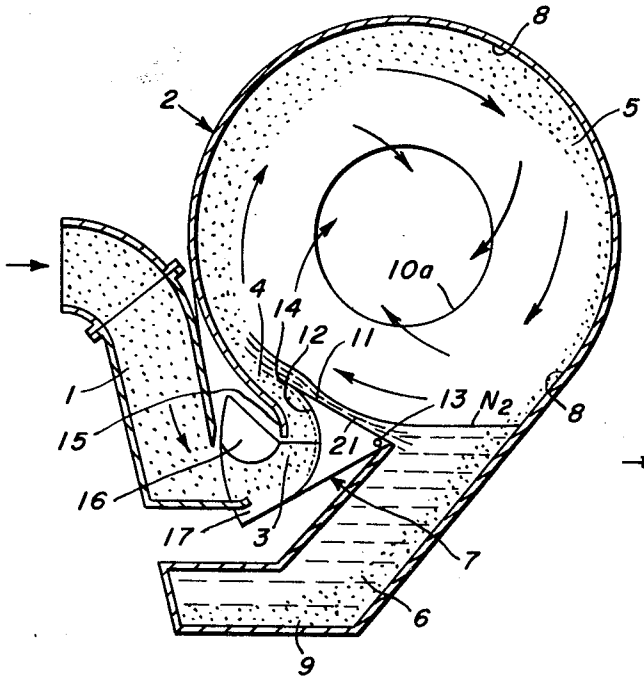


FIG. 3.

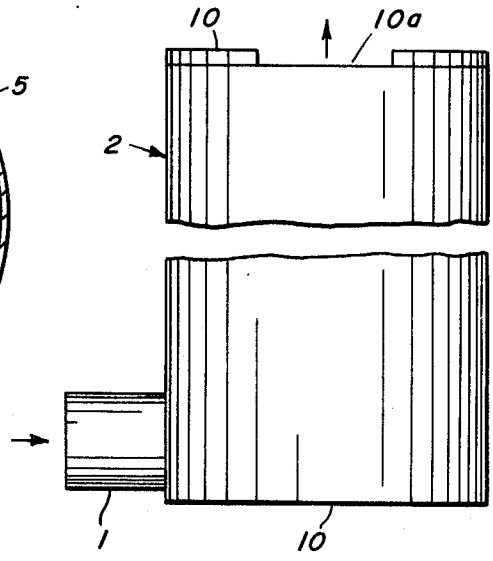


FIG. 2.

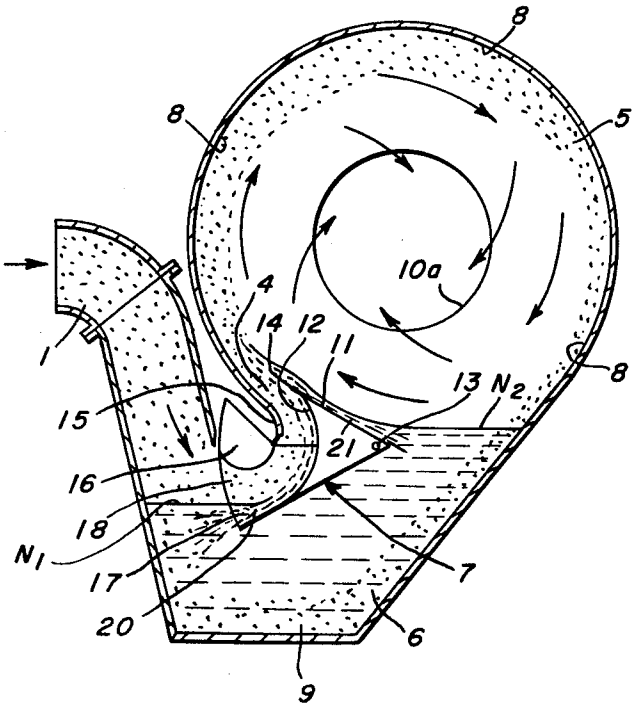
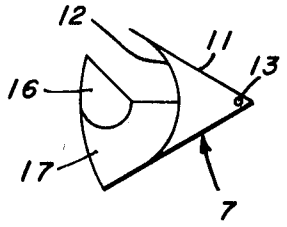


FIG. 4.



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DUST ARRESTOR

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Continuation of application Ser. No. 740,787, Apr. 3, 1968. This application Aug. 20, 1969, Ser. No. 853,604
Int. Cl. B01d 47/02
U.S. Cl. 55—237 6 Claims

ABSTRACT OF THE DISCLOSURE

A dust arrestor for washing dust containing air having a cylindrical horizontal chamber with a water reservoir having an air contacting surface defined within the bottom of the chamber. Nozzle means disposed closely adjacent the water reservoir for introducing the dust containing air into the chamber and establishing a peripheral air current about the chamber in a direction initially moving away from the reservoir. A second air contacting surface may be provided exteriorly of the chamber for removing a portion of the dust prior to introduction of the air into the chamber.

A baffle member separating the two air contacting water surfaces having an upwardly forming surface extending from the nozzle to the water reservoir and a lateral surface defining a portion of the nozzle. The baffle member may be rotatably mounted to provide for adjustment of the angle of inclination of the upper facing surface and the cross-section of the nozzle opening.

This application is a continuation of Ser. No. 740,787, filed Apr. 3, 1968, now abandoned.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a dust arrestor for washing dust out of air. More specifically it relates to such an arrestor having means for establishing contact between a water reservoir and peripheral air current within a cleansing chamber to cause transfer of the dust from the air to the water.

Prior art

It has been known to wash dust containing air within a cylindrical chamber by imparting a generally circular movement to the air in a chamber within which both water and air are introduced. Such a system is disclosed in Norwegian Pat. 76,916 wherein air is introduced into a cylindrical chamber in a generally cylindrical or peripheral direction along the chamber periphery and water is introduced through a nozzle disposed centrally within the chamber. This system, however, requires a pumping device for introducing the water and a continuously operating water supply.

It is also known to employ a cylindrical washing chamber having a horizontal axis and an interior divided by helical vanes secured to the interior surface of the cylindrical wall. At the bottom, a water trough is provided from which water drops are carried away by the moving air waves.

These known systems fail to provide apparatus which has an air nozzle so disposed with respect to the water reservoir that effective control of the air current and water pickup is obtained in order to effect maximum removal of dust through centrifugal force applied to the water particles. Also, no provision of suitable means for preliminary washing is provided. Finally, cooperating means for effectively controlling the air velocity and water pickup are lacking.

SUMMARY OF THE INVENTION

The apparatus of this invention has solved the above described problems. The apparatus of this invention provides a cylindrical wash chamber having a water reservoir defined within the bottom of the chamber and providing an air contacting water surface. An air nozzle is positioned adjacent, but spaced from, the air contacting surface and so oriented as to provide an air stream moving about the interior periphery of the chamber initially in a direction away from the air contacting surface. A second air contacting water surface may be provided exteriorly of the chamber adjacent the nozzle to provide for preliminary cleansing of the air.

An adjustable baffle member which is preferably rotatably mounted has an upwardly facing surface disposed within the chamber between the nozzle and interior air contacting surface. The baffle member also has a lateral surface which partially defines the nozzle. Adjustment of the position of the baffle member alters the inclination of upwardly facing surface and also adjusts the cross-sectional area of the nozzle.

It is an object of this invention to provide a dust arrestor having improved means of controlling the air velocity, the amount of water pickup and the resultant centrifugal force on the water droplets.

It is another object of this invention to provide a dust arrestor which provides an air contacting surface disposed exteriorly of the wash chamber and adapted to effect a preliminary cleansing of the air.

It is another object of this invention to provide means for adjusting the quantity of water pickup and in coordinated fashion adjusting the air velocity through adjustment to the size of the nozzle opening.

It is yet another object of this invention to provide a dust arrestor which provides two air contacting water surfaces of a single reservoir with interconnected means for adjusting the air velocity over each contacting surface.

Other objects and advantages of the invention will be understood from the following description of the invention on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional elevation of one form of apparatus contemplated by this invention;

FIG. 2 is a sectional elevation of another form of apparatus contemplated by this invention;

FIG. 3 is a fragmented plan view of the apparatus of FIG. 2; and

FIG. 4 is a detail view of a portion of the flow control apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Considering now the drawing in greater detail, FIG. 1 shows one form of dust arrestor contemplated by this invention, an air inlet section **1** for the introduction of dust containing air into cylindrical housing **2** is provided. The dust containing air passes through inlet section **1**, through deflecting section **3** and is then introduced into cylindrical housing **2** through nozzle **4**. The cylindrical housing **2** defines a circular chamber **5** and a water reservoir **6** disposed in underlying relationship with respect to the chamber **5**. The chamber ends are enclosed by end walls **10**. (FIG. 3). The water reservoir **6** provides an air contacting water surface N_2. A baffle or threshold member **7** separates the water reservoir **6** from the nozzle **4**.

In operation, of the dust arrestor, a stream of dust containing air is introduced into circular chamber **5** through nozzle **4**, which is positioned adjacent, but spaced

from, the water reservoir **6**. The nozzle **4** is so positioned as to direct the air stream peripherally about the circular chamber **5** in a direction initially away from the water reservoir **6**. The air stream, in the form illustrated in FIG. 1, moves in a clockwise direction and impinges upon air contacting water surface N_2. As the air stream continues its movement it carries with it droplets of water picked up from surface N_2 which droplets entrap dust particles present in the air. The water droplets are brought directly into the air stream being introduced through nozzle **4**. Because of the centrifugal forces established by the rotating air mass, the water drops are moved radially outwardly toward the interior peripheral walls of cylindrical housing **2**. The water drops will not only convey with them the originally entrapped dust and foreign matter, but as a result of the difference in velocity and direction of movement of the incoming air and the water drops, collisions between free dust particles and water drops occur. Thus, the free dust will be captured by the radially outwardly moving water drops. The water drops will contact peripheral wall **8** and flow, in the form show in FIG. 1, in a clockwise direction along the wall **8** and ultimately will return to water reservoir **6**. The dust removed from the air by the water drops will be carried into the water reservoir **6** and tend to move gravitationally to the dust wall **9** of water reservoir **6**. The cleansed air ultimately is removed from cylindrical housing **2** through an opening **10***a* in the downstream end wall **10**, as shown in FIG. 3.

In addition to collisions between free dry dust particles and water drops, the dry dust will also collide with wet dust particles and agglomerate. This process will continue until the agglomerated dust particle has a collision with a water drop or will drop through gravitational effect into the water reservoirs **6**.

Considering now the threshold, or baffle member **7** in greater detail, it is seen that it has an upwardly facing surface **11** which extends angularly from the nozzle **4** to the reservoir **6**. The baffle member **7** also has a lateral surface which defines a portion of nozzle **4** and deflecting section **3**. Means are provided for adjusting the slope of surface **11**. Means are also provided for adjusting the position of surface **12** in order to adjust the cross-sectional opening of nozzle **4** and deflecting section **3**. In the form shown in FIGS. 1 and 4, baffle member **7** is a unitary structure which is adapted to rotate about axis **13**. Rotation of baffle member **7** in a clockwise direction increases the slope of surface **11** and increases the opening of nozzle **4**. Rotation of baffle member **7** in a counterclockwise direction reduces the slope of surface **11** and reduces the opening of nozzle **4**. In the form shown in FIG. 1 the nozzle **4** is defined in part by outer edge **11** of surface **12** and in part by the lower end **15** of peripheral wall **8** of the housing **2**.

In the form of apparatus illustrated in FIG. 2 the dust arrestor provides a means of initially washing the dust containing air to remove a portion of the dust prior to introduction of the air in to the circular chamber **5**. In this form of the apparatus air contacting water surface N_1 is provided intermediate the inlet section **1** and deflecting section **3**. In the form illustrated, the air stream in inlet section **1** is directed in a substantially vertical direction downwardly into contact with surface N_1. This causes most of the coarse constituents of the dust and foreign matter to be retained by the water vapor contact between the incoming air and surface N_1. These coarse constituents then move downwardly into the dust well **9**.

In the form shown both surfaces N_1, N_2 are provided by the single water reservoir **6**. The two surfaces N_1, N_2 are separated from each other by baffle member **7**. The baffle member **7** has lateral surface **12** which in part defines deflecting section **3**. Air entering through inlet section **1** will contact surface N_1 yielding some of the coarse dust and picking up some water from surface N_1 which will be carried through deflecting section **3** along surface **12** by the air. The deflecting section **3** is curved in a direction of curvature opposite to the curvature of the direction of movement of the air current within the chamber **5**. In moving through the curved deflecting section **3**, strong centrifugal forces are built up within the air and this causes a large portion of the dust to be thrown out of the air and caught by the water layer **20**, within the deflecting section **3**. As a result of the pressure drop established by the frictional loss as the air moves through the arrestor, the water surface N_2 which in essence forms the lower limit of the circular chambers, will be higher than the water surface N_1. The water level of surface N_2 may be kept constant by means of a conventional level regulator.

The curvature of the deflecting section in FIG. 2 is such that the air stream between entering the deflecting section **3** and being discharged therefrom is deflected about 150 degrees and is also accelerated so as to increase the discharge velocity of the air stream emerging from nozzle **4**. The air stream emerging from nozzle **4** begins movement in a path which moves peripherally around the circular chamber **5**, at a velocity slightly less than the input or introduction velocity. Ultimately, after cleansing the air will be discharged from the circular chamber **5** through an opening **10***a* in end wall **10**.

In a certain position of the baffle member **7** and with a certain amount of air passed through the arrestor there will be a definite pressure drop present across the baffle member **7**. This pressure drop is related to the energy which is dissipated in or supplied during the washing process, and this energy is in turn related to the degree of separation which is obtainable for the dust contained in the air.

If a higher degree of separation is desired this can be attained in increasing the energy, which may also be designated as contact energy, which increase is accomplished by increasing the pressure drop through the washer. This is effected by adjusting the baffle member **7** in counterclockwise direction. The upper edge or lip **14** will then assume a position of reduced spacing with respect to the lower edge **15** of peripheral wall **8** which serves to reduce the cross-sectional area of the nozzle **4**. The nozzle cross-sectional area is, therefore, restricted and thus produces an increase in the outlet velocity from the air emerging therefrom. This results in the attainment of the desired increased pressure drop.

As a result of the increased pressure drop, the difference between the water levels N_1 and N_2 will increase. Since the level N_2 is kept constant, the level N_1 will be lowered.

When the pressure drop through the washing arrangement is increased for obtaining a higher degree of separation, it is at the same time desirable to increase the amount of water in the washing process. This is desirable as more water is carried away from the water surface N_2 both as a result of the increased rotational velocity of the air over this water surface N_2 and also as a result of the reduction of slope angle of the upper surface **11** on the threshold or baffle member **7** when the device is adjusted or rotated counterclockwise about the axis **13**.

It will be appreciated that while adjustment of the position of baffle member **7** results in change in cross-section of the nozzle **4**, only a portion of the preceding air carrying sections are changed in cross section. This may be altered by providing a curved blocking member **16** as is shown in FIG. 4, which is secured to baffle member **7** and adapted to move therewith. Thus, as baffle **7** is rotated counterclockwise to restrict the cross-sectional area of the nozzle **4**, the curved blocking member **16** moves downwardly to thereby restrict the air passageway between the member **16** and surface N_1.

It will be noted that water from surface N_2 will flow over upwardly facing surface **11** and establish a current **21** adjacent nozzle **4** which current **21** will be picked up

by the incoming air in similar fashion to current **20** obtained from surface N_1. Rotation of baffle member **11** controls the flow which establishes current **21**.

It will be appreciated that the dust arrestor of this invention provides an effective water cleaning system for dust containing air. A single reservoir may be employed to provide more than one air contacting water surface. A nozzle **4** introduces air into the arrestor chamber **5** from a position adjacent but spaced from the water fountain **6** and establishes a current about the periphery of the chamber **5**. Adjustment of baffle member **7** controls the opening of nozzle **4** and where provided, the position of curved blocking member **16**, to establish the desired pressure differential and effectively control the same. A portion of the dust is removed by the contacting surface N_1 and a portion by air contact with surface N_2 as well as currents **20, 21**. The curved deflection section **3** establishes a centrifugal force which effects some dust separation within the section **3**. The system, therefore, provides an adjustable system for effectively controlling dust removal in either a single or multistage water cleaning operation.

Whereas particular embodiments of the invention have been described above for purposes of illustration, it will be apparent to those skilled in the art that numerous variations of the details may be made without departing from the appended claims.

I claim:

1. An apparatus for water cleansing of dust containing air comprising:

(a) a substantially horizontal cylindrical housing open at the bottom forming a chamber having a closure at one end and an end wall with a central opening at the other end through which air entering the chamber is exhausted including a tangential inlet to said housing adjacent said closure,

(b) means positioned under the cylindrical housing arranged to hold a water reservoir therein with the surface of the water forming the bottom of said cylindrical housing,

(c) a baffle adjacent said inlet and the closed end of said housing extending upwardly from and through the surface of the water in said reservoir towards one side of the cylindrical chamber and rotatable on a pivot about a horizontal axis, said baffle including nozzle means and said side of the cylindrical chamber and said nozzle means forming said inlet means, and

(d) means for introducing an air stream to be cleaned upwardly between said baffle and the portion of the cylindrical wall toward which the baffle extends and so arranged that the entering air sweeps around the interior of the housing and across the surface of the water to sweep droplets of water from the surface over the baffle into the entering air stream.

2. An apparatus for water cleansing of dust-containing air as described in claim **1** including an air inlet section disposed exteriorly of said chamber and wherein said means to hold a water reservoir is arranged to hold a water reservoir in said air inlet section with the surface of the water forming an air contacting water surface exteriorly of said cylindrical housing which acts as an initial air contacting surface for said dust-containing air prior to introduction between said baffle and said portion of the cylindrical wall.

3. An apparatus for water cleansing of dust-containing air as described in claim **2** wherein said baffle has an upwardly facing surface extending from said water reservoir towards said portion of the cylindrical wall and is rotatably mounted so that rotation of said baffle in one direction will reduce the cross-sectional opening between said baffle and said portion of the cylindrical wall and rotation of said baffle in a second direction will increase the slope angle of said upwardly-facing surface and increase the cross-sectional opening between said baffle and said portion of the cylindrical wall.

4. An apparatus for water cleansing of dust-containing air as described in claim **3** wherein said baffle is disposed intermediate and separates said water surface that is a portion of the interior periphery of said cylindrical housing and said water surface that is exterior of said cylindrical housing, said latter water surface adapted to be at a lower level than said former water surface.

5. An apparatus for water cleansing of dust-containing air as described in claim **4** having a curved air supply passageway disposed intermediate said water surface that is exterior of said cylindrical housing and said opening between said baffle and said portion of the cylindricaly wall, the curvature of said passageway being opposite to the curvature of the sweep of said air about the interior of said cylindrical housing.

6. An apparatus for water cleansing of dust-containing air as described in claim **5** including an adjustable blocking member disposed adjacent the entrance to said curved air supply passageway, connecting means rigidly securing said blocking member to said baffle member whereby rotary movement of said baffle member in said direction in rotation which reduces the cross-sectional opening between said baffle means and said portion of the cylindrical wall also produces movement of said blocking member to reduce the opening defined between said air contacting water surface exteriorly of said cylindrical housing and said blocking member.

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U.S. Cl. X.R.

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