



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:
24.07.2024 Bulletin 2024/30
- (51)

International Patent Classification (IPC):
G08C 17/00 (2006.01)
- (21)

Application number: 23382047.1
- (52)

Cooperative Patent Classification (CPC):
G08C 17/00
- (22)

Date of filing: 20.01.2023

- (84)

Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN
- (71)

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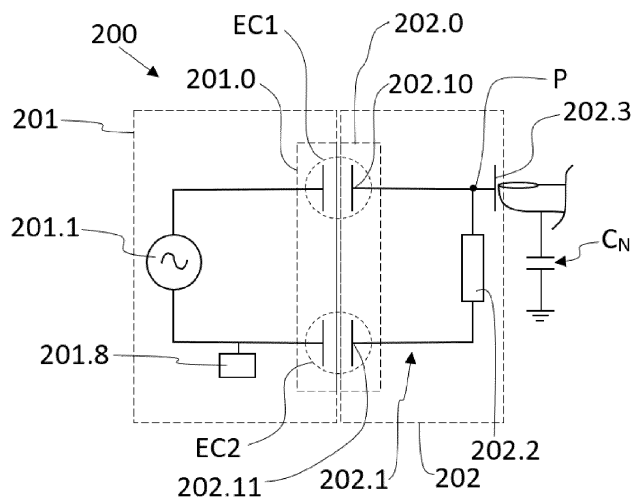
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CONTROL SYSTEM FOR AN ELECTRICAL APPARATUS

- (57)

The invention relates to a control system for an electrical apparatus, comprising a control knob. The electrical apparatus is controlled by means of the relative movement of the control knob with respect to the electrical apparatus when the control knob is operated by a user. The control system also comprises a wireless system (200) with an emitter module (201) arranged in the electrical apparatus and a receiver module (202) asso-
- ciated with the control knob, with an energy coupling (EC1, EC2) being generated between the emitter module (201) and the receiver module (202) in such a way that enables the transfer of electrical power between said emitter module (201) and said receiver module (202) through said energy coupling (EC1, EC2). The receiver module (202) moves integrally with the control knob.
- 
- Fig. 3
- Processed by Luminess, 75001 PARIS (FR)
- EP 4 404 167 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to control systems for electrical apparatuses, in which electrical power is transmitted in a wireless manner.

PRIOR ART

[0002] Electrical apparatuses such as heaters, ovens, washing machines, and the like usually include a control panel having a control knob projecting from a main body of the apparatus such that it is accessible for a user, said lever being operable to control the operation of the apparatus. In general, the knob is a rotary lever, and the apparatus can be controlled with at least a turning of said lever being caused, although it could be a linearly movable knob.

[0003] The knob can contain electronic components which can also be physically and electrically connected with other electronic circuits arranged inside the main body of the apparatus. Due to these physical connections, the apparatus is susceptible to the entry of dust, liquids, and other particles, for example, and this can damage both the electronic components which are arranged inside the main body of the apparatus and the electronic components which are contained in the knob.

[0004] EP3671401A1 discloses a control system for an electrical apparatus which intends to eliminate or to reduce this drawback. The control system comprises a control knob, with the electrical apparatus being controlled by means of the relative movement of the control knob with respect to the apparatus when the control knob is operated by a user, and a wireless system comprising an emitter module arranged in the apparatus and a receiver module associated with the control knob, with at least one wireless energy coupling being generated between the emitter module and the receiver module. The knob comprises a rotational housing and an encoder for detecting the rotation of said casing and converting said detection into control signals as a result of associated electronics, said control signals being used in the control of the apparatus.

DISCLOSURE OF THE INVENTION

[0005] The object of the invention is to provide a control system for an electrical apparatus, as defined in the claims.

[0006] The control system is adapted for being used in an electrical apparatus, such as a cooker, for example. The control system comprises a knob module, the electrical apparatus being controlled by means of the relative movement of the control knob with respect to the electrical apparatus when the control knob is operated by a user.

[0007] The control system further comprises a wireless

system for the transfer of electrical power in a wireless manner, the wireless system comprising an emitter module arranged in the electrical apparatus and a receiver module associated with the control knob. Said modules are arranged with respect to one another in such a way that a wireless energy coupling is generated between same, and this enables the transfer of electrical power in a wireless manner between said emitter module and said receiver module through said energy coupling.

[0008] It is thereby possible to transmit electrical power from the apparatus to the control knob without using any wiring. Being able to dispense with wiring allows being able to have a control knob that can be uncoupled from and coupled to the apparatus, such that when the apparatus is not being used, said control knob does not need to be arranged in the apparatus or associated with same. The energy coupling between the emitter module and the receiver module that enables the transfer of electrical power logically is generated when the control knob is arranged in the apparatus or associated with same.

[0009] When the control knob is in its operative position, the receiver module moves integrally with the control knob, with respect to the emitter module, when the movement of said control knob with respect to the electrical apparatus is caused to control said electrical apparatus. This allows being able to design and manufacture the knob in a simple and cost-effective manner, while at the same time it is more compact, safe, and robust, given that the integral movement allows encapsulating and/or isolating from the outside the sensitive parts of the knob in a simpler manner, in contrast with the situation in which the knob rotates with respect to the receiver module.

[0010] These and other advantages and features of the invention will become apparent in view of the figures and detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1a shows a front view of a control knob of an embodiment of a control system according to the invention, arranged in an electrical apparatus.

Figure 1b laterally shows the arrangement of the control knob of Figure 1a.

Figure 2 depicts in a schematic and simplified manner a wireless system of an embodiment of the control system of the invention.

Figure 3 schematically shows a wireless system of an embodiment of the control system of the invention.

Figure 4 schematically shows a wireless system of another embodiment of the control system of the invention.

Figure 5 schematically shows a wireless system of another embodiment of the control system of the invention.

Figure 6a shows a transfer area between an emitter module and a receiver module of a capacitive wireless system, of an embodiment of the control system of the invention in which the control knob is linearly movable.

Figure 6b shows a transfer area of the wireless system according to the embodiment of the control system of Figure 6a, with the control knob in a different position.

Figure 7 shows the configuration of conductive surfaces of the emitter module and of the receiver module of a capacitive wireless system, of an embodiment of the control system of the invention in which the control knob is rotational.

DETAILED DISCLOSURE OF THE INVENTION

[0012] The proposed control system is adapted for an electrical apparatus 300, preferably a home appliance, such as a heater, an oven, a cooktop, a washing machine, or the like. These apparatuses 300 comprise a control system through which a user can control the different options or parameters offered by the apparatus in question (such as control of the electrical power of a burner, for example).

[0013] The control system comprises a control knob 101 which is accessible for a user, with said control knob 101 being actuated by the user to control the operation of the apparatus, such that the electrical apparatus 300 is controlled by means of the relative movement of the control knob 101 with respect to the apparatus 300, when the control knob 101 is operated by a user. In general, the control knob 101 is rotational (comprising a rotary lever), as depicted in Figures 1a and 1b, and can be moved angularly with respect to an axis of rotation 101.0; although the control knob 101 could be a linearly movable knob.

[0014] The proposed control system further comprises a wireless system 200, which is configured to transmit electrical power in a wireless manner from the apparatus 300 to the control knob 101 when said control knob 101 is attached to said apparatus 300.

[0015] Dispensing with cables for powering the control knob 101 from the apparatus 300 allows isolating from the outside the inside of the apparatus 300 and of the control knob 101, such that dirt or liquids are prevented from being able to enter said apparatus 300 and said control knob 101, with a wireless transfer of electrical power being maintained between same. Preferably, the wireless system 200 is inductive or capacitive, but, in any case, it is wireless.

[0016] The control system comprises attachment

means not depicted in the figures, which are configured to be able to attach or associate the control knob 101 in a manner that it can be uncoupled to an outer surface 301 of the electrical apparatus 300. This makes it unnecessary for the control knob 101 to always be arranged attached to the electrical apparatus 300, and it may only be attached to said apparatus 300 when said apparatus 300 is to be controlled. In that sense, the control knob 101 can be arranged in an operative position in which it is arranged in or associated with the apparatus 300, and in an inoperative position in which it is not arranged in or associated with said apparatus 300. The control knob 101 can control the apparatus 300 while in the operative position.

[0017] The attachment means can be magnetic or mechanical, for example, and both the control knob 101 and the apparatus 300 are adapted to the corresponding attachment means, such that the attachment and detachment of the control knob 101 does not require tools. The fact that the control knob 101 can be uncoupled allows being able to keep the apparatus 300 clean or to clean said apparatus 300 in a simpler manner, given that the outer surface 301 is accessible when the control knob 101 is detached and it also allows being able to clean the control knob 101 with greater ease given that it can be manipulated individually (independently of the apparatus 300).

[0018] As depicted in Figure 2, the wireless system 200 comprises an emitter module 201, which is arranged in the electrical apparatus 300, and a receiver module 202, which is associated with or arranged in the control knob 101, and the electrical power can thus be transferred from the emitter module 201 to the receiver module 202 (when the control knob 101 is in the operative position). The emitter module 201 may comprise a power source 201.1 for generating electrical power, although said electrical power to be transmitted could come from another part of the apparatus 300 (another power source for example) and comprises an emission zone 201.0 from which the electrical power is transmitted to the receiver module 202. Said receiver module 202, in turn, comprises a reception zone 202.0 which receives said electrical power.

[0019] At least one wireless energy coupling is generated between the emitter module 201 and the receiver module 202 while the control knob 101 is in the operative position, thus enabling the wireless transfer of electrical power between said emitter module 201 and said receiver module 202 through said energy coupling. The amount of electrical power which is transmitted depends on the value of the energy coupling.

[0020] The receiver module 202 moves integrally with the control knob 101, thus being movable with respect to the emitter module 101, without involving any unwanted loss in the electrical power transfer capacity.

[0021] Preferably, the value of the energy coupling between the emitter module 201 and the receiver module 202 varies when the receiver module 202 moves together

with the control knob 101 with respect to the emitter module 201, with the position of the control knob 101 being determined based on the value of said energy coupling. A variation of the value of the energy coupling involves a variation in the electrical power transmitted, and the wireless system 200 can be configured, for example, so that the electrical power transmitted between the emitter module 201 and the receiver module 202 increases as said receiver module 202 moves in one a direction and so that said electrical power transmitted decreases as said receiver module 202 moves in the direction opposite. In that sense, the control system has the encoder function incorporated therein.

[0022] The encoder function can be linked to the required value of a specific parameter of the apparatus 300, by a user. For example, when the control system is used in a kitchen cooktop, the movement of the control knob 101 can indicate that the user requires a change of value in the electrical power of a cooking burner, and since this movement of the control knob 101 involves a change in the value of the energy coupling, this results in a change in the electrical power transmitted between the emitter module 201 and the receiver module 202. By detecting this electrical power, the new need of the user is detected and actions can accordingly be taken.

[0023] The value of the electrical power transmitted can be detected by detecting the electrical power transmitted from the emitter module 201 and/or also by detecting the electrical power received in the receiver module 202. In that sense, the control system may comprise a detector 201.8 in the emitter module 201 for the corresponding detection and/or a detector 202.8 in the receiver module 202 for the corresponding detection, with the detected value of an electrical power being dependent on the position of the knob 101. In the case where the receiver module 202 comprises a detector 202.8 and the emitter module 201 does not comprise a detector, the control knob 101 may comprise a wireless emitter 202.9 configured to transmit said detection to the apparatus 300 (see Figure 4).

[0024] In some embodiments of the control system, the control knob 101 may comprise a notification module for emitting an indication about the position of the control knob 101 based on the detected value of the electrical power in the emitter module 201 and/or in the receiver module 202. Said notification module may comprise an illumination device selected from at least one illumination point, preferably a LED, the illumination level of which varies based on the detected value of the electric current, said level being higher the higher said value is, and a plurality of illumination points, with each illumination point preferably being a LED, with said illumination device being configured so that the number of illumination points which are illuminated depends on the detected value of the electric current, with said number of illuminated illumination points being higher the higher said value is; or it may comprise a sound device, for example.

[0025] The notification module is part of an electrical

circuit of the control knob 101, with said electrical circuit being supplied with an electrical power when the receiver module 202 receives an electrical power from the emitter module 201. In this way, no additional power supply is required to apply this notification, since the supply received wirelessly for the control of the apparatus 300 with the control knob 101 can be used.

[0026] In the control system, the energy coupling is generated between an emission zone 201.0 of the emitter module 201 and a reception zone 202.0 of the receiver module 202, the value of said energy coupling depending on the distance between the emitter module 201.0 and the receiver module 202 and on the size of a transfer area which is the part of the emission zone 201.0 of the emitter module 201.0 that is facing the reception zone 202.0 of the receiver module 202. Therefore, simply varying one of these two characteristics, size of the transfer area A or distance, is enough to vary the value of the energy coupling. The type of emission zone 201.0 and reception zone 202.0 depends on the type of wireless system used. For example, in a capacitive wireless system 200 the emission zone 201.0 and the reception zone 202.0 correspond with a corresponding conductive surface, with a conductive surface of the emission zone 201.0 and a conductive surface of the reception zone 202.0 facing the conductive surface of the emission zone 201.0 acting as a capacitor; and in an inductive wireless system 200 each emission zone corresponds with at least one electric coil, with the electrical power being induced from the emission zone 201.0 to the reception zone 202.0 by means of an electric field generated between the electric coils of the emission zone 201.0 and the electric coils of the reception zone 202.0.

[0027] The way to vary the energy coupling of the wireless system 200 in relation to a capacitive wireless system 200, in which the energy coupling is therefore a capacitive coupling, is explained below with an example.

[0028] In a capacitive wireless system 200, such as in those depicted in Figures 3 to 5, the energy coupling is formed by a first capacitive coupling EC1 through which the electrical power is transferred and a second capacitive coupling EC2 serving as a return. Preferably, a capacitive coupling selected from the first energy coupling EC1 and the second energy coupling EC2 varies and the other energy coupling EC1 or EC2 remains constant, when the energy coupling varies, but the two capacitive couplings EC1 and EC2 can be variable.

[0029] This example refers to the first capacitive coupling EC1 as variable energy coupling, but it would also be applicable to the second capacitive coupling EC2 if the latter were variable.

[0030] The first capacitive coupling EC1 is defined between two conductive surfaces CS1 and CS2 which act as a capacitor, with the first conductive surface CS1 being part of the emitter module 201 and the second conductive surface CS2 being part of the receiver module 202. Since it is capacitive, the value of the first capacitive coupling EC1 (capacitance) is defined according to the following

equation:

$$C = \frac{A}{D} \epsilon,$$

wherein:

C: capacitance (value of the first capacitive coupling EC1),

A: transfer area between the two conductive surfaces CS1 and CS2,

D: distance between the two conductive surfaces CS1 and CS2, and

ϵ : permeability of free space ($8.85 \cdot 10^{-12}$ F/m).

[0031] The value of the first capacitive coupling EC1 is thus dependent both on the transfer area A and on the distance D between the two conductive surfaces CS1 and CS2.

[0032] In this example, the unit of measure of the value of the first capacitive coupling EC1 is the capacitance, although it depends on the type of energy coupling used. For example, in the case of a capacitive coupling such as the one in the preceding example (in the case of having a capacitive wireless system), the unit of measure is the capacitance; and in the case of an inductive coupling (in the case of having an inductive wireless system), the unit of measure is the inductance.

[0033] When the transfer area A is varied, the emission zone 201.0 and/or the reception zone 202.0 is designed so that the transfer area A varies in a specific way with the movement of the control knob 101. This is reflected with the example shown in Figures 6a and 6b, which depict a capacitive wireless system 200 and a linearly movable control knob 101.

[0034] Figure 6a shows in a representative manner the position of a conductive surface CS2 of the receiver module 202 with respect to a conductive surface CS1 of the emitter module 201, the transfer area A at that time being marked with continuous lines in the conductive surface CS1, and Figure 6b shows in a representative manner another position of the conductive surface CS2 of the receiver module 202, after a movement of the knob 101 in direction L, with respect to a conductive surface CS1 of the emitter module 201, the transfer area A at that time being marked with continuous lines in the conductive surface CS1. As can be seen, in the second case, Figure 6b, the transfer area A is smaller, the value of the capacitive coupling EC1 being smaller.

[0035] Figure 7 shows two conductive surfaces CS1 and CS2 for the case of a rotational control knob 101, with said conductive surfaces CS1 and CS2 being designed so that the transfer area A between both conductive surfaces CS1 and CS2 varies with the rotation of the control knob 101.

[0036] The explanation provided for capacitive wireless systems 200 would be similar for an inductive wire-

less system 200 (where electric coils are used instead of conductive surfaces CS1 and CS2).

[0037] Although the example has been explained for the case of variations of the transfer area A, as described, the value of the first capacitive coupling EC1 can be varied by varying the distance between the emitter module 201 and the receiver module 202. In this case, movement of the control knob 201 causes the receiver module 202 to move closer to or farther away from the emitter module 201, based on the direction of the movement.

[0038] The receiver module 202 further comprises an electrical circuit 202.1, which is connected to the reception zone 202.2 or comprises said reception zone 202.2, with said electrical circuit 202.1 being movable with respect to the apparatus 300. In this way, the reception zone 202.2 and the electronics (electrical circuit 202.1) move integrally. The electrical circuit 202.1 will comprise different devices and/or elements based on the embodiment of the control system.

[0039] The electrical circuit 202.1 comprises an input 202.10 and an output 202.11, which are connected to the reception zone 202.0 or are part of the reception zone 202.0, such that the electrical circuit 202.1 is powered when said receiver module 202 is powered; and a load 202.2 connected between said input 202.10 and said output 202.11, such that an electric current circulates through said load 202.2. The load 202.2 may comprise an illumination device such as at least one LED, for example, such that when the electrical circuit 202.1 is electrically powered, said load 202.2 is illuminated and the user can perceive same. Said illumination device could be the notification module or part of same.

[0040] In some embodiments of the control system, such as for example the embodiment comprising the wireless system 200 shown in Figure 3, the electrical circuit 202.1 further comprises a metal plate 202.3 which is connected between the input 202.10 and the load 202.2, at a connection point P. Said metal plate 202.3 is arranged in a specific way with respect to an outer contact surface of the control knob 101 which is accessible for a user, such that when a user contacts said contact surface the metal plate 202.3 acts like a touch button. This is possible because contact with a user's finger generates a new capacity C_N through the actual user, which modifies the electrical properties of the electrical circuit 202.1, as depicted in Figure 3. Incorporating the metal plate 202.3 in this way facilitates the user's interaction with the control system, given that there may be an additional control over said system in a simple manner, by simply touching the contact surface of the knob 101 (to turn it on and off, for example). This action can be detected in the apparatus 300 with the corresponding means (a current sensor, for example), and can be responded to accordingly. For detecting this action, it is possible to use any known method, such as for example detecting the electric voltage at the connection point P or the electric current through any part of the electrical circuit 202.1 and sending this detection in a wireless manner to the appa-

ratus 300.

[0041] In some embodiments of the control system, such as for example the embodiment comprising the wireless system 200 shown in Figure 5, the control knob 101 comprises an additional module 102 electrically coupled, in a wireless manner, with the receiver module 202, such that relative movement between the receiver module 202 and the additional module 102 is allowed. In some cases, the additional module remains stationary with respect to the apparatus 300 with the control knob 101 arranged in said apparatus 300 and independently of the fact that the control knob 101 (and the receiver module 202) moves, but in other cases the additional module 102 can also be movable in a manner that is independent of the receiver module 202.

[0042] The additional module 102 comprises a reception zone 102.0 configured to receive the electrical power from the receiver module 202, and an electrical circuit 102.1 which is connected to said reception zone 102.0 or comprises said reception zone 102.0. At least in cases where the additional module 102 remains stationary, said electrical circuit 102.1 may comprise a viewing device in the form of a display 400, for showing the information required of the control system and, since it remains stationary, a user can see the corresponding information in a comfortably manner.

[0043] In these embodiments in which the control knob 101 comprises an additional module, said wireless system 200 comprises an additional wireless energy coupling between the receiver module 202 and the additional module 102, such that said additional module 102 is configured to receive electrical power in a wireless manner through the receiver module 202 when said receiver module 202 receives electrical power from the emitter module 201. The description above for the energy coupling between the emitter module 201 and the receiver module 202 is also valid for the energy coupling between said receiver module 202 and said additional module 102, but in this case it is not necessary for said last energy coupling to vary given that the position of the control knob 101 could be detected with the variation of the energy coupling between the emitter module 201 and the receiver module 202. Alternatively, the variable energy coupling for detecting the position of the control knob 101 could be the energy coupling between said receiver module 202 and said additional module 102, by detecting the electrical power in the receiver module 202 and/or in the additional module 10.

[0044] In the embodiments in which the control knob 101 comprises an additional module 102, if a touch button is to be implemented as described above, the metal plate would preferably be arranged in the additional module 102.

[0045] In some embodiments of the control system, not depicted in the figures, the receiver module 202 comprises a second reception zone having a specific wireless energy coupling with the emitter module 201, with the value of said energy coupling being constant independ-

ently of the position of the control knob 101.

Claims

1. Control system for an electrical apparatus, the control system comprising a control knob (101), the electrical apparatus (300) being controlled by means of the relative movement of the control knob (101) with respect to the apparatus (300) when the control knob (101) is operated by a user, and the control system also comprising a wireless system (200) comprising an emitter module (201) arranged in the apparatus (300) and a receiver module (202) associated with the control knob (101), at least one wireless energy coupling (EC1, EC2) being generated between the emitter module (201) and the receiver module (202), in such a way that enables the transfer of electrical power between said emitter module (201) and said receiver module (202) through said energy coupling (EC1, EC2), **characterized in that** the receiver module (202) moves integrally with the control knob (101).
2. Control system according to claim 1, wherein the energy coupling (EC1, EC2) between the emitter module (201) and the receiver module (202) varies when the receiver module (202) moves together with the control knob (101) with respect to the emitter module (201), the position of the control knob (101) being determined based on the value of said energy coupling (EC1, EC2).
3. Control system according to claim 2, comprising a detector in the emitter module (201) for detecting the electrical power transmitted from said emitter module (201) and/or a detector (202.8) in the receiver module (202) for detecting the electrical power received in said receiver module (202), the position of the control knob (101) being determined based on the value of said measured electrical power.
4. Control system according to claim 3, wherein the receiver module (202) comprises a detector (202.8) for detecting the electrical power received in said receiver module (202) and a wireless emitter (202.9) configured to transmit said detection to a control unit of the apparatus (300).
5. Control system according to claim 3 or 4, wherein the control knob (101) comprises a notification module for emitting an indication about its position based on the detected value of the electrical power, said notification module preferably comprising an illumination device selected from at least one illumination point, preferably a LED, the illumination level of which varies based on the detected value of the electric current, said level being higher the higher said

value is; and a plurality of illumination points, with each illumination point preferably being a LED, with said illumination device being configured so that the number of illumination points which are illuminated depends on the detected value of the electrical power, with said number of illuminated illumination points being higher the higher said value is.

6. Control system according to claim 5, wherein the notification module of the control knob (101) is part of an electrical circuit of said control knob (101), with said electrical circuit being supplied with electrical power when the receiver module (202) receives electrical power from the emitter module (201). 5
7. Control system according to any of claims 2 to 6, wherein the energy coupling (EC1, EC2) is generated between an emission zone (201.0) of the emitter module (201) and a reception zone (202.0) of the receiver module (202), the value of said energy coupling (EC1, EC2) depending on the distance between the emitter module (201.0) and the receiver module (202) and on the size of a transfer area (A) which is the part of the emission zone (201.0) of the emitter module (201.0) that is facing the reception zone (202.0) of the receiver module (202), with the wireless system (200) being configured so that the size of the transfer area (A) and/or said distance varies with the movement of the receiver module (202) with respect to the emitter module (201). 10 15 20 25 30
8. Control system according to claim 7, wherein the emission zone (201.0) and/or the reception zone (202.0) is designed so that the transfer area (A) between the emitter module (201) and the receiver module (202) varies in a specific way with the movement of the control knob (101). 35
9. Control system according to any of claims 2 to 8, wherein the wireless system (200) is capacitive and the energy coupling (EC1, EC2) is formed by a first capacitive coupling (EC1) through which the electrical power is transferred and a second capacitive coupling (EC2) serving as a return, at least one of said first capacitive coupling (EC1) and second capacitive coupling (EC2) being varied so as to vary the energy coupling (EC1, EC2) between the emitter module (201) and the receiver module (202). 40 45
10. Control system according to any of claims 1 to 8, wherein the wireless system (200) is inductive or capacitive. 50
11. Control system according to any of claims 1 to 10, wherein the receiver module (202) comprises a second reception zone having a specific second energy coupling with the emitter module (201), with the value of said second energy coupling being constant inde-

pendently of the position of the control knob (101).

12. Control system according to any of claims 1 to 11, wherein the control knob (101) is rotational and can be moved angularly with respect to an axis of rotation (101.0); or wherein the control knob (101) is adapted for being moved linearly. 5
13. Control system according to any of claims 1 to 12, wherein the receiver module (202) comprises an electrical circuit (202.1) comprising an input (202.10) and an output (202.11); a load (202.2) connected between said input (202.10) and said output (202.11); and a metal plate (202.3) connected at a connection point (P) between said input (202.10) and said load (202.2) and arranged in such a way with respect to a contact surface of the control knob (101) which is accessible for a user, that acts as a touch button when a user contacts said contact surface of the control knob (101). 10 15 20 25 30
14. Control system according to any of claims 1 to 13, wherein the control knob (101) comprises an additional module (102) and an additional energy coupling between the receiver module (202) and the additional module (102), such that said additional module (102) is configured to receive electrical power in a wireless manner from the receiver module (202), said additional module (102) preferably comprising an electrical circuit (102.1) comprising at least one display (400). 35
15. Electrical apparatus, in particular a home appliance, **characterized in that** it comprises a control system according to any of the preceding claims. 40 45 50 55

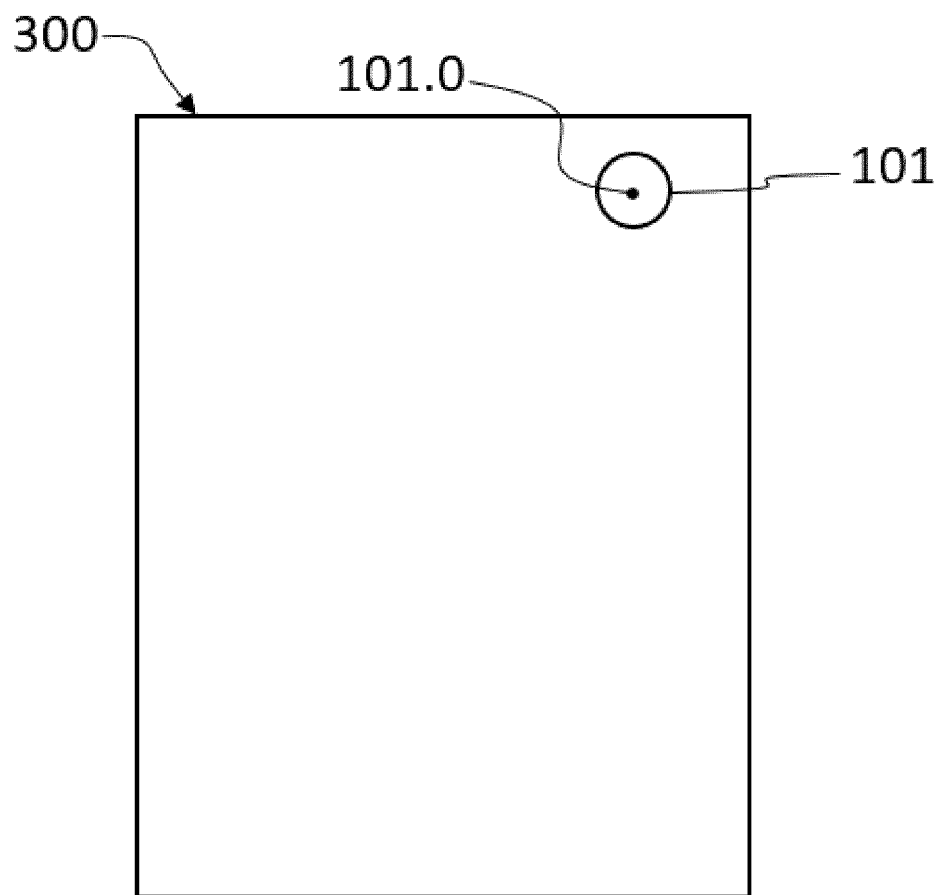


Fig. 1a

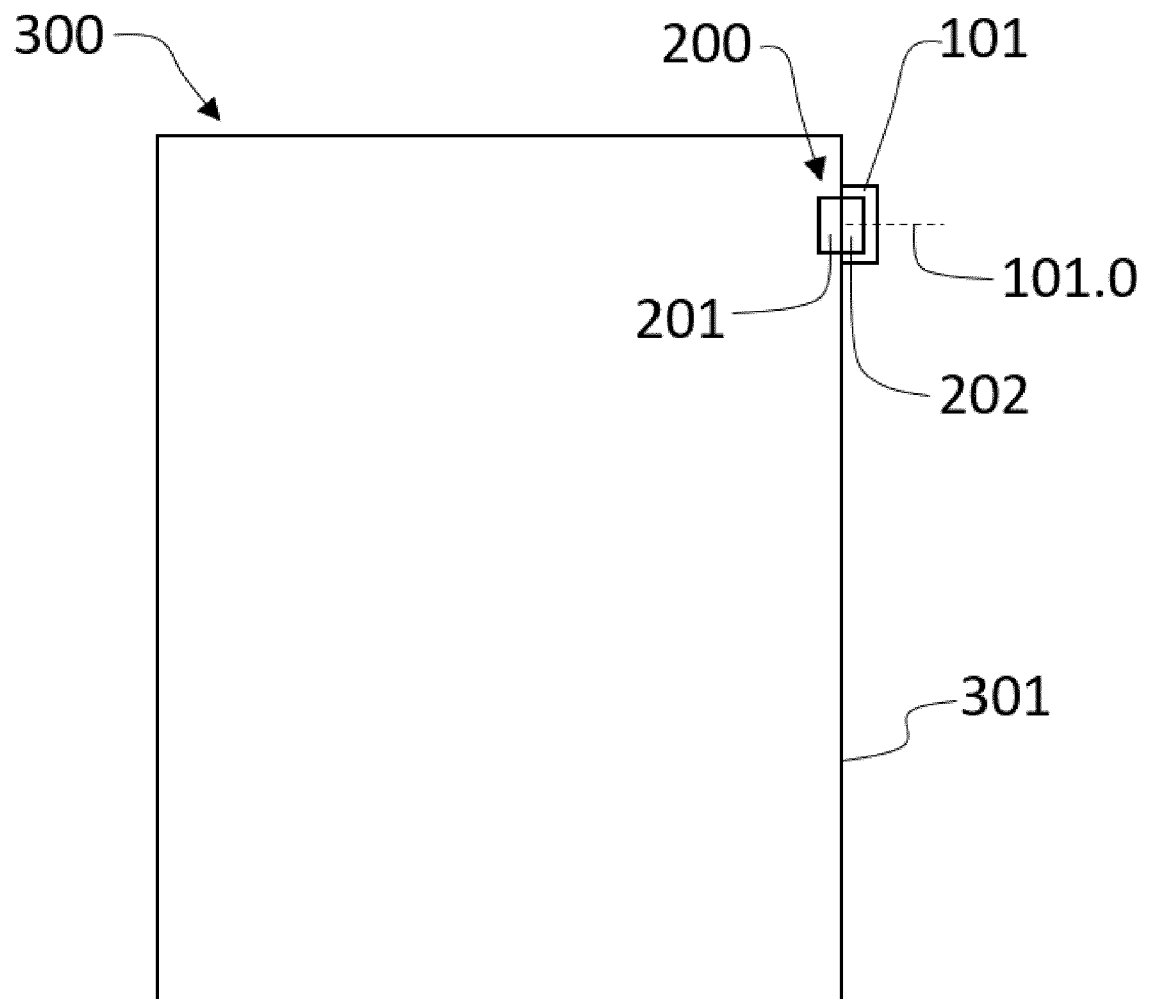


Fig. 1b

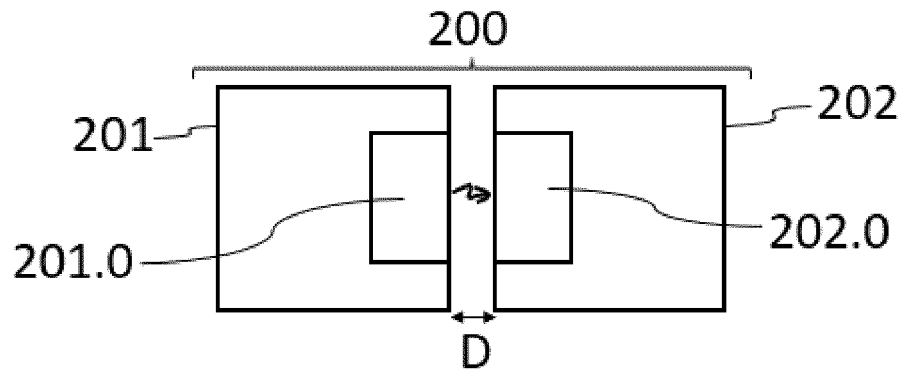


Fig. 2

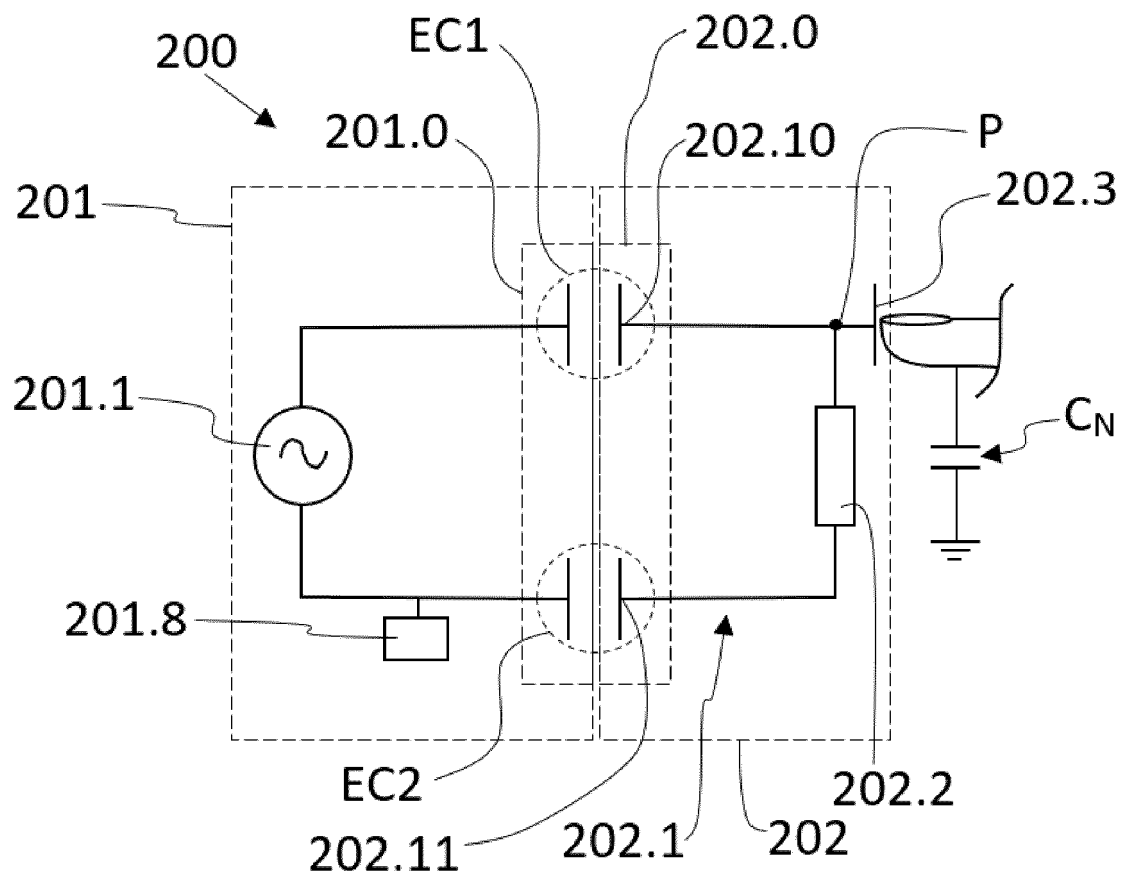


Fig. 3

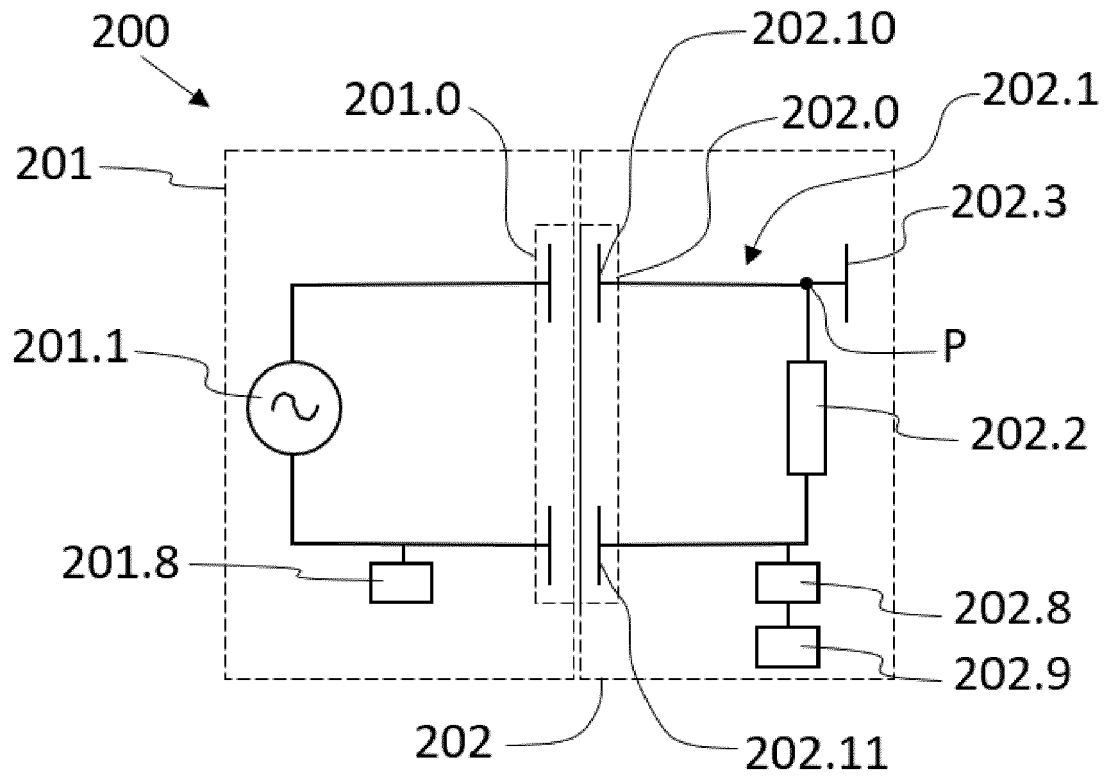


Fig. 4

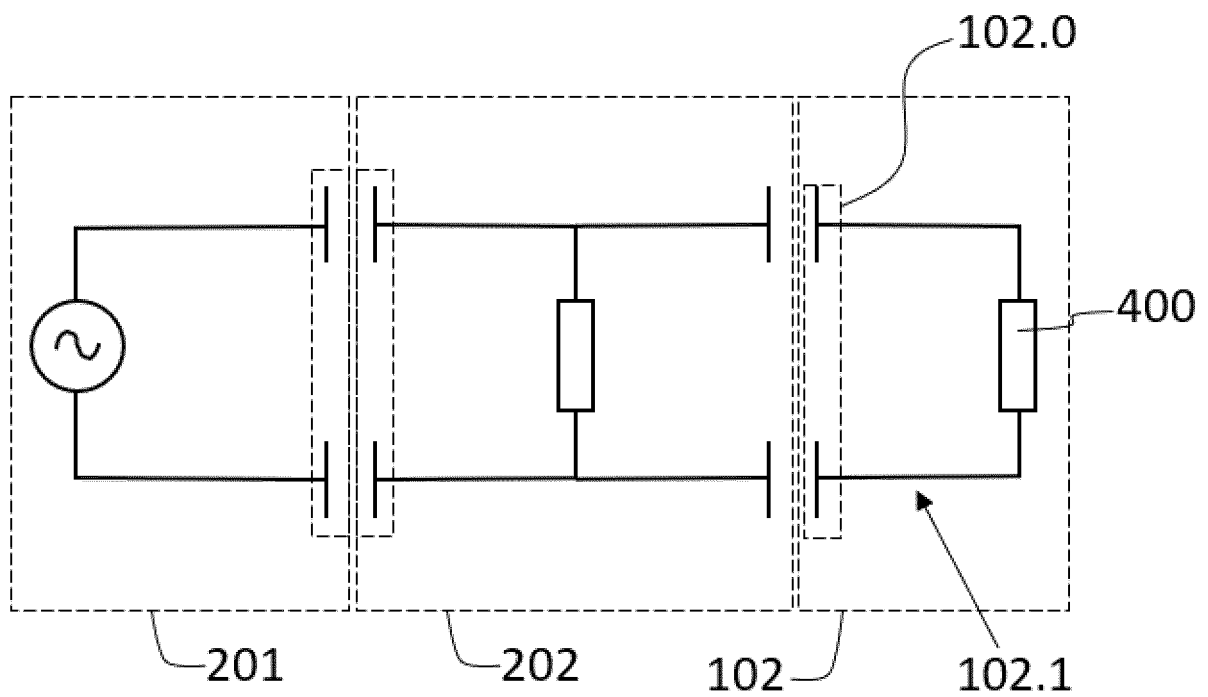
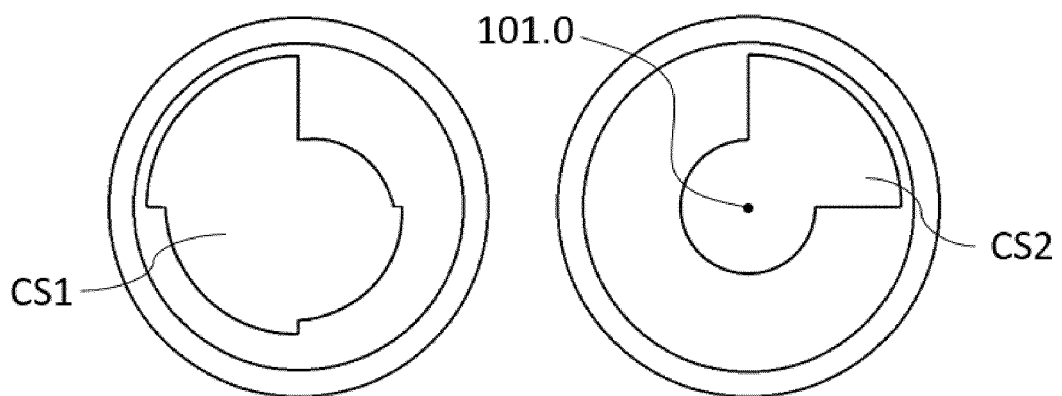
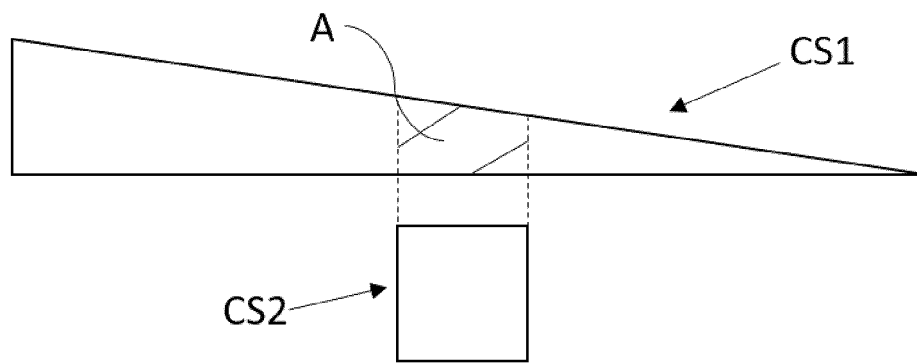
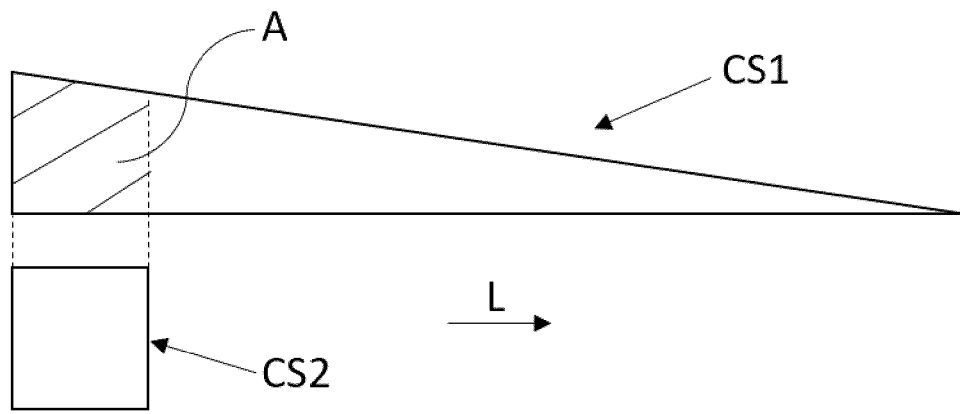


Fig. 5



Application Number

EP 23 38 2047

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DOCUMENTS CONSIDERED TO BE RELEVANT					
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)		
X	DE 10 2017 215416 B3 (EGO ELEKTRO GERAETEBAU GMBH [DE]) 17 January 2019 (2019-01-17)	1, 2, 7, 8, 10, 12, 14, 15	INV. G08C17/00		
A	* paragraph [0026] - paragraph [0045] * -----	3-6, 9, 11, 13			
			TECHNICAL FIELDS SEARCHED (IPC)		
			G08C		
The present search report has been drawn up for all claims					
Place of search The Hague		Date of completion of the search 6 July 2023	Examiner Pham, Phong		
CATEGORY OF CITED DOCUMENTS			T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		
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ON EUROPEAN PATENT APPLICATION NO.

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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06-07-2023

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REFERENCES CITED IN THE DESCRIPTION

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