United States Patent [19]

Lawson

[11] **3,795,181**

[45] **Mar. 5, 1974**

[54] **FLUE CLEANING DEVICE**

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[73] Assignee: **Flue Cleaners Inc.,** Fresno, Calif.

[22] Filed: **Nov. 5, 1971**

[21] Appl. No.: **196,119**

[52] **U.S. Cl.** ..... **98/115 K,** 15/249, 134/115 R, 134/167 C

[51] **Int. Cl.** **F23j 11/00,** F23j 3/02

[58] **Field of Search** ... 98/115 K; 134/115 R, 166 C, 134/167 C, 168 C, 169 C, 104; 126/299 R, 299 A, 299 B, 299 C, 300, 301, 302, 303; 239/239, 240; 15/249

[56] **References Cited**

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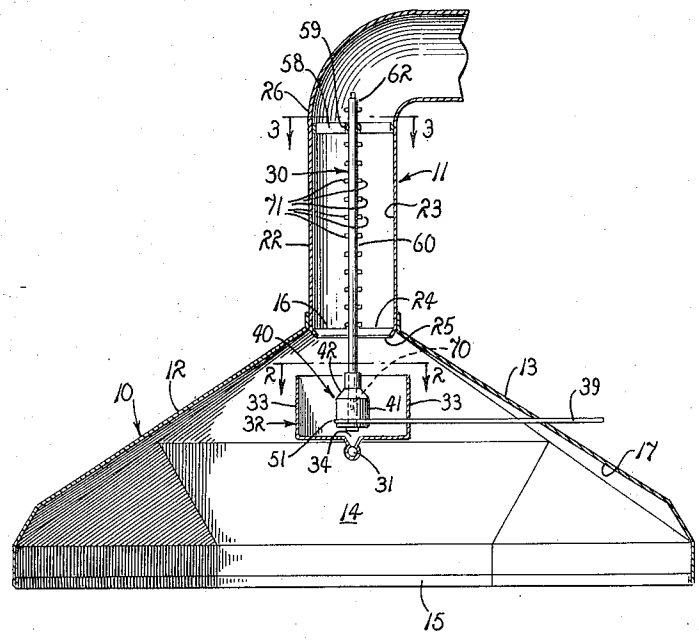
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Primary Examiner—Carroll B. Dority, Jr.
Assistant Examiner—Paul Devinsky
Attorney, Agent, or Firm—Huebner & Worrel

[57] **ABSTRACT**

A flue cleaning device adapted to be mounted in the interior of a flue having a fluid housing with a turbine mounted for rotational movement therein; a spray tube having a plurality of discharge jets disposed in spaced relation along the length thereof mounted on the turbine and extended axially of the flue; a receiving tray mounted below the fluid housing in vertical alignment with the flue; and a source of cleaning solution under pressure in operable connection to the fluid housing so that upon activation of the device, cleaning solution is forced into the fluid housing to drive the turbine and associated spray tube rotationally within the flue to discharge the solution under pressure from the discharge jets and against the interior of the flue in a uniform spray pattern to clean the flue and the solution and residue from the cleaning is gravitationally deposited in the receiving tray.

4 Claims, 7 Drawing Figures



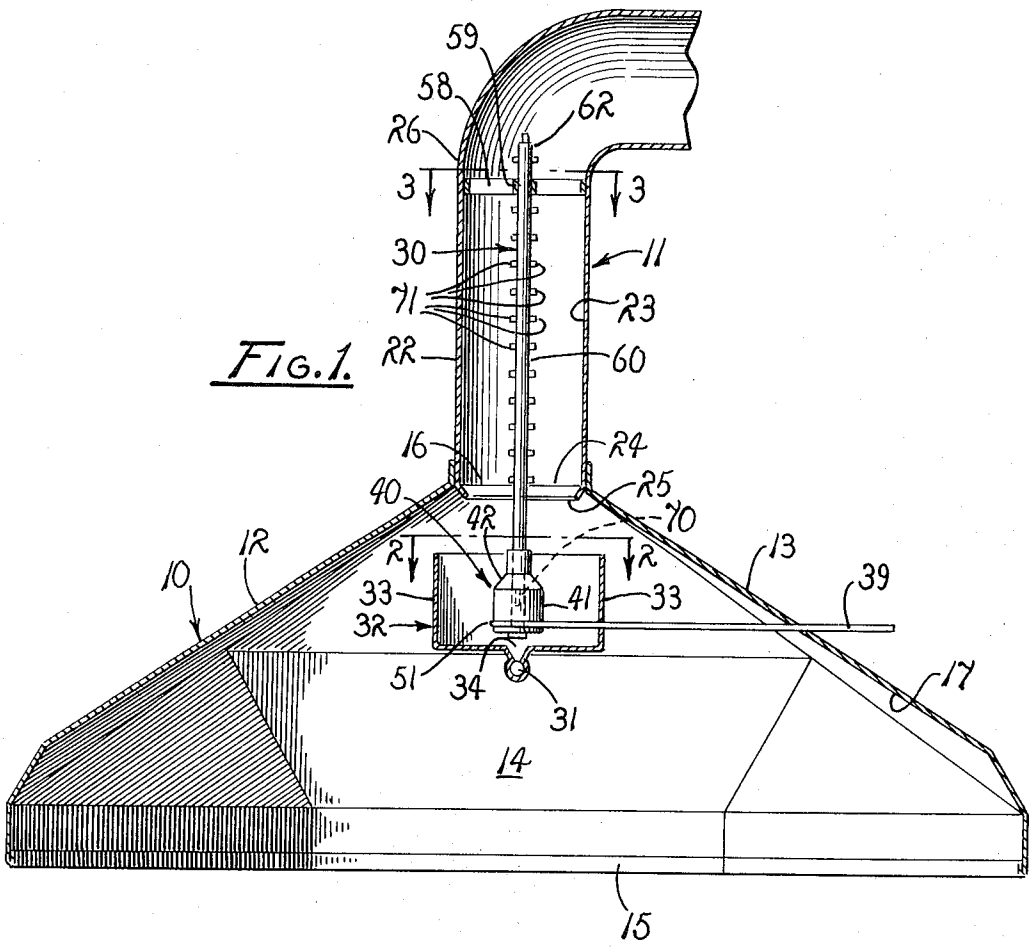


FIG. 1.

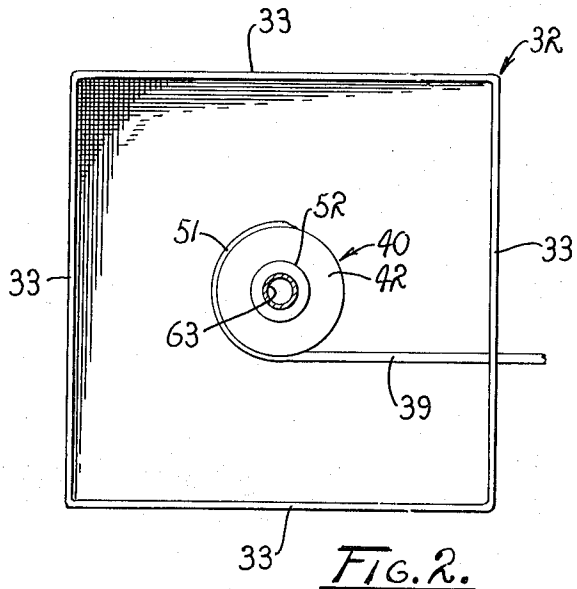


FIG. 2.

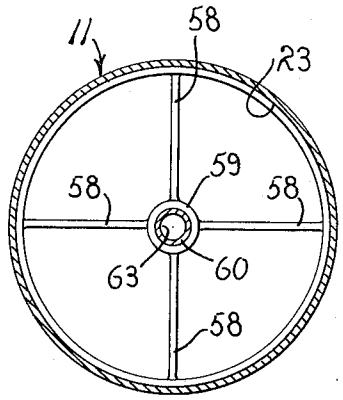


FIG. 3.

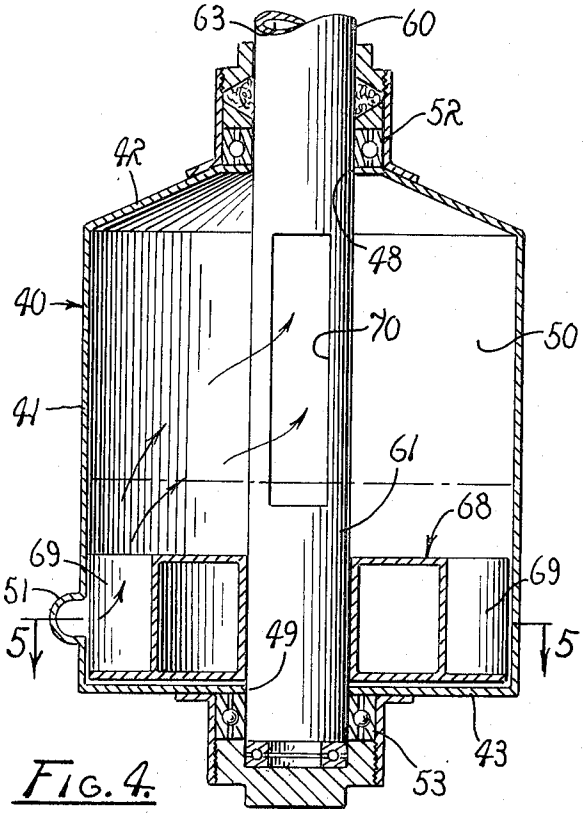


FIG. 4.

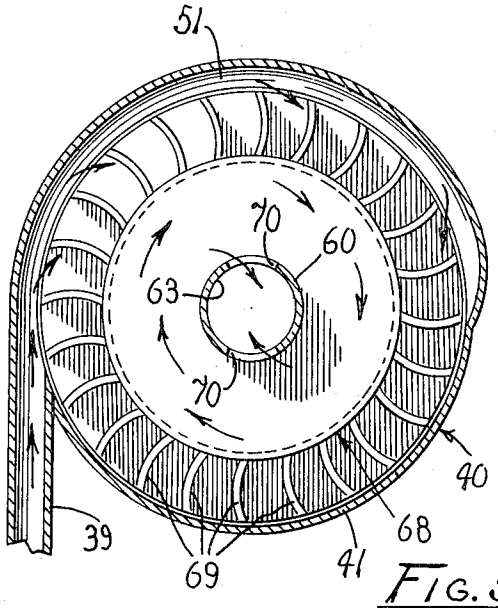


FIG. 5.

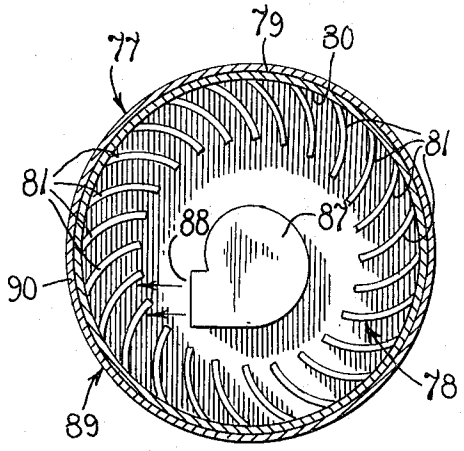


FIG. 7.

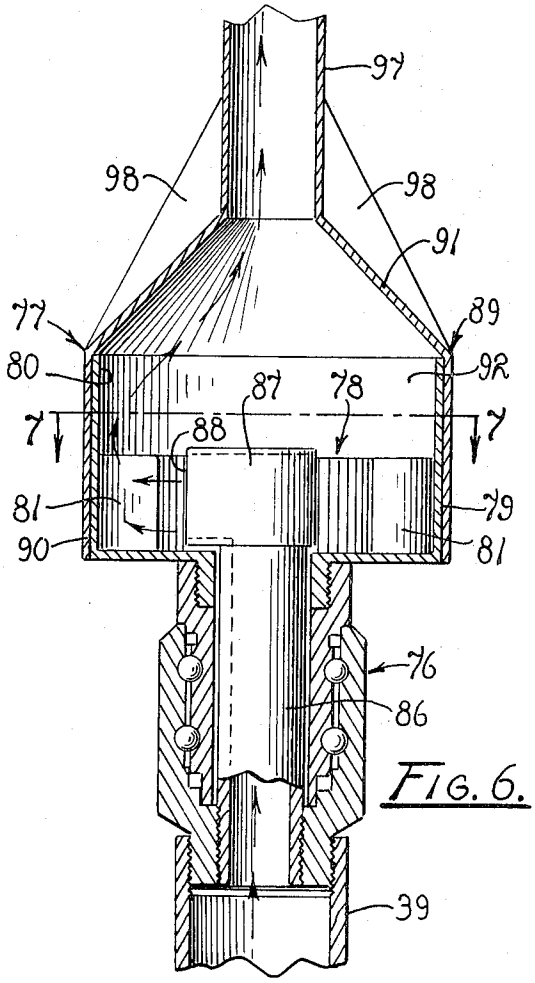


FIG. 6.

FLUE CLEANING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to flue cleaning devices and more particularly to such a device for permanent mounting within a flue for periodic, automatic cleaning thereof and for use in fire protection.

It has long been the practice in restaurants, cafeterias and other facilities where large quantities of food are prepared on a daily basis, to use a cooking range having an overhanging hood and connecting exhaust flue and fan to draw off the smoke, heat and gases created in the cooking of the food. While such flues are successful in evacuating such undesirable by-products from the kitchen, volatilized grease and other residue is also borne upwardly through the flue. Cooling of the volatilized grease during passage through the flue causes it to condense and to adhere to the interior surfaces of the flue.

Continued use of the cooking range causes a corresponding accumulation of grease creating thick deposits within the flue which impair the ability of the flue to operate efficiently. Since this accumulation takes place directly over the cooking range, it is at least unsanitary if not actually injurious to the health of employees working in the area and patrons consuming the food prepared on the range. Further, this accumulation constitutes a fire hazard. The proximity of this inflammable material to the heat from the range as well as to the hot gases passing through the flue creates a serious hazard that the grease will be ignited within the flue. This, of course, subjects the range, hood and flue to possible damage or destruction and the building in which the range, hood and flue are housed to be ignited.

Conventional practice directs that the exhaust flues of such public eating establishments manually be cleaned at least every few months. Because of the extremely confined areas in which cleaning is required within the flues, such cleaning is only partially effective and is onerous and repugnant to the person hired to perform the operation and consequently expensive to the owner of the establishment. The result is that while it would be desirable to clean the flues more frequently, the expense is prohibitive at other than minimal frequency of about 3 months. Consequently, to some degree, inefficient operation of these flues as well as the attendant health and fire dangers continue to exist under manual cleaning practices.

It has long been recognized that it would be desirable to have a cleaning device which can automatically be operated to clean such flues as frequently as desired without the need for manual assistance and consequently at low cost.

SUMMARY OF THE INVENTION

An object of the present invention, therefore, is to provide a cleaning device for exhaust flues which makes possible automatic cleaning of such flues.

Another object is to provide such a device which is intended for permanent mounting within an exhaust flue.

Another object is to minimize the labor and expenses heretofore required in the cleaning of exhaust flues.

Another object is to provide such a device which can be instantaneously operated to inhibit or extinguish fires which may occur within an exhaust flue.

Another object is to provide such a device which promotes sanitary, healthful conditions adjacent to the cooking ranges over which exhaust flues are mounted.

A further object is to provide such a device which automatically collects and disposes of the cleaning solution and residue resulting from the cleaning operation.

A still further object is to provide such a device in which the entire source of power to operate the device is provided by the introduction of fluid under pressure thereto.

Further objects and advantages are to provide improved elements and arrangements thereof in a device for the purposes described which is dependable, economical, durable and fully effective in accomplishing its intended purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, vertical section of a hood and connecting exhaust flue having the device of the present invention installed therein.

FIG. 2 is a somewhat enlarged, horizontal section, taken at the position represented by line 2—2 of FIG. 1.

FIG. 3 is a somewhat enlarged, horizontal section, taken at the position represented by line 3—3 of FIG. 1.

Fig. 4 is a somewhat enlarged, fragmentary vertical section of the fluid housing of the first form of the invention.

FIG. 5 is a fragmentary, horizontal section, taken at the position represented by line 5—5 of FIG. 4.

FIG. 6 is a fragmentary, vertical section of the fluid housing of a second form of the invention.

FIG. 7 is a horizontal section, taken at the position represented by line 7—7 of FIG. 6.

DESCRIPTION OF THE FIRST PREFERRED EMBODIMENT

Referring in greater detail to the drawings, in FIG. 1 a conventional hood 10 for use over a commercial cooking range, not shown, is illustrated in operable connection with an exhaust flue 11. In the conventionally recognized manner, the exhaust flue is in connection with a fan, not shown, which is designed to draw smoke, heat and gases upwardly through the flue for exhaust on the exterior of the building in which it is housed. The hood has opposite side walls 12 and 13 and a back wall 14. It also has a front wall which has been removed for illustrative convenience which, along with the side walls and back wall, define a reception opening 15 and a discharge opening 16. The hood has an interior 17.

The exhaust flue 11 has a cylindrical wall 22 and an interior surface 23. The flue has an entrance end 24 weldably secured to the hood 10 in circumscribing relation to the discharge opening 16. A downwardly convergent annular lip 25 is provided at the entrance end of the flue and circumscribes the discharge opening of the hood. Remote from the entrance end is an upper portion 26 to which subsequent reference will be made.

The flue cleaning device of the present invention is generally indicated by the numeral 30 in FIG. 1 and is shown therein mounted within the hood 10 and exhaust flue 11. The flue cleaning device preferably includes a discharge conduit 31 which is mounted in and extends through the back wall 14 of the hood 10 and communicates with suitable disposal facilities, such as a sewer.

The conduit extends into the interior 17 of the hood below the annular lip 25 of the flue. A residue receiving tray 32 is mounted on the discharge conduit below and in vertical alignment with the exhaust flue. The receiving tray has side walls 33 and communicates with the discharge conduit through a drain 34. The length and width of the receiving tray are greater than the diameter of the annular lip 25 of the exhaust flue so that the side walls of the tray extend laterally beyond the annular lip which serves as a funnel. The receiving tray is supported in the interior of the hood by the discharge conduit and/or by any suitable brackets, not shown, fastened in the interior of the hood.

A solution supply conduit 39 connected to a source of cleaning solution under pressure, not shown, extends horizontally through side wall 13 of the hood 10 and through side wall 33 of the receiving tray 32 into the interior thereof to a point in spaced tangential relation to the axis of the exhaust flue 11, as best shown in FIGS. 1 and 2. The cleaning solution under pressure may be of any suitable type such as a mixture of a cleaning solvent and water. A substantially cylindrical driving means or fluid housing 40 is mounted on and in communication with the solution supply conduit within the receiving tray in axial alignment with the exhaust flue. The fluid housing has a cylindrical side wall 41, a substantially conical top wall 42, and a bottom wall 43. The top wall has an opening 48 in axial alignment with the flue. The bottom wall has an opening 49 of the same diameter also in axial alignment with the flue. The cylindrical side wall, top wall, and bottom wall of the fluid housing define and enclose a fluid chamber 50. The fluid chamber 50 communicates with the solution supply conduit 39 through a peripheral inlet 51 which extends preferably in excess of 180° about the fluid housing 40, as best shown in FIGS. 4 and 5. Mounted above the top wall 42 of the fluid housing in axial alignment with opening 48 is upper bearing assembly 52. Mounted below the bottom wall 43 in axial alignment with the opening 49 is lower bearing assembly 53.

Mounted in the upper portion 26 of the exhaust flue 11 is a conventional spider assembly 58 having a bearing 59 centrally positioned therein in axial alignment with the openings 48 and 49 of the fluid housing 40. A cylindrical applicator probe or spray tube 60 is rotationally received in the bearing of the spider assembly 58, the upper bearing assembly 52, and lower bearing assembly 53 of the fluid housing. The spray tube has a lower end 61 extending axially through the fluid chamber 50 of the fluid housing 40 and an upper end 62 extending axially through the flue 11. The spray tube encloses an interior portion 63.

A fluid turbine 68 is mounted about the lower end 61 of the spray tube 60 within the fluid chamber 50 of the fluid housing 40 in horizontal alignment with the peripheral inlet 51 thereof. The fluid turbine provides a plurality of arcuate vanes 69 disposed in spaced relation about the periphery of the turbine in driven relation to the peripheral inlet, as best shown in FIG. 5. A pair of opposite longitudinal fluid inlets 70 are provided in the lower end of the spray tube within the fluid chamber above the fluid turbine and the inlets communicate with the interior portion 63 of the spray tube. A plurality of discharge ports or jets 71 are mounted in spaced relation along the length of the upper end 62 of the spray tube from the annular lip 25 of the exhaust flue 11 to the upper portion 26 thereof. One of the jets is mounted on the distal end of the spray tube in upwardly facing relation. Each of the discharge jets communicates with the interior portion of the spray tube. As with many conventional hoods 10 and exhaust flues 11, all of the elements of the flue cleaning device 30 are preferably constructed of stainless steel, or some other non-corrosive material, to avoid corrosion resulting from frequent contact with cleaning solutions.

SECOND EMBODIMENT

The second embodiment of the present invention incorporates the same basic features and elements of the first form of the invention with the exception of the construction and operation of the fluid housing and associates solution supply conduit 39. As in the first form of the invention, the solution supply conduit extends horizontally through the side wall 13 of the hood 10 and the side wall 33 of the receiving tray 32. However, it extends to a position within the receiving tray which is in axial alignment with the exhaust flue thereabove unlike the first form of the invention. At this point, the supply conduit curves to an upwardly facing attitude and provides a bearing assembly 76 in axial alignment with the flue.

A driving means or fluid housing 77 of the second form of the invention is mounted for rotational movement in the bearing assembly 76, as best shown in FIG. 6. The fluid housing includes a fluid turbine 78 mounted for rotational movement in the bearing assembly and having a cylindrical outer surface 79 and an interior surface 80. A plurality of arcuate vanes 81 are mounted about the interior surface of the turbine, as best shown in FIG. 7. An inlet tube 86 is mounted in fixed, non-rotational relation in the bearing assembly 76 in communication with the supply conduit 39 and extends into the fluid housing, as shown in FIG. 6. Mounted on the portion of the inlet tube within the fluid housing and in horizontal alignment with the arcuate vanes 81 is an impeller nozzle 87 having an offset dscharge port 88.

A covering portion 89 having a cylindrical side wall 90 and a conical top wall 91 is mounted in covering relation to the fluid turbine 78, as best shown in FIG. 6, thereby enclosing and defining a fluid chamber 92 therein. The outer surface 79 of the turbine and the side wall 90 of the covering portion are pressure fitted together in order to form a water-tight fluid housing. A coextensive applicator probe or spray tube 97 is provided centrally of the conical top wall 91 of the fluid housing 77 in axial alignment with the flue 11 so as to communicate with the fluid chamber 92 of the fluid housing. The portion of the spray tube extending above the fluid housing corresponds directly to the upper end 62 of the spray tube 60 of the first form of the invention in that it provides thereon a plurality of discharge ports or jets 71 disposed in spaced relation along the length thereof and said jets communicate with the interior portion 63 of the spray tube.

Supports 98 are affixed to the conical top wall 91 of the fluid housing 77 in supporting relation to the spray tube 97 in order to maintain it in fixed, rigid configuration. Also, as in the first form of the invention, the spray tube is mounted in the bearing 59 of a spider assembly 58 in the upper portion 26 of the exhaust flue 11.

OPERATION OF THE FIRST PREFERRED EMBODIMENT

The operation of the first preferred embodiment of the subject invention is believed to be clearly apparent and is briefly summarized at this point. As shown in its typical operational environment in FIG. 1, the flue cleaning device 30 of the present invention is intended for permanent installation within a conventional hood 10 and exhaust flue 11 which are suspended over a cooking range.

As described, the solution supply conduit 39 is in operable connection with a source of cleaning solution under pressure. The conduit is so connected through a switch or valve, not shown, which is operable to discharge cleaning solution under pressure through the supply conduit and into the cleaning device 30. When cleaning of the exhaust flue 11 is desired, this switch or valve is operated to discharge the solution through the supply conduit, the peripheral inlet 51 of the fluid chamber 50 and against the arcuate vanes 69 of the fluid turbine 68, as best shown in FIG. 5. The contact of the solution against the vanes causes the turbine to be rotated in a clockwise direction, as viewed in FIG. 2, thereby causing the spray tube 60 in connection therewith to be rotated within the upper portion 26 of the flue. Subsequent to striking of the vanes, the fluid chamber fills with solution. The solution is forced under pressure through the fluid inlets 70 of the spray tube and upwardly through the interior portion 63 thereof. Because of the restriction of the discharge jets 71 of the spray tube, back pressure is built up within the interior portion of the spray tube so that solution is discharged under pressure from the discharge jets outwardly against the interior surface 23 of the flue.

Contact of the cleaning solution with the accumulated deposits of grease and residue on the interior surface 23 of the exhaust flue 11 causes the deposits to be dissolved and gravitationally to descend through the exhaust flue to the annular lip 25 of the flue. The grease and residue borne by the solution is thereby channeled inwardly by the annular lip so that it is caused to fall into the residue receiving tray 32. The solution, grease and residue are there accumulated and caused to pass through the drain 34 of the receiving tray, and through the discharge conduit 31 for subsequent disposal.

Upon a sufficient passage of time to allow thorough cleansing of the interior surface 23 of the exhaust flue 11, the valve or switch in connection with the source of cleaning solution under pressure is turned off to terminate flow of solution through the supply conduit 39. The flue continues to drain into the tray 32 until it is substantially dry.

OPERATION OF THE SECOND EMBODIMENT

Operation of the second form of the invention is substantially as described for the first preferred embodiment of the invention with the exception of the precise operation of the fluid housing 77. Upon discharge of cleaning solution under pressure through the solution supply conduit 39, as above described, solution is caused to flow through the supply conduit, subsequently through the inlet tube 86 passing through the bearing assembly 76, and subsequently out through the discharge port 88 of the impeller nozzle 87, as best shown in FIG. 6. Discharge of the solution under pressure from the offset discharge port 88 causes the solution to be directed in driving relation against the arcuate vanes 81 of the turbine 78 within the fluid chamber 92 of the fluid housing. The turbine is thereby caused to be rotated in a clockwise direction, as viewed in FIG. 7, by the flow of the solution. This causes the fluid housing and associated spray tube 97 to rotate in the same direction within the exhaust flue 11. It will be noted in FIG. 6 that the fluid housing rotates in the bearing assembly 76 while the inlet tube 86 remains stationary, thereby causing solution to be continually discharged against the rotating arcuate vanes 81 and thereby maintaining constant rotation of the fluid housing.

As in the first form of the invention, the solution, upon striking the vanes 81, fills the fluid chamber 92 and the interior of the spray tube 97. Also, as with the first form of the invention, the back pressure built up by the restriction of the discharge jets 71 causes pressure to be maintained within the fluid housing and spray tube, thereby causing solution to be discharged in the form of spray from the discharge jets. Cleansing of the exhaust flue is thereby performed in the same manner as described in the first form of the invention.

It will be noted that with both forms of the invention the flue cleaning device 30 operates automatically, requiring only activation to initiate operation and deactivation to terminate operating when the cleansing has been completed. Consequently, the substantial expense involved in manual cleaning of exhaust flues is avoided. Furthermore, the automatic, inexpensive operation of the device makes possible frequent cleaning of the flue for maximum efficiency, safety and sanitation. Such optimum conditions can be maintained by cleansing on regular intervals of approximately four or five days as opposed to the present customary minimum frequency of approximately 90 days. Such, as noted, the operative elements of the flue cleaning device are constructed of stainless steel, or some other noncorrosive material, corrosion caused by the cleaning solution is thereby avoided to make possible trouble-free operation of the device with a minimum of service.

Finally, it will be noted that the flue cleaning device 30 can be operated as an effective fire-preventive device. If, for some reason, a fire develops within the exhaust flue 11 or any outlet conduits connected to its upper portion 26, more activation of the device to cause cleaning solution to be discharged through the discharge jets 71 of the device will immediately inhibit or extinguish the fire within the exhaust flue, thereby preventing spread of the fire to the rest of the building. Any fluid vaporizing within the flue itself is carried by draft into any associated outlet conduits and has a cleaning and fire retardant effect therein by the exclusion of oxygen. Similarly, it will be seen that if it becomes apparent that the temperature within the exhaust flue is becoming excessive, operation of the device can be initiated to cause cooling of the flue, thereby minimizing any resultant dangers therefrom.

Although the invention has been herein shown and described in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination with a hood, and a substantially cylindrical flue upwardly extended from the hood to exhaust air upwardly from the hood, an elongated spray tube, means mounting the spray tube permanently coaxially in the flue for rotrtion therein, means for supplying fluid under pressure to rotation tube whereby the fluid is sprayed in circumscribing relation to the tube on the interior of the flue to descend therealong, a lip mounted on the flue within the hood in circumscribing relation to the flue and downwardly and inwardly extended therefrom to direct fluid descending from the flue downwardly in an annular curtain, and fluid receiving means mounted within the hood in downwardly spaced relation thereto for the passage of air and air borne contaminants upwardly therebetween through said annular curtain of descending fluid and said fluid receiving means being mounted in substantial coaxial alignment with the flue and having circumscribing walls in outwardly and downwardly spaced relation to the lip to receive said curtain of fluid descending from the lip.

2. In combination with a hood, and a substantially cylindrical flue connected to the hood and upwardly extended therefrom adapted to convey air upwardly from the hood; a fluid receiving tray mounted in coaxial alignment with the flue in downwardly spaced relation to the hood to define an annular air passage between the hood and the tray and circumscribing the tray, an elongated spray tube having laterally disposed discharge ports, means mounting the spray tube substantially coaxially in the flue for rotation therein, drive means connected to the tube for rotating the tube in the flue, and means for supplying fluid under pressure to the tube whereby the fluid is sprayed on the interior of the flue gravitationally to descend therealong and downwardly from the flue through the air passage to wash impurities from the air passing upwardly through the annular passage, the tray being disposed to receive such fluid descending through said passage.

3. The flue cleaning device of claim 2 in which the driving means comprises a fluid housing having a turbine adapted for rotational movement therein and said turbine is in operable association with the spray tube whereby cleaning solution supplied to the fluid housing under pressure rotationally drives the turbine and spray tube within the flue to discharge the cleaning solution against the interior of the flue in a substantially uniform spray pattern.

4. The flue cleaning device of claim 2 in which the driving means comprises a fluid housing adapted for rotational movement and in operable connection with the spray tube whereby cleaning solution supplied to the driving means under pressure rotationally drives the fluid housing and spray tube within the flue to discharge the cleaning solution against the interior of the flue in a substantially uniform spray pattern.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,795,181 Dated March 5, 1974

Inventor(s) Richard L. Lawson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specification:

Column 4, line 41, delete "dscharge" and insert ---discharge---.

Column 6, line 37, delete "Such" and insert ---Since---; and

line 47, delete "more" and insert ---mere---.

In the Claims:

Column 7, line 5, delete "rotrtion" and insert

---rotation---; and

line 6, delete "rotation" and insert ---the---.

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.