Sept. 3, 1963 N. BORA 3,102,800

SMOKE AND FUME ELIMINATOR

Filed June 14, 1961 2 Sheets-Sheet 1

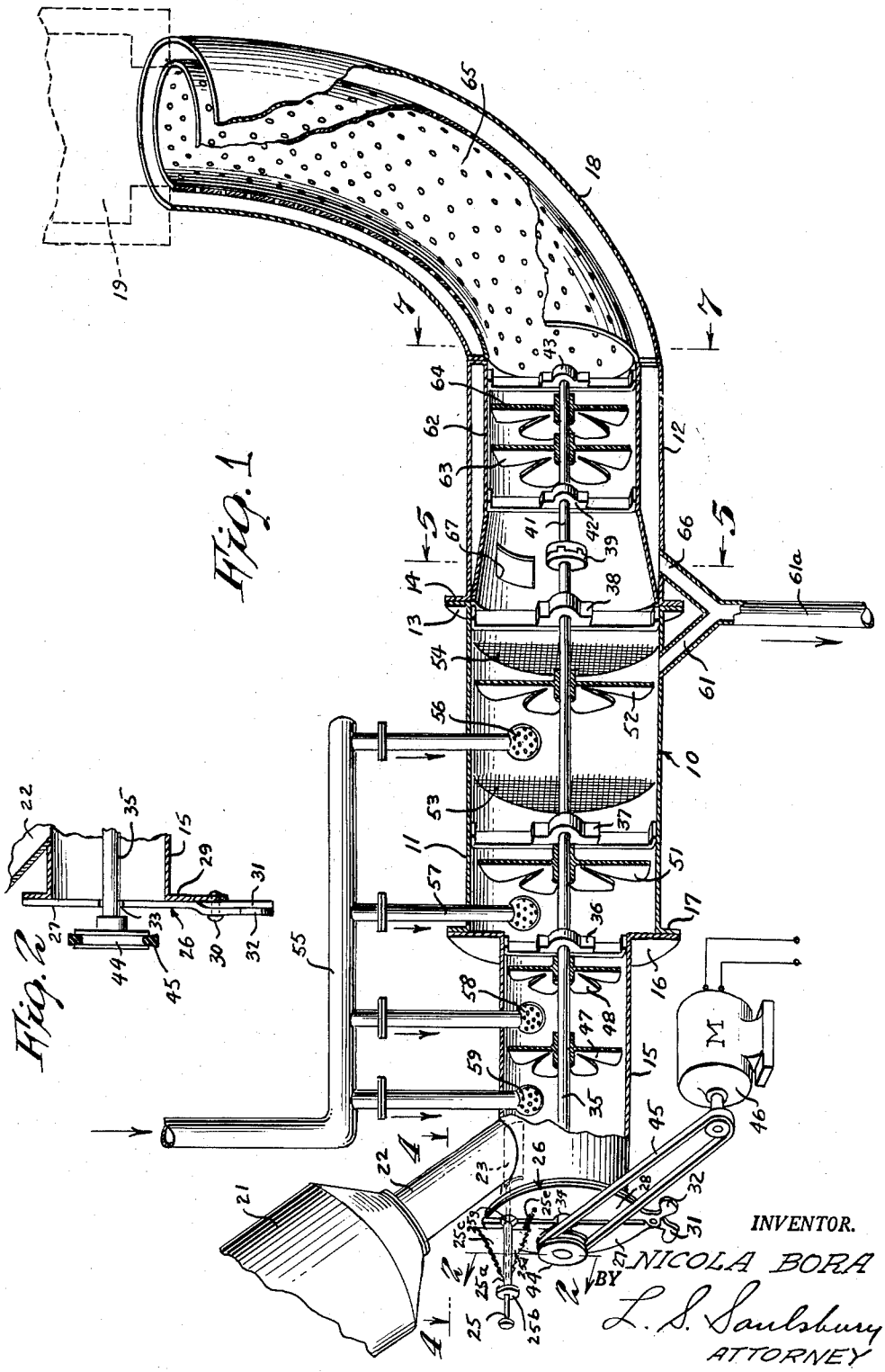


Fig. 1

Fig. 2

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SMOKE AND FUME ELIMINATOR

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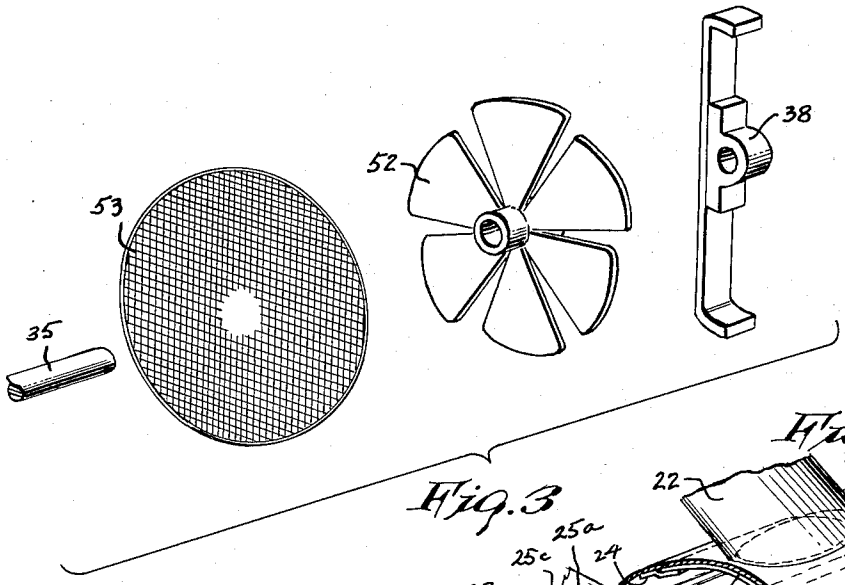


Fig. 3

Fig. 4

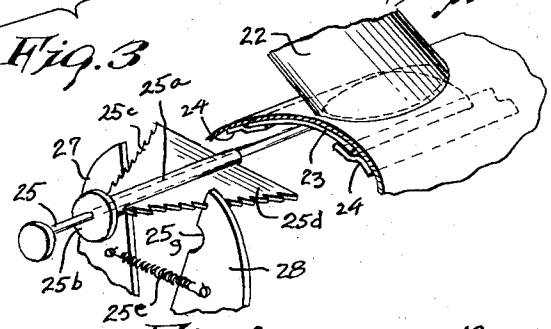


Fig. 5

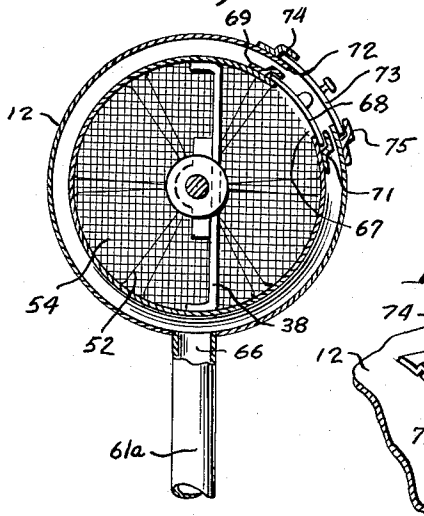


Fig. 7

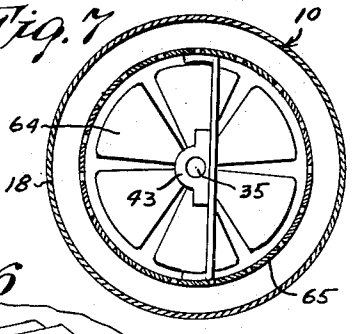
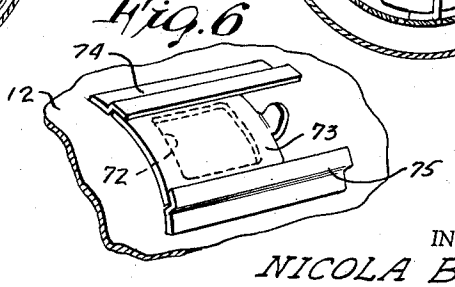


Fig. 6



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United States Patent Office 3,102,800
Patented Sept. 3, 1963

3,102,800

SMOKE AND FUME ELIMINATOR

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Filed June 14, 1961, Ser. No. 117,240
6 Claims. (Cl. 55—257)

This invention relates to a smoke and fume eliminator.

It is the principal object of the present invention to provide a smoke and fume eliminator for use in homes and factories and in connection with incinerators to wash the gases and fumes and reduce the pollution of air in city and factory areas.

It is another object of the invention to provide a smoke and fume eliminator in which the fumes will be submitted to several stages of receiving water to flush the smoke particles and fumes and to effect its cleansing action upon the same, and wherein with each of the spray heads there is an associated suction and mixing fan.

It is still another object of the invention to provide in a smoke and fume eliminator utilizing water spray for the extraction and absorbing of the smoke particles and fumes, adequate drainage of the water and the disbursal and separation of the water from the washed gases and fumes on leaving the eliminator and entering the chimney and so that only a dry smoke fume or steam leaves the chimney and penetrates the atmosphere.

It is a further object of the invention to provide a smoke or fume eliminator with adequate control means for the delivery of the smoke or fumes to the eliminator and for mixing of the same with suction air to insure the entry of the proper concentration of mixture for the best treatment of moisture to get the maximum extraction of the smoke and fume elements.

Other objects of the invention are to provide a smoke and fume eliminator for homes and factories having the above objects in mind, which is of simple construction, inexpensive to manufacture, easy to install, easy to maintain, parts readily replaceable, durable, compact, efficient and effective in use.

For a better understanding of the invention reference may be had to the following detailed description taken in connection with the accompanying drawing, in which

FIGURE 1 is a perspective view of the smoke and fume eliminator embodying the features of the present invention, with portions broken away to show the interior construction thereof,

FIG. 2 is a fragmentary sectional view of the air inlet end of the eliminator as viewed on line 2—2 of FIG. 1,

FIG. 3 is a collective and perspective view of one screen and fan stage assembly within the eliminator,

FIG. 4 is a transverse sectional view of a valve for controlling the supply of smoke and fume to the eliminator as viewed on line 4—4 of FIG. 1,

FIG. 5 is a transverse sectional view of the eliminator as viewed on line 5—5 of FIG. 1,

FIG. 6 is a fragmentary perspective view of a slide cover on the exterior of the eliminator that can be opened to permit hand access to the eliminator, and

FIG. 7 is a transverse sectional view of the eliminator taken on line 7—7 of FIG. 1.

Referring now to the drawings, 10 represents the eliminator casing that comprises two large diameter cylindrical sleeves 11 and 12 that are joined together by their respective flanges 13 and 14 and a small diameter first stage cylindrical sleeve 15 joined by a large flange 16 to a flange 17 of the large cylindrical sleeve 11. Fastening screws extend between the flange to hold the sleeve parts together. Joined to the sleeve 12 is an elbow-shaped strainer assembly 18 that leads to a chimney 19 to discharge the washed smoke gases and fumes thereto and from such chimney to the atmosphere. A pipe 21 leads from a furnace, fireplace or incinerator that has a reduced diameter portion

22 leading into the small casing sleeve 15 and by which the smoke, fume and gases are delivered to the eliminator. A control valve 23 is provided at the inlet of the small pipe portion 22 on the pipe 15, FIGS. 1 and 4, and is slidable in guideways 24 therein to close off or vary the supply of smoke and fumes to the eliminator. The slide valve 23 has a handle 25 easily accessible from the end of the eliminator.

In order to control the air sucked into the eliminator to mix with smoke and fumes entering the same to provide a proper mixture to facilitate treatment of the fumes and gases, an air inlet control valve 26 is provided on the small diameter casing sleeve 15 and consists of separable half circular parts 27 and 28 pivoted together and fastened to a flange 29 depending from the sleeve part 15 by a pin 30 and respectively having handles 31 and 32 that are gripped to open the parts 27 and 28. The inner edges of the parts 27 and 28 are respectively recessed at 33 and 34 to accommodate a fan drive shaft 35 and is journalled on brackets 36, 37 and 38 within the casing sleeve parts and to which there is connected by a clutch 39 a shaft extension 41 that is journalled bearings 42 and 43.

Rotatable and slidable upon the handle 25 is a sleeve 25*a* having a handle 25*b* by which the sleeve 25*a* can be slid and rotated upon the handle 25. Extending diametrically oppositely from one another and from the sleeve 25*a* are fins 25*c* and 25*d* with serrated or stepped edges so that upon the sleeve being turned and located between the edges of the half circular valve parts 26 in the manner illustrated in FIG. 4, the valve parts 27 and 28 can be held separated from one another to any desired extent in accordance to the condition of the smoke and gases entering the eliminator and the amount of air desired therewith and against the action of a tension spring 25*e* anchored between the valve parts 27 and 28. The valve parts 27 and 28 are recessed at 25*g* in their edges to allow the valve parts 27 and 28 to close upon the inner end of the sleeve when no air is being permitted to enter the eliminator. The sleeve 25*a* can be aligned vertically with the inner edges of the valve parts and held against turning on the valve handle 25 when not in use position, the recesses 25*g* in the valve parts accommodating the sleeve.

The fan drive shaft 35 has externally of the air control valve assembly 26, a pulley 44 and it is connected by a belt 45 to an electric motor 46 and by which the fan shaft 35 is rotated to the desired speed.

Within the small diameter valve part 15, where the smoke and fume enters the casing, the shaft 35 has two small suction fans 47 and 48. Within the large diameter sleeve part 11 are two large suction fans 51 and 52. The large sleeve part 10 also has two mesh screens 53 and 54 to break up large particles of smoke and debris tending to pass through the eliminator.

Water is supplied to the casing parts 10 and 15 by a water manifold 55 from which spray heads 56, 57, 58 and 59 respectively extend into the casing parts 10 and 15. Water from these spray heads will wash the smoke and fumes and absorb many of the smoke particles and the gases into the water collected in the casing part 10, will leave the same through a drain branch pipe 61 and the drain pipe 61*a*.

The smoke and fumes after having been given this treatment with water is substantially clean but may contain water. Accordingly, the smoke and fume is driven through a narrowed diameter casing 62 lying within the casing part 12 and within which are exhaust or discharge fans 63 and 64 driven by the shaft extension 41. This cleansed smoke and fume is discharged at full blast against a curved internal strainer 65 through the perforations and by virtue of the centrifugal action effect made possible by the curved shape of the strainer the particles

of water are forced and will drain downwardly through the elbow pipe **18** to branch pipe **66** of the drain pipe **61***a*. Thus when the smoke and fume enter the chimney **18** they have been ridded of much of their color material, obnoxious gases, and other deleterious matter, the water having absorbed the same and taken them down the drain **61***a*.

The inner sleeve **62** has an opening **67** on which there is a slide cover **68** held in guides **69** and **71**. On the sleeve **12** is another opening **72** which is aligned with the opening **67** and this opening is covered by a slide cover **73** operating in guideways **74** and **75**, FIGS. 5 and 6. Similar openings can be provided in the other portions of the casing **10**, by which hand access is readily had, upon opening the covers **73** and **68**, into the casing and access to the clutch coupling **39** which can be released in order that the shaft **35** may be pulled from the casing for cleaning purposes.

It should now be apparent that smoke and fumes delivered by the pipe **21** are drawn through the eliminator and water sprayed thereto by the several suction fans, and the water at the initial stages drained off so that the smoke and fumes are deprived of their harmful matter and are ready to be delivered to the atmosphere.

It should also be apparent that there has been provided at the discharge end of the eliminator means whereby substantially all of the water will be forced from the smoke and fumes before the same is passed to the atmosphere.

While various changes may be made in the detailed construction, it shall be apparent that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A smoke and fume eliminator comprising an elongated casing, pipe means for admitting smoke and fumes to one end of the casing, a shaft extending through the casing and having a plurality of suction fans thereon, power means for driving said shaft, water spray heads extending into the casing between the fans, drain pipe means for removing the water from the elongated casing, discharge fans carried by said shaft, and an elbow outlet fixed to the other end of the casing and against which the smoke and gases are finally exhausted by said discharge fans to rid them of their final water by centrifugal action, said elbow turned to drain water in to said casing, and a reduced diameter sleeve concentrically arranged within the casing about the discharge fans and a perforated elbow tube concentrically arranged in the elbow outlet and extending from the reduced diameter sleeve to confine the remaining gases therewithin while permitting the water to be finally extracted through the tube to the elbow outlet.

2. A smoke and fume eliminator comprising an elongated casing, pipe means for admitting smoke and fumes to one end of the casing, a shaft extending through the casing and having a plurality of suction fans thereon, power means for driving said shaft, water spray heads extending into the casing between the fans, drain pipe means for removing the water from the elongated casing, discharge fans carried by said shaft, and an elbow outlet fixed to the other end of the casing and against which the smoke and gases are finally exhausted by the discharge fans to rid them of their final water by centrifugal action, said elbow turned to drain water into said casing, and a smoke and gas inlet pipe entering the casing at one side thereof and adjacent one end thereof, a slide valve overlying the inlet pipe on the casing, a control valve formed of two parts and mounted on the casing over the end thereof and hingeable outwardly from one another to permit air to enter the eliminator from the end thereof along with the smoke and fume, said slide valve having a handle extending through the end of the casing and between the inner edges of the valve parts and means on said handle slidable and rotatable to be extended between the edges of the valve parts and bearing effective width to control the extent of opening of the valve parts, and spring tension means normally biasing said valve parts to their closed positions and against the rotatable and slidable means on the inlet valve handle.

3. An exhaust device for cleansing exhaust gases and smoke and discharging same to the atmosphere comprising an elongated cylindrical body, a smoke and exhaust gas inlet at one end of said body, communication means interconnected with said inlet for delivering smoke and exhaust gases thereto, a rotating shaft mounted along the central axis of said body and said inlet, bearings mounting said shaft in said body, a discharge casing extending from said body at the end thereof opposite from said inlet and having a smaller diameter than that of the body, said shaft extending from said body into said discharge casing, a plurality of spray heads located in said exhaust device, pipe means connected to said spray heads for delivering water to said device for spraying exhaust gases and smoke as the same passes therethrough, a plurality of impellers mounted on said shaft for impelling exhaust gases and smoke from said inlet toward and into said discharge casing, at least one exhaust fan mounted on said shaft and within said discharge casing for moving smoke and exhaust gases at increased velocity through said discharge casing, drive means for rotating said shaft and said impellers and fans, a centrifugal separator connected to and curving away from said discharge casing, the curve of said centrifugal separator forming a relatively sharply curved path for the flow of exhaust gases and smoke such that liquid and solid particles carried by said exhaust gases and smoke impinge against said centrifugal separator and are removed from the flow, and drainage pipes for the removal of liquid from said body, said discharge casing and said centrifugal separator.

4. An exhaust device for cleansing exhaust gases and smoke and discharging same to the atmosphere comprising an elongated cylindrical body, a smoke and exhaust gas inlet at one end of said body of a diameter smaller than the diameter of said body, communication means interconnected with said inlet for delivering smoke and exhaust gases thereto including a control valve, a rotating shaft mounted along the central axis of said body and said inlet, bearings mounting said shaft in said body, a discharge casing extending from said body at the end thereof opposite from said inlet and having a first portion of decreasing diameter adjacent said body and a second portion of reduced diameter extending axially from said first portion, said shaft extending from said body into said discharge casing, a plurality of spray heads located in said inlet and said body, pipe means connected to said spray heads for delivering water to said device for spraying exhaust gases and smoke as the same passes therethrough, a plurality of impellers mounted on said shaft for impelling exhaust gases and smoke from said inlet toward and into said discharge casing, at least one exhaust fan mounted on said shaft and within said discharge casing for moving smoke and exhaust gases at increased velocity through said discharge casing, drive means for rotating said shaft and said impellers and fans, a centrifugal separator connected to and extending upwardly from the second portion of said discharge casing including a curved inner tubing having a plurality of openings formed in its walls and a coaxial outer tubing, the curve of said centrifugal separator forming a relatively sharply curved path for the flow of exhaust gases and smoke such that liquid and solid particles carried by said exhaust gases and smoke impinge against said inner piping and are removed from the flow, and drainage pipes for the removal of liquid from said body, said discharge casing and said centrifugal separator.

5. An exhaust device for cleansing exhaust gases and smoke and discharging same to the atmosphere comprising an elongated cylindrical body, a smoke and exhaust

gas inlet at one end of said body, communication means interconnected with said inlet for delivering smoke and exhaust gases thereto including a control valve, air inlet means and an air inlet control valve at said one end of said body, a rotating shaft mounted along the central axis of said body and said inlet, bearings mounting said shaft in said body, a discharge casing extending from said body at the end thereof opposite from said inlet and having a first portion of decreasing diameter adjacent said body and a second portion of reduced diameter extending axially from said first portion, said shaft extending from said body into said discharge casing, a plurality of spray heads located in said inlet and said body, pipe means connected to said spray heads for delivering water to said device for spraying exhaust gases and smoke as the same passes therethrough, a plurality of impellers mounted on said shaft for impelling exhaust gases and smoke from said inlet toward and into said discharge casing, at least one exhaust fan mounted on said shaft and within said discharge casing for moving smoke and exhaust gases at increased velocity through said discharge casing, drive means for rotating said shaft and said impellers and fans, a centrifugal separator connected to and extending upwardly from the second portion of said discharge casing including a curved inner tubing having a plurality of openings formed in its walls and a coxial outer tubing, the curve of said centrifugal separator forming a relatively sharply curved path for the flow of exhaust gases and smoke such that liquid and solid particles carried by said exhaust gases and smoke impinge against said inner tubing and are removed from the flow, and drainage pipes for the removal of liquid from said body, said discharge casing and said centrifugal separator.

6. An exhaust device for cleansing exhaust gases and smoke and discharging same to the atmosphere comprising a horizontal, elongated cylindrical body, a smoke and exhaust gas inlet at one end of said body of a diameter smaller than the diameter of said body, communication means interconnected with said inlet for delivering smoke and exhaust gases thereto including a control valve, an air inlet port adjacent said communication means including an air inlet control valve, a rotating shaft mounted along the central axis of said body and said inlet, bearings mounting said shaft in said body, a discharge casing extending from said body at the end thereof opposite from said inlet and having a first portion of decreasing diameter adjacent said body and a second portion of reduced diameter extending axially from said first portion, said shaft extending from said body into said discharge casing, a plurality of spray heads located in said inlet and said body, pipe means connected to said spray heads for delivering water to said device for spraying exhaust gases and smoke as the same passes therethrough, a plurality of impellers mounted on said shaft for impelling exhaust gases and smoke from said inlet toward and into said discharge casing, a plurality of exhaust fans mounted on said shaft and within said discharge casing for moving smoke and exhaust gases at increased velocity through said discharge casing, drive means for rotating said shaft and said impellers and fans, a centrifugal separator connected to and extending upwardly from the second portion of said discharge casing including a curved inner tubing having a plurality of openings formed in its walls and a coaxial outer tubing, the curve of said centrifugal separator forming a relatively sharply curved path for the flow of exhaust gases and smoke such that liquid and solid particles carried by said exhaust gases and smoke impinge against said inner tubing and are removed from the flow, and drainage pipes for the removal of liquid from said body, said discharge casing and said centrifugal separator.

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