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(54) **Title**: ELECTRONIC DEVICE FOR OPENING/CLOSING A DOOR OR OTHER CLOSURE ELEMENT

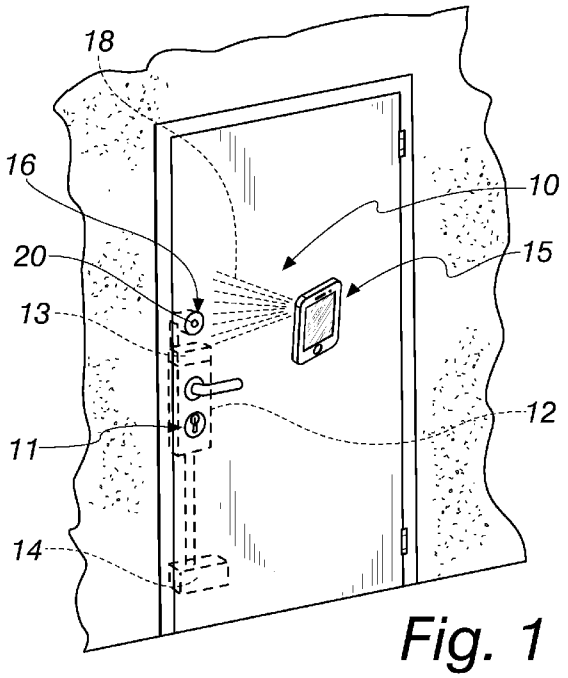

Fig. 1

(57) **Abstract**: An electronic device (10) for opening/closing a door or other closure element, comprising: an electronic lock (11), comprising an automated spring latch (12) with electric means (13) for its movement, and power supply means (14) for the electric means (13) for spring latch movement, a portable signal emitter (15), comprising means for emitting light pulses in the visible spectrum which are adapted to define an opening or closing code of the automated spring latch (12), signal receiving means (16), adapted to detect the light pulses in the visible spectrum, an electronic control and management unit (17) interconnected to the electric means (13) for moving the spring latch and to the receiving means (16) and designed to decode the light pulses detected by the receiving means (16) and to determine a command for the electric means (13) for moving the automated spring latch (12).

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ELECTRONIC DEVICE FOR OPENING/CLOSING A DOOR OR OTHER CLOSURE ELEMENT

The present invention relates to an electronic device for opening/closing a door or other closure element.

Nowadays electronic locks are known and increasingly widespread which comprise an automated spring latch with electrical means for the movement thereof, and power supply means for such electrical means for spring latch movement; the electrical means of such locks are interconnected to an electronic control and management unit for the movement of the spring latch, such electronic unit being in turn interconnected to means of receiving signals originating from corresponding emitter means, which are designed to decode such signals which are adapted to determine a command for the electrical means for the movement of the automated spring latch.

Systems are known and widespread on the market for commanding an electronic lock, and these systems are complex and costly not least because of the high level of security that they have to ensure, such as for example fingerprint readers, electronic keypads, magnetic cards, access badges, infrared remote controls and the like.

Such electronic locks are widely used in residential contexts and especially in the hospitality sector for managing entry to rooms, parking spaces and other areas reserved for clients, and are also used, similarly, in public places where access is reserved such as for example fitness gyms.

The less burdensome systems among those cited are based on the adoption of magnetic cards, or access badges, or remote controls, which must be given to the clients.

Such cards, access badges and remote controls must be periodically renewed owing to normal wear from use.

Furthermore, cards, access badges and remote controls constitute an object that must be treated with care and attention by the user to whom it

has been given for temporary use, since the user is called on not to lose such item, and not to forget it, under penalty of inability to access the premises for which the item is the key, and obviously not to break it.

The aim of the present invention is to provide an electronic device for opening/closing a door or other closure element which is capable of overcoming the limitations of the cited known art.

Within this aim, an object of the invention is to provide a device that can be adapted with or without the adoption of cards, remote controls, access badges and other, similar items.

Another object of the invention is to provide a device that is economic with respect to conventional electronic locks with means of recognition by fingerprint or with a keypad.

Another object of the invention is to provide a device that can be easily installed and is simple and intuitive to use.

Another object of the invention is to provide a device that is remotely programmable and controllable.

This aim and these and other objects which will become better apparent hereinafter are achieved by an electronic device for opening/closing a door or other closure element, characterized in that it comprises:

- an electronic lock, comprising an automated spring latch with electric means for its movement, and power supply means for said electric means for spring latch movement,

- a portable signal emitter, comprising means for emitting light pulses in the visible spectrum defining an opening or closing code of said automated spring latch,

- signal receiving means, adapted to detect said light pulses in the visible spectrum,

- an electronic control and management unit interconnected to said electric means for moving the spring latch and to said receiving means and

designed to decode the light pulses detected by said receiving means and to determine a command for said electric means for moving the automated spring latch.

Further characteristics and advantages of the invention will become better apparent from the description of two preferred, but not exclusive, embodiments of the device according to the invention, which are illustrated by way of non-limiting example in the accompanying drawings wherein:

- Figure 1 is a schematic perspective view of a device according to the invention, in use;

- Figure 2 is a schematic plan view of the operation of the device according to the invention in a first embodiment thereof;

- Figure 3 is a perspective view of the device according to the invention in a second embodiment thereof;

- Figure 4 is a schematic plan view of the operation of the device according to the invention in the second embodiment in Figure 3;

- Figure 5 is a perspective view of a variation of embodiment of the device according to the invention;

- Figure 6 is a cross-sectional view of the variation in Figure 5.

With reference to the figures, an electronic device for opening/closing a door or other closure element is generally designated with the reference numeral 10.

The device 10 comprises:

- an electronic lock 11, comprising an automated spring latch 12 with electric means 13 for its movement, and power supply means 14 for the electric means 13 for spring latch movement,

- a portable signal emitter 15, comprising means for emitting light pulses in the visible spectrum defining an opening or closing code of the automated spring latch 12,

- signal receiving means 16, adapted to detect the light pulses in the visible spectrum,

- an electronic control and management unit 17 interconnected to the electric means 13 for moving the spring latch 12 and to the receiving means 16 and designed to decode the light pulses detected by the receiving means 16 and to determine a command for the electric means 13 for moving the automated spring latch 12.

The electrical means 13 for the movement of the automatic spring latch comprise, for example, an electric motor.

The portable signal emitter 15 is constituted by a smartphone, which can be of known type.

The means for emitting light pulses, which are shown for the purposes of example in the figures and are designated therein with the reference numeral 18, are constituted by a flash 19 integrated in the smartphone, or by the torch for illumination integrated in the smartphone and also having the function of flash.

Alternatively, the means for emitting light pulses are constituted by the luminous screen of the smartphone.

In both cases, both the flash 19 and the luminous screen of the smartphone are activated and managed for such use by way of an adapted application made available to the user and loaded on the smartphone.

The signal receiving means 16 comprise, in the first embodiment of the invention, a detector photodiode 20 which is capable of detecting the signals in the visible spectrum.

The detector photodiode 20 detects the light pulses emitted by the flash of the smartphone and translates them into signals for the electronic unit 17, which is arranged for example inside a body 21 which supports the photodiode 20.

The electronic unit 17 is programmed to decode the light pulses 18 and translate them into a signal to open or close the electronic lock 11.

An organization that adopts such a device 10 according to the invention is capable of making a key for the existing electronic locks at its

premises available to its clients without having to give them magnetic cards, access badges, or remote controls, simply by allowing to the customer to use his/her own smartphone conveniently provided with the special application adapted to convert a recognition code into a train of light pulses emitted by the flash or by the luminous screen of the smartphone.

In a second embodiment of the device according to the invention, designated with the reference numeral 110 in Figure 3, the device 110 also comprises an emitter photodiode 124, which is designed to emit light pulses 126 that are adapted to be detected by the video camera 25 of the smartphone.

The emitter photodiode 124 is conveniently integrated in the body 121 which also supports the detector photodiode 120.

The emitter photodiode 124 is also interconnected to the electronic control and management unit 117.

Such second embodiment of the device 110 according to the invention enables a reciprocal transmission of data and information between the smartphone and the signal receiving means 116, so that, for example, when a certain opening code is used, at the same time a new code is communicated to the smartphone from the receiving means 116, by way of the emitter photodiode 124, and will be automatically used for the next opening command, in this manner increasing the security of the system, since the opening code changes with every opening operation carried out.

The detector photodiode 20 and 120 can be equivalently substituted, in a variation of embodiment, with a video camera.

In a further variation of embodiment of the invention, shown for the purposes of example in Figures 5 and 6, and designated therein with the reference numeral 210, the signal receiving means 216 are fixed to a box-like body 227 which is contoured to contain part of a smartphone, at least the part in which the flash 219 and the video camera are located.

The box-like body 227 has a window 228 for the passage of signals at

the detector photodiode 220, or at the detector and emitter photodiodes.

The box-like body 227 is designed to be embedded in a leaf 230 of a door in which the device 210 is installed.

Obviously such box-like body 227 can also be fixed in a wall or in the frame of a closure element, with the rest of the device being interconnected equivalently to what is described above.

The box-like body 227 allows the transmission of the light pulses in total security, without it being possible for such pulses to be detected and recorded, and therefore replicated, for the purposes of forcing entry by ill-intentioned individuals.

The electronic device 10, 110 and 210 according to the invention is described as having an automatic spring latch, and it can be connected with a plurality of automatic spring latches for the simultaneous opening of a plurality of doors, with the corresponding electronic unit 17 interconnected with such plurality of automatic spring latches operating mutually in parallel.

Obviously the electronic device 10 according to the invention can be applied not only to doors and closure elements for residential environments, but also to doors of vehicles, or to the door of a safe, and other applications that are similar and equivalent, and in general anywhere an electronic lock is required.

In practice it has been found that the invention fully achieves the intended aim and objects.

In particular, with the invention a device is provided that does not involve the adoption of cards, remote controls, access badges and other, similar items, which thus do not pose any encumbrance for a user, and there is no risk of loss or breakage.

Moreover, with the invention a device is provided which is economic compared to electronic locks with conventional means of recognition using fingerprints or keypads, since the detection means using the video camera

and photodiode are relatively economic, and the smartphone is already in the possession of the user, and there is therefore no cost to the organization that adopts an electronic device for opening/closing according to the invention.

Also, with the invention a device is provided which can be installed easily, since it is sufficient to fit the photodiode detection means and the electronic lock, which can be of known type, in the door, and it is simple and intuitive to use since nowadays the use of smartphones is very widespread and the ease of their use is intrinsic.

With the invention a device is provided which, by way of the application loaded on the smartphone, is easily remotely programmable and controllable, and similarly the electronic control and management unit associated with the means of detection of the light pulses can be remotely programmable with conventional means.

The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

In practice the components and the materials employed, provided they are compatible with the specific use, and the contingent dimensions and shapes, may be any according to requirements and to the state of the art.

The disclosures in Italian Patent Application No. PD2015A000021 (102015902327419) from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. An electronic device (10) for opening/closing a door or other closure element, characterized in that it comprises:

- an electronic lock (11), comprising an automated spring latch (12) with electric means (13) for its movement, and power supply means (14) for said electric means (13) for spring latch movement,

- a portable signal emitter (15), comprising means for emitting light pulses in the visible spectrum defining an opening or closing code of said automated spring latch (12),

- signal receiving means (16), adapted to detect said light pulses in the visible spectrum,

- an electronic control and management unit (17) interconnected to said electric means (13) for moving the spring latch and to said receiving means (16) and designed to decode the light pulses detected by said receiving means (16) and to determine a command for said electric means (13) for moving the automated spring latch (12).

2. The device according to claim 1, characterized in that said portable signal emitter (15) is constituted by a smartphone.

3. The device according to claim 2, characterized in that said means for emitting light pulses are constituted by the flash (19) integrated in said smartphone.

4. The device according to claim 2, characterized in that said means for emitting light pulses are constituted by the luminous screen of said smartphone.

5. The device according to one or more of the preceding claims, characterized in that said signal receiving means (16) comprise a detector photodiode (20) capable of detecting the signals in the visible spectrum.

6. The device according to one or more of the preceding claims, characterized in that said electronic unit (12) is arranged inside a body (21) which supports said photodiode (20).

7. The device according to one or more of the preceding claims, characterized in that it comprises an emitter photodiode (124), designed to emit light pulses (126) adapted to be detected by a video camera (25) of the smartphone.

8. The device according to one or more of the preceding claims, characterized in that said emitter photodiode (124) is integrated in a body (121) which also supports the detector photodiode (120).

9. The device according to one or more of the preceding claims, characterized in that said signal receiving means (216) are fixed to a box-like body (227) which is contoured to contain at least the part of a smartphone in which the flash (219) and the video camera are located, said box-like body (227) having a window (228) for the passage of signals at the detector photodiode (220) or at the detector and emitter photodiodes.

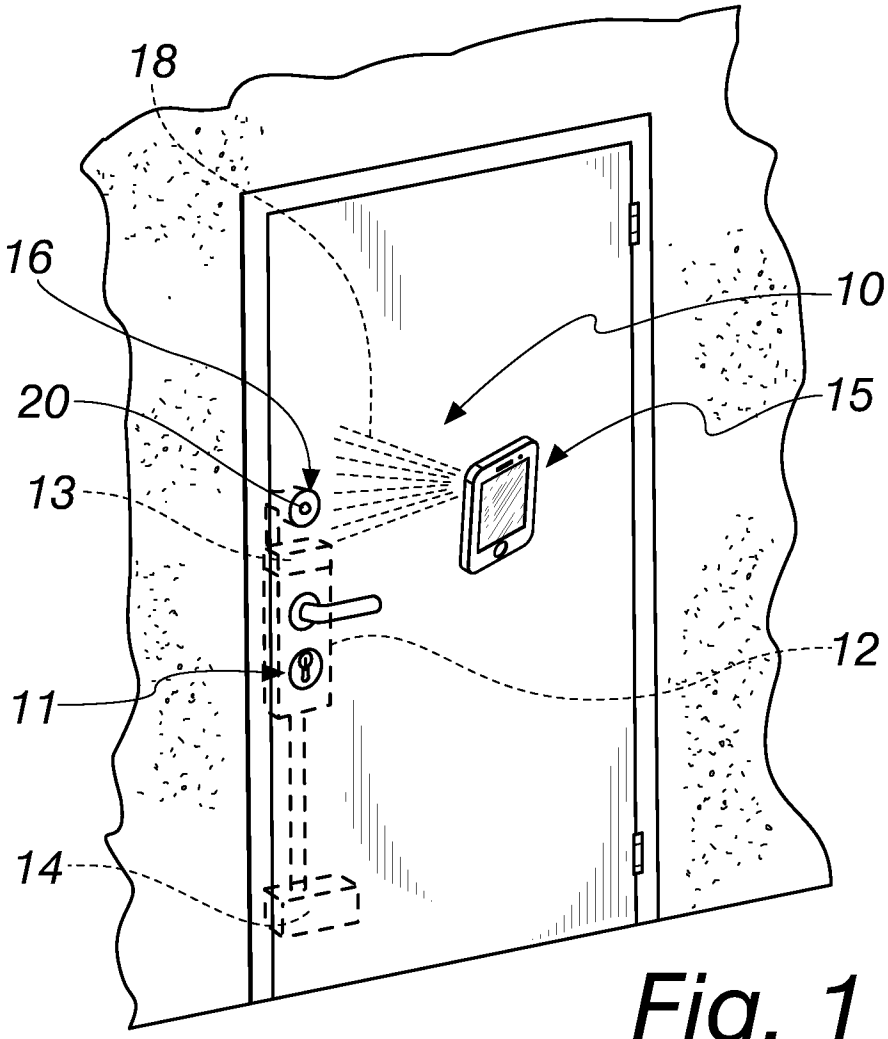

Fig. 1

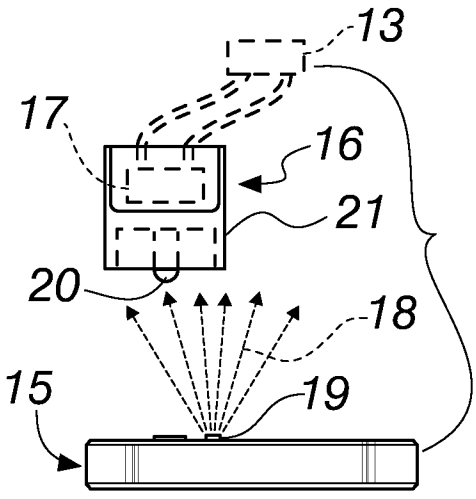

Fig. 2

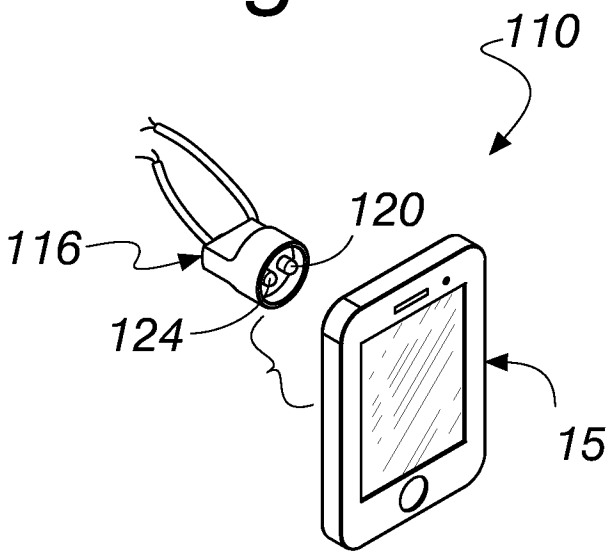

Fig. 3

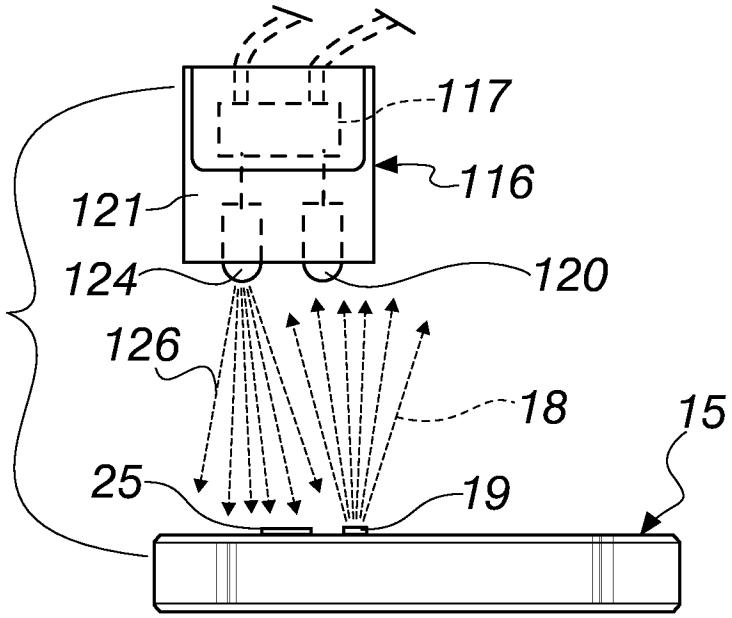

Fig. 4

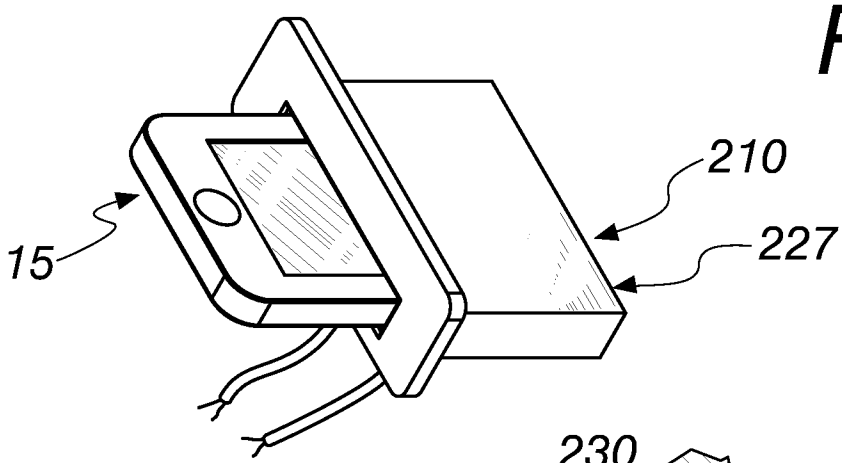

Fig. 5

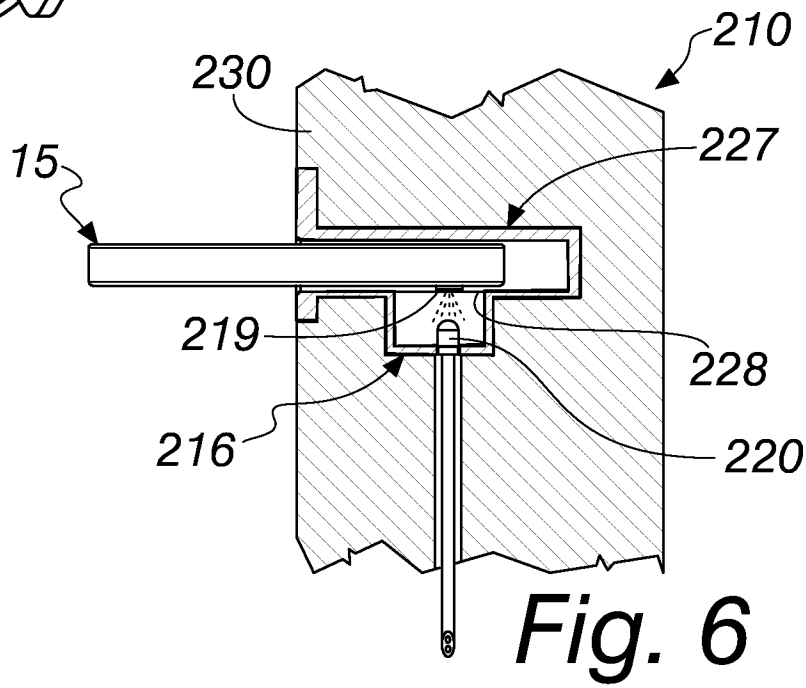

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/052070

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07C9/00 G08C23/04
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)
G07C 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, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	WO 2014/026601 A1 (KUANG CHI INNOVATIVE TECH LTD [CN]) 20 February 2014 (2014-02-20) abstract & US 2015/162984 A1 (LIU RUOPENG [CN] ET AL) 11 June 2015 (2015-06-11) abstract paragraph [0002] paragraph [0015] - paragraph [0025] paragraph [0051] paragraph [0042] - paragraph [0043] figure 1 ----- -/--	1-3,5,6 4,7,8 9

[X] Further documents are listed in the continuation of Box C.

[X] 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

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 April 2016	15/04/2016

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/183042 A1 (KNAPP DAVID J [US] ET AL) 18 July 2013 (2013-07-18) abstract paragraph [0071] paragraph [0074] paragraph [0090] claim 17 figure 5	4
Y	DE 10 2013 218871 A1 (E G O ELEKTRO GERÄTEBAU GMBH [DE]) 7 August 2014 (2014-08-07) abstract paragraph [0007] - paragraph [0022] figure 1	7,8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2016/052070

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US 2015162984 A1	11-06-2015
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DE 102013218871 A1	07-08-2014	NONE	