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Household gas stove

Abstract

A household gas stove, comprising a gas burner, a gas valve for controlling a flow of combustion gas to the gas burner, an ignitor for igniting the combustion gas at the gas burner, and a knob mechanism for actuating the gas valve, wherein the knob mechanism comprises a movable magnet for generating a magnetic field and an immovable switch, wherein the switch is switchable from an off mode, in which the switch is outside a range of the magnetic field, into an on mode, in which the switch is within the range of the magnetic field, by means of moving the magnet relative to the switch, wherein the switch activates the ignitor when being switched from the off mode into the on mode.

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Background/Summary

[0001] The present invention relates to a household gas stove.

[0002] Household gas stoves usually comprise a burner, a knob to control a gas (in the following, also “combustion gas”) supply to the burner and an ignitor to ignite the gas at the burner. It is desirable to ignite the gas when the gas is supplied to the burner. This can be achieved by complex switching or additional buttons pressed by a user. It is one aspect to reduce the complexity of the knob and to increase the operational safety of the household gas stove by preventing of emitting unburned gas. The complexity of the knob should be reduced, and the operational safety of the household gas stove should be increased by preventing of emitting unburned gas.

[0003] It is one object of the present invention to provide an improved household gas stove.

[0004] Accordingly, a household gas stove, comprising a gas burner, a gas valve for controlling a flow of combustion gas to the gas burner, an ignitor for igniting the combustion gas at the gas burner, and a knob mechanism for actuating the gas valve is provided. The knob mechanism comprises a movable magnet for generating a magnetic field and an immovable switch, wherein the switch is switchable from an off mode, in which the switch is outside a range of the magnetic field, into an on mode, in which the switch is within the range of the magnetic field, by means of moving the magnet relative to the switch, wherein the switch activates the ignitor when being switched from the off mode into the on mode.

[0005] When the gas valve is activated by a movement of a knob element of the knob mechanism, the switch automatically activates the ignitor to ignite the combustion gas at the burner. Thus, no unburned gas will leak into the environment which increases the safety of the household gas stove. Since the ignitor is activated automatically without pressing any additional buttons, it also increases the usability of the household gas stove.

[0006] The ignitor can be a spark plug. “Activation” of the ignitor in this context means that the ignitor ignites the combustion gas at the burner. “Activation” can also mean that the ignitor is unblocked so that the ignitor can be switched on by a user. In the on mode of the switch, the switch is closed. In the off mode of the switch, the switch is opened. The on mode of the switch is defined that other devices, in particular the ignitor, are turned on. The off mode of the switch is defined that the other devices are turned off. The movement of the magnet relative to the switch may be a rotational movement or a translational movement, e.g., in a slide control to actuate the gas valve.

[0007] According to an embodiment, the switch closes an ignitor circuit of the household gas stove to supply power from a power supply to the ignitor to ignite the combustion gas at the burner when the switch is switched into the on mode.

[0008] The household stove comprises an ignitor circuit. The ignitor circuit is connected to the power supply, which may be connected to a household power supply, for example. When the switch is switched into the on mode, the ignitor may ignite the combustion gas at the burner.

[0009] According to a further embodiment, the knob mechanism comprises a control element and a knob element which is removable and attachable, wherein the knob element is held to the control element by means of the magnet.

[0010] The knob mechanism may be arranged at a top sheet, comprising cooking area, or a panel of the household gas stove. When the knob element is removed, the top sheet or the panel may be a smooth surface which may simplify cleaning the panel or the top sheet. The magnet used for

switching the switch may be advantageously used for holding the knob element to the control element. An additional magnet may be saved. Removable” in context with the knob mechanism means that the knob element can be lifted from the control element. The knob element is not fixedly attached to the control element.

[0011] According to a further embodiment, the knob mechanism comprises a stem which is arranged between the control element and the knob element, wherein the knob element is attached to the stem.

[0012] Preferably, the stem is a cylindrical part which allows a rotational movement of the stem and the knob element and can be inserted into the control element.

[0013] According to a further embodiment, the stem and the knob element comprise a rotation axis, wherein the stem and the knob element rotate around the rotation axis relative to the control element, wherein the switch is arranged at the control element, wherein the magnet is arranged at the stem to move the magnet by means of the rotation of the stem around the rotation axis, and wherein the switch switches into the on mode when the movable magnet approaches the switch within the range of the magnetic field generated by the moveable magnet.

[0014] According to a further embodiment, the household gas stove further comprises a top sheet, comprising a cooking area, with an upper and a lower surface, wherein the magnet is arranged at the stem above the upper surface of the top sheet, and wherein the switch is arranged at the control element under the lower surface of the top sheet.

[0015] When the magnet is arranged at the stem, the magnetic field generated by the magnet is sufficiently strong to use the magnet to attach the knob element to the stem. The upper surface of the top sheet is defined as a surface which faces an environment of the gas stove. The lower surface of the top sheet is defined as a surface which faces away from the environment of the gas stove. The top sheet may be plate shaped. The top sheet can be a glass or glass ceramic plate. The top sheet can also be a steel sheet.

[0016] According to a further embodiment, the household gas stove further comprises a device which is turned on when the switch is switched into the on mode and turned off when the switch is switched into the off mode.

[0017] By using the switch to turn on other devices, simultaneously to the ignitor, additional switches may be saved. The other devices may be an outer burner surrounding the burner to provide additional heat power, or a vent which is integrated into the household gas stove to remove airborne grease, combustion products, fumes, smoke, heat, and steam from the air.

[0018] According to a further embodiment, the device is an illumination device.

[0019] The illumination device may show the user of the gas stove that the gas valve is open and combustion gas is supplied to the burner. The illumination device may also show the user that the ignitor is activated.

[0020] According to a further embodiment, the switch is a reed switch.

[0021] The switch may be also any other magnetic switchable switch.

[0022] According to a further embodiment, the magnet is a permanent magnet or a solenoid.

[0023] There can also be provided an array of magnets.

[0024] Further possible implementations or alternative solutions of the invention also encompass combinations—that are not explicitly mentioned herein—of features described above or below with regard to the embodiments. The person skilled in the art may also add individual or isolated aspects and features to the most basic form of the invention.

Description

[0025] Further embodiments, features and advantages of the present invention will become apparent from the subsequent description and dependent claims, taken in conjunction with the

accompanying drawings, in which:

[0026] FIG. 1 shows a schematic top view of a household gas stove;

[0027] FIG. 2 shows a perspective view of a knob mechanism for the household gas stove;

[0028] FIG. 3 shows a schematic cross-sectional view of the knob mechanism according to FIG. 2;

[0029] FIG. 4 shows a further schematic cross-sectional view of the knob mechanism according to FIG. 2 when a switch is in an on mode; and

[0030] FIG. 5 shows a further schematic cross-sectional view of the knob mechanism according to FIG. 2 when the switch is in an off mode.

[0031] In the Figures, like reference numerals designate like or functionally equivalent elements, unless otherwise indicated.

[0032] FIG. 1 shows a schematic top view of an embodiment of a household gas stove **1**. The gas stove **1** comprises a plurality of gas burners **2** to **5**. The number of gas burners **2** to **5** is arbitrary. As FIG. 1 shows, there can be provided four gas burners **2** to **5**. The gas burners **2** to **5** protrude over a top sheet **6** of the gas stove **1**. The top sheet **6** can be a glass or glass ceramic plate. However, the top sheet **6** can also be a steel sheet. Each gas burner **2** to **5** has a thermocouple **7** to **10** for flame monitoring. The thermocouples **7** to **10** protrude over the top sheet **6**. In use of the gas burners **2** to **5**, the thermocouples **7** to **10** are heated.

[0033] The gas stove **1** has a plurality of knob mechanisms **11** to **14**. Each knob mechanism **11** to **14** belongs to a gas valve **15** to **18**. The gas valves **15** to **18** are arranged below the top sheet **6**. The number of knob mechanisms **11** to **14** is the same as the number of gas burners **2** to **5**. Each knob mechanism **11** to **14** is assigned to one gas burner **2** to **5**. By means of the knob mechanisms **11** to **14** and the gas valves **15** to **18**, a stream of combustion gas from a main gas pipe (not shown) to the assigned gas burner **2** to **5** can be controlled continuously or stepwise.

[0034] FIG. 2 shows one of the knob mechanisms **11** to **14** for the household gas stove **1**. The functionality of the knob mechanisms **11** to **14** is explained in the following. However, in the following only the knob mechanism **11** will be referred to. The knob mechanism **11** comprises a knob element **19**, e.g., a handle. The knob element **19** is attached by means of a magnet **20** to a stem **21** or any other cylindrical element. The attachment is not fixed so that the knob element **19** can be removed and attached any number of times to the stem **21**. The knob element **19** is attached to the stem **21** so that a rotational movement of the knob element **19** is transferred to the stem **21**. The knob mechanism **11** further comprises a control element **22**, e.g., comprising a housing, into which the stem **21** is partially inserted. The stem **21** may also be entirely accommodated to enable a smooth surface when the knob element **19** is removed.

[0035] FIG. 2 illustrates that the control element **22** comprises an entirely surrounding flange **23** with a lower surface **24** pointing towards the household gas stove **1**. The top sheet **6** comprises an upper surface **25** (FIG. 3) facing away to an environment E of the household gas stove **1**. The top sheet **6** further comprises a lower surface **26** pointing towards an interior I. For example, when the knob mechanism **11** is mounted on the top sheet **6**, the lower surface **24** of the flange **23** lies on the upper surface **25** of the top sheet **6** as shown in FIG. 3. The control element **22** comprises a plurality of flexible portions **27** protruding radially outwards of the control element **22**. The portions **27** fix the knob mechanism **11** on the lower surface **26** to the top sheet **6** so that the knob element **19** can be removed from the magnet **20** and the control element **22**.

[0036] FIG. 2 further shows a switch **28** immovably arranged at the control element **22**. Preferably, the switch **28** is a reed switch or any other magnetic switchable switch. The switch **28** is switchable into an off mode OFF and into an on mode ON which will be explained later in more detail.

[0037] FIG. 3 shows a schematic cross-sectional view of the knob mechanism **11** in a status when the knob element **19** is removed from the stem **21**. The stem **21** can also be accommodated in the control element **22**, thus a smooth surface with the top sheet **6** can be formed. The magnet **20** is preferably arranged at the stem **21** above the top sheet **6**. The magnet **20** may also be arranged below the top sheet **6**, for example, when the stem **21** is accommodated in the control element **22**.

The magnet **20** may also comprise an array of magnets. The magnet **20** can be a permanent magnet or a solenoid. The knob mechanism **11** comprises a rotation axis R. The knob element **19** and the stem **21** rotate around the rotation axis R. The magnet **20** is arranged at the stem **21** with a distance d to the rotation axis R. When the knob element **19** and the stem **21** rotate around the rotation axis R, the magnet **20** moves on a circular path around the rotation axis R.

[0038] In the following, the on and off mode of the switch **28** will be described and it is referred to the gas burner **2** and the associated gas valve **15**.

[0039] FIG. **4** shows a further schematic cross-sectional view of the knob mechanism **11** when the switch **28** is in the on mode ON. The magnet **20** emits a magnetic field F with a range r. When the stem **21** rotates around the rotation axis R, the magnet **20** moves closer to the switch **28** so that the switch **28** is within the range r of the magnetic field F and the switch **28** switches into the on mode ON. The household gas stove **1** comprises an ignitor circuit **29** with a power supply **30** which may be connected electrically to a power supply network of a building (not shown). The power supply **30** may also be a battery.

[0040] The household gas stove **1** further comprises an ignitor **31** to ignite the combustion gas which flows from the gas valve **15** to the associated gas burner **2**. The number of switches, ignitors and circuits is equal to the number of gas burners **2** to **5**. Every switch, ignitor and circuit are associated to one gas burner **2** to **5**. The ignitor **31** is included into the circuit **29**. When the switch **28** is within the range r of the magnetic field F, the magnetic field F causes the switch **28** to switch into the on mode ON and the switch **28** closes the circuit **29**. When the circuit **29** is closed, the ignitor **31** is connected to the power supply **30** and the ignitor **31** ignites the combustion gas at the gas burner **2**.

[0041] FIG. **5** shows a further schematic cross-sectional view of the knob mechanism according to FIG. **4** when the switch is in an off mode OFF. When the stem **21** rotates around the rotation axis R, the magnet **20** moves away from the switch **28** so that the switch **28** is out of the range r of the magnetic field F. The absence of the magnetic field F causes the switch **28** to switch into the off mode OFF and the switch **28** opens the circuit **29**. When the circuit **29** is open, the ignitor **31** is not connected to the power supply **30** anymore and the ignitor **31** can not ignite the combustion gas at the gas burner **2**.

[0042] In another embodiment, the household gas stove **1** further comprises a device (not shown) which may be turned on when the switch **28** is switched into the on mode ON or turned off when the switch **28** is switched into the off mode OFF. The device may be an illumination device (not shown), an outer burner (not shown) surrounding the gas burner **2** to **5** to provide additional heat power, or a vent (not shown) which is integrated in the household gas stove **1**.

[0043] Although the present invention has been described in accordance with preferred embodiments, it is obvious for the person skilled in the art that modifications are possible in all embodiments.

REFERENCE NUMERALS

[0044] **1** gas stove [0045] **2** gas burner [0046] **3** gas burner [0047] **4** gas burner [0048] **5** gas burner [0049] **6** top sheet [0050] **7** thermocouple [0051] **8** thermocouple [0052] **9** thermocouple [0053] **10** thermocouple [0054] **11** knob mechanism [0055] **12** knob mechanism [0056] **13** knob mechanism [0057] **14** knob mechanism [0058] **15** gas valve [0059] **16** gas valve [0060] **17** gas valve [0061] **18** gas valve [0062] **19** knob element [0063] **20** magnet [0064] **21** stem [0065] **22** control element [0066] **23** flange [0067] **24** surface [0068] **25** surface [0069] **26** surface [0070] **27** portion [0071] **28** switch [0072] **29** circuit [0073] **30** power supply [0074] **31** ignitor [0075] d distance [0076] E environment [0077] F magnetic field [0078] I interior [0079] OFF off mode [0080] ON on mode [0081] r range [0082] R rotation axis

Claims

1-10. (canceled)

11. A household gas stove, comprising: a gas burner, a gas valve designed to control a flow of combustion gas to the gas burner; an ignitor designed to ignite the combustion gas at the gas burner; and a knob mechanism designed to actuate the gas valve and comprising a movable magnet, which is designed to generate a magnetic field, and an immovable switch switchable from an off mode, in which the switch is outside a range of the magnetic field, into an on mode, in which the switch is within the range of the magnetic field, by moving the magnet relative to the switch, wherein the switch activates the ignitor when being switched from the off mode into the on mode.

12. The household gas stove of claim 11, further comprising an ignitor circuit, said switch being designed to close the ignitor circuit to supply power from a power supply to the ignitor to ignite the combustion gas at the gas burner when the switch is switched into the on mode.

13. The household gas stove of claim 11, wherein the knob mechanism comprises a control element and a knob element which is held to the control element by the magnet such as to be removable and attachable.

14. The household gas stove of claim 13, wherein the knob mechanism comprises a stem which is arranged between the control element and the knob element, said knob element being attached to the stem.

15. The household gas stove of claim 14, wherein the stem and the knob element comprise a rotation axis, with the stem and the knob element rotating around the rotation axis relative to the control element, said switch being arranged at the control element, wherein the magnet is arranged at the stem to move the magnet as the stem is rotated around the rotation axis, and wherein the switch switches into the on mode when the movable magnet approaches the switch within the range of the magnetic field generated by the moveable magnet.

16. The household gas stove of claim 13, further comprising a top sheet which comprises a cooking area and includes an upper surface and a lower surface, with the magnet being arranged at the stem above the upper surface of the top sheet, and with the switch being arranged at the control element under the lower surface of the top sheet.

17. The household gas stove of claim 11, further comprising a device interacting with the switch such that the device is turned on when the switch is switched into the on mode and turned off when the switch is switched into the off mode.

18. The household gas stove of claim 17, wherein the device is an illumination device.

19. The household gas stove of claim 11, wherein the switch is a reed switch.

20. The household gas stove of claim 11, wherein the magnet is a permanent magnet or a solenoid.
