A grease extractor is provided with a frame, a first array of convex baffle plates, a second array of concave baffle plates, and a steam ejector. The first array of convex baffle plates is carried by the frame in spaced-apart relation, so as to provide a first ventilation slot between adjacent, convex baffle plates. The second array of concave baffle plates is carried by the frame in spaced-apart relation, so as to provide a second ventilation slot between adjacent, concave baffle plates. A selected one of the concave baffle plates is offset from a respective, downstream convex baffle plate such that the first ventilation slot opens into a base portion of the concave baffle plate. The steam ejector is supported proximate each ventilation slot for delivering steam into the first ventilation slot and toward a respective one of the concave baffle plates. A method is also provided.
GREASE EXTRACTION SYSTEM, PARTICULATE EXTRACTOR, AND METHOD

RELATED PATENT DATA

[0001] This application claims priority from U.S. Provisional Patent Application Ser. No. 60/637,264, which was filed Dec. 17, 2004, and which is incorporated by reference herein.

TECHNICAL FIELD

[0002] The present invention pertains to kitchen ventilation systems. More particularly, the present invention relates to grease extractors for kitchen ventilating systems, such as kitchen exhaust hood assemblies.

BACKGROUND OF THE INVENTION

[0003] It is previously known to use porous filter-type grease extractors supported within a frame to extract grease from contaminated air that is being drawn into a kitchen exhaust hood assembly. One such construction uses a metal mesh that is contained within an outer peripheral frame to provide a modular grease filter for an exhaust hood. However, porous filter-type grease extractors tend to be relatively inefficient at extracting grease from contaminated air in an exhaust hood. Hence, grease is typically carried into exhaust ducts and components of the exhaust hood, which reduces airflow over time and creates a potential fire hazard. Secondarily, the screens tend to clog, and they have to be removed and cleaned periodically.

[0004] Another technique uses a series of baffles configured in a frame to extract grease and other contaminants from air that is being drawn into a kitchen exhaust hood assembly. U.S. Pat. No. 3,945,812 discloses one such baffle-type grease extractor that is configured in a removable, modular assembly that can be used to replace porous-type grease extractors. The modular assembly facilitates installation and cleaning of the baffle-type grease extractor. The baffles create a circuitous airflow paths that redirect and divert exhaust air that is being drawn into an exhaust hood which causes grease and contaminants to be deposited onto the interior surfaces of the baffles. However, the circuitous paths do not trap enough of the grease, in many cases, more than half of the grease may still pass through the grease extractor and up into the ventilation system of the hood, including the airflow ducts and hood. This has an undesirable effect of reducing airflow and efficiency of the ventilation system. Secondly, buildup of grease within the ventilation system, downstream of the baffles, increases a risk of fires in the ventilation system. In many cases, the baffle-type grease extractors need to be periodically removed and cleaned.

[0005] Accordingly, further improvements are needed for grease extractors in order to increase efficiency and performance of grease extraction systems for cooking environments including those for commercial (or restaurant) usage and home usage.

SUMMARY OF THE INVENTION

[0006] A highly efficient grease extractor includes multiple arrays of baffle plates that are configured to provide a circuitous path in combination with a steam ejector in order to generate more efficient and effective extraction of grease from ventilated cooking gases and air.

[0007] According to one aspect, a grease extractor is provided with a frame, a first array of convex baffle plates, a second array of concave baffle plates, and a steam ejector. The first array of convex baffle plates is carried by the frame in spaced-apart relation, so as to provide a first ventilation slot between adjacent, convex baffle plates. The second array of concave baffle plates is carried by the frame in spaced-apart relation, so as to provide a second ventilation slot between adjacent, concave baffle plates. A selected one of the concave baffle plates is offset from a respective, downstream convex baffle plate such that the first ventilation slot opens into a base portion of the concave baffle plate. The steam ejector is supported proximate each ventilation slot for delivering steam into the first ventilation slot and toward a respective one of the concave baffle plates.

[0008] According to another aspect, a ventilation filter for a cooking device is provided with an array of parallel, spaced-apart concave channels, an array of parallel, spaced-apart concave channels, an array of parallel, spaced-apart plates, and a steam pipe. The array of parallel, spaced-apart concave channels is offset a half-mode and intermeshed with the convex channels to provide circuitous flow paths therebetween. The array of parallel, spaced-apart plates is offset a half-mode from the concave channels. The steam pipe is provided between adjacent ones of the concave channels and is configured to direct steam into a slot between the adjacent convex channels.

[0009] According to yet another aspect, a method is provided for extracting grease from cooking exhaust fumes. The method includes: providing a grease extractor with convex baffle plates, adjacent axial slots, and concave baffle plates offset a half-mode from the convex baffle plates; directing flow over the convex baffle plates and into the adjacent axial slots; delivering steam into the axial slots in a same direction as flowing exhaust fumes; splitting flow of exhaust fumes and steam exiting the axial slots into the concave baffle plates into lateral, opposing directions, and directing the flow into a direction reversing the direction of flow in the axial slots, and into the concave side of the convex baffle plates; and diverting flow from the concave side of the convex baffle plates into the second axial slots provided between adjacent concave baffle plates.

[0010] One advantage is provided by more efficient and thorough extraction of grease from exhaust fumes entering a kitchen ventilation system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Preferred embodiments of the invention are described below with reference to the following accompanying drawings.

[0012] FIG. 1 is a simplified perspective view of a kitchen grill and ventilation system having grease extractors according to one aspect of the present invention, and showing an exhaust hood in partial breakaway view.

[0013] FIG. 2 is a simplified perspective view of a kitchen ventilation system having grease extractors according to another aspect of the present invention.

[0014] FIG. 3 is an enlarged partial breakaway perspective view of a selected grease extractor of FIG. 1 and showing configuration of the baffles and steam ejectors.
FIG. 4 is a sectional view taken along line 4-4 of FIG. 3 and showing arrangement of convex baffle plates, concave baffle plates, and steam ejectors in the grease extractor.

FIG. 5 is a further enlarged portion of the sectional view of FIG. 4 and showing a diagrammatic representation of exhaust gases, ventilation air, and grease being drawn through the grease extractor of FIGS. 1 and 2-4.

FIG. 6 is a plan view of a selected grease extractor of FIG. 1 and showing an inlet side of the grease extractor in plan view.

FIG. 7 is a partial and breakaway view of a top corner portion of a grease extractor taken from region 7 of FIG. 6.

FIG. 8 is a partial and breakaway view of a top center portion of a grease extractor taken from region 8 of FIG. 6.

FIG. 9 is a partial and breakaway view of a bottom end portion of a grease extractor taken from region 9 of FIG. 6.

FIG. 10 is a partial and breakaway view of a bottom center portion of a grease extractor taken from region 10 of FIG. 6.

FIG. 11 is a top edge partial breakaway view relative to the view of FIG. 6 and showing arrangement of the baffles.

FIG. 12 is a plan view showing an outlet side of the grease extractor of FIG. 6, but with the diffuser panel removed to show the third baffle panel.

FIG. 13 is a longitudinal side view of a selected steam ejector pipe from the grease extractor of FIG. 6 taken from a downstream end and showing ejector nozzles on the pipe.

FIG. 14 is a top end view of the steam ejector pipe taken from the right of FIG. 13 and showing an inlet for receiving steam into the pipe.

FIG. 15 is a partial breakaway longitudinal side view of the steam ejector pipe of FIG. 13 and showing an entrance end with an opening and an exit end with a plug.

FIG. 16 is a further enlarged partial breakaway longitudinal side view of FIG. 15.

FIG. 17 is a top end view of the pipe of FIG. 16 and enlarged over that depicted in FIG. 14.

FIG. 18 is a partial sectional view of a steam channel taken along a top portion of the grease extractor taken along line 18-18 of FIG. 6.

FIG. 19 is a partial sectional view of an effluent channel taken along a bottom portion of the grease extractor taken along line 19-19 of FIG. 6.

FIG. 20 is a partial breakaway side view of the grease extractor taken through a solid frame bar and showing the clamp assemblies for removably mounting the grease extractor into a kitchen exhaust hood.

FIG. 21 is an enlarged partial sectional view of the steam channel of FIG. 18 taken along line 21-21 of FIG. 6.

FIG. 22 is an enlarged partial sectional view of the effluent channel of FIG. 19 taken along line 22-22 of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

This disclosure of the invention is submitted in furtherance of the constitutional purposes of the U.S. Patent Laws “to promote the progress of science and useful arts” (Article 1, Section 8).

Reference will now be made to preferred embodiments of Applicant’s invention comprising grease extractors for use with kitchen ventilation systems over kitchen ranges, grills, griddles, and/or fryers. While the invention is described by way of preferred embodiments, it is understood that the description is not intended to limit the invention to such embodiments, but is intended to cover alternatives, equivalents, and modifications which may be broader than the embodiments, but which are included within the scope of the appended claims.

In an effort to prevent obscuring the invention at hand, only details germane to implementing the invention will be described in great detail, with presently understood peripheral details being attached as an appendix, as needed, as being presently understood in the art.

FIG. 1 illustrates a kitchen ventilation system 10 having a ventilation hood 12 containing a hood manifold 14 in which a pair of grease extractors, or grease extraction modules, 20 are supported side-by-side for extracting grease and contaminants from cooking gases and air that is being ventilated from beneath hood 12. Manifold 14 includes a pair of sidewalls 13 and 15, a front wall 16, and a top wall 17. Front wall 16 cooperates with the sidewalls 13 and 15 and a back wall 42 to provide a manifold opening framework 19. Grease extractors 20 are removably received within framework 19. One suitable size for grease extractors 20 are 172 inches by 38 inches. Other sizes are also possible.

Hood manifold 14 mates with an exhaust duct 18 that draws air, fumes, contaminants and grease up into grease extractors 20 where the grease and contaminants are separated from the air and fumes and collected for delivery via an effluent pipe 26 for collection within a waste housing, or weir 28. Exhaust duct 18 is couple at a downstream location with a ventilation exhaust fan (not shown) that pulls exhaust through grease extractors 20 up into duct 18 for delivery (typically) outside of a building.

Hot steam is generated at a source, such as a steam generator 32 for delivery via a steam inlet pipe 30 to grease extractors 20 by way of individual steam inlet assemblies 44 into each grease extractor 20. The steam helps capture grease particles and contaminants that are airborne within the air and fumes being pulled through grease extractors 20. Assemblies 44 are covered up by a metal facia plate 24 that is removably mounted onto grease extractors 20.

Accumulated grease and contaminants are collected in the bottom of each grease extractor 20 where they are drawn out via individual effluent outlet assemblies 46 for delivery via effluent pipe 26 to waste housing 28. Assemblies 46 are covered up by a metal facia plate 22 that is removably mounted onto grease extractors 20.
As shown in FIG. 1, ventilation hood 12 is provided above one or more cooking appliances, such as a kitchen range, a griddle, a grease fryer 38, and/or a toaster 40. Many of such appliances tend to generate grease along with smoke (and particulates) when cooking food under hood 12. Grease extractors 20 are operative to facilitate capture and removal of grease and airborne contaminants from air and cooking gases that are drawn up into hood 12 via a ventilation exhaust fan.

FIG. 2 illustrates an alternative construction for grease extractors 1020 over those depicted in FIGS. 1 and 3-22. More particularly, grease extractors 1020 are shorter in length than those depicted in FIG. 1. One suitable size is 17.2 inches×20 inches. Other sizes are available. Grease extractors 1020 are removably mounted within a ventilation hood 1012, inside of a hood manifold 1014. Upper and lower trim panels 1024 and 1022, respectively, cover up steam an effluent delivery lines extending between adjacent grease extractors 1020. Exhaust gases are ventilated up an exhaust duct 18 in response to action of an exhaust fan (not shown) that is typically provided downstream of hood 12.

Hood 1012 also includes a fire suppression system comprising supply pipes 50 and fire suppression emitters 52 that suspend in front of wall 1016. Either fire retardant or water, can be emitted from such system in order to put out cooking fires.

FIG. 3 illustrates in detail the circuitous path that cooking gases, air, grease, and airborne contaminants take as they are drawn through a selected grease extractor 20. More particularly, contaminated hot air is drawn up from a cooking appliance through a front side of grease extractor 20 as a result of an exhaust fan (not shown) that is provided behind the grease extractors 20 (typically at a downstream end of an exhaust hood). The contaminated hot air passes through slots 79 in a first array 54 of baffle plates 64 and 66, then passes around a second array 56 of baffle plates 68, and then passes through slots 80 in a third array 58 of baffle plates 70 and 72. The tortuous path provided by arrays 54, 56, and 58 helps collect and precipitate out grease and other airborne contaminants from the contaminated hot air. In addition, steam is injected directly into slots 78 via steam pipes (or injectors) 76 provided along an upstream of each slot 78. It has been discovered that such steam injection into slots 78 further increases the efficiency and ability to capture grease and contaminants within grease extractor 20.

Additionally, baffles 64 and 66 of array 54 are constructed from stainless steel according to one configuration. Also, baffles 68 of array 56 are constructed from aluminum. Likewise, baffles 70 and 72 are also constructed from aluminum. Finally, diffuser panel 74 is constructed from a sheet of ¼" thick aluminum that is perforated with apertures, or holes (see FIG. 3), to provide a surface area with apertures that cover 30-40% of the total surface area of the sheet. Steam pipes 76 are constructed from stainless steel tubing, according to one construction. It is understood that alternative materials can also be used for these components. Likewise, panel 74 can be constructed with other configurations or aperture sizes and shapes.

As shown in FIG. 3, baffles 64, 66, 68, 70 and 72 are supported at top and bottom edges by frame 60. Additionally, diffuser panel 74 is affixed onto a back surface of array 58 via a plurality of threaded fasteners (not shown). More particularly, the baffles have tabs on their top and bottom ends that fit into slots in the frame. After assembly, the tabs are twisted to lock the baffles into place. For example, baffle 68 has a tab 90 at each end that is twisted after insertion into a slot in frame 60.

Baffles 64 and 66 of first array 54 each have a flange 94 that forms a convex portion. Each flange 94 turns back toward pipe 76 to form a reverse flange 96. Slot 78 is provided between adjacent flanges 94 for passage of contaminated air, as well as for injection of steam therein from apertures along steam pipe 76. Furthermore, baffles 70 and 72 include concave portions provided by flanges 100. A front flange 92 covers a square tube 76 that forms an effluent collection manifold 130 that collects grease and contaminants via drain holes 97 (see FIG. 4) and 99. Flange 92 cooperates with solid stainless steel bars, such as bar 62, and tube 76 to form frame 60.

In operation, contaminated air is drawn through slots 78 and into grease extractor 20 in response to a kitchen ventilation system pulling air through extractor 20. The contaminated air goes through slot 78 and splits into two diverging paths 82 and 84 which double back 180 degrees. The air then reverses again after clearing flange 98 of baffle 68. The air then follows a respective path 86 and 88 when the split paths rejoin and exit via slot 80. The air further passes through perforations in perforated diffuser panel 74 before being drawn through an exhaust duct (not shown).

According to one implementation, steam in the range of 140-180 degrees Fahrenheit is delivered into slots 78. When contaminated air drops below approximately 140 degrees Fahrenheit, suspended contaminants and grease tend to precipitate out from the steam and onto baffle surfaces. As the steam and contaminated air is mixed in slot 78, the contaminants and grease are put into suspension. After contacting aluminum baffles 68 (which tend to cool down due to the relatively good thermal conductivity of aluminum), grease and contaminants tend to collect on the surfaces of baffle 68. Additionally, grease and contaminants also tend to collect onto the surfaces of baffles 70 and 72. The grease and contaminants also tend to slide downward and collect along the bottom edge of each baffle. As grease extractor 20 is tilted forward when in use, the grease and contaminants also tend to slide forward for collection and drainage through holes 97 (see FIG. 4) and 99. Holes 97 and 99 lead to an effluent collection manifold 130 within square tube 76. The grease and contaminants are then further collected through the manifold 130, going through aperture 46 (see FIG. 6) in each grease extractor 20 for collection via effluent pipe 26 in waste housing 28 (see FIG. 1). Hence, grease extractor 20 tends to be somewhat self-cleaning.

FIG. 4 illustrates the configuration of apertures 77 in steam pipes 76 for delivering steam into slots 78. The steam is drawn in along with contaminated air (from a cooking operation). The mixture then travels along paths 82 and 84, as well as paths 86 and 88, while depositing grease and contaminants onto surfaces of baffles 64, 66, 68, 70 and 72. Baffles 64 and 66 are constructed from stainless steel which provides an effective flame shield, or heat shield. This serves to protect and help reduce the temperature of baffles 68, 70 and 72 (which increases grease extraction thereof). Baffles 68, 70 and 72 are formed from aluminum, which tends to help conduct heat (and is an excellent heat sink), and
keeps them cooler. Accordingly, grease and contaminants are encouraged to further deposit onto baffles 68, 70 and 72 due to the further reduced surface temperatures. Additionally, air is drawn through grease extractor 20, along with cooking gases, which helps to reduce temperatures and further help to precipitate out grease from contaminated air (and cooking gases). This cooperation enhances the ability of grease extractor 20 to remove grease and contaminants from contaminated air that passes therethrough.

[0051] By providing smooth surfaces on baffles 64, 66, 70 and 72, accumulated grease tends to slide down the surfaces and collect at the bottom for delivery through holes 97 and 99. According to one construction, steam is continuously emitted via holes 77. According to another construction, steam is intermittently emitted via holes 77.

[0052] FIG. 5 further illustrates the ejection of steam via holes 77 spaced apart axially along each steam pipe 76 and into a respective slot 78. Path 82 leads to path 86, whereas path 84 leads to path 88. Slot 80 leads into a chamber 101 where relatively clean air is passed through apertures in diffuser plate 74 for delivery through an exhaust duct and out of a building.

[0053] FIG. 6 shows a front view of grease extractor 20, but with the baffles de-emphasized and showing the steam pipes 76 in relation to frame 60. Additionally, a top facia plate 102 and a bottom facia plate 104 (of stainless steel) are removably mounted over flexible rubber steam pipe 106, flexible rubber effluent pipe 108 and associated steam inlet assembly 44 and effluent outlet assembly 46, respectively. Frame 60, including solid bars 62, supports steam pipes 76 and assemblies 44 and 46.

[0054] FIG. 7 depicts a top left corner of frame 60 in partial breakaway view to show attachment of solid bar 62 onto a square tube 79. A steam supply plenum 110 is provided inside of tube 79 and configured to deliver steam into a top opening on each steam tube 76. Flexible rubber steam supply pipe (or hose) 106 is also shown covered by facia 102 of grease extractor 20.

[0055] FIG. 8 depicts a top center view of steam inlet assembly 44. A steam inlet t-shaped fitting 112 provides an inlet for receiving steam via pipes 106 and into manifold 110 (of FIG. 7). Connectors 114, 116 and 118 are used to removably couple together flexible pipes 106 onto fitting 112 to facilitate removal and maintenance of individual grease extractors 20.

[0056] FIG. 9 depicts a bottom left corner of frame 60 in partial breakaway view to show attachment of bar 62 to square tube 76 of grease extractor 20. Each steam tube 76 is received through a bore in a top surface of tube 130 for securement therein via press fit or welding. A plug 120 in the bottom end of tube 130 causes steam to be ejected from a plurality of steam emitters, or holes 77. Effluent manifold 130 can also be seen inside of tube 76.

[0057] FIG. 10 shows a bottom center view of effluent outlet assembly 46 of grease extractor 20. More particularly, flexible rubber effluent outlet pipes (or hoses) 108 are fastened onto an effluent outlet t-shaped fitting 122 of grease extractor 20. Connectors 124, 126 and 128 are used to removably fasten pipes 108 onto fitting 122 to facilitate maintenance and cleaning of grease extractor 20. Collected grease and contaminants are drawn through an aperture 166 of fitting 122 for delivery through pipe 108 onto effluent pipe 26 for collection into waste housing 28 (see FIG. 1).

[0058] FIG. 11 shows grease extractor from a top edge view with a top surface partially removed to facilitate viewing of the first array 54, second array 56, and third array 58 of baffles. Holes 97 and 99 and steam pipes 76 are shown in relation to arrays 54, 56, and 58. Likewise, diffuser plate 74 is also shown.

[0059] FIG. 12 shows a back side of grease extractor 20 with diffuser plate 74 (of FIG. 11) removed to facilitate viewing of the arrangement of slots 80 provided in third array 58. Slots 80 cooperate in array 58 to provide baffles therein. Frame 60 is also shown supporting array 58.

[0060] Steam pipe 13 is shown prior to assembly in FIGS. 13-17. A bottom brass end plug 120 is inserted (or press fit) into pipe 76 to force steam to eject via ejectors (or holes) 77. A slot 134 is provided in a top end of pipe 76 to facilitate assembly onto the grease extractor frame. Slot 134 is provided about an open end 132 of pipe 176. As shown in greater detail in FIG. 16, plug 120 is inserted into a bore 136 of pipe 76. Bore 136 is also shown in relation with slot 134 in FIG. 17.

[0061] FIG. 18 illustrates in vertical sectional view a supply system for supplying steam via fitting 112 through a feed tube 164 into steam supply manifold 110 for delivery into individual bores 136 of steam pipes 76 for ejection via hole 77 into a stream of contaminated air. A frame lip extrusion 138 supplies a pair of top and bottom grooves for removably securing facia plate 102 there along. A resilient O-ring gasket 146 (of EPDM) encircles the top portion of tube 76 to ensure that steam is delivered within bore 136. Another resilient gasket 142, comprising Santoprene, is configured to seal with a frame 19 (see FIG. 1) after installation of grease extractor 20 therein. A pair of top clamps 148 are mounted to frame 60 for securing and releasing grease extractor 20 from within frame 19 (of FIG. 1). Diffuser panel 74 is made from a sheet of perforated aluminum sheet metal that is folded along each edge and which forms a relief opening 162 at each corner. Flanges 100 are also shown in relation to diffuser plate 74.

[0062] FIG. 19 illustrates in vertical sectional view the withdrawal of grease and contaminants (effluent) via effluent outlet T-shaped fitting 122 by way of a drain tube 166 that communicates with effluent manifold 130. Effluent is received in the manifold 130 via holes 77 and 79 (see FIG. 3). Another pair of clamps 150 are mounted along frame 60 for securing and releasing grease extractor 20 from frame 19 (see FIG. 1). Another resilient gasket (of Santoprene) 144 is provided along a bottom surface of frame 60 so as to seal steam extractor 20 there along. Additional gaskets can be provided between adjacent grease extractors when they are mounted together in assembly. Furthermore, a frame lip extrusion 140 is provided along a bottom edge of frame 60 having an upper groove and a lower lip edge configured to removably secure a facia plate 104 there along. Finally, an exemplary steam pipe 76 is shown having an internal bore 136 that communicates with individual holes 77 for rejecting steam therethrough. A bottom end of pipe 76 is closed via a tightly fitting plug 120 which forces steam to eject the holes 77. A flange 100 is shown in relation to diffuser panel 74 and gap 162.

[0063] FIG. 20 illustrates in greater detail the configuration of pairs of clamps 148 and 150 relative to frame 60.
shown, there are two clamps 148 along a top edge of frame 60 and two clamps 150 along a bottom edge of frame 60. Each clamp 148 is secured via a threaded fastener 154 onto frame 60. Fastener 154 is captured for rotation within a stepped recess or bore 158 in frame 60. Fastener 154 is secured via a pair of ring clips 152 such as C-clips or E-clips. Clips 152 cooperate to retain clamp 148 along a threaded portion 150 of fastener 154. Clamp 148 (as well as clamp 150) includes a threaded bore that is threadingly engaged along threaded section 150. As fastener 158 is rotated, clamp 148 can be moved toward and away from frame 60 in order to clamp and unclamp grease extractor 20 from a neighboring frame 19 (see FIG. 1). Additionally, a pair of captive screws 160 are also provided within frame 60, mainly within solid bar 62 along each lateral edge of frame 60.

[0064] FIG. 21 illustrates in enlarged view the relationship of clamps 148 relative to an external frame 19 where clamps 148 have been secured onto frame 19. Steam is delivered via fitting 112 and feed tube 164 for delivery into individual steam pipes 76 for ejection via holes 77.

[0065] FIG. 22 illustrates in enlarged detail the configuration of clamps 150 when secured onto exterior frame 19 so as to mount grease extractor 20 within a ventilation hood of a kitchen ventilation system. Collected grease is accumulated and delivered via fitting 122 for withdrawal from grease extractor 20.

[0066] In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features shown and described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.

The invention claimed is:

1. A grease extractor, comprising:
   a frame;
   a first array of convex baffle plates carried by the frame in spaced-apart relation providing a first ventilation slot between adjacent, convex baffle plates;
   a second array of concave baffle plates carried by the frame in spaced-apart relation defining a second ventilation slot between adjacent, concave baffle plates, a selected concave baffle plate offset from a respective, downstream convex baffle plate such that the first ventilation slot opens into a base portion of the concave baffle plate; and
   a steam ejector supported proximate each ventilation slot for delivering steam into the first ventilation slot and toward a respective one of the concave baffle plates.

2. The grease extractor of claim 1 wherein a selected concave baffle plate is offset a half-mode from a respective convex baffle plate.

3. The grease extractor of claim 1 further comprising a third array of baffle plates in spaced-apart relation and defining a third ventilation slot therebetween and downstream of the second array of baffle plates.

4. The grease extractor of claim 3 wherein each baffle plate in the third array of baffle plates is supported offset a half-mode from a respective one of the concave baffle plates in the second array such that the third ventilation slot aligns substantially with the base of the concave baffle plate and the first ventilation slot.

5. The grease extractor of claim 4 wherein the first array, the second array and the third array of baffles plates are each in substantially parallel relation with one another.

6. The grease extractor of claim 1 wherein the first array of convex baffle plates and the second array of concave baffle plates are provided in substantially parallel, spaced-apart relation.

7. The grease extractor of claim 3 wherein the baffle plates in the third array are convex baffle plates.

8. The grease extractor of claim 7 wherein the convex baffle plates in the third array are U-shaped plates having a base and a pair of substantially parallel, right-angle legs.

9. The grease extractor of claim 1 wherein the convex baffle plates each comprise a central, convex portion and a pair of concave, turned-back outer portions, wherein the first ventilation slot is provided between adjacent turned-back portions of respective, adjacent convex portions.

10. The grease extractor of claim 6 wherein the turned-back outer portions are parallel and provide the first ventilation slot between adjacent turned-back portions of adjacent, respective convex baffle plates.

11. The grease extractor of claim 6 wherein the turned-back outer portions are parallel to a flow direction through the grease extractor and perpendicular to the first, second, and third arrays of baffle plates.

12. The grease extractor of claim 1 wherein the concave baffle plates are more thermally conductive than the convex baffle plates.

13. The grease extractor of claim 3 wherein the third array of baffle plates are more thermally conductive than the convex baffle plates.

14. The grease extractor of claim 1 further comprising a third array of baffle plates in substantially spaced-apart relation and defining a third ventilation slot therebetween and downstream of the second array of baffle plates.

15. The grease extractor of claim 13 wherein the concave baffle plates and the third array of baffle plates are each more thermally conductive than the convex baffle plates.

16. The grease extractor of claim 12 wherein the concave baffle plates are made from aluminum.

17. The grease extractor of claim 13 wherein the baffle plates in the third array are made from aluminum.

18. The grease extractor of claim 1 wherein the steam ejector comprises a steam supply rod provided upstream of the first ventilation slot, the steam supply rod including a plurality of spaced-apart ejection nozzles on a downstream side of the rod configured to eject steam into the first ventilation slot.

19. The grease extractor of claim 18 wherein the steam supply rod is substantially parallel to the first ventilation slot.

20. The grease extractor of claim 1 wherein the frame is configured to support the first array and the second array and encircle an outer periphery of the first array and the second array.
21. The grease extractor of claim 20 wherein a top edge of the frame includes a steam manifold communicating with the steam ejector to deliver a supply of steam to the steam ejector.

22. The grease extractor of claim 21 wherein the steam ejector comprises a steam supply rod provided upstream of and parallel to the first ventilation slot, the steam supply rod including a plurality of spaced-apart ejection nozzles on a downstream side of the rod configured to eject steam into the first ventilation slot.

23. The grease extractor of claim 20 further comprising a plurality of drainage apertures provided along a bottom edge of the frame for draining grease that accumulates along the bottom edge from the concave and convex baffle plates.

24. The grease extractor of claim 23 wherein the drainage apertures are provided upstream of the first ventilation slots.

25. The grease extractor of claim 23 wherein the drainage apertures are provided downstream of the second ventilation slots.

26. The grease extractor of claim 23 wherein the drainage apertures are provided upstream of the first ventilation slots.

27. The grease extractor of claim 23 wherein the frame includes a drainage manifold along a bottom edge of the frame communicating with the drainage apertures to accumulate grease from the drainage apertures for collection and transfer to a collection device.

28. The grease extractor of claim 1 wherein the convex baffle plates of the first array have a u-shaped, convex cross-sectional configuration relative to an upstream side of the grease extractor.

29. The grease extractor of claim 1 wherein the concave baffle plates of the second array have a u-shaped concave cross-sectional configuration relative to an upstream side of the grease extractor.

30. The grease extractor of claim 29 wherein the u-shaped concave baffle plates have square corners between a central base and a pair of opposed edges.

31. The grease extractor of claim 30 wherein the square corners have a bend radius.

32. The grease extractor of claim 30 further comprising a third array of baffle plates in substantially spaced-apart relation and defining a third ventilation slot therebetween and downstream of the second array of baffle plates, and wherein the central base includes an angled channel provided on a back face of the central base configured to divert flow into a respective third ventilation slot.

33. The grease extractor of claim 1 wherein each of the concave baffle plates includes a pair of lateral edges each folded back to provide an inverted cuff portion.

34. A ventilation filter for a cooking device, comprising:

an array of parallel, spaced-apart convex channels;

an array of parallel, spaced-apart concave channels offset a half-mode and interconnected with the convex channels to provide circuitous flow paths therebetween;

an array of parallel, spaced-apart plates offset a half-mode from the concave channels; and

a steam pipe provided between adjacent ones of the concave channels and configured to direct steam into a slot between the adjacent convex channels.

35. The ventilation filter of claim 34 wherein slots are provided between adjacent convex channels.

36. The ventilation filter of claim 34 wherein slots are provided between adjacent concave channels.

37. The ventilation filter of claim 34 wherein slots are provided between adjacent plates.

38. The ventilation filter of claim 34 wherein each plate includes an edge flange extending in a forward direction.

39. The ventilation filter of claim 38 wherein a pair of the edge flanges on one of the plates provides a concave plate.

40. The ventilation filter of claim 34 further comprising a steam plenum configured to deliver steam to the steam pipe.

41. A method for extracting grease from cooking exhaust fumes, comprising:

providing a grease extractor with convex baffle plates, adjacent axial slots, and concave baffle plates offset a half-mode from the convex baffle plates;

directing flow over the convex baffle plates and into the adjacent axial slots;

delivering steam into the axial slots in a same direction as flowing exhaust fumes;

splitting flow of exhaust fumes and steam exiting the axial slots into the concave baffle plates into lateral, opposing directions, and directing the flow into a direction reversing the direction of flow in the axial slots, and into the concave side of the convex baffle plates; and

diverging flow from the concave side of the convex baffle plates into the second axial slots provided between adjacent concave baffle plates.

42. The method of claim 41 further comprising directing flow from the second axial slots along the concave side of the convex baffle plates and through a third longitudinal slot in a third array of baffle plates.

43. The method of claim 41 further comprising providing a base ridge on a bottom, outside portion of the concave baffle plates and directing flow along the bottom of the concave baffle plates into the third longitudinal slot.

44. The method of claim 41 further comprising providing a second array of baffle plates having a higher thermal conductivity than the first array of baffle plates, and collecting grease on the second baffle plates at least in part from thermal cooling of the second baffle plates relative to the first baffle plates.

45. The method of claim 41 wherein the first baffle plates have an m-shaped cross-sectional configuration viewed from an upstream side of the grease extractor.

46. The method of claim 45 wherein the m-shaped baffle plates have a pair of vertical, outer legs.

47. The method of claim 41 wherein the second baffle plates have a u-shaped cross-sectional configuration viewed from a downstream side of the grease extractor.

48. The method of claim 47 wherein the u-shaped baffle plates have right angle corners.

49. The method of claim 41 further comprising providing drainage apertures along a bottom edge of the grease extractor, and draining accumulated grease through the apertures.

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