United States Patent [19]

King

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[54] RANGE HOOD AIR CLEANING DEVICE

[75] Inventor: Donald E. King, Louisville, Ky.

[73] Assignee: Ayr-King Corporation, Louisville, Ky.

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[21] Appl. No.: 397,091

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 378,566, July 12, 1973.

[52] **U.S. Cl.** ..... **98/115 K**, 55/118, 55/122, 55/126, 55/228, 55/242, 55/259, 55/267, 55/320, 55/436, 55/DIG. 36, 126/299 R, 210/513, 261/115

[51] **Int. Cl.** **B01d 47/06**

[58] **Field of Search** ..... 55/228, 239, 240, 241, 55/260, 434, 436, 447, 461, 421, DIG. 36, 118, 122, 126, 242, 259, 267, 320; 98/115 R, 115 K; 126/299 R, 299 A, 299 B, 300, 301; 210/513, 532, 538; 261/115, 116, 117, 118

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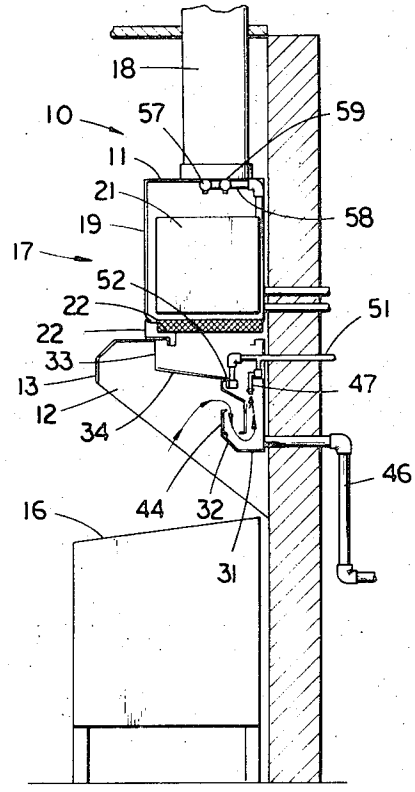
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Primary Examiner—Dennis E. Talbert, Jr.
Attorney, Agent, or Firm—Woodard, Weikart, Emhardt & Naughton

[57] **ABSTRACT**

Disclosed is a hood structure for ventilating, primarily, commercial cooking ranges which is provided with an air intake slot defined by inwardly formed lip portions which aid in centrifugally extracting grease particles from air flowing through the hood. A continuous spray of water cools the adjacent lip portion and further removes grease particles and the like from the air stream. A separate, remote grease trap removes grease from the water draining from the hood.

1 Claim, 5 Drawing Figures



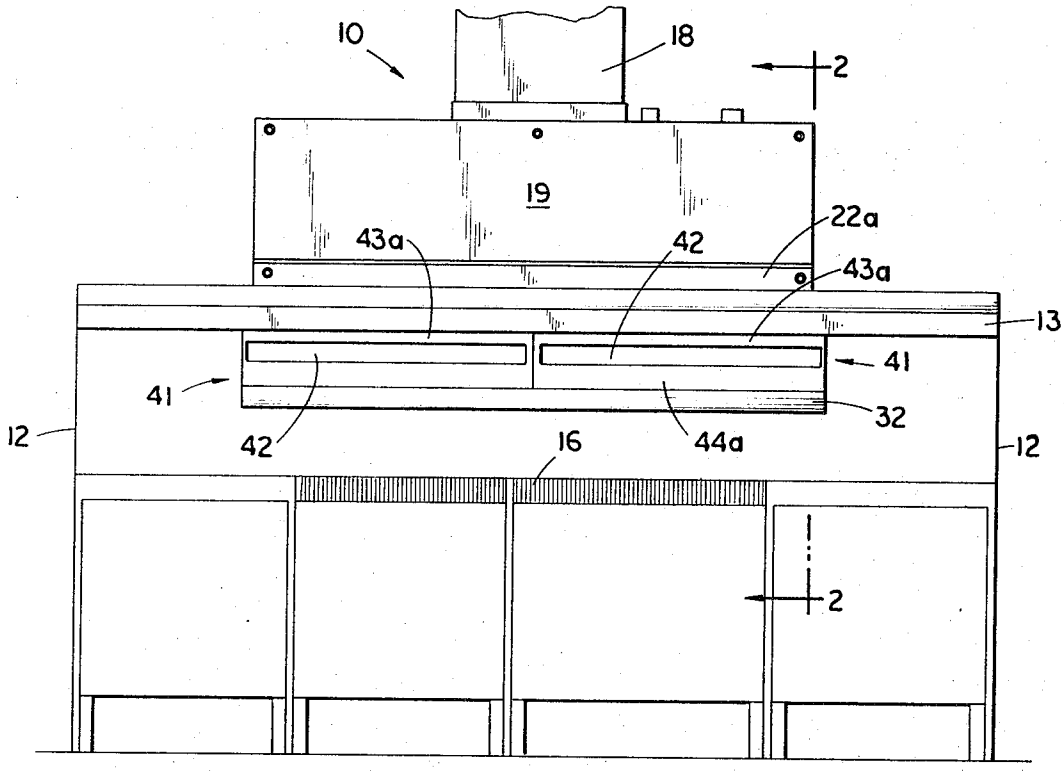

10
18
2
19
22a
43a
42
43a
13
41
41
32
12
42
44a
16
12
2

Fig. 1

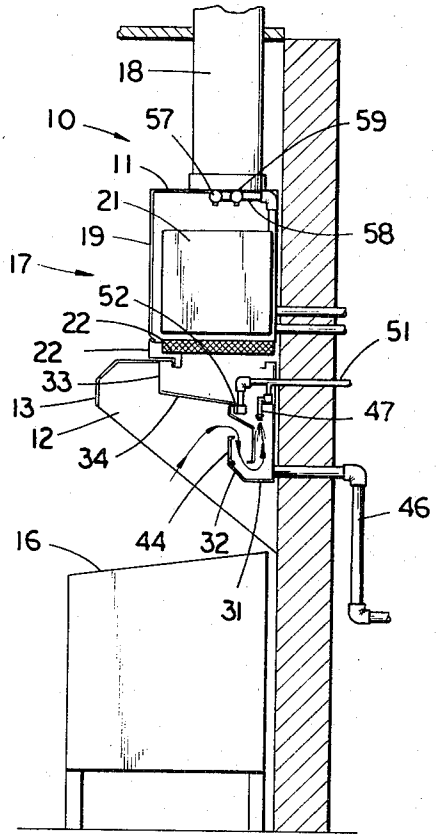

18
10
57
59
11
21
58
19
17
52
22
51
22
33
13
47
12
34
46
44
32
16
31

Fig.2

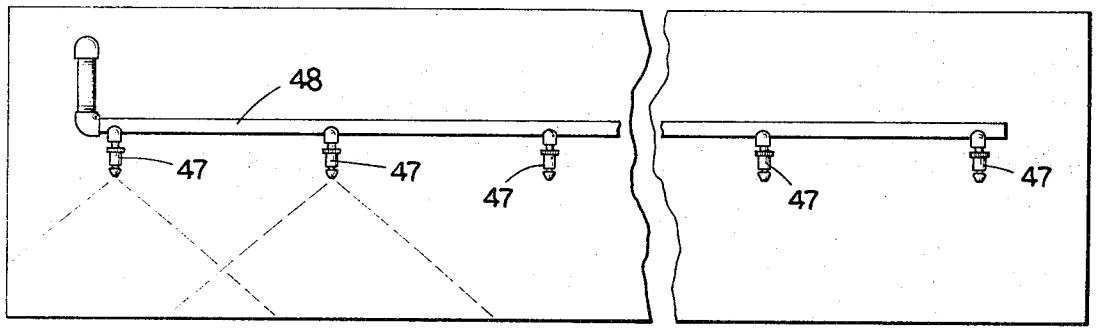

48
47
47
47
47
47

Fig. 3

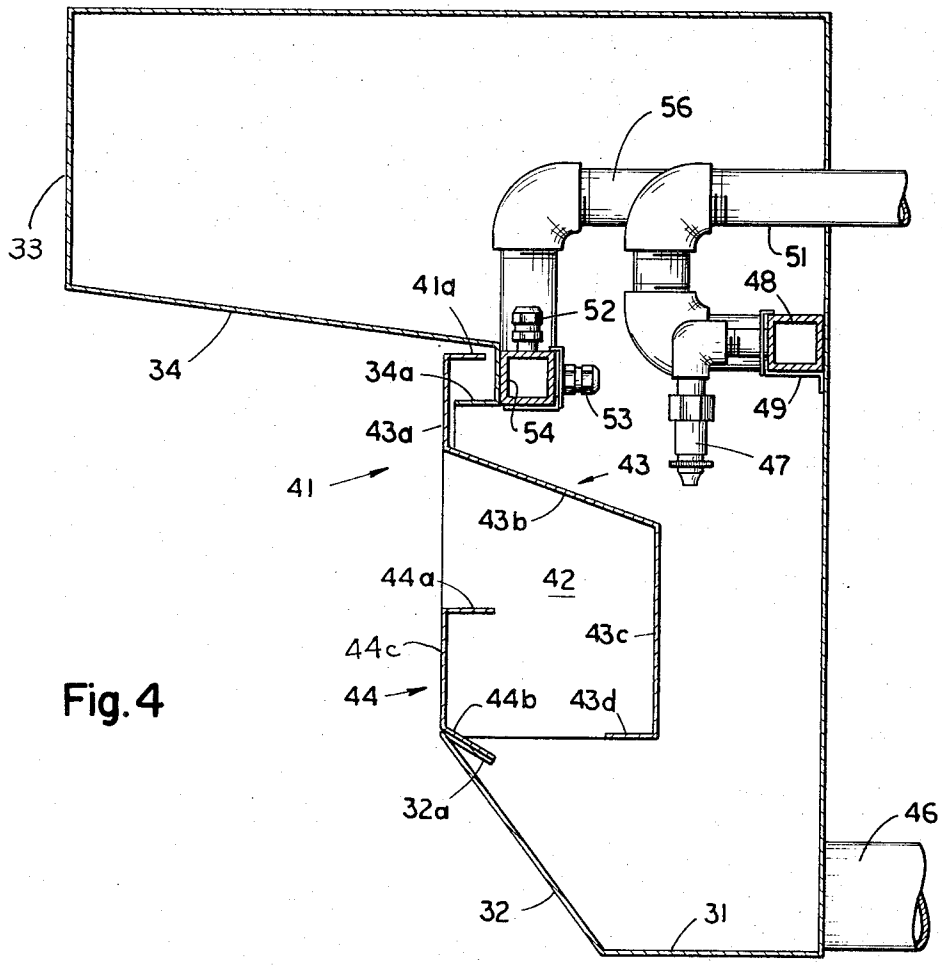

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33
51
41a
48
52
34
34a
49
53
54
43a
47
43
41
43b
42
44a
43c
44c
44
44b
43d
32a
46
32
31

Fig. 4

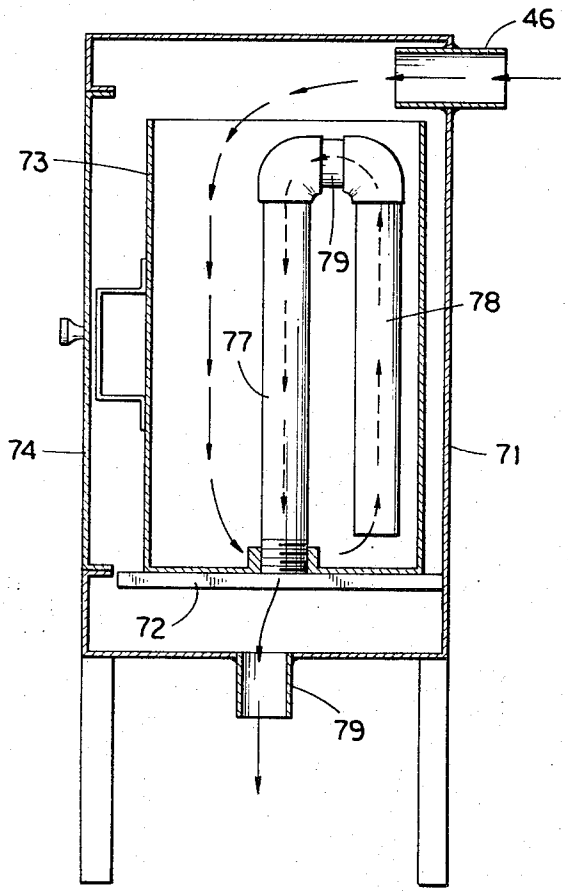


Fig. 5

RANGE HOOD AIR CLEANING DEVICE

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of my copending U.S. patent application Ser. No. 378,566, filed July 12, 1973 and titled "Ventilating System Cleaning Apparatus".

The ventilation of enclosures in which a smoke and grease laden atmosphere is generated (for example, commercial and institutional kitchens) is beset with problems. Difficulties in disposing of grease vapor, odors and smoke, time consuming clean-up and maintenance of the equipment and ventilating apparatus, the fire hazard resulting if such periodic clean-up is not rigorous, are some of the difficulties involved. Air-pollution ordinances have forclosed the possibility of meeting these difficulties by merely dumping the contaminated ventilating air stream to atmosphere exterior of the building or enclosure.

The apparatus of the present invention utilizes a hood structure incorporating a centrifugal extractor, internal portions of the extractor being cooled by a continuous water spray to prevent grease particles from baking on these surfaces. The water spray, flowing counter to the air flow, also serves to wash grease and smoke particles from the air stream. The grease contaminated water is moved through a separate grease trap assembly which accumulates the grease entrained in the contaminated water, thus permitting the decontaminated water to be returned to the conventional sewer drain or other drain facility.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front view of a structure embodying the present invention.

FIG. **2** is a side sectional view of the structure taken generally along the line **2—2** of FIG. **1.**

FIG. **3** is a fragmentary view of the continuous spray nozzle assembly shown in FIG. **2.**

FIG. **4** is an enlarged side sectional view of a portion of the structure shown in FIGS. **1–3.**

FIG. **5** is a side sectional view of the grease trap apparatus utilized with, but remote with respect to, the structure of FIGS. **1** and **2.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIGS. **1** and **2,** the apparatus includes a generally vertically arranged hood structure indicated generally at **10,** the hood having a generally vertically extending box-like configuration with a forwardly extending upper portion **11.** Generally triangularly shaped side members **12** extend downwardly from the hood portion **11,** the transverse portion **13** joining the side members and extending across the front face of the structure. As will be evident from FIG. **2,** particularly, the side members **12** and the transverse member **13** form a hood proper which overlies the cooking surface **16** of a conventional cooking range. The range may be of the type utilized in commercial kitchens and may include cooking elements suitable for deep-fry and char-broil functions.

The hood structure thus includes an intake portion adjacent the hood proper defined by the walls **12** and **13,** a filter and electrostatic precipitator section indicated generally at **17** and an outlet conduit indicated at **18** which may extend to and discharge from a powered roof exhauster (not shown) located on the roof of the structure in which the apparatus is installed. The portion **17** is provided with an access door **19** which is removable to expose the interior of the hood structure and the series of electrostatic precipitator cells identified at **21.** These cells are vertically arranged in side-by-side fashion within the hood structure and are given an electrical charge which funtions to remove fine particles from the air stream moving through them. These precipitator cells are conventional and are disclosed in somewhat more detail in my aforementioned copending application. Just below the precipitator cells **21,** and extending transversely across the air flow path through the hood structure, is a removable, filter **22** accessible through the removable panel **22***a.*

The lower wall **31** (FIG. **2**) of the hood structure merges with an inclined portion **32** of the front wall of the hood structure, the remaining portion of the front wall being formed by the vertical portion **33** and the inclined portion **34.** The horizontally elongated opening between the upper margin of the wall portion **32** and the lower margin of the wall portion **34** accommodates a generally tubular insert indicated generally at **41.** As will be evident from FIG. **1** there are two duplicate unitary tubular structures **41,** only one being visible in FIGS. **2** and **4.** The structure **41** is provided with a flanged margin **41***a* which extends into the reversely flanged portion **34***a* of the wall **34** (FIG. **4**). An inclined flange **44***b* engages a similarly inclined flange **32***a* formed on the inclined wall **32.** The structure **41** defines an opening or slot **42** which is bounded by an upper lip portion **43** and a lower lip portion **44.** The upper lip portion has a front panel **43***a* and a portion **43***b* which is turned inwardly and downwardly to merge with the vertical portion **43***c.* The wall **43***c* terminates short of the base wall **31** of the hood and at its lower margin is provided with an outwardly extending flange **43***d.*

The lower lip portion **44** is provided with a front wall **44***c,* the inclined lower marginal flange **44***b,* previously mentioned, and an inwardly turned flange **44***a* defining the lower margin of the slot **42.** The lower lip portion or flange **44***a* is spaced above the lower marginal flange **43***d* of the upper lip member **43** and the area available for flow of contaminated air is narrowed by the oppositely extending flanges **44***a* and **44***d,* thereby increasing the velocity of the air flow. Contaminated air entering the slot **42** thus has its velocity increased and is directed downwardly, the inclined wall **32** and the base wall **31** of the hood structure functioning to reverse the flow of air, turning it upward, after it leaves the member **41.** The increase in velocity of the air stream and its abrupt change in direction centrifugally extracts the larger grease particles from the air stream causing them to move into the area above the base wall **32** of the hood. This deposited grease and the water flowing from the continuous spray nozzle structure, to be subsequently described, is drained from the interior of the hood structure through the drain pipe **46** which is connected to the remote grease trap structure to be subsequently described with reference to FIG. **5.**

As may best be seen in FIGS. **2, 3** and **4,** there is supported just above and behind the wall **43***c* a series of continuous water spray nozzles **47.** The nozzles **47** are fed from a header pipe **48,** supported by means of a bracket **49** within the hood structure, and supplied with cold water through the pipe **51** (FIG. **2**). As will be evi-

dent from FIG. 3, the spray angle of the nozzles 47 is approximately 120 degrees and the spray patterns overlap so that a curtain of water droplets is directed into and counter to the air as it flows upwardly into the upper portion of the hood structure. As will be evident from FIG. 2, a portion of the spray issuing from the nozzles 47 engages and cools the walls 43*b* and 43*c* of the lip structure 43, thereby holding the operating temperature of these surfaces at a level such that grease droplets entrained in the contaminated air moving through the slot 42 are not baked on the lip portion surfaces. The flow of water to the continuous spray nozzles 47 and to the wash-down nozzles to be subsequently described is controlled by control elements not shown and not forming a part of the present invention but described in detail in my aforementioned copending patent application.

Slightly above and forwardly of the nozzles 47 is an array of upwardly directed wash-down nozzles 52 and an array of inwardly directed wash-down nozzles 53. Both sets of nozzles are supplied by the header pipe 54, the pipe 54 being supplied at the desired intervals with warm water through the pipe 56 which extends to the exterior of the hood structure in side-by-side relation to the pipe 51. Referring to FIG. 2, above the electrostatic cells 21 there is disposed a series of nozzles 57 which are also supplied with warm wash-down water through a pipe 58 which communicates with the water inlet pipe 51 (FIG. 4) previously mentioned. Closely adjacent the wash-down water nozzles 57 there is provided a series of detergent spray nozzles 59 which, at the desired intervals, provide detergent solution to the surfaces of the precipitator cells 21, the sequence of operation of these wash-down nozzles 57 and the detergent nozzles 58 being controlled by control apparatus not shown but described in some detail in my aforementioned copending patent application.

Referring to FIG. 5, the apparatus for separating grease from the grease contaminated water draining from the hood structure will now be described. The apparatus includes a generally rectangular housing 71 into which an extension of the drain pipe 46 extends. Supported on side brackets 72 within the housing is a receptacle 73 which, as indicated by the arrows in FIG. 5, receives the contaminated drain water from the pipe 46. A removable access door 74 in the housing permits the removal of the receptacle 73 for purging it of accumulated grease. The interior of the receptacle 73 is provided with an inverted-U shaped tube. One leg 77 of the tube extends to the exterior of the receptacle at the receptacle base and the other leg 78 of the tube terminates adjacent to but above the receptacle base, the junctional portion 79 of the tube being disposed adjacent the upper margin of the receptacle 73. It will be understood that grease is separated from the contaminated water by the flotation principle, that is, grease accumulates at the surface of the water emptied into the receptacle 73, the water at the base of the receptacle flowing through the leg 78 and the leg 77 of the tubular member to exit through the drain 79. The water leaving the drain is substantially clean and free of grease which accumulates in the receptacle 73.

In operation, when the range is in operation and the pressure in the hood structure is below atmospheric pressure, contaminated air will be drawn through the slot 42 and will increase in velocity by its passage through the restricted area provided by the lip portions 43 and 44. The larger grease particles will be removed by centrifugal force as the air stream is changed in direction and further particles will be washed from the air as it moves counter to the cold water spray from the nozzles 47. The surfaces of the lip structure, particularly portions 43*b* and 43*c* (FIG. 4) will be cooled by the water spray. The air flow will continue through the filter 22 and the precipitator cells 21 to exit through the flue 18 with grease particles and smoke particles removed. By a control sequence not shown, upon shutdown of the apparatus, the wash-down nozzles 52 and 53 and the detergent nozzles 59 and wash-down nozzle 57 will be energized for the desired time intervals providing a wash-down of the apparatus, the water from the wash-down accumulating at the base 31 of the structure to be carried away by the drain pipe 46. The grease trap structure described with reference to FIG. 5 removes grease from this drain water permitting it to be emptied into conventional floor drains through the outlet 79 (FIG. 5).

From the foregoing it will be evident that the continuous water spray from the nozzles 47 impinges on the surface of the lip structure cooling these surfaces to that grease particles are not baked on them. The preferred form of the structure utilizes the electrostatic precipitator cells 21, although satisfactory results, under some conditions, can be obtained in hood structures in which these cells are eliminated. The lip structure 41 forming the slot 42 can be removed from the hood structure by withdrawing the unitary structure provided by the lip portions 43 and 44, and may be removed from the hood (the adjacent surfaces of the flanges 41*b* and 32*a* (FIG. 4) sliding with relation to each other) for cleaning and maintenance of the nozzle arrays which are accessible agter removal of the lip structure 41 from the hood.

I claim:

1. Range ventilating apparatus for removing grease vapors, odors, smoke and the like including a hood structure overhanging and spaced above a range cooking surface, said hood structure having a vertically extending box-like configuration with a forwardly extending upper portion, an elongated horizontal slot formed in the front face of said box-like hood structure below said extending upper portion, said slot being defined by a unitary tubular structure removably inserted into said box-like hood, one wall of said tubular structure being formed to provide an upper lip portion at the upper edge of said slot turned inwardly and downwardly within said hood and terminating above the base of said hood, the other wall of said tubular structure being formed to provide a lower lip portion at the lower edge of said slot, and outwardly directed horizontally extending flange provided along the lowermost margin of said upper lip portion and an inwardly directed horizontally extending flange provided along the uppermost margin of said lower lip portion, said horizontal flanges providing a passage of reduced area therebetween for air and fumes within the hood structure, a series of spray nozzles supplied with cooling water arranged along the rear surface of said upper lip portion and within the hood structure for directing a continuous water spray downwardly within said hood structure to impinge on the rear surface of said upper lip portion, whereby when the pressure within said hood structure is below atmospheric, air and fumes from the range surface are drawn through said slot and provided in-

creased downwardly directed velocity by the proximity to each other of said horizontal flanges and are then reversed to flow upwardly through said hood structure, the water spray cooling said upper lip portion to prevent grease particles impinging thereon from being baked on the lip surface, and the removability of said unitary tubular structure permitting maintenance access to said spray nozzles and the interior of said hood structure.

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