OPERATOR CONTROL FOR A DOMESTIC APPLIANCE AND METHOD FOR OPERATING A DISPLAY UNIT

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Abstract
An operator control for a domestic appliance includes an actuator shaft penetrating through a cover plate, an actuator beneath or behind the cover plate and actuable by the actuator shaft, a control knob on the actuator shaft with an indicator, and an induction coil behind or beneath the cover plate for inductively transferring energy to operate the indicator on the control knob.
OPERATOR CONTROL FOR A DOMESTIC APPLIANCE AND METHOD FOR OPERATING A DISPLAY UNIT

[0001] The invention relates to an operator control for a domestic appliance according to the pre-characterizing clause of claim 1 and to a method for operating a display unit or indicator unit of an operator control for a domestic appliance according to the pre-characterizing clause of claim 14.

[0002] A multiplicity of domestic appliance control devices comprising a cover plate and control knobs arranged above or in front of the cover plate for the purpose of actuating a domestic appliance are known from the prior art. The control knobs are frequently coupled to an actuating shaft so as to co-rotate therewith, the shaft establishing a mechanical connection between the control knob and an actuation mechanism arranged under or behind the cover plate. By rotating the control knob it is possible to move the actuation mechanism into different actuating positions which correspond to different operating states of the domestic appliance that is to be controlled. Generic operator controls for domestic appliances are widely established in particular in the case of cooking equipment, such as in the case of stovetops or cooking stoves, but they can also be found on refrigerators, dishwashers or the like.

[0003] Furthermore it is known to integrate display units or indicator units, such as e.g. light-emitting diodes, into a control knob and to supply them with electric current via power supply leads running in the actuating shaft.

[0004] Control knobs of rotary selector switches that are mounted on the glass/ceramic cooking surface are known, in particular from the field of hotplates having glass or ceramic cooking surfaces, whose actuating position is detected inductively for example. These types of operator controls for domestic appliances avoid an actuating shaft penetrating through the glass/ceramic cooking surface so that holes and instabilities of the glass/ceramic cooking surface resulting therefrom can be avoided. An operator control device of said kind for a domestic appliance is disclosed for example in DE 102 12 954 A1, the domestic appliance operator control device revealed therein additionally comprising means for inductively transferring energy to the control knob in order to actuate light-emitting elements arranged in the control knob.

[0005] Whereas the contactless detection of the position of the control knob in operator control devices without actuating shaft is complicated and prone to error, in the case of an energy transfer by means of electric leads running in or along the actuating shaft problems can occur due to corrosion, in particular at contacts, which problems can only be solved by completely sealing the contacts. The latter solution leads to disadvantages in terms of cleaning properties, however.

[0006] The object underlying the invention is in particular to provide an operator control for a domestic appliance, said operator control comprising a control knob which is connected to an actuation mechanism by way of an actuating shaft and includes at least one indicator unit, and avoiding contacts prone to corrosion.

[0007] The object is achieved by means of an operator control for a domestic appliance as claimed in claim 1 and by means of a method for operating a display unit or indicator unit of an operator control for a domestic appliance as claimed in claim 14. Further advantageous embodiments and developments of the invention will emerge from the dependent claims.

[0008] The invention relates in particular to an operator control for a domestic appliance, comprising an actuating shaft penetrating through a cover plate for the purpose of actuating an actuation mechanism arranged beneath or behind the cover plate and a control knob inserted onto the actuating shaft and comprising at least one indicator unit.

[0009] It is proposed to equip the operator control for a domestic appliance with an induction coil arrangement for inductively transferring energy for operating the indicator unit, wherein the induction coil arrangement transfers the energy onto the control knob from a space beneath or behind the cover plate. Owing to the inductive transfer of the energy, plug-in contacts which are opened or closed when the control knob is pulled off or pushed on can be avoided, with the result that the entire apparatus is less susceptible to corrosion. In the design of the plug-in connection between the control knob and the actuating shaft a plug-in contact for transferring the electrical energy can be omitted, which means that the plug-in connection overall can be optimized in terms of the cleaning properties.

[0010] Owing to the inductive transfer of energy onto the control knob and the indicator unit arranged therein it is possible to avoid sparking completely when the control knob is removed from or inserted onto the actuating shaft. Thanks to the inventive design of the operator control for a domestic appliance, therefore, additional advantages in terms of operational reliability and safety can be achieved in particular when the actuation mechanism is embodied for switching a gas supply for a domestic appliance on and off.

[0011] In a particularly simple embodiment of the indicator unit the latter can comprise at least one light-emitting diode. Owing to the low energy consumption of light-emitting diodes the inductive energy transfer is then also particularly unproblematic.

[0012] At the same time more elaborate colors can be realized if the light-emitting diode is an organic light-emitting diode or a polymer light-emitting diode.

[0013] According to a development of the invention it is proposed that the indicator unit is embodied for assuming at least two different activation states in addition to an inactive state as a function of signals transmitted via the induction coil arrangement. The different activation states can visualize, for example, a residual heat indicator, a switched-on or switched-off gas valve, the expiration of a timer for measuring a cooking time, or other features that appear useful in connection with the special domestic appliances including the domestic appliances and operator controls.

[0014] A particularly complex display having a high information content can be implemented if the indicator unit comprises a display unit. The display unit can be embodied, for example, as a seven-segment display, as a liquid crystal display or as comparable displays.

[0015] The presence of the control knob can be taken into account in the control of the domestic appliance by means of a detector arrangement for detecting whether the control knob is fitted. For example, the operator control for a domestic appliance can trigger an emergency cutout if the control knob is removed. A structure of this kind can serve for example as a child safety device in connection with stovetops.

[0016] The control knob can either be mountable onto the actuating shaft such that it can be easily removed from the
actuating shaft for cleaning or for triggering a child safety device or inserted onto the actuating shaft, in particular without the need for tools to be used, or it can be fitted onto the actuating shaft during assembly, in which case in the latter instance it can also be cast with or adhesively attached to the actuating shaft. A complete electrical isolation of the indicator unit and the associated electronic elements can be realized if the indicator unit is encapsulated in an in particular transparent plastic material of the control knob. The operation of the domestic appliance can be guaranteed in spite of a control knob having been mounted onto the actuating shaft at an incorrect angle and a possibility of control by means of an infinitely rotatable control knob can be realized if the operator control for a domestic appliance includes a means for inductively detecting a rotational position of the control knob.

[0017] If the control knob and a part of the induction coil arrangement that is arranged beneath or behind the cover plate are electrically isolated, corrosion-prone electrical contacts can be avoided altogether. More complex information can be presented on the indicator unit if the induction coil arrangement is embodied for the purpose of transmitting at least one item of information to the indicator unit.

[0018] A complex visualization of an operating state of a domestic appliance including the operator control for a domestic appliance can be realized if the domestic appliance operator control includes a control unit for actuating the indicator unit via the induction coil arrangement. The control unit can determine the state of the indicator unit in a flexible manner as a function of the operating state.

[0019] A further aspect of the invention relates to a method for operating an indicator unit or display unit of an operator control for a domestic appliance, the operator control comprising an actuating shaft penetrating through a cover plate for the purpose of actuating an actuation mechanism arranged beneath or behind the cover plate and a control knob inserted onto the actuating shaft and including at least one indicator unit.

[0020] In order to improve a generic method it is proposed in particular that energy for operating the indicator unit is transferred inductively onto the control knob via an induction coil arrangement from a space beneath or behind the cover plate. This makes it possible to avoid a transfer via electric leads and contacts which leads to a shorter service life due to corrosion occurring at contacts and to less advantageous cleaning properties.

[0021] Further advantages will emerge from the description of the drawing. The drawing illustrates an exemplary embodiment of the invention. The drawing, the description and the claims contain numerous features in combination. The person skilled in the art will additionally also consider the features individually and combine them to create further useful combinations.

[0022] FIG. 1 shows a gas cooking stove having an operator control for a domestic appliance, the operator control comprising an actuating shaft penetrating through a cover plate for the purpose of actuating an actuation mechanism arranged beneath the cover plate, and

[0023] FIG. 2 shows the operator control for a domestic appliance from FIG. 1 with a gas cock and an induction coil arrangement.

[0024] FIG. 1 shows a gas cooking stove having an operator control for a domestic appliance which comprises a plurality of actuating shafts 12 in each case penetrating through a cover plate 10 of the operator control for a domestic appliance. In the exemplary embodiment shown in FIG. 1 the gas cooking stove has four flames 14, each flame 14 being associated with a control knob 16 which is inserted onto an actuating shaft 12 and by means of which a gas cock arranged beneath the cover plate 10 can be opened or closed in a manner known per se. The actuating shaft 12 penetrates the cover plate 10 through a circular opening and is mechanically coupled to the actuation mechanism 18 which in the present exemplary embodiment is embodied as a gas cock.

[0025] FIG. 2 shows a detailed view of the actuating shaft 12, the actuation mechanism 18 and an induction coil arrangement 20 for inductively transferring energy for the purpose of operating an indicator unit 22 which is integrated in the control knob 16. The induction coil arrangement 20 serves for inductively transferring energy onto the control knob 16 from a space beneath the cover plate 10.

[0026] The actuating shaft 12 is constructed in the manner of a telescope out of two parts (not shown explicitly in the figure) moving coaxially relative to another. In this arrangement a part that is movable relative to the actuation mechanism 18 is loaded by means of a spring 24 which pushes the actuating shaft 12 upward in the direction of its end equipped with the control knob 16.

[0027] The gas cock cooperates with a bimetallic switch of the actuation mechanism 18, said switch implementing a flame monitoring device in a known manner.

[0028] In order to ignite a gas flame, the control knob 16 must be pressed axially downward against the restoring force of the spring 24 and rotated.

[0029] In the exemplary embodiment shown in FIGS. 1 and 2 the indicator unit 22 comprises a light-emitting diode 26, embodied, for example, as an organic light-emitting diode or as a polymer light-emitting diode, which serves for indicating a residual heat.

[0030] In alternative exemplary embodiments of the invention the indicator unit 22 can be configured to assume two different activation states in addition to an inactive state as a function of signals transmitted via the induction coil arrangement 20. For example, the indicator unit 22 can comprise different-colored light-emitting diodes 26, wherein a first color can be switched on and off as a function of a residual heat measured, for example, via a temperature sensor and wherein a second, different-colored light-emitting diode 26 can be used, for example, to indicate a status of a gas supply and can light up whenever the gas cock is opened, for example.

[0031] In a further exemplary embodiment the indicator unit 22 comprises a display unit on which more complex information, relating, for example, to specific cooking programs, the time elapsed thus far in a cooking process or similar, can also be displayed.

[0032] The induction coil arrangement 20 comprises a first induction coil 28 which is arranged beneath the cover plate 10 and is supplied with alternating current via a transformer 32 which can be controlled by a control unit 34 that is represented only schematically here, and a second induction coil 30 which is arranged on a underside of the control knob 16 inserted onto the actuating shaft 12 and which is integrated in an electric circuit including the indicator unit 22.

[0033] From a dielectric loss angle which can be measured at the lower induction coil 28, the control unit 34 can deduce the presence or non-presence of the control knob 16 by means of the integrated inductive load, which means that the induc-
tion coil arrangement 20 can simultaneously be used as a detector arrangement for detecting whether the control knob 16 is fitted.

In a particularly advantageous exemplary embodiment of the invention the indicator unit 22 and the induction coil 20 are encapsulated in a transparent plastic material of the control knob 16. The induction coil 30 encapsulated in the control knob 16 is arranged coaxially with respect to the actuating shaft 12 which penetrates through the coil. The energy transfer between the lower induction coil 28 and the induction coil 30 encapsulated in the control knob 16 is therefore independent of a rotational position of the control knob 16 or, as the case may be, of the actuating shaft 12 and accordingly is ensured in every operating state.

As a result of the fact that the indicator unit 22 and the upper part of the induction coil arrangement 20 are completely encapsulated in the plastic material of the control knob 16, the control knob 16 is completely isolated electrically from a part of the induction coil arrangement 20 arranged beneath or behind the cover plate 10 and is effectively protected against any corrosion.

In further exemplary embodiments of the invention the operator control for a domestic appliance can include, for example, a means for inductively detecting a rotational position of the control knob 16, and the induction coil arrangement 20 can be configured for the purpose of transmitting more complex information to the indicator unit 22, for example in that the induction coil arrangement 20 includes a receiver chip arranged in the control knob 16 for the purpose of processing a data stream transmitted via the induction coil arrangement 20.

The inventive operator control for a domestic appliance implements a method for operating an indicator unit 22 of an operator control for a domestic appliance, the operator control comprising an actuating shaft 12 penetrating through the cover plate 10 for the purpose of actuating an actuation mechanism 18 arranged beneath or behind the cover plate 10 and a control knob 16 inserted onto the actuating shaft 12 and including at least one indicator unit 22.

The energy for operating the indicator unit 22 is transferred inductively onto the control knob 16 from beneath the cover plate 10 via the induction coil arrangement 20 by means of the induction coils 28, 30.

The person skilled in the art will recognize that the inventive operator control for a domestic appliance and the inventive method for operating a display unit or indicator unit 22 can be beneficially used not only in connection with gas cooking stoves but also in connection with further domestic appliances comprising a control knob 16 having an actuating shaft 12. For example, an application in electric cooking stoves, dishwashers or the like is readily conceivable.

REFERENCE SIGNS

Cover plate 28
Actuating shaft 12
Flame 14
Control knob 16
Actuation mechanism 18
Induction coil arrangement 20
Indicator unit 22
Spring 24
Light-emitting diode 26

An operator control for a domestic appliance, the operator control comprising:

- an actuator shaft penetrating through a cover plate;
- a control knob on the actuator shaft with an indicator; and
- an induction coil behind or beneath the cover plate for inductively transferring energy to operate the indicator on the control knob.

The operator control of claim 15, wherein the actuator switches a gas supply of the domestic appliance on and off.

The operator control of claim 15, wherein the indicator comprises a light-emitting diode.

The operator control of claim 17, wherein the light-emitting diode comprises an organic light-emitting diode or a polymer light-emitting diode.

The operator control of claim 15, is capable of assuming two different activation states and an inactive state as a function of a signal transmitted via the induction coil.

The operator control of claim 15, wherein the indicator comprises a display.

The operator control of claim 15, further comprising a detector that detects whether the control knob is fitted.

The operator control of claim 15, wherein a transparent plastic material of the control knob encapsulates the indicator.

The operator control of claim 15, further comprising a means for inductively detecting a rotational position of the control knob.

The operator control of claim 15, wherein the control knob and a part of the induction coil beneath or behind the cover plate are electrically isolated.

The operator control of claim 15, wherein the induction coil transmits information to the indicator.

The operator control of claim 15, further comprising a controller that actuates the indicator via the induction coil based on an operating state of the domestic appliance.

A gas cooking stove having an operator control for a domestic appliance, comprising:

- an actuator shaft penetrating through a cover plate;
- a control knob on the actuator shaft with an indicator; and
- an induction coil behind or beneath the cover plate for inductively transferring energy to operate the indicator on the control knob.

A method for operating a display unit or indicator unit of an operator control for a domestic appliance, the operator control comprising an actuator shaft penetrating through a cover plate for the purpose of actuating an actuator arranged beneath or behind the cover plate and a control knob inserted onto the actuator shaft and including an indicator unit, the method comprising:

- inductively transferring energy onto the control knob via an induction coil from a space beneath or behind the cover plate; and
- operating the indicator with the transferred energy.

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