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(72) Inventors:
• **Kafali, Zeki**
Nanjing (CN)
• **Liu, Yun**
Nanjing city (CN)
• **Tao, Jiabin**
210000 Nanjing (CN)
• **Wu, Jinhua**
210000 Nanjing (CN)
• **Chen, Yongliang**
210000 Nanjing City (CN)

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(71) Applicant: **BSH Hausgeräte GmbH**
81739 München (DE)

(54) **OPERATION APPARATUS FOR COOKTOP, AND COOKTOP**

(57) The present invention relates to an operation apparatus for a cooktop, and a cooktop. The operation apparatus has at least two gears, and includes a panel, a rotation shaft, a knob, and a light emitting component. The operation apparatus further includes a light guide component connected to the rotation shaft and rotating under the drive of the rotation shaft when the rotation shaft rotates, and the light guide component is located between the light emitting component and the panel. The light guide component includes a light incident surface facing the light emitting component and a light exit surface facing the panel, and light of the light emitting component enters the light guide component through the light incident surface and is emitted to the panel from the light exit surface. One of the light exit surface and the panel has at least two light-transmissive gear marks, and the other of the light exit surface and the panel has a light-transmissive area. When the knob is rotated to one of the gears of the operation apparatus, the panel merely displays one lightened gear mark.

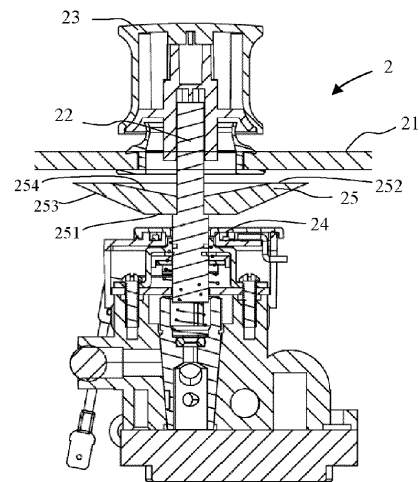


FIG. 1

Description

[0001] The present invention relates to an operation apparatus for a cooktop, and in particular, to an operation apparatus for a cooktop having a light emitting component and gear marks, and a cooktop having the operation apparatus.

[0002] For a light-emitting knob on an existing cooktop, light is merely decorative, or on/off of the light is simply used to display an on/off state of the cooktop. This kind of light-emitting knob transfers limited information to a user, and a current fire/power state of the cooktop cannot be displayed through the light. Some knobs can emit light of different colors, so as to display different fire/power of the cooktop. However, a gas cooktop generates open fire during working, and burning flame generates certain interference on determination of the user on the color of the knob, so that the user cannot recognize the current fire/power correctly. For a cooktop having many gears designed, it is improper to display fire/power by using colors.

[0003] Unless supported by sufficient evidences, the prior art described herein does not mean that it is known to those of ordinary skill in the art before the filing date of this application.

[0004] The present invention is directed to solving at least one technical problem as described above, and therefore provides an operation apparatus for a cooktop that displays a relative magnitude of current fire/power of a cooktop more directly and correctly, and a cooktop having the operation apparatus.

[0005] To achieve the above technical objective, the present invention provides the following technical solution: an operation apparatus for a cooktop has at least two gears, and the operation apparatus includes a panel, a rotation shaft, a knob, and a light emitting component; the rotation shaft is at least partially located at an inner side of the panel, the knob is configured to drive the rotation shaft to rotate, the knob is at least partially located at an outer side of the panel, and the light emitting component is located at the inner side of the panel; the operation apparatus further includes a light guide component connected to the rotation shaft and rotating under the drive of the rotation shaft when the rotation shaft rotates, and the light guide component is located between the light emitting component and the panel; the light guide component includes a light incident surface facing the light emitting component and a light exit surface facing the panel, and light of the light emitting component enters the light guide component through the light incident surface and is emitted from the light exit surface to the panel; one of the light exit surface and the panel has at least two light-transmissive gear marks, and the other of the light exit surface and the panel has a light-transmissive area; and when the knob is rotated to one of the gears of the operation apparatus, the panel merely displays a lightened gear mark. That is, the lightened gear mark correspondingly displays a current gear of the operation

apparatus, so that a user can acquire power/fire magnitude information of the cooktop directly and correctly. Even though a kitchen is dim, the user can still clearly see the lightened gear mark when standing, without the need of frequently bowing to check the power/fire magnitude of the cooktop. The panel included in the operation apparatus may be understood as a panel configured to enclose some parts of the operation apparatus in the cooktop, so as to protect the parts from being contaminated by dirt or soup. In an embodiment, the panel may be a cooktop panel. The present invention does not have too many elements additionally disposed, and is simple in structure. Some technical features may be combined with the structure of an existing cooktop, for example, the light-transmissive gear mark is disposed on the cooktop panel, so that the manufacturing cost is low, and the limitation of the number of gears is less. It should be noted that, the expression of "located at the outer side of the panel" in the present invention may be understood as being located at a side of the panel facing the outside, and in a use state of a cooktop, the side may generally be a side that can be seen by the user. The expression of "located at the inner side of the panel" may be understood as being located at a side of the panel facing the inside of the cooktop, and in the use state of the cooktop, the side may generally be a side that cannot be seen by the user. The gear marks may be numerals such as 0 to 9, symbols or patterns such as gas flames with different magnitudes. The light-transmissive gear marks may be formed in a manner such as printing, coating, film pasting or etching.

[0006] In a possible implementation manner of the present invention, the light entering the light guide component is uniquely emitted from the light exit surface to the panel. This is conducive to concentrated illumination of light, thereby improving the utilization of a light source and improving the brightness of the gear marks. In addition, a gear mark or position that does not need to be lightened is not illuminated.

[0007] In a possible implementation manner of the present invention, the light guide component is approximately dish shaped, and an orthographic projection of an outer edge of the light incident surface on the panel falls within the range of an orthographic projection of an outer edge of the light exit surface on the panel. In this design, light of the light emitting component disposed in a concentrated manner can irradiate an area with a larger area after the light is conducted by the light guide component, and the structure that the operation apparatus is located at the inner side of the panel is compact, so that the light-transmissive area on the panel or the light-transmissive gear marks may have a large enough design space for disposition.

[0008] In a possible implementation manner of the present invention, the light exit surface is a surface of the light guide component relatively adjacent to the panel, which reduces loss during light propagation, thereby further improving the utilization of light and improving the

brightness of the gear marks. Moreover, there is no need to additionally dispose an element for conducting light between the light exit surface and the panel.

[0009] In a possible implementation manner of the present invention, the light guide component includes an outer side surface forming a first angle α with the light exit surface and an inner side surface forming a second angle β with the light exit surface.

[0010] In a possible implementation manner of the present invention, the outer side surface and/or the inner side surface is used to enable the light entering the light guide component to be reflected by the outer side surface and/or the inner side surface to reach the light exit surface. The light entering the light guide component may be reflected by the outer side surface or inner side surface once to reach the light exit surface and is emitted from the light exit surface to the panel, or, the light entering the light guide component may be reflected by the outer side surface and the inner side surface for multiple times to finally reach the light exit surface and is emitted from the light exit surface to the panel. Such a design prevents an area on the panel that does not need to be lightened from being illuminated by light, and the light irradiates a required position in a concentrated manner, thereby greatly improving the using efficiency of light and improving the brightness of the gear marks.

[0011] In a possible implementation manner of the present invention, value ranges of the first angle α and the second angle β are: $30^\circ \leq \alpha \leq 60^\circ$; and $120^\circ \leq \beta \leq 150^\circ$. The design of α and β enables incident light entering the light guide component in a direction parallel to an axial direction of the rotation shaft to be reflected by the inner side surface and the outer side surface for multiple times, thereby reaching the light exit surface. In the present invention, it is unnecessary to design a complicated inclined surface or an uneven structure on the light guide component to enable the incident light to reach the light exit surface, thereby simplifying the appearance designing, machining and manufacturing of the light guide component.

[0012] To further facilitate mold design of the light guide component and mounting of the light guide component, in a possible implementation manner of the present invention, the first angle α and the second angle β satisfy a relation: $\beta \geq 180^\circ - \alpha$. If the light guide component uses a connection manner of being simply, conveniently and directly sleeved over the rotation shaft, when the light incident surface is perpendicular to the axial direction of the rotation shaft, $\beta \geq 180^\circ - \alpha$ enables a joint of the light guide component and the rotation shaft to have an enough thickness to ensure strength of the connection.

[0013] In a possible implementation manner of the present invention, $\alpha = 45^\circ$ and $\beta = 135^\circ$. By means of such angle design, the incident light incident to the light guide component in a direction parallel to the axial direction of the rotation shaft is totally reflected by the inner side surface to the outer side surface, and is then reflected for multiple times to reach the light exit surface. Compared

with other design, the utilization of a light source is very high. Moreover, the light is emitted from the light exit surface to the panel in a direction parallel to the axial direction of the rotation shaft, which is conducive to improving uniformity and observability of light passing through the gear marks.

[0014] In a possible implementation manner of the present invention, the outer side surface and the inner side surface are lightproof. On one hand, the utilization of light is improved; on the other hand, light is prevented from being emitted from the inner side surface and the outer side surface to the panel to cause unnecessary light spots.

[0015] In a possible implementation manner of the present invention, the outer side surface and the inner side surface are coated with a lightproof reflective material; or the outer side surface and the inner side surface have a lightproof reflective film attached thereto. Therefore, the utilization of light is further improved, and the brightness of gear marks under the same light source is improved.

[0016] In a possible implementation manner of the present invention, the light exit surface is formed by a light-transmissive area and a first lightproof area defining the light-transmissive area; and the panel has at least two light-transmissive gear marks and a second lightproof area defining the gear marks. The light incident to the light guide component passes through the light-transmissive area on the light exit surface and is emitted to the panel in a beam of light, and the beam of light is emitted from a light-transmissive gear mark on the panel. Therefore, the user sees a bright and luminous gear mark on the panel, and learns a current gear of the cooktop according to the luminous gear mark correctly.

[0017] In a possible implementation manner of the present invention, the light exit surface is formed by at least two light-transmissive gear marks and a third lightproof area defining the gear marks; and the panel has a light-transmissive area and a fourth lightproof area defining the light-transmissive area. The light incident to the light guide component is emitted to the panel from every light-transmissive gear mark on the light exit surface, and merely exit light of one gear mark can pass through the light-transmissive area on the panel, so as to present a luminous gear mark on the panel.

[0018] In a possible implementation manner of the present invention, the operation apparatus for a cooktop further includes a hood configured to prevent the light of the light emitting component from being scattered to the panel. By means of this improvement, with the same light emitting component, when the hood is additionally provided, the brightness of the gear mark is obviously improved, thereby improving the utilization of light.

[0019] In order to shield light effectively while not affecting normal propagation of light, in a possible implementation manner of the present invention, the hood is in a hollow-cylinder shape or a shirt shape.

[0020] In a possible implementation manner of the

present invention, the hood is provided with at least one hook at a top edge thereof, the light guide component is provided with a mounting hole, and the hood is disposed on the light guide component by matching and buckling the hook with the mounting hole. The mounting of the hood is a big problem. However, in the present invention, the hood is connected to the light guide component innovatively, which is a great improvement. The hood is fixed conveniently and simply, and generates little interference on propagation of light in the light guide component.

[0021] Based on the major objective of the present invention, the present invention further provides a cooktop, and the cooktop includes the operation apparatus for a cooktop as described above. Gears of the cooktop of the present invention may be displayed on the panel intuitively, so that the user can determine a relative magnitude of fire/power accordingly. During use, a luminous gear mark is displayed on the panel, which also provides a fashion sense on the appearance of the cooktop.

[0022] In order to be integrated with the design of the cooktop, in a possible implementation manner of the present invention, the cooktop includes a cooktop panel, and the panel is the cooktop panel.

[0023] In a possible implementation manner of the present invention, the cooktop is a gas cooktop or an induction cooktop.

[0024] In a possible implementation manner of the present invention, the gas cooktop includes a gas valve located at an inner side of the panel, the gas valve includes a valve rod controlling on/off and flow of gas, and the rotation shaft is the valve rod. The application of the present invention does not affect working of the existing gas valve, and the design of existing gas valves does not need to be modified, so that the present invention can be widely applied to the field of gas cooktops.

[0025] The disclosure will become more fully understood from the detailed description given herein below for illustration only, and thus are not limitative of the disclosure, and wherein:

- FIG. 1 is a sectional view of an operation apparatus for a cooktop according to Embodiment 1 of the present invention;
- FIG. 2 is a front view of a panel according to Embodiment 1 of the present invention;
- FIG. 3 is a three-dimensional view of a light guide component according to Embodiment 1 of the present invention;
- FIG. 4 is a three-dimensional view of a light guide component according to Embodiment 1 of the present invention under another angle of view;
- FIG. 5 is a sectional view of a light guide component according to Embodiment 1 of the present invention;
- FIG. 6 is a schematic view of propagation of light in a light guide component according to Embod-

- FIG. 7 is an exploded view of a light emitting component according to Embodiment 1 of the present invention;
- FIG. 8 is an effect view of an operation apparatus for a cooktop according to Embodiment 1 of the present invention in a use state;
- FIG. 9 is a front view of a panel according to Embodiment 2 of the present invention;
- FIG. 10 is a three-dimensional view of a light emitting component according to Embodiment 2 of the present invention;
- FIG. 11 is an effect view of an operation apparatus for a cooktop according to Embodiment 2 of the present invention in a use state;
- FIG. 12 is a sectional view of an operation apparatus for a cooktop according to Embodiment 3 of the present invention;
- FIG. 13 is a three-dimensional view of a hood according to Embodiment 3 of the present invention;
- FIG. 14 is a three-dimensional view of a light guide component according to Embodiment 3 of the present invention;
- FIG. 15 is a sectional view of a hood and a light guide component after being assembled together according to Embodiment 3 of the present invention; and
- FIG. 16 is a sectional view of a gas cooktop according to an embodiment of the present invention.

[0026] In order to have further understanding on objectives, structures, features and functions of the present invention, detailed descriptions are made through the following embodiments.

Embodiment 1

[0027] Referring to FIG. 1, FIG. 1 is a sectional view of an operation apparatus for a cooktop according to Embodiment 1 of the present invention. The operation apparatus 2 includes a panel 21, a rotation shaft 22, a knob 23 and a light emitting component 24. The rotation shaft 22 is at least partially located at an inner side of the panel 21. The operation apparatus 2 has at least two gears, and rotating the rotation shaft 22 can adjust the gears of the operation apparatus 2. The knob 23 is at least partially located at an outer side of the panel 21, and is sleeved over the rotation shaft 22 to drive the rotation shaft 22 to rotate. The light emitting component 24 is located at an inner side of the panel 21.

[0028] The operation apparatus 2 further includes a light guide component 25 connected to the rotation shaft 22 and rotating under the drive of the rotation shaft 22 when the rotation shaft 22 rotates, and the light guide component 25 is located between the light emitting component 24 and the panel 21. The light guide component 25 includes a light incident surface 251 facing the light emitting component 24 and a light exit surface 252 facing

the panel 21, and light emitted by the light emitting component 24 enters the light guide component 25 through the light incident surface 251 and is emitted from the light exit surface 252 to the panel 21. Referring to FIG. 2, FIG. 2 is a front view of a panel according to Embodiment 1 of the present invention. The panel 21 has at least two light-transmissive gear marks 100, and the gear marks 100 are numerals "0", "1", "2", ..., and "9". The numerals on the panel 21 are light-transmissive, and other parts are lightproof. Here, the part defining the numerals is defined as a second lightproof area 102, and the second lightproof area 102 may be, for example, coated with a black material or attached with a black film. "0" indicates an off state, "1" indicates a first gear, "2" indicates a second gear, ..., and "9" indicates a ninth gear. Referring to FIG. 3, FIG. 3 is a three-dimensional view of a light guide component according to Embodiment 1 of the present invention. The light exit surface 252 of the light guide component 25 has a light-transmissive area 200, and specifically, the light exit surface 252 is formed by the light-transmissive area 200 and a first lightproof area 201 defining the light-transmissive area 200.

[0029] Referring to FIG. 3 to FIG. 5, FIG. 4 is a three-dimensional view of a light guide component according to Embodiment 1 of the present invention under another angle of view, and FIG. 5 is a sectional view of a light guide component according to Embodiment 1 of the present invention. The light guide component 25 is approximately dish shaped, and an orthographic projection of an outer edge of the light incident surface 251 on the panel 21 falls within the range of an orthographic projection of an outer edge of the light exit surface 252 on the panel 21. In this way, gear marks on the panel 21 have a room for disposition, and can be disposed around the knob 23. In addition to the light incident surface 251 and the light exit surface 252, the light guide component 25 further includes an outer side surface 253 forming a first angle α with the light exit surface 252 and an inner side surface 254 forming a second angle β with the light exit surface 252, and the light exit surface 252 is a surface of the light guide component 25 relatively adjacent to the panel 21. The outer side surface 253 and the inner side surface 254 are lightproof, and are coated with a lightproof and light-reflective material in a spraying manner; therefore, the light entering the light guide component 25 is uniquely emitted from the light exit surface 252 to the panel 21. Referring to FIG. 6, FIG. 6 is a schematic view of propagation of light in a light guide component according to Embodiment 1 of the present invention. As shown by dashed lines in FIG. 6, the light of the light emitting component enters the light guide component in a direction parallel to an axial direction of the rotation shaft, the light entering the light guide component reaches the inner side surface 254 and then is reflected by the inner side surface 254 back to the light guide component, then reaches the outer side surface 253 and is reflected by the outer side surface 253 back to the light guide component. The light is reflected by the inner side surface

and the outer side surface for multiple times, and then reaches the light exit surface 252. In this embodiment, value ranges of the first angle α and the second angle β are: $30^\circ \leq \alpha \leq 60^\circ$; and $120^\circ \leq \beta \leq 150^\circ$. In this way, the light incident to the light guide component in a direction parallel to the axial direction of the rotation shaft 22 is well guided to the light exit surface 252. Moreover, the light emitting component 24 may also be disposed right under the light guide component, thereby facilitating disposition of the light emitting component. When $\alpha=45^\circ$ and $\beta=135^\circ$, the light incident to the light guide component in a direction parallel to the axial direction of the rotation shaft is totally guided to the light exit surface, and reaches the light exit surface in a direction parallel to the axial direction of the rotation shaft; therefore, the light source is utilized to the maximum extent, and under irradiation of the same light emitting component, gear marks with the maximum brightness may be acquired. As shown in FIG. 5, in a central area of the light guide component 25 of this embodiment, a through hole 255 is provided for the rotation shaft 22 to pass through and for the light guide component 25 to be connected to the rotation shaft 22. In order that the through hole 255 has a certain thickness to ensure strength of the connection, α and β satisfy a relation: $\beta \geq 180^\circ - \alpha$.

[0030] As shown in FIG. 7, FIG. 7 is an exploded view of a light emitting component according to Embodiment 1 of the present invention. It should be supplemented that, the operation apparatus 2 of this embodiment is an operation apparatus of a gas cooktop. The gas cooktop includes a gas valve 4 disposed at the inner side of the panel 21, the rotation shaft 21 is a valve rod of the gas valve 4, and the light emitting component 24 is disposed on the gas valve 4 by means of a bracket 240. The light emitting component 24 includes a light-transmissive cover 241, a circuit board 242 having multiple light emitting diodes 2420 welded thereto, and a base 243. The circuit board 242 is disposed in the base 243, and the light-transmissive cover 241 covers the base 243. The light-transmissive cover 241 has a recess 2411 facing the circuit board 242 and used to accommodate the light emitting diodes 2420. In order to ensure a desirable seal effect and prevent vapor and soup from damaging the light emitting component, the base 243 is provided with a flange 2431 connected to the light-transmissive cover 241 in a sealed manner, and after the light emitting component is assembled, the circuit board 242 and the light emitting diodes 2420 are enclosed by the flange 2431 in an enclosed space.

[0031] As shown in FIG. 8, FIG. 8 is an effect view of an operation apparatus for a cooktop according to Embodiment 1 of the present invention in a use state. When the knob 23 is rotated to the ninth gear of the operation apparatus, the panel 21 merely displays a lightened gear mark, that is, the numeral "9". The luminous numeral on the panel intuitively displays a current gear of the operation apparatus, so that the user can determine a relative magnitude of the current fire/power of the cooktop cor-

rectly. Moreover, the lightened gear mark is bright enough to be seen by the user clearly when a kitchen is dim, without the need of bowing. FIG. 8 merely shows the lightened gear mark, and short lines around the numeral indicate that the numeral "9" is lightened, and is luminous as seen by the user. Other gear marks that are not lightened are extremely unobvious in the use state, and are not displayed on the panel in FIG. 8.

Embodiment 2

[0032] The same or corresponding structures of this embodiment and Embodiment 1 have the same or corresponding reference numerals, and have the same or similar functions, which are not repeated herein, and reference may be made to the corresponding descriptions of Embodiment 1. Different from Embodiment 1, a panel 21' in this embodiment has a light-transmissive area 300 and a fourth lightproof area 304 defining the light-transmissive area 300. That is, except for the light-transmissive area 300, other parts of the panel 21' are lightproof. As shown in FIG. 9, FIG. 9 is a front view of a panel according to Embodiment 2 of the present invention. As shown in FIG. 10, FIG. 10 is a three-dimensional view of a light emitting component according to Embodiment 2 of the present invention. In this embodiment, the light exit surface 252' of the light emitting component 25' has at least two light-transmissive gear marks 400, and the gear marks 400 are numerals "0", "1", "2", ..., and "9". The numerals on the light exit surface 252' are light-transmissive, and other parts are lightproof. Here, the part defining the gear marks, that is, the numerals, is defined as a third lightproof area 403, and the third lightproof area 403 may be subject to a lightproof treatment, for example, coated with a black material or attached with a black film.

[0033] As shown in FIG. 11, FIG. 11 is an effect view of an operation apparatus for a cooktop according to Embodiment 2 of the present invention in a use state. When the knob 23 is rotated to the ninth gear of the operation apparatus, the panel 21' merely displays a lightened gear mark "9". The luminous numeral on the panel displays the current gear of the operation apparatus, so that the user can determine a relative magnitude of current fire/power of the cooktop correctly. FIG. 11 merely shows the lightened gear mark, and short lines around the numeral indicate that the numeral "9" is lightened, and is luminous as seen by the user. Other gear marks that are not lightened are extremely unobvious in the use state, and are not displayed on the panel in FIG. 11.

Embodiment 3

[0034] The same or corresponding structures of this embodiment and Embodiment 1 have the same or corresponding reference numerals, and have the same or similar functions, which are not repeated herein, and reference may be made to the corresponding descriptions of Embodiment 1. Referring to FIG. 12, FIG. 12 is a sec-

tional view of an operation apparatus for a cooktop according to Embodiment 3 of the present invention. A difference between this embodiment and Embodiment 1 lies in that, the operation apparatus of this embodiment further includes a hood 26 configured to prevent the light of the light emitting component 24 from being scattered to the panel 21. Referring to FIG. 13 to FIG. 15, FIG. 13 is a three-dimensional view of a hood according to Embodiment 3 of the present invention, FIG. 14 is a three-dimensional view of a light guide component according to Embodiment 3 of the present invention, and FIG. 15 is a sectional view of a hood and a light guide component after being assembled together according to Embodiment 3 of the present invention. The hood 26 is in a hollow cylinder shape. The hood 26 is provided with two hooks 261 at a top edge thereof, the light guide component 25 is provided with two mounting holes 256, and the hood 26 is disposed on the light guide component 25 by matching and buckling the hooks 261 with the mounting holes 256. To facilitate buckling of the hook 261, an edge of the mounting hole 256 located on the outer side surface 253 is provided with a protrusion 2560, so as to match a hook portion of the hook 261.

[0035] Finally, referring to FIG. 16, FIG. 16 is a sectional view of a cooktop according to an embodiment of the present invention. The present invention further provides a cooktop 1, and a gas cooktop is used as an example in the drawing for illustration. The cooktop 1 includes an operation apparatus 2, a cooktop panel 3 and a gas valve 4. The gas valve 4 includes a valve rod 40 controlling on/off and flow of gas, and the valve rod 40 extends from an inner side of the cooktop panel 3 to an outer side, and has a knob 23, for driving the valve rod 40 to rotate, sleeved at an end portion thereof. The operation apparatus 2 includes a light emitting component 24 disposed on the gas valve 4.

[0036] The operation apparatus 2 further includes a light guide component 25 connected to the valve rod 40 and rotating under the drive of the valve rod 40 when the valve rod 40 rotates, and the light guide component 25 is located between the light emitting component 24 and the cooktop panel 3. The light guide component 25 includes a light incident surface 251 facing the light emitting component 24 and a light exit surface 252 facing the cooktop panel 3, and light of the light emitting component 24 enters the light guide component 25 through the light incident surface 251 and is emitted from the light exit surface 252 to the cooktop panel 3.

[0037] One of the light exit surface 252 and the cooktop panel 3 has at least two light-transmissive gear marks, and the other of the light exit surface 252 and the cooktop panel 3 has a light-transmissive area; when the knob 23 is rotated to one of the gears of the operation apparatus 2, the cooktop panel 3 merely displays a lightened gear mark. For the specific structure, feature and function of the light guide component 25, reference may be made to the descriptions of the above embodiments.

[0038] The present invention is described through the

above relevant embodiments; however, the above embodiments are merely examples for implementing the present invention. It should be noted that, the disclosed embodiments are not intended to limit the scope of the present invention. In contrast, modifications and improvements made without departing from the spirit and scope of the present invention shall fall within the patent protection scope of the present invention.

Reference numerals:

[0039]

1	Cooktop;	
2	Operation apparatus;	
3	Cooktop panel;	
4	Gas valve;	
21, 21'	Panel;	
22	Rotation shaft;	
23	Knob;	
24	Light emitting component;	
25, 25'	Light guide component;	
26	Hood;	
40	Valve rod;	
100	Gear mark;	
102	Second lightproof area;	
200	Light-transmissive area;	
201	First lightproof area;	
240	Bracket;	
241	Light-transmissive cover;	
242	Circuit board;	
243	Base;	
251	Light incident surface;	
252, 252'	Light exit surface;	
253	Outer side surface;	
254	Inner side surface;	
255	Through hole;	
256	Mounting hole;	
261	Hook;	
300	Light-transmissive area;	
304	Fourth lightproof area;	
400	Gear mark;	
403	Third lightproof area;	
2411	Recess;	
2420	Light emitting diode;	
2431	Flange;	
2560	Protrusion	

Claims

1. An operation apparatus (2) for a cooktop, having at least two gears, the operation apparatus (2) comprising:

a panel (21, 21'),
a rotation shaft (22), at least partially located at an inner side of the panel (21, 21'),

a knob (23), configured to drive the rotation shaft (22) to rotate, the knob (23) being at least partially located at an outer side of the panel (21, 21'), and

a light emitting component (24), located at the inner side of the panel (21, 21'),

characterized in that,

the operation apparatus further comprises a light guide component (25, 25') connected to the rotation shaft (22) and rotating under the drive of the rotation shaft (22) when the rotation shaft (22) rotates, the light guide component (25, 25') being located between the light emitting component (24) and the panel (21, 21');

the light guide component (25, 25') comprises a light incident surface (251) facing the light emitting component (24) and a light exit surface (252, 252') facing the panel (21, 21'), and light of the light emitting component (24) enters the light guide component (25, 25') through the light incident surface (251) and is emitted to the panel (21, 21') from the light exit surface (252, 252'); and

one of the light exit surface (252, 252') and the panel (21, 21') has at least two light-transmissive gear marks (100, 400), and the other of the light exit surface (252, 252') and the panel (21, 21') has a light-transmissive area (200, 300); when the knob (23) is rotated to one of the gears of the operation apparatus (2), the panel (21, 21') merely displays one lightened gear mark (100, 400).

2. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light entering the light guide component (25, 25') is uniquely emitted from the light exit surface (252, 252') to the panel (21, 21').

3. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light guide component (25, 25') is approximately dish shaped, and an orthographic projection of an outer edge of the light incident surface (251) on the panel (21, 21') falls within the range of an orthographic projection of an outer edge of the light exit surface (252, 252') on the panel (21, 21').

4. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light exit surface (252, 252') is a surface of the light guide component (25, 25') relatively adjacent to the panel (21, 21').

5. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light guide component (25, 25') comprises an outer side surface (253) forming a first angle α with the light exit surface (252, 252') and an inner side surface (254) forming

- a second angle β with the light exit surface (252, 252').
6. The operation apparatus (2) for a cooktop according to claim 5, **characterized in that** the outer side surface (253) and/or the inner side surface (254) is used to enable the light entering the light guide component (25) to be reflected by the outer side surface (253) and/or the inner side surface (254) to reach the light exit surface (252). 5
 7. The operation apparatus (2) for a cooktop according to claim 5, **characterized in that** value ranges of the first angle α and the second angle β are: $30^\circ \leq \alpha \leq 60^\circ$; and $120^\circ \leq \beta \leq 150^\circ$. 10
 8. The operation apparatus (2) for a cooktop according to claim 7, **characterized in that** the first angle α and the second angle β satisfy a relation: $\beta \geq 180^\circ - \alpha$. 15
 9. The operation apparatus (2) for a cooktop according to claim 7, **characterized in that** $\alpha = 45^\circ$ and $\beta = 135^\circ$. 20
 10. The operation apparatus (2) for a cooktop according to claim 5, **characterized in that** the outer side surface (253) and the inner side surface (254) are light-proof. 25
 11. The operation apparatus (2) for a cooktop according to claim 5, **characterized in that** the outer side surface (253) and the inner side surface (254) are coated with a lightproof reflective material; or the outer side surface (253) and the inner side surface (254) have a lightproof reflective film attached thereto. 30
 12. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light exit surface (252) is formed by a light-transmissive area (200) and a first lightproof area (201) defining the light-transmissive area (200); and the panel (21) has at least two light-transmissive gear marks (100) and a second lightproof area (102) defining the gear marks (100). 35
 13. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that** the light exit surface (252') is formed by at least two light-transmissive gear marks (400) and a third lightproof area (403) defining the gear marks (400); and the panel (21') has a light-transmissive area (300) and a fourth lightproof area (304) defining the light-transmissive area (300). 40
 14. The operation apparatus (2) for a cooktop according to any one of claims 1 to 13, **characterized by** further comprising a hood (26) configured to prevent the light of the light emitting component (24) from being scattered to the panel (21, 21'). 45
 15. The operation apparatus (2) for a cooktop according to claim 14, **characterized in that** the hood (26) is in a hollow-cylinder shape or a skirt shape. 50
 16. The operation apparatus (2) for a cooktop according to claim 15, **characterized in that** the hood (26) is provided with at least one hook (261) at a top edge thereof, the light guide component (25) is provided with a mounting hole (256), and the hood is disposed on the light guide component (25) by matching and buckling the hook (261) with the mounting hole (256). 55
 17. A cooktop (1), **characterized in that** the cooktop (1) comprises the operation apparatus (2) for a cooktop according to any one of claims 1 to 16.
 18. The cooktop (1) according to claim 17, **characterized in that** the cooktop (1) comprises a cooktop panel (3), and the panel (21, 21') is the cooktop panel (3).
 19. The cooktop (1) according to claim 17, **characterized in that** the cooktop (1) is a gas cooktop or an induction cooktop.
 20. The cooktop (1) according to claim 19, **characterized in that** the gas cooktop comprises a gas valve (4) located at an inner side of the panel (21, 21'), the gas valve (4) comprises a valve rod (40) controlling on/off and flow of gas, and the rotation shaft (22) is the valve rod (40).

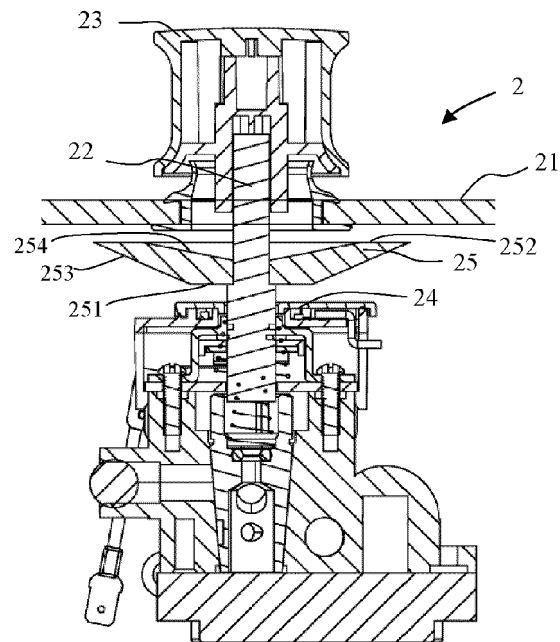


FIG. 1

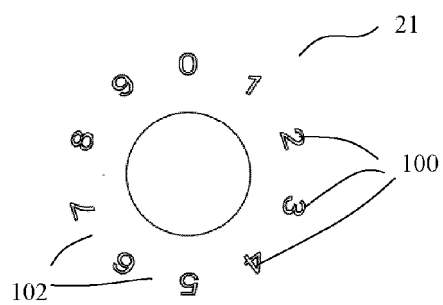


FIG. 2

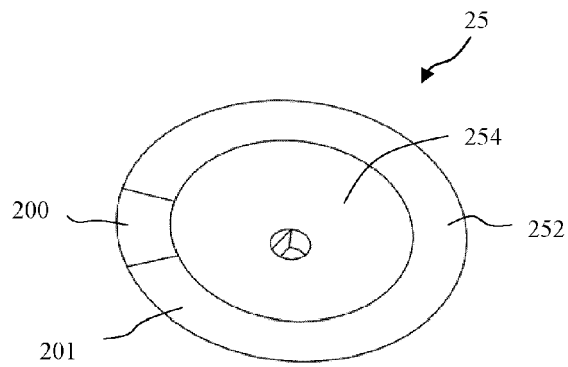


FIG. 3

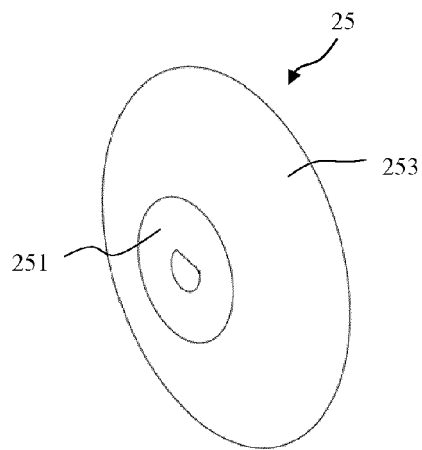


FIG. 4

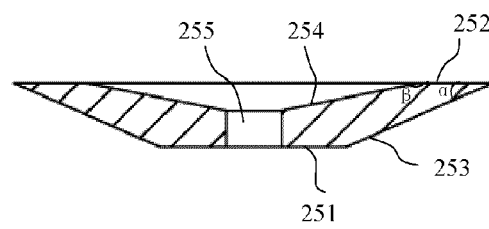


FIG. 5

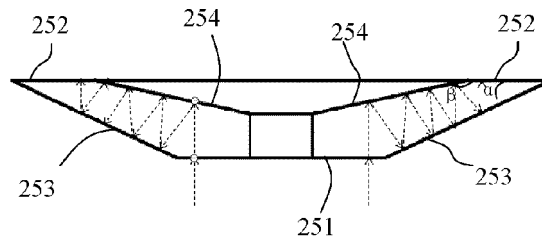


FIG. 6

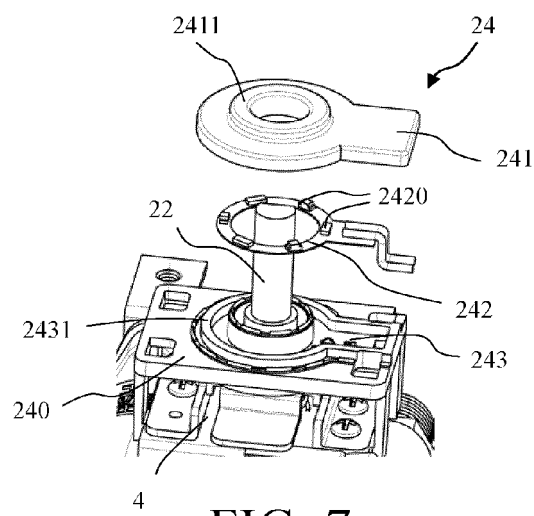


FIG. 7

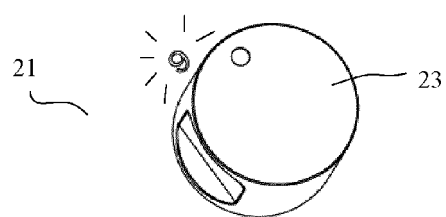


FIG. 8

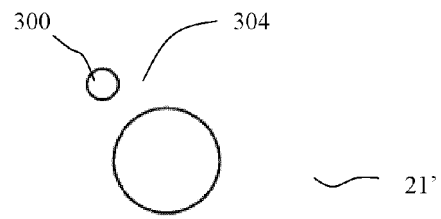


FIG. 9

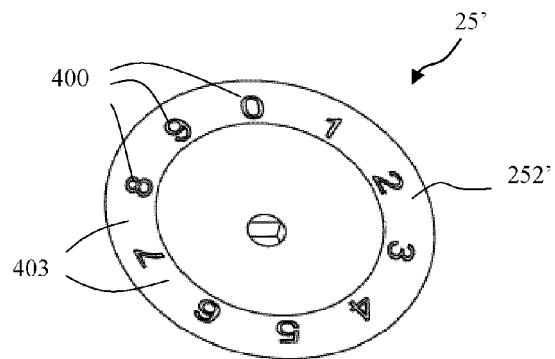


FIG. 10

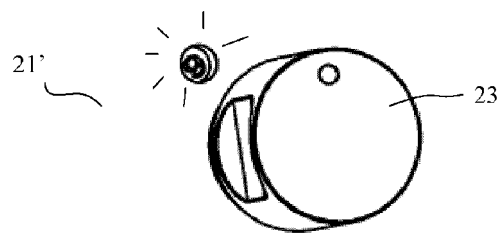


FIG. 11

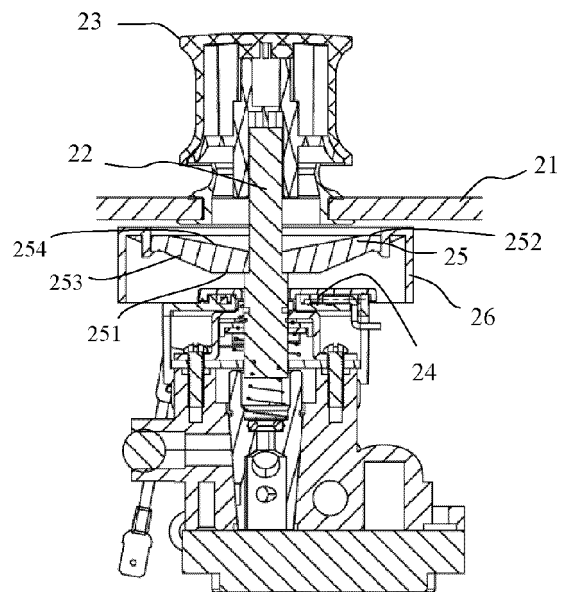


FIG. 12

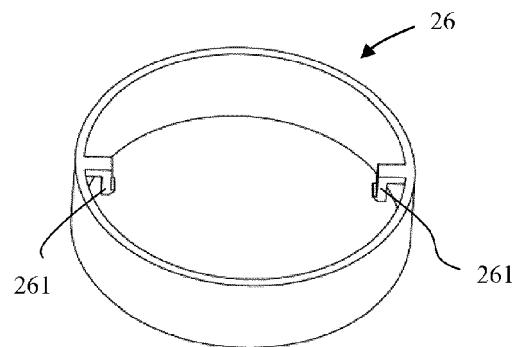


FIG. 13

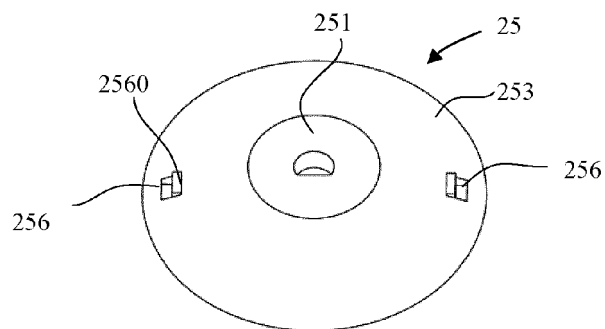


FIG. 14

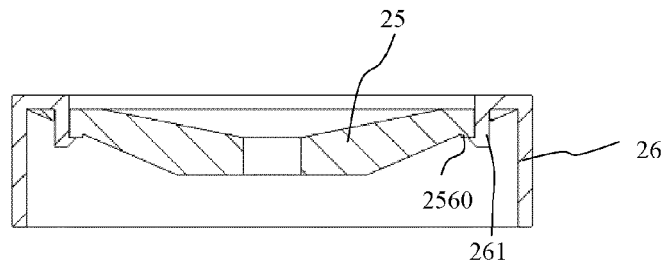


FIG. 15

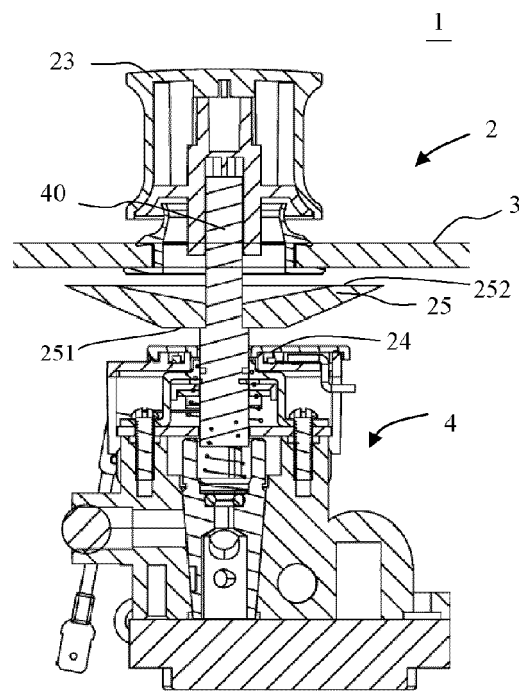


FIG. 16



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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		5 January 2016	Delval, Stéphane
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