Jan. 26, 1960 R L. HOLLINGSWORTH 2,922,489

GAS WASHING, CLEANING AND DRYING APPARATUS

Filed April 5, 1957

FIG. 1

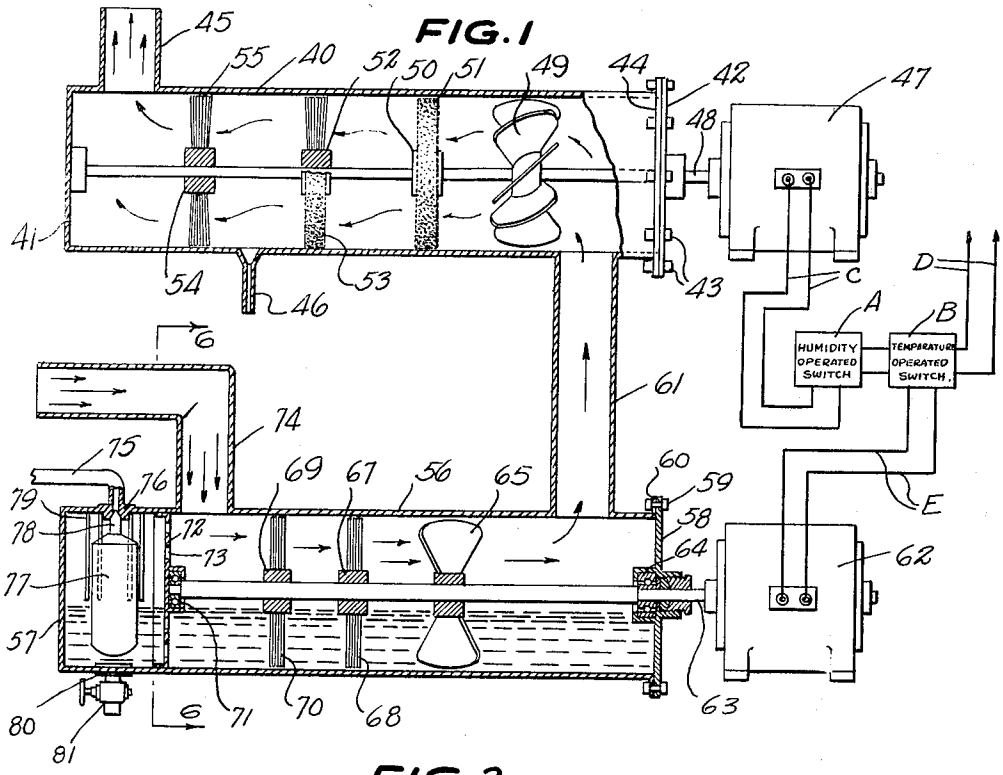


FIG. 3

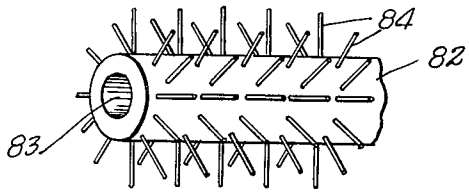


FIG. 2

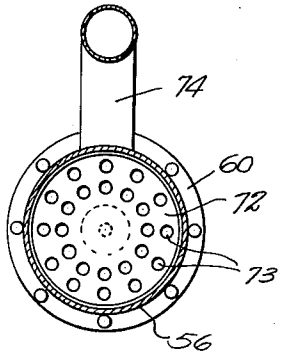
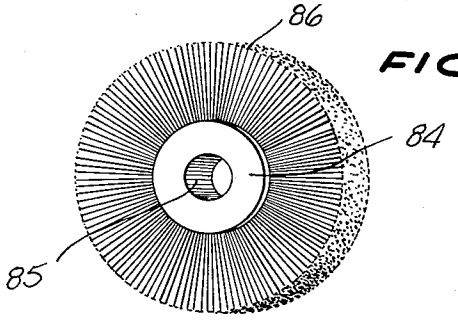


FIG. 4



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2,922,489

Patented Jan. 26, 1960

2,922,489

GAS WASHING, CLEANING AND DRYING APPARATUS

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Application April 5, 1957, Serial No. 651,060

8 Claims. (Cl. 183—24)

The present invention relates to apparatus for conditioning gas and is more particularly concerned with apparatus for removing undesirable foreign matter and for also removing moisture from the same.

The principal object of the invention is to provide an apparatus which can treat the gas in such a manner as to remove undesirable material distributed therein including the washing of the gas and addition of moisture thereto and which apparatus can also be used either subsequent to the cleaning function or separately for removing some or all of the moisture contained in the gas to the degree desired.

A further and important object of the invention is to provide apparatus capable of being universally used in the treatment of gases for washing the gas cleaned, deodorizing gases, eliminating soot and fumes from exhaust gases, eliminating dust and purifying gas and drying gases which apparatus can be of a wide variety of sizes while being capable of handling varying volumes of gases as well as gases of varying degrees of contamination.

A still further object of the invention is to provide economically producible apparatus having a minimum number of operating parts and which apparatus can quickly clean, moisturize, or demoisturize gases travelling in a continuous driven stream.

Another and very important object of the invention is to provide a novel device for driving undesirable particles from gases and also the washing of gases with a liquid, which also can be employed for removing moisture from the gas which device is not adversely affected by the chemicals or liquids present in the gases.

Further objects of the invention will be apparent in the following description of the accompanying drawings, wherein

Fig. 1 is a longitudinal section of a modified form of the present apparatus including a diagrammatic showing of a control system therefor.

Fig. 2 is a cross sectional view taken on line 6—6 of Fig. 1.

Fig. 3 is a perspective view of an end portion of a spinner forming part of the present invention; and

Fig. 4 is a perspective view of a modified form of spinner.

Referring now more particularly to the accompanying drawings, like and corresponding parts are designated by similar reference characters.

In the apparatus shown in Figs. 1 and 2 a cylindrical duct 40 has a bottom 41 and a closure plate 42 at the head thereof connected by bolts 43 to a lateral flange 44 of said casing. A duct 45 extends through one end of said casing providing a gas outlet, while a drain 46 extends from the lower face of said casing.

A driving motor 47 has a shaft 48 connected thereto and is rotatably supported by bottom 41 and plate 42 while extending axially of said casing. An impeller 49 is fixedly mounted on said shaft as is a hub 50 having

radially extending fingers 51, hub 52 having fingers 53 and hub 54 having fingers 55.

Casing 40 provides one section of the present apparatus which is superimposed above the second section provided by cylindrical casing 56 having a bottom 57 and a head plate 58 connected by bolts 59 to a lateral flange 60 at the head of casing 56. A duct 61 connects the lower side of casing 40 to the top side of casing 56 placing both sections in communication.

A driving motor 62 has a shaft 63 extending through a bearing 64 mounted on plate 58 with said shaft extending axially of casing 56. An impeller 65 is fixedly mounted on shaft 63 as is hub 67 with fingers 68 and hub 69 with fingers 70. The inner end of said shaft is rotatably supported by a bearing 71 mounted on a plate 72 having a plurality of openings 73 therethrough and extending across the interior of casing 56.

A duct 74 is connected to casing 56 between plates 72 and fingers 70 forming an inlet for the gases to be treated. A pipe 75 connected to a source of liquid is also connected to casing 56 between plate 72 and bottom 57 and has a tapered opening 76. A float 77 has a pointed rod 78 insertable in said opening 76 for closing the same while a plurality of guides 79 are connected to the interior casing 56 for guiding the movement of said float. An outlet pipe 80 is connected to the lower face of casing 56 and is controlled by valve 81 for permitting the draining of the fluid in said casing.

In the operation of the apparatus of Figs. 1 and 2 the gas to be treated is admitted through duct 74 while liquid is admitted from pipe 75 into said casing until a predetermined amount is admitted whereupon float 77 will rise with rod 78 closing opening 76. The liquid will flow through openings 73 in order that a portion of the fingers 68 and 70 will travel therethrough with the rotation of shaft 63 carrying portions of said liquid for adding the same to the gas passing through and around said fingers whereby the gas will have moisture added thereto and while the undesirable particles in the gas will be washed by the liquid and driven to the lower portion of the casing by said fingers. Impeller 65 will move the gas from duct 74 to duct 61, while impeller 49 will move the gas from duct 61 to the outlet duct 45 past and around the fingers 51, 53 and 55. Said fingers which are rotating due to the driving shaft 48 will drive the moisture from the gas against the interior of casing 40 where it will drain through outlet 46.

Motors 47 and 62 operate at the same or varying speeds and both are controlled automatically depending upon the humidity of the surrounding atmosphere, and the temperature thereof, by means of a humidity operated electrical switch A and a thermostatically controlled electrical switch B, which is electrically connected with switch A by wires C to motor 47 and switch B connected by wires D to a source of electrical current and also by wires E to motor 62. Switches A and B can also be located within end casing 40 or 56 as desired. Thus the moisture content of the casing leaving duct 45 can be controlled by automatic switches A and B.

The spinner shown in Fig. 3 consists of a hub 82 having an axial bore 83 and from which extend a plurality of semi-rigid fingers 84 which are connected at one end in any known manner as for example by a threaded connection or by welding or other known methods with the hub 82 and extend equally therearound and radially therefrom. Said fingers are further spaced apart with the spaces therebetween being greater than the diameter of the fingers providing a plurality of tortuous passageways therebetween and along the length of the hub.

The spinner shown in Fig. 4 has a flanged hub 84 with axial bore 85 with a plurality of fingers 86 closely grouped together, but spaced from one another around

the periphery of said hub and extending radially therefrom.

The fingers **84** are of a slightly larger diameter than the fingers **86** and are thus somewhat more rigid and stronger in order that the spinner of Fig. 3 can be used for heavy duty work such as in large capacity cleaners for cleaning the entire discharge from a large smokestack or for washing and drying large volumes of air such as required in air conditioning theaters, factories and other large buildings. The fingers **86** are strands of a relatively stiff, strong and durable material which fingers are clamped securely together by the flanges of hub **84** or in other normal manners and as an example, 1000 individual strands can be mounted on a three inch hub. Varying amounts of fingers can thus be provided on hubs of varying sizes.

The fingers **84** and **86** can be formed of varying materials, such as metal, plastic, glass strands or others having sufficient rigidity and the material of which they are composed will vary with the particular conditions under which they are to be employed. For example Phosphor bronze, nickel or stainless steel can be employed where fingers resistant to chemical reaction or oxidation from contact with liquid are desired.

The present apparatus are capable of being used in a great many varying applications, and where no liquid is employed they can be used solely for drying and as examples only of their application, they may be employed for washing air, cleaning and drying the same to a desired degree and distributing the same. They can be employed for deodorizing the air in areas like toilet rooms, kitchens, laboratories and the like or they may be used for removing moisture from air for defrosting windows and windshields or the like which would require relatively small units or they can be employed for drying air to effect the drying of textiles, fresh newsprint and the like. They may also be employed for treating smoke in smokestacks, the exhausts of engines to capture the fumes, collect dust and purify the air, freeing the same of pollen and in many other ways.

The term "gas" as employed herein is meant to include atmospheric air as well as other gas mediums and the term "liquid" is meant to include water as well as other suitable liquids usable with the present device.

The present apparatus is capable of considerable modification and such changes thereto as come within the scope of the appended claims are deemed to be parts of the invention.

What I claim is:

1. A gas washer and drier comprising a closed housing of an annular cross-sectional configuration having superimposed connected sections, a plurality of driven shafts with at least one shaft extending longitudinally of each of said sections, a plurality of spaced fingers connected to and spaced along said shafts with said fingers extending radially substantially to said housing interior wall, a plurality of impellers with at least one fixedly mounted on each of said shafts for moving gas through said housing, said housing having an inlet for said gas in one of said sections and an outlet in the other of said sections and means for supplying sufficient water to said section having the gas inlet to be contacted by a portion of the fingers in said section.

2. The invention in accordance with claim 1 wherein substantially all of the gases treated pass around and between said plurality of fingers.

3. The invention in accordance with claim 1 wherein substantially all of the gases treated are caused to flow into and out of the area occupied by said plurality of rotating fingers.

4. The invention in accordance with claim 1 wherein substantially all of the gases treated are passed into the area occupied by said plurality of fingers and hurled therefrom by centrifugal force exerted by said fingers during rotation.

5. A spinner mechanism for gas cleaning devices in combination with a housing, a hub, a driven shaft upon which said hub is mounted to rotate in said housing, a plurality of semi-rigid elongated fingers each connected at one end to said hub and positioned around said hub along the length thereof and extending radially therefrom substantially to said housing, and said fingers being spaced apart for the passage of gases therebetween, said fingers being encased by said housing forming a passageway for the movement of gases, means for establishing a liquid level within said housing and impeller means to move gases through said housing automatically.

6. A spinner mechanism for gas washing and drying devices as claimed in claim 5 which includes a rotating brush mechanism to absorb moisture from substantially all gases under treatment as substantially all of said gases pass between the elements of said rotating brush mechanism and being disposed by rotation to deliver the collected moisture onto the housing walls by centrifugal force, a thermostat for controlling said first mentioned brush elements, and a humidifier control means for controlling said moisture absorbing brush mechanism.

7. A gas cleaning device comprising a closed housing of an annular cross-sectional configuration having an inlet opening at one end for the admission of gas to be treated, means for supporting said housing with the inlet opening end lowermost, means for introducing water within said lower end of said housing, a driven shaft extending longitudinally of said housing, at least one group of a plurality of spaced apart fingers connected to and extending radially of said shaft in said housing and with at least a portion of said fingers positioned for contacting the water within said housing and distributing moisture therefrom to the gas in said housing and a second group of fingers positioned to be rotated for engaging said gas and removing moisture from said gas, an outlet at the upper end of said housing positioned for receiving the demoisturized gas and means for moving said gas from said inlet to said outlet.

8. In a gas cleaner comprising a driven wheel-like rotor having a plurality of spaced apart spokes, means for passing gases to be washed and treated initially between said spokes, means for moistening said spokes, and a second driven wheel-like rotor having a plurality of spaced apart spoke like elements for contacting said gases and absorbing and disposing of the moisture first imparted to said gas by said first spokes, and means for independently controlling said first and second rotors.

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