

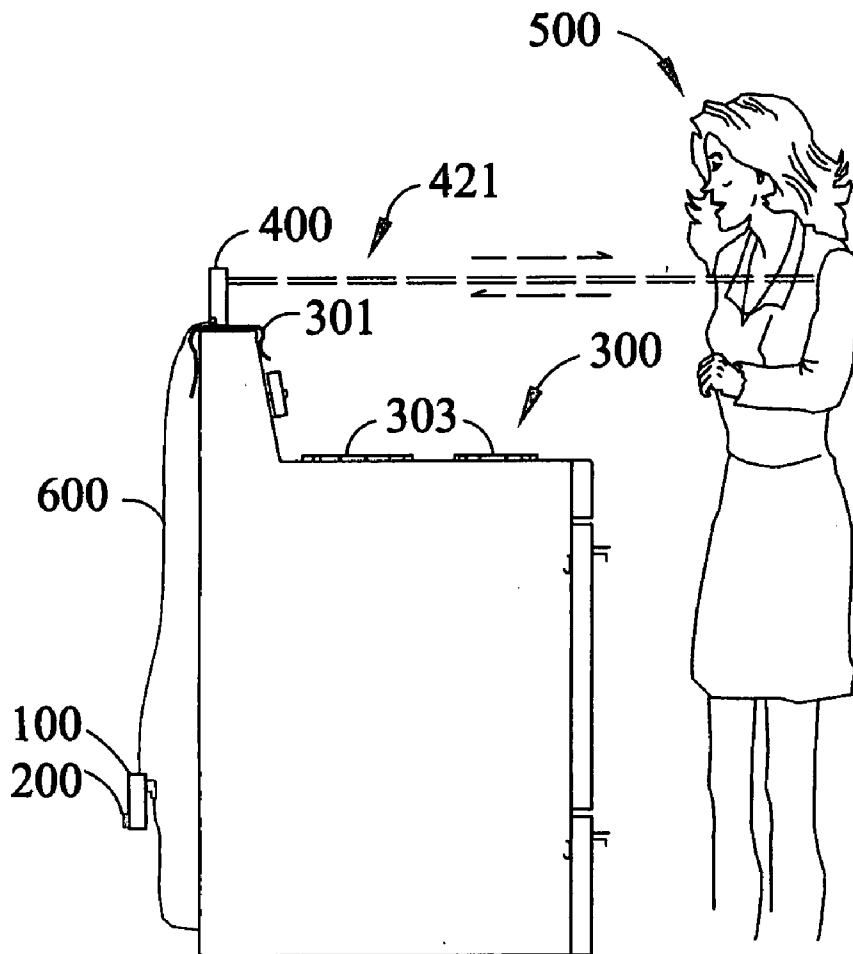


US 20050109333A1

(19) **United States**(12) **Patent Application Publication****Thomas**(10) **Pub. No.: US 2005/0109333 A1**(43) **Pub. Date: May 26, 2005**(54) **SAFETY DEVICE FOR REGULATING ELECTRICAL POWER TO A COOKING APPLIANCE**(52) **U.S. Cl. 126/42; 126/39 BA**(76) **Inventor: Lowell Richard Thomas, Bozeman, MT (US)**(57) **ABSTRACT**

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A safety device for regulating electrical power to a cooking appliance, comprising a control module having a power routing means, a power supply means, a load current sensing means for detecting a load current to the cooking appliance and a power relay means for controlling the electrical current to the cooking appliance, and a sensor module located adjacent to the cooking appliance for observation by an appliance operator and connected to the control module. The sensor module governs the production of the electrical current to the cooking appliance, and has a monitoring means, a distance sensing means, a timer means for showing elapsed cooking time, and a light emitting means. The monitoring means is responsive to outputs of the distance sensing means and includes a timer assembly programmed to a predetermined period of time for responding to the distance sensing means detecting the presence of the appliance operator.

(21) **Appl. No.: 10/991,382**(22) **Filed: Nov. 19, 2004****Related U.S. Application Data**(60) **Provisional application No. 60/523,821, filed on Nov. 21, 2003.****Publication Classification**(51) **Int. Cl.⁷ F24C 3/12**

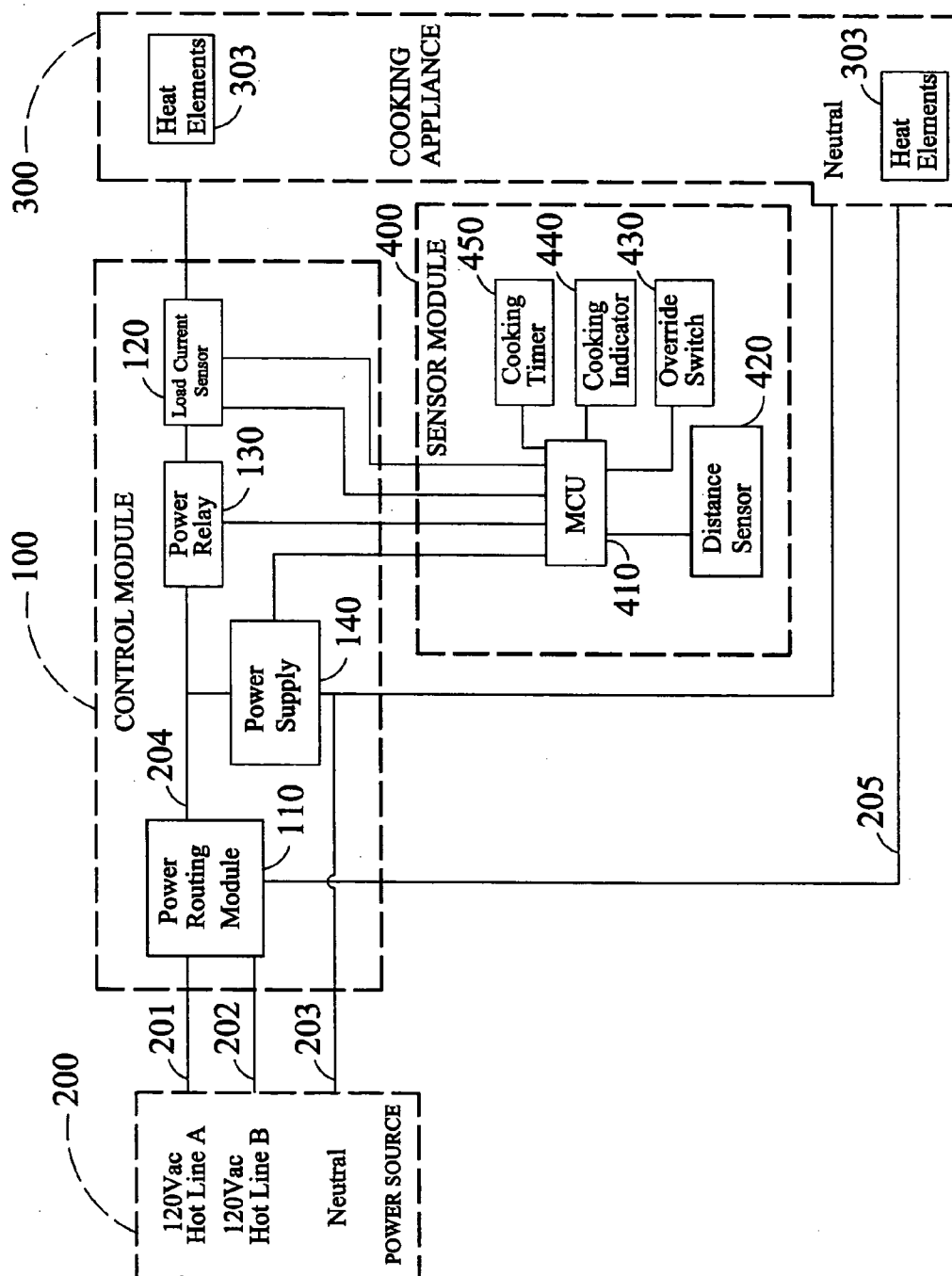


FIG. 1

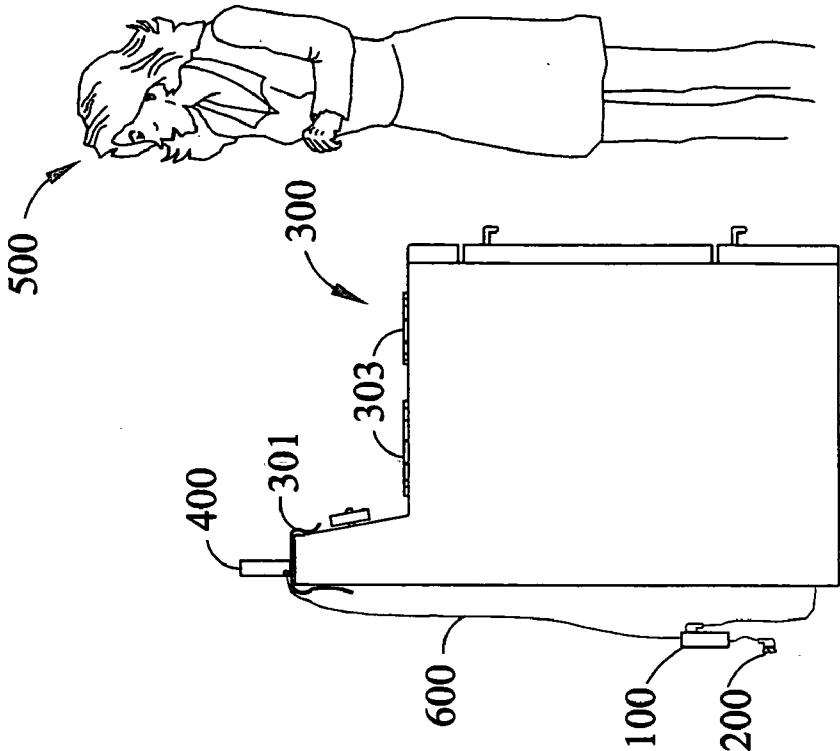


FIG. 2

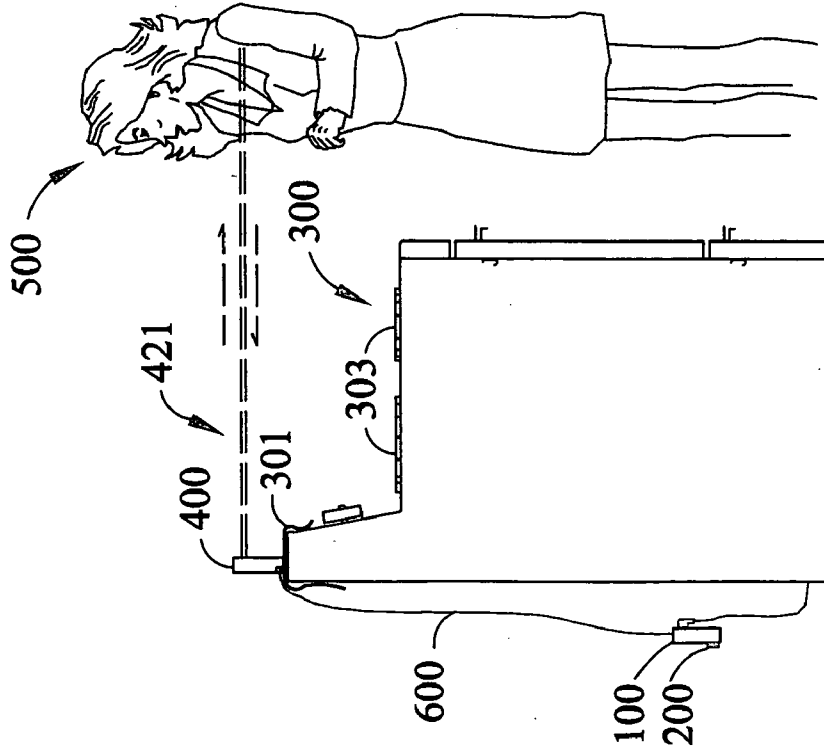


FIG. 3

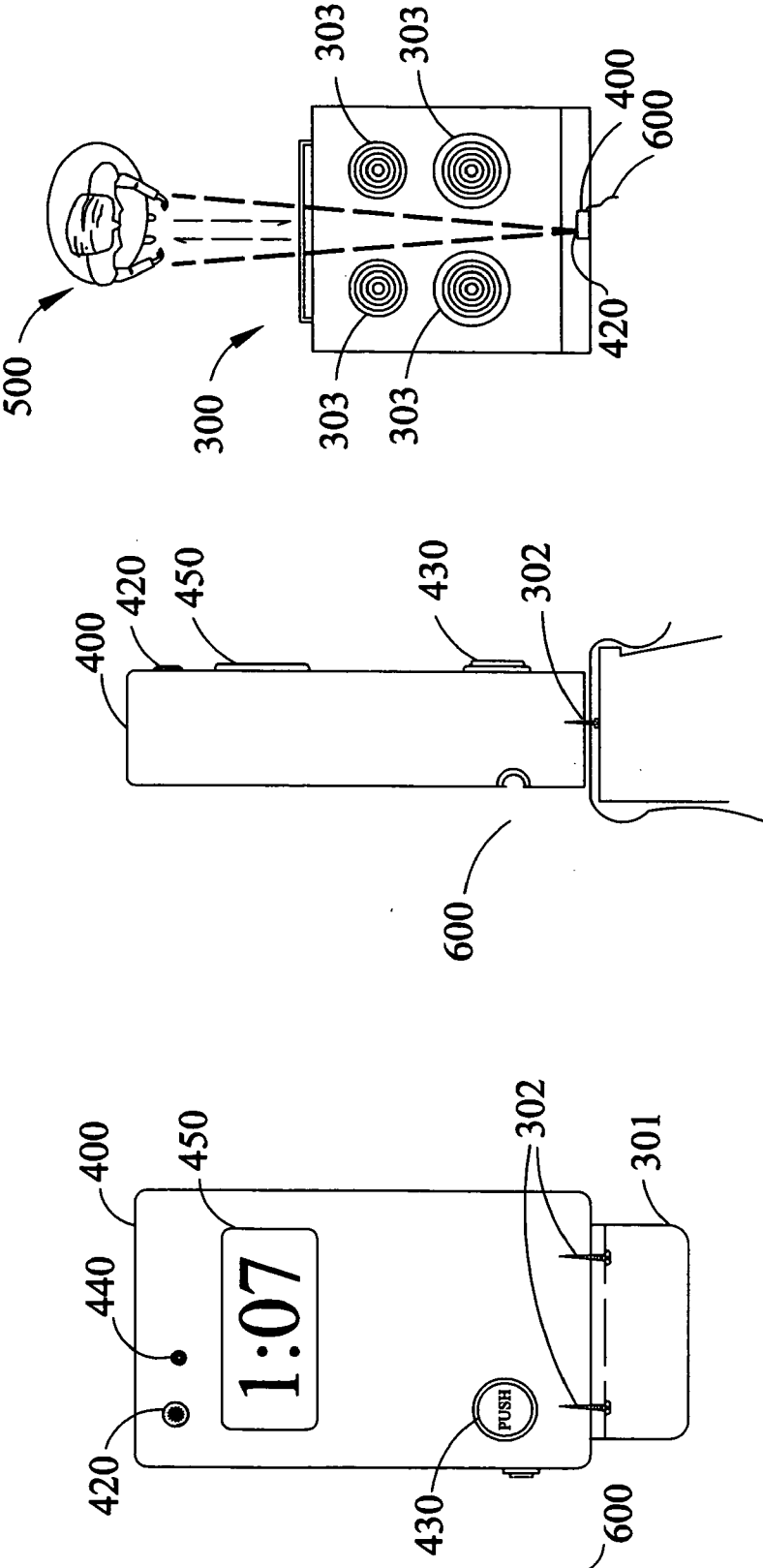


FIG. 4

FIG. 5

FIG. 5A

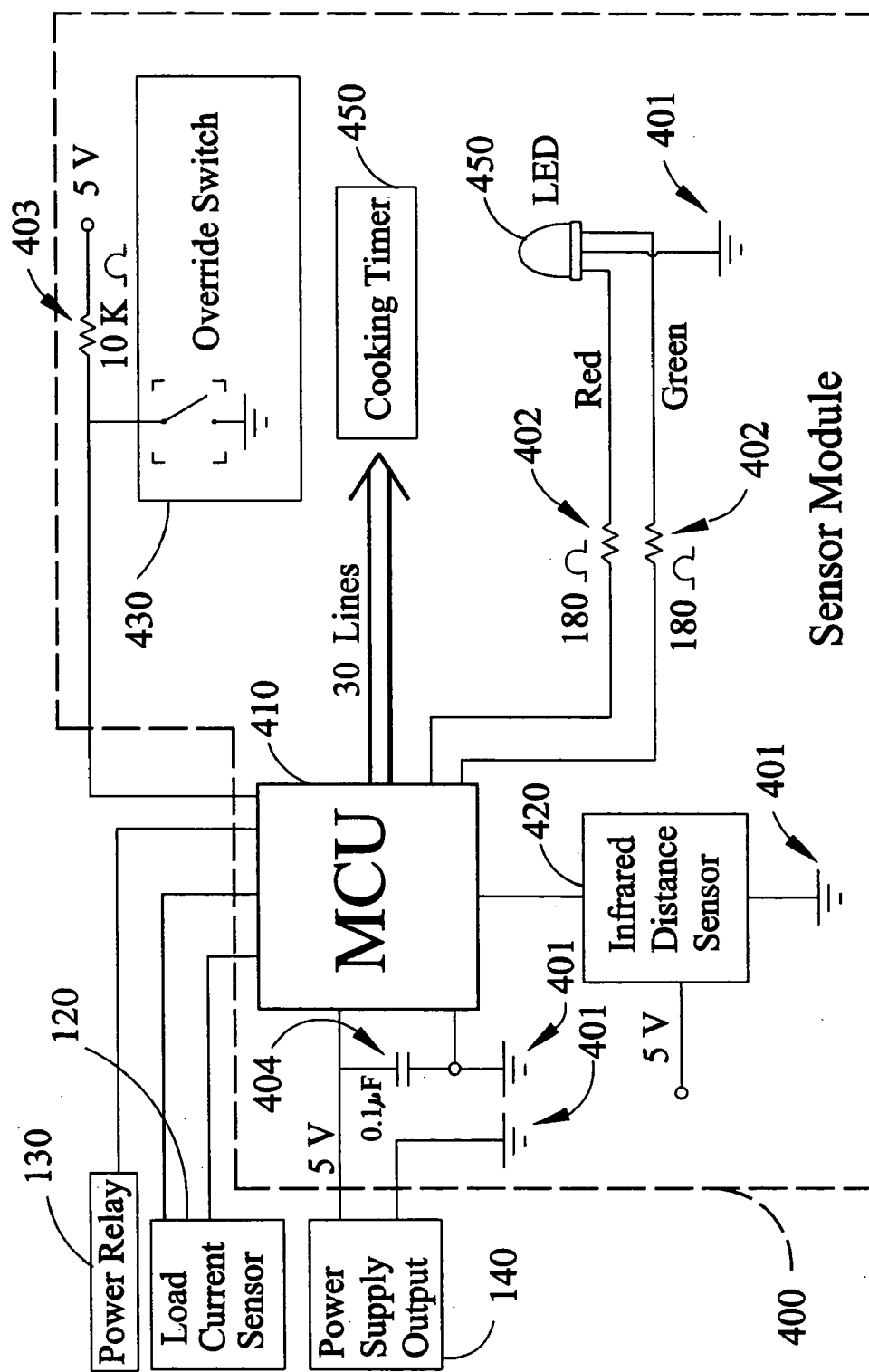
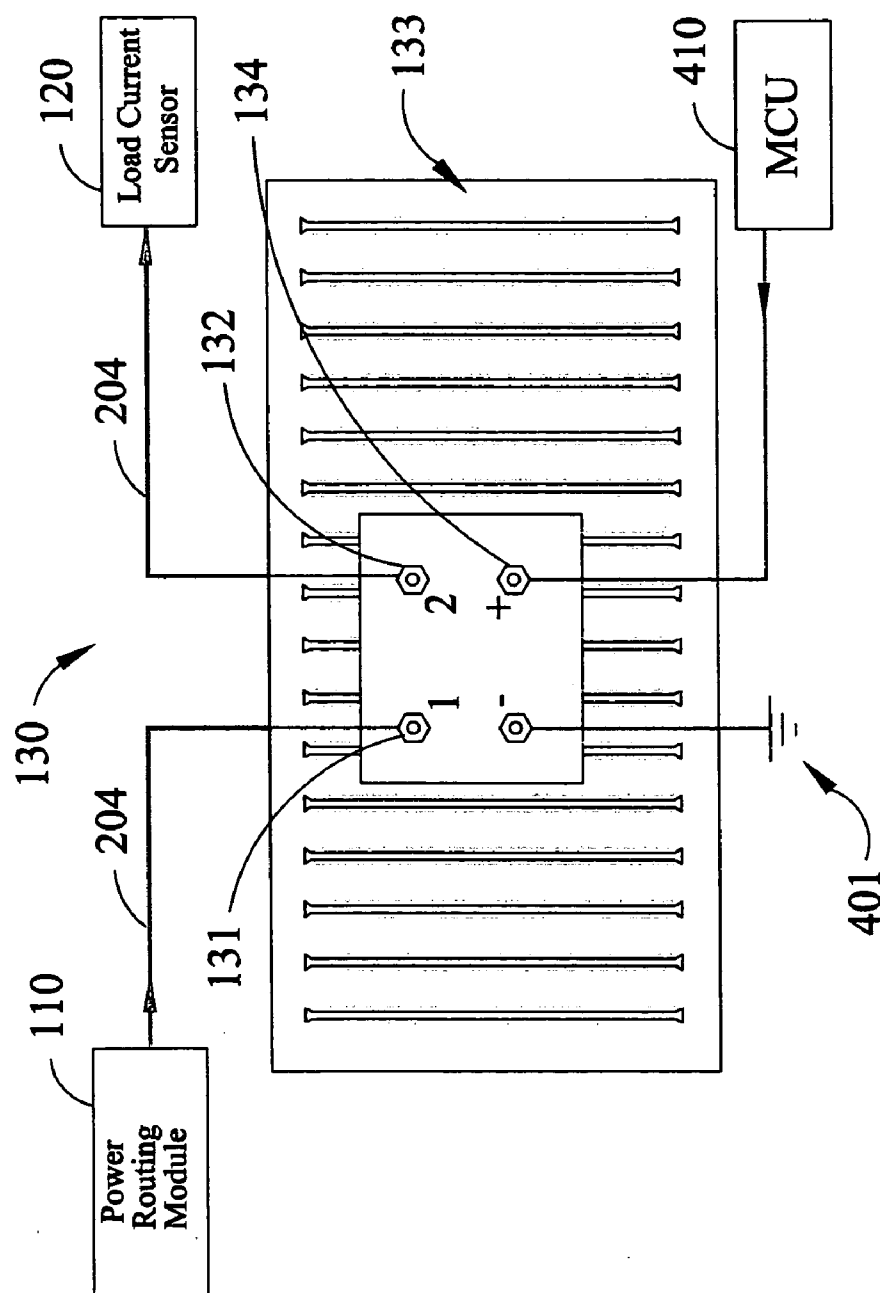


FIG.6



7.
G
H
H

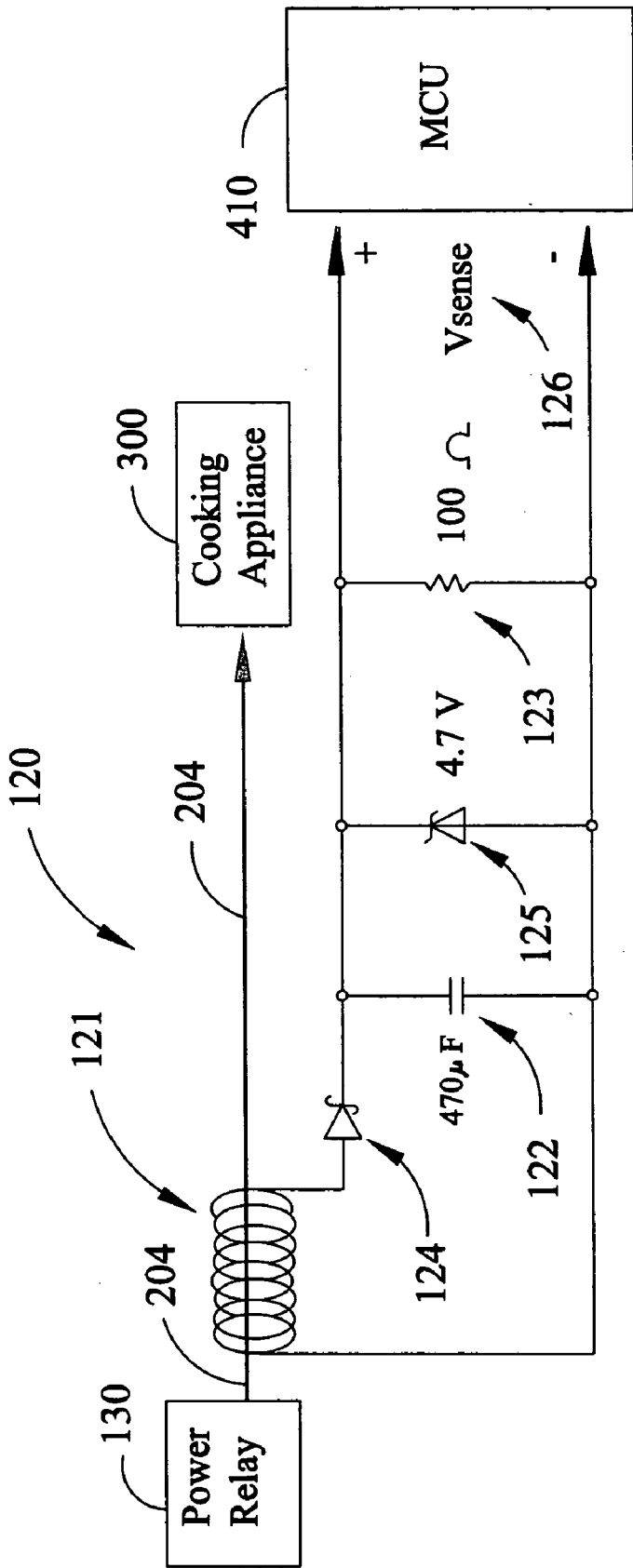


FIG. 8

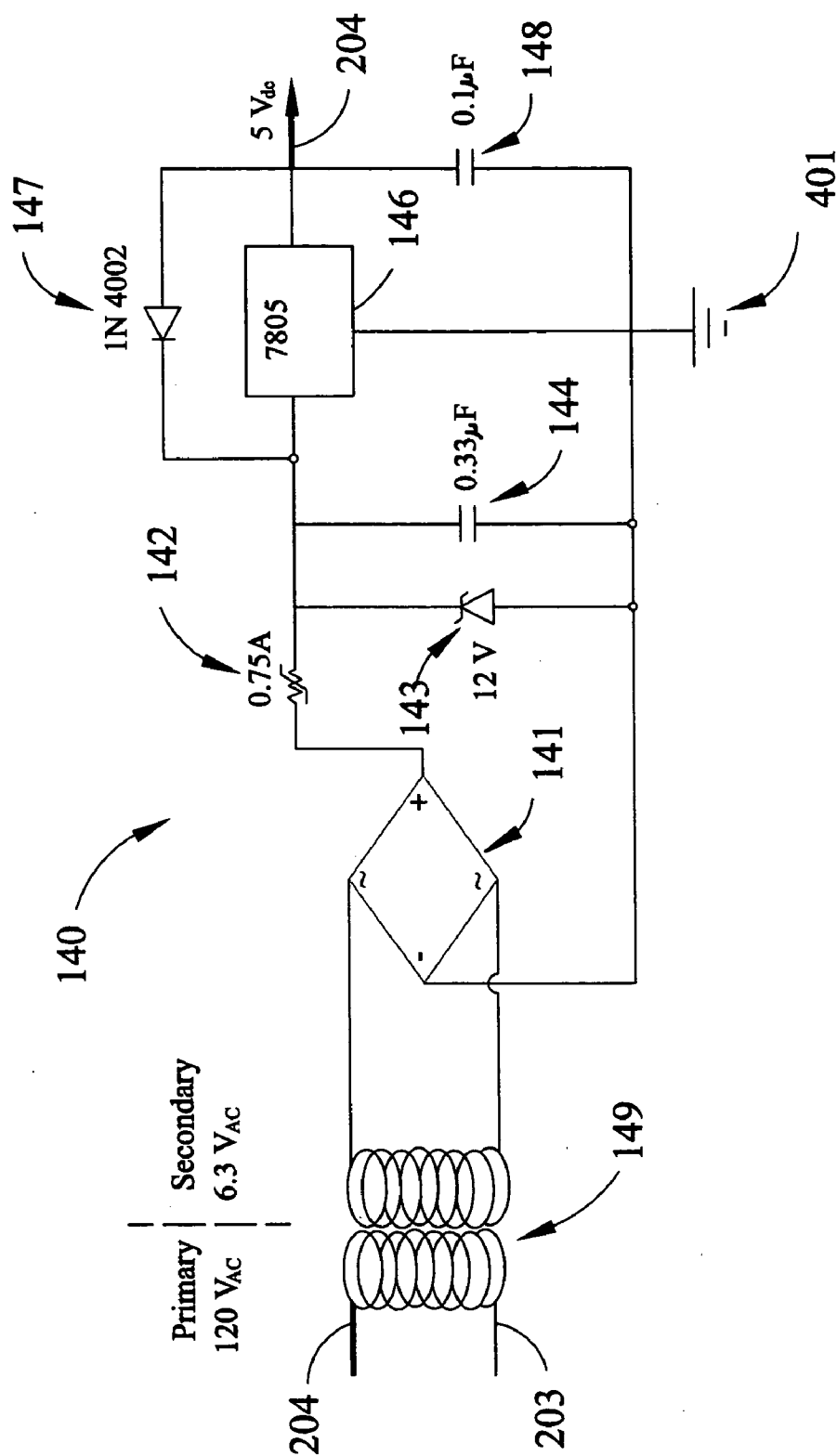


FIG. 9

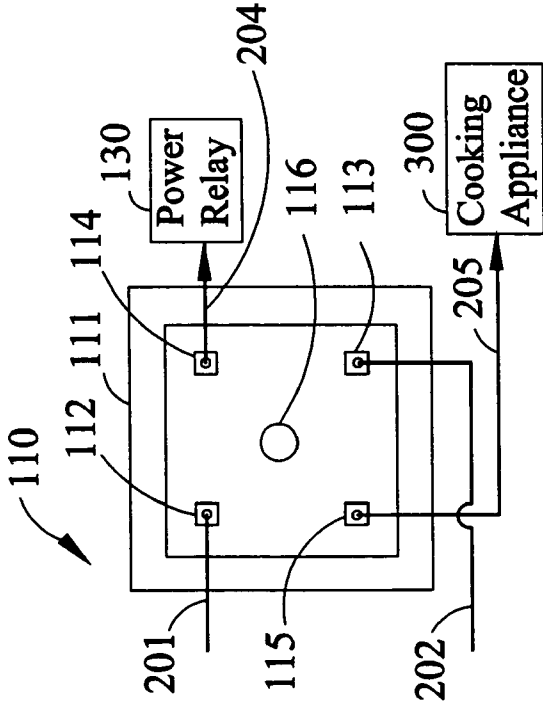


FIG. 10

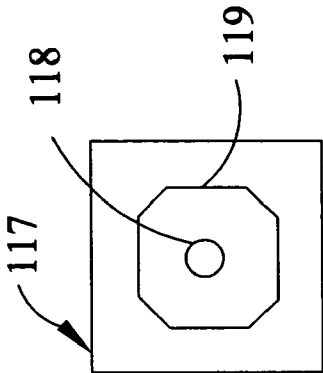


FIG. 10A

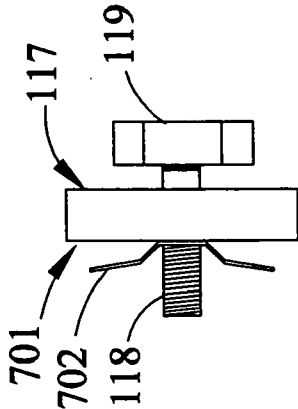


FIG. 10C

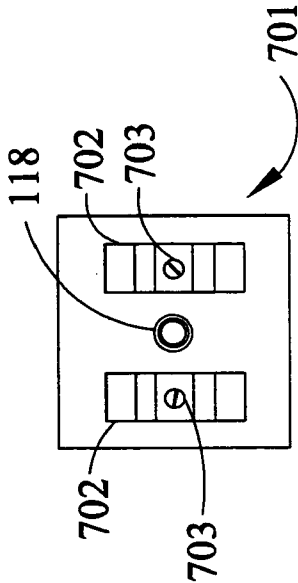


FIG. 10B

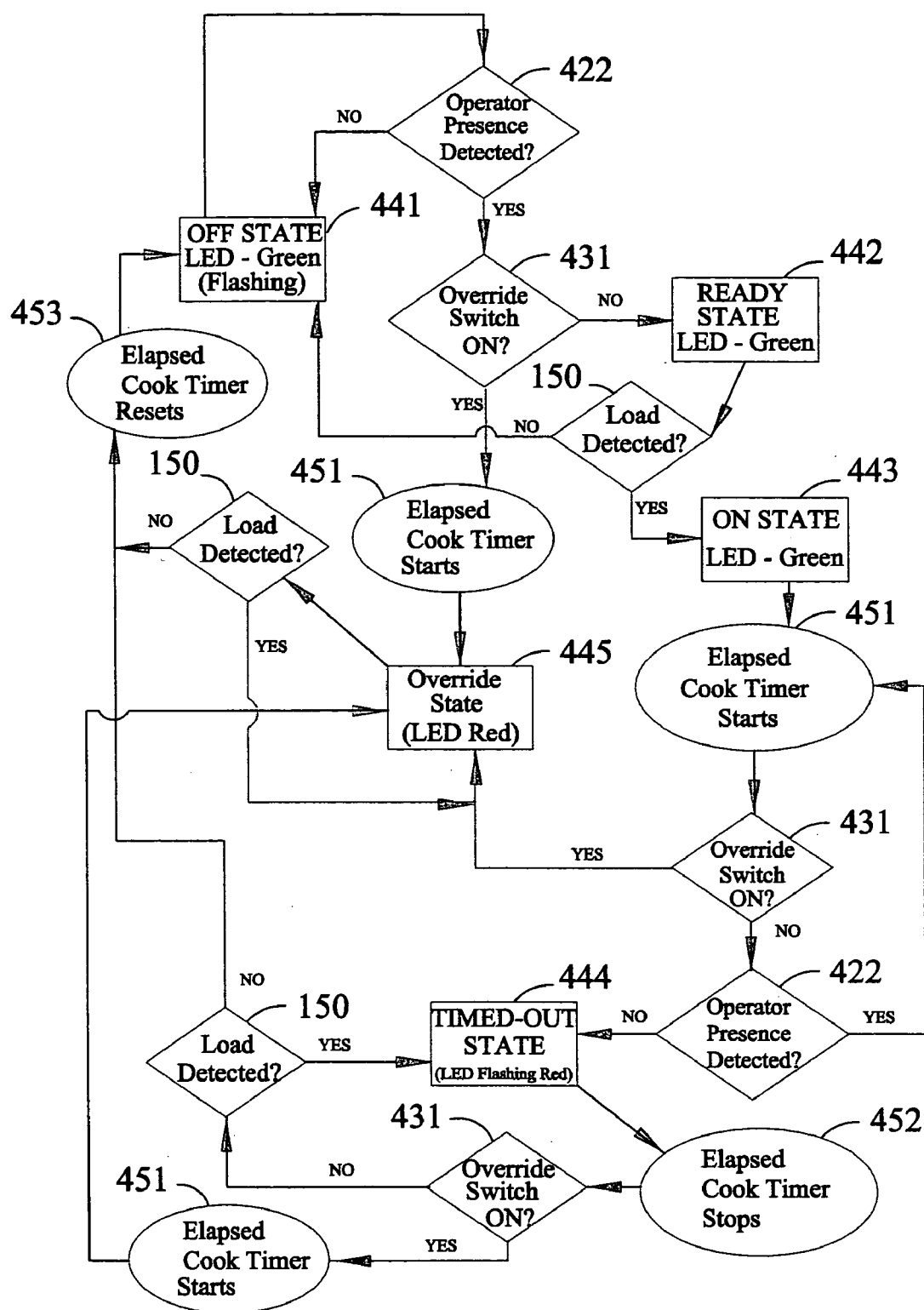


FIG. 11

SAFETY DEVICE FOR REGULATING ELECTRICAL POWER TO A COOKING APPLIANCE

[0001] This application claims the benefit of provisional patent application Ser. No. 60/523,821, filed Nov. 21, 2003, by the present inventor.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of safety devices for domestic cooking appliances, and more particularly to a safety switch and means for regulating electrical power to the cooking appliances and thereby reducing hazards of cooking appliances.

BACKGROUND OF THE INVENTION

[0003] Reportedly, more than 4,000 Americans die each year in the U.S. due to household fires and more than 25,000 are injured from those fires. "Nelsonville," www.homefire-sprinkler.org (2003). Cooking is the leading cause of home fires in the U.S. and also the leading cause of injuries. Lisa Goff, "Why Kitchen Fires," *Good Housekeeping*, July 1999, pp. 82, 84-85. Older Americans (over the age of 65) are considered to be at a greater risk of dying in a household fire, and people over the age of 80 are considered to have a risk of dying from a household fire three times higher than the rest of the population. National Fire Protection Association (c. August, 2003). On average, elderly are more likely than younger people to be on medication that affects decision making and reaction times, to live alone, to live in older homes with faulty wiring and older appliances, and to have health conditions affecting judgment (such as Alzheimer's disease). Nat. Fire Prot. Assoc., *supra*.

[0004] Cooking appliances such as stoves or stove top burners, may be hazardous if left unattended. Items which are on the stove may boil over or overheat when left unattended, leading to the production of smoke and fire. Safety devices adapted to provide warnings or shut off currents to stoves and burners are known in the related art. The present state of the art for safety of cooking appliances, such as a kitchen range, is the consumer's review of a safety video or pamphlet included in the purchase of the appliance. This may be consumer education of the hazards of unattended functioning cooking appliances, but this method does not stop or prevent a kitchen range or other unattended cooking appliance from starting a fire due to unmonitored overheating or over cooking during operation.

[0005] During a fire, consumers may turn off a household electrical breaker switch to the cooking appliance. This requires knowledge of the breaker box, which isn't always easy or readily accessible.

[0006] Manufacturers of kitchen ranges have also tried devices within the stove and have been unsuccessful. The devices were either too expensive or they interfered with the cooking ability of the range. Kitchen ranges have changed their designs so switches to the burners have lights that let the cook know that the burner is on, but that doesn't help if the cook leaves the kitchen.

[0007] This invention is an independent device that is used in conjunction with, and added to, domestic or household cooking appliances, such as an oven, stove, range, cooktop or other cooking appliance. The invention may be utilized

with electric, gas or propane stoves. Home cooking appliance fires are responsible for a large amount of fire damages and loss of lives. The device of the present invention would automatically shut off the unattended appliance, thus preventing a fire due to inattention of the user.

[0008] An object of the present invention is to be an after market add-on device to a household cooking appliance, with a twofold purpose: (1) as a safety device in that humans make errors and forget things; so this device shuts off the cooking element if a human is not present to supervise the cooking, and (2) as a learning device in that it teaches humans not to leave a cooking appliance unattended (and in an "on" status) or the food will not get cooked properly. Additional objects and advantages of present invention include, but are not limited to, the following:

[0009] 1. The device is easier to install than an alarm clock;

[0010] 2. The device is portable;

[0011] 3. The device doesn't interfere with a clock or timer already on the cooking appliance;

[0012] 4. The device works in the instance of a power outage;

[0013] 5. There is no timer to set for the device to be operational;

[0014] 6. The device will work every time the cooking appliance is left on unattended for any length of time unless the consumer pushes an override button. An override mechanism must be engaged each and every time as a safety switch is activated automatically when the cooking appliance is shut off; and

[0015] 7. The device will work every time the stove is left on unattended for any length of time unless the consumer pushes the override button.

[0016] Most present safety devices in the related art require an appliance operator to set a timer and/or activate the device. Each use requires remembering to set the time or to know what was the previous setting. This requirement changes the operation of the stove each time it is turned on. The setting could be very inappropriate if, for instance, the knob to a burner was accidentally turned to high, and the timer had been set for 60 minutes. On object of the device is that it doesn't require the operator to set anything, and the device is ready to go each time the stove is turned on, as the timer is already set. The override feature has to be activated at the beginning of a cooking session. The device returns to active state as soon as stove is shut off therefore ready to go at the next use. In other words this device does not need to be reset and is always ready to do its job.

[0017] Throughout the years, a number of innovations have been developed relating to the reduction of hazards from unattended stoves, and the following U.S. patents are representative of some of those innovations: U.S. Pat. No. 4,070,670 to Chen, U.S. Pat. No. 4,659,909 to Knutson, U.S. Pat. No. 4,775,913 to Ekblad, U.S. Pat. No. 5,380,985 to Graham, U.S. Pat. No. 6,294,994 to Hoellerich, U.S. Pat. No. 6,130,413 to Rak, and U.S. Pat. No. 5,717,188 to Vaillancourt.

[0018] Chen Patent '670 discloses a device that senses the occurrence of the hazardous conditions of water spillage or

overflow in a cooking burner unit or, sounds an alarm when a hazardous condition has occurred, and shuts off fuel flow to the burner. Knutson patent '909 discloses a device that senses the occurrence of smoke indicating a hazardous condition. Although it is desirable to sense the occurrence of a hazardous condition, and it is desirable to sound an alarm when the hazardous condition has occurred, it would also be desirable to prevent a hazardous condition in the first place. If no person is present to promptly respond the alarm, the hazardous condition continues. The device of the present invention turns off a stove when no human presence has been detected for a predetermined period of time, such as seven (7) minutes.

[0019] Knutson patent '909 discloses a device that shuts off electric power to a kitchen range, through alteration of the cooking appliance itself. Shutting off power or fuel source to the appliance has previously been disclosed in the related art, by altering the mechanics of the appliance, which can be a time consuming and expensive procedure. Altering the appliance can also render it less efficient. The device of the present invention does not alter the appliance and is easily installed to any kitchen stove. The present invention can be uninstalled, subsequently, and taken with the owners to their new home to be reinstalled to a different cooking appliance.

[0020] The safety devices of the related art use differing sensing mechanisms to identify the presence of an appliance operator. Vaillancourt patent '188 and Rak patent '413 uses motion indicators or detectors rather than the type of infrared sensor, transmitter/detector, found in the present invention. Motion detectors of these related art inventions have the disadvantage of picking up motion from varying sources in addition to the appliance operator, including children and pets.

[0021] Safety devices utilizing an infrared sensor adapted to sense the presence of a an appliance operator near an electric stove are known in the related art. Ekblad patent '913, Graham patent '985, Vaillancourt patent '188, and Rak patent '413 all relate to electric stoves, and they all sense the presence of a person, the user or appliance operator, near the electric stove. They all have a timer that is set by the user of the stove and begins to run when that person is not sensed in the presence of the electric stove. All of these patented inventions turn off the electric power to the stove when the operator has not been sensed near the stove for a predetermined period of time. However, these patents utilize the more widely used passive infrared (PIR) motion sensor, which does not actively emit any signal. Vaillancourt patent '188 implies that it uses an active infrared sensor but does not disclose how it works to detect a person. The present invention in its preferred embodiment uses a Sharp brand GP2Y0A02YK sensor which is an active sensor, a detector/transmitter, emitting an infrared beam of light detected as it reflects off of an object. The PIR sensor, attempting to detect long wavelengths of radiated heat from a human body, is easily saturated by radiated heat of similar wavelength from a cooking appliance, such as a stove, which then masks, and defeats, its ability to detect appliance operator. An additional advantage of the present invention utilizing the active sensor is that it is narrowly focused above and perpendicular to the cooking appliance's radiation direction in the preferred

embodiment, and therefore less likely to receive radiation from a stove than a PIR sensor, which typically has a broader detection angle.

[0022] Another crucial disadvantage in Ekblad patent '913, Graham patent '985, Vaillancourt patent '188, and Rak patent '413 is that the predetermined period of time to detect the presence of the appliance operator is set and reset for each one of these devices by the appliance operator or by various appliance operators for the same appliance. Therefore, in each of these cases the predetermined period of time could be different each time the stove, or another cooking appliance, is subsequently used, thus creating a hazardous situation if the timer isn't set properly or consistently. For instance, if the appliance operator inadvertently turns the appliance on (for example, by returning to the kitchen and briefly moving past the stove), after having left the stove's operation understanding that the sensor would turn the stove off, the stove, or other cooking appliance would begin to cook again. In the case of the Rak '413 patent, an intervening operator could reset the appliance for a time period unexpected by a later operator.

[0023] Ekblad patent '913 proposes a device for use in conjunction with a stove which enables operation of a stove when an appliance operator is in the area of the stove, and temporarily disables the stove for a predetermined time after the appliance operator leaves the area of the stove. Operation is automatically re-enabled when the appliance operator returns a first time; however, thereafter the appliance operator must reset the device upon his or her return to the stove. The operation of this patent has the disadvantage in that it creates a hazardous situation whereby the stove might inadvertently return to "on" state before cooled to a safe temperature or unbeknownst to the user. Human error causes the hazardous situations to occur, such as leaving the stove unattended, forgetting to set the timer, or forgetting to turn the device on or off.

[0024] Graham patent '985 also proposes a detector device built into a stove by a manufacturer to perform generally similar function of disabling the stove when it is left unattended for more than a given period. However, installation of this element is cost prohibitive and can interfere with the operation of the stove. Graham patent '985 cuts off power to the entire operation of the cooking appliance. As well, the current manufacturing situation leaves those stoves already manufactured and installed in homes without a safety shutoff device. The Rak '413 patented invention weighs an inconvenient seven pounds.

[0025] Canadian Patent Application No. 2,152,015 to Vaillancourt discloses a safety device, which may be either incorporated into or used in conjunction with a stove for detecting the absence of an operator and some other condition such as excessive heat, or the activation of a heating element, and in response, cutting power to the stove. The specification suggests that heat output from the stove may be reduced rather than cut off, but Canadian Vaillancourt '015 application does not disclose a means of achieving such a result.

[0026] Japanese Patent Publication, No. 02279925, also discloses a device that detects both the presence of a user and heat from the stove, and controls a stove operation accordingly. Again, this device has the same disadvantage of other inventions, a sensor that is limited to motion detection

and its attendant problems and being susceptible to the radiant heat of a stove; which sensors are built into the cooking appliance by the manufacturer as set forth above. Additionally, the Japan '925 patent, does not disclose how it reduces the electrical power to a stove; it merely measures the number of amperes drawn from the appliance.

[0027] Devices which are built into a cooking appliance, such as a stove, have the disadvantage that they can only practicably be installed as original equipment in a new stove. Furthermore, some of the built in devices disclosed in the above patents, such Graham '985 patent, share with the add-on devices the severe disadvantage that cutting off power to the cooking appliance (or even substantially reducing it) which will disable or cause malfunction in the clocks or timers almost invariably incorporated in domestic cooking stoves. The device of the present invention does not disable appliance clocks, timers, or other factory displays on the stove control panel.

[0028] Another critical element found in the present invention that is missing in Hoellerich patent '994, Chen patent '670, Knutson patent '909, Graham '985 patent, and other related art devices in the market is the microcontroller unit (MCU) element of the present invention, that provides an integral interrelationship between the control module element governing the power to the cooking appliance and the sensory module element governing the monitoring of the cooking appliance operation. As well, the Ekblad '913 patent refers to logic circuitry which is notably poor at managing continuous process controls. Vaillancourt patent '188 provides a logic circuit, and Rak patent '413 suggests a microcontroller, as well, without, in either patent, explaining how the motion detector, timer, current sensor, power control, relay, and other peripheral assemblies or elements achieve a means for integrally functioning and operating. The function of the Rak '413 patent does not include an elapsed cooking timer of the present invention, or a cooking status indicator.

[0029] The device of the present invention is an after-factory unit that shuts off power to the cooking appliance, disabling, for example the heating elements of stove burners, by blocking the electrical current to the cooking mechanism of the appliance through the use of control and sensor modules. A solid-state power relay of the present invention is preferred to a mechanical relay found in related art, such as Graham patent '985, for several reasons:

[0030] 1) the solid state power relay can be driven directly by a micro processor or microcontroller (MCU) without an external driver;

[0031] 2) the solid state power relay switches power on and off silently; and

[0032] 3) the solid state power relay has an almost infinite switching life

[0033] The device of the present invention has the predetermined time period set at the factory by the manufacturer during production of the device, which element becomes active every time the cooking appliance is turned on by the appliance operator. Once the cooking appliance is turned off by the device of the present invention, it cannot be inadvertently turned on. Only an advertent, heedful action by the appliance operator will cause the cooking appliance to

operate again. None of the other inventions in the related art teach or even suggest this novel and critical function of the present invention.

SUMMARY OF THE INVENTION

[0034] It is an object of the present invention to not change the working of the cooking appliance nor require any action from the operator to activate the device after it is installed with the appliance. The distance measuring unit in the present invention is attached to the cooking appliance; for example, to a range console; or on the wall above the cooking appliance. A power line wire comes from the device to the outlet where the stove is otherwise connected. This device can be connected to either end of the electrical cord pigtail at a range or stove, and will shut off the power to oven burners that are operating (or on) if the distance-measuring unit fails to detect human presence around the appliance after a certain amount of pre-determined time set in the microcontroller (MCU).

[0035] This device consists of two modules: a control module is placed between the wall outlet and the stove, and the other module is placed on top of the stove and connected to the control module via a cable. Installation of the device consists of plugging a module into the electrical socket, plugging the stove into the module and attaching the distance measuring sensor module either to the stove control panel or directly on the wall behind the stove, with provided clamp. In the case of a power outage, the MCU unit would not allow current to the "on" burner unless it also detected a human presence when the power resumed.

[0036] The device has a distance measuring sensor element that is attached to the cooking appliance, for example, to a range console, or on the wall above the cooking appliance. The distance measuring sensor is different than a motion detector. A motion detector has the disadvantages of a wide angle of range, and its efficiency is subject to disruption by the radiating heat of the stove. For example, the cooking appliance operator could be out of the appliance area, and a pet or toddler could be in the vicinity thus the cooking appliance would remain on because the motion detector, monitoring movement of the pet or toddler, had not discovered an absence. As well, the act of cooking can cause a motion detector to remain in an on status.

[0037] The distance measuring sensor element is not sensitive to the heat of the stove and detects a human presence within five feet in front of the stove and within a narrow angle directly in front of the distance sensor, which is placed on the stove control panel or on the wall behind the stove. The distance-measuring sensor only detects a human presence when the human is standing directly in front of the stove. This narrow range and short distance from the stove prevents the device from being tricked by other non-cooking activity like a pet wandering through the kitchen after the cook has stop attending to the stove.

[0038] Another important feature of this device is MCU count-up cooking timer with a digital display that will tell the cook how long the stove was on before the safety device shut off the stove, the elapsed cooking time. This informs the cook how long the food had already cooked which aids in deciding how much cooking time is required to fully cook the food. This time information can also be interpreted as to the attention of lack or attention given to operating a kitchen stove.

[0039] A primary object of the present invention is that it is designed to automatically cut power to the elements of a stove if the distance measuring sensor does not detect human presence directly in front of the stove within a fixed period of time such as seven (7) minutes. This time period is pre-determined and programmed into the microcontroller at production time. It cannot be reset by the appliance operator.

[0040] The device of the present invention has an override switch. The cooking appliance can be put into override by the appliance operator, evading the safety features of the present invention, at the beginning of a cooking session. The override function will be cancelled automatically when the stove is shut off.

[0041] The above brief description sets forth rather broadly important features of the present invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. Still further objects and advantages of the present invention will become apparent from a consideration of the ensuing descriptions and drawings. It is understood that the present invention is not limited to its application to the details of the construction and to the arrangements of the components or elements set forth in the following description or illustrated in the drawings. The present invention is capable of other embodiments and of being practiced and carried in out various ways. Also, it is to be understood, that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting. Those skilled in the art will appreciate that the conception upon which disclosure is based may readily be utilized as a basis for designing other structures, methods, and systems for carrying out the several purposes of the present invention. The claims herein should be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] Other objects and features will become apparent from the following detailed description taken in combination with the accompanying drawings. However, the drawings are provided for purpose of illustration only, and are not intended as a definition of the limits of the invention.

[0043] FIG. 1 is a block diagram of the safety device for regulating electrical power to a cooking appliance in accordance with the present invention.

[0044] FIG. 2 is a side plan view of a cooking appliance with the safety device for regulating electrical power connected directly to the power source and the cooking appliance in accordance with the present invention.

[0045] FIG. 3 is a side plan view of a cooking appliance with the safety device for regulating electrical power located on the power cable between the outlet power source and the cooking appliance in accordance with the present invention.

[0046] FIG. 4 is a front plan view of the sensor module for detecting the presence of an appliance operator in accordance with the present invention.

[0047] FIG. 5 is a side plan view of the sensor module for detecting the presence of an appliance operator in accordance with the present invention.

[0048] FIG. 5A is a perspective view of the operation of the distance sensor element of the sensor module for detecting the presence of an appliance operator in accordance with the present invention.

[0049] FIG. 6 is an electrical schematic diagram of the circuit of the sensor module in accordance with the present invention.

[0050] FIG. 7 is an electrical schematic diagram of the circuit of the power relay element of the control module in accordance with the present invention.

[0051] FIG. 8 is an electrical schematic diagram of the circuit of the load current sensor element of the control module in accordance with the present invention.

[0052] FIG. 9 is an electrical schematic diagram of the circuit of the power supply element of the control module in accordance with the present invention.

[0053] FIG. 10 is a plan view of the top of the base of the power routing module element of the control module in accordance with the present invention.

[0054] FIG. 10A is a plan view of the top of the jumper block of the power routing module element of the control module in accordance with the present invention.

[0055] FIG. 10B is a plan view of the bottom of the jumper block of the power routing module element of the control module in accordance with the present invention.

[0056] FIG. 10C is a plan view of the side of the jumper block of the power routing module element of the control module in accordance with the present invention.

[0057] FIG. 11 is a logical flowchart illustrating operation of the microcontroller unit of the sensor module to the safety device in accordance with the present invention.

[0058] Similar reference characters denote corresponding features consistently throughout the accompanying drawings.

DETAILS OF THE INVENTION

[0059] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which the preferred embodiment of the invention is shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiment set forth herein. Rather, the illustrative embodiment is provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

[0060] As best shown in FIG. 1, a block diagram, and FIGS. 2 and 3, plan views, the device of the present invention consists of two basic units or modules, as elements: (a) a "control module" 100, placed between a power source 200, such as a wall outlet, and a cooking appliance 300, and (b) a second module, a "sensor module" 400, in a location convenient for observation by an operator 500 of the cooking appliance 300 (a human), adjacent to the appliance 300; for example: securedly attached on top of the cooking appliance 300 with an attachment clip 301 and a plurality of screws 302, or other attaching means, or alternatively, on a counter space adjacent to the cooking appli-

ance **300**, and connected to the control module **100** via a cable **600**. In an alternative embodiment, the sensor module **400** could remotely and wirelessly interact with the control module via radio waves. A common cooking appliance in a household contains a plurality of heating elements **303**, such as burners on a stove.

[0061] As further shown in **FIG. 1** and **FIGS. 4 and 5**, front and side plan views respectively, the sensor module **400** element of the present invention consists of the following additional elements:

[0062] a microcontroller unit ("MCU") **410**

[0063] an infrared distance measuring sensor ("distance sensor") **420**

[0064] a safety override switch ("override switch") **430**

[0065] a multi-colored light emitting diode (LED) cooking status indicator ("cooking indicator") **440**

[0066] a digital display, elapsed cooking timer ("cooking timer") **450**

[0067] As further shown in **FIG. 1**, the control module **100** element of the present invention consists of the following additional elements:

[0068] a power routing module **110**

[0069] a load current sensor ("current sensor") **120**

[0070] a power relay **130**

[0071] a power supply **140**

[0072] As shown in **FIG. 1**, the power source **200** of the preferred embodiment consists of two (2) 120 volt (V) lines of electrical alternating current (ac), standard household electrical current lines, Hot Line A **201** and Hot Line B **202** and a Neutral return line **203**. Hot Line A **201** and Hot Line B **202** run from the power source **200** to the power routing module **110** within the control module **100**. The power routing module **110** is the power routing means for routing electrical current thru a power line, Hot Line **1204** to the power relay **130** and the power supply **140**, and from the power relay **130** to the sensor module **400** and the load current sensor **120**, and ultimately to the cooking appliance **300**; and routes another power line, Hot Line **2205** directly to the cooking appliance **300**.

[0073] As shown in **FIG. 1**, the principal object of the device of the present invention is to provide a means to automatically cut electrical power to a cooking appliance **300** when the distance sensor **420** does not detect appliance operator **500** presence directly in front of the cooking appliance (**300**) within a fixed time period, such as seven (7) minutes. Setting the fixed time period is a common operation performed on solid state electronic devices on the market such as MCU **410**, the microcontroller unit of the present invention. The time periods are determined and programmed into the microcontroller unit at the time of manufacture of the device.

[0074] The elements of the sensor module **400**, depicted in **FIGS. 1 through 5**; the MCU **410**, cooking indicator **440**, and the cooking timer **450**; are commonly known and readily available electronic parts on the electronics market. The MCU **410** is a microprocessor commonly found in

every household in any of numerous electrical devices such as cooking appliances, washing machines, and telephones. The MCU **410** is mass produced and widely used to control a particular systems, composed of a central processing (CPU) core, a memory for programming (ROM), a memory for data (RAM), one or more internal timers, and input/output (I/O) lines to communicate with peripherals (such as the cooking timer, cooking indicator, override switch, distance sensor, power relay and load current sensor), all in a single integrated circuit. MCUs also can have a variety of I/O devices, such as analog-to-digital converters and timers. Commonly these integrated devices can be controlled by specialized instructions to the MCU **410**, as in the preferred embodiment.

[0075] In the preferred embodiment, the cooking indicator **440** is a bi-color light emitting diode, commonly available on the market, such as the Lite-On brand LTL-30EHJ. The cooking timer **450** is the digital display controlled by the timing mechanism of the MCU **410**.

[0076] As shown in **FIG. 1**, the sensor module **400** element of the present invention by operation of its MCU **410** integrated with, and monitoring and responding to, the other elements of the sensor module **400** functions to govern the elements of the control module **100**, by directing the power relay **130** of the control module **100** to cut electrical power from the power source **200** automatically to the heating elements **303** of a cooking appliance **300** (for example, to the burners of a stove) if the distance sensor **420** does not detect presence of the operator **500** directly in front of the appliance within a predetermined period of time, for example seven (7) minutes, a period of time as found appropriate for the particular cooking appliance. This predetermined period of time is programmed into the MCU **410** by the manufacturer during production of the cooking appliance **300**. The predetermined period of time is not manually set or manually adjusted. A consumer, the cooking appliance operator **500**, cannot adjust this period of time, and only can override the monitoring functions of the device by use of an override switch **430** element to the present invention. Therefore, once the device of the present invention turns the cooking appliance **300** off it cannot be inadvertently turned on, an important and novel safety feature of the present invention.

[0077] As further shown in **FIG. 1** and in **FIG. 6**, an electrical schematic diagram, the MCU **410** of the sensor module **400** of the present invention monitors and responds to the output of the distance sensor **420**, as well as the cooking timer **450**, the cooking indicator **440** and the override switch **430**. In the preferred embodiment, the MCU **410** uses its own internal analog-to-digital converter (ADC) to monitor output from the distance sensor and other elements of the sensor module **400**, said converter commonly found within MCUs on the market. In alternative embodiments, the MCU **410** can use an on-board comparator or an external comparator to monitor output from the distance sensor **420**. Where the ADC is used, software or "firmware" code is be written by the manufacturer to read the analog voltage output of the distance sensor **420**.

[0078] As best shown in the plan views of **FIGS. 2-3** and **5A**, a perspective view, of the preferred embodiment, the distance sensor **420** measures the presence of a cooking appliance operator **300** in a planar, arced area, within a

distance of five feet (5') and a five degree (5°) to degree (10°) angle (a predetermined sensor space 421 or arc) in front of the cooking appliance 300. The distance sensor 420 element of the present invention is an infrared detector/transmitter, emitting and receiving infrared rays, available on the electronics market, such as a Sharp brand distance sensor, model GP2Y0A02YK.

[0079] The threshold level, the sensor space 421 depicted in FIG. 5A, at which the distance sensor 420 determines that the operator 500 is close enough to be operating the cooking appliance 300, such as a stove, is also written into software code for the MCU 410 by the appliance manufacturer, a common feature of distance sensors available on the market. In an alternative embodiment, where a comparator is used (either in the MCU 410 or off chip), a potentiometer or resistor voltage divider, commonly found in comparators on the market, is used to set a threshold voltage at which an operator 500 is determined to be within the acceptable range of the cooking appliance 300.

[0080] FIG. 6 depicts an electrical circuit schematic diagram of the sensor module 400 circuit, one embodiment of the current invention. Components used in the sensor module 400 circuit, depicted in FIG. 6, commonly known and readily available electronic parts on the electronics market, consist of grounds 401, two (2) 180 ohms (Ω) resistors 402 to limit current to the cooking indicator, a 10K Ω resistor 403, a pull-up resistor for the override switch, and a 0.1 microfarad (μ F) capacitor 404 between ground and the MCU to guard against power surges. Additional elements discussed above within the sensor module 400 are also depicted in FIG. 6, including the MCU 410, the distance sensor 420, the override switch 430, the LED cooking indicator 440, having in this embodiment the colors red and green, the LCD cooking timer 450 and the override switch 430, depicted in this embodiment by single pole single throw switch (SPST).

[0081] As shown in FIG. 1, the MCU 410 element of the present invention is a power controlling means for controlling the power to the cooking appliance 300. The MCU 410 directs the functioning of the control module 100 in accordance with the readings from the load current sensor 120, the distance sensor 420, and the override switch 430, depicted in FIG. 1. As best shown by FIGS. 1 and 6 together, the MCU 410 element of the sensor module 400 also monitors the load current of a cooking appliance 300, such as a stove, being powered by the electrical power source 200. The MCU 410 is the element of the sensor module 400 that responds to the output of the distance sensor 420 to activate the power relay 130 which automatically cuts the electrical power from the power source 200 to the cooking appliance 300 through a solid-state make of power relay 130 controlling a power circuit to the cooking appliance 300, when the MCU 410 determines through the distance sensor 420 that the cooking appliance operator 500 has not come within the sensor space 421. In other words, the operator 500 has not come near enough to check on the status of the cooking appliance 300, as determined by the infrared output of the distance sensor 420, connected to the MCU 410, within the predetermined period of time, set by the cooking appliance manufacturer.

[0082] Additionally, as shown by FIGS. 1 and 6, the MCU 410 monitors activation of the safety override switch 430 (a single pole single throw (SPST) switch commonly

known and readily available in the market) located in the control module 100, that interfaces with the LED cooking indicator 440 and the cooking timer 450, all elements of the present invention. When the override switch 430 is depressed or activated by the cooking appliance operator 500, the MCU 410 allows the cooking appliance 300 to operate on its manual state as a normal appliance, with no automatic power shut-off, until the cooking appliance 300 has been turned off manually by the operator 500 (depicted in FIGS. 2 and 3) at which time the safety features of the device of the present invention are re-implemented or re-initiated. The override switch 430 is any type of momentary acting switch available in the market, mounted on the sensor module 400. The MCU 410 monitors the override switch 430 by waiting for a voltage change, indicating that the override switch 430 is activated. Once voltage is detected, the MCU 410 switches into an "override" mode, allowing the cooking appliance 300 to operate without the safety control of the MCU 410.

[0083] As best shown in FIG. 6, the cooking indicator 440 has a plurality of color phases and changes color and/or flashes, depending on the load current mode to the cooking appliance 300 or on the status of the function of the device, further described below. A three (3)-leaded, two color, red/green LED cooking indicator 440 is used in the preferred embodiment of the present invention to indicate electrical power status of the invention. Two (2) anodes of the cooking indicator 440 are connected to two (2) input/output (I/O) pins of the MCU 410 through the two 180 Ω resistors 402, and the single cathode of the cooking indicator 440 is tied to the ground 401. Each color of the cooking indicator is turned on, off, or toggled on and off, depending on the current state of the MCU 410.

[0084] The cooking timer 450 element displays the elapsed time since the start of power-up of the cooking appliance 300; for instance, of one or more of a stove's burners. It will continue to register or count up time on its digital cooking timer 450, as depicted in FIG. 4 until either the cooking appliance 300 is manually shut off or the MCU 410 automatically shuts off electrical power 200 to the cooking appliance 300, due to the absence of the appliance operator 500. If the MCU 410 shuts the cooking appliance 300 off (because no operator 500 came by to check on the appliance within the pre-determined time period), the elapsed time prior to automatic shut-off will remain displayed on the cooking timer 450 until the cooking appliance 300 is manually shut off.

[0085] Several different digital display types and interfaces can be used in different embodiments of the present invention for the cooking timer 450, to display the elapsed cooking time of the cooking appliance 300. In the preferred embodiment of the present invention, the MCU 410 is chosen which has a built-in digital driver, a compatible display with at least four (4) digits, commonly available on the market, as depicted in FIG. 4. Alternative embodiments where the MCU 410 does not have a built-in digital drive include the following: an MCU to configure sixteen (16) pins for binary coded decimal (BCD) output and connect them to four (4) BCD-to-seven (7) segment decoder/drivers, that can then drive either a digital display. Another alternative embodiment uses an LCD character module, which takes four (4) or eight (8) data lines plus three (3) control

lines. All of these alternative embodiments include commonly known and readily available electronic parts in the market.

[0086] Elements, shown in FIG. 1, within the control module 100 of the present invention—the load current sensor 120, the power relay 130 and the power supply 140—are commonly known and readily available electronic parts in the electronics market. The solid-state type power relay 130, monitored by the MCU as referenced above, controls power to the cooking appliance 300, such as to the burners of a stove. The MCU 410 will frequently switch the power relay 130 on and off to check for load current. If a mechanical relay were used, the relay would wear out much sooner and would make much more noise.

[0087] FIG. 7 depicts an electrical circuit schematic diagram of the power relay 130 circuit, of one embodiment of the circuit of the power relay 130 element of the current invention. As discussed above, the MCU 410 is the element of the sensor module 400 that controls the power to the cooking appliance 300 through the power relay 130, activating the power relay 130 to automatically cut off power to the cooking appliance 300 when the MCU 410 determines that the cooking appliance operator 500 has not come within the sensor space 421. The power relay 130 is a commonly known and readily available solid state relay, electronic part in the market. Components of the power relay 130 include load 1 input and 2 output current terminals (131 and 132 respectively), line 1131 from the power routing module 110 and line 2132 to the load current sensor 120, and two control terminals, the + current terminal 134 from the MCU 410, a – terminal to ground 401. The power relay is surrounded by a heat sink 133, to dissipate heat from operation of the power relay 130.

[0088] FIG. 8 depicts an electrical circuit schematic diagram of the load current sensor 120 circuit, of one embodiment of the current invention. The MCU 410 element monitors the load current of the cooking appliance 300 by use of the load current sensor 120 element located within the control module 100 of the device of the present invention. Current load sensors are commonly known and readily available electronic parts on the electronics market, such as an Amveco/Talema brand AC-1020 current sensor transformer. Output from the load current sensor 120 transformer 121 is rectified (converting alternating current (ac) to direct current (dc) current) and filtered so that the MCU 410 can measure a dc voltage between approximately 0.2 volts (V) dc and 4.7 V dc.

[0089] As shown in FIG. 8, additional components used in the load current sensor 120 element, commonly known and readily available electronic parts on the electronics market, include a filter capacitor 122, a resistor 123 to control the time constant of the circuit, the current sensing transformer 121, a Schottky diode 124 to convert ac into dc current, and a zener diode 125 to limit the voltage. The capacitance is adjusted by the manufacturer in accordance with the cooking appliance 300. V sense 126 is the voltage to the MCU 410. In the best mode of the present invention, the capacitor 122 signal is adjusted by the manufacturer to hold at least eighty percent (80%) of peak voltage value from one cycle to the next (17 milliseconds at 60 Hz), but decaying down to a relatively low value within 10 cycles (170 ms).

[0090] FIG. 9 shows the power supply 140 element of the control module 100 to the preferred embodiment of the

present invention. The function of the power supply is to provide the MCU with a fixed 5V power supply. Components used in the power supply 140 element, depicted in FIG. 9, commonly known and readily available electronic parts on the electronics market, include a bridge rectifier 141 to convert ac signals to dc signals, a 0.75 amperes (A) resettable fuse 142, a 12 volt (V) transient voltage suppressor (TVS) diode 143 to filter out voltage spikes, a 0.33 microfarad (μ F) capacitor 144 to filter output voltage, a ground 401, a 7805 V voltage regulator to maintain a steady voltage, a 1N 4002 diode 147 protecting the voltage regulator, a 0.1 microfarad (μ F) capacitor 148, and a transformer 149 to transfer high voltage to low voltage.

[0091] FIGS. 10A-10D show plan views of the makeup of the power routing module 110 element to the control module 100 in the device of the present invention. The power routing module 110 properly routes 120V line service to establish proper circuits to the device. FIG. 10 shows a top view of a base 111, of the power routing module 110 having four (4) terminals. Hot line A 201 is connected to Terminal 1112, hot line B 202 is connected to terminal 3113, hot line 1204 is connected to terminal 2114, and hot line 2205 is connected to terminal 4115. A threaded screw hole 116 is provided for fastening a jumper block 117. FIG. 10A shows a top view of the jumper block 117 of the power routing module 110, a threaded screw insert 118, and a screw handle 119, to fasten the jumper block 117 to the base 111 by inserting the threaded insert 118 into the screw hole 116 by manipulation of the screw handle 118. FIG. 10B shows a bottom view 701 of the jumper block 700 having two (2) flexible metal jumpers 702 and fastening screws 703 for fastening the metal jumpers 702 to the bottom of the jumper block 701. FIG. 10C is a side view of the top 117 and the bottom 701 of the jumper block.

[0092] In the preferred embodiment of the invention, the jumper block top 117 and bottom 501 of the power routing module 110 are inserted and screwed into the base 111 in an orientation where jumpers 702 short terminals 1 to 2 (112 and 114 respectively) and terminals 3 to 4 (113 and 115 respectively), sending Line A 201 to Line 1204 and Line B 202 to Line 2205. In an alternate embodiment, the jumper block top 117 and bottom 501 are inserted and screwed into the base 111 in an orientation so that jumpers 702 short terminals 1 to 4 (112 and 115 respectively) and terminals 2 to 3 (114 and 113 respectively), sending Line A 201 to Line 2205 and Line B 202 to Line 1204.

[0093] The device of the present invention functions or operates in one (1) of five (5) following modes or states through the sensor module 400, by the MCU 410 as depicted in the flowchart, FIG. 11:

[0094] “Off State 441”

[0095] “Ready State 442”

[0096] “On State 443”

[0097] “Timed-Out State 444”

[0098] “Override State 445”

[0099] The different states and the operations of the MCU 410 in conjunction with the monitoring device elements of the present invention are best shown by FIGS. 1 and 11 together. In the Off State 441, indicated by a flashing green LED of the cooking indicator 440, the control module 100

is powered by the power source **200** but the power relay **130** supplying power to the cooking appliance **300** has not yet been turned on, indicating no human presence is detected (“Operator Presence Detected?”**422**). The MCU **410** is monitoring the distance sensor **420**, checking for presence of the operator **500**. Once the distance sensor **420** detects the presence of the operator **422**, the MCU **410** turns on the cooking appliance **300** power relay **130**, and the cooking indicator **440** goes to the Ready State **442**, indicated by a green LED of the cooking indicator. In the preferred embodiment, the MCU **410** software code developer programs the MCU **410**, standard procedure during manufacture, to make several “positive” readings from the distance sensor **420** for detecting operator presence **422** before continuing to the Ready State **442**.

[0100] As shown in FIG. 1, in the Ready State **442**, indicated by a steady green LED on the cooking indicator **440**, the MCU **410** monitors the override switch **430** and the load current sensor **120** to the cooking appliance **300**. If the MCU **410** detects activation of the override switch (“Override Switch On?”**430**), the MCU **410** goes to the Override State **445**. If the load current sensor **120** detects a load current (Load Detected?”**150**), the MCU **410** goes to the On State **443**.

[0101] While in the Ready State **442**, the MCU **410** monitors the load current by doing analog-to-digital conversions of the voltage coming from load current sensor **120** circuit. Prior to production of the device of the present invention, the preferred embodiment includes having tests or readings performed on several makes of cooking appliances, such as stoves, to determine what sort of voltages the appliance operator **500** should expect at various appliance **300** power settings. From these tests, the manufacturer of the cooking appliance **300** then writes software code for the MCU **410**, allowing the MCU **410** to determine if the cooking appliance **300** elements **303**, such as stove burners, are on and at approximately what level of voltage. This is a function commonly performed by manufacturers of load current sensor **120** devices available on the market, to properly calibrate this device.

[0102] The On State **443** can be designed for one of two functions: (1) a “Fixed Time-Out Period,” as in the preferred embodiment, or (2) a “Variable Time-Out Period,” an alternate embodiment. Either function may be produced simply by changing the software in the MCU **410** at production time, commonly accomplished by a manufacturer of the device.

[0103] Continuing in FIG. 11, in the On State **443**, for the Fixed Time-Out Period, indicated by a steady green LED on the cooking indicator **440**, the MCU **410** starts counting up the elapsed cook time (“Elapsed Cook Time Starts”**451**) on the digital display of the LCD to the cooking timer **450**, to display the amount of time food has been cooking. The MCU **410** also starts an internal timer counting down from (or up) to a factory-programmed fixed period of time, such as seven (7) minutes, during which the cooking appliance operator **500** is absent from the pre-programmed sensor space **421** in front of the cooking appliance **300**, by use of the distance sensor **420**. At the same time, the MCU **410** monitors the override switch **430** for activation **431**. If the distance sensor **420** detects the appliance operator **422** within the sensor space **421**, the MCU **410** resets the internal

counter and starts counting down the fixed time period again. If the MCU **410** detects activation of the override switch **431**, the MCU **410** goes to the Override State **445**. If the internal counter expires without detecting either activation of the override switch **431** or presence of an operator **422**, the MCU **410** goes to the Timed-Out State **444**.

[0104] Continuing with FIG. 11, when in operation, the MCU **410** element of the present invention controls the power relay **130** of the control module **100** which controls flow of electrical power from the power source **200** to the cooking appliance **300**. The absence of human presence (the cooking appliance operator **500**) **422** at the appliance **300** within the sensor space **421** in front of the appliance **300**, as monitored by the distance sensor **420** to the MCU **410**, determines whether the cooking appliance **300** stays in the On State **443**. Therefore, if the time period within the MCU **410** expires before detecting operator presence **422**, the MCU **410** turns off the power relay **130**, causing the control module **100** to cut off primary power **200** to the cooking appliance **300**. The MCU **410** is validated during production to receive several positive readings (of presence of a human) from the distance sensor **420** over several seconds before establishment of a resetting time to the internal counter.

[0105] Activation of the override switch **431** of the present invention during the operation of the cooking appliance **300** causes the MCU **410** to disable the distance sensor **420** of the MCU **410** and allow for unmonitored operation of the cooking appliance **300**.

[0106] Referring again to FIG. 11, no load current readings **150** are required in the Fixed Time-Out Period version of the On State **443**. Therefore, in the case of those cooking appliances, such as stoves that periodically cycle “on and off,” particularly older production models, the MCU **410** will not inadvertently shut the appliance **300** at the same time.

[0107] An alternate embodiment of the present invention provides for the Variable Time-Out period. In the On State **443** for this embodiment of the present invention, this state indicated by a steady green LED on the cooking indicator **440**, the MCU **410** starts counting up the Elapsed Cook Time **451** on the digital display to the cooking timer **450**. It also starts an internal timer counting down (or up) to a factory-programmed variable length of time, as above, but dependent upon the load current measured. If the MCU **410** measures a relatively low load current, it sets a longer time period for a Timed-Out State **444** to occur, and shorter lengths of time for progressively higher load currents. If the load current is changed significantly by the operator **500**, the timer would be reset to the time associated with the new current load.

[0108] Returning to FIG. 11, in the Timed-Out State **444** for the present invention, indicated by a flashing red LED by the cooking indicator **440**, the MCU **410** turns off the power relay **130** to the control module **100**, cutting power from the power source **200** to the cooking appliance **300**, and to its heating elements **303**, for example, to stove burners. The LCD digital display of the cooking timer **450** shows the elapsed cooking time from when the cooking appliance **300** was turned on (Elapsed Cook Timer Starts **451**), continuing so long as the cooking appliance **300** is on, and stopping (Elapsed Cook Timer Stops **452**) and remaining static in the Timed-Out State **444**, when the MCU **410** cut power to the

cooking appliance **300**. The cooking timer **450** reading allows the appliance operator **500** to know how long the food has been cooked prior to shut-off of the cooking appliance **300**. This cooking timer **450** reading will not change until the cooking appliance **300** is manually shut off or the override switch **430** is depressed. Upon returning to the cooking appliance **300**, the appliance operator **500** would have an indication of how much longer the food needs to cook to be ready.

[0109] If the MCU **410** detects the override switch **430** at any time while in the Timed-Out State **444**, it turns on the power relay **130** and goes to the Override State **445**, allowing manual operation of the cooking appliance. While in the Timed-Out State **444**, the MCU **410** regularly, but only for brief periods, turns on the power relay **130** and checks for any load current through the load current sensor **120**. If the load current sensor **120** detects any load current, the MCU **410** remains in the Timed-Out State **444**. This mechanism of the present invention effectively verifies whether control knobs of the cooking appliance **300** are turned off, but it does not allow enough power through the control module **100** to the cooking appliance **300** to do any significant heating to the cooking appliance **300**, such as the heating elements **303**, if they are still on. Once the MCU **410** determines that there is no load current, for example, indicating that all control knobs on the cooking appliance **300** have been turned off, the MCU **410** goes to the Off State **445**, and the cooking timer **450** resets (Elapsed Cook Timer Resets **453**) to zero.

[0110] The Override State **445** in the present invention, indicated with the steady red LED by the cooking indicator **440**, allows continuous operation of the cooking appliance **300** without monitoring the presence of a human (appliance operator **500**) nearby, as set forth above. The digital display to the cooking timer **450**, already showing any elapsed time that the cooking appliance **300** has been on, will restart during the Override State **445** to display total elapsed cooking time. The device will remain in the Override State **445** as long as the MCU **410** detects a load current, indicating that the stove is in use. Once the MCU **410** detects no load current, it goes to the Off State **441**.

[0111] When the MCU **410** determines that the cooking appliance **300** has been shut off its manual controls, the MCU **410** will switch to the Off State **441**, causing power to be cut from the power source **200** to the cooking appliance **300**. The visual indication of this would be the LED of the cooking indicator **440**, which will change from red to flashing green.

[0112] There are other alternative embodiments of the present invention with variations to the structure of the preferred embodiment and from the basic function described above. In one alternative embodiment, the time-out duration of the MCU **410** maybe varied based on the level of load current measured to the cooking appliance **300**. In this embodiment, the MCU **410** is programmed at the factory to allow longer time-out duration if the load current is low, and/or to allow a shorter duration for a high load current. Another embodiment of the present invention has differing settings to the distance sensor **420** to accommodate differing kitchen settings and layouts.

[0113] The device of the present invention functions to automatically shut off power to the electrical cooking appliance **300**, such as a stove or kitchen range, when unattended

for a set amount of time whether the cooking appliance **300** is turned on intentionally or unintentionally. Alternative embodiments of this device could be adapted to other cooking appliances, such as toaster ovens, electrical frying pans, and to the on and off valve of a gas range. In another alternative embodiment, the distance sensor **420** could be mounted remotely and use a radio frequency (RF) transmitter or transceiver to transmit information back to the sensor module **400**. The distance sensor **420** could be powered either by battery or by electrical power from an available wall outlet. This technology is readily available today and could allow for more flexibility to the distance sensor **420** mounting location.

[0114] While this invention has been described as having a preferred design, it is understood that it is capable of further modifications, uses and/or adaptations following in general the principle of the invention and including such departures form the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features set forth and fall within the scope of the invention or the limits of the appended claims.

What is claimed:

1. A safety device for regulating electrical power to a cooking appliance, said device comprising:

- (a) an electrical power source providing an electrical current;
- (b) a control module regulating the electrical current from said electrical power source to said cooking appliance;
- (c) said control module connectedly interposed between said cooking appliance and said electrical power source, said control module integrally and connectedly comprising a power routing means, a power supply means, a power relay means, and a load current sensing means;
- (d) said power routing means for routing the electrical current from the electrical power source to said power relay and to said power supply;
- (e) said power supply means for supplying the electrical current to a sensor module;
- (f) said power relay means for controlling the electrical current to the cooking appliance enabling said cooking appliance to operate by producing said electrical current and disabling said cooking appliance by preventing said electrical current;
- (g) said load current means for detecting a load current to said cooking appliance;
- (h) said sensor module located remotely from and connected to said control module, governing the production of the electrical current to the cooking appliance from the control module;
- (i) said sensor module integrally and connectedly comprising a monitoring means, a distance sensing means, a timer means, and a light emitting means;
- (j) said sensor module being positioned adjacent to said cooking appliance for observation by said appliance operator;

- (k) said monitoring means for integrally controlling the distance sensing means, the timer means, and the light emitting means;
 - (l) said monitoring means being responsive to outputs of the distance sensing means for overriding the control module, the timer means, the light emitting means, and the load current means;
 - (m) said monitoring means being connected to the power relay means and including a means for activating said power relay means;
 - (n) said distance sensing means for detecting the presence of the appliance operator within a predetermined arc in front of said cooking appliance;
 - (o) said power relay means responding to the monitoring means;
 - (p) said monitoring means further including a timer assembly programmed for a predetermined period of time for responding to the distance sensing means detecting the presence of the appliance operator, on expiry of which the monitoring means activates the power relay means to automatically cut the electrical power to the cooking appliance;
 - (q) said timer means for displaying an elapsed cooking time;
 - (r) said light emitting means for indicating electrical power routing to the cooking appliance;
 - (s) said monitoring means having a means to re-initiate the sensor module when the cooking appliance is manually re-activated by the appliance operator; and
 - (t) whereby the safety device regulates the electrical power to said cooking appliance.
2. The safety device of claim 1 wherein said timer means includes a liquid crystal digital display.
3. The safety device of claim 1 wherein said light emitting means is a light emitting diode having a plurality of color indicators.
4. The safety device of claim 1 wherein said distance sensing means is an infrared sensing means actively emitting and receiving infrared rays.
5. The safety device of claim 1 wherein said monitoring means is a microcontroller.
6. The safety device of claim 1 wherein the load current sensing means is a load transformer rectified for converting alternating current to direct current.
7. The safety device of claim 1 wherein said monitoring means further includes a timer assembly programmed for varying periods of times responding to the distance sensing means, integrally relating to varying output of the load current means.
8. The safety device of claim 1 further including a means for overriding said control module, disabling the sensor module until the cooking appliance is manually re-activated by the appliance operator;
9. The safety device of claim 8 wherein the means for overriding the control module is a single pole single throw momentary override switch.

10. A method of regulating electrical power to a cooking appliance, said method comprising:

- (a) using an electrical power source providing an electrical current;
- (b) providing a control module which regulates the electrical current from said electrical power source to said cooking appliance;
- (c) interposing said control module connectedly between said cooking appliance and said electrical power source, said control module integrally and connectedly comprising a power routing means, a power supply means, a power relay means, and a load current sensing means;
- (d) using said power routing means for routing the electrical current from the electrical power source to said power relay and to said power supply;
- (e) using said power supply means for supplying the electrical current to a sensing module;
- (f) using said power relay means for controlling the electrical current to the cooking appliance enabling said cooking appliance to operate by producing said electrical current and disabling said cooking appliance by preventing said electrical current;
- (g) using said load current means for detecting a load current to said cooking appliance;
- (h) locating said sensor module remotely from and connected to said control module, to govern the production of the electrical current to the cooking appliance from the control module;
- (i) having said sensor module integrally and connectedly comprising a monitoring means, a distance sensing means, a timer means, and a light emitting means;
- (j) positioning said sensor module adjacent to said cooking appliance for observation by said appliance operator;
- (k) using said monitoring means for integrally controlling the distance sensing means, the timer means, and the light emitting means;
- (l) making said monitoring means said responsive to outputs of the distance sensing means for overriding the control module, the timer means, the light emitting means, and the load current means;
- (m) connecting said monitoring means to the power relay means and including a means for activating said power relay means;
- (n) using said distance sensing means for detecting the presence of the appliance operator within a predetermined arc in front of said cooking appliance;
- (o) using said power relay means responding to the monitoring means;
- (p) having said monitoring means further include a timer assembly programmed for a predetermined period of time for responding to the distance sensing means detecting the presence of the appliance operator, on expiry of which the monitoring means activates the

power relay means to automatically cut the electrical power to the cooking appliance;

(q) using said timer means for displaying an elapsed cooking time;

(r) using said light emitting means for indicating electrical power routing to the cooking appliance;

(s) including said monitoring means having a means to re-initiate the sensor module when the cooking appliance is manually re-activated by the appliance operator; and

(t) whereby the safety device regulates the electrical power to said cooking appliance.

11. The safety device of claim 10 wherein said timer means includes a liquid crystal digital display.

12. The safety device of claim 10 wherein said light emitting means is a light emitting diode having a plurality of color indicators.

13. The safety device of claim 10 wherein said distance sensing means is an infrared sensing means actively emitting and receiving infrared rays.

14. The safety device of claim 10 wherein said monitoring means is a microcontroller.

15. The safety device of claim 10 wherein the load current sensing means is a load transformer rectified for converting alternating current to direct current.

16. The safety device of claim 10 wherein said monitoring means further includes a timer assembly programmed for varying periods of times responding to the distance sensing means, integrally relating to varying output of the load current means.

17. The safety device of claim 10 further including a means for overriding said control module, disabling the sensor module until the cooking appliance is manually re-activated by the appliance operator;

18. The safety device of claim 17 wherein the means for overriding the control module is a single pole single throw momentary override switch.

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