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

(57) Disclosed are an operation apparatus for a cooktop, and a cooktop. The operation apparatus has at least two gears, the operation apparatus including a panel, a rotation shaft and a knob; the panel has at least two light-transmissive gear marks, the rotation shaft is at least partially located on an inner side of the panel, and the knob is at least partially located on an outer side of the panel, for driving the rotation shaft to rotate. The operation apparatus further includes a connecting element lo-

cated on the inner side of the panel, connected to the rotation shaft and rotating under the driving of the rotation shaft when the rotation shaft rotates; and the connecting element is provided with a light-emitting member, and one gear mark on the panel is lit up by light of the light-emitting member when the knob rotates to one gear of the operation apparatus. Thus, users can intuitively and accurately obtain power/fire size information of the cooktop.

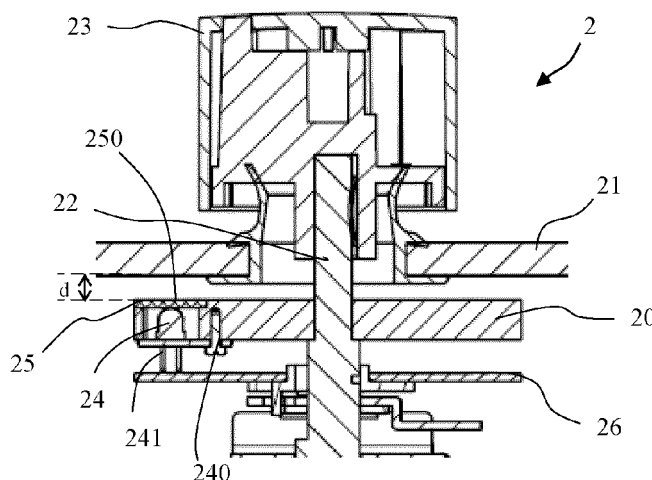


FIG. 1

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 member and gear marks, and a cooktop having the operation apparatus.

[0002] For knobs capable of emitting light on existing cooktops, light generally only plays a role of decoration, or an open/closed state of a cooktop is displayed by simply using ON/OFF of light. Information transmitted by such light-emitting knobs to users is limited, and a current fire/power state of a cooktop cannot be displayed through light. Moreover, some knobs may emit light in different colors, so as to display different fire/power of the cooktop. However, a gas cooktop produces open fire at work, the burning flame interferes with a user's judgment on the color of a knob to some extent, and thus the user cannot accurately identify the current fire/power. In addition, it is worth mentioning that those skilled in the art have formed a deep-rooted understanding that light sources of the knobs capable of emitting light are all fixedly set and will not rotate with rotation of the knobs, because line connection of rotating light sources is a problem.

[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] An objective of the present invention is to solve the above at least one technical problem, and therefore, an operation apparatus for a cooktop that displays a relative size of a current fire/power of a cooktop more directly and accurately, and a cooktop having the operation apparatus are provided.

[0005] To achieve the above technical objective, the present invention proposes a technical solution as follows: an operation apparatus for a cooktop, having at least two gears, the operation apparatus including a panel, a rotation shaft and a knob, where the panel has at least two light-transmissive gear marks, the rotation shaft is at least partially located on an inner side of the panel, and the knob is at least partially located on an outer side of the panel, for driving the rotation shaft to rotate. The operation apparatus further includes a connecting element located on the inner side of the panel, connected to the rotation shaft and rotating under the driving of the rotation shaft when the rotation shaft rotates; and the connecting element is provided with a light-emitting member, and one gear mark on the panel is lit up by light of the light-emitting member when the knob rotates to one gear of the operation apparatus. The gear mark lit up correspondingly displays the current gear of the operation apparatus, so that users can intuitively and accurately obtain power/fire size information of the cooktop. Even if in a situation in which a kitchen is dim, the users, when standing, can clearly see the light-emitting gear mark without frequently bending down to check the power/fire size of the cooktop. The panel included in the operation apparatus may be understood as a panel for closing some parts of the operation apparatus inside the cooktop, so as to protect the parts from contamination by dirt and soup. In one embodiment, the panel may be a cooktop panel. The present invention has a simple structure, some technical features can be naturally merged into the structure of the existing cooktops, for example, light-transmissive gear marks may be disposed on the cooktop panel, the manufacturing cost is low, and the present invention is less limited by the number of gears. Moreover, the present invention overcomes technical bias, to enable the light-emitting member to rotate with the rotation shaft, and light of the light-emitting member is rotatably irradiated to the light-transmissive gear marks on the panel directly; in this way, it is unnecessary to dispose an element making light selectively transmit or irradiate between the light-emitting member and the panel. It should be noted that, "located on an outer side of the panel" in the present invention can be understood as being located on one side of the panel facing the outside, which is a side that often can be seen by the users in a use state of the cooktop. "Located on an inner side of the panel" can be understood as being located on one side of the panel facing the interior of the cooktop, which is a side that often cannot be seen by the users in the use state of the cooktop. The gear marks may be numbers such as 0-9, symbols or patterns such as different sizes of gas flames. The gear marks may be formed through printing, coating, laminating or etching.

[0006] In one possible implementation manner of the present invention, the connecting element includes a light-transmissive portion, and the light of the light-emitting member is evenly emitted to the panel through the light-transmissive portion. Light emitted from different angles of the light-emitting member is concentrated on the front of the light-transmissive portion, thereby improving brightness and evenness of the gear marks.

[0007] In one possible implementation manner of the present invention, the light-transmissive portion includes a light exit surface facing the panel, and a distance (d) from the light exit surface to the panel is within a range of $0.5\text{ mm} \leq d \leq 2\text{ mm}$. In this way, the light of the light-emitting member can be gathered in a corresponding position on the panel, to ensure that the required position has sufficient brightness, which will not cause that gear marks adjacent to the gear mark lit up are lit up to some extent.

[0008] In order to obtain more ideal light and enable the light of the light-emitting member to be transmitted more evenly, in one possible implementation manner of the present invention, the light exit surface is a matte surface.

[0009] In order to make the light-transmissive portion have good light permeability and light diffusivity, in one possible implementation manner of the present invention, the light-transmissive portion is made of an acrylic material, or the light-transmissive portion is made of a polycarbonate material to which a light diffusant is added.

[0010] In one possible implementation manner of the present invention, the connecting element is disk-like. The mold is simple and manufacturing is easy.

[0011] In order to better protect the light-emitting member and prevent failure of the light-emitting member caused by soup, water vapor or even oil entering from an opening on the panel, in one possible implementation manner of the present invention, the connecting element includes a groove that receives the light-emitting member, and the light-transmissive portion is located at the top of the groove.

[0012] In one possible implementation manner of the present invention, the connecting element is made of an opaque material, and the light-transmissive portion is assembled at the top of the groove; or the light-transmissive portion is formed integrally by the connecting element, the connecting element is made of a light-transmissive material, and an opaque material is coated or an opaque film is pasted on a surface of the connecting element facing the panel except the top of the groove. That the light-transmissive portion is formed integrally by the connecting element saves the trouble of manual assembly of the light-transmissive portion.

[0013] In one possible implementation manner of the present invention, the operation apparatus for a cooktop further includes a circuit board that controls ON/OFF of the light-emitting member, where the light-emitting member includes a connecting pin, and the connecting pin rotatably contacts the circuit board when the connecting element rotates. The technical solution creatively solves the problems of line connection and control of the rotating light-emitting member, which is a great progress compared with the existing technologies. Moreover, when the light-emitting member is damaged, the damaged light-emitting member can be replaced with a light-emitting member individually, but the circuit board does not need to be replaced, which can save the maintenance cost.

[0014] In one possible implementation manner of the present invention, the rotation shaft is capable of moving axially under the driving of the knob, and the connecting pin flexibly contacts the circuit board when the connecting element moves along an axial direction of the rotation shaft. Thus, a feasible solution is provided for the rotation shaft to move along the axial direction thereof to implement some functions of the operation apparatus, for example, a children lock function.

[0015] Based on the main objective of the present invention, the present invention further provides a cooktop, including the operation apparatus for a cooktop as described above. The gears of the cooktop of the present invention can be intuitively displayed on the panel, and users can accurately judge relative sizes of fire/power accordingly. In use, light-emitting gear marks are displayed on the panel, which also adds a sense of fashion to the appearance of the cooktop.

[0016] In one possible implementation manner of the present invention, the cooktop includes a cooktop panel, the panel being the cooktop panel. It can be seen that, some features of the present invention can be naturally merged into the structure of the existing cooktops. In one possible implementation manner of the present invention, the cooktop is a gas cooktop or an induction cooktop.

[0017] 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 one embodiment of the present invention;
 FIG. 2 is a front view of a panel according to one embodiment of the present invention;
 FIG. 3 is an exploded three-dimensional view of a connecting element and a circuit board according to one embodiment of the present invention;
 FIG. 4 is a view of an effect of an operation apparatus for a cooktop in a use state according to one embodiment of the present invention; and
 FIG. 5 and FIG. 6 are schematic views of a connecting element according to another embodiment of the present invention.

[0018] In order to further understand the objective, structure, features and functions of the present invention, the present invention is described in detail as follows in combination with embodiments.

[0019] As shown in FIG. 1, FIG. 1 is a sectional view of an operation apparatus for a cooktop according to one embodiment of the present invention. The operation apparatus 2 includes a panel 21, a rotation shaft 22 and a knob 23. The rotation shaft 22 is at least partially located on an inner side of the panel 21. The operation apparatus 2 has at least two gears, and rotation of the rotation shaft 21 can regulate the gear of the operation apparatus 2. The knob 23 is at least partially located on an outer side of the panel 21, for driving the rotation shaft 22 to rotate. The panel 21 has at least two light-transmissive gear marks 100; as shown in FIG. 2, FIG. 2 is a front view of a panel according to one embodiment of the present invention. The gear marks 100 are numbers "0", "1", "2", ..., and "9". The numbers on the panel 21 are light-transmissive, while the other parts are opaque, and for example, a black material may be coated or a black film may be pasted thereon. "0" indicates a closed state, "1" indicates Gear 1, "2" indicates Gear 2, ..., and "9" indicates Gear 9. The panel 21 has an opening 210 that allows the rotation shaft 22 to pass through, and the gear marks 100 are disposed around the opening 210. After the operation apparatus 2 is assembled, the gear marks 100 are just disposed around the knob 23.

[0020] In addition, the operation apparatus 2 further includes a disk-like connecting element 20 located on the inner

side of the panel 21, and the connecting element 20 is connected to the rotation shaft 22 and rotates under the driving of the rotation shaft 22 when the rotation shaft 22 rotates. Referring to FIG. 3, FIG. 3 is an exploded three-dimensional view of a connecting element and a circuit board according to one embodiment of the present invention. The connecting element 20 includes a groove 201, and the top of the groove 201 is provided with a light-transmissive portion 25 that can play a role of optical diffusion. A light-emitting member 24 consisting of LEDs is disposed in the groove 201, and is fixedly connected to the connecting element 20 through a screw 240. Light of the light-emitting member 24 is emitted to the panel 21 through the light-transmissive portion 25. The light-transmissive portion 25 is made of a polycarbonate material to which a light diffusant is added, and has a light exit surface 250 facing the panel 21, and a distance (d) from the light exit surface 250 to the panel 21 is within a range of $0.5\text{ mm} \leq d \leq 2\text{ mm}$. In order to make brightness of the light emitted by the light-emitting member 24 and irradiated to the panel 21 even, the light exit surface 250 is a matte surface.

[0021] Referring to FIG. 4, FIG. 4 is a view of an effect of an operation apparatus for a cooktop in a use state according to one embodiment of the present invention. The light of the light-emitting member 24, after passing through the light-transmissive portion 25, becomes a beam of light evenly emitted to the panel 21, and when the knob 23 rotates to one gear of the operation apparatus 2, for example, Gear 9, only one gear mark on the panel 21, that is, the number "9", is lit up by the light of the light-emitting member 24, to intuitively display the current gear of the operation apparatus, so that a user can accurately judge a relative size of the current fire/power of the cooktop. Moreover, the gear mark lit up is sufficient to let the user see clearly without bending down in a situation in which a kitchen is dim. FIG. 4 only illustrates the gear mark lit up, the short lines around the number indicate that the number "9" is luminous, the user sees that it is luminous, while the other gear marks not lit up are inconspicuous in the use state, which are indicated by not being displayed on the panel in FIG. 4.

[0022] The connecting element 20 in this embodiment is made of an opaque material, for example, usually an opaque plastic material, and has a low cost. The light-transmissive portion 25 is assembled to the top of the groove. Referring to FIG. 5 and FIG. 6, FIG. 5 and FIG. 6 are schematic views of a connecting element according to another embodiment of the present invention. In another embodiment of the present invention, a light-transmissive portion 25' is formed integrally by a connecting element 20'. The connecting element 20' is made of a light-transmissive material, and an opaque material is coated or an opaque film is pasted on a portion 202' on a surface of the connecting element 20' facing the panel 21 except the top of a groove 201'. Further, in order to better prevent the light of the light-emitting member 24 from leaking to cause that portions on the panel not needing to be lit up are irradiated, opaque treatment is also carried out on a side surface 203' of the connecting element 20' adjacent to the surface facing the panel 21, for example, an opaque material is coated or an opaque film is pasted thereon.

[0023] Further referring to FIG. 3, the operation apparatus 2 further includes a circuit board 26 that controls ON/OFF of the light-emitting member 24, and the circuit board 26 is fixedly set relative to the rotation shaft 22, that is, when the rotation shaft 22 rotates, the circuit board 26 is stationary. The light-emitting member 24 includes two J-shaped connecting pins 241, and the connecting pins 241 rotatably contact the circuit board 26 when the connecting element 20 rotates, so as to implement electrical connection to and control over the light-emitting member 24. The operation apparatus 2 in this embodiment can rotate the rotation shaft 22 only after the user presses down the knob 23, and has a children lock function. The J-shaped connecting pins 241 flexibly contact the circuit board 26 during axial movement of the connecting element 20 along the rotation shaft 22, so that the light-emitting member 24 still can work normally in the process that the rotation shaft 22 moves along the axial direction thereof.

[0024] The present invention further provides a cooktop, including the operation apparatus 2 for a cooktop as described above. The cooktop, for example, may be a gas cooktop or an induction cooktop. The cooktop includes a cooktop panel and a gas valve located on an inner side of the cooktop panel, and the gas valve includes a valve rod controlling ON/OFF and flow of gas; in one embodiment, the panel is the cooktop panel, and the rotation shaft is the valve rod. It can be seen that, applications of the present invention do not hinder the work of the existing gas valves, and it is unnecessary to modify the design of the existing gas valves.

[0025] The present invention has been described through the above related embodiments, but the embodiments are merely examples of implementing the present invention. It should be pointed out that, the embodiments disclosed do not limit the scope of the present invention. On the contrary, variations and modifications made without departing from the spirit and scope of the present invention all fall within the patent protection scope of the present invention.

Reference numbers

[0026]

| | |
|---------|----------------------|
| 2 | operation apparatus; |
| 20, 20' | connecting element; |
| 21 | panel; |
| 22 | rotation shaft; |

| | | |
|----|-----------|-----------------------------|
| | 23 | knob; |
| | 24 | light-emitting member; |
| | 25, 25' | light-transmissive portion; |
| | 26 | circuit board; |
| 5 | 100 | gear mark; |
| | 201, 201' | groove; |
| | 203' | side surface; |
| | 210 | opening; |
| | 240 | screw; |
| 10 | 241 | connecting pin; |
| | 250 | light exit surface |

Claims

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

20 a panel (21), wherein the panel (21) has at least two light-transmissive gear marks, a rotation shaft (22), at least partially located on an inner side of the panel (21), and a knob (23) for driving the rotation shaft (22) to rotate, wherein the knob (23) is at least partially located on an outer side of the panel (21),

characterized in that,

the operation apparatus (2) further comprises a connecting element (20, 20') located on the inner side of the panel (21), connected to the rotation shaft (22) and rotating under the driving of the rotation shaft (22) when the rotation shaft (22) rotates; and

25 the connecting element (20, 20') is provided with a light-emitting member (24), and one gear mark on the panel (21) is lit up by light of the light-emitting member (24) when the knob (23) rotates to one gear of the operation apparatus (2).
- 30 2. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that**, the connecting element (20, 20') comprises a light-transmissive portion (25, 25'), and the light of the light-emitting member (24) is evenly emitted to the panel (21) through the light-transmissive portion (25, 25').
- 35 3. The operation apparatus (2) for a cooktop according to claim 2, **characterized in that**, the light-transmissive portion (25, 25') comprises a light exit surface (250) facing the panel (21), and a distance (d) from the light exit surface (250) to the panel (21) is within a range of $0.5\text{ mm} \leq d \leq 2\text{ mm}$.
- 40 4. The operation apparatus (2) for a cooktop according to claim 3, **characterized in that**, the light exit surface (250) is a matte surface.
- 45 5. The operation apparatus (2) for a cooktop according to claim 2, **characterized in that**, the light-transmissive portion (25, 25') is made of an acrylic material, or the light-transmissive portion (25, 25') is made of a polycarbonate material to which a light diffusant is added.
- 50 6. The operation apparatus (2) for a cooktop according to claim 1, **characterized in that**, the connecting element (20, 20') is disk-like.
7. The operation apparatus (2) for a cooktop according to claim 2, **characterized in that**, the connecting element (20, 20') comprises a groove (201, 201') that receives the light-emitting member (24), and the light-transmissive portion (25, 25') is located at the top of the groove (201, 201').
- 55 8. The operation apparatus (2) for a cooktop according to claim 7, **characterized in that**, the connecting element (20, 20') is made of an opaque material, and the light-transmissive portion (25, 25') is assembled at the top of the groove (201, 201'); or the light-transmissive portion (25, 25') is formed integrally by the connecting element (20, 20'), the connecting element (20, 20') is made of a light-transmissive material, and an opaque material is coated or an opaque film is pasted on a surface of the connecting element (20, 20') facing the panel (21) except the top of the groove (201, 201').
9. The operation apparatus (2) for a cooktop according to claim 1, **characterized by** further comprising a circuit board

(26) that controls ON/OFF of the light-emitting member (24), wherein the light-emitting member (24) comprises a connecting pin (241), and the connecting pin (241) rotatably contacts the circuit board (26) when the connecting element (20, 20') rotates.

- 5 **10.** The operation apparatus (2) for a cooktop according to claim 9, **characterized in that**, the rotation shaft (22) is capable of moving axially under the driving of the knob (23), and the connecting pin (241) flexibly contacts the circuit board (26) when the connecting element (20, 20') moves along an axial direction of the rotation shaft (22).
- 10 **11.** A cooktop, **characterized by** comprising the operation apparatus (2) for a cooktop according to any one of claims 1 to 10.
- 12.** The cooktop according to claim 11, **characterized by** comprising a cooktop panel, the panel (21) being the cooktop panel.
- 15 **13.** The cooktop according to claim 11, **characterized in that**, the cooktop is a gas cooktop or an induction cooktop.

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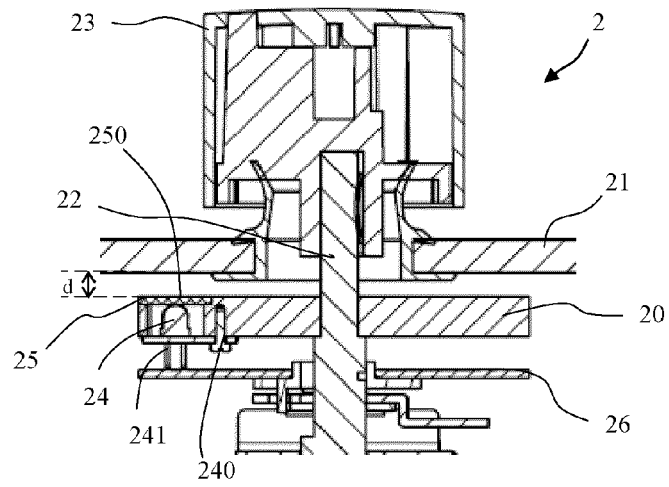


FIG. 1

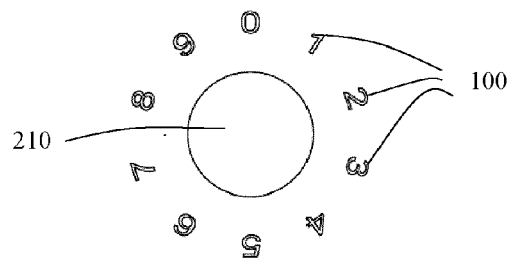


FIG. 2

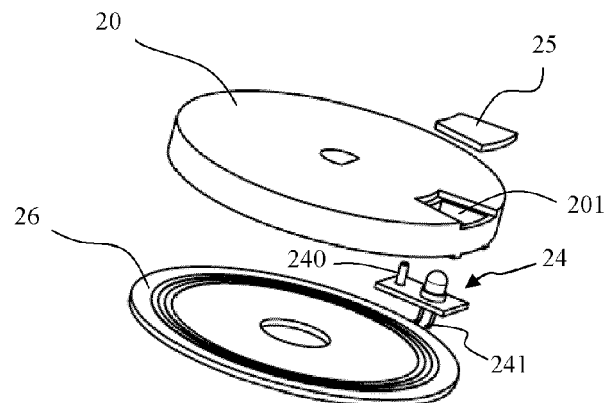


FIG. 3

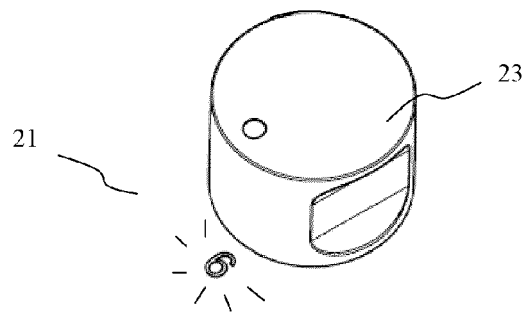


FIG. 4

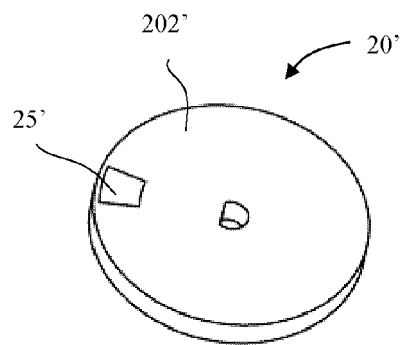


FIG. 5

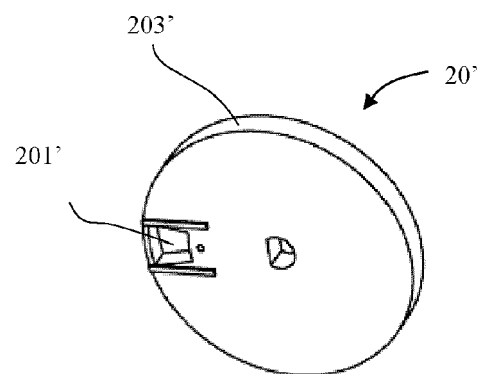


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 8185

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