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(54) Title: A GREASE INTERCEPTOR FOR A WASTE WATER STREAM FROM AN EXHAUST FAN ASSEMBLY

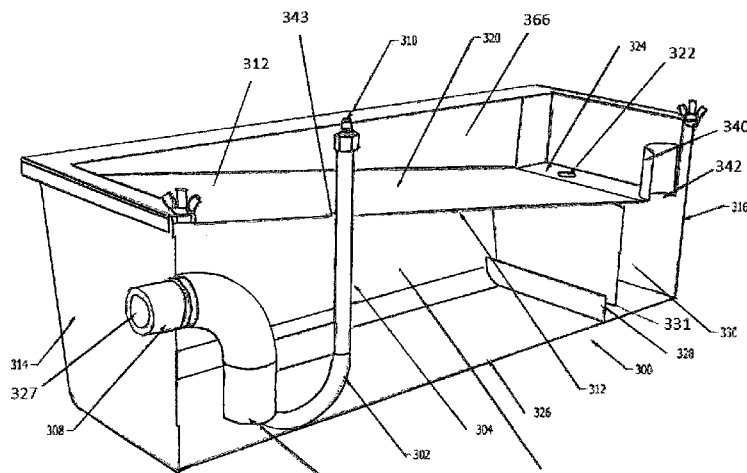


Figure 20

(57) Abstract: To facilitate the collection of grease and water from commercial kitchen exhaust fans the invention provides a collection tank in communication with the drainage spout of the fan assembly. The tank has a lid for sealing the tank, a first reservoir for collecting the stream of grease and water and a second reservoir below the first reservoir for receiving water separated from the grease and water stream in the first reservoir. The first and second reservoirs are separated by a sloping plate. The tank also includes a siphoning apparatus which when connected to a source of high pressure fluid such as water or steam can purge the second reservoir of water and recycle the water back to a fan cleansing operation or to a disposal facility.

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Description

Title of Invention: A Grease Interceptor for a Waste Water Stream from an Exhaust Fan Assembly

Technical Field

- [1] The present invention relates generally to removal of organic contaminants from wastewater and in particular, to removal and collection of wastewater fats, oils, and grease from the waste water stream of commercial exhaust fans such as those found on the roof tops of large kitchen facilities.

Background Art

- [2]
- [3] A typical kitchen ventilation system includes an exhaust hood or canopy, ductwork, fan system, and a means of providing adequate make-up air. The entire system must constitute a fire-safe assembly within the building.
- [4] Exhaust hoods and canopies capture heat and contaminants in the air by means of filters, extraction baffles (cartridges), and water mist systems. There are many style variations of hoods with canopy styles-a large box with an open bottom-being the most common. Style selection is based on the type of oven and the expected contaminants to be removed. Referring to Figure 1, there is a drawing of one type of venting arrangement comprising a back shelf hood over a cook line. While there are several styles of hoods, all fall within two major categories:
- [5] • Type I hoods carry a listing label and are manufactured and installed according to the manufacturer's and listing agencies' requirements. They are designed to handle grease and include a number of integrated components within the hood.
- [6] • Type II hoods are used in the collection of steam, vapor, heat, and odors-but not grease. The two sub-classifications of Type II hoods are condensate and heat/fume.
- [7] Referring to Figure 2, there is shown one example of an exhaust hood and associated duct work installed in a ceiling. The exhaust ductwork transfers contaminated air, cooking heat, and grease vapors from the hood to the exhaust fan. Exhaust ducting should have the following qualities:
- [8] • Ducts that accumulate combustible grease should be constructed from 16- steel or 18-gage stainless steel as per code requirements.
- [9] • Ducts must be securely supported by non-combustible duct bracing and supports designed to carry the gravity and seismic loads as per code requirements. No fasteners should penetrate the duct.
- [10] • Duct enclosures made from materials such as of gypsum board, plaster, concrete, or ceramic tiles must be approved as a continuous fire-rated enclosure.

[11] Referring to Figure 3 there is shown a typical exhaust fan used for a commercial kitchen. Exhaust fans move the heat and contaminated air out of the building. All exhaust fan components must be accessible or have removable access panels for cleaning and inspection and must be designed to contain and drain any excess grease. There are three major types of exhaust fans:

[12] • Up-blast fans are typically aluminum centrifugal fans that are designed for roof mounting directly on top of the exhaust stack.

[13] • Utility fans are normally roof-mounted with the inlet and outlet 90 degrees from each other and are typically used where high-static pressure losses exist.

[14] • Inline fans are typically located in the interior duct and are used where exterior fan mounting is impractical.

[15] Fire Code Requirements

[16] As kitchen ventilation is used, grease laden vapors are carried through the entire system. This action deposits oil on all interior parts of the system which must be cleaned to reduce the risk of fire. The minimum frequency and standard for cleaning is provided by the National Fire Protection Association (NFPA) and fire codes NFPA96.

[17] Cleaning ducting and fans also requires following these codes:

[18] Restaurant NFPA Fire Code 96: 4.1.5

[19] The responsibility for inspection, maintenance, and cleanliness of the ventilation control and fire protection of the commercial cooking operations shall be the ultimate responsibility of the owner of the system provided that this responsibility has not been transferred in written form to a management company or other party.

[20] Fan Access Panel NFPA Fire Code 96: 8.1.5.3.1

[21] Up-blast fans shall be supplied with an access opening of a minimum 76 mm by 127 mm (3 in. by 5 in.) or a circular diameter of 101 mm (4 in.) on the curvature of the outer fan housing to allow for cleaning and inspection of the fan blades.

[22] Electrical Wiring/Fan Hinge NFPA Fire Code 96: 7.8.2.1

[23] Rooftop terminations shall be arranged with or provided with the following: (8) a hinged up-blast fan supplied with flexible weatherproof electrical cable and service hold-open retainer to permit inspection and cleaning that is listed for commercial cooking equipment.

[24] NFPA Fire Code 96: 8.1.1.1

[25] Approved up-blast fans with motors surrounded by the airstream shall be hinged, supplied with flexible weatherproof electrical cable and service hold-open retainers, and listed for this use.

[26] NFPA Fire Code 96: 9.2.1

[27] Wiring systems of any type shall not be installed in ducts.

[28] Rooftop Grease Containment NFPA Fire Code 96: 7.8.2.1

[29] Rooftop termination shall be arranged with or provided with the following: (4) The ability to drain grease out of any traps or low points formed in the fan or duct near the termination of the system into a collection container that is noncombustible, closed, rainproof, and structurally sound for the service to which it is applied and that will not sustain combustion. (5) A grease collection device that is applied to exhaust systems that does not inhibit the performance of any fan.

[30] NFPA Fire Code 96: 8.1.1.3

[31] Up-blast fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 3.8 L (1 gal).

[32] Inspection & Cleaning Frequency NFPA Fire Code 96: 11.4, 11.6.1, 11.6.2

[33] The entire exhaust system shall be inspected for grease buildup by a properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction and in accordance with Table 11.4. [See Figure 4]. Upon inspection, if the exhaust system is found to be contaminated with deposits from grease-laden vapors, the contaminated portions of the exhaust system shall be cleaned by a properly trained, qualified, and certified company or person(s) acceptable to the authority having jurisdiction. Hoods, grease removal devices, fans, ducts, and other appurtenances shall be cleaned to remove combustible contaminants prior to surfaces becoming heavily contaminated with grease or oily sludge.

[34] Kitchen Ventilation Cleaning Process

[35] The kitchen Ventilation cleaning process can be broken into 5 stages:

- [36] • Cleaning of Filters
- [37] • Bagging the Hood
- [38] • Exhaust fan cleaning
- [39] • Fans Grease receptacle
- [40] • Ducting and Hood

[41] Cleaning of Filters

[42] The kitchen exhaust cleaning personnel first remove and clean the filters from the hood, this cleaning is usually done by means of applying a degreaser and washing with high pressure steam over a containment tank to capture all waste generated. This process is complete once all built up oil and grease is no longer present on the visible surfaces.

[43] Bagging the Hood

[44] Once the hoods filters are removed, the cleaning personnel begin what is called the bagging process. Using plastic, tape and clamps, the kitchen hood is surrounded with plastic in a manner to capture all wash water. This is then to be collected and funneled into a collection container and not to fall on the floor or ground.

[45] Exhaust fan cleaning

[46] Once the hood is bagged, the cleaning personnel begin the cleaning process of the exhaust fan on the roof. This includes spraying chemical degreasers and high pressure steam onto the interior parts of the fan. During this process all wash water injected into and onto the fans parts is expelled through the precipitation drain and onto the roof and eventually into the storm drain connecting to the roof top. This cleaning process merely displaces the grease from the fan to the roof drain and causes pollution. This task is complete once all built up of oil and grease is no longer present on the visible surfaces.

[47] Fans Grease Receptacle

[48] The grease receptacle must be emptied of oil and grease and or the filters must be changed. Typically this unit is mounted to the fan to collect the oil that drips from the fan during operation. Rain water must also pass this system so grease is easily carried away and onto the roof. A typical capturing design is a collection box that fails its intended function. This is because once full of rain water, the oil floats to the top and spills onto the roof. This grease receptacle can also contain filter media to hold onto the grease and prevent escape; unfortunately this media most often does not get changed due to its unavailability or its inability to perform its deigned function. The result is the hazardous condition depicted in the photograph in Figure 5.

[49] Ducting and Hood

[50] Once the fan is cleaned, chemical degreasers and high pressure steam are sprayed into the ducting below the fan leading down from the roof and towards the kitchen below. In most cases access doors can be found that supply additional cleaning points for further cleaning. This wash water and chemical flows towards the hood and is then directed by the tarp into the collection container. Once the ducting is cleaned the hood is washed by the same manor of steam and chemicals. All waste water is then disposed of according to the local sewer use bylaw.

[51] The Exhaust Fan Drain Spout

[52] Referring back to Figure 3, there is shown one example of an exhaust fan. Since the first edition of NFPA96 in 1961 exhaust fan design has improved in order to meet rigid fire safety requirements. Thanks to the adoption of these codes by local fire departments across North America there have been dramatic improvements in fire safety. Prior to the enforcement of these codes, fans would discharge oil directly and uncontrollably from multiple drain points directly onto the roof. As restaurants upgraded over the years to conform to the NFPA standards, exhaust fans have become more reliable and waste discharge points have been focused to one spout.

[53] • Through this spout, rainwater that falls into the interior of the fan is permitted to escape.

[54] • Without the spout, water would build up inside the fan and eventually spill into the

interior of the building.

[55] This spout also permits excess oil to be released from the fan

[56] Exhaust Fan Grease Discharge

[57] Still referring to Figure 3, exhaust fans are welded to their base; these fans rarely leak or drain from any place other than the spouts. However, exhaust fans have a silicon seal around the bottom and these seals typically begin to leak within one year of installation. The only way to properly reseal these leaks is by an adhesive. Silicon will break down under oily conditions.

[58] Another common problem with a silicon seal is that the exhaust fan cleaning process tends to remove any silicon and makes replacement necessary. An adhesive will withstand both the properties of operating and cleaning.

[59] Environmental Requirements

[60] The kitchen exhaust fan has proven to be the most difficult to manage both during operation and maintenance. Oil can be observed leaking from the fan during the cooking operation and rain provides the transportation it needs to be carried to the roof and drain. This event is both harmful for the roof and the environment.

[61] When servicing the exhaust fan, a typical service company will use high pressure steam, water and chemicals. These methods are used to break down the oil and grease from exhaust fan.

[62] Grease and chemicals can be observed discharging from the drain spout during the cleaning process. Costly truck mounted vacuums or effective onsite improvisation is needed to avoid this infraction.

[63] Therefore, considering the above shortcomings, there is still a requirement for a device that will capture contaminated water waste and grease operation and maintenance and eliminate the pollution caused by cleaning and operation of exhaust fans. There is also a requirement for a device that will help restaurants and cleaning personnel to meet stringent fire codes and anti-pollution codes.

Disclosure of Invention

Technical Problem

[64]

Technical Solution

[65]

Advantageous Effects

[66]

[67] One object of the present invention is to meet NFPA 96 requirements.

[68] Another object of the invention is to protect the roofs of kitchen buildings from grease and oil spillage.

- [69] Yet another object of the invention is to provide adequate grease capture capacity.
- [70] A further object of the invention is to fit all commercial exhaust fan systems.
- [71] Still another object of the invention is to provide an economical solution in the marketplace.
- [72] One advantage of the present invention is that it requires far less maintenance than known technology.
- [73] A second advantage of the present invention is that it can be coupled to a treatment process such as biotechnology cleansing process resulting in an effluent which places significantly less stress on both public and private sewer systems.
- [74] Yet another advantage of the invention is that grease and oil can be collected and then used in the manufacture of biodiesel.
- [75] Yet another advantage is the cost savings to both public and private entities that result from such cleaner effluent.
- [76] Still a further advantage of the invention is that there is no mechanical process involved in collecting the waste water stream.
- [77] Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiments, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

Description of Drawings

- [78] Figure 1 illustrates a typical installation of a back shelf ventilation hood over a cook line.
- [79] Figure 2 illustrates a typical hood and ceiling enclosure.
- [80] Figure 3 illustrates a typical roof top ventilation fan.
- [81] Figure 4 illustrates a typical inspection schedule for grease buildup.
- [82] Figure 5 illustrates a damaged and polluted roof from grease leakage.
- [83] Figure 6 illustrates a second embodiment of a roof installed exhaust fan assembly.
- [84] Figure 7 illustrates the same exhaust fan assembly of Figure 6 showing exhaust air flow.
- [85] Figure 8 illustrates the same exhaust fan assembly of Figure 6 and 7 showing water drainage flow.
- [86] Figure 9 illustrates one embodiment of the invention installed on an exhaust fan assembly.
- [87] Figure 10 is a perspective view of one embodiment of the containment tank of the invention.
- [88] Figure 11 is a cross-sectional side view of the tank of Figure 10.
- [89] Figure 12A is a top view of the right hand wall of the containment tank of Figure 10.
- [90] Figure 12B is a front view of the right hand wall of the containment tank of Figure

10.

- [91] Figure 12C is a side view of the right hand wall of the containment tank of Figure 10.
- [92] Figure 13A is a top view of the left hand wall of the containment tank of Figure 10.
- [93] Figure 13B is a front view of the left hand wall of the containment tank of Figure 10.
- [94] Figure 13C is a side view of the left hand wall of the containment tank of Figure 10.
- [95] Figure 14 is a top perspective view of the containment tank of Figure 10 and the piping assembly.
- [96] Figure 15A is a top view of the piping assembly.
- [97] Figure 15B is a side view of the piping assembly.
- [98] Figure 15C is a front view of the piping assembly.
- [99] Figure 15D is a cross-sectional side view of the piping assembly.
- [100] Figure 16A is a front view of the elbow of the piping assembly.
- [101] Figure 16B is a side view of the elbow of the piping assembly.
- [102] Figure 17A is a front view of the 'J' tube of the piping assembly.
- [103] Figure 17B is a top enhanced view of the lower tip of the 'J' tube of the piping assembly.
- [104] Figure 17C is a top view of the 'J' tube of the piping assembly.
- [105] Figure 17D is a side view of the 'J' of the piping assembly.
- [106] Figure 18 is a top perspective view of an embodiment of the lid of the invention.
- [107] Figure 19 is a side perspective view of an embodiment of the mounting bracket of the invention.
- [108] Figure 20 is a side cross-sectional perspective view of the assembled containment tank of one embodiment of the invention.
- [109] Figure 21 is a view of the invention in operation with a fan and duct assembly mounted to a roof top.

Best Mode

- [110] Referring now to Figure 6 there is shown a typical installation of an exhaust fan assembly 2 on a roof 30. The exhaust fan assembly 2 may be on the roof of a restaurant or other commercial kitchen facility. The exhaust fan assembly 2 comprises a housing 28 for housing the exhaust end of the ventilation ducting 16 coming up from a stove or an oven. The ducting housing 28 is fixed to the roof by support members 26 and 18. On top of the duct housing 28 is installed the fan and motor assembly 29. The fan and motor assembly 29 comprises an electric motor 8, a belt drive 6 to connect the motor to a fan drive shaft 7 and a fan belt tension adjuster 4. Drive shaft 7 is connected to a set of fan blades to create suction within the ducting and blow the exhaust out the exhaust cowling 32 which encircles the fan and motor housing 34. Cooling vent 10 provides cooling air to the electric motor 8. The fan and motor housing 34 is hinged 14 to the duct housing 28 for access to the upper reaches of the duct 16 for cleansing and

servicing. A drain spout 22 is provided to drain rain water that falls into the interior of the fan housing and to prevent a buildup of water within the fan housing that would eventually spill into the interior of the building. The water that flows through the drain spout is highly contaminated with fats, oils and grease. The drain spout drains into a grease containment tray 24 which is often prone to overflowing onto the surface of the roof 30 as illustrated in the photograph of Figure 5.

[111] Referring now to Figure 7 there is shown the same exhaust fan assembly 2 of Figure 6 indicating the path of exhaust air 40 from the duct 16 through the exhaust cowling 32 and into the atmosphere.

[112] Referring now to Figure 8 there is shown the same exhaust fan assembly 2 roof top installation indicating pathways 42 of rainwater and wash water/chemical mixtures into the fan and motor assembly 29. Furthermore, fan blade 12 when rotating at very high speeds drives grease-laden moisture 44 into the spout 22 where it drains 46 into grease containment tray 24.

[113] Still referring to Figure 8 and to Figure 5, it can be seen that failure to properly clean the ducting and exhaust fan assembly 2, blockage of the drainage spout 22 or overflowing of the grease collection tray 24 will result in significant spillage, environmental liability and damage to the roof. Therefore there is a requirement to provide for a waste collection device that prevents these spills and provides for a clean and cost effective way to maintain the exhaust fan and housing assembly.

[114] Referring now to Figure 9 there is shown one embodiment of the invention 80 in operation with fan assembly and ducting installation 50 installed on roof 52. The exhaust cowling 54 and the motor fan housing 64 are mounted to duct housing 56. Exhaust pathways 58 are shown from ducting 60 through exhaust cowling 54. Rainwater and wash water pathways 70 are shown draining 74 through drain spout 76 into the invention 80. This embodiment of the invention 80, shown in cross-section, comprises a collection tank 82, a tank cover plate 84, a wall mounting bracket 86 for mounting the collection 82 to a side wall 88 of the duct housing 56 and a piping assembly 90 the operation of which is more fully explained below.

[115] Referring now to Figure 10 there is shown a containment tank 100 of one embodiment of the invention from a right-hand top perspective. The containment tank 100 is manufactured from '16 gauge 316 stainless steel'. The containment tank 100 comprises a right hand wall 102, a left hand wall 104, a front wall 106, a rear wall 108 and a bottom 110. The tops of the walls 102 to 108 each have a lip 112 to 118 to permit sealing placement of a cover plate (described below) using bolts 120 and 122 and a suitable nut such as a butterfly nut. The right hand wall 102 includes an aperture 130 which connects the containment tank a piping assembly more fully explained below.

- [116] Referring now to Figure 11 there is shown the containment tank 100 of Figure 10 in cross-sectional view through section A-A in Figure 10. The front surface 106, the back surface 108 and the bottom surface 110 are formed from a single piece of 316 stainless steel and bent so that the corners 132 and 134 are rounded. The front wall lip 136 projects outwards from the containment tank and the rear wall lip 138 projects inwards into the containment tank. The back wall 108 mounts adjacent to the duct housing containment wall 88 and projecting the lip 138 inwards prevents interference with the installation of the containment tank against the duct housing wall.
- [117] Referring now to Figures 12 A, B and C there is shown in Figure 12A a top view of right hand wall 102, in Figure 12B a front view of right hand wall 102 and in Figure 12C a side view of right hand wall 102. The right hand wall 102 is manufactured from a single piece of 16 gauge 316 stainless steel. The front view shows the location of aperture 130. Corners 140 and 142 are cut to fit corners 132 and 134 respectively of tank 100. Figure 12A shows the top lip 116 of wall 102 having aperture 144 to accommodate bolt 122 as shown in Figure 10. Figure 12C shows the wall in side view with lip 116 projecting into the containment tank. Wall 102 is fixed in place to the right hand side of the containment tank using suitable fixing means such as welding.
- [118] Referring now to Figures 13 A, B and C there is shown in Figure 13A a top view of left hand wall 104. Figure 13B shows a front view of the left hand wall 104 and Figure 13C shows a side view of left hand wall 104 of the containment tank 100. The corners 150 and 152 of wall 104 are contoured to fit the left hand side of the containment tank 100 corners 132 and 134 respectively. The top view in Figure 13A illustrates the lip 114 projecting into the tank 100 and the bolt aperture 154 which is used to accommodate bolt 120. The side view of Figure 13C shows lip 114 in side view.
- [119] Referring now to Figure 14 there is illustrated containment tank 100 in a left hand wall 104 top perspective view. Piping assembly 200 is installed within the tank 100. The piping assembly 200 is connected to the containment tank by way of aperture 130 in right hand wall 102.
- [120] Referring now to Figures 15 A to D there is shown the piping assembly 200 in top view in Figure 15A, in side view in Figure 15B, in front view in Figure 15C and in cross-sectional side view in Figure 15D.
- [121] Referring to Figure 15B, the piping assembly comprises a piping elbow 202, a 'J'-shaped venturi pipe 204, a connector 206 which is inserted into aperture 130 in right hand wall 102 and a stiffening member 208. The first end 205 of the venturi pipe 204 is located within the elbow 202 and the second end 207 of the venturi pipe 204 is open to atmosphere above the tank lid and outside of the tank. The operation of the piping assembly is more fully explained below.
- [122] Referring now to Figures 16A and B there is shown in Figure 16A a front view of

elbow 202 and in Figure 16B a side view of elbow 202. The elbow is manufactured from 16 gauge 316 stainless steel. In the embodiment shown the pipe is about 1.5 inch in diameter and forms a 90 degree elbow. The elbow has an inlet 201 and an outlet 203. The elbow is used to drain water from the tank 100 that will fill the tank 100 during the course of cleansing operations as more fully explained below.

[123] Referring now to Figures 17A to D there is shown in Figure 17A a front view of one embodiment of the venturi pipe 204. Figure 17D shows a side view of the venturi pipe and Figure 17C shows a top view of the venturi pipe 204. A detailed view of pipe end 210 is shown in Figure 17B. The venturi pipe 204 is a 'J'- shaped pipe having a higher end 212 and a lower end 210. End 212 penetrates the top lid of the tank as more fully explained below and is exposed to atmospheric pressure whereas end 210 is tapered so as to create a venturi tube. The venturi pipe 204 acts with elbow 202 to siphon water from the containment tank second reservoir either in a recirculating mode during cleaning and degreasing of the fan and ducting; or, in a draining mode to drain the containment tank to a mobile disposal unit.

[124] Referring to Figure 18 there is shown one embodiment of the lid 220 for placement over the top of the containment tank 100. The lid 220 comprises a flat stainless steel panel 222 surrounded by upwardly disposed edges on each side 224 to 230. The lid 220 is fastened to the top of the containment tank 100 by bolts 120 and 122 as shown in Figure 10 which are placed through lid apertures 232 and 234 in Figure 18. A suitable nut such as a butterfly nut can be used to tighten the lid onto the surface of the container. Aperture 236 is a drain aperture and is used to drain fluids that drip from the fan housing during operation as a result of rain or to drain cleaning and degreasing fluids during servicing onto the top of the lid and into the container. Aperture 238 permits end 207 of the venturi pipe 204 to have access to atmospheric pressure.

[125] Referring now to Figure 19 there is shown a perspective view of one embodiment of the wall mount assembly 240 used to mount the containment tank 100 to the sidewall of the duct housing 88 as illustrated in Figure 9. The wall mount assembly 240 comprises a wall mount bracket 242 having a plurality of apertures 244 for mounting to the side wall 88 of the duct housing 56. The profile of the bracket 240 is 'L' shaped. Fixed to the bottom leg 246 of the wall mount bracket is an adjusting bracket 248. The adjusting bracket relies upon nut and bolt assemblies 250 for fixing to the wall mount bracket 240. The wall mount assembly ensures the top surface of the tank remain horizontal.

[126] Referring now to Figure 20 there is shown another embodiment of the containment tank 300 with internal structures. The horizontal lid is removed. The containment tank 300 comprises a first upper reservoir 366 and a second lower reservoir 368 separated by sloping plate 312. The plate 312 has a sloped portion 320 and a horizontal portion

324. The plate 312 has at least three apertures. Aperture 343 permits the end 310 of the venturi tube 304 to penetrate the plate 312 and rise above the lid. Aperture 322 and aperture 342 surrounded by a standpipe 340 permits drainage of fluids from the top reservoir 366 to the bottom reservoir 368. Piping assembly 302 comprising venturi pipe 304 and elbow 306 are located in the lower reservoir 368 of the containment tank 300. The discharge end 327 of the elbow 306 penetrates wall 314 through aperture 308. On the bottom inside surface 326 of containment tank 300 is an upwardly projecting baffle member 328 extending across the width of the tank. Depending down from the sloped section 320 of plate 312 is a second baffle 330. The bottom 331 of the second baffle is above the surface 326 of the tank 300 thereby permitting water to move from bottom reservoir section 330 to the main section 326.

[127] Still referring to Figure 20 and also to Figure 21 the operation of the invention is explained. Figure 21 shows the duct housing 350 and the motor fan housing 352 mounted to a roof 354. The exhaust outlet cowling 356 surrounds the fan and motor housing 352. During operation significant amounts of grease and dirt will accumulate on the inside surface of the cowling 356 and on the fan blades 360. Rain and moisture falling into the exhaust cowling will collect grease and dirt which will be drained off through the outlet 362 and into the containment tank 300. The top reservoir of the containment tank 366 is sealed from the bottom portion 368 by the inclined separation plate 320. The top reservoir 366 of the containment tank 300 has a capacity of about 1.3 gallons according to code and is intended to collect grease between scheduled cleanings of the fan assembly and the duct. The fluid draining into the top reservoir of the containment tank is an oil and grease/water mixture. The oil and grease will be floating on top of the water. As the fluid level in the upper reservoir 366 of the tank 300 rises, water will flow into the bottom reservoir 368 by way of aperture 322; however, stand pipe 340 will prohibit the oil from entering into the lower reservoir of the containment tank. If the fluid level in the upper reservoir of the containment tank is excessive then grease and oil will overflow into the standpipe 340 and into the bottom reservoir 368 by way of aperture 342 and into the sump portion 330 instead of overflowing the tank and falling onto the roof of the building 354.

[128] During cleaning operations the exhaust cowling, the fan and motor housing and the fan blades will be thoroughly cleaned using high-pressure water, steam and degreasers. The contaminated solution will flow through outlet 362 into the tank top reservoir 366 and then into the bottom reservoir 368. Since oils and grease are dissolved in the run-off it is necessary to purge the containment tank of the contaminated cleaning run-off. The top portion of the separating plate will be cleaned by degreasers and steam and that run-off will flow into the lower reservoir. To cleanse and purge the containment tank 300 a high-pressure water source 351 is attached to the top end 312 of the venturi

pipe 304. High pressure water is forced through the venturi 304 pipe and through the tapered opposite end of the venturi 370. The water is then expelled out of the containment tank by way of elbow 306 and into a recirculating hose 380. The high-pressure water flowing through the venturi nozzle 210 in Figure 17 creates a syphoning effect inside of the elbow 306 which will draw all of the fluid in the lower reservoir 368 out and into the recirculating hose. When the cleaning is finished, the water can be directed to a waiting mobile containment tank for further treatment and disposal.

[129] The invention is defined by the following claims.

Mode for Invention

[130]

Industrial Applicability

[131]

Sequence List Text

[132]

Claims

- [Claim 1] A grease interceptor for a wastewater stream from an exhaust fan assembly wherein said wastewater stream comprises a mixture of grease and water, said interceptor comprising:
- a. A tank comprising:
 - i. An removable lid;
 - ii. A first reservoir disposed beneath said aperture removable lid and having an inlet in communication with a drainage spout from said exhaust fan assembly for receiving said mixture of grease and water and at least two outlets;
 - iii. Wherein the mixture of grease and water drains by gravity;
 - iv. Wherein said first reservoir has a first volume;
 - v. A second reservoir in communication with said first reservoir by said at least two outlets;
 - vi. Wherein said second reservoir has a second volume greater than said first volume;
 - vii. Wherein the first reservoir is located above the second reservoir and separated from the second reservoir by;
 - b. A separation plate; and,
 - c. A siphoning apparatus located within the second reservoir for evacuating water from the second tank.
- [Claim 2] The device of claim 1 wherein the siphoning apparatus comprises:
- a. An elbow having an inlet within the second reservoir and an outlet penetrating a wall of said tank; and,
A 'J'-shaped pipe having a first tip located outside of the tank and a second tip located within said elbow.
- [Claim 3] The device of claim 2 wherein said second tip of said 'J' shaped pipe is truncated into a nozzle.
- [Claim 4] The device of claim 3 wherein when a high pressure fluid source is connected to said first tip, said second tip accelerates said high pressure fluid through the elbow thereby creating a siphoning effect inside of the elbow for draining the contents of the tank.
- [Claim 5] The device of claim 4 wherein a first outlet of said at least two outlets is a first aperture through said separation plate so that a water component of said mixture of grease and water can flow into the second reservoir and a grease component cannot.
- [Claim 6] The device of claim 5 wherein a second outlet of the at least two outlets

is a second aperture surrounded by a standpipe having an opening disposed below said lid so that as the level of the mixture of grease and water rises in the first reservoir said grease component is allowed to flow through said standpipe into the second reservoir to prevent tank overflow.

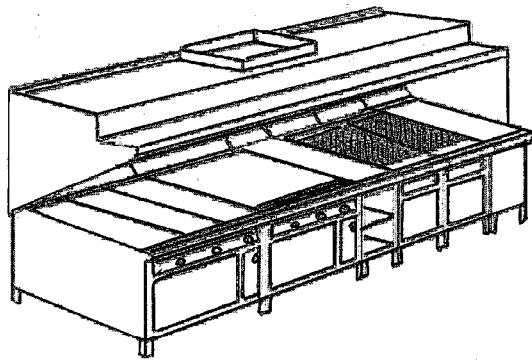
- [Claim 7] The device of claim 5 wherein an inlet of the standpipe is below a level of the removable lid.
- [Claim 8] The device of claim 6 wherein the second reservoir comprises a sump disposed beneath the at least two apertures for receiving the grease and water mixture.
- [Claim 9] 1. The device of claim 8 wherein said sump is separated from the second reservoir by:
- a. a first upwards projecting baffle plate fixed to a bottom inside surface of the tank and extending a width of the tank; and,
 - b. a second downwards depending baffle plate fixed to a bottom surface of said separating plate and offset a horizontal distance from said first baffle plate and extending said width of the tank;
- so that said grease component is trapped in said sump and so that a flow path is created for the water component into the second reservoir adjacent to the sump.
- [Claim 10] The device of claim 9 wherein a height of the first baffle plate is substantially less than a height of the second baffle plate.
- [Claim 11] The device of claim 10 further including an adjustable wall mounting bracket for mounting the tank to a side wall of a duct housing and for maintaining the lid of the tank horizontal.
- [Claim 12] The device of claim 11 wherein the first reservoir has a capacity of at least 1.3 US gallons.
- [Claim 13] The device of claim 12 wherein the removable lid has:
- a. four sides;
 - b. a raised edge along each of said four sides;
 - c. a first lid aperture to permit said first tip of the 'J' shaped-pipe to locate above the level of the removable lid for connection to a high pressure fluid source; and,
- a second aperture to permit waste water draining from a drainage spout depending from the exhaust fan into the first reservoir.
- [Claim 14] The device of claim 13 wherein the containment tank outlet is coupled to a biological treatment system so that the wastewater can be further processed prior to disposal.

- [Claim 15] In an exhaust fan cleansing operation, a method of recycling a waste water mixture of grease, cleansing detergents, degreasers and water from and to a waste water containment tank comprising the following steps:
- a. Providing a containment tank inlet to receive said waste water mixture;
 - b. Providing a containment tank outlet connected to a cleansing apparatus directed at said exhaust fan;
 - c. Locating a siphoning apparatus within the containment tank, said siphoning apparatus comprising an elbow having discharge end connected to said containment tank outlet and an inlet submerged within the waste water within the containment tank and a venturi tube having one end outside of the containment tank and one end within said elbow;
 - d. Connecting a source of high pressure fluid to said venturi tube end outside of the containment tank;
 - e. Activating the siphoning apparatus; and,
- Continuation to recycle the waste water until completion of the exhaust fan cleansing operation.
- [Claim 16] The method of claim 15 wherein said source of high pressure fluid is water.
- [Claim 17] The method of claim 15 wherein said source of high pressure fluid is steam.
- [Claim 18] The method of claim 15 comprising the following additional steps:
- a. Upon completion of the exhaust fan cleansing operation, deactivating the siphoning apparatus;
 - b. Connecting the containment tank outlet to a mobile waste water disposal tank;
 - c. Re-activating the siphoning apparatus; and,
 - d. Purging the containment tank of waste water until clean and empty.
- [Claim 19] The method of claim 18 wherein the step (b) of connecting the containment tank outlet to a mobile waste water disposal tank is replaced by the step of (b) Connecting the containment tank outlet to a biological treatment system.
- [Claim 20] A wastewater collection device for an exhaust fan assembly wherein said wastewater comprises a mixture of grease and water, said collection device comprising:
- a. A tank comprising:

- i. An removable horizontal lid having an inlet disposed beneath a drainage spout from said exhaust fan assembly so that said mixture of grease and water does not accumulate on said removable lid;
- ii. A first reservoir having a first volume and disposed beneath said removable lid for receiving said mixture of grease and water, wherein said first reservoir has at least two outlets in communication with;
- iii. A second reservoir having a second volume greater than said first volume;
- iv. Wherein the first reservoir is located above said second reservoir and separated from the second reservoir by;
 - b. A downward sloped separation plate traversing a length of the tank between a tank right hand wall and a tank left hand wall and terminating in a horizontal section adjacent to said tank left hand wall, wherein said horizontal section comprises at least a first and a second apertures, wherein said first aperture is surrounded by a standpipe so that a water component of the mixture of grease and water flows through said second aperture into the second reservoir and a grease component of the mixture of grease and water is trapped in the first reservoir;
 - c. A siphoning apparatus located within the second reservoir for evacuating said water component from the second reservoir; and,
 - d. At least one adapter apparatus for accommodating a connection between said tank and said drainage spout.

[Fig. 1]

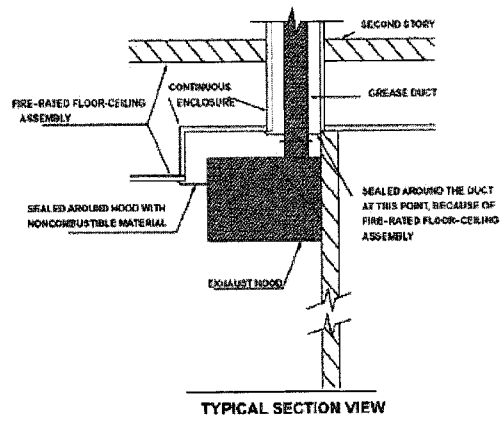
Figure 1



**Typical installation of backshelf hood over
cook line.**

[Fig. 2]

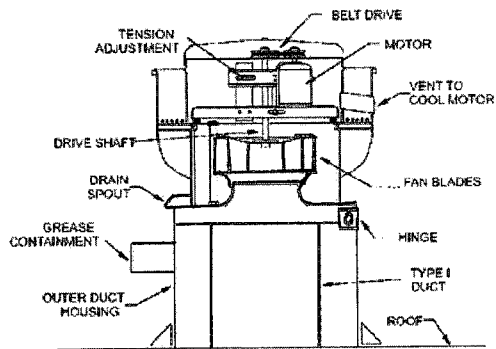
Figure 2



Hood and ceiling enclosures

[Fig. 3]

Figure 3



A Typical exhaust fan referred to as an up-blast fan assembly

[Fig. 4]

Figure 4

Schedule of Inspection for Grease Buildup

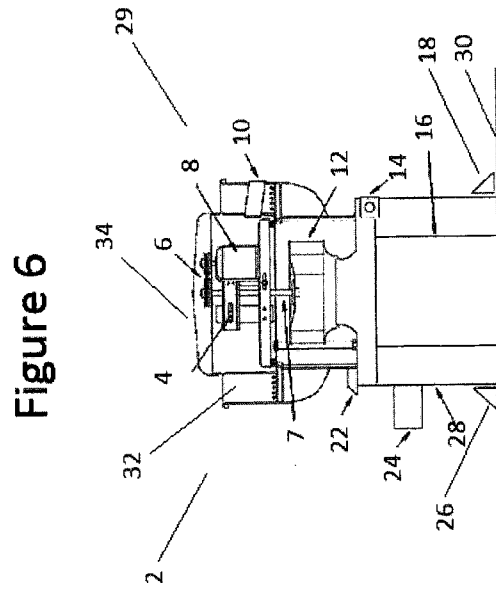
Type or Volume of Cooking	Inspection Frequency
<i>Systems serving solid fuel cooking operations</i>	<i>Monthly</i>
<i>Systems serving high-volume cooking operations, such as 24-hour cooking, charbroiling, or wok cooking</i>	<i>Quarterly</i>
<i>Systems serving low-volume cooking operations</i>	<i>Semiannually</i>
<i>Systems serving low-volume cooking operations, such as churches, day camps, seasonal businesses, or senior centers</i>	<i>Annually</i>

[Fig. 5]

Figure 5



[Fig. 6]



[Fig. 7]

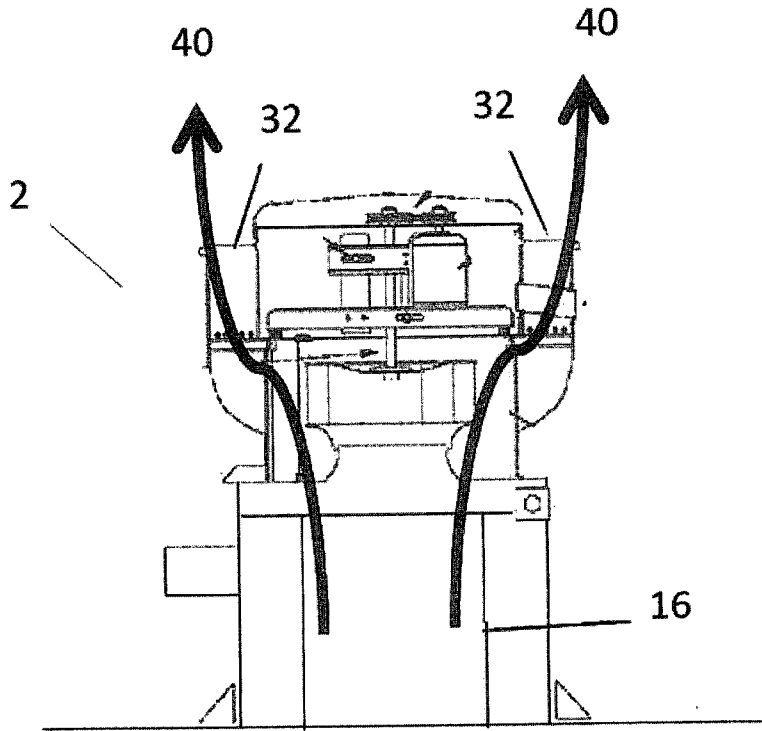


Figure 7

[Fig. 8]

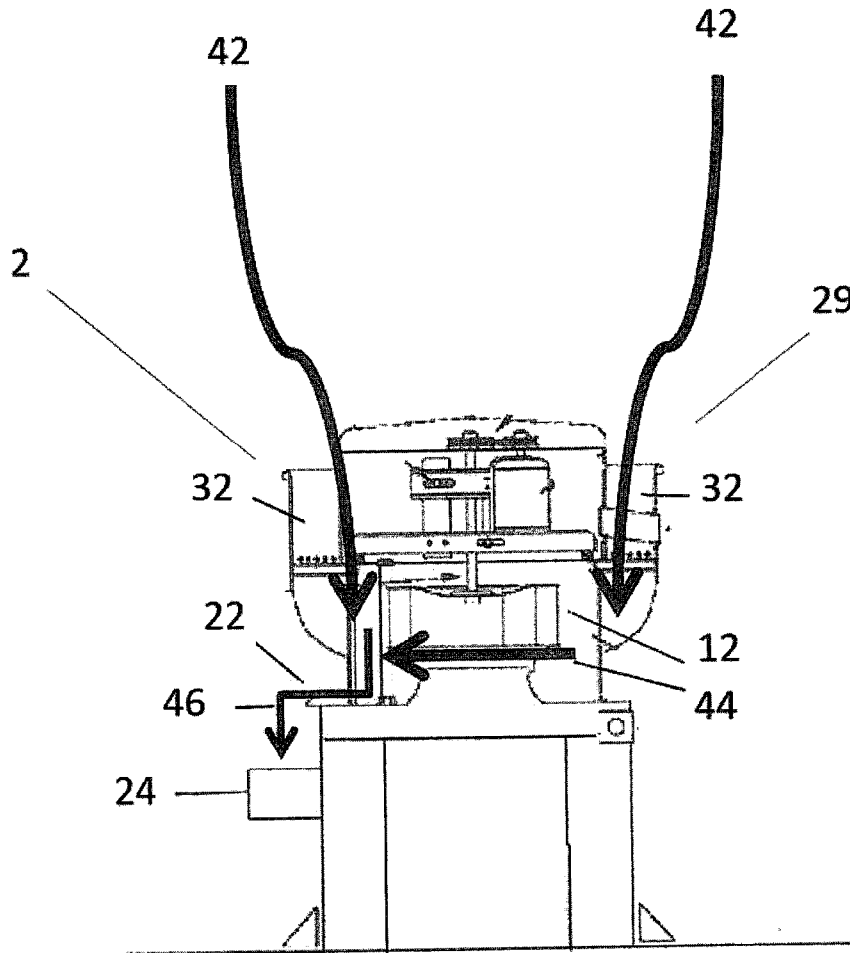
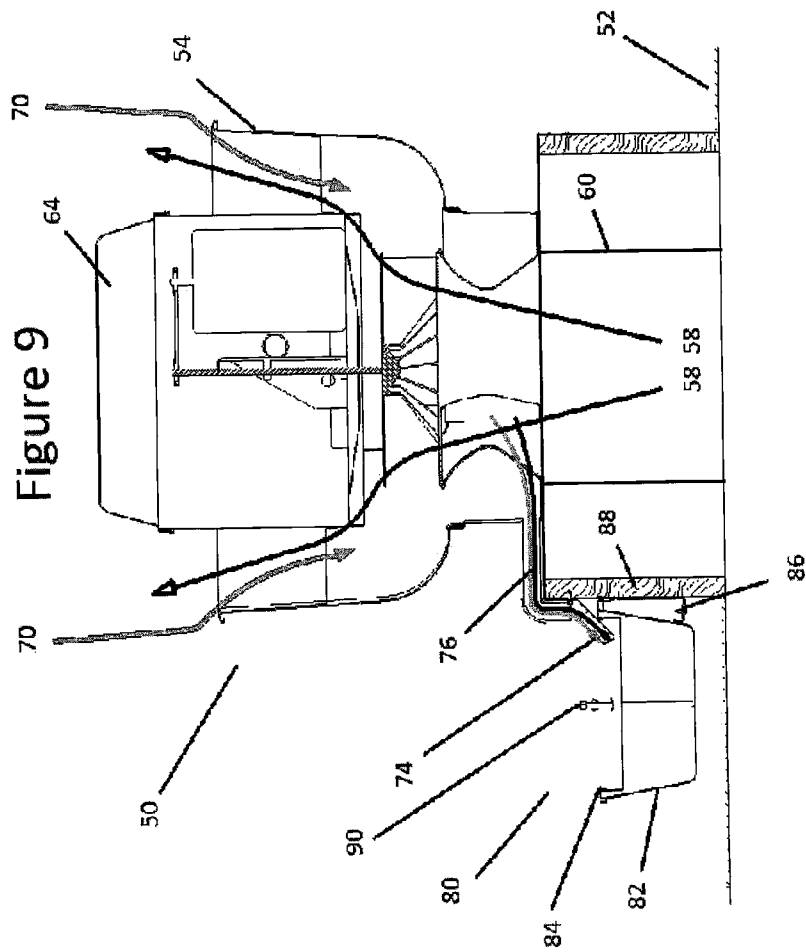


Figure 8

[Fig. 9]



[Fig. 10]

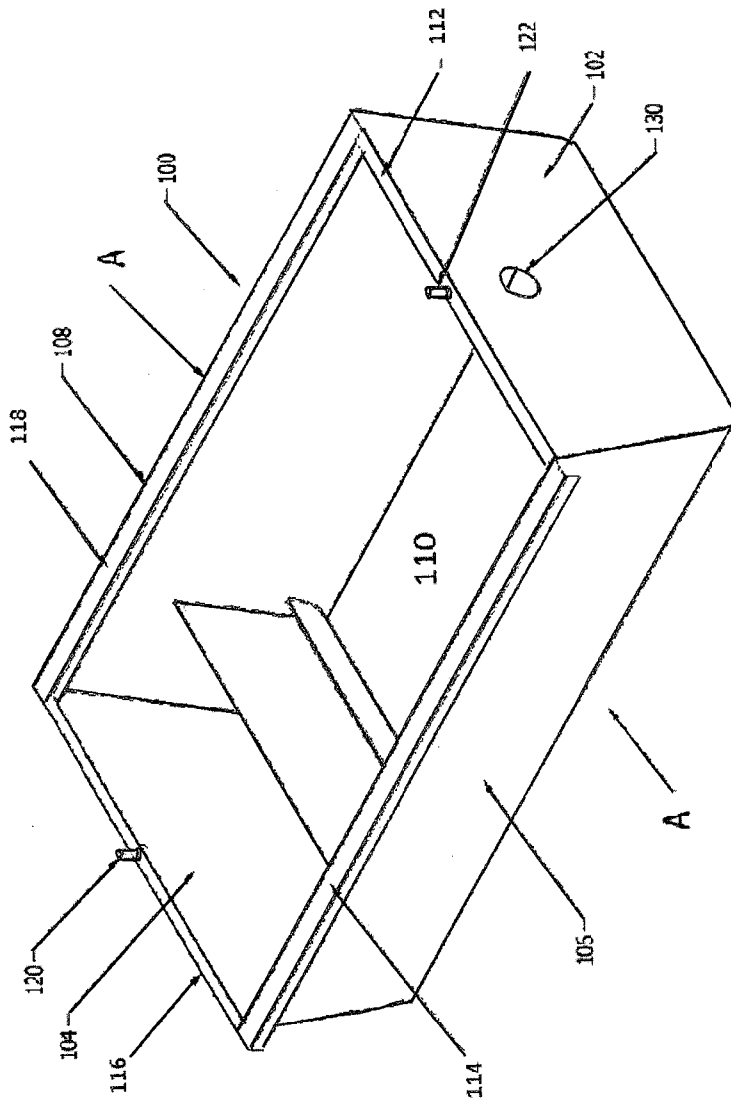


Figure 10

[Fig. 11]

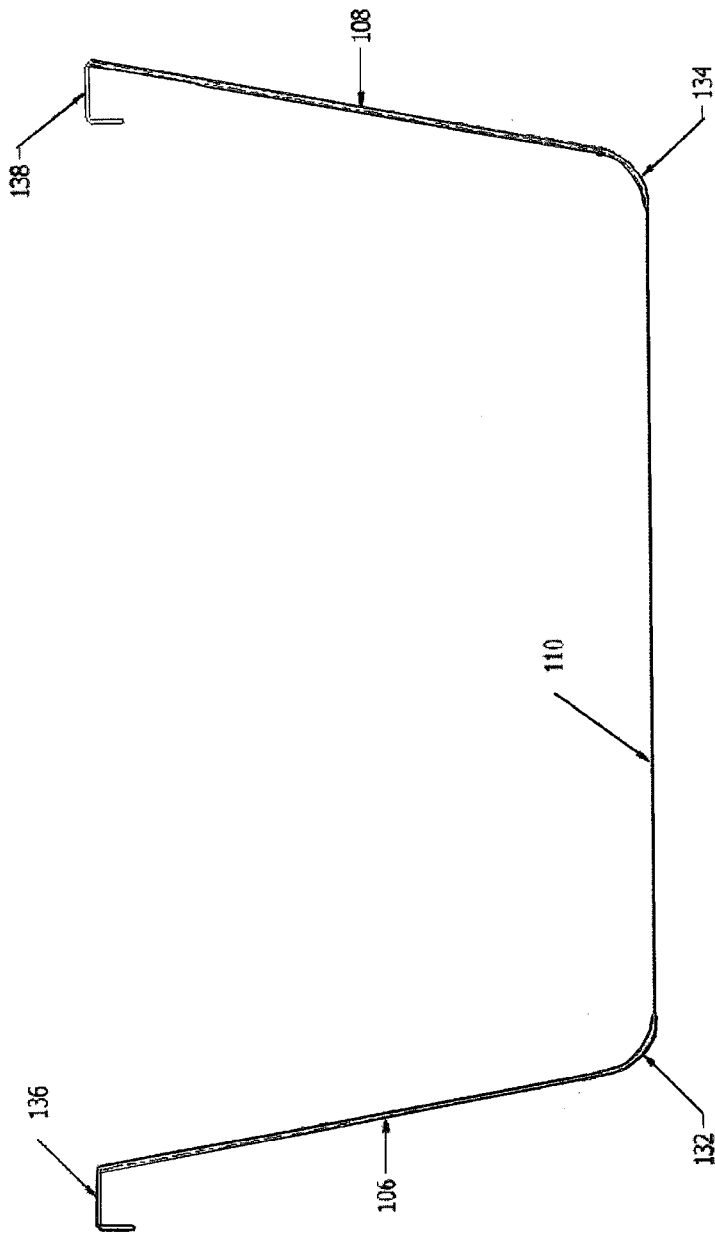


Figure 11

[Fig. 12]

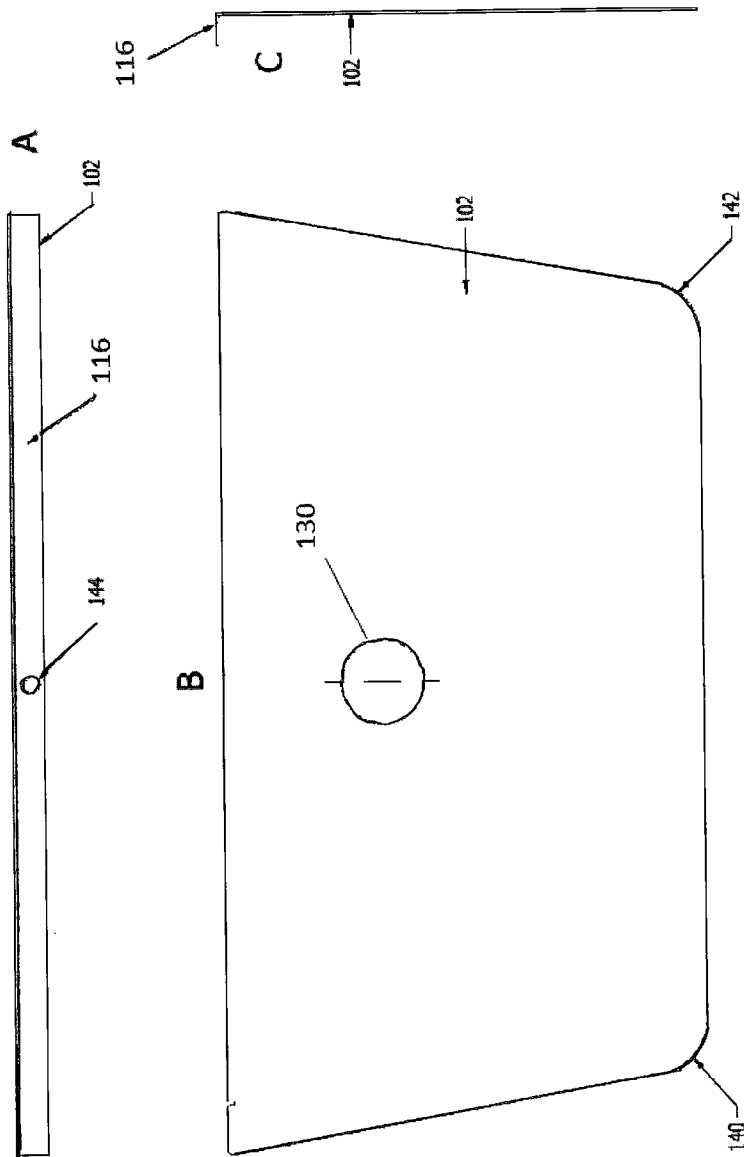


Figure 12

[Fig. 13]

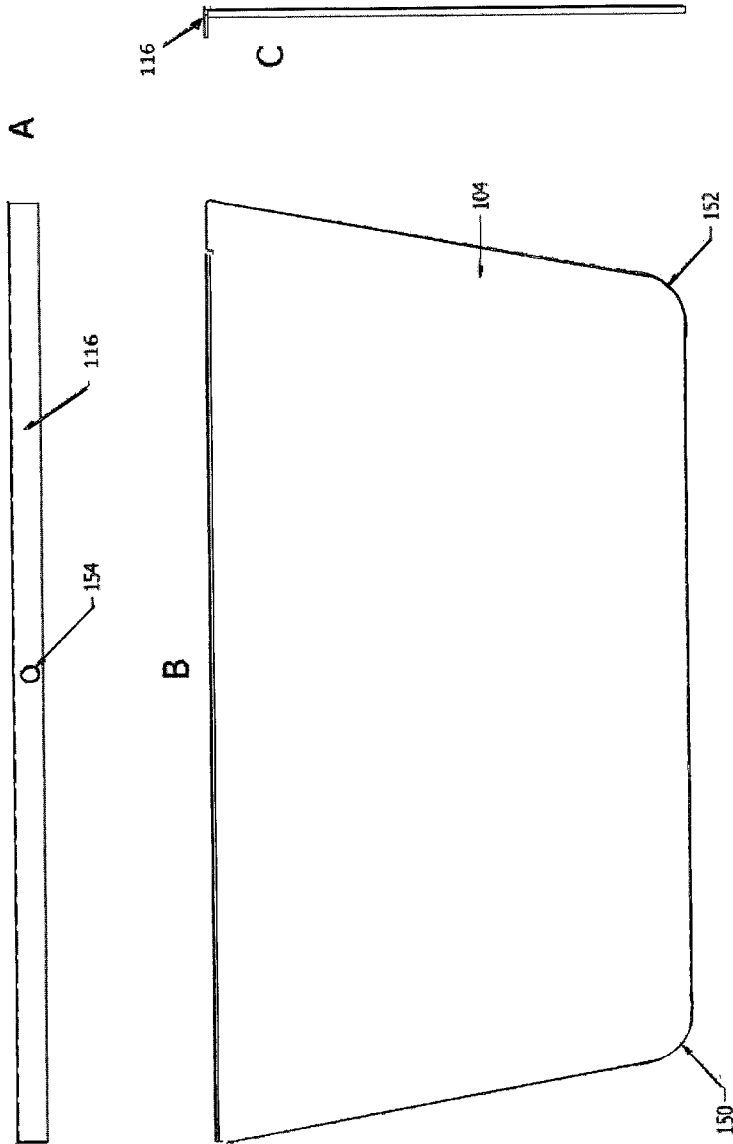


Figure 13

[Fig. 14]

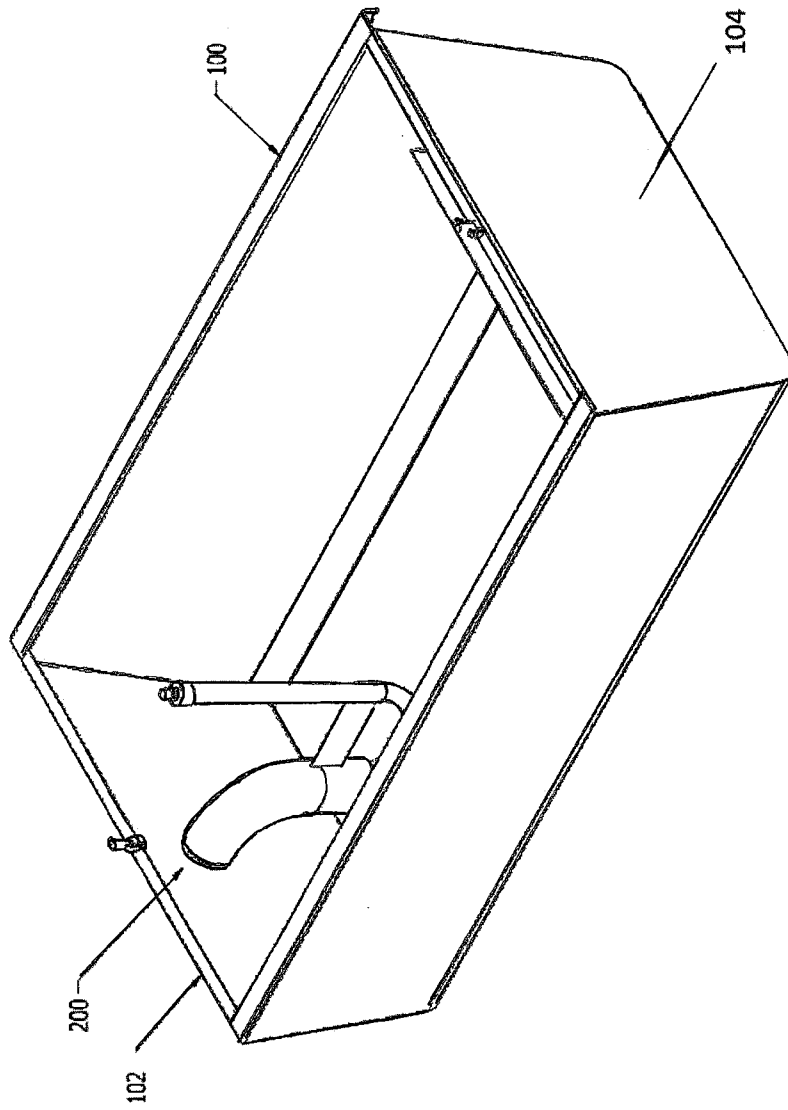


Figure 14

[Fig. 15]

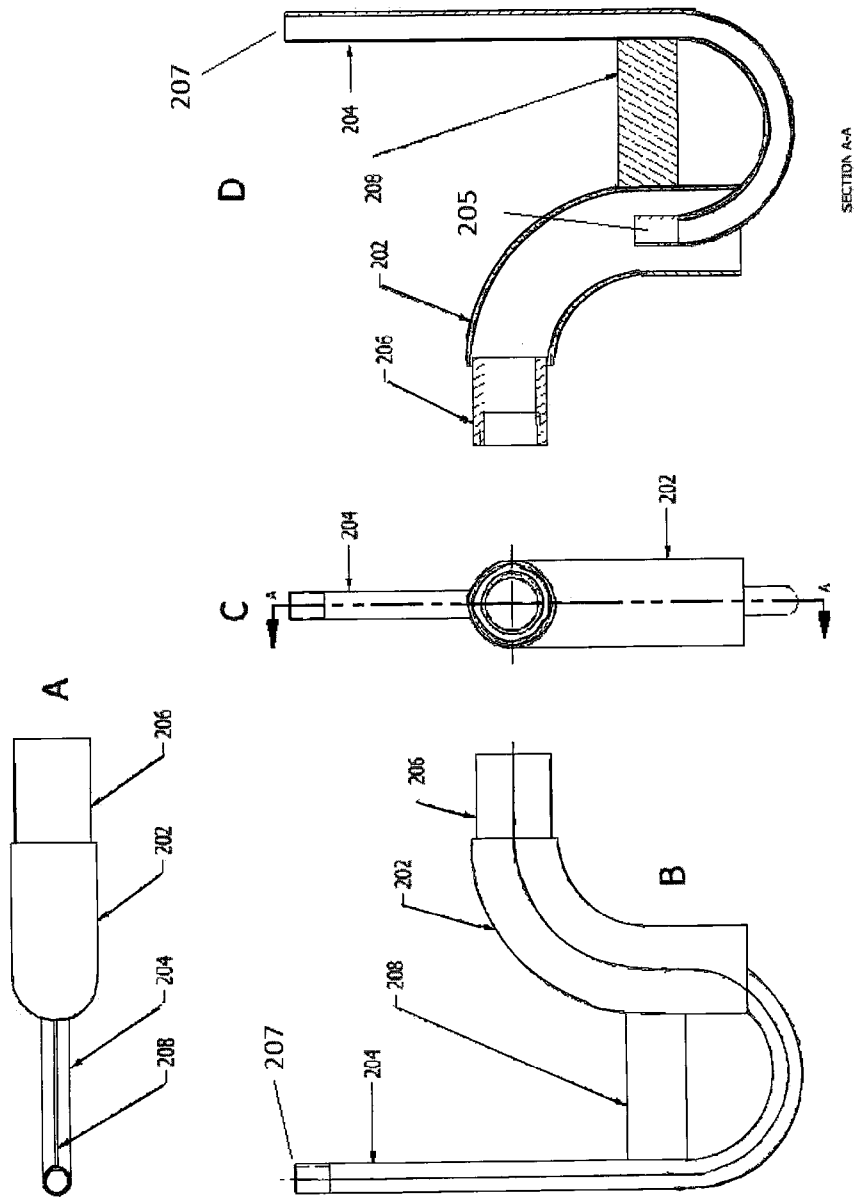


Figure 15

[Fig. 16]

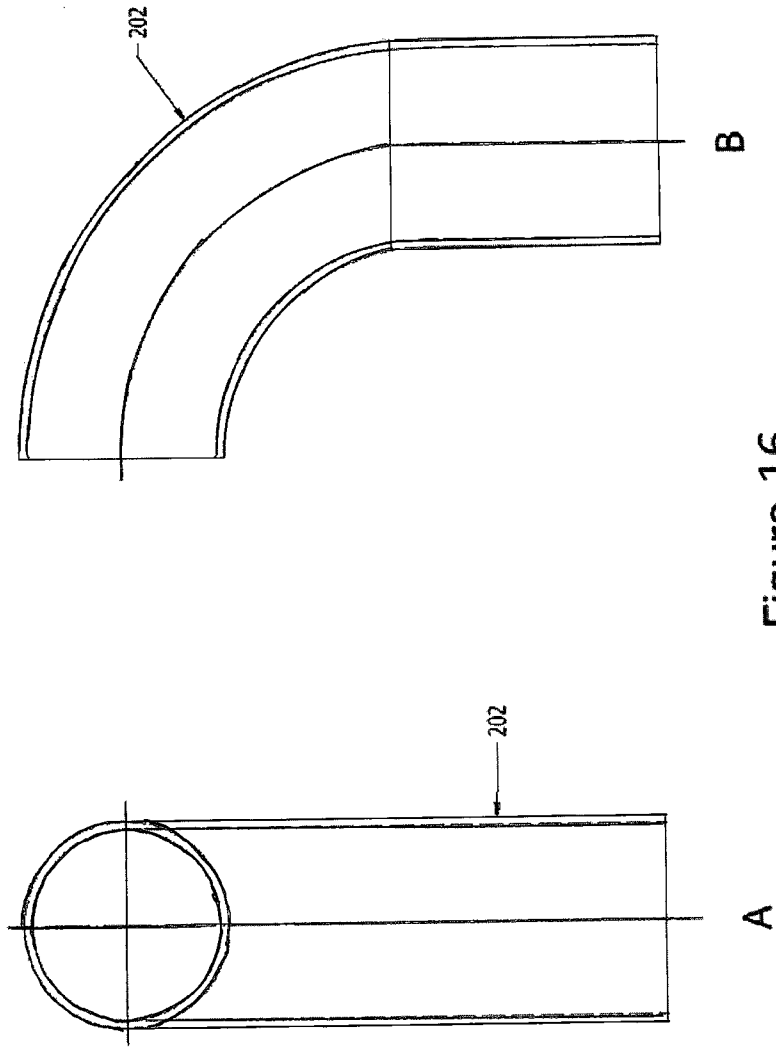


Figure 16

[Fig. 17]

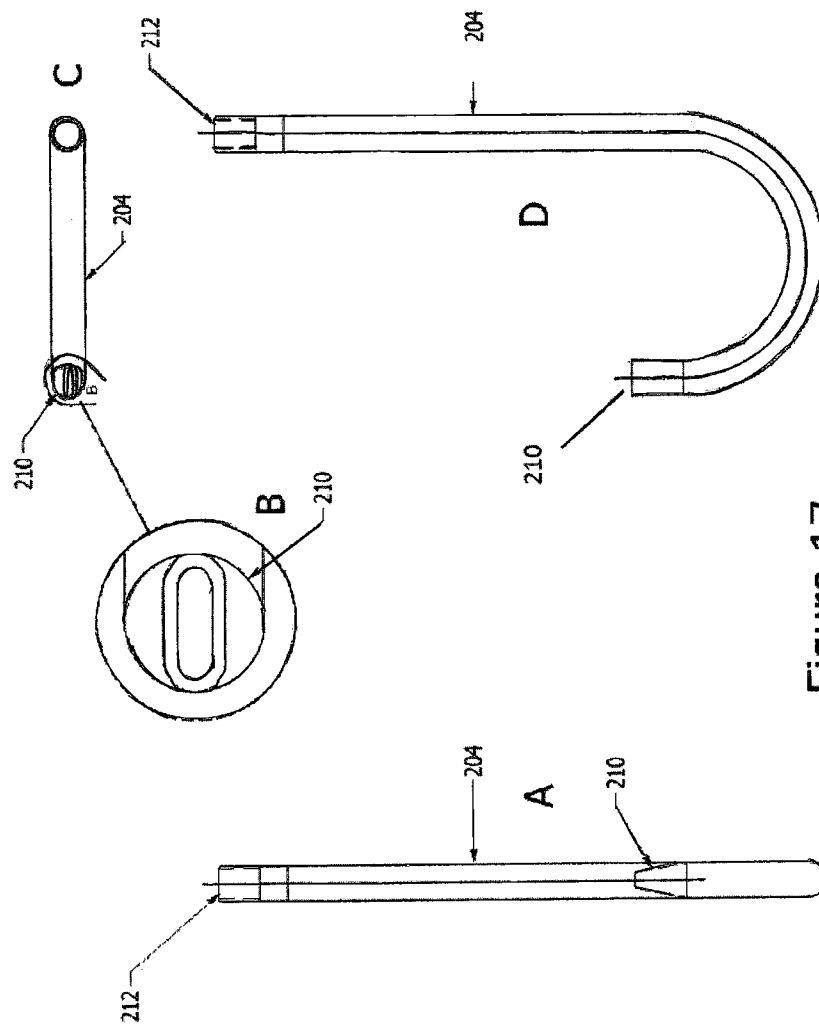


Figure 17

[Fig. 18]

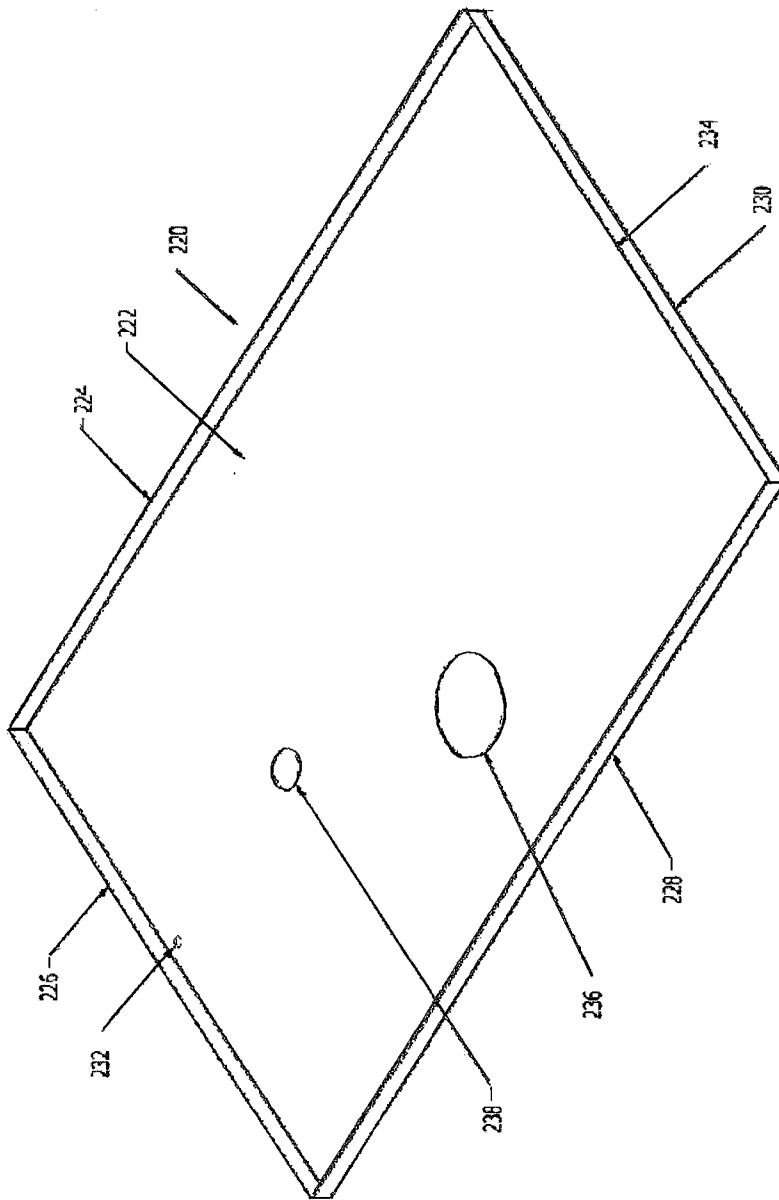


Figure 18

[Fig. 19]

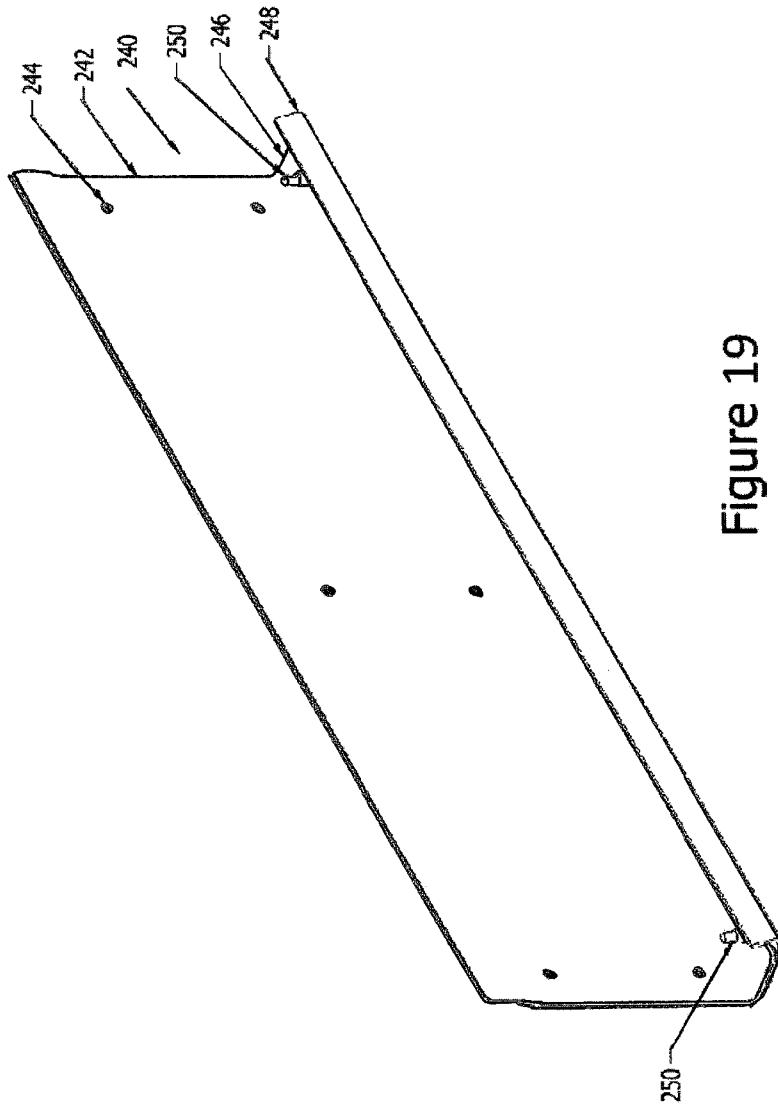


Figure 19

[Fig. 20]

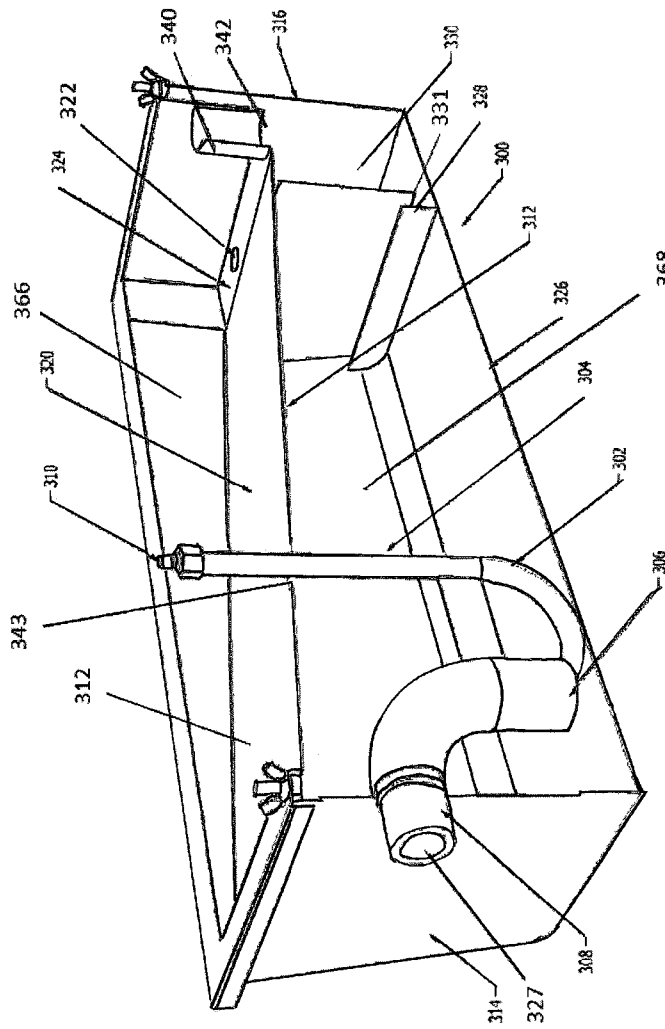
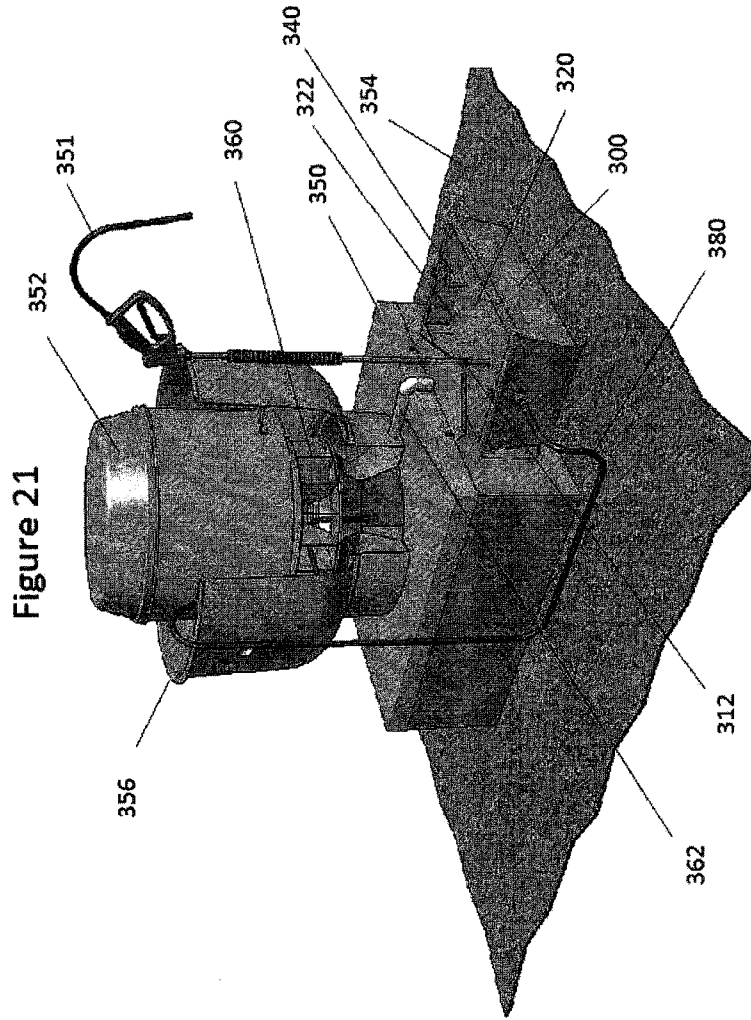


Figure 20

[Fig. 21]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/052269

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC: B08B 15/00 (2006.01) , E03F 5/16 (2006.01) , F24F 13/22 (2006.01) , F24F 13/28 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC</p>																
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) IPC: B08B 15/00 (2006.01) , E03F 5/16 (2006.01) , F24F 13/22 (2006.01) , F24F 13/28 (2006.01)</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used) EPOQUE (EpoDoc) - grease, tank, exhaust fan, siphon, reservoir, oil, venturi Google Patents - grease remove siphon, grease remove venturi</p>																
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:10%;">Category*</th> <th style="width:60%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width:30%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td align="center">A</td> <td>US 6824696 B1 (TOLMIE, D. et al.) 30 November 2004 (30-11-2004) *abstract, figures*</td> <td align="center">1-14 and 20</td> </tr> <tr> <td align="center">A</td> <td>EP 1401770 B1 (BATTEN, W. et al.) 20 February 2008 (20-02-2008) *entire document*</td> <td align="center">15-19</td> </tr> <tr> <td align="center">A</td> <td>US 6951615 B2 (TRIPODI, J. et al.) 4 October 2005 (04-10-2005) *abstract, figures*</td> <td></td> </tr> <tr> <td align="center">A</td> <td>WO 2007/127612 A1 (BATTEN, W. et al.) 8 November 2007 (08-11-2007) *abstract, figures*</td> <td></td> </tr> </tbody> </table>		Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	US 6824696 B1 (TOLMIE, D. et al.) 30 November 2004 (30-11-2004) *abstract, figures*	1-14 and 20	A	EP 1401770 B1 (BATTEN, W. et al.) 20 February 2008 (20-02-2008) *entire document*	15-19	A	US 6951615 B2 (TRIPODI, J. et al.) 4 October 2005 (04-10-2005) *abstract, figures*		A	WO 2007/127612 A1 (BATTEN, W. et al.) 8 November 2007 (08-11-2007) *abstract, figures*	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.														
A	US 6824696 B1 (TOLMIE, D. et al.) 30 November 2004 (30-11-2004) *abstract, figures*	1-14 and 20														
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A	WO 2007/127612 A1 (BATTEN, W. et al.) 8 November 2007 (08-11-2007) *abstract, figures*															
<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%; vertical-align: top;"> * Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width:50%; vertical-align: top;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>		* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family													
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Date of the actual completion of the international search 9 January 2013 (09-01-2013)	Date of mailing of the international search report 17 January 2013 (17-01-2013)															
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Authorized officer Lily Truong (819) 953-1624															

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/IB2012/052269**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons :

1. Claim Nos. :
because they relate to subject matter not required to be searched by this Authority, namely :

2. Claim Nos. :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically :

3. Claim Nos. :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows :

Group A: Claims 1-14 and 20

A grease interceptor having a first and second reservoir wherein the first reservoir is above the second reservoir and separated by a separation plate.

Group B: Claims 15-19

A method of recycling waste water comprising a tank having a siphoning apparatus and a venturi tube connected to a high pressure fluid with one end within said siphoning apparatus and the other end outside of the tank.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos. :
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos. :

Remark on Protest The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/052269

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
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		AUPP274298D0	30 April 1998 (30-04-1998)
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		WO03011767A1	13 February 2003 (13-02-2003)
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		EP2010301A4	25 April 2012 (25-04-2012)
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