

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization

International Bureau

(43) International Publication Date  
04 July 2019 (04.07.2019)



(10) International Publication Number  
**WO 2019/130177 A1**

- (51) **International Patent Classification:**  
G08C 17/00 (2006.01)
- (21) **International Application Number:**  
PCT/IB2018/060402
- (22) **International Filing Date:**  
20 December 2018 (20.12.2018)
- (25) **Filing Language:** Italian
- (26) **Publication Language:** English
- (30) **Priority Data:**  
102017000150244 28 December 2017 (28.12.2017) IT
- (71) **Applicant: NICE S.P.A** [IT/IT]; Via Pezza Alta, 13, 31046 Oderzo (TV) (IT).
- (72) **Inventor: MARIUZZO, Alberto;** c/o NICE S.p.A, Via Pezza Alta, 13, 31046 Oderzo (TV) (IT).
- (74) **Agent: CITRON, Massimiliano;** Via Primo Maggio 6, 31020 San Fior (TV) (IT).

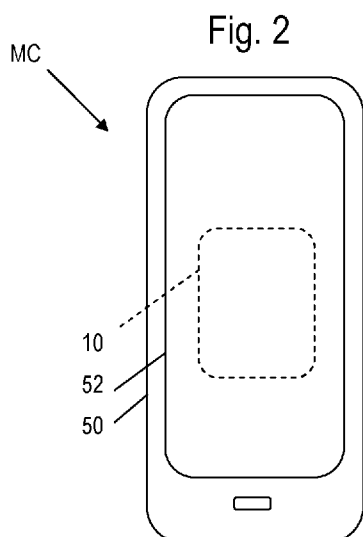
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**  
— with international search report (Art. 21(3))

(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

(54) **Title:** CONTROL SYSTEM FOR AUTOMATION



(57) **Abstract:** A remote control method is described for a home automation component executed by a card (10) equipped with a NFC/RFID communication stage (40), and a radio transmitter (30) tuned on a frequency dedicated to the home automation component. The method comprises the step of inducing the transmission, by the radio transmitter (30) of the card (10), of a control signal towards the home automation component when an external NFC/RFID transmission circuit is neared to the card.



WO 2019/130177 A1

## Control System for automation

The invention refers in general to a remote control system for home automation components, such as a tubular motor or an actuator of movable barriers, such as roller shutters, blinds, curtains, sectional shutters, doors or gates, or in general for a domotic component such as a door, a gate, a window or a light device or an alarm system or an irrigation command or a temperature conditioning or a generic electric command.

The control of the aforementioned home automation components becomes everyday more and more complex and full of functionalities. FR3001098 e.g. shows how to control gates via a smartphone that communicates via WLAN with a control unit and is able to display the state of the component. The system envisages connection to the Internet and use of images on display to make sending commands intuitive.

Clearly the system in FR3001098 is complex, and forces the user to complicate the automation system with the interface to the network, which on the other hand is not always feasible or desirable for reasons of costs and - above all - of effective connectivity.

The main object of the invention is therefore to provide an improved remote control method and device.

A particular object is to make a control device easier to use and/or less cumbersome, and/or to implement a control method easier to execute for the user.

An aspect of the invention is a remote control method for a home automation component performed by a card (*smart card*) equipped with

an NFC/RFID communication stage and

a radio transmitter tuned to a frequency dedicated to the home automation component,

comprising the steps of

inducing the transmission of a control signal via the radio transmitter of the card towards the home automation component when an external NFC/RFID transmission circuit is neared to the card.

Another aspect of the invention is a remote control system for a home automation component, comprising

an electronic, portable or non-portable, device equipped with an operating system and an NFC/RFID communication stage,

a card, separated from the electronic device, equipped with a NFC/RFID communication stage and a radio transmitter tuned on a frequency dedicated to the home

automation component,

wherein

the electronic device is programmed for

- enabling communication via its NFC/RFID stage when the electronic device is neared to the card, and
- sending a command via its own NFC/RFID stage to the NFC/RFID stage of the card, which is programmed to react to such command by transmitting with its radio transceiver a control signal towards the home automation component.

Another aspect of the invention is an *app* for smartphone or tablet able to perform one or each of the method steps defined here.

Another aspect of the invention is a smartphone or tablet comprising a radio transmitter tuned on a frequency dedicated to the home automation component, in order to transmit a control signal with the radio transmitter to the home automation component.

Another aspect of the invention is an electronic device, portable or not, like a smartphone or tablet, comprising an accessory in the form of a card equipped with a radio transmitter tuned to a frequency dedicated to the home automation component, in order to transmit with the radio transmitter a control signal to the home automation component; the accessory being placeable in contact or near the electronic device to establish a communication and/or power supply via the NFC/RFID channel.

Another aspect of the invention is a smartphone casing comprising a card equipped with a radio transmitter tuned on a frequency dedicated to the home automation component, so as to transmit with the radio transmitter a control signal to the home automation component; the casing being placed in contact or near the electronic device to establish communication and/or power supply via the NFC/RFID channel.

By frequency *dedicated* to the home automation component it is meant a frequency or band of frequencies with which the home automation component must necessarily be controlled, owing to standards or regulations.

Below are some advantageous variants for the aforementioned aspects of the invention.

Said NFC/RFID communication stage may be a NFC communication stage, an RFID communication stage, or both.

An advantage of the method is to be able to transform an NFC/RFID card into a remote control, providing it with the radio transceiver tuned on the band frequencies necessary to interact via radio with the home automation component. It is also possible to

turn any electrical/electronic device equipped with a NFC/RFID communication card into a remote control, interacting with a home automation component,

In particular, a preferred step of the method envisages exploiting the external NFC/RFID communication circuit to power-supply the card when the external circuit is neared to the card and, after the power supply has taken place, there follows said step of transmitting the control signal.

Thus, a known remote control can be e.g. replaced by the NFC/RFID card mentioned above when it is associated with an electronic device, e.g. portable, provided with NFC/RFID stage and antenna, such as a NFC/RFID power supply, an MP3 player, a smartphone, a tablet, a computer, a digital programmer, an NFC/RFID card reader, etc. In addition, the assembly [portable or non-portable electronic device + NFC/RFID card] can become a remote control with high computing power, because the technical characteristics and/or computing power of the electronic device can be exploited to manage complex control functions for the home automation component.

Another advantage of the method is to be able to do without WiFi and Internet connections, like in FR3001098, because the native radio channel is used on which the home automation component is designed to tune in order to receive and send commands.

In a variant, the NFC/RFID card is inductively electrically powered from the NFC stage of the electronic device; or the card comprises an autonomous power supply, such as a battery and/or a solar cell and/or one or more capacitors.

An advantage of the power-supply via the NFC/RFID stage from the portable electronic device is e.g. the lightening, the circuit simplification and the dimensional reduction of the NFC/RFID card.

In a variant, a signal is transceived through the radio transmitter of the NFC/RFID card to and from the home automation component, i.e. the communication between the card, which in this case comprises a radio transceiver, and the home automation component, is bidirectional.

An advantage of the bidirectional communication is, for example, to be able to process with the computational power of the electronic device feedback data or status data sent in real time from the home automation component(s) to the card.

In a variant, the signal transmitted by the card's radio transmitter towards the home automation component is pre-established or pre-programmed, or is selected/selectable from/via an app or program executed on board the electronic device. Or said transmitted signal is selected by means of a manually operable selector placed on board the card (e.g.

one or more buttons, a fingerprint reader or a touch screen).

An advantage of the method, when there is an app or management program, is flexibility. By programming the app one can implement many command and management functions, making the most out of the intuitive interface of the electronic device, so familiar to the user.

In a variant, the electronic device comprises a memory with an app stored therein which, when executed, puts in place an authentication procedure of the NFC/RFID card and/or of the codes to be transmitted with the radio transmitter of the NFC/RFID card.

In a variant, the radio codes for coded communication with the domotic component are stored in the card, so only the owner of the card can command the home automation component independently of the type or the owner of the electronic device. In fact the interaction between the latter and the NFC/RFID card will be limited to electrical power supply only.

Or, said radio codes are stored in said electronic device, and transmitted to the radio transmitter of the NFC/RFID card by an app via the NFC/RFID channel.

Or, said radio codes sent from the NFC/RFID card to the domotic component are composed of a first part stored in the electronic device and a second part stored in the NFC/RFID card. This allows a double level of security/verification of the command.

In a variant, the card is a part detached from the electronic device, and the card and the electronic device interact when they are brought in mutual proximity, within the field of action/work of the respective electronic NFC/RFID communication stages.

In a variant, the card is mounted/inserted on a casing of the electronic device. In particular, the NFC/RFID card is mounted on a flap of a casing that is book-like foldable over the electronic device, such as a smartphone, a tablet, a computer, a programmer. The advantage is that a shift of the flap can entail the approach and the separation between the electronic device and the NFC/RFID card, in order to activate the NFC channel.

In a variant, the NFC/RFID card is (either removably or permanently) attached to the external surface of the electronic device, in particular at the position of the NFC/RFID circuit of the latter. E.g. the NFC/RFID card will be positioned on the opposite side of the front display of a smartphone, tablet and portable programmer.

In a variant, the NFC/RFID card is integrated within the electronic device, in particular the NFC/RFID card is integrated within a casing of the electronic device, even more particularly the NFC/RFID card is integrated into the electronic circuitry of the electronic

device enclosed by the casing.

In a variant, the command sent via the NFC/RFID transceiver stage from the electronic device to the NFC/RFID card is a command entered by a user through a user interface on the electronic device, e.g. a touch-screen. In particular, said command entered by a user is detected through the user interface, and

the command sent to the domotic component via the NFC/RFID card is sent as a result of the command entered by the user.

In each variant of the method or system, the electronic, e.g.. portable, device is equipped with a NFC/RFID stage and antenna, as in the case, for example, a NFC/RFID power supply, an MP3 player, a smartphone, a tablet, a computer, a digital programmer, an NFC/RFID card reader, etc.

In a variant, the NFC/RFID card comprises a power-supply device to inductively receive energy from the NFC/RFID stage of the electronic device; or the NFC/RFID card comprises an autonomous power-supply, such as a battery and/or a solar cell and/or one or more capacitors.

In a variant, the card's radio transmitter is a bidirectional transmitter (transceiver).

In a variant, the NFC/RFID card comprises a memory for holding at least one code to be transmitted with the radio transmitter towards the home automation component.

Or the NFC/RFID card comprises a manually-operated selection member (e.g. one or more buttons, a touch screen or a fingerprint reader), to receive a selection from a user related to the signal to be transmitted.

Or a program or app is installed on the electronic device which when executed receives a selection by the user and correspondingly sends a respective command to the card via the NFC channel, wherein the respective command determines the signal to be transmitted via the radio transmitter.

In a variant, the electronic device comprises inside a memory an app that, when executed, puts in place an authentication procedure of the card and/or of codes to be transmitted with the card's radio transmitter.

In a variant, the NFC/RFID card comprises a memory in which there are stored radio codes for coded communication with the home automation component. Or, the electronic device comprises a memory in which radio codes are stored for the coded communication with the home automation component, and the codes are transmitted to the NFC/RFID card's radio transmitter via the NFC/RFID channel by an app or software that runs in the electronic device.

In a variant, the NFC/RFID card is a part detached from the electronic device, and the NFC/RFID card and the electronic device interact when they are brought close to each other.

In a variant, the system comprises a casing for the electronic device, the NFC/RFID card being mounted on or in the casing. In particular, the casing comprises a book-like foldable flap over the electronic device, on or in the flap being mounted the NFC/RFID card. Or, the casing comprises a proper seat or recess for the insertion/positioning of the NFC/RFID card. This seat is for example positioned at the NFC/RFID stage of the electronic device, so as to obtain the best communication condition and/or power supply. E.g. the seat or recess made in the casing of a smartphone and/or a tablet will be placed in the back part. Each smartphone and/or tablet model could have significantly different positions.

In a variant of the system, the NFC/RFID card is attached permanently to the external surface of the electronic device, in particular on the side opposite the front display of the electronic device.

In a variant of the system, the NFC/RFID card is integrated inside the electronic device, in particular the NFC/RFID card is integrated within a housing of the electronic device, even more particularly the card is integrated into the electronic circuitry of the electronic device enclosed by the housing.

In a variant, the electronic device comprises a user interface, e.g. a touch-screen, to determine the command sent via the NFC/RFID stage to the NFC/RFID card. In particular, the electronic device is programmed with an app or software for

detecting said command entered by a user through the user interface, and

sending said command sent through the NFC/RFID stage as a result of the command entered by a user; and

in turn the NFC/RFID card is programmed for such command inducing the transmission with the radio transmitter of the NFC/RFID card of a control signal/command towards the home automation component.

In all the above mentioned variants, it is preferable that the NFC/RFID card is programmable in various ways. E.g. the card comprises for the purpose discrete circuits, logical networks or a microprocessor. The variant with microprocessor is preferable, due to the simplicity of implementation and reduced overall dimensions. In the card the microprocessor is connected to the NFC/RFID communication stage and to the radio transmitter, and controls them.

In all the variants, it is preferable that the NFC/RFID card comprises an operating system of its own.

The frequency *dedicated* to the home automation component is e.g. 433 MHz and/or 868 MHz.

The portable or non-portable electronic device is e.g. a smartphone, a tablet, a computer, a programmer, a power supply for NFC/RFID (the NFC/RFID card could also be powered by the induction charging base present in some car models and dedicated to charging of smartphones) or in general a portable electronic device for mobile telephony managed by a software operating system.

Said card may be e.g. a pocket card or badge, e.g. with the size of a known credit card or an additional memory card (SD card ...).

In all the aforesaid aspects of the invention, the radio transmitter of the card may be a bidirectional transceiver (transceiver). So a signal is transceived through the NFC/RFID card's radio transceiver to and from the home automation component, i.e. the communication between the card and the home automation component is bidirectional.

Note that what has been said for the (wireless) remote control of the domotic component also applies to any device that can be controlled by radio.

The following description relates to a preferred embodiment of system and will highlight further advantages thereof, referring to the annexed drawings wherein:

Fig. 1 shows a block diagram of a control card for a domotic component;

Fig. 2 shows the card in fig. 1 associated with a smartphone.

Fig. 3 shows a graph with some operating steps.

Figure 1 shows a card or badge (*smart card*) 10 for the remote control of a home automation component (not shown). The home automation component is e.g. one among: a roller shutter, a gate or a door, a lighting appliance, an alarm or irrigation system or a temperature conditioning system or a generic electric command.

The card 10 comprises a microprocessor 20 connected to a radio transceiver 30 and to a NFC/RFID interface stage 40.

The radio transceiver 30 comprises an antenna 32 and works on a *dedicated* band, e.g. 433 MHz and/or 868 MHz, a specific band e.g. for the opening signals for motorized gates or doors, and/or for home automation of the house in general.

The NFC/RFID interface 40 comprises an NFC/RFID antenna 42 and works on the band e.g. of 13.56 MHz.

The card 10 optionally comprises an electric power source 50, such as e.g. a battery,



one or more capacitors and/or a photovoltaic module.

The card 10 is to be neared or applied in contact with an electric/electronic device, powered by the mains or a battery, equipped with NFC/RFID interface. Alternatively, the card 10 is to be applied in contact with - or close to - an electronic device such as a smartphone 50, equipped with display or touch-screen 52. In the example (Fig. 2) the card 10 is applied in contact with - or close to - the back of the smartphone 50, to form a complete remote control system MC. The electric/electronic device comprises a NFC/RFID communication stage.

## OPERATION

Also see the graph in fig. 3, showing some operating steps.

Initially, the card 10 is brought near to the NFC/RFID stage of the electrical/electronic device (phase 1).

According to a first embodiment, when the card 10 is brought near to the NFC/RFID stage of the electrical/electronic device, the card 10, through the NFC/RFID interface 40, receives the power supply necessary for the microprocessor 20 to operate. The microprocessor 20 activates and executes stored instructions that involve sending a command which is emitted by the radio transceiver 30 and is intended for the home automation component. The command can be immediate or issued later upon activation of a button 44 or similar means placed on the card 10.

The receding of the card 10 from the electric/electronic device 50 inhibits its operation, unless an independent power supply is provided on the card 10.

According to a second embodiment, when the smartphone 50 (or other similar electronic device such as tablet, computer, programmer, etc.) recognizes the interface 40 via the NFC/RFID channel, in the smartphone 50 an app dedicated to the management of, and/or communication with, the interface 40 (phase 2) is activated. This app enables the data communication between the smartphone 50 and the interface 40.

Or, according to another variant (step 3), the app execution gets initiated as a result of a direct command of the user or upon the occurrence of a programmed event.

Through the app one can organize other functions for the remote control system MC.

E.g. the smartphone 50 and the card 10 can initially interact via the NFC channel through an authentication procedure, see phase 4. In this phase, for example, the microprocessor 20 may verify the presence of an identification code in the smartphone 50; so the card 10 can be bound to the use only with a particular smartphone.

E.g. app of the smartphone 50 during the authentication procedure can verify the

presence of an identification code in the card 10. So only cards 10 with the right identifier can operate on a certain smartphone.

The combined use of the two aforementioned logics allows, for example, to create hierarchical levels of access to the remote home automation component.

The app emulates one or more remote control interfaces for the home automation component through the GUI of the smartphone 50. E.g. the user can use the smartphone 50 as a remote control, to send commands to the home automation component. In this case the app communicates with the microprocessor 20 via the NFC/RFID channel and instructs it to drive the radio transmitter 30 so as to send a radio command to the home automation component.

Preferably, the app is advantageously programmed to allow the user to send various commands to a single home automation component, or one or more commands to a plurality of home automation components.

Preferably, the app is programmed to receive and/or display in real time feedback information about the correct execution of the command and/or the status of the home automation component.

With regard to the radio codes to be transmitted, the system envisages variants. E.g. the codes to be transmitted are stored only in the smartphone 50 (phase 5), or the smartphone 50 can be exploited to download codes from the network (via GSM or WiFi) to then send them to a domotic component via the card 10. Or (phase 6) the codes are stored only in the card 10. Or there can be a distributed storage of the codes. E.g. the command sent by the transceiver 30 towards the home automation component can be composed of a part assigned by (and stored in) the electronic device 50 and of a part assigned by (and stored in) the card 10. This methodology of creating the command allows various possibilities of management and use of the card 10, also associated with several and different electronic devices that may belong to different people (in the context of car sharing for example). Therefore, certain commands and/or authorizations may be associated exclusively to certain cards and/or electronic devices.

The remote control system MC can therefore benefit from versatility, ease of use and programming of a smartphone.

Preferably, the app is programmed (phase 7) to receive from the user a selection command relative to the code to be transmitted and/or to the domotic component recipient of the command, with the advantage of being simple and easy to operate.

The app may be configured to reactivate the smartphone 50 with a shaking, so it is

possible for example to send a radio command via the card 10 only by moving the smartphone 50. In general, according to the interface of the smartphone 50, the app may be programmed to send a radio command via the card 10 when a particular event is detected by the smartphone 50.

The app can e.g. be programmed to enable only a subset of home automation components, e.g. according to the geographical position of the smartphone 50 (detected e.g. via GPS).

The app may be programmed to send via the transceiver 30 commands or data updating the access credentials to certain automations, just as it can modify and/or update functionality and capacity.

All the updates/changes can be obtained from different data media such as Q-codes, barcodes, or from other NFC/RFIDs or from Internet.

The card 10 may comprise only a radio transmitter, i.e. an unidirectional transmitter towards the home automation device.

## CLAIMS

1. Remote control method for a home automation component executed by a card (10) equipped with  
a NFC/RFID communication stage (40), and  
a radio transmitter (30) tuned on a frequency dedicated to the home automation component,

comprising the step of inducing the transmission, by the radio transmitter (30) of the card (10), of a control signal towards the home automation component when an external NFC/RFID transmission circuit is neared to the card.

2. Method according to claim 1, wherein the external NFC/RFID communication circuit is exploited to power-supply the card when the external circuit is neared to the card and, after the power supply, there follows said step of transmitting the control signal.

3. Method according to claim 2, wherein said step of transmitting the control signal takes place automatically after the nearing of the card (10) and the external circuit.

4. Method according to claim 2, wherein said step of transmitting the control signal takes place after the nearing between the card (10) and the external circuit, and following a command entered by a user.

5. Method according to claim 4, wherein the command inserted by a user is inserted by means of the card (10) and/or an interface present in the external circuit.

6. Method according to claim 5, wherein the external circuit comprises a smartphone comprising  
an NFC/RFID communication stage e  
an app programmed to manage the data communication between the NFC/RFID communication stage of the smartphone and the NFC/RFID communication stage (40) of the card.

7. Remote control system for a home automation component, comprising:  
an electronic device (50) equipped with an operating system and an NFC/RFID communication stage,  
a card (10), separated from the electronic device (50) and equipped with:  
an NFC/RFID communication stage (40) and a radio transmitter (30) tuned on a frequency dedicated to the home automation component,  
wherein the electronic device (50) is programmed for  
enabling the communication via its own NFC/RFID stage when the card (10) is neared to the electronic device, and

sending a command through its own NFC/RFID stage to the NFC/RFID stage of the card, which is programmed to react to this command by transmitting a control signal to the home automation component via its own radio transmitter.

8. System according to claim 7, wherein the card (10) comprises a selection member which can be operated manually to receive a selection from a user relative to the signal to be transmitted.

9. System according to claim 7 or 8, wherein a program or app is installed on the electronic device (50) which when executed receives a selection from a user and correspondingly sends a respective command to the card through the NFC/RFID stage, wherein the respective command determines the signal to be transmitted via the radio transmitter (30).

10. System according to claim 7 or 8 or 9, wherein the electronic device (50) is programmed to implement an authentication procedure for the card and/or codes to be transmitted with the card radio transmitter.

11. System according to claim 7 or 8 or 9 or 10, wherein the electronic device is a smartphone.

11. System according to claim 7 or 8 or 9 or 10 or 11, wherein the card (10) comprises a memory for holding at least a code to be transmitted by the radio transmitter to the automation component.

Fig. 1

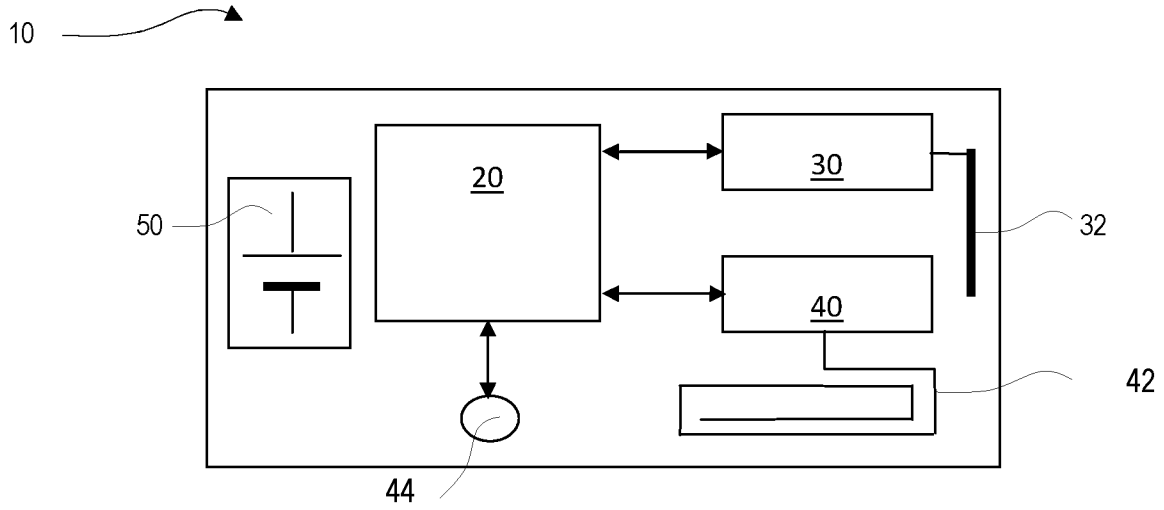


Fig. 2

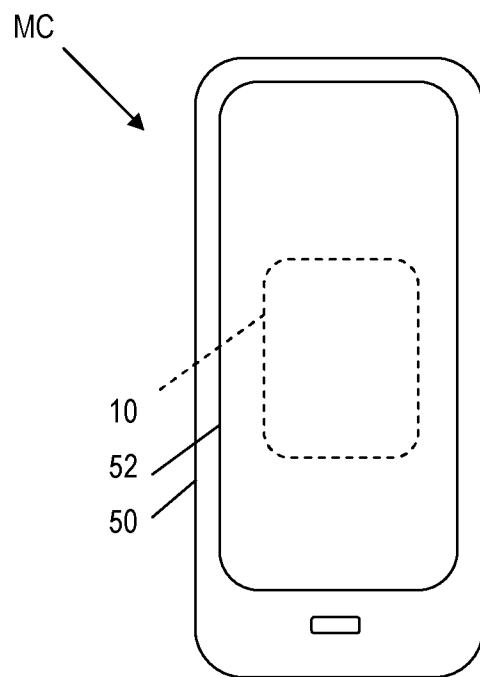
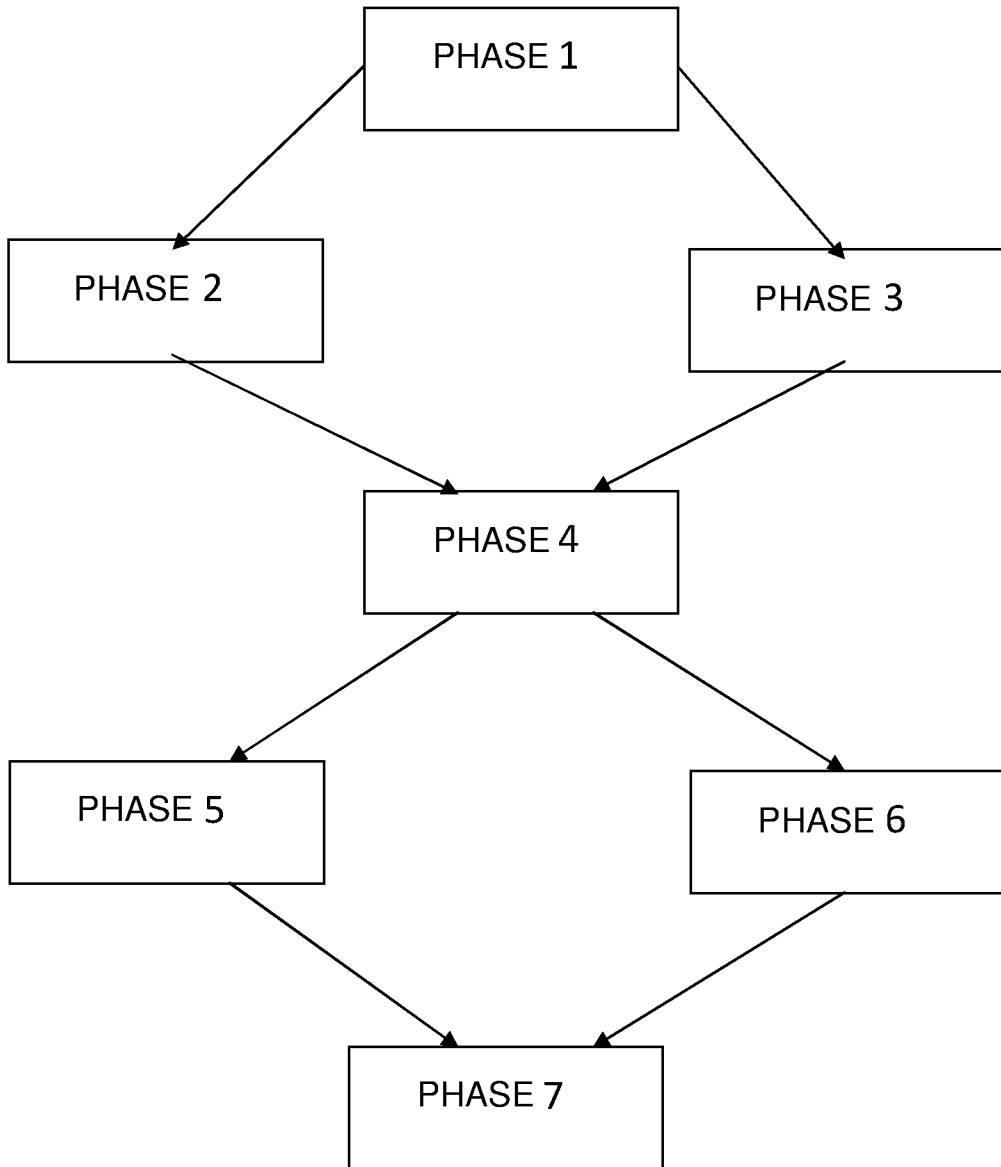


Fig. 3



# INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/060402

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. G08C17/00  
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G08C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/193417 A1 (BSH HAUSGERÄTE GMBH [DE]) 8 December 2016 (2016-12-08) *page 15, lines 4-24* *page 13, lines 7-8*	1,4,6-9
X	----- US 2014/191848 A1 (IMES KEVIN R [US] ET AL) 10 July 2014 (2014-07-10) *paragraphs [0014]-[0016]* *paragraph [0026]*	1-3,7, 10-12
X	----- US 8 498 572 B1 (SCHOOLEY STEPHEN [US] ET AL) 30 July 2013 (2013-07-30) *figure 1*	1,5,7
X	----- US 2017/171949 A1 (KIM CHANG SEOB [KR] ET AL) 15 June 2017 (2017-06-15) *paragraphs [0070]-[0072]*	1,7

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 February 2019

Date of mailing of the international search report

18/02/2019

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040,  
 Fax: (+31-70) 340-3016

Authorized officer

Iavarone, Federico



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2018/060402
---

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016193417 A1	08-12-2016	CN 106292565 A WO 2016193417 A1	04-01-2017 08-12-2016
-----			
US 2014191848 A1	10-07-2014	NONE	
-----			
US 8498572 B1	30-07-2013	CN 103795444 A EP 2701407 A1 EP 3116247 A1 JP 5395299 B1 JP 2014044705 A KR 20140026242 A US 8498572 B1	14-05-2014 26-02-2014 11-01-2017 22-01-2014 13-03-2014 05-03-2014 30-07-2013
-----			
US 2017171949 A1	15-06-2017	CN 106871006 A KR 20170070328 A US 2017171949 A1 US 2018077782 A1	20-06-2017 22-06-2017 15-06-2017 15-03-2018
-----			