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Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:
— *with international search report (Art. 21(3))*

(54) **Title:** APPARATUS AND METHOD FOR POSITIONING A COOKING INSTRUMENT

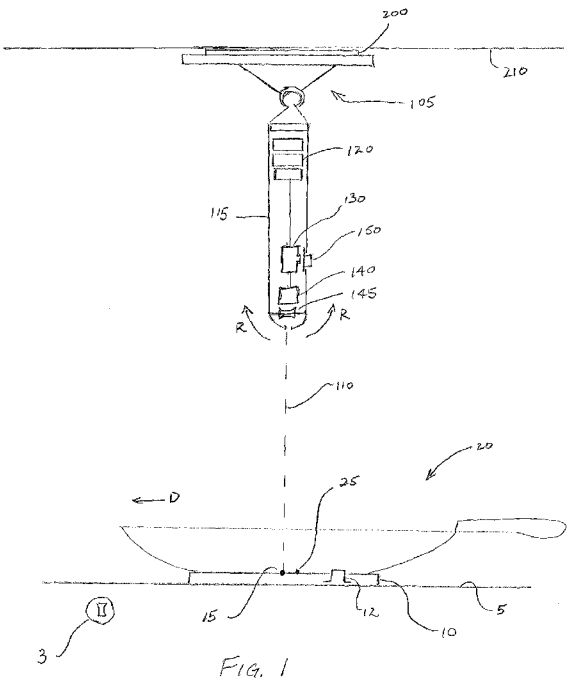

FIG. 1

(57) **Abstract:** The present invention discloses an apparatus and method for flagging a location on an object with a light image so that when a line of sight of the object is later obstructed, the light flagged location is known available to be utilized. A light is projected onto a cooktop to flag a burner location in order to use that location for centering of a pot over on burner when the pot being placed on the burner obstructs the line of sight of the cook to the burner.

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[0001] APPPARATUS AND METHOD FOR POSITIONING A COOKING INSTRUMENT

[0002] BACKGROUND OF THE INVENTION

[0003] A typical cooking instrument such as a stove may include multiple burners on a cook top. The burners generate cooking heat and are positioned in various locations on or in the general plane of the cooktop. When placing a cooking implement (e.g., a pot or pan) on a burner, a user may want to ensure that the cooking instrument is perfectly centered on the burner or as close to perfect as possible. For example, perfect centering enables food to cook more evenly.

[0004] One of the challenges of such a centering process is that centering generally requires the user to be able to see the burner as the center of the pot is being adjusted to coincide with the center of the burner. This is especially true for large pots where the larger the pot, the harder to center. Unless the cooking instrument is transparent, as soon as any portion of the cooking instrument is placed over the burner, the user faces challenges seeing both the instrument and the burner simultaneously. Therefore, it becomes more difficult for the user to adjust or superimpose the center position of the implement to coincide with center of the burner and would have to guess as to the accuracy of the centering.

[0005] It would be beneficial to develop a mechanism, method, or system for aiding a user to more accurately center a cooking instrument on a burner. Specifically, it would be beneficial to develop a system for flagging (e.g., visually) a center position of a burner and to visually project that flagged image onto the cooktop and/or to the cooking instrument so that (when placing a cooking instrument) the user can adjust the center position of the cooking instrument to the projected, flagged center position.

[0006] SUMMARY OF THE PRESENT INVENTION

[0007] The present invention discloses an apparatus for projecting a directed light source toward and/or onto a location in order to flag such location. When the location is no longer visible the flagging light source continues to direct light and remains visible to tell the user where the location is. For example, a portion of a burner on a cooktop is flagged by directing a light image thereon. When a pot or cooking instrument is being placed on a burner, the pot inevitably blocks the cook's view of the burner. The cook is then unable to judge whether the cooking instrument is placed centrally on the burner. However, since the light image projected on the pot flags the location of the burner, centering that image relative to the pot centers the pot on the burner.

[0008] BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 shows an image of the cooking instrument positioner of the present invention.

[0010] Figure 2 shows a cooktop and the apparatus of claim 1 supported from a microwave of the cooktop and directing a light toward a burner of the cooktop.

[0011] Figure 3A shows a first arrangement of the present invention of Figure 1 with the control supported independently from the light source.

[0012] Figure 3B shows a second arrangement of the present invention of Figure 1 with the control supported on the light source.

[0013] Figure 4A shows an example electrical schematic of the apparatus of Figure 1 including a proximity sensor module and a timer module.

[0014] Figure 4B shows an example electrical schematic of the apparatus of Figure 1 including a module which combines a proximity sensor module and a timer module.

[0015] Figure 5A shows an example electrical schematic of the apparatus of Figure 1 including a transistor and a resistor for boosting a laser signal and turning laser off when a signal is received.

[0016] Figure 5B shows an example electrical schematic of the apparatus of Figure 1 including a transistor and a resistor for boosting a laser signal and turning laser on when a signal is received.

[0016] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Figures 1 and 2 show a cook top **5** including a burner **10** thereon and a center location **15** of the burner. A cooking instrument such as a pot is also shown at **20** with a pot center shown at **25**. A light emitter **100** is shown supported from a kitchen structure **210** via a pivotable base **105**. Pivot base **105** may include a connection element **200**. Connection element **200** may include at least one of temporary connector (e.g., an adhesive or a magnet) or a permanent connector (e.g., a mechanical connection such as a (e.g. a rivet or threaded member)). Other suitable connection means may be employed. Pivotable base **105** may also include a ball and socket or other pivotable element such as a bendable memory element (e.g., metal) that holds a selectable bent configuration and that allows light emitter **100** to supportably pivot relative to kitchen structure **210** so that a user may selectively direct a light stream **110** in a variably selectable direction **R**. Direction **R** includes

any and all 3D polar positions about pivotal base **105** and kitchen structure **210** may be an appliance or a kitchen wall or a ceiling.

[0018] In the embodiment of Figure 1, light emitter **100** includes a housing **115**. Inside housing **115** may be a power supply such as a battery **120**, may include a control switch **130** actuated by a button **150**, and may include a light emitter **140** and a lens **145** for focusing the light directed from light source **100**. Battery **120** may be replaced with another source of power (e.g., hard wired power from a house wall socket or from cooktop **5**).

[0019] Control switch **130** may be controlled by a button **150** on the light emitter, or a button **12** on cook top **5** when the system is integrated into cooktop **5**. Furthermore, switch **130** could be triggered by a turn of the burner ignition knob **3**. Specifically, control switch **130** which may be onboard light emitter **100** or may be on cooktop **5** or remote from the light emitter **100**. Switch **130** of the positioner of the present invention may also include button **150** such that one button depression turns on light source **100** and release of button **150** stops light source **100**. In another embodiment, a depression of button **150** closes switch **130** the light source **100** remains on after release. A subsequent button depression turns light source **100** off and it remains off after release.

[0020] Switch **130** may also include or be replaced by a voice activator or a proximity sensor. Figure 3A shows an embodiment of the present invention positioner including a housing **300**. Housing **300** is attachable to a kitchen structure **210** (not shown) via connection element **200** and may include a proximity sensor module **310**. Proximity sensor **310** may be for example, a capacitive sensor switch or an IR sensor switch (e.g., HC-SR505 mini infrared PIR motion body sensor module). Module **310** controls the flow of power from a battery or hardwire to light source **100**. For example, the motion of a users hand or motion of a pot might energize the light source **100**. Housing **300** has a portion **A** which may contain the switch **130** (e.g., a proximity sensor **310**), battery **120** and other control circuitry. A

portion **B** of the positioner of Figure 3A may include pivot mechanism **105** that enables light source **100** to direct light beam **110** in a continuum of 3D polar directions. Portion **A** and portion **B** are shown connected, but may be separable in order to position light source **100** in sight of burner **10** while placing switch **130** in a convenient place for control by a user/cook.

[0021] Figure 3B shows an embodiment of the positioner of claim 1 which further includes a proximity sensor module **310** (e.g., an IR sensor module) connected to and supported from light source **100**. In this embodiment, a base **105** which (as discussed above) is connectable to kitchen structure **210** includes a pivot member **105** and both light source **100,** sensor module **310,** and battery **120** pivot together relative to kitchen structure **210**. A housing such as a plastic housing **305** may secure each (i.e., light source **100**, sensor module **310**, and battery **120**) together for pivoting by pivot member **105**.

[0022] The duration of time in which light source **100** is energized may also be controlled by employing a timer as shown in Figure 4A between switch **130** and/or **310** and the light source **100** to control the supply of power therebetween. For example, a button **150** depression or sensed movement may energize light source **100** for a predetermined period (e.g., 30 seconds) to give a user sufficient time to accurately position cooking instrument **20** on burner **10**.

[0023] In order for Proximity sensor **310** to be continusously ready to sense a cooking activity (such as a movement of a pot or a wave of a hand of a cook), it uses a small continuous amount of power. When both Switch **130** and sensor switch **310** are simultaneously employed, switch **130** may be employed as a master switch **405** which opens between battery **120** and sensor switch **310** to control power to censor switch **310**. The ability of master switch **405** to cut off power to sensor switch **310** preserves battery power.

[0024] As mentioned above, the light source controller may be dependent on a sensor which senses the presence of the hand of a cook or senses the presence of a cooking implement **20**. Figure 4A shows a proximity sensor module **310**. Proximity sensor electronic module **310** receives power from battery **120** and outputs a high output control signal when movement of an object (e.g., a pot or a hand) is detected. Timer relay module **410** (i.e., widely commercially available) receives an input control signal from proximity sensor module **310** to tell the normally open terminals **421** and **422** of timer **410** to close. The closed circuit allows the light source/laser circuit to be complete in order to energize laser light source **100** for a period of time (e.g., 10 seconds).

[0025] In another embodiment shown in Figure 4B, a single sensor delay module **440** includes the elements of both sensor **310** and timer **410** to control light source **100**. The modules **310**, **410**, and **440** include electronic elements such as resistors, capacitors, diodes, transistors, and relay coils in addition to any proximity sensing elements.

[0026] Alternatively, the cooktop **5** or specifically the burner **10** may include a button **12** which when depressed by cooking instrument **20** sends a signal to power light source **100** at least for a predetermined period. Other types of proximity sensors besides IR sensors, or capacitive sensors may be used to detect the presence of cooking implement **20** on the burner **10**.

[0027] Light emitter **140** may be a diode or other light-emitting element and may include a lens **145** through which emitted light **110** passes before projecting the centering image **15**. The light emitter **140** may be of any kind (e.g., laser) so long as the visual indication projected is effective to identify/locate/specify a particular position/location.

[0028] In use, a user places a cooking instrument **20** on burner **10**. Because cooking instrument **20** may be significantly larger than burner **10**, as soon as a

cooking instrument **20** cuts off a portion of a user's line of sight to burner **10**, the user has diminished ability to center cooking instrument **20** on burner **10**. This is so because the best way to ensure a relative centering between cooking instrument **20** and burner **10** is to view them simultaneously while positioning them centrally. Again, because in the process of placing cooking instrument **20**, cooking instrument **20** obstructs a users line of sight to burner **10**, the user is unable to see both simultaneously.

[0029] To over come this impediment, before placing cooking instrument **20**, the user directs light stream **110** at burner center **15** (e.g., by triggering a proximity sensor with the wave of a hand). Light **110** projects a visual indication onto a center location of burner **10** (e.g., for **10** seconds then goes off). The visual indication may be a dot or some other shape or form that when projected onto the cooking instrument aids the user in positioning cooing instrument **20**. Now when cooking instrument **20** is placed over burner **10**, the visual indication appears on cooking instrument **20**, but in the same location as the center of burner **10**. The visual light indicator directed on the cooking instrument therefore represents an actual location of the center of burner **10**. The user can then judge the actual center of cooking implement **20** and adjust the position of cooking instrument **20** (e.g., in a direction **D**) until the light representing the visually indicated burner center corresponds with the perceived center of cooking instrument **20**. Alternatively, a marking or indicia representing a center of the cooking implement **20** may be placed thereon. In that case, the position of cooking instrument **20** would be adjusted until a location of the visual indicator coincides with the light indicia.

[0030] The circuit of the present invention may also employ a transistor **525** (e.g., ON semiconductor FDN327N mosfet, 2A, 20V, 0.04 ohm, 4.5V, 400mv) and a 90 or less ohm resistor **530**. Specifically, such a transistor **525** may be employed as shown in Figures 5 in order to boost the signal of laser **100** when multiple lasers are being employed. Each laser **100** in the cooking instrument may be controlled by its own sensor **440** or set of sensors (e.g., proximity/motion sensor(s)), all lasers may

be controlled by a single sensor, or subsets of laser(s) may be controlled by certain sensor(s).

[0031] Sensors (e.g., proximity or motion sensors) may be directed in a direction not only to detect movement at the cook top, but also to detect the presence of a cook (i.e., a person cooking) at the cooktop. A signal from a sensor detecting a cook can be made to be necessary before the pot centralizing lasers can be activated. Otherwise, the lasers can be independently controlled. In addition, the centralizer lasers can be normally on and deactivated when no signal is detected indicating that a cook is present at the cooktop.

[0032] Other stovetop features may be controlled by the proximity/motion sensors such as turning on a work light. For example, motion of a pot at the stove, a waved hand at the stove, or a cook approaching the stove may signal an energizing of one or more of the centering lasers and/or a turning on of some other cooktop feature such as a work light for enhancing visibility at the stove. Furthermore, certain cooktop features may be activated only when certain combination(s) of sensor signals are activated together or in the alternative. For example, the certain cooktop features (e.g., pot centering or work light) may be shut off if no movement of a cook is detected at the stove.

[0033] Other temperature, smoke, gas, or moisture sensors may be employed at the cook top to signal alarms. For example, a signal that the stove is on and that a moisture sensor at a burner senses moisture may generate an alarm indicating a pot has boiled over, but only if the proximity sensor detects no cooker at the cooktop. Otherwise, the alarm could sound regardless of the sensor detecting a presence of a cooker. A gas sensor could detect that someone is either present or absent from the cooktop and too much uncumbusted gas is at the stove top indicating that dangerous gasses may be present at the cooktop or in the kitchen.

[0034] The arrangement of the basic elements may be varied. As discussed above the basic elements include a power source, a light source (e.g., a laser) and an electronic controller which controls the flow of power to the laser. The controller may include one or more of a switch, a proximity sensor, and a timer. The basic elements also include a pivot support for selectively and supportingly aiming the light source. If the positioner of the present invention is incorporated/integrated into an appliance, the light source or laser may be permanently positioned to direct a centering image so that no pivotal adjustment is necessary. Any of these basic elements may be rearranged. For example, the laser may be separated from the switch by hard wire or by wireless control. The switch may be supported on the light source or the switch may be remote from the light source.

[0035] Furthermore, the invention contemplates incorporation of one or more of the basic elements into a cooktop. For example, a microwave with a built in light source, switch control system, or power source as might be included by an appliance manufacturer.

Claims

1. A cooking instrument comprising:

a cooktop including a burner with a heat source, the burner including a center;

a light source distant from the cooktop, the light source projecting a directed image at the cooktop; and

wherein the image is projected at a location on the cooktop that corresponds to the center of the burner and the image aids a user in accurately positioning a cooking implement on the burner relative to a center of the burner even when the cooking implement blocks a line of sight to at least a portion of the burner during placement of the cooking implement on the burner.

2. The cooking instrument of claim 1, wherein the image directed at the cooktop is directed onto the cooktop.

3. The cooking instrument of claim 1, wherein the light source is supported by a housing.

4. The cooking instrument of claim 3, wherein the housing is connected to the cooking instrument.

5. The cooking instrument of claim 3, wherein the light source is pivotable relative to the housing to allow the user to adjust a direction of projection of the image.

6. The cooking instrument of claim 5, wherein a switch remote from the housing controls power to the light source.

7. The cooking instrument of claim 3, wherein the cooking instrument further incudes a light sensor; and wherein the light sensor senses a presence of the cooking

implement in proximity to the burner and the image is projected when a cooking implement is sensed.

8. The cooking instrument of claim 1, wherein a laser is the source of the projected directed image.

9. The cooking instrument claim 3, wherein the image is projected onto the burner and centered on the burner.

10. The cooking instrument of claim 2, wherein the cooking instrument includes a plurality of light sources each directing an image onto the cooktop.

11. The cooking instrument of claim, 1 further including a switch and a timer, wherein when the switch is closed the timer energizes the light source for a predetermined period of time.

12. A cooking instrument positioner for positioning a cooking instrument on a cook top burner, the positioner comprising:

a base and a light source,

the base including a connector for connecting the positioner to a structure, the base further including a pivot member, the pivot member permitting the light source to pivot relative to the base and the structure;

the light source including a power source for powering a light beam that is projectable from the light source, a light emitter for emitting a light beam from the light source, and a switch for controlling power between the power source and the light source.

13. The positioner of claim 12, wherein the switch further includes a timer such that when the switch is closed, the light beam projects from the light source for a predetermined time period and then no longer projects.

14. The positioner of claim 12, further including a sensor for sensing a cooking movement, wherein when the sensor senses the cooking movement the sensor sends a signal to close a light source circuit to energize the light source.

15. The position of claim 12, further including a sensor for sensing a presence of the cooking instrument, and further including a timer such that when the presence of the cooking instrument is sensed, the switch is closed and the timer energizes light source to project the light beam for a predetermined time period.

16. A method of positioning a cooking instrument on a cooktop which includes at least one burner, the method comprising the steps of:

providing a directed light source;

providing a power source;

providing a control switch for controlling power between the power source and the directed light source;

securing the directed light source to a kitchen support;

energizing the directed light source by closing the control switch;

directing a light beam from the directed light source to project an image onto a portion of a burner of a cooktop;

positioning a cooking implement on the burner in the path of the light beam so that the image appears on the cooking instrument;

adjusting a position of the cooking instrument relative to the image until a predetermined relative position between the image and the cooking instrument is achieved.

17. The method of claim 16, wherein the step of projecting an image onto a portion of a burner includes projecting the image onto a center of the burner.

18. The method of claim 17, wherein the relative adjusting of a position of the cooking instrument includes a relative adjusting of a center of the cooking

instrument to generally coincide with the image projected onto the cooking instrument.

19. The method of claim 18, wherein the control switch is a sensor for sensing a presence of one of a user's hand or a cooking instrument.

20. The method of claim 16, wherein the control switch is a sensor for sensing a cooking activity movement at the cooktop.

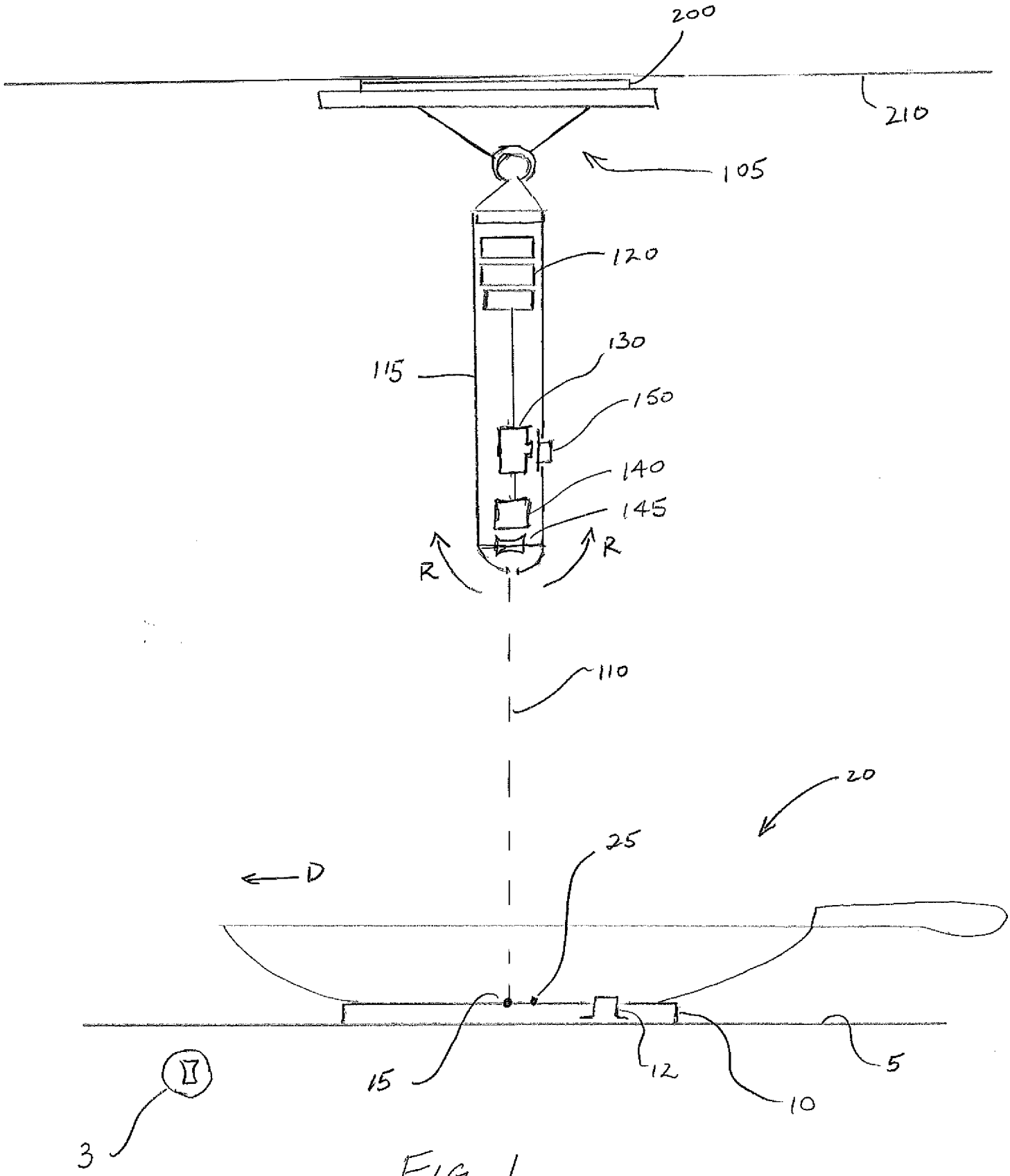

FIG. 1

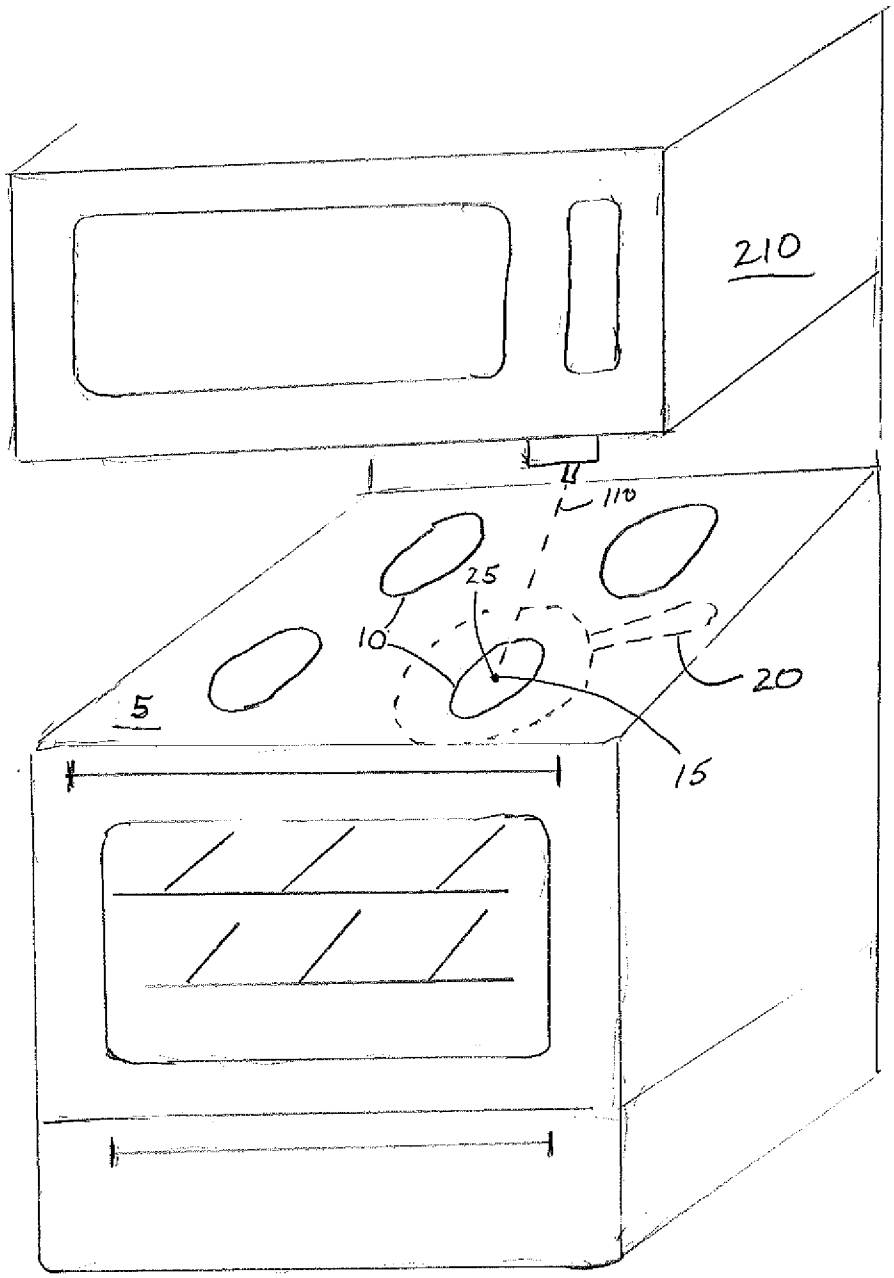

FIG. 2

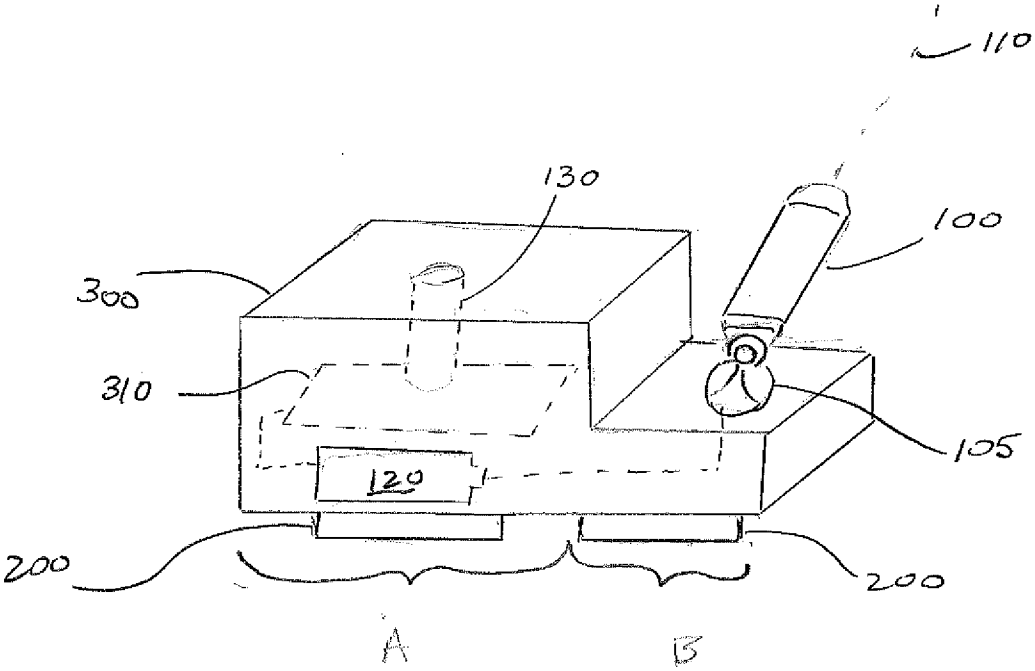

FIG. 3A

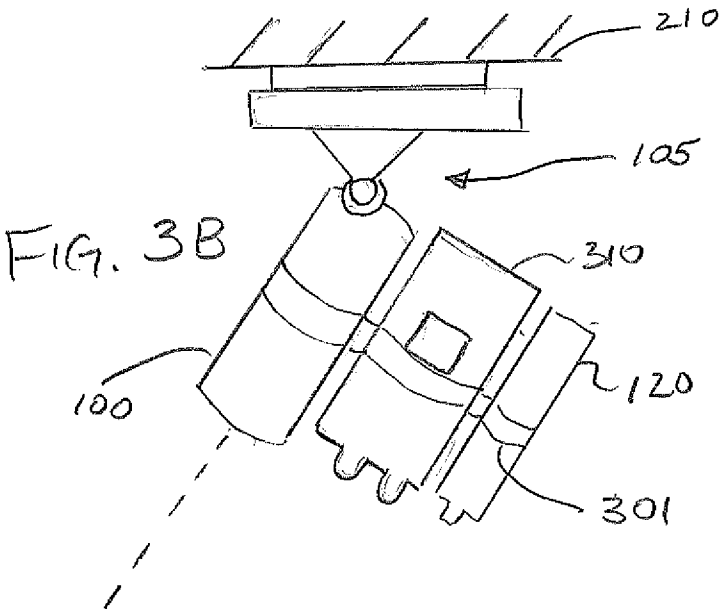

FIG. 3B

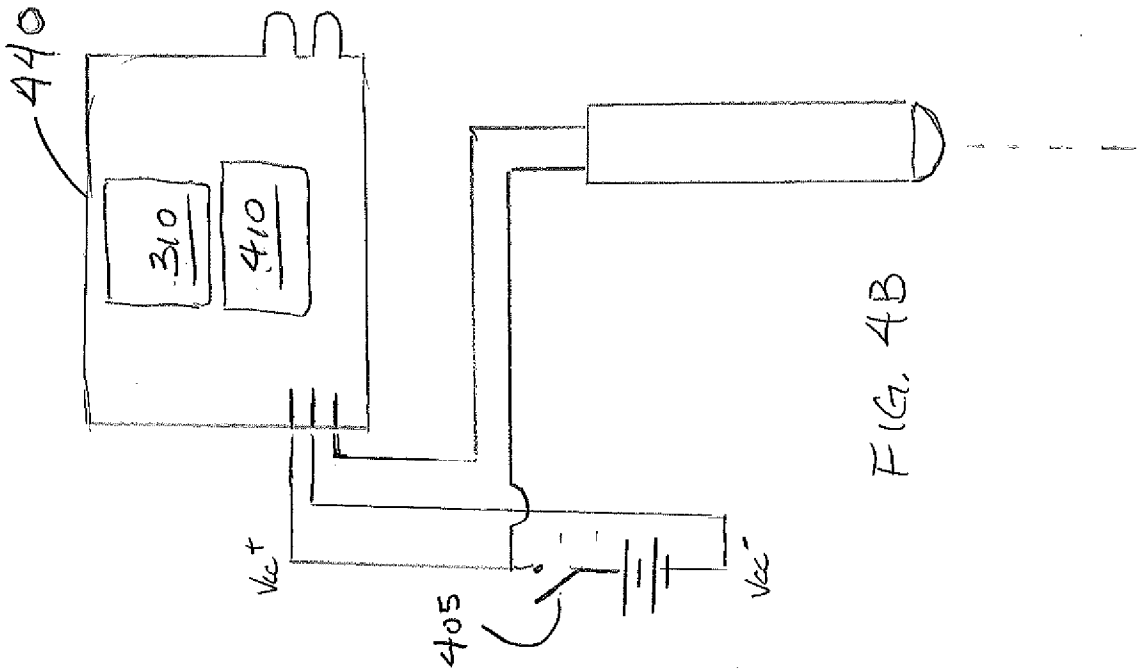
440
310
410
Vcc+
405
Vcc-

FIG. 4B

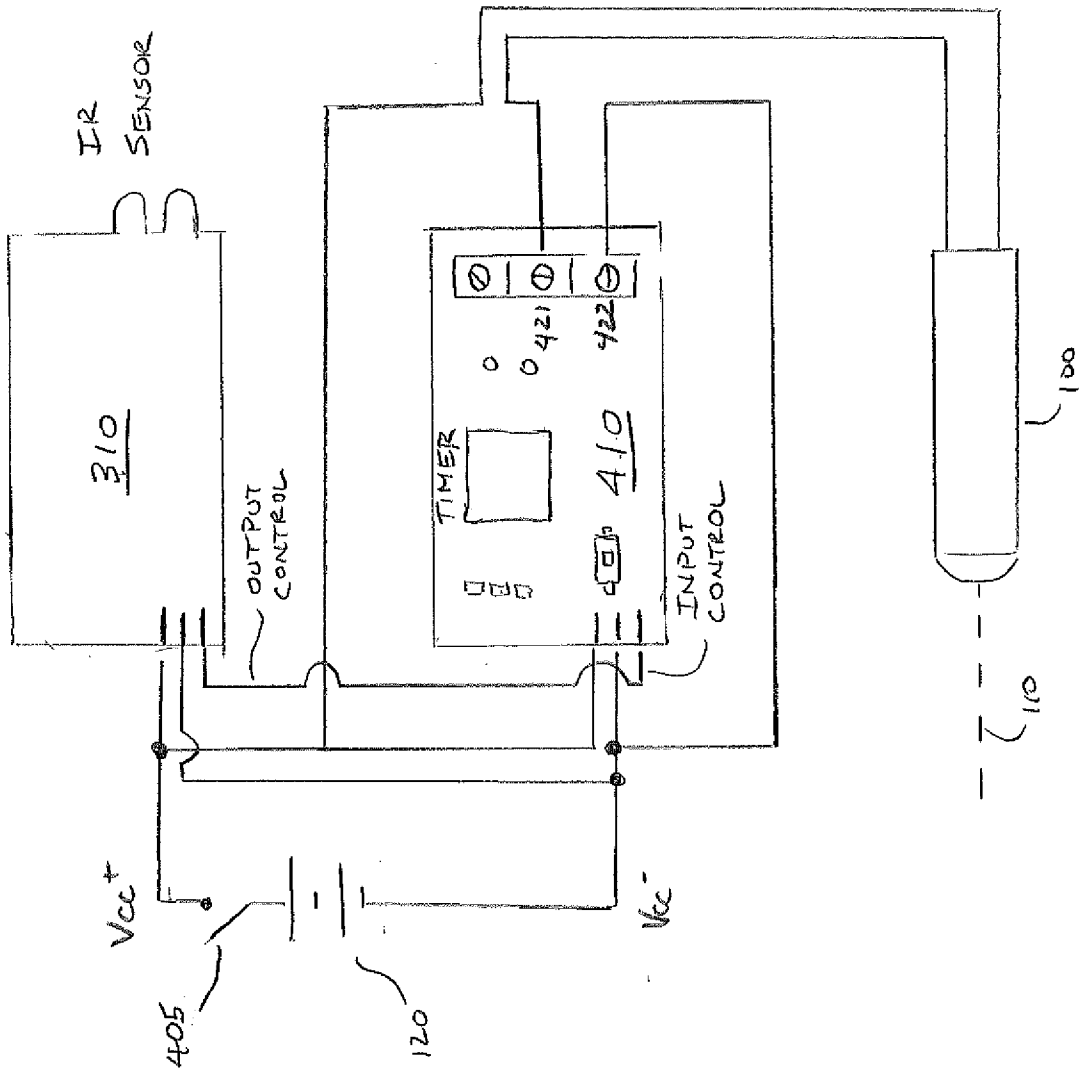
IR SENSOR
310
OUTPUT CONTROL
421
422
TIMER
410
INPUT CONTROL
100
110
Vcc+
405
120
Vcc-

FIG 4A

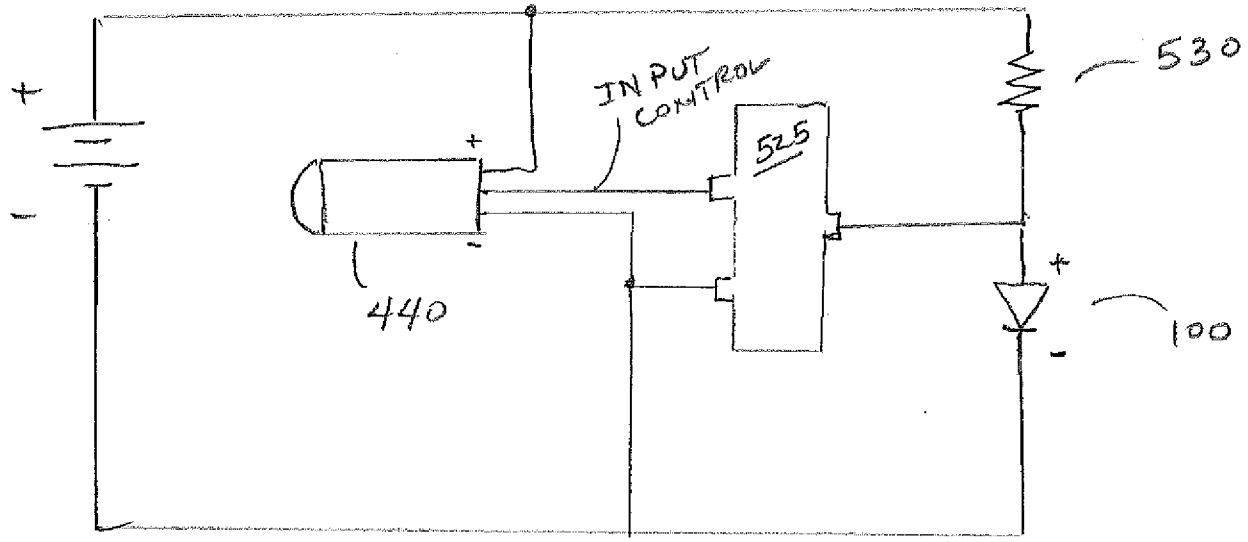

FIGURE 5A

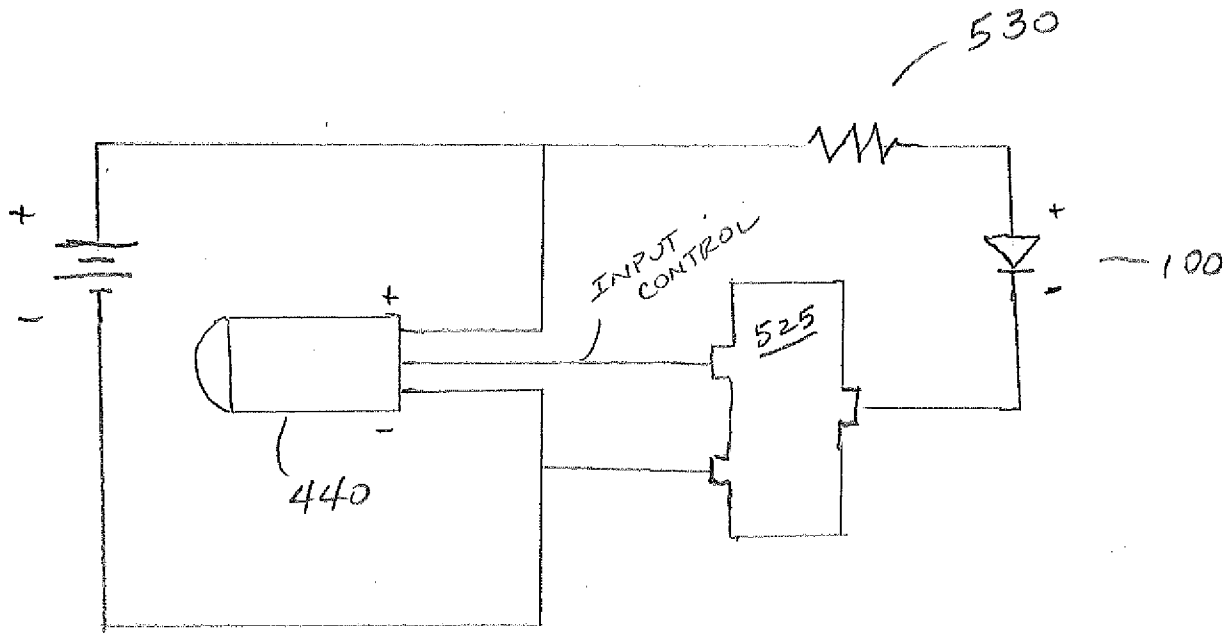

FIGURE 5B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/040513

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

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

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

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

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

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet(s).

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-11

Remark on Protest

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

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

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/040513

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - F24B 1/20; F21V 33/00; F24C 15/00 (2019.01)
CPC - F24B 1/20; F21V 33/0044; F24C 15/2064 (2019.08)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 126/1R; 126/299R; 362/259 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	CN 203810489 U (ZHONGSHAN LE YI-JIA HOUSEHOLD EQUIPMENT CO LTD) 03 September 2014 (03.09.2014) machine translation	1-3, 5, 9, 10 --- 4, 6-8, 11
Y	US 2016/0054007 A1 (BULTHAUP GMBH & CO. KG) 25 February 2016 (25.02.2016) entire document	4
Y	US 2016/0296056 A1 (ARCELIK ANONIM SIRKETI) 13 October 2016 (13.10.2016) entire document	6
Y	EP 3 059 506 A1 (MIELE & CIE. KG) 24 August 2016 (24.08.2016) machine translation	7
Y	US 2013/0187781 A1 (BACH) 25 July 2013 (25.07.2013) entire document	8
Y	KR 2017-0120260 A (SUN WAVE) 31 October 2017 (31.10.2017) machine translation	11
A	US 2014/0041649 A1 (BROAN-NUTONE LLC) 13 February 2014 (13.02.2014) entire document	1-11
A	US 2017/0023260 A1 (EUROKERA S.N.C.) 26 January 2017 (26.01.2017) entire document	1-11
A	US 2010/0231506 A1 (PRYOR) 16 September 2010 (16.09.2010) entire document	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/040513

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-11, are drawn to a cooking instrument comprising: a cooktop including a burner with a heat source, the burner including a center.

Group II, claims 12-15, are drawn to a cooking instrument positioner for positioning a cooking instrument on a cook top burner, the positioner comprising: a base and a light source, the base including a connector for connecting the positioner to a structure.

Group III, claims 16-20, are drawn to a method of positioning a cooking instrument on a cooktop which includes at least one burner, the method comprising the steps of: providing a directed light source; providing a power source; providing a control switch for controlling power between the power source and the directed light source.

The inventions listed as Groups I, II and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a cooktop including a burner with a heat source, the burner including a center; a light source distant from the cooktop, the light source projecting a directed image at the cooktop; and wherein the image is projected at a location on the cooktop that corresponds to the center of the burner and the image aids a user in accurately positioning a cooking implement on the burner relative to a center of the burner even when the cooking implement blocks a line of sight to at least a portion of the burner during placement of the cooking implement on the burner as claimed therein is not present in the invention of Groups II and III. The special technical feature of the Group II invention: a base and a light source, the base including a connector for connecting the positioner to a structure, the base further including a pivot member, the pivot member permitting the light source to pivot relative to the base and the structure; the light source including a power source for powering a light beam that is projectable from the light source, a light emitter for emitting a light beam from the light source, and a switch for controlling power between the power source and the light source as claimed therein is not present in the invention of Groups I or III. The special technical feature of the Group III invention: providing a power source; providing a control switch for controlling power between the power source and the directed light source; securing the directed light source to a kitchen support; energizing the directed light source by closing the control switch; directing a light beam from the directed light source to project an image onto a portion of a burner of a cooktop; positioning a cooking implement on the burner in the path of the light beam so that the image appears on the cooking instrument; adjusting a position of the cooking instrument relative to the image until a predetermined relative position between the image and the cooking instrument is achieved as claimed therein is not present in the invention of Groups I or II.

Groups I, II and III lack unity of invention because even though the inventions of these groups require the technical feature of a cooking instrument comprising a cooktop; and a light source projecting a directed image at the cooktop, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2014/0041649 to Borad-NuTone LLC teaches a cooking instrument comprising a cooktop; and a light source projecting a directed image at the cooktop (Paras. [0093-0097]).

Since none of the special technical features of the Group I, II or III inventions are found in more than one of the inventions, unity of invention is lacking.