



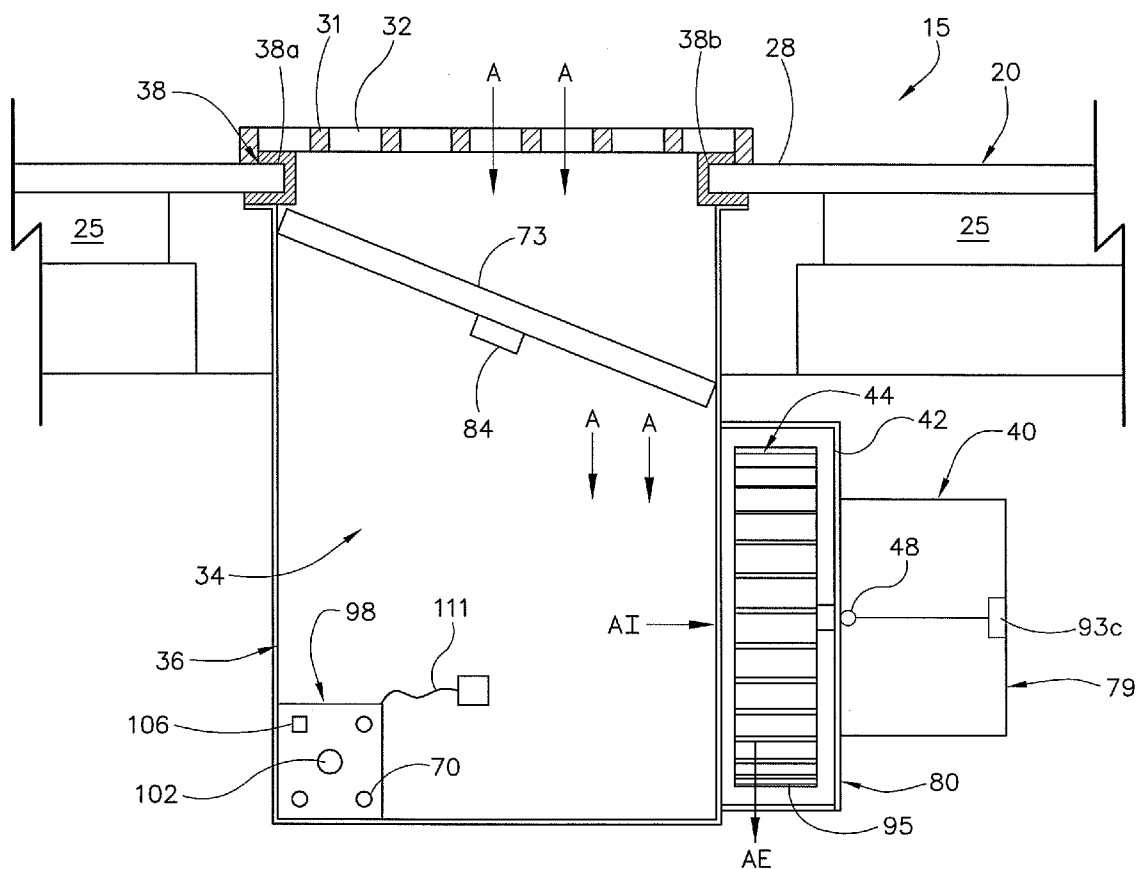
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(19) **United States**(12) **Patent Application Publication**
Gagas(10) **Pub. No.: US 2007/0062513 A1**(43) **Pub. Date: Mar. 22, 2007**(54) **COOKING SYSTEM WITH VENTILATOR
AND BLOWER**(52) **U.S. Cl. 126/299 D**(76) Inventor: **John M. Gagas**, Milwaukee, WI (US)

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MILWAUKEE, WI 53202 (US)**(21) Appl. No.: **11/232,050**(22) Filed: **Sep. 21, 2005****Publication Classification**(51) **Int. Cl.**
F24C 15/20 (2006.01)(57) **ABSTRACT**

An indoor or outdoor cooking system with integrated down-draft or elevating ventilator uses cross-flow or centrifugal blower technology. The system is controlled by an electronic or mechanical controller through a touch device, a slide, or knob. These provide precise control and an efficient way of removal of gases/fumes. A cook top incorporates the heating elements and a downdraft. The ventilator's blower assembly has a fan and a filter. The system may use sensors to detect temperature, fire, effluent, filter change requirements, fan speed, power, and voltage. The system has programmable operations and numerous set points.



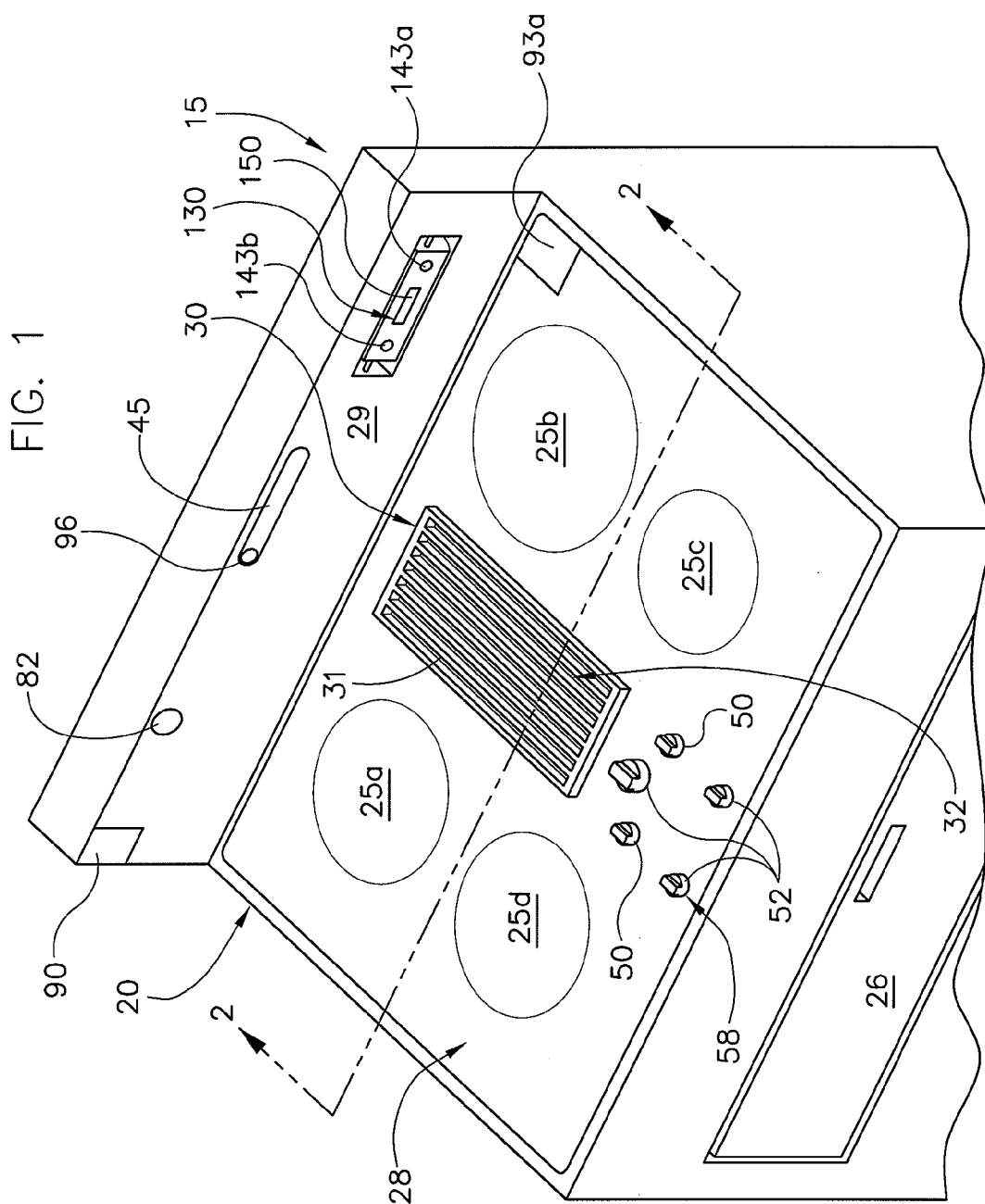


FIG. 2

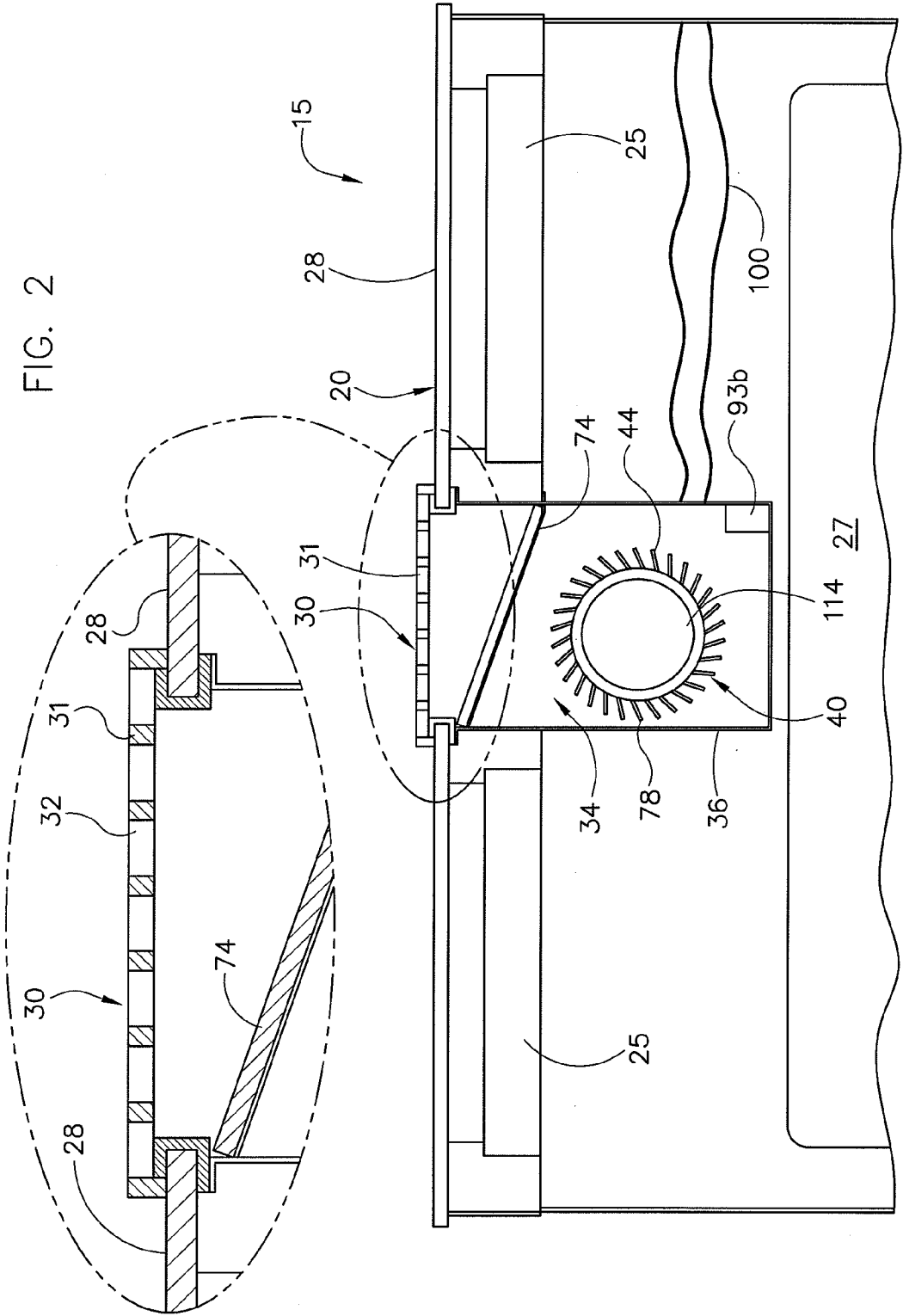


FIG. 3

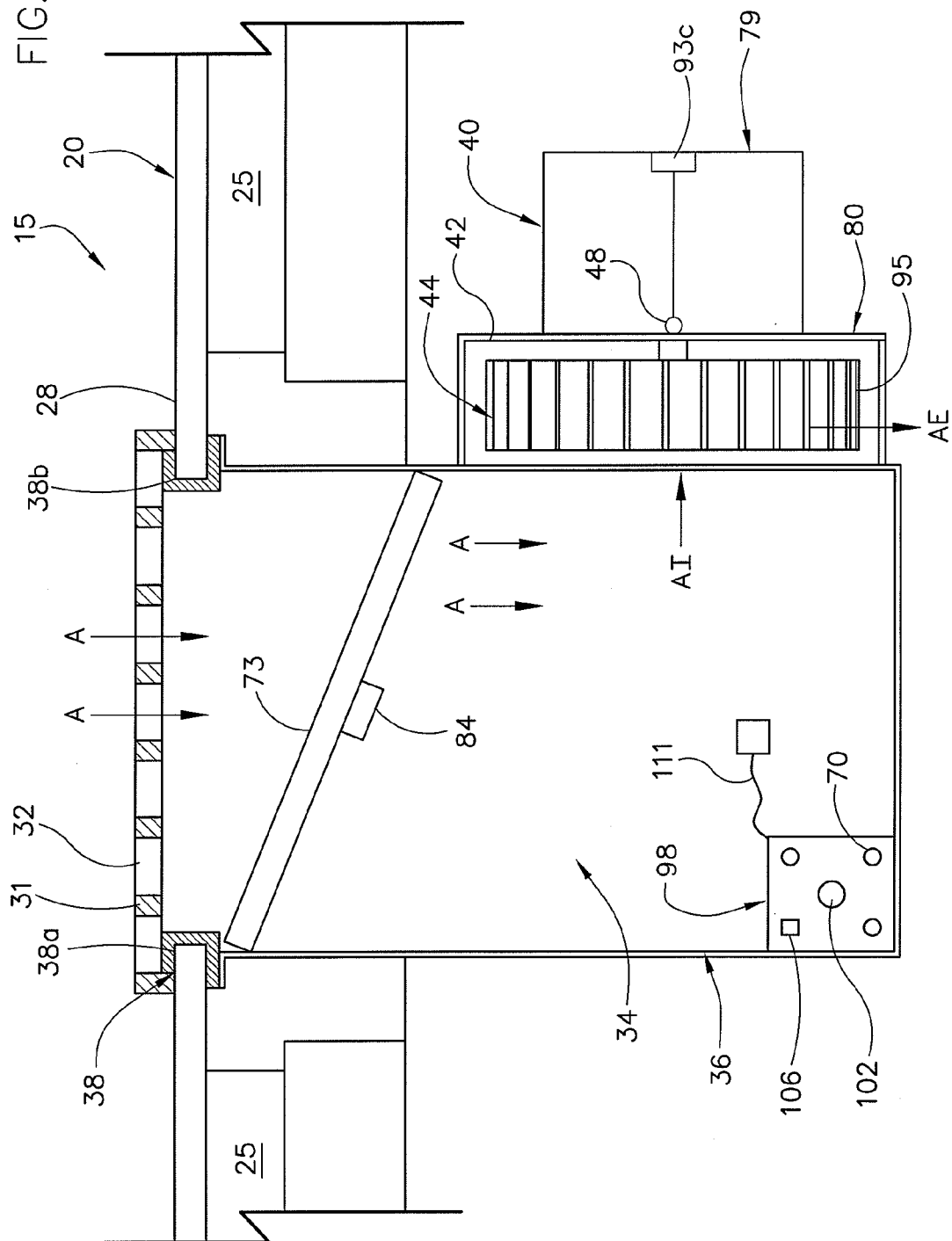
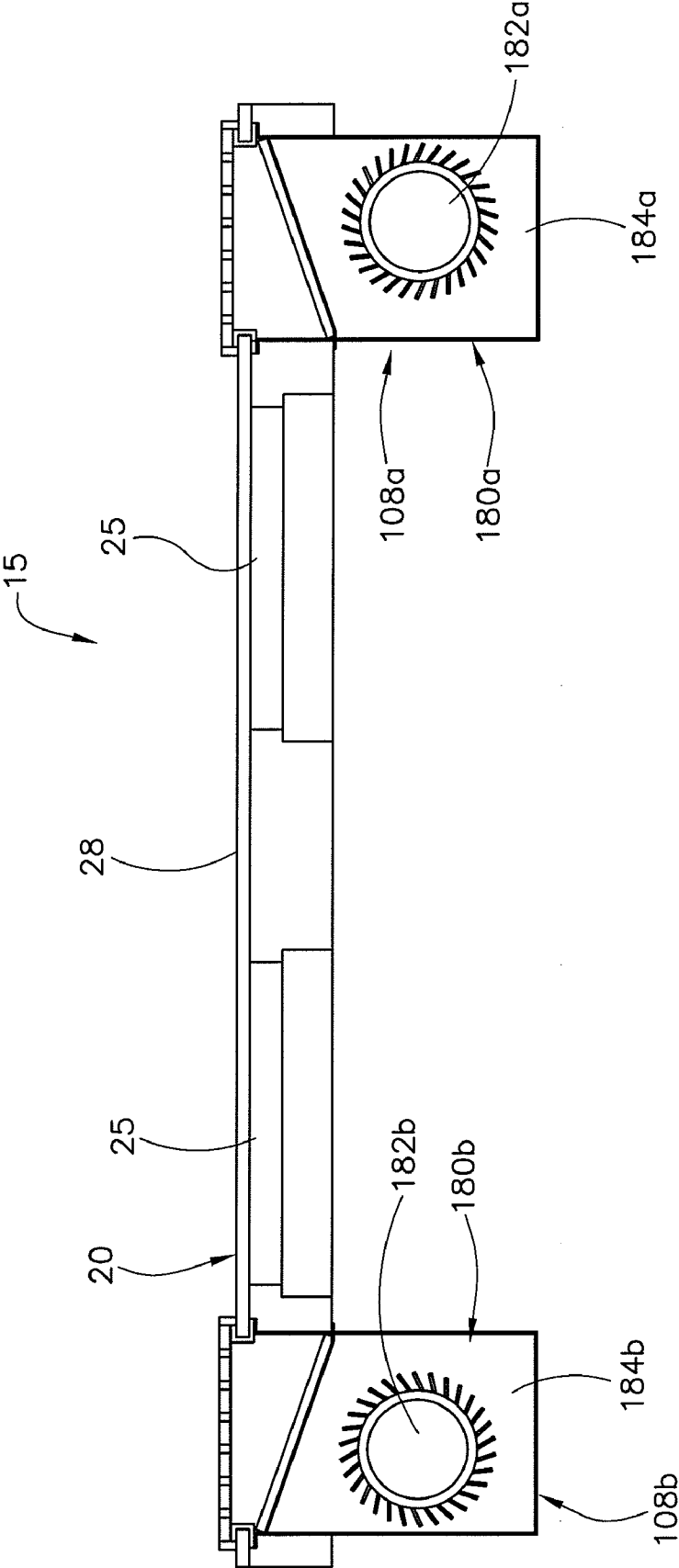


FIG. 4



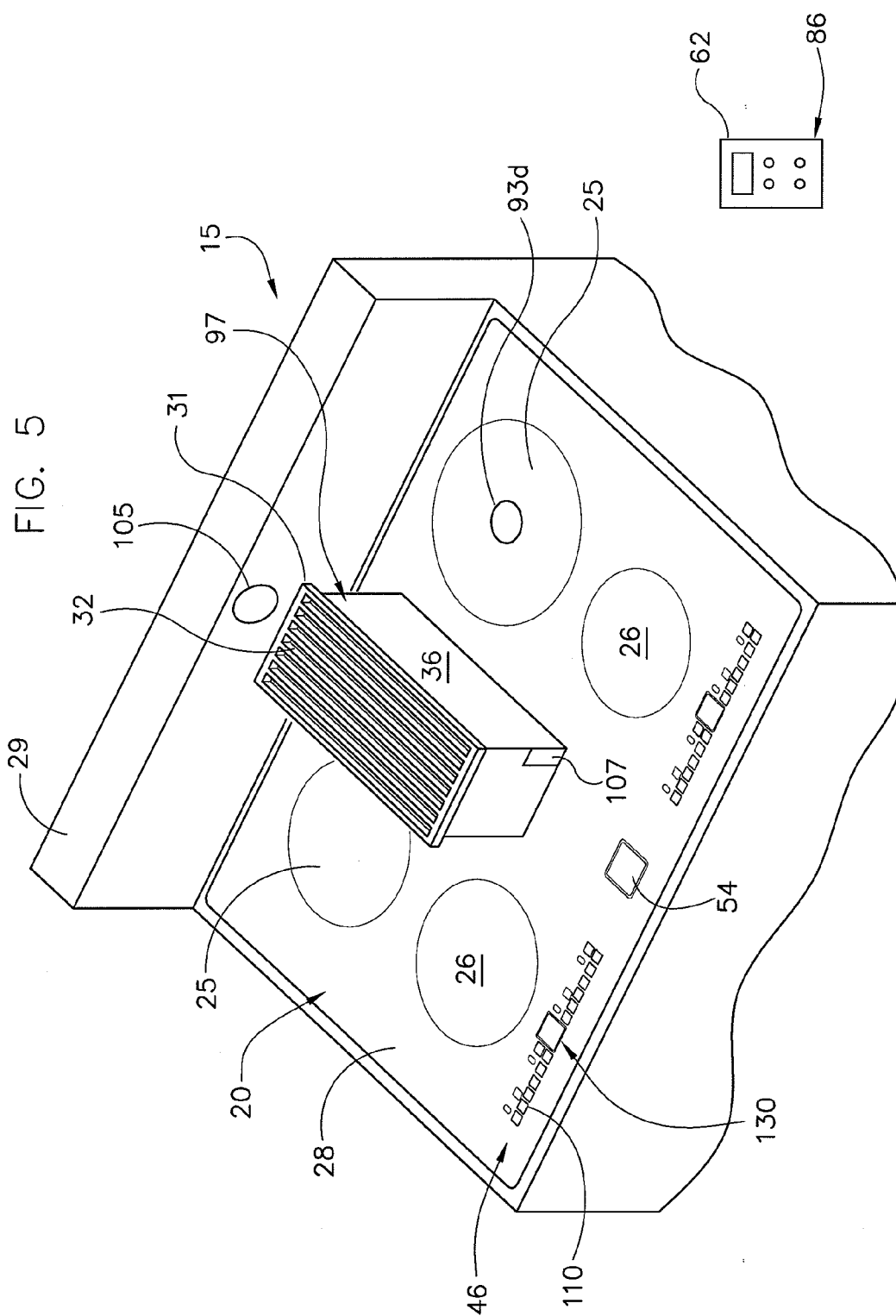


FIG. 6

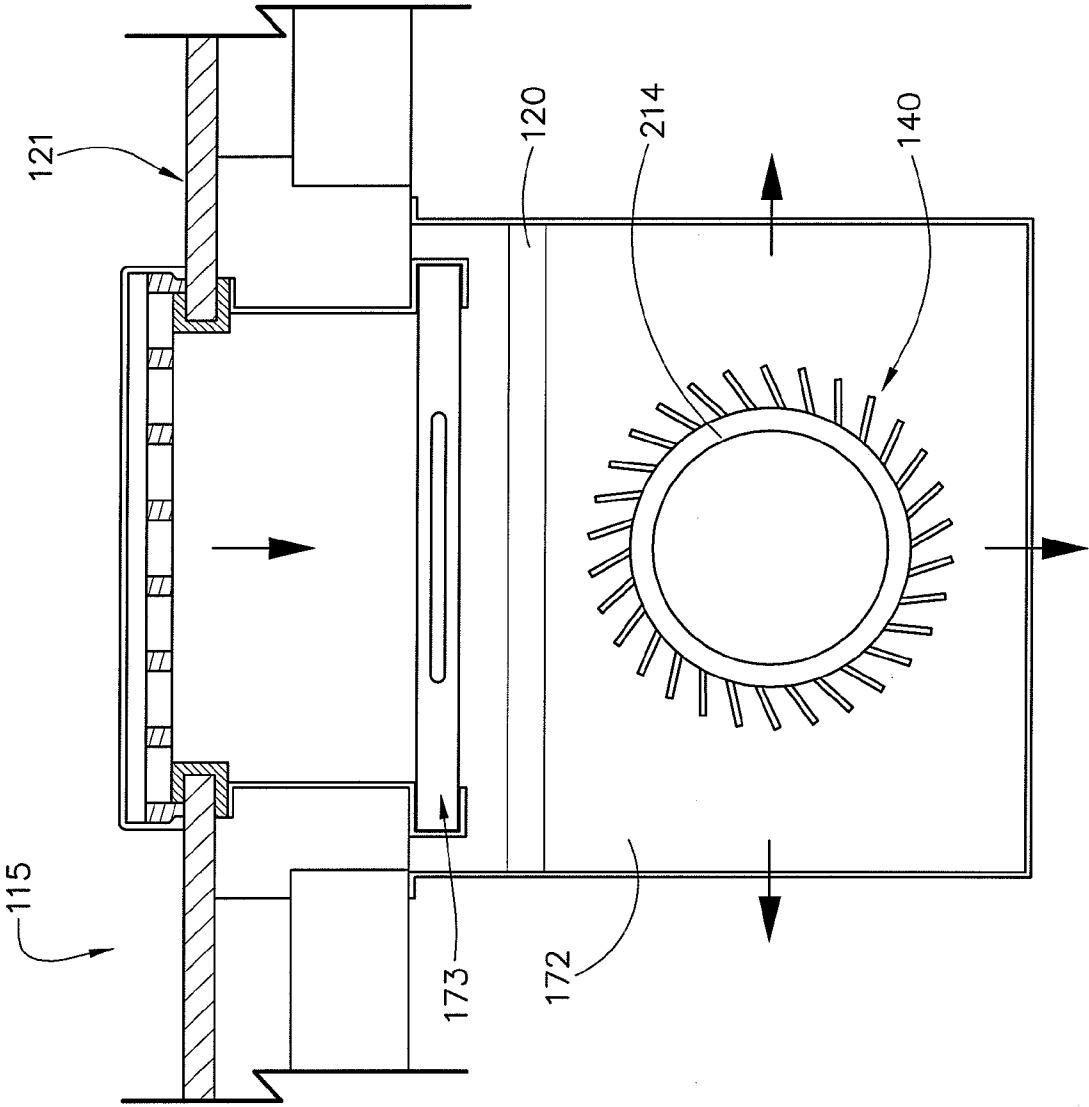


FIG. 7A

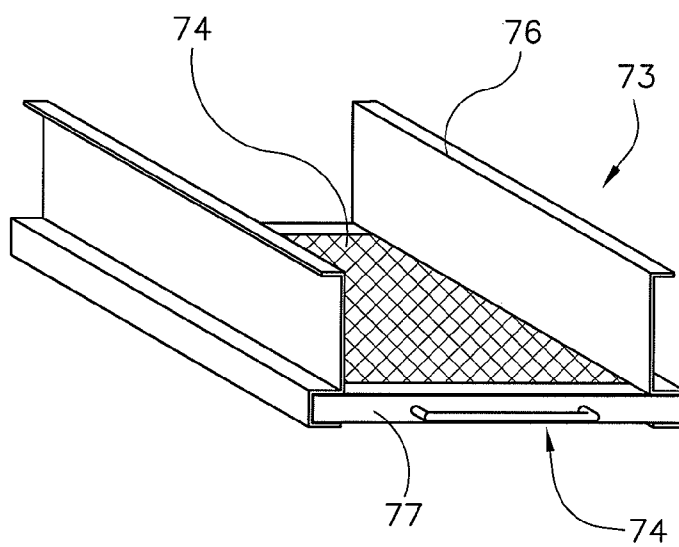


FIG. 7B

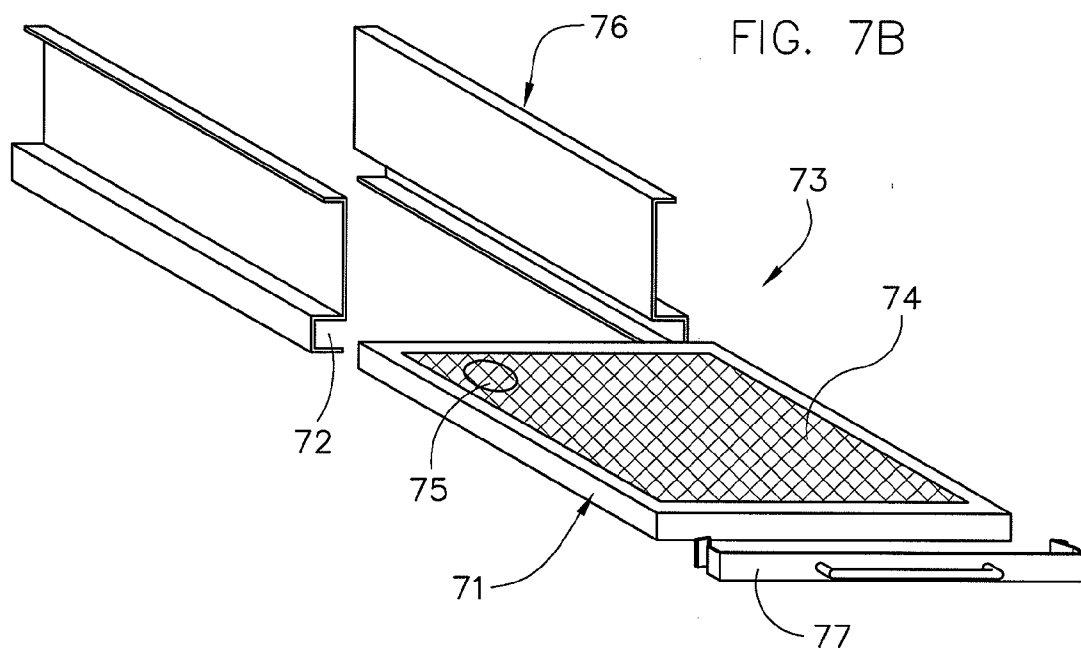


FIG. 8

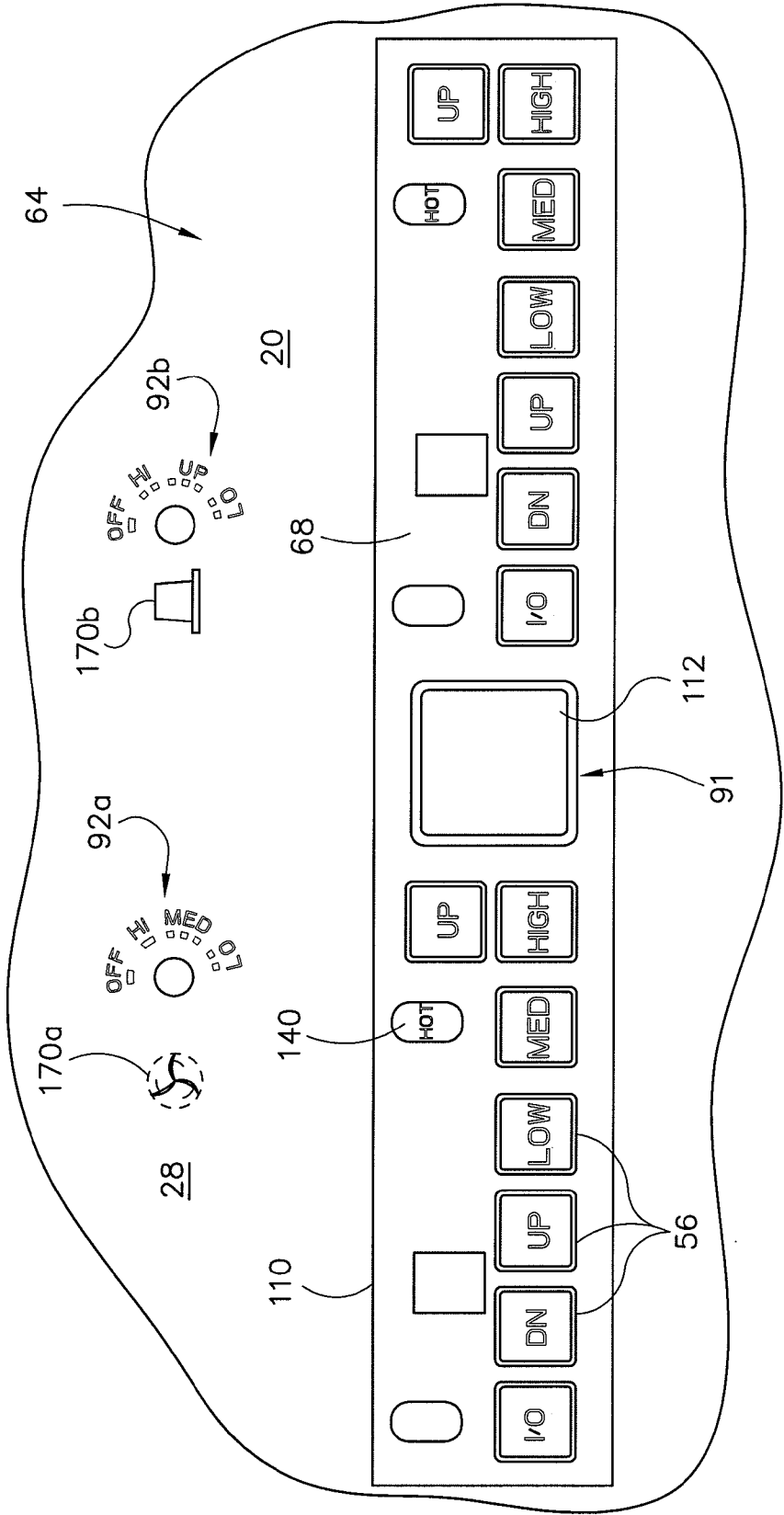


FIG. 9A

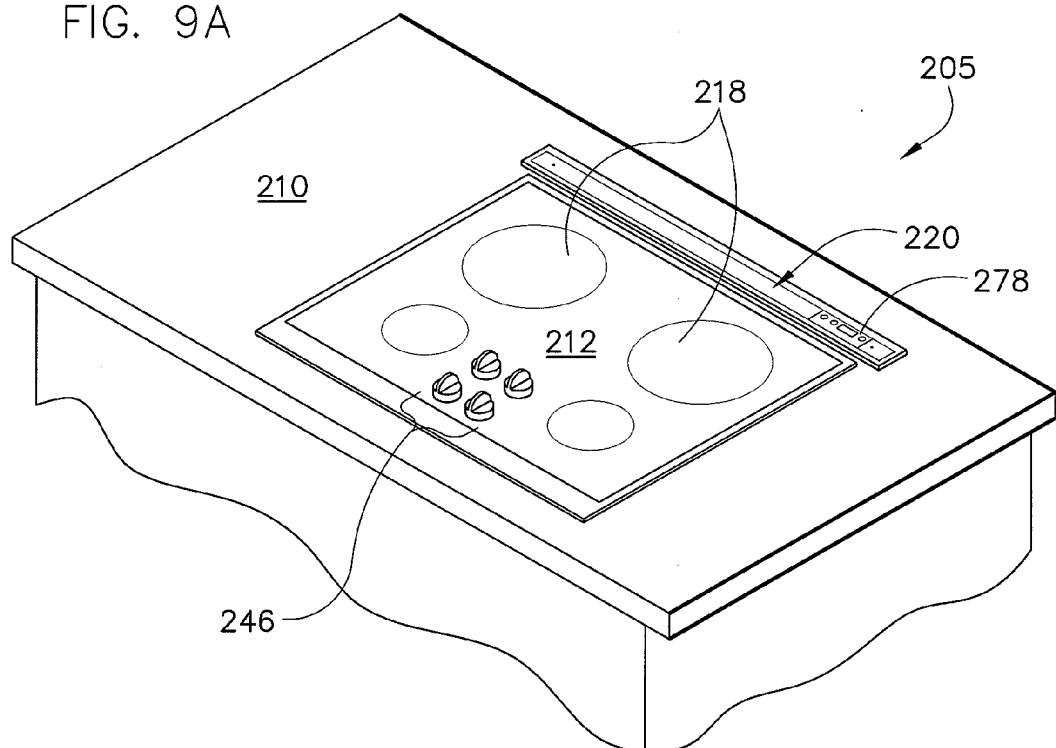


FIG. 9B

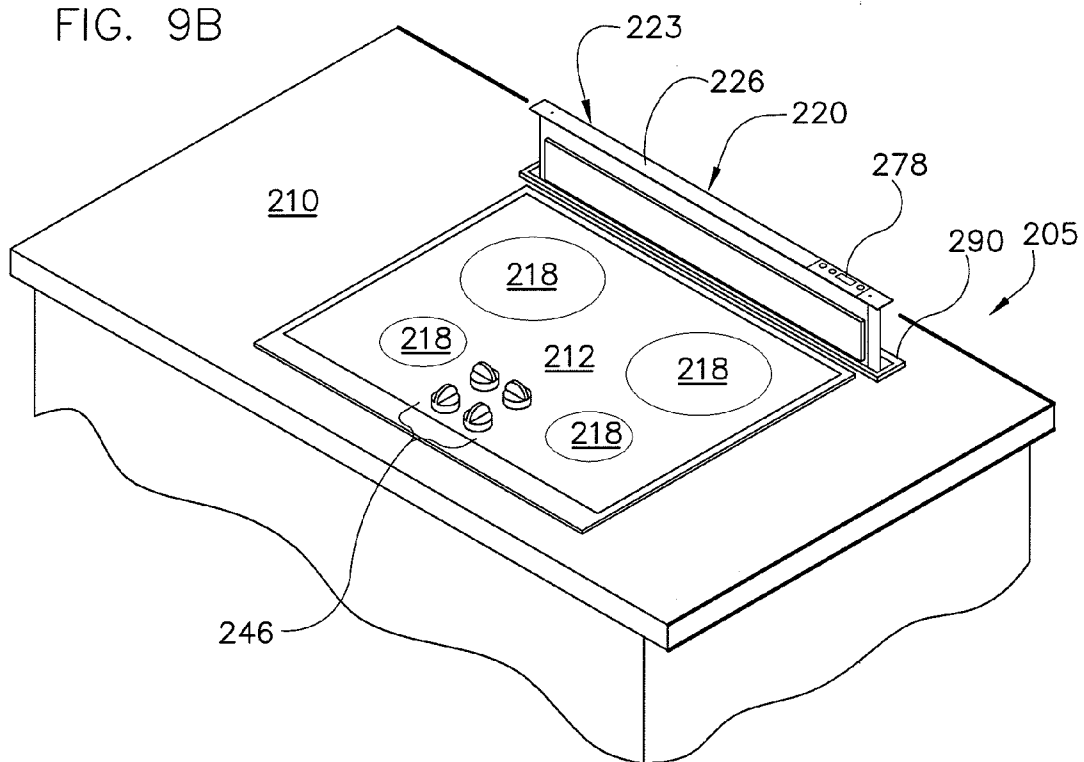


FIG. 10

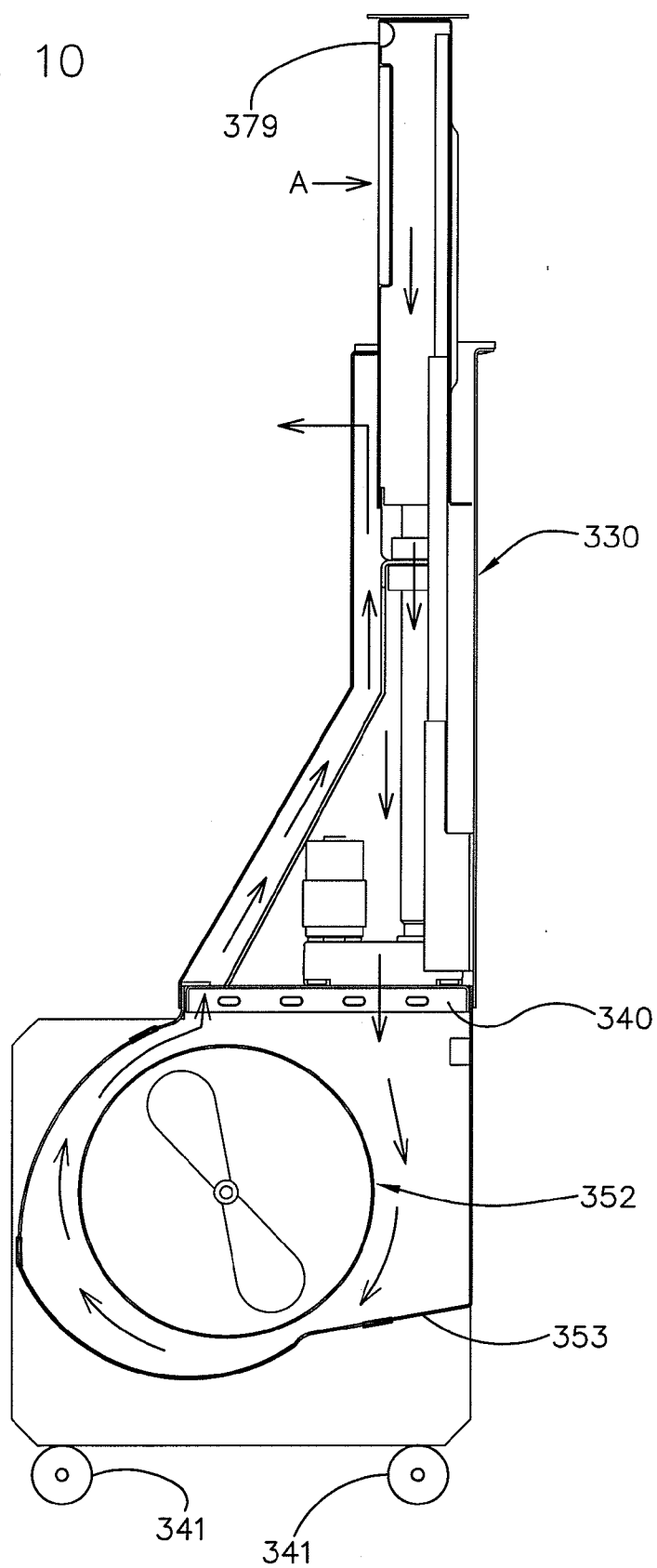


FIG. 11

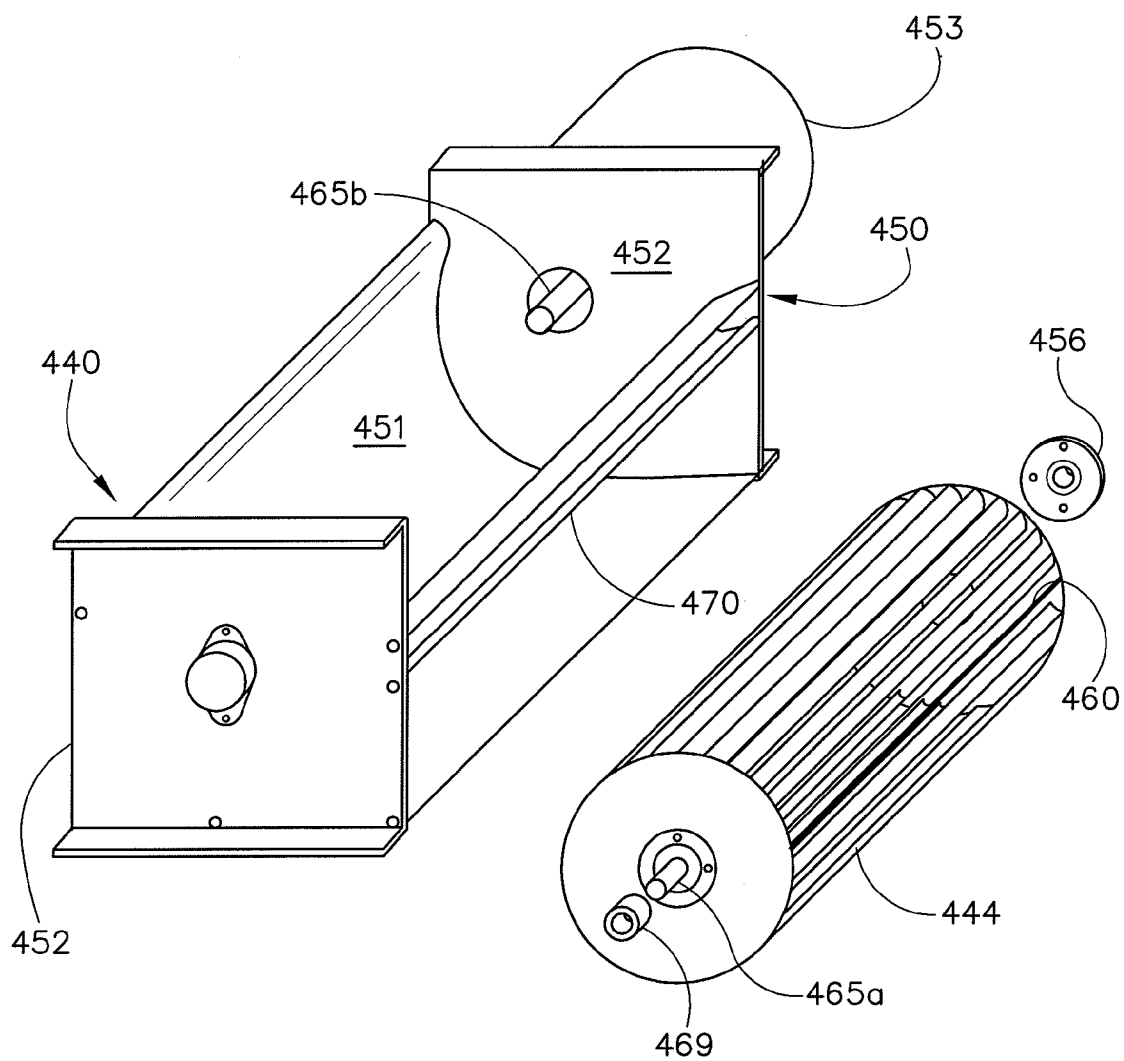


FIG. 12

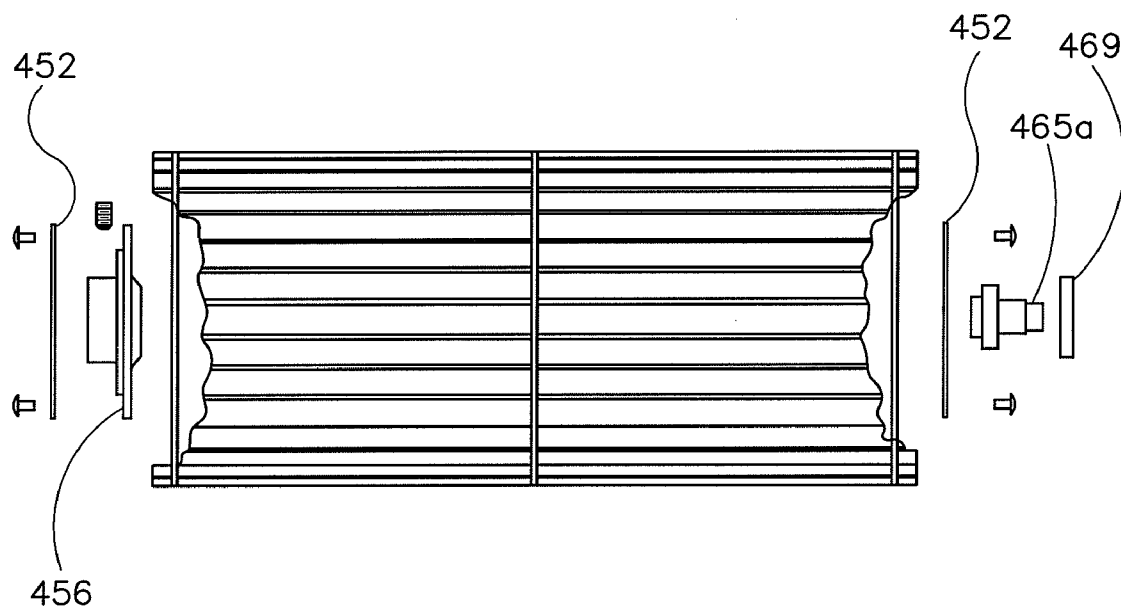


FIG. 13

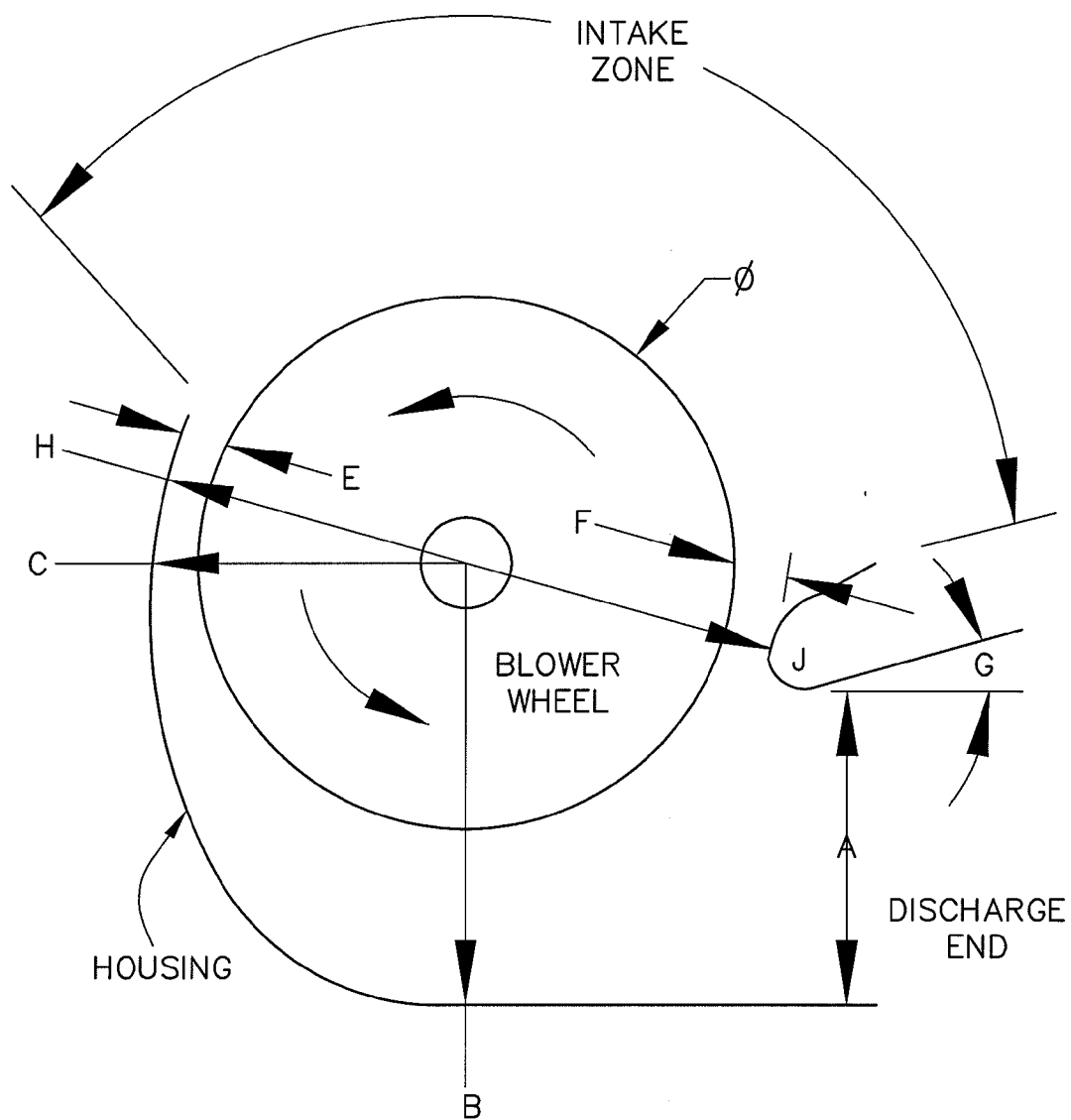


FIG. 14A
9 INCH CONTROL

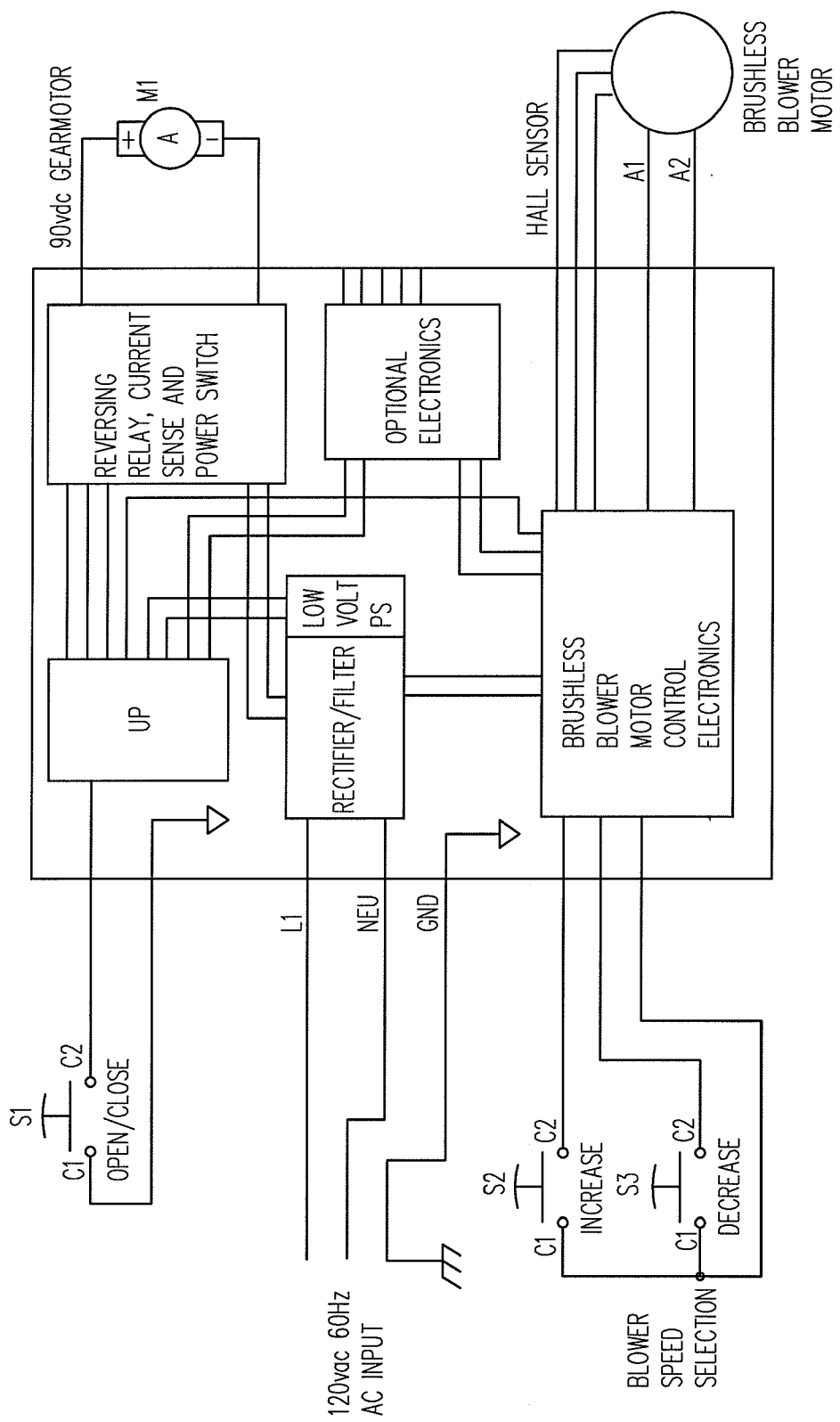
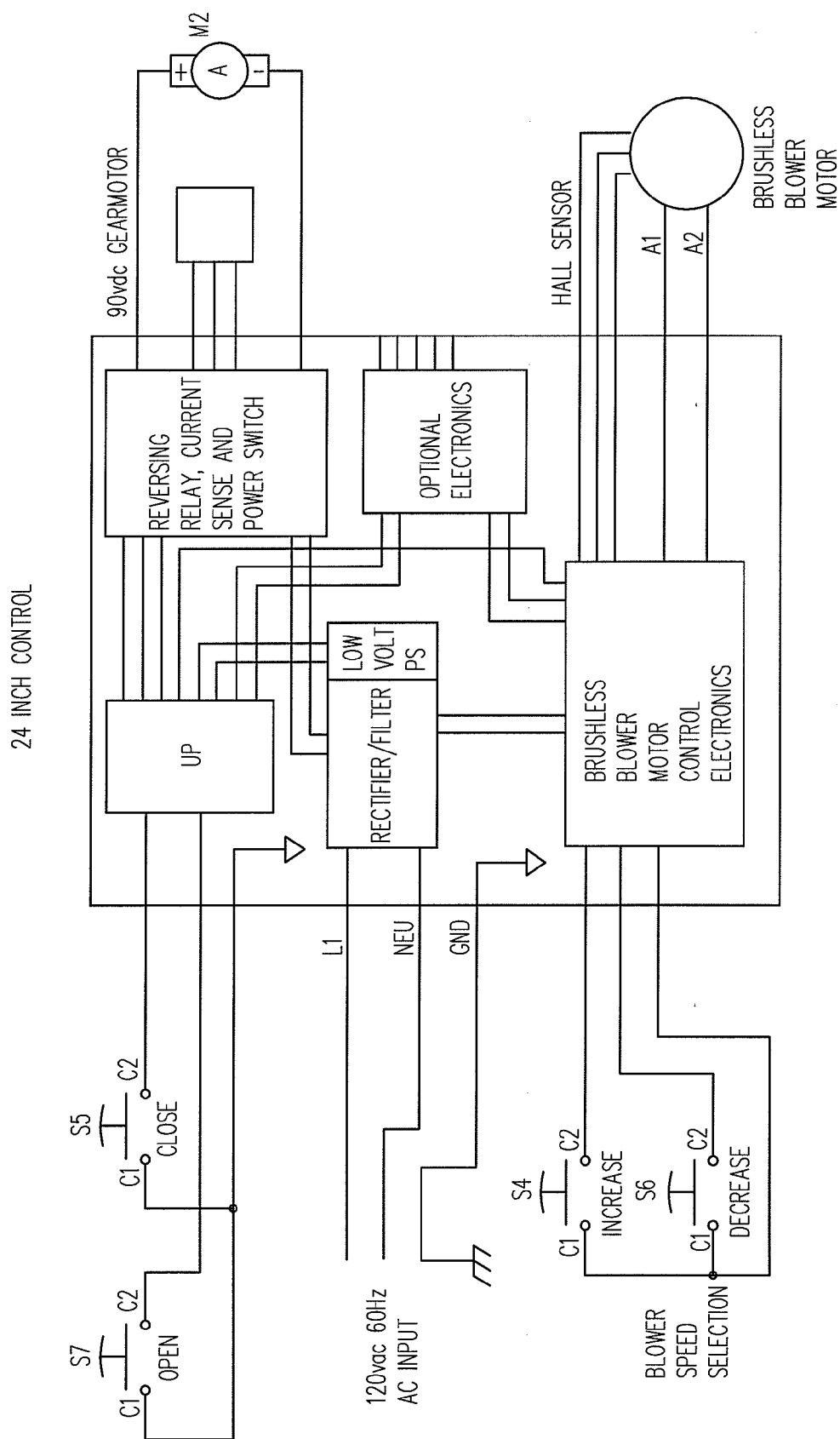


FIG. 14B



COOKING SYSTEM WITH VENTILATOR AND BLOWER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention pertains to cooking appliances and, more particularly, to an appliance with a ventilation system having a fixed or adjustable ventilator and an adjustable blower.

[0003] 2. Discussion of the Related Art

[0004] Many different types of cooking appliances produce smoke, steam, or other gaseous contamination during use. Often, it is considered beneficial to utilize some type of ventilation system to evacuate this air borne contamination, either upward through a venting hood or downward into a draft flue. In kitchens, most known venting arrangements take the form of a hood which is fixed above a cooking surface and which can be selectively activated to evacuate the contaminated air. Downdraft vent arrangements are also widely known in the art wherein a cooking surface will incorporate a vent opening that is positioned between different sections of the cooking surface or extends along a back of the cooking surface. These downdraft vents can either be fixed relative to the cooking surface or can be raised relative to the cooking surface to an operating position.

[0005] Downdraft blowers are generally multiple speed fans, having a low speed and a high speed. Blowers are typically controlled by a mechanical multi-position switch, potentiometer, or rheostat type control, which set the speed of the fan. For removal of normal cooking odors, steam, and other effluents and contaminants, low speed operation of the downdraft blower has been adequate. However, when using such a cooking system such as a grill, a blower set at high speed has been better able to withdraw all of the grease laden air from a kitchen and duct it to the outside environment. In systems, such as cook tops and grills with optimized proximity ventilation, cooking gases, vapors and odors are drawn into an exhaust inlet and are exhausted into the atmosphere. Usually, the exhaust inlet or vent is located adjacent the cooking surface. The inlet flow path serially includes a plenum, a blower, an atmospheric exhaust, and interconnecting ductwork. The flow path to the atmosphere normally extends through a wall or floor of the room in which the cooking system is located, but can also be exhausted into a room if filtered.

[0006] The blower/fan is frequently a generally separate unit from the rest of the cooking system and is installed prior to the installation of the unit into a counter top. Some blower systems are provided with a pair of brackets, which permits the selective mounting of the blower to the floor or the appliance itself for discharge either through a wall or through the floor, as required by the installation. Conventional downdraft venting system configurations with an exhaust air inlet located at cook top level work well with electric surface units. However, when used in combination with gas on glass surface units, the downdraft induced air flow at the cook top surface tends to interfere with the gas flame.

[0007] A cooking system using electrical or gas heating for cooking purposes is normally constructed of a metal

housing and a supporting glass or other cooking surface. The housing normally contains an electronic or gas package for use in supplying heat to the element and/or surface and the pot or other container thereon. This package consists of a group of interconnected components, such as, coils with wires that are mounted within the housing.

[0008] Because of the heat generated by the package, it is often necessary to provide some form of cooling for the package. Fans have been found to be the least expensive and most reliable cooling solution. The known drawback here, though, has been the sensitivity of the air flow, or disruption of which causes failure or reduced energy for operation of the system.

[0009] In order to operate for a prolonged period without the system breaking down/turning off, it is necessary then to use a fan that circulates air throughout the interior of the cooking system housing so as to maintain the proper temperature for the heating components employed. Failure to keep the element cool results in loss of power to the cooking product or a complete unit shutdown. Normally, such a fan or blower is connected into the circuit used to supply power to the electronic components and, thus, is automatically turned on each time the cooking element/generator is turned on. However, to avoid overheating, the fan often remains on after shutdown of the cooking elements so that heated air within the cooking system housing can be removed until a proper safe temperature level is obtained.

[0010] While the use of a fan in this manner is desirable in preventing heat-caused damage to the electronic components employed, it is also considered a disadvantage. The use of a fan has two problems when used for cooling a cook top. First, noise is often associated with the fan's operation. Too many users find this noise to be objectionable. Further, the use of a fan alone is considered a problem because if air flow is blocked, the unit must be completely shut down for safety reasons. However, a user does not take into consideration whether or not there is heat buildup present within a housing, rather only noting that the unit failed to operate.

[0011] Although it is possible to use other methods to prevent overheating, e.g., by the use of thermostats and various related known temperature sensing apparatus for controlling the flow of current in an electrical circuit, it is known that relying solely on such expedients is undesirable for any of a variety of reasons, including effectiveness, cost, and reliability.

[0012] As noted, many conventional cook tops often have integrated downdraft ventilators. Present designs have long rectangular boxes extending below the glass or metal cook top as much as 30 inches. A blower assembly is attached to this box or plenum and extends therefrom. The plenum does not in some cases provide any sealing to prevent the drawing of air from the box. Included in the typical downdraft assembly are: the blower housing assembly, squirrel cage housing assembly, centrifugal wheel, blower motor assembly, plenum chamber assembly, and a passage between the cook top and the plenum chamber for removal of air from the top surface of the appliance. The box is often of a single-walled or a double-walled construction if you include the cook top box/housing and has insulating air in between the plenum and cook top housing. An opening is provided to the interior of the box for exhausting. The centrifugal type fan/blower may be housed in the squirrel cage housing

assembly with both attached to the plenum. Alternatively, such a single fan blower may also be attached to the side of the plenum with air flow at 90 degrees from the side of the plenum.

[0013] Blowers have been generally designed to draw air downwardly with the use of a centrifugal type fan, and thus remove contaminated air from a cook top surface to a box, remove the interior air from the box, and exhaust it outside or return to the room. A centrifugal fan creates higher pressures than that of an axial flow fan. In such conventional systems, the air flow stream is pulled from the front and sides of the work area to the middle where the ventilator is. The air stream has to then turn 90 degrees downwardly, once inside the plenum chamber. The air stream has to then turn 90 degrees again into a small diameter opening when compared to the size of the ventilator's plenum chamber. Once the air stream enters the blower flow, it usually is redirected downwardly again for exhausting. With all this bending of the air stream, air is lost. Thus, large amounts of draw/vacuum/suction are needed to overcome all these losses. With the need for more draw/vacuum/suction comes a larger fan/blower motor, which increases costs, noise, size, and weight.

[0014] Present centrifugal fans consist of a wheel with small blades on the circumference and a shroud to direct and control the air flow into the center of the wheel and out at the periphery. The blades move the air by centrifugal force, literally throwing the air out of the wheel at the periphery, creating a vacuum/suction inside the wheel. There are two basic design types of wheel blades in centrifugal blowers—forward curved blades and backward inclined blades.

[0015] Forward curved wheels are operated at relatively low speeds and are used to deliver large air volumes against relatively low static pressures. However, the light construction of the forward curved blade does not permit this wheel to be operated at speeds needed to generate high static pressures. Thus, this type is generally not used in downdraft ventilators.

[0016] The backward inclined blade blower wheel design has blades that are slanted away from the direction of the wheel travel. The performance of this wheel is characterized by high efficiency, high cubic foot per minute (CFM) operation and is usually of rugged construction making it suitable for high static pressure applications. The maximum static efficiency for these types is approximately 75 to 80%. A drawback to this type is that it must be designed for twice the speed, which increases the cost of the unit.

[0017] To date, axial flow fans are not used for such cook top venting as it was believed that they could not provide the static pressures needed for drawing/vacuum/suction, size, and spacing requirements. Axial flow fans come in three basic types of fans. The propeller fan (e.g., the household fan), the tube axial fan, and vane axial fan (cross-flow or tangential). The first of these is the most familiar. The propeller fan consists of a propeller blade and a so-called "aperture" to restrict blowback from the sides. Without the aperture, the fan is not truly a propeller fan, since it cannot positively move air from one space to another. The aperture is usually sheet metal/plastic designed to fit closely around the periphery of the propeller. The tube axial fan (found in computers) is literally a propeller fan in a tube. In this case, the tube replaces the aperture. The tube axial fan generally

increases flow quantity, pressure, and efficiency due to the reduced air leakage at the blade tips. The vane axial fan (cross-flow or tangential) is a tube axial fan with the addition of vanes within the tube to straighten out the air flow. Here, the air flow changes from helical flow imparted by the propeller into a more nearly straight line flow and in the process increases the suction or draws pressure and efficiency while reducing noise. In general, the propeller fan operates at the lowest pressure. The tube axial fan is somewhat higher, and the vane axial fan supplies the highest-pressure output of the three. Vane axial fans are used when available space for installation is limited, such as that of computers. Static efficiencies of at least 70 to 75% are achieved with vane axial fans. The CFM and static performance ranges of the vane axial fan are similar to that of a centrifugal fan. Horsepower requirements are also about the same for both designs.

[0018] The present downdraft ventilator designs also present problems when integrated into a cook top. Because of the low profile, spilled food and liquids can enter the grate. Removal of these items is difficult when not captured by the filter. This is due, in part, to the deep depth of the plenum and the narrow box size.

[0019] The present design of ventilators is also often large and bulky. Examples would be downdraft ventilators built into a cabinet or used on an island counter top. There, space below the unit is not available for a user to use for storage due to the centrifugal blower below and the size of the plenum presently used. Large size also limits the downdraft ventilator from being placed in other areas or used with other products below the cook top. This also limits the downdraft ventilator from being used as a freestanding unit, as a mobile unit, used in a cabinet (e.g., suspended), or in areas that do not have the ability to support a large structural frame below.

[0020] The below-referenced U.S. patents disclose embodiments that were at least, in part, satisfactory for the purposes for which they were intended. The disclosures of all the below-referenced prior United States patents in their entireties are hereby expressly incorporated by reference into the present application for purposes including, but not limited to, indicating the background of the present invention and illustrating the state of the art.

[0021] U.S. Pat. No. 3,859,499 discloses an air flow system for heat-cleaning ranges in which room air is drawn through air inlets located along the sides and top of an oven opening. The air passes through a space between the range's outer casting and the inner oven cabinet. A blower draws air into the upper air flow passageway during an oven heat-cleaning cycle. The blower exhausts air to the atmosphere through a vented splash panel.

[0022] U.S. Pat. No. 6,821,31, entitled "Kitchen air filtration system" discloses an improved air filtration system for a kitchen island to cleanse cooking vapors from the air. The system includes an updraft or downdraft air inlet vent for capturing, either individually or simultaneously, the vapor-containing air generated during the cooking process. The captured air is directed through an exhaust duct to an air filter which removes the cooking vapors from the air. The filtered air is then discharged back into the kitchen. The filtered air may also be dehumidified or heated, and a fragrance may optionally be provided to the filtered air. The air filtration system can also be used simply as air cleaner for the kitchen with the option of adding a fragrance to the air.

[0023] U.S. Pat. No. 6,455,818, entitled "Downdraft filter assembly for a cooking appliance" discloses a filtering system for a downdraft cooking appliance. A filter assembly is arranged directly below an air grill leading to a venting plenum. The filter assembly includes a liner which supports a filter element and is removably positioned inside the plenum. The filter element can be arranged inside the liner, attached thereto or insert molded into the liner material. The liner is preferably suspended from the air grill so as to be readily removable in unison with the grill for inspection, cleaning or replacement. In a preferred embodiment, the liner is formed with opposing, outwardly projecting flanges which slide into mating channels formed into the underside of the grill. With this arrangement, exposure of the wall surfaces of the plenum to the cooking byproducts is minimized, thereby greatly reducing any necessary cleaning of these surfaces.

[0024] U.S. Pat. No. 6,119,680, entitled "Ventilation system for an appliance" discloses a ventilation system for an appliance, such as a clothes dryer or a cooking device. The invention includes a blower unit located remotely from the appliance and connected to the appliance through an elongated duct. To control the operation of the blower unit, a transmitter is used to send signals to a receiver electrically connected to the blower unit. In accordance with certain preferred embodiments of the invention, radio frequency, ultrasonic or other similar types of signals are directed through the duct to the receiver. In accordance with another preferred embodiment, a power line transmitter is utilized. A method of remotely controlling the operation of the appliance ventilation system is also provided.

[0025] However, as the above attempts are lacking, there exists a need for a state-of-the-art cooking system with an integrated downdraft or a elevating ventilator using cross-flow or centrifugal blower technology to accurately control speed, power, voltage, venting, and noise, reduce weight, cost, and size, and better remove contaminants. There also exists a need for an accurate method of controlling the system's operations and a need for the user to be able to view/see the operations, speeds, set points, functions, and the contents on the cook top. There is also a need for a proper vent design so that drawn air does not improperly remove air at the burner and a need for a system that is easy to clean and maintain.

[0026] Further, there is a need for controls to be less susceptible to the environment, a need for a remote control, a need to accurately apply and control heat output as it is returned to the room, and a need for a new design that can be used in a variety of places and spaces.

SUMMARY OF THE INVENTION

[0027] The inventive cooking system preferably has a fixed or an elevating ventilator integrated into a smooth glass ceramic cook top for removal of contaminated air. The system may also incorporate a cross-flow or centrifugal blower system for the source of air removal device. Further, a cook top with integrated downdraft or elevating ventilator using cross-flow or centrifugal blower may be combined with other counter top range items to reduce the need for an over-the-head (updraft) type ventilator and increase space below.

[0028] Such a system preferably includes a cook top/grill, built-in range, or other cooking appliance. It has a single to

a plurality of/inductor heating elements located on a counter, range, or other surface. However, this inventive system may also use gas or electric type heating elements found on appliances. The ventilator preferably includes a base housing or plenum and cross-flow blower assembly. The base housing is attached to a cook top or other surface and is preferably permanently fixed. The plenum is preferably only as deep as a cook top housing member and is preferably sealed to the glass/metal to prevent leaking of air. The invention preferably incorporates a keypad and control circuit, which enables adjustment of the fan speeds and sensors. The control of the ventilator may be integrated into present controls, located on or under the cook top, remotely located, or parts of the keypad/control can be split between the ventilator and other locations. The controls may include an electronic control board that may be located on the cook top, or remotely, or parts of the electronic control board may be split between the cook top and other locations. The control board also preferably determines that a stop/obstruction is present by the increase in current, air flow, voltage, or resistance, and accordingly adjusts or turns off the power supply.

[0029] In one embodiment, the present invention is preferably a cook top with integrated downdraft or elevating ventilator using an electronically controlled cross-flow or centrifugal blower technology assembly. It preferably includes a cook top housing assembly, a cross-flow blower assembly, a ventilation system, a ceramic glass cook top, an opening for the vent or downdraft, and a filter. The cross-flow blower assembly is composed of a motor item, a fan wheel with blades, and a blower housing preferably attached to an air passage in the cook top housing. These items, motor, fan wheel, housing may be one assembly or may be made so as to be separate components integrated into a plenum. Seals are provided for sealing the space between plenum or base housing and walls in the passage created by the cook top housing. The seal also preferably makes contact with the vent or grate member to provide sealing on the cook top. It is also important that the sealing provide a barrier to the air flow so as not to disrupt the cooling air to the generator in any way. This provides for better air loss control and reduces side air removal. This method need not use the double wall construction used in centrifugal types. In another embodiment, the plenum may be part of the cook top passage. The cross-flow blower may be preferably attached to the cook top housing. This single box design reduces the cost of manufacturing.

[0030] A cross-flow blower assembly may be used as long as the surrounding surfaces can take the air movement and not be interfered with. In one embodiment, air moves down the passage of the cook top lower housing to the blower assembly from an opening in the glass ceramic cook top surface. The advantage to using this method is that the base plenum housing is eliminated and the need for sealing from the base plenum housing to the cook top member is eliminated. Note, however, that a centrifugal type blower assembly may also be used.

[0031] It should be noted that the downdraft ventilator may consist of multiple cavities or compartments in the same appliance or multiple fans/blowers and that the invention may be built into/on a mobile island or cart for use with grilling/cooking equipment. A mobile unit is preferable so

one does not need to have it installed into/on a cabinet or structural or supporting frame and thus there is now space below for use by the user.

[0032] Preferably, the construction of the present invention includes a smooth glass, ceramic, metal, etc. cook top with a ventilation system that provides air flow for cooling the heating elements, electronics, and cook top. Because of the invention's constructions, methods, and designs, one may have nearly limitless designs, features, appearances, elevations, styles, operations, sensing, and performances for both fixed and elevating downdrafts. Further, with the ability to properly seal/isolate the ventilator, one can have great flexibility in ventilator shapes. Moreover, there are a number of fans/blowers used. Such fans/blowers come in many shapes and sizes and may be formed and bent into nearly any shape. These fans/blowers may be located along/on the cook top's housing or any other surface. Using such a fan/blower improves air removal throughout the inside cavity. The use of two or more fans/blowers can improve on the air removal in the inner cavity and exhausting. See, e.g., FIG. 4. The use of a variety of electronics and controls for the blower may also greatly improve on the removal of contaminated air. Greater control means less flow loss and fan noise and smaller overall blower size. Preferably, the assembly of a fan/blower assembly is comprised of a housing, fan, and motor assembly with bearings to support the fan and motor on the housing.

[0033] Blower/motor specifications can significantly influence the performance and reliability of cooking units. First, placing the blower assembly as close to the items on a cook top location as possible increases the effectiveness of drawing contaminated air in and out of the vent system. Second, reducing the number of bends the air has to flow through and around helps reduce air flow losses. Also, a cross-flow blower does not need the air stream to change directions, as does a centrifugal type fan/blower. Further, using a cross-flow blower increases in effectiveness, and thus permits the size of the blower/motor to be reduced. Thus, the noise level is reduced. Long-wheeled cross-flow blowers and tangential blowers provide other advantages including wide uniform air flow over the width of the unit without gaps, uniform air delivery for high capacity geometry that results in a significantly quieter blower/fan and a smaller profile for the same length of exterior housing. Good speed control of such blowers may be achieved by using electronics like resistors, regulating transformers, and voltage regulators. Other advantages include: the ability to design for overload protection, no warming of the air as the motor is situated outside the air flow, longer bearing life, and higher efficiency. The energy saving from not having to turn on a large blower motor provides added benefits to the user in the way of cost saving. Another added benefit is a unit with a lower profile so that there is more useable room under a range/cook top or in a cabinet. Finally, the fan may be used for not only ducting heated air and effluent but also moisture.

[0034] The present invention preferably also includes a control board and related circuitry to control power/control to the motor, control to the fan(s)/blower(s), control to an electronic controller, glass touch pad, or mechanical controls. Controls can be built with power control to sensors. AC or DC power supplies the electronic current to the board and other components. As mentioned, the control board can be located on/in the cook top or remotely. It can also be

divided into more than one board and located at different locations. The electronic board also can use flex technology, which permits the board to be or bend into any shape. There are a number of types of controls that may be connected to the board. For example, one control may have a real or simulated mechanical look with electronics below and a knob for turning on the top. Also, a rotary encoder for high precision sensing and control or for position detection may be present for control at different heating levels.

[0035] The present invention may further include a passage in the cook top housing that provides for a filter. While typically found in the opening called the "plenum", there are a number of ways to attach filters including attaching the filter into a recess in order to lock the filter in place, snapping into or dropping into place, or using a filter tray.

[0036] A sensor may be used with the filter for the detection of air flow. Such a sensor improves on the efficiency and required servicing of the filter. A flow sensor in, on, or behind the filter area and communication with the electronic control board preferably detects the movement or reduced movement of air passing by the sensor. This air movement may have set limits as to when the filter needs changing. These limits can be adjusted for the type of filter used, which may be metal mesh, louver, carbon, or a combination of these types. A different way is to have the electronic control board set the change out limits automatically based on percentage of flow blockage.

[0037] Other sensors for air flow may include the simplest and lowest cost types such as a strain gage on a reed, in which the air moving across the reed bends the reed causing the strain gage to send a signal to an electronic control board system. In such a system, as the air is reduced, the signal changes and the electronic control board signals the user to change the filter. Signaling the user may be by sound or by lights or other methods such as "system not operating" or a combination of signals. Another low cost method is by magnetics. This would be very similar to the one above, but would be based on detecting a magnetic gain or loss. Another sensor type is a differential pressure sensor, which has one open end on the outside of the filter and one end on the other side behind the filter. The difference between the sensor openings can be signaled to the electronic control board, which then can watch for the changes either up or down. Then when a set point is reached, the board signals the user for change. A microbridge mass air flow sensor is another sensor. This sensor operates on the theory of heat transfer. The other types of possible sensors are: solid state Hall effect sensors, piezoresistive sensors, calibrated pressure sensors, transducers, bonded element transducers, transmitters, and ultrasonic, Doppler, IR, and fiber optic sensors.

[0038] Additional sensors may be used with the electronic board to optimize system operation. These include: current sensors to monitor AC or DC current, adjustable linear, null balance, digital, and linear current sensors, and magnetoresistive, closed loop current and digital current sensors, as well as a variety of others.

[0039] With the present invention, it is also desirable to better regulate the electrical current to the cross-flow/tangential fan(s)/blower(s) such that the power output can be increased or reduced with improved accuracy, and similarly automatically increasing or decreasing the speed output

from the cross-flow/tangential fan(s)/blower(s) with greater accuracy. Determining the needed air flow loading for the inner member cavity and only supply that amount of power, may be done with electronics. This method may provide an “energy star” rating and improved energy use.

[0040] Another aspect of the present invention is to have a nearly infinitely selectable speed fan adjustment range. This can be done, for example, by having the user touch down on a glass, resistance keypad until the speed required is reached. Once the required speed is reached, the electronic control board may completely cut off current/power to the blower(s)/fan(s) slowing or stopping the user’s speed adjustments. The keypad may have one or two keypad locations for operating up or down the speed by the user. Using two or more locations for each independent operation provides the user better control. The use of a display to show user the speed level may assist in finding proper speeds, which then can be programmed into the electronic control board for repeated operations later.

[0041] The present invention may also include the ability to supply a fresh stream of air up the sides or back of the downdraft ventilator, thus providing a supply of burnable air for a gas cook top, which has been a problem with present units due to the blocking by the ventilator. The air is preferably ducted out the bottom or along the sides or back of a downdraft ventilator tapping of the vented air, and returns the air at the bottom of the grate to the cooking area.

[0042] These, and other aspects and objects of the present invention will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following description, while indicating preferred embodiments of the present invention, is given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications. Note the drawings may not be shown, components of the inventive system are drawn to scale.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] A clear conception of the advantages and features constituting the present invention, and of the construction and operation of typical mechanisms provided with the present invention, will become more readily apparent by referring to the exemplary, and therefore non-limiting, embodiments illustrated in the drawings accompanying and forming a part of this specification, wherein like reference numerals designate the same elements in the several views, and in which:

[0044] FIG. 1 illustrates a perspective view of the cooking system or appliance of the present invention;

[0045] FIG. 2 illustrates a cutaway front view of the appliance of FIG. 1 along the line 2-2;

[0046] FIG. 3 illustrates a cutaway front view of another embodiment of the present invention;

[0047] FIG. 4 illustrates a cutaway front view of yet another embodiment of the present invention;

[0048] FIG. 5 illustrates a perspective view of yet another embodiment of the present invention;

[0049] FIG. 6 illustrates a cutaway front view of still another embodiment of the present invention;

[0050] FIGS. 7A-B illustrate enlarged perspective views of various embodiments of a filter assembly of the present invention;

[0051] FIG. 8 illustrates a top view of controls of yet another embodiment of the present invention;

[0052] FIGS. 9A-9B illustrate a view of vents of another embodiment of the present invention;

[0053] FIG. 10 illustrates an enlarged broken away side view of ventilator and blower housing assemblies of one embodiment of the present invention;

[0054] FIG. 11 illustrates a perspective view of a blower wheel assembly of one embodiment of the present invention.

[0055] FIG. 12 is a side view of the wheel assembly of FIG. 11;

[0056] FIG. 13 is a schematic showing air flow through the assembly of FIG. 11; and

[0057] FIG. 14 is a wiring schematic for electronics of the present invention.

[0058] In describing the preferred embodiments of the invention that are illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so selected and it is to be understood that each specific term includes all technical equivalents that operate in a similar manner to accomplish a similar purpose. For example, the words “connected,” “attached,” “coupled,” and “mounted” and variations thereof herein are used broadly and encompass direct and indirect connections, attachments, couplings, and mountings. In addition, the terms “connected,” “coupled,” etc. and variations thereof are not restricted to physical or mechanical connections, couplings, etc. as all such types of connections should be recognized as being equivalent by those skilled in the art.

[0059] Further, before any embodiments of the invention are explained in detail, it is to be understood that the invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. For example, the use of “including,” “comprising,” “at least one of,” or “having” and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0060] The present invention and the various features and advantageous details thereof are explained more fully with reference to the non-limiting embodiments described in detail in the following description.

1. System Overview

[0061] The appliance of the present invention preferably includes a cook top with at least one heating element or burner on a cooking surface, a cook top vent operably connected to the cook top for removing at least one of air and effluent from the cook top to a lower cavity, and a blower

assembly in communication with the vent. The appliance may be an outdoor unit, an indoor unit, a mobile unit, an island unit, a fixed location unit, a drop- or slide-in cook top, and/or a grill. In such units, the cooking surface is preferably glass or any of a variety of materials.

[0062] The vent or vent assembly preferably comprises a vent cover for covering a vent hole. In one embodiment, the vent preferably includes an elevating downdraft. The vent or ventilator is preferably operably connected to the cooking surface for drawing air and effluents therefrom and has an inner cavity and a plenum. The plenum preferably has walls surrounding a chamber. In other embodiments, the ventilator folds, slides, or retracts. The vent may include an actuator-driven venting system having at least one of: a motorized, electromagnetic, solenoid, and powered venting control. Such electronic exhausting controls are preferably in communication with the vent. These controls may be used to, for example, close a flap or door to the vent when not in use. In one embodiment, these controls are integrated with those of the burner and the blower. The downdraft or vent has a shape that may be rounded, squared, oval, triangular, and rectangular.

[0063] The blower assembly preferably includes at least one of the following: a system that manages air and effluent from the cook top and cooling air from the heating element, a regulator for electrical current to a blower motor such that the power output can be changed as needed, a tangential fan to circulate air downward, a cross-flow fan, a centrifugal fan, a fan that can be remotely located in attached duct work, a fixed speed fan, a variable speed fan to control air movement, a squirrel cage wheel fan, a fan with adjustable speeds that may be preset, a fan used as a power vent for removing air, a fan for management of moisture build up and controlled by a humidity sensor, a re-circulating system, a mechanism for sucking air from the appliance top, a fan for management of heat buildup and controlled by a heat sensor, a large chamber plenum assembly, and a fan to move air through a heat exchanger. The blower has an AC or DC motor. The fan may include blades of straight or skewed design and a long length axial wheel. Preferably, the appliance's blower operation is synchronized with the operations of the heating element and its cooling system.

[0064] As mentioned, a controller is preferably present to control the appliance, e.g., operations such as ventilator movement, element heating, etc. In one embodiment, the controller is preferably an electronic controller to control blower speed. Such an electronic controller includes at least one of: a touch device, a keypad, a slide, and a knob. The keypad controller may be located on the cook top, located remotely, split into parts between the top and another location, or matched to a size, appearance, and function of another neighboring appliance and the cook top. The controller includes an electronic control panel having at least one of a piezo, tactile, membrane, inductive, capacitance, and resistance device. The panel is constructed from at least one of: glass, metal, plastic, wood, and composite substrates. The controller is at least one of: a piezo, capacitance, and resistance type touch control keypad for use with any size appliance, a membrane switch, a tactile, resistance, inductive, capacitance control with decorative overlays, labels, or trim, and a complete control panel assembly. The controller is preferably installed in a plane relative to the cooking surface and may be flush, raised, recessed, and remotely

located. The controller may have an integrated control circuit board. The board may be in at least one of the following locations: on the cook top, remotely, and split into several parts between the cook top and other locations and attached thereto. The circuit board may also include: a microcontroller, microprocessor control, an IC, a driver, a PC board, a processor, and a power controller in communication with the electronic controller.

[0065] In another embodiment, the controller is a remote control for wireless control of an operation. A device may be provided for making such a controller at least one of: automatic with no user interface, semi-automatic with a limited user interface, and completely manual with the user setting, operating, and adjusting the system or parts thereof. As such, the controller may also include a programmable controller to monitor at least one of: temperature, operations, speed, time, blower efficiency, lighting, the need for filter change, and air movement.

[0066] In another embodiment, a sound activated control is used to control at least one operation of the appliance. A computer system including a full memory and processor may also be used for connecting the appliance to a whole house system. A display interface may also be available with the controller to help the operator with the functions, temperatures, speeds, need for a filter change, and time. The controller may have a graphic specific to the design and function of at least one of the blower assembly, lighting, and the ventilator.

[0067] One or more sensors for the cook top may also be used to sense various environmental conditions. In one embodiment, a sensor scans the cook top for an item placed thereon. It may then provide feedback to the appliance to operate a fan in the blower assembly. Sensors for the appliance may be also used to detect at least one of: filter buildup, back pressure, air flow, gas, smoke, heat, temperature, filter change requirements, speed, power, resistance, voltage, programmed operations, and set points.

[0068] The appliance may also be equipped with at least one of: an output display, a rotating display, an LED display, an LCD display, a sliding panel, a retractable display, a removable display, a fixed display, an illuminated display that can be adjusted in color and intensity, a plasma display, a dot matrix display, a vacuum fluorescent display, and a pop up display. The display is preferably mounted on the cooking surface or backing for easy viewing. The display device preferably displays to the operator at least one of: operations, temperature, functions, range position, and times.

[0069] The appliance preferably further comprises movable lighting, for example, on the backing, cook top, or the ventilator for illuminating a work surface. The lighting can be any device to illuminate the cook top including a device that is at least one of: an adjustable light level device, adjustable light position, hidden lights, exposed lights, a series of lights, a mini fluorescent tube, mini neon tube, an LED, rope lights under a decorative flange trim of the ventilator, recessed lighting, direct lighting, and indirect lighting.

[0070] In one embodiment, the ventilator is adjacent at least two cavities and has at least two blowers. The second blower preferably has a speed control independent from a first for moving a different volume of air away from a second heating element.

[0071] A filter is preferably attached below the vent with the cavity at an angle and coated with an agent for cleansing air that passes therethrough.

[0072] The appliance preferably also has a heat exchanger in fluid communication with the blower and vent for at least one of: extracting effluents, cooling drawn air to a proper temperature, and recycling air back. This heat exchanger includes at least one of: a heat pump, an electronic cooling device, a refrigeration unit, and a magnetic cooling device. The heat exchanger may be used in such a way to turn the downdraft into a cooling/heating ventilator.

[0073] One embodiment of the appliance has a fire suppression system operably connected to the cook top for controlling fires and added safety. An IR system may be employed in such a system. The IR system may be operably connected to the cook top for detecting at least one of temperature, resistance, heat, fire, distance, moisture, and steam. The IR system may employ a variety of sensors. Such sensors may have at least one of an electronic, an electro-mechanical, and mechanical component. This system may also have an electronic touch controller in communication with the circuit board.

[0074] The appliance may also include other specialized devices, such as a device for detecting and controlling of speed for the blower, an air flow sensor for detecting the flow of air past a filter, a sensor that measures the air flow and provides a signal to user for filter replacement due to restricted air flow, a beam or other detector sensor to scan the surface of a work area for an item placed on the work area and to provide feedback or control with automatic operation of the ventilator, a means for detecting gas flow, an ultrasonic sensor, a thermo detection device for the control of the downdraft, a digital CO₂ sensor, an NDIR technology sensor, and a sensor having the ability to detect back pressure that triggers an increase in fan speed to maintain the proper volume of extraction.

2. Detailed Description of Preferred Embodiments

[0075] Various embodiments of the present invention are shown in FIGS. 1-14 which are described in additional detail below.

[0076] FIG. 1 shows one preferred embodiment of an appliance 15 of the present invention.

[0077] Now referring specifically to FIG. 1, the appliance 15 is preferably a cooking system that includes a cook top 20 with one or more heating elements 25 A-D on the cooking surface 28. In one preferred embodiment, a backing 29 is provided for splash protection. The appliance 15 and cooking surface 28 are preferably comprised of a metal, glass, stone, plastic or other materials.

[0078] A vent system or ventilator 30 is operably connected to the cook top 20 of appliance 15 for removing effluent and hot air from the cooking surface 28. The ventilator or vent system may consist of a vent cover 31, which covers a vent hole 32. Below the vent cover 31 is a lower cavity (not shown) which preferably attaches to a plenum (not shown). The components of the ventilator are preferably made from metal, although glass, stone, heat resistant plastic or other materials may be used. Because of the flexibility of the design and the low profile of the blower

assembly, the outer shape of the ventilator can be styled to meet nearly any requirements.

[0079] Also shown in FIG. 1 are various controls 58 on the cook stop 20, which may include slides 50 and knobs 52 to control, e.g., heat to heating elements 25a-25d and also in another embodiment the up or down movement of the ventilator 30. On the backing 29, a scanner 82 may be mounted. Also mounted on the backing may be lighting 45, which preferably includes a light control 96. In one preferred embodiment, a sensor 90 is also provided. A drawer 26 may be present below the cook top 20. The drawer 26 may allow access to storage or a warmer drawer 27.

[0080] FIG. 2 shows a cutaway of the embodiment of FIG. 1 along the lines 2-2. In FIG. 2, the lower cavity 34 and the plenum 36 are shown. Inside the cavity 34 and preferably under the cook top 20, is preferably a blower assembly 40 which may include a fan or blower 44. The blower may alternatively be located in a plenum chamber. The fan 44 may have fan blades 78 protruding from a center portion. Above the fan 44 and below the vent cover 31, is preferably mounted a filter 74. The filter may be mounted at an angle to allow for ease of runoff of any grease or other unwanted materials. In one preferred embodiment, the fan 44 is a cross-flow blower 114. In the preferred embodiment shown in FIG. 2, ductwork 100 connects the lower cavity 34 with an outside vent. The storage or other space 27 is below the blower assembly 40. A sensor or detector 93b is also preferably present for detecting fan air flow draw efficiency.

[0081] FIG. 3 shows another embodiment to the current invention. In this embodiment, the vent cover 31 includes a grate which has a series of vent holes 32. A system for managing air flow 38 is also provided. In this embodiment, the system for managing air flow 38 includes seals 38a and 38b. Of course, many other components are possible. A filter assembly 73 is also present. Preferably, a means for detecting filter buildup 84 is included with the filter assembly 73. Within the plenum and the lower cavity, is a control board 98, which includes a micro-controller 70, a processor 102, and preferably a programmable control 106. On one side of the plenum is mounted a blower assembly 40. The blower assembly includes a fan 44, which in this embodiment is a centrifugal flow fan 95. A regulator 48 for controlling the electric current to the blower assembly 40 may be connected to a heat sensor 93c. When the heat sensor 93c detects an increase of heat, the sensor may signal the regulator to shut off electric current to the blower assembly. Here, the fan 44 is preferably driven by a variable speed AC motor 79. Centrifugal fans are sometimes referred to as wheel fans 80.

[0082] In FIG. 3, air, shown by arrows A, enters through holes 32 in the grate 31 and travels downwardly into the cavity in the cooking system appliance 15. The air (arrows A) then travels past the filter assembly 73 and is drawn toward the fan assembly 40. The air enters into the fan assembly (arrows AI) and then is exhausted from the appliance preferably out an exhaust vent (see, e.g., arrows AE). Of course, the air entering the vent grate may be laden with cooking gases, odors, effluents, grease, oils, etc., but the air exiting (arrows AE) is preferably cleaned air.

[0083] FIG. 4 shows another embodiment of the appliance 15 having a cook top 20 with at least two assemblies 108a and 108b to provide and enhance cooling to the heating elements 25 and the cooking surface 28. These assemblies

are preferably provided with a mechanism for sucking air. In this preferred embodiment, the mechanism for sucking air preferably includes a first blower assembly **180a** and a second blower assembly **180b**. The blower assemblies include a first fan **182a** and a second fan **182b**. The fans are preferably mounted in cavities **184a** and **184b**.

[0084] Another embodiment of the present invention is shown in FIG. 5. There, the appliance **15** has a cook top **20** that has two cooking elements **25** and two regular electric heating elements **24**. The heating elements may be electric, gas, or inductive elements or a combination thereof. As heating elements are well known in the art, these will not be described in further detail.

[0085] The center of the cooking surface **28** preferably has an elevating downdraft ventilator **97**. The ventilator **97** includes a plenum **36** and a vent cover **31**, which covers a vent hole **32a**. This elevating ventilator **97** can move up and down relative to the surface **28** to provide maximum ventilation. Also included on the cooking surface **28** are means for adjusting the ventilator's fan speed. Preferably such a means includes a keypad **110** having an output display **130**. Also included on the cooking surface may be a membrane switch **54** which, in this embodiment, preferably controls the up and down movement of the telescopic ventilator **97**. Integral with the heating element **25**, may be a heat sensor **93d** to detect and control heat to the unit. In this embodiment, a remote control unit **62** may be included for remotely controlling the appliance **15**. The remote control unit **62** may be integrated into computer system **86** to add further appliance integration and control. Such a unit may be integrated into a whole house system (not shown) which controls various appliances and household operations.

[0086] FIG. 6 shows yet another embodiment of the current invention. This embodiment includes a filter assembly **173** which is contained in the inner cavity **172** of the appliance **115** below the cook top **121**. Below the filter assembly **173** and filter, is preferably a heat exchanger **120** which provides for cooling of the effluent and heated air as it passes through the air filter and down into the inner cavity toward the blower assembly **140**. In this embodiment, the blower assembly preferably includes a cross-flow blower **214** with a wheel fan.

[0087] FIGS. 7A and 7B show a filter assembly **73**. This assembly **73** may be used with an embodiment of the present invention like that shown in FIG. 6. The filter assembly includes a filter tray **71** which fits into a tray slot **72**. The filter tray includes a filter **74** and an air flow sensor **75**. The filter tray **71** has a filter tray handle **77**, which may be removed when the filter **74** is ready to be discarded. The filter assembly preferably forms a filter tray drawer **78**. Such a drawer can slide in and out of the inner cavity **172** of the appliance **115** as best illustrated by FIG. 6.

[0088] The filter or catch **74** is preferably used for removal of effluents. The filter **74** may use carbon for removing odors, particulates, greases and oils, and moisture that condensates on the median. Additional filters may also be included. A metal mesh filter also may be used as well as a louver type filter. A combination of these filters with a charcoal element may also be used in this application. In a preferred embodiment, the filters are angled to drain fluids off and collect them into a grease trap. A grease trap or

trough is also preferably provided. These troughs are removable for ease of cleaning. The filter may be set at angle in the drawer also.

[0089] FIG. 8 shows another embodiment of the present invention. In this embodiment, a broken-away section of a cook top **20** is shown. In this embodiment, on the cooking surface **28** is preferably mounted a series of controls. These controls include touch devices **56** which are part of preferably a keypad **110**. The keypad **110** may be integrated into a control panel assembly **64** which may include another touch control panel **68**. A display device **91** may also be present. The display device **91** acts as a display interface **112** to interface with the user. Also on the cooking surface may be other controls such as selection switches **92a** to control the fan speed, and **92b** to control the height of the elevating ventilator. Graphics such as a fan **170a** and a elevating ventilator **170b** are used to indicate the type of controls. As can be seen at FIG. 8, the controls can act as on/off switches, high/low switches, up/down switches, and high/medium/low switches. On the panel may also be an indicator light to indicate that the surface is hot. Such an indicator light may be an LED display **140**.

[0090] The sheet metal/material construction of the appliance's back housing **29** may also accommodate a lighting system **45** as mentioned above. This design allows any type lamp holder to be installed in a convenient way. For example, in one embodiment, by twisting a male connector to the female connection, a fixture is locked in place. The female connection can be designed into the housing providing a fixed point.

[0091] Alternatively, lighting may come from ventilator and provide lighting at different angles. Lighting provided may also be on a bendable, moveable arm, e.g., a snake light system.

[0092] In one preferred embodiment, such as that shown in FIG. 1, housed within the appliance's frame of metal/plastic or other material is an opening to provide the viewing of an electronic display **130**. The electronic display **130** preferably rotates and may also include the control board electronics. The controller is preferably an electronic board attached by bolts and nuts, but could be held in place by other methods like adhesive, tape, connector, etc. The wiring for the control panel preferably is shielded from being seen and being contaminated by dirt that may coat the wires.

[0093] As mentioned above and shown in FIG. 1, the appliance **15** of the present invention preferably has at least, e.g., one sensor **90**. The sensor may form part of a sensor system that includes one or more of the following: a pot detector system, an IR detector system for heat, smoke, fire and/or distance, humidity, a gas (e.g., hydrocarbons, CO, CO₂) detector, a pressure sensor, moisture or steam sensor, temperature or thermal sensing technology such as RTDs (resistance temperature detectors), integrated circuit sensors (IC), thermistors, IR thermometers, bimetallic, and thermocouples. Other sensors may include: any electronic AC or DC sensor used for detecting movement, UV reflectance, resistance, flow, item detection, noise, power or other sensor for the detection and control of the ventilator blower with electronics. Also, a sensor may be used for detection and control of speed for both the fan/blower and the drive mechanism. Sensors for the detection of the temperature are preferably located on the cooking surface **28**, back housing

29, ventilator 30 or blower assembly 40. Other sensors are directed for the sensing of the items placed on the cook top or the range. The sensors are preferably connected to control board 98 (see FIG. 3) via wires or a wireless connection. Finally, an air flow sensor may be provided to detect the flow of air past the filter(s) (See, e.g., FIGS. 7A-B, sensor 75). This feature preferably measures the air flow and indicates to user the need for filter replacement or cleaning due to restricted air flow.

[0094] Of course, any IR/thermometer that can measure objects that move, rotate, or vibrate (e.g., web process or any moving process) may be used in addition to the ones mentioned above. Such IR sensors are useful as they do not damage or contaminate the surface of the object of interest and they measure the temperature of the actual product being used on a cook top or range and not some of the other parts of the surfaces. Further, the thermal conductivity of the object being measured such as glass, metal, wood, or even very thin objects does not present a problem, as with other sensors. Response time of these sensors is in the millisecond range, which gives the user more information per time period. Any other electronic IR sensor used for detecting temperature, resistance, heat/fire, distance, moisture/steam, or power for detection and control of the ventilator blower with electronics may also be used.

[0095] Two types of ventilators may be used with the present invention, ducted and non-ducted. In a ducted type ventilator, there is a duct that is used for venting air to the outside. See, e.g., FIG. 2. This duct can be attached at the top, back, or directed downward to the floor in a room, or have a chimney cover the duct at the top.

[0096] In a non-ducted type ventilator, there is no duct that is used for venting air to the outside. See, e.g., FIGS. 3 and 6. This non-ducted unit can be vented at the top, side, back, front, and/or directed downward to the floor in a room.

[0097] As mentioned, a cross-flow fan/blower assembly preferably provides the drawing force needed to pull contaminated air into the ventilator. As best shown in FIGS. 11-12, the assembly is preferably composed of a housing mounted to the appliance. Attached to the housing is the drive motor. A wheel assembly contains the bearings, hub, and a wheel of either the skewed or straight bladed type. A fastener preferably connects the wheel assembly to the motor.

[0098] Multiple burner specific blowers and ventilators may be used to divide the cooking surface 28 into zones that provide air flow control within the zone. See, e.g., FIG. 4. An air curtain may be created at the perimeter to preferably enclose these zones. Blower motor speed in the zone may be reduced with the improved efficiency and thus the noise level may be decreased. This greatly increases the overall efficiency of venting. Moreover, the energy saved from not having to turn on and run another large blower motor provides added benefits to the user in the way of cost saving. An added benefit is a lower ventilator profile due to the more efficient, smaller motor(s)/blower(s) assembly. This gives a person more room for viewing and working near a ventilator, or room for a larger cabinet below the ventilator to provide more user space. The fan/blower may also be used for ducting heated air or moisture out.

[0099] Another aspect of this design is the ability for the fan to be controlled by a humidity sensor, CO, or CO2

sensor, and/or hydrocarbon detectors. (See, e.g., FIG. 1, sensor 90). Greater versatility may be had with the use of electronics and the different types exhaust elements. These innovations control the power load for the exhaust vent and only supply that amount of power needed to effectively operate the ventilator. Electronics or electromechanical controls may also prevent the spread of fire through regulating electricity flow, blower speed, and heat.

[0100] As shown in FIGS. 5 and 8, unit 15 may have a panel 64 with, for example, a display 191 that shows the user, e.g., fan speed levels. This can be used to assist in finding proper speeds and heights, which then can be programmed into an electronic control board for repeated operations later. Further, the panel 64 has the ability to show to the operator, e.g., types of operations, functions, filter life/change, and times using electronics and to accurately control these operations to remove contaminated air. Such a panel 64 may also be used to control movement and operation of the ventilator 30. Construction of the electronics includes: high heat construction design; specialized adhesive construction; loop resistant circuitry; ESD/EMI/RFI shielding; and LED, LCD, plasma, dot matrix, vacuum fluorescent display(s). All of these can improve the control, display, design, look, and operation of the electronic(s). Electronic touch control panel(s) could use a piezo touch panel (keypad) for selection of operations by operator. In some instances, the controls are sufficiently isolated in other ways to prevent appliance temperatures from damaging the control.

[0101] As mentioned, the panel 64 may include an electronic touch controller 68, e.g., a keypad that may be made of glass, metal or plastic, with selection of the operating function(s) made by touching the surface of the glass, metal, or plastic. For the ventilator, a resistance type touch control keypad may be used whereby touching plastic, metal, or glass at a location, e.g., on top of the ventilator, causes a change in an electrical signal. The piezo, capacitance, resistance, inductive and tactile membrane switches used maybe fitted with decorative overlays, under lays, labels, trim and completed control panel assemblies. Touch control key pads/panels may be installed flush, raised, or recessed. It should be noted that the touch control key pads/panels may be installed in nearly any plane and on any surface. For example, touch controls keypads and displays may be placed on the front or top of the cooking surface 28 to provide the operator with instant viewing of the operations and functions. A remote control 62 may be added by wire or by wireless controls, see, e.g., FIG. 5.

[0102] As mentioned, the electronics provided allow for programmable/selectable set points, programmable/selectable set times, and programmable/selectable set operations as well as set times for both on and off or changes in functions, set points, speed, or functions. The ability to select multiple functions, operations, and times gives the inventive appliance advantages over non-electronic controlled units. This programmability/selectability provides the advantage of being able to enter different functions or operations into the electronic controls and have the system respond. Further, an electronic control permits more user freedom.

[0103] Another aspect of the present invention is a multi-function display. For example, a clock may be on the

electronic(s) display when not in use or when in use. See, e.g., item 112 in FIG. 8. It may also be changed to permit other programmable information to be displayed, such as, messages or computer information. This area may also have an LED night light included in the electronics such that the LED would come on when the room is dark. The use of an LED or a bulb of this type can save energy and space.

[0104] Another aspect of this invention is the ability to have “no switch” controls. Here, for example, the cook top backing 29 acts as the switch. For example, a user may touch the trim top surface in the front, top, or sides and this would operate the ventilator by moving it and turning on the blower. Alternatively, a user may touch the ventilator a number of times to move it up or down or to speed up or slow down the fan. The user may also touch the ventilator and hold for a longer time to which the blower would turn off or on. The user may turn a light on in the same manner.

[0105] The appliance 15 may also be equipped with a sound- or voice-activated system that in one embodiment lets the user speak to the appliance and state what controls and operations the user wants. Sensor 90 may be to detect the sound needed for such control. This provides the user the ability to operate hands free, therefore, allowing the users to do something else with their hands. Alternatively, the appliance can be hooked up to a PC computer or a whole house computer system for operation and control.

[0106] Another aspect of this invention is an appliance 15 designed with a temperature control or cooling element 120. See, e.g., FIG. 6. The element 120 is preferably secured to the inside of cavity 172 or remotely. In this one embodiment, heated air is circulated through the ventilator 130 and past the element 120 to provide better heat control to the non-ducted ventilator both inside the appliance and inside the cooking room. The fan or blower assembly 140 provides air movement inside cavity. This system cools/heats the exhaust air before delivery of air to the room. Preferably, such a system is included with a non-ducted unit. These cooling systems are sometimes referred to as a “heat pump.” Thus, such a heat pump may be used to make the ventilator not only a venting unit, but a cooling/heating unit. This feature is important, for example, when larger ventilators are designed to recycle air back into the room. With the use of larger cook ranges, a large amount of heat is generated and returning this heated air to the room can be a big issue for the user. Here, the cooling/heating system is used for extracting effluents (like steam) and cooling of the drawn air to a proper temperature for return. The system may also include a device to select a precise return air temperature. For example, with the ability to cool and treat the exhaust air, this feature provides the user the ability to select the temperature of the returning treated air to the room, e.g. 70 degrees Fahrenheit. Humidity buildup in the cavity chamber may also be controlled by a power venting or condensation drainage system. The system may include an electric chill or a refrigerant such as that found in freezers, a circulating system to provide removal of heat, or an electric cooling heat exchanger.

[0107] In accordance with another aspect of this invention, the ventilator may be controlled by electronics and equipped with an AC or DC electronic temperature sensor, e.g., sensor 93a, 93b, 93c, and 93d, located on the ventilator, cook top, or elsewhere such that the temperature of the ventilator can

be detected accurately. See FIGS. 1-5. Such controls provide control and operation response to sense temperature on the range or in the ventilator and then turn the exhausting functions on/off and adjust speed according to needs. Any electronic sensor used for detecting heat/temperature, CO, CO₂, hydrocarbons, or power, for example, thermal detection devices may be used to control the exhaust. In one embodiment, the blower exhaust motors are electronically connected to a temperature-sensing device and is DC powered in accordance with requirements for the unit. Here the motor/blower is also protected in the event of a fire by an automatic turn off. The user may also select settings or preset settings for the electronic control(s) to maintain the desired exhaust flow within the vent's chamber. The sensing device maintains performance in a predetermined desired range of operating temperature(s) or set point(s). A sensor may also be mounted on an electronic board or it can be attached by itself to any wall or location from which detection of the board's temperature can be made. FIG. 14 shows examples of wiring schematics for electronics of the present invention.

[0108] RTDs may be used to provide the appliance low cost sensing over other methods when used with electronics. Even though RTD sensors tend to be relatively slower in response than thermocouples, which are used in many ventilators today, RTDs offer several advantages well known to those of ordinary skill in the art.

[0109] For example, one method for a sensor circuit uses a RTD temperature sensitive element to measure temperature from ambient to elevated temperatures. One of ordinary skill in the art is familiar with such sensor circuits, so the circuit is not shown. The information from the sensor circuit can be also displayed and/or processed for control of the motor, blower, and speeds. All of the above information can be made on a chip. This chip can be placed in an ideal area for detection of temperature. This circuitry preferably provides data/information to the control board for controlling functions of the ventilator. Alternatively, distributed temperature may be used to sense temperature at every point along an SS sheathed fiber and feature a resolution of 0.5 degree C. and a spatial resolution of 1.5 m. The fiber can range up to 2,000 m and can be coiled at specific points of interest. The fiber can be sheathed with a nonconductive polymer for intrinsic applications. This method provides the ability to profile a range/cook top for detection of temperatures at many points. The strip may be along the complete front of a ventilator trim at the edge. Response times are thus reduced and provide the control board the ability to sense the complete top of a target zone rather than just one zone. This also provides the manufacturers the ability to customize the zones placing more points in areas for detection. The use of electronics and sealed components allow these systems to be used outdoors also.

[0110] Next generation fiber optic distributed temperature sensors (DTS) may be used as part of the present invention to sense temperature at every point along an SS sheathed fiber. These feature a resolution of 0.5 degree C. and a spatial resolution of 1.5 m. The fiber may range up to 2,000 m and can be coiled at specific points of interest. The fiber may be sheathed with a nonconductive polymer for intrinsic applications. With this system, many locations for detection are provided. Response times are shorter and sensing of the complete top of a target zone rather than the one zone may

occur. This also provides the manufacturers the ability to customize the zones by placing more points in areas for better detection.

[0111] As mentioned, another aspect of the present invention is to have nearly infinite fan speed adjustment levels. This can be done, for example, by having the user touch down on a glass resistance keypad until the speed required is reached. Once the speed is reached, the electronic control may reduce or completely cut off current/power to the blower(s)/fan(s). The keypad may have one or more keypad location(s) for operating the increase or decrease/on or off of the speed by the user. For example, three locations for independent operations can provide the user with better control. A display may show the user the speed level and may be used to assist in finding proper speeds, which then can be programmed in to the electronic control circuit for repeated operations later. Alternatively, the sensor **93c** for controlling the fan **44** may be connected to fan regulator **48** as shown in FIG. 3.

[0112] The appliance of this invention is designed for outdoor locations as well as indoor ones. The appliance design has the ability to weather outdoor temperatures and environment. For example, the use of electronics for appliance provides better sealing for these environments. Further, remote electronic controls **62** not only provide convenient remote operations for use outdoors, but also reduce the effects for some of the environment on the controls. Further, electronics are not subject to the mechanical problems of turning in extreme weather conditions. They are also resistant to other environmental conditions.

[0113] As previously mentioned above, the ventilator of the present invention is very versatile. For example, it may be built into/on a mobile island or cart; such as for use with grilling/cooking equipment. Alternatively, the ventilator **330** itself may be a separate mobile unit, e.g., a frame that is self-supporting or free-standing. See, e.g., FIG. 10. Such a mobile ventilator may be, e.g., mounted on wheels **314** and does not need to be installed into a cabinet or other unit to add structural support. This embodiment **330** preferably has a combined heat exchanger and filter **340** that is mounted over the blower **352** and duct **353**. A light **379** may also be included.

[0114] FIG. 5 shows a remote sensing and receiving system which includes a sensor and/or a remote receiver **107** along with remote control panel **62** at a different location. Here, the sensor preferably includes a transducer to sense a physical parameter on the cook top of a range. The transducer will generate an electrical signal representative of the physical parameter and apply the data to a processor. In response, the processor drives a digital display, which produces visual indications of these parameters. The processor provides communication between the sensor(s) and the remote receiver, which drives some operations by the ventilator. For example, the receiving unit **62** controls the ventilator from signals for turning on, to adjusting the speed of the blowers. The sensor(s) and receiver(s) may both have a transmitter and receiver to enable communication through signals. This would be helpful when changing set points or detection points.

[0115] In one embodiment, the remote sensing and receiving system or detecting and display system is configured as a remote keypad. For example, the keypad apparatus pref-

erably includes a display and a remote transducer unit having a temperature sensor unit or other transducer exposed to the cook top/range.

[0116] As discussed, physical parameters measured by remote sensing and receiving system are not limited to temperature. For example, a sensor/transducer may be used in extinguisher devices in which the quality of the air from a range is measured for CO, CO₂ or other gasses for fire fighting. Note: Transducer Technology, Inc offers a T series carbon monoxide sensor using nano—particulate technology for sensing or an amperometric electrochemical sensor. In this embodiment, if a fire develops, the remote sensor and remote control devices can activate a fire extinguisher. Here, a microprocessor preferably controls the various circuits associated with this system. Various other devices may be coupled to such a microprocessor to control other functions within the appliance.

[0117] In another embodiment, a fire protection system may be included. See, e.g. FIG. 5, system **105**. The fire protection system **105** preferably has a warning device and a built-in fire extinguisher. The fire detection system preferably also turns off the blower and other electronics and closes at least one vent through a control board. This feature prevents the spread of fire in and around the appliance. Further, critical temperature levels may be set by the factory so that when the sensors detect these present levels, the ventilator activates the fire protection system.

[0118] Another feature of the present invention is preferably the use of an output device or display **130** located, for example, on a sliding panel, a rotating panel, or popup panel attached to the backing **29** of the appliance **15**. See FIG. 1. In the rotating display shown, the display panel or screen is an LCD display **150**. Input buttons **143a**, **143b** may also be present. This ability to conceal the display **130** protects it from damage and provides a smooth looking surface. In one embodiment, this is accomplished by placing an electronic display on a rotating drum, a rotating L-shaped plate, or on a triangle-shaped part. Once the operations are complete, the user or the appliance **15** can rotate the display **130**. In one embodiment, the user can touch the front of the display **130** to activate movement. Once the electronics sense the pressure on the display **130**, the rotation begins until it reaches the stop point. In this case, the stop point would be when the unit provides the smooth surface. The other way the display **130** may move to a closed position is if the display **130** and the ventilator have been off for a time. Once that time has been reached, the display **130** returns back to the closed position. A motor or some other means of rotating the display **130** may be used to provide movement. Switches, stepper motors, or magnetism can be used for the location of stop points.

[0119] In another embodiment, one or more displays may be used to interface with the operator the functions, temperatures, speeds, need for a filter change, and time. For example, the controller may have a graphic specific to the design and function of at least one of the blower assembly (e.g., a small fan picture), lighting, and the ventilator (e.g., ventilator graphic) as shown in FIG. 8. Again, such controls are preferably mounted on at least one of: a top, face, side, or other surface of the ventilator or cooking surface for easy viewing and use.

[0120] In the embodiment shown in FIGS. 9A-9B, the cooking system **205** includes a counter top **210**, cooking

surface **212**, and a ventilator **220**. The ventilator **220** is a telescoping system located at the rear of the cooking surface **212**. A vent **223** is provided preferably in front of the ventilator **220**.

[**0121**] Burners **218** are located on the cooking surface **212**. Controls **246**, preferably for the cooking surface, are located toward the front of the cooking surface **212**. Controls **278** for the ventilator **220** are preferably located on the top **226** of the ventilator. The ventilator top **226** fits into an opening **290** when the ventilator is closed and is flush with the surrounding molding.

[**0122**] As mentioned, the ventilator preferably includes a tangential or cross-flow fan/blower that uses an AC or DC drive motor(s). See, e.g., FIGS. **11-13**. The cross-flow blower(s) may use tangential wheels and skewed fan blades, straight blades or other blade designs for the moving of air. Alternatively, a long length axial or centrifugal fan/blower assembly wheel may be used. The fan may be of a fixed or a variable speed with nearly infinite speed setting. As mentioned, the blower is preferably located as close to each of the burners as possible. With two or more blowers, different size blowers may be used with different cubic feet per minute ratings (CFM). This provides greater effluent removal where needed.

[**0123**] If large burner elements are located at the front of a range, the invention provides the ability to use a large cross blower (CFM) near those burners to remove the contaminated air. Each fan can be used as a power exhaust vent for removing air, or mixing fresh air with return air, and/or management of moisture/heat buildup. Fan operations may be controlled by a sensor, detector, or switch. Such individualized features allow the ventilator to detect the air flow draw needs for each burner and also the amount of draw needed. As the blower draws air downward, it eliminates hot spots or stratified layers of varying temperatures on a range's cook top. Alternatively, the fan/blower(s) may be remotely located from the ventilator or built on/in with ductwork while still providing individual air removal near a burner. These ducts can be closed off to each location and opened when selected by a user or system.

[**0124**] Referring more particularly to FIG. **11**, a preferred embodiment of a blower fan assembly **440** and fan or impeller **444** is shown. In general, with a crossflow/tangential fan or blower, the air is drawn in over the entire length of the fan impeller. Inside the impeller the airflow is diverted and accelerated by the vortex created by the rotation of the impeller. The air stream then exits over the entire length of the impeller on the discharge side. At the narrowest point between the impeller and the vortex creator, the intake and discharge side of the fan is separated and, together with the fan rear guide wall directs the airflow crossflow/tangential (impellers, e.g.) wheels are usually more efficient when a focused flow of air is required to cool or heat an immediate space such as the cook top. When used in this manner, the air does not have to travel long distances, but instead is used in the immediate surroundings such as in stoves or on a cook top.

[**0125**] One of the reasons that crossflow/ tangential wheels are quieter in comparison to a centrifugal-style blower is that for products with the same CFM rating, the air speed of the tangential wheel is much slower since the outlet area is much larger than that of a centrifugal blower. This

can be seen as an advantageous feature, because the large area of discharge of the tangential blower does not require additional diffusion. Diffusion areas create losses and decrease efficiency. Reduced noise is a highly sought after feature for kitchens due to the user using the kitchen as a central meeting point in a home. Crossflow blowers may be retrofitted to existing systems after older, less efficient blower assemblies have been removed.

[**0126**] Moreover, when compared to double inlet wheels used in a double blower, tangential impellers will generally provide an equal or slightly increased CFM with the same motor. The airflow is tangentially across the inlet area and tangentially out across the discharge area. The most efficient configuration is when this 90-degree change in direction can be utilized in the design of a product. The flow principle allows the air intake of the blower to take place over the whole length of the outer impeller periphery. The air then flows into the impeller interior where it is reversed and accelerated by the vortex, which is caused by the impeller rotation (acceleration due to the turning of the blades). Finally the air is distributed at the discharge side or bottom and any where in between over the whole impeller length. In this way, the air flows through the impeller first from outside to inside and then from inside to the outside. The impeller is typically a cylindrical cage of forward curved impeller blades with two or more supporting discs, i.e., the so-called "wheel". Here the vortex separates suction side and discharge side at the narrowest line between impeller and vortex and causes the flow pattern together with the scroll.

[**0127**] Ideally, if filters or coils are involved, tangential blowers are best used in a pull-through rather than a push-through manner. The inlet air speed is over a larger surface and, therefore, is lower than the discharge airspeed. This usually contributes to lowering the static in the system as well. Crossflow/tangential wheels do best in low-static situations, so it would be a good idea to try to minimize the static in a system to best utilize the power of a blower. This can be achieved by minimizing the changes in direction of airflow within a cook top down draft system. Using the 90-degree change within the tangential occurs by positioning the blower where the airflow is required to make a 90-degree turn. A 180-degree flow of air can be designed such that the air is drawn in to the cross-flow tangential wheel and exits by going straight through. Funneling of the discharged air should be avoided. This is best done by reducing the discharge closest to the wheel rather than to slowly reduce the discharge area. For example, having the opening for exhausting at less than 0.45 times the diameter causes problems and having restricted or tapered flowing out the end results in back pressure and reduced blower efficiency.

[**0128**] Thus, housing design is critical in blower performance. As best shown in FIG. **13**, the preferred housing design includes: For optimum CFM, $A=0.60\phi$, $B=0.85\phi$, $C=0.60\phi$, $E=F=0.07\phi$, $G=15$ deg, and HIJ should be a straight line. If a smaller outlet is necessary, it is better to reduce A first to a minimum of 0.45ϕ , then A and B together rather than tapering the outlet. Air will discharge following the 15 degree upward. If this is not desirable, for maximum discharge, the entire housing must be rotated-G should not be reduced. Reducing A will affect CFM, but not air speed. For noise control, dimensions E and F are critical, with F being the most critical. Reducing both E and F will increase

CFM and noise level. When using grills at discharge, the CFM will be directly reduced by the percent of area covered if the blower maintains the same wheel speed. For the cook top down draft application when the motor runs below its maximum speed: when static of any kind is applied to the system at the discharge, the wheel will speed up to try and maintain the same CFM up to the maximum speed of the motor. This is a useful design feature that is used in this application where static might build with time (as contamination in a filter). If the initial motor is designed to run below its maximum speed, this leaves room for the motor to speed up and maintain its performance.

[0129] The housing 450 used for the crossflow/tangential impeller wheel 444 has galvanized steel for end plates 452 and two parts to produce vortex baffle 470 and scroll. Alternatively, aluminum could be used for less weight as could stainless steel or steel painted. The impeller used in the down draft appliance is aluminum for lightweight and thus a lower horsepower motor would be required to drive the blower. But galvanized steel, stainless steel or steel painted can be used but require a larger motor 453 to drive these designs due to the added weight. These heavy weight materials also provide other benefits such as stronger blades, which can run at higher speeds, chemical resistance, and better aesthetics. The blower wheel blades 460 are preferably made of lightweight and strong materials also. The wheel 444 is mounted in the housing 450 on shafts 465a, b, which are mounted on bearings 469 on one end and a motor 453 on the other.

[0130] The following formulae represent the preferred optimum operational design criteria of the blower wheel.

[0131] For specified wheel dimensions, a change in speed will optimize the system:

$$N_{new} = N_{old} \times \left(\frac{CFM_{new}}{CFM_{old}} \right)$$

Resulting in:

$$HP_{new} = HP_{old} \times \left(\frac{N_{new}}{N_{old}} \right)^3$$

$$SP_{new} = SP_{old} \times \left(\frac{N_{new}}{N_{old}} \right)^2$$

[0132] If the static pressure is acceptable, wheel length can be optimized (while other conditions remain constant):

$$L_{new} = L_{old} \times \left(\frac{CFM_{new}}{CFM_{old}} \right)$$

Resulting in:

$$HP_{new} = HP_{old} \times \left(\frac{new}{old} \right)$$

[0133] If the static pressure is not acceptable, wheel diameter must be resized using:

$$SP_{new} = SP_{old} \times \left(\frac{D_{new}}{D_{old}} \right)^2$$

Resulting in:

$$CFM_{new} = CFM_{old} \times \left(\frac{D_{new}}{D_{old}} \right)^3$$

$$HP_{new} = HP_{old} \times \left(\frac{D_{new}}{D_{old}} \right)^5$$

[0134] Where:

[0135] N=Speed

[0136] (Revolutions per minute)

[0137] CFM=Volume

[0138] (Cubic Feet per minute)

[0139] HP=Horsepower

[0140] SP=Static Pressure

[0141] (inches of water)

[0142] L=Wheel Length

[0143] (inches)

[0144] D=Wheel Diameter

[0145] (inches)

[0146] The below illustrate examples of preferred embodiments of the present invention:

Wheel Diameter	Housing Dimensions				
	A	B	C	D	E
4"	6.25"	6.00"	2.70"	2.24"	1.30"
4.5"	6.65"	6.50"	3.00"	2.50"	1.25"
5"	7.15"	7.25"	3.12"	3.02"	1.91"
5.5"	7.63"	8.00"	3.45"	3.50"	2.15"
6"	8.00"	8.75"	3.90"	3.75"	1.80"
8"	10.00"	11.50"	5.00"	5.40"	3.25"

[0147]

Diameters available (inches)	Number of Blades
4"	29 blades
4.5"	30 blades
5"	36 blades
5.5"	36 blades
6"	36 blades
8"	52 blades

[0148]

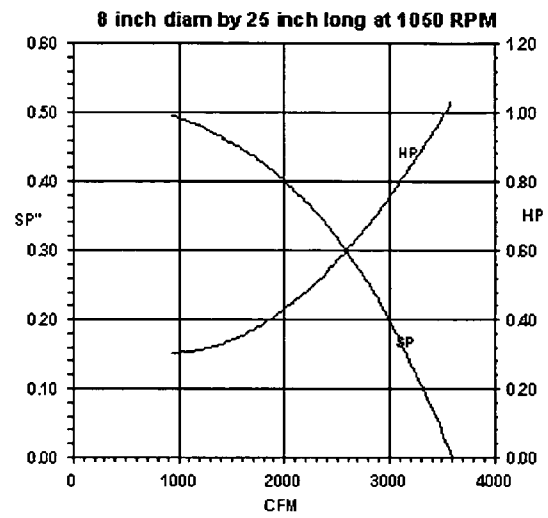
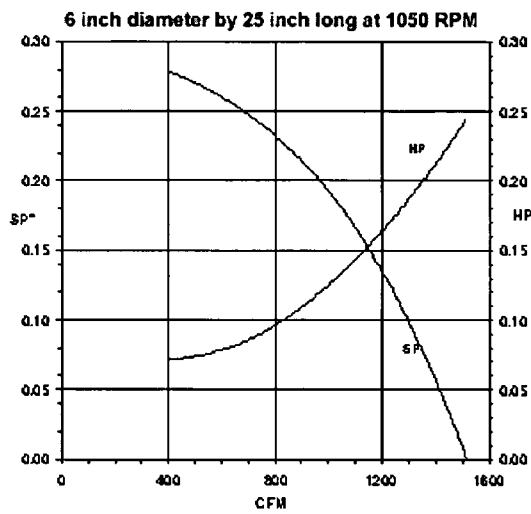


Table 1 shows a comparison between different diameter wheels.

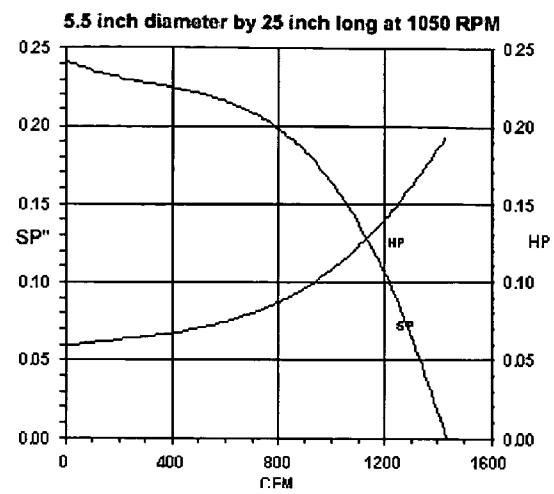
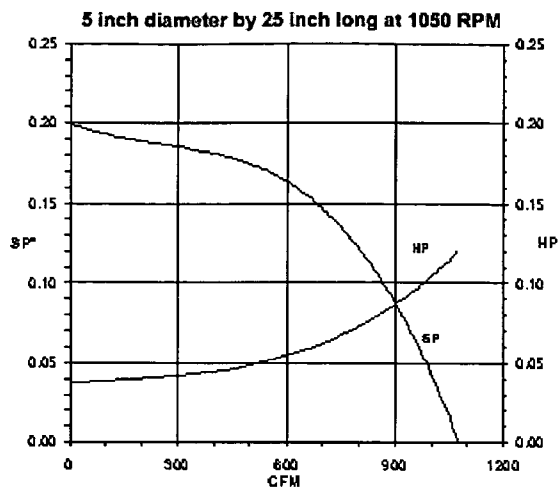


Table 2 shows a comparison between between different diameter wheels.

TABLE 3

CFM for different sized cross-flow/tangential wheels at zero static pressure and 1625 RPM.									
Wheel	Sample Wheel Length (in.)								Static Pressure (in.) Maximum
Dia. (in.)	10	15	20	25	30	35	40	45	at 1750 rpm
4	350	525	700	875	1050	n/a	n/a	n/a	0.18
4.5	500	750	1000	1250	1500	1750	n/a	n/a	0.23
5	650	1000	1325	1650	2000	2325	2675	n/a	0.45
5.5	900	1350	1775	2200	2650	3100	3550	n/a	0.57
6		1400	1900	2350	2800	3300	3750	4225	0.65
8		3350	4500	5550	6700	7800	8900	1000	1.10

[0149] In sum, the advantages of using a cross-flow/tangential blower are generally as follows:

[0150] Uniform, extended airflow over large surfaces,

[0151] Space-saving installation due to 90 degrees airflow pattern or 180 degrees air flow,

[0152] Fan length can be matched to appliance width (note: airflow conditions remain the same even for wider appliances, i.e., there is a simplified design and drafting in case of modular systems),

[0153] Quieter operation due to flow-inducing impeller and housing design,

[0154] Longer working life due to the robust design and location of bearings away from the hot air zone,

[0155] Works equally well in any arrangement, e.g., right or left hand drives,

[0156] Dynamically balanced to minimize noise and vibration,

[0157] High performance with low noise and low electricity consumption,

[0158] Long, narrow air flow path for very efficient cooling, and

[0159] Easier to install.

[0160] There are virtually innumerable uses for the present invention, all of which need not be detailed here. For example, the cook top disclosed herein may be used in a side-to-side, back-to-back, or other configuration for serving as part of a larger, expandable cooking area. Of course, this and all of the other disclosed embodiments can be practiced without undue experimentation.

[0161] Although the best mode contemplated by the inventors of carrying out the present invention is disclosed above, practice of the present invention is not limited thereto. It will be manifest that various additions, modifications, and rearrangements of the features of the present invention may be made without deviating from the spirit and scope of the underlying inventive concept. In addition, the individual components need not be fabricated from the disclosed materials, but could be fabricated from virtually any suitable materials. For example, construction materials for the cook top, the downdraft, and blower are at least one of: metal, glass, stone, a transparent material, tile, plastic, and manmade material.

[0162] Other features may be added to the conventional cross-flow blower to further increase the effectiveness, e.g., a heavy duty double-ball bearing motor, an aluminum impeller, and self-lubricating sleeve bearings. Further, a tangential fan with c-frame shade pole motor may be used as it can better withstand hot air exhaust.

[0163] Moreover, the individual components need not be formed in the disclosed shapes, or assembled in the disclosed configuration, but could be provided in virtually any shape, and assembled in virtually any configuration. Further, although various components as described herein as physically separate modules, it will be manifest that they may be integrated into the apparatus with which they are associated. Furthermore, all the disclosed features of each disclosed embodiment can be combined with, or substituted for, the disclosed features of every other disclosed embodiment except where such features are mutually exclusive.

[0164] It is intended that the appended claims cover all such additions, modifications and rearrangements. Expedient embodiments of the present invention are differentiated by the appended claims.

What is claimed is:

1. An appliance comprising:

a cook top having at least one cooking element;

a vent system operably connected to the cook top; and

a cross-flow blower assembly operably connected to the vent system.

2. The appliance of claim 1, wherein at least one of the cooking elements is an induction hob assembly.

3. The appliance of claim 1, wherein at least one of a centrifugal blower motor, squirrel cage wheel, blower housing assembly, large plenum chamber assembly are replaced with the cross-flow blower assembly.

4. The appliance of claim 1, wherein the cross-flow blower assembly further comprises a cross-flow fan, a wheel, and a housing that are attached below the cooktop and provide direct communication to an opening in the vent system.

5. The appliance of claim 1, further comprising storage space below the blower assembly.

6. The appliance of claim 1, wherein the cross-flow blower assembly further comprises a fan, a variable speed fan motor, an electrical current regulator such that motor

power output can be increased or decreased to change the air output accordingly as needed, and a detector for monitoring airflow draw.

7. The appliance of claim 1, wherein the vent system includes at least one of: an automatic, semi-automatic, or manual controlled ventilator, and a user interface to set, operate, and adjust the ventilator.

8. The appliance of claim 6, wherein the fan motor has multiple selectable or preset speed levels.

9. The appliance of claim 1, wherein a cross-flow blower assembly further comprises a fan that is used as a power vent for removing air and mixing air, and for management of moisture; and sensor for sensing the same.

10. The appliance of claim 1, further including at least one of:

controls for controlling the vent system that are integrated with the cook top;

electronic controls that use: a tactile, membrane, piezo, capacitance, resistance, induction system, touch panel, or keypad for selection of operations;

controls constructed of glass, metal or plastic; operating functions made by touching a surface of the cook top constructed of glass, metal, or plastic;

controls flush, raised, recessed, or remotely installed in any plane or on any surface of the appliance; and

a control remotely controlled by wired or by wireless electronics and located not on the appliance.

11. The appliance of claim 1, further including a control display mounted on a top, front, or side of the vent system or appliance for easy viewing.

12. The appliance of claim 1, further including an electronic control housing that is detachable from vent system.

13. The appliance of claim 1, further including a control device with graphics.

14. The appliance of claim 1, wherein the cook top is a slide-in, drop-in, or outdoor unit type.

15. The appliance of claim 1, further including at least one additional cross-flow blower assembly and vent system.

16. The appliance of claim 1, further including at least one of: an AC or DC powered electronic, mechanical, electro-mechanical sensor for detecting at least one of temperature, resistance, and current to aid in the control of the assembly.

17. The appliance of claim 1, further including at least one of:

a sensor used for detecting and controlling speed for a fan/blower;

an airflow sensor for detecting the flow of air past a filter;

a sensor to scan the surface of the work area for an item placed on the work area and to control automatic operation of the vent system;

an ultrasonic flow, digital CO₂ gas, and NDIR gas sensor that has the ability to detect backpressure in an exhaust stream from or as a result of strong winds at a house discharge vent;

a sound-activated system for controlling a vent system; and

blower operations synched with cooking controls.

18. The appliance of claim 1, wherein the vent system is at least one of: fixed, retractable, and free-standing when used with a counter, island, wall, or mobile unit.

19. The appliance of claim 1, further including warmer drawer below the assembly.

20. The appliance of claim 1, further including at least one of: a display for showing operation, function, speed, blocked filter, or time; an LED, LCD, Plasma, dot matrix, or vacuum fluorescent mechanism; and a rotating or popup display.

21. The appliance of claim 1, further including at least one of: a true timed on/off control; a programmable set point; programmable set time; programmable set operation; programmable set temperature for turn on; and programmable filter change requirement based on air flow.

22. An appliance comprising:

at least one cooking element;

a ventilator in communication with the element;

a cross-flow blower in communication with the ventilator; and

a heat exchanger in fluid communication with the blower.

23. A cooking system comprising:

a burner;

a ventilator operably communicating with the burner;

a blower assembly operably connected to the ventilator;

a filter drawer placed below the ventilator; and

a filter placed at an angle in the drawer.

* * * * *