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(54) ELECTRICAL OUTLET APPARATUS AND METHOD OF OPERATION

(57) There is provided an electrical outlet apparatus (200) comprising a first slot arrangement (220a) for receiving pins of a first electrical plug and at least one second slot arrangement (220b) for receiving pins of a second electrical plug. The electrical outlet apparatus (200) comprises a cover arrangement. The cover arrangement is configurable between a first configuration in which the first slot arrangement (220a) is exposed to receive the pins of an electrical plug and the second slot arrangement (220b) is not exposed to receive pins of an electrical plug and at least one second configuration in which the second slot arrangement (220b) is exposed to receive the pins of an electrical plug and the first slot arrangement (220a) is not exposed to receive pins of an electrical plug.

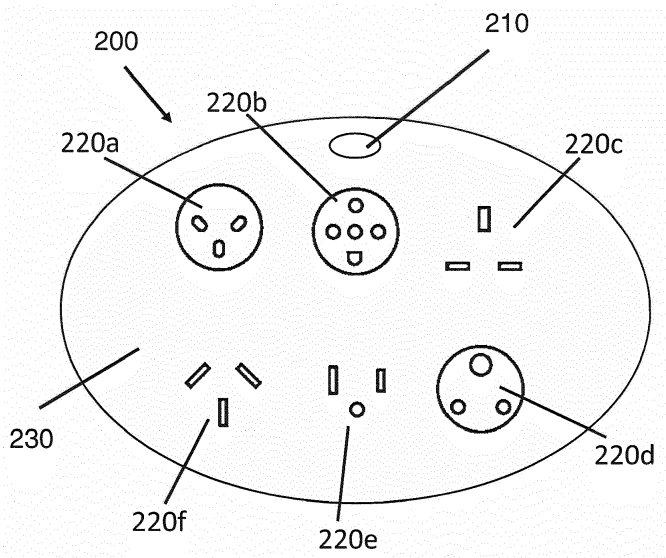

Fig. 2

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Description

Technical Field

[0001] The present disclosure relates to an electrical outlet apparatus for receiving an electrical plug and a method of operating an electrical outlet apparatus.

Background

[0002] Electrical outlets allow electrical equipment to be connected, via a power plug, to a primary, or mains, power supply. The voltage and frequency of the mains power supply differs across countries and regions. In addition, safety requirements for plug design, to avoid electric shocks and fires, vary from country to country. Consequently, electrical plugs and socket outlets differ in voltage and current rating as well as the shape, size and type of connectors. Approximately 20 types of sockets and connectors are in common use around the world.

Summary

[0003] According to a first aspect disclosed herein, there is provided an electrical outlet apparatus comprising a first slot arrangement for receiving pins of a first electrical plug, at least one second slot arrangement for receiving pins of a second electrical plug and a cover arrangement that is configurable between a first configuration in which the first slot arrangement is exposed to receive the pins of an electrical plug and the second slot arrangement is not exposed to receive pins of an electrical plug, and at least one second configuration in which the second slot arrangement is exposed to receive the pins of an electrical plug and the first slot arrangement is not exposed to receive pins of an electrical plug.

[0004] The electrical outlet apparatus may comprise a controller in communication with an actuator, the controller being configured to send control signals to the actuator to cause the cover arrangement to change between the first configuration and the at least one second configuration.

[0005] The actuator may be a servomotor.

[0006] The electrical outlet apparatus may comprise a sensor, wherein the controller is in communication with the sensor, the sensor being arranged to sense an electrical plug and provide electrical plug identity information to the controller.

[0007] The controller may be configured to determine which of the first slot arrangement and the at least one second slot arrangement to expose based on the electrical plug identity information.

[0008] The sensor may comprise a camera.

[0009] The controller may be configured to determine which of the first slot arrangement and the at least one second slot arrangement to expose based on data received from a remote server.

[0010] The electrical outlet apparatus may comprise a voltage converter, wherein the controller is in communication with the voltage converter and configured to send control signals to the voltage converter to cause the voltage converter to change voltage type.

[0011] The cover arrangement may be configurable to a third configuration in which no arrangement of slots is exposed.

[0012] The cover arrangement may comprise a movable cover. The movable cover may comprises an aperture. The cover arrangement may comprise a plurality of covers, each cover associated with a respective one of the slot arrangements.

[0013] According to a second aspect disclosed herein there is provided a method of operating an electrical outlet apparatus comprising determining which of a first slot arrangement for receiving pins of a first electrical plug and at least one second slot arrangement for receiving pins of a second electrical plug to expose to receive pins of an electrical plug and configuring a cover arrangement to a configuration in which the determined slot arrangement is exposed to receive pins of the corresponding electrical plug.

[0014] The method may comprise sending control signals from a controller to an actuator to configure the cover arrangement to the configuration in which the determined slot arrangement is exposed to receive pins of the corresponding electrical plug.

[0015] The method may comprise sensing an electrical plug at a sensor and providing plug identity information from the sensor to the controller for use in determining which the first slot arrangement and the second slot arrangement to expose.

[0016] The method may comprise providing the plug identity information to a remote sensor and, in response, receiving an indication of the plug identity from the remote sensor.

[0017] The method may comprise determining the voltage required for an electrical plug and providing control signals to a voltage converter to cause the voltage converter to convert mains voltage to the determined voltage.

Brief Description of the Drawings

[0018] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figure 1a shows a schematic front view of an example electrical outlet;

Figure 1b shows a schematic front view of an alternative example electrical outlet;

Figure 2 shows a schematic front view of an uncovered electrical outlet apparatus according to an example;

Figure 3 shows a schematic front view of an electrical outlet apparatus with a cover according to one example;

Figure 4 shows a schematic view of an electrical outlet control system according to an example.

Detailed Description

[0019] Figure 1a shows a schematic front view of an electrical outlet 100a used according to UK standards. The electrical outlet 100a includes a cover plate 120 having slots 110 arranged therein to receive the pins of a corresponding electrical plug (not shown). The electrical outlet 100a shown in Figure 1a comprises three rectangular slots 110 arranged at three points of a triangle.

[0020] Figure 1b shows an electrical outlet 100b used according to certain European standards. The cover plate 120 of the electrical outlet 100b shown in Figure 1b comprises a recessed portion 130 for receiving the body of a corresponding electrical plug. The slot arrangement of the electrical outlet 100b comprises two circular slots 110 arranged in a line for receiving the pins of a corresponding electrical plug.

[0021] The slots 110 such as those shown in Figures 1a and 1b provide access to electrical contacts which are connected to the mains power supply. When a corresponding electrical plug is inserted into the electrical outlet, the pins of the plug make an electrical connection with the contacts. The plug is then able to supply power to an electronic device to which it is attached.

[0022] Although two electrical outlet designs are shown in Figure 1a and Figure Ib, many other electrical outlets are in common use. The slot arrangements on electrical outlets may comprise circular, rectangular or otherwise shaped slots. The slots may be arranged perpendicular, parallel or at an angle to one other. The slots may be arranged in a straight vertical or horizontal line relative to the cover plate, in rows on the cover plate or otherwise. Cover plates 120 of a socket outlet may comprise a recessed portion 130 for receiving the body of a plug as shown in Figure 1b, or may be substantially flat, as shown in Figure 1a. The cover plate 120 of an electrical outlet may comprise plastic, metal or any other suitable material

[0023] In addition to the different arrangements of slots provided in different electrical outlets, different electrical outlets operate using different voltages and frequencies, depending on the AC mains voltage and frequency in the country the outlet is designed to be used in. As a result, even if a plug can be made to fit an electrical outlet, the frequency and/or voltage of the power supplied by the electrical outlet may not be suitable for the device to which the electrical plug is attached.

[0024] In effect, an electronic device including a plug made to the standards of one country cannot be used in another country without either replacing the plug (if the device supports the correct voltage and or frequency) or using an adapter. This diversification is not only an inconvenience but introduces costs and waste.

[0025] Figure 2 shows an electrical outlet 200 according to one example. The socket outlet includes a camera 210 and six slot arrangements 220a-f arranged on a first plate 230. Each slot arrangement 220a-f is designed for use according to a different standard, and thus has differently shaped slots arranged in differing patterns. Although six slot arrangements are shown in the example electrical outlet 200, an electrical outlet according to embodiments may comprise two or more slot arrangements. The slot arrangements may comprise slot arrangements according to any suitable standard.

[0026] Same socket inputs, for example ground socket inputs, can be connected to each other internally on the electrical outlet 200.

[0027] The electrical outlet includes a cover arrangement that is configurable between a first configuration in which a first slot arrangement is exposed to receive the pins of an electrical plug and the second slot arrangement is not exposed to receive pins of an electrical plug, and at least one second configuration in which a second slot arrangement is exposed to receive the pins of an electrical plug and the first slot arrangement is not exposed to receive pins of an electrical plug.

[0028] Figure 3 shows the electrical outlet 200 of Figure 2 and a movable cover 340. The cover 340 comprises an aperture 350 which, in a first position as shown, is arranged to expose one of the slot arrangements 220a of the electrical outlet such that the slot arrangement can receive a corresponding electrical plug. The cover 340 can be moved to a respective position for each of the slot arrangements 220a-f so that the aperture 350 is positioned over the respective slot arrangement. The respective slot arrangement is thus arranged to receive a corresponding electrical plug. The cover 340 prevents access to slot arrangements other than the exposed slot arrangement.

[0029] Alternatively to the cover 340 described with reference to Figure 3, a cover arrangement may comprise a plurality of covers, each cover being associated with a respective one of the slot arrangements and arranged to be expose or prevent access to the slot arrangement as determined.

[0030] The cover arrangement may be arranged such that in one configuration, none of the slot arrangements 220a-f are exposed.

[0031] The electrical outlet 200 described with reference to Figures 2 and 3 may include a controller (not shown). The controller is configured to determine which of the slot arrangements is to be exposed based on plug identity. The plug identity can be determined based on image data received from camera 210. In one example, the image data may be provided by the controller to a server via the internet for processing. Alternatively or additionally, identification of the plug identity may take place locally at the controller.

[0032] Figure 4 shows an example of a control system

400. The control system includes the electrical outlet 200 as described with reference to Figures 2 and 3 and a controller 440. The controller 440 may be a microcontroller.

[0033] The system 440 includes a sensor 410. The sensor 410 may comprise the camera 210. The sensor 410 is in communication with the controller 440. The sensor 410 is arranged to sense the presence of a plug and provide plug identity information to the controller 440.

[0034] The controller 440 may be in communication with a remote server 450. The connection may be a wireless and/or wired connection. In one example, the controller 440 is configured to send the plug identity information to the remote server 450 and receive plug identity information from the remote server 450. The identification of the plug identity may take place at the controller 440 or at the remote server 450. This may be carried out by for example comparing an image of the plug that is captured by the camera 210 with images of a range of plugs according to different standards which are stored at the remote server 450.

[0035] Machine learning may be used as part of the process to identify the plug type. Machine learning is a sub-domain in computer science which enables computers to learn without being explicitly programmed. This is achieved by training and using relevant machine learning models. The training requires a machine learning algorithm with relevant training data to learn from. The machine learning algorithm finds patterns in the training data and assigns the attributes of the input data to the target. The training data needs the correct answer which is known as target. The machine learning model attributes to the resulting output of the training. The generation of the machine learning model enables predictions of new data of which the target is not known. Therefore, identifying the matching plug and plug type requires training the model with many different plugs and plug types. The ability to identifying plug types is increased due to machine learning.

[0036] The controller 440 is configured to determine which of the plurality of slot arrangements 220a-f to expose based on the electrical plug identity.

[0037] The system 400 includes an actuator 430. The actuator may comprise a motor, such as a servomotor. The actuator 430 is configured to receive control messages from the controller 440 and cause reconfiguration of the cover arrangement.

[0038] The system 400 includes a voltage converter 460. The voltage converter 460 is configured to receive control messages from the controller 440. The voltage converter 460 is configured to convert AC mains voltage to the voltage and frequency suitable for a given plug type. The controller 440 is configured to determine if voltage conversion is required and, if so, provide a control message to the voltage converter including an indication of the voltage required. The controller 440 is configured to determine which voltage is required based on the electrical plug identity. The identified plug type is used to identify the voltage that is needed since different plug types are associated with different voltages throughout the world.

[0039] In use, the camera 210 senses the plug. The camera 210 takes a photo of the plug and provides the image data to the controller 440. The data is transmitted to the server 450. The server 450 identifies the plug identity based on the data and sends an indication of the plug identity to the controller 440.

[0040] The controller 440 determines which of the plurality of slot arrangements 220a-f to expose based on the electrical plug identity and provides a control message to the actuator 430. In response to the control message, the actuator 430 causes the cover 340 to move such that the aperture 350 is aligned with the determined slot arrangement and access to the other slot arrangements is disabled.

[0041] The controller 440 determines whether voltage conversion is required and, if so, provides a control message to the voltage converter 460.

[0042] The voltage converter 460 changes the voltage type in response to the control message received from the controller, for example, from 220 volts to 110 volts.

[0043] The electrical outlet is now ready for use.

[0044] With the use of an electrical outlet as described above, both voltage and plug type adapters are no longer required.

[0045] It will be understood that the processor or processing system or circuitry referred to herein may in practice be provided by a single chip or integrated circuit or plural chips or integrated circuits, optionally provided as a chipset, an application-specific integrated circuit (ASIC), field-programmable gate array (FPGA), digital signal processor (DSP), graphics processing units (GPUs), etc. The chip or chips may comprise circuitry (as well as possibly firmware) for embodying at least one or more of a data processor or processors, a digital signal processor or processors, baseband circuitry and radio frequency circuitry, which are configurable so as to operate in accordance with the exemplary embodiments. In this regard, the exemplary embodiments may be implemented at least in part by computer software stored in (non-transitory) memory and executable by the processor, or by hardware, or by a combination of tangibly stored software and hardware (and tangibly stored firmware).

[0046] Although at least some aspects of the embodiments described herein with reference to the drawings comprise computer processes performed in processing systems or processors, the invention also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of non-transitory source code, object code, a code intermediate source and object code such as in partially compiled form, or in any other non-transitory form suitable for use in the implementation of processes according to the invention. The carrier may be any entity or device capable of car-

rying the program. For example, the carrier may comprise a storage medium, such as a solid-state drive (SSD) or other semiconductor-based RAM; a ROM, for example a CD ROM or a semiconductor ROM; a magnetic recording medium, for example a floppy disk or hard disk; optical memory devices in general; etc.

[0047] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. An electrical outlet apparatus comprising:

a first slot arrangement for receiving pins of a first electrical plug;
at least one second slot arrangement for receiving pins of a second electrical plug; and
a cover arrangement that is configurable between a first configuration in which the first slot arrangement is exposed to receive the pins of an electrical plug and the second slot arrangement is not exposed to receive pins of an electrical plug, and at least one second configuration in which the second slot arrangement is exposed to receive the pins of an electrical plug and the first slot arrangement is not exposed to receive pins of an electrical plug.

2. An electrical outlet apparatus according to claim 1, comprising a controller in communication with an actuator, the controller being configured to send control signals to the actuator to cause the cover arrangement to change between the first configuration and the at least one second configuration.

3. An electrical outlet apparatus according to claim 2, wherein the actuator is a servomotor.

4. An electrical outlet apparatus according to claim 2 or claim 3, comprising a sensor, wherein the controller is in communication with the sensor, the sensor being arranged to sense an electrical plug and provide electrical plug identity information to the controller.

5. An electrical outlet apparatus according to claim 4, wherein the controller is configured to determine which of the first slot arrangement and the at least one second slot arrangement to expose based on the electrical plug identity information.

6. An electrical outlet apparatus according to claim 4 or claim 5, wherein the sensor comprises a camera.

7. An electrical outlet apparatus according to any of claims 2 to 6, wherein the controller is configured to determine which of the first slot arrangement and the at least one second slot arrangement to expose based on data received from a remote server.

8. An electrical outlet apparatus according to any of claims 2 to 7, comprising a voltage converter, wherein the controller is in communication with the voltage converter and configured to send control signals to the voltage converter to cause the voltage converter to change voltage type.

9. An electrical outlet apparatus according to any one of claims 1 to 8, wherein the cover arrangement is configurable to a third configuration in which no arrangement of slots is exposed.

10. An electrical outlet apparatus according to any of claims 1 to 9, wherein the cover arrangement comprises a movable cover.

11. A method of operating an electrical outlet apparatus comprising:

determining which of a first slot arrangement for receiving pins of a first electrical plug and at least one second slot arrangement for receiving pins of a second electrical plug to expose to receive pins of an electrical plug; and
configuring a cover arrangement to a configuration in which the determined slot arrangement is exposed to receive pins of the corresponding electrical plug.

12. A method according to claim 11, comprising sending control signals from a controller to an actuator to configure the cover arrangement to the configuration in which the determined slot arrangement is exposed to receive pins of the corresponding electrical plug.

13. A method according to claim 12, comprising sensing an electrical plug at a sensor and providing plug identity information from the sensor to the controller for use in determining which the first slot arrangement and the second slot arrangement to expose.

14. A method according to claim 13, comprising providing the plug identity information from the controller to a remote sensor and, in response, receiving an

indication of the plug identity from the remote sensor.

15. A method according to any one of claims 9 to 14 comprising:

determining the voltage required for an electrical plug; and
providing control signals to a voltage converter to cause the voltage converter to convert mains voltage to the determined voltage.

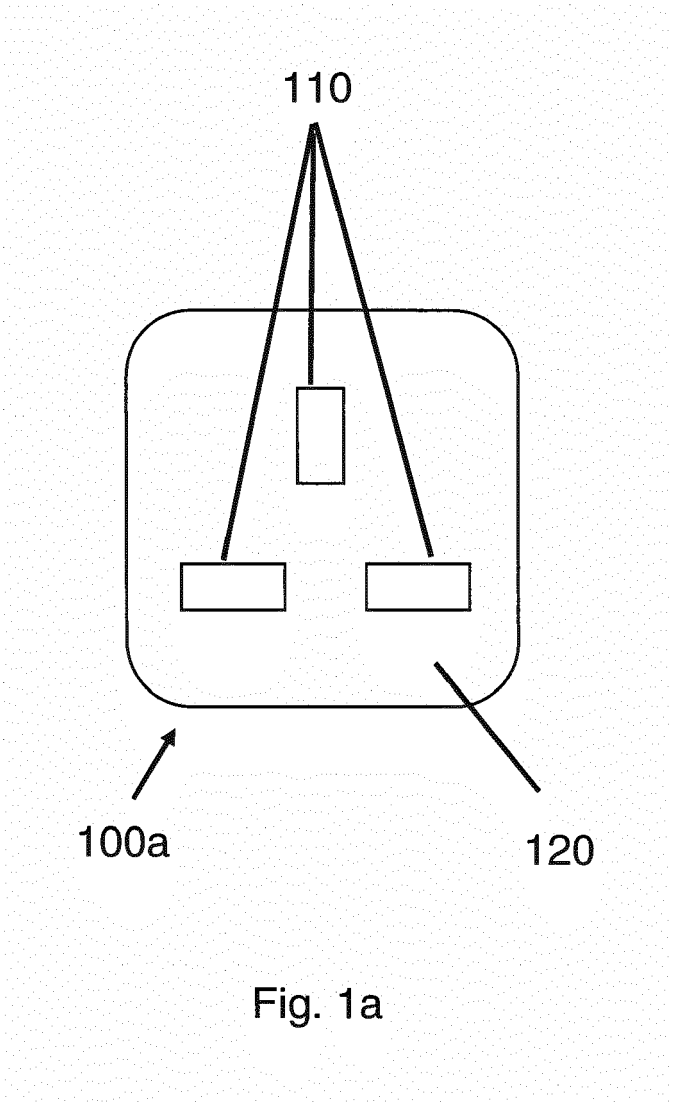

Fig. 1a

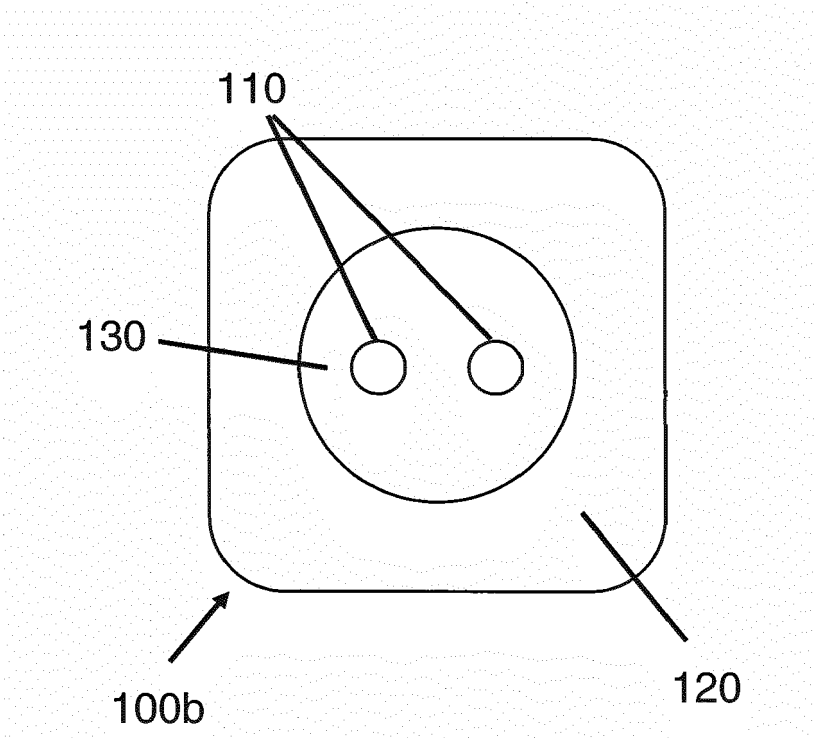

Fig. 1b

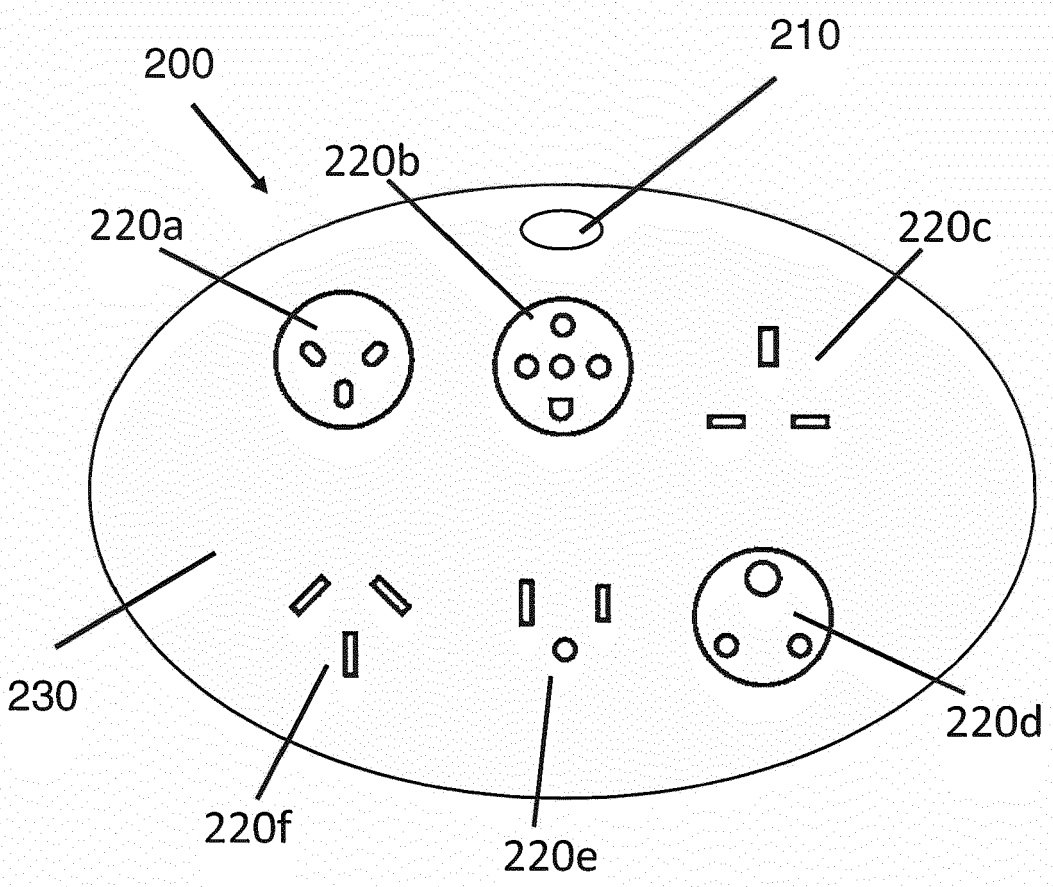

Fig. 2

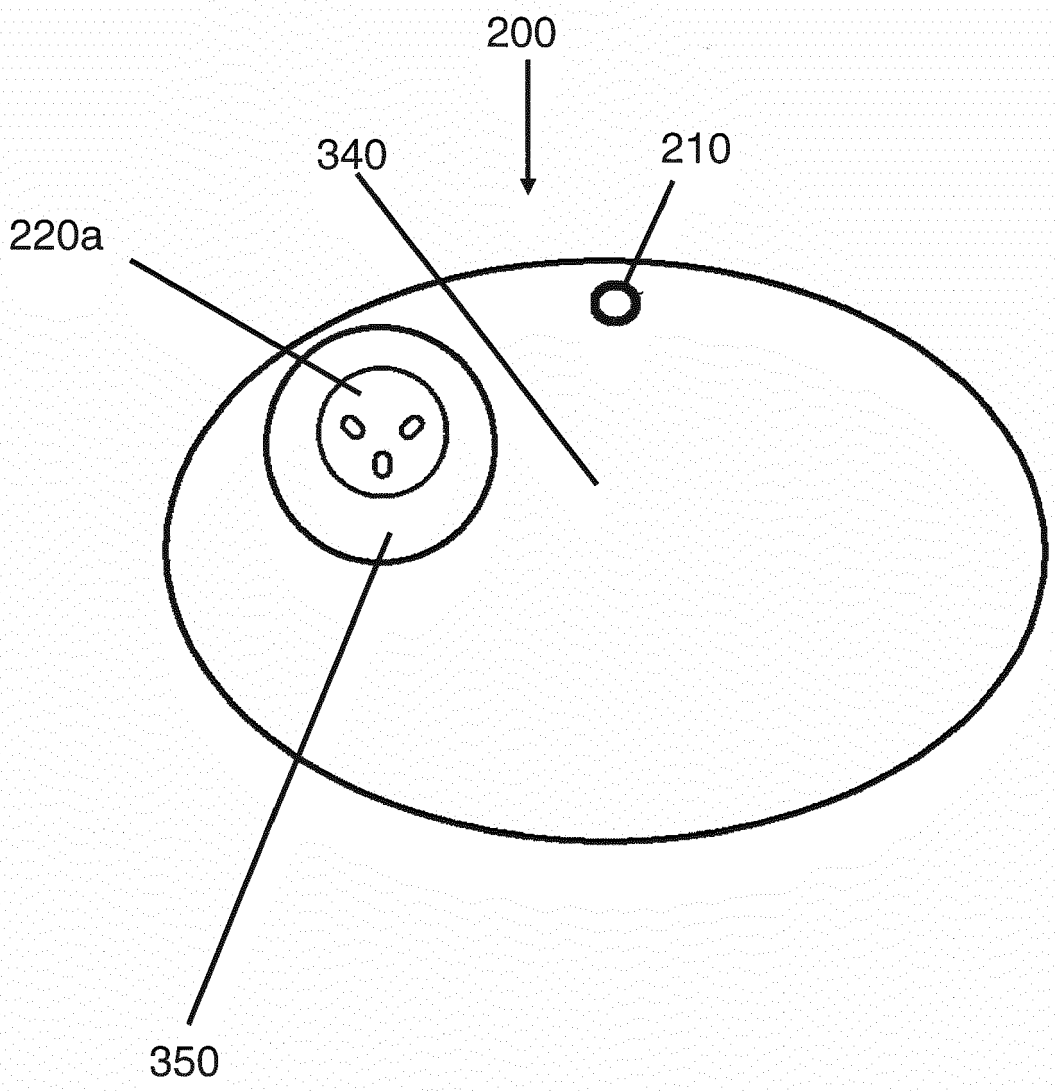

Fig. 3

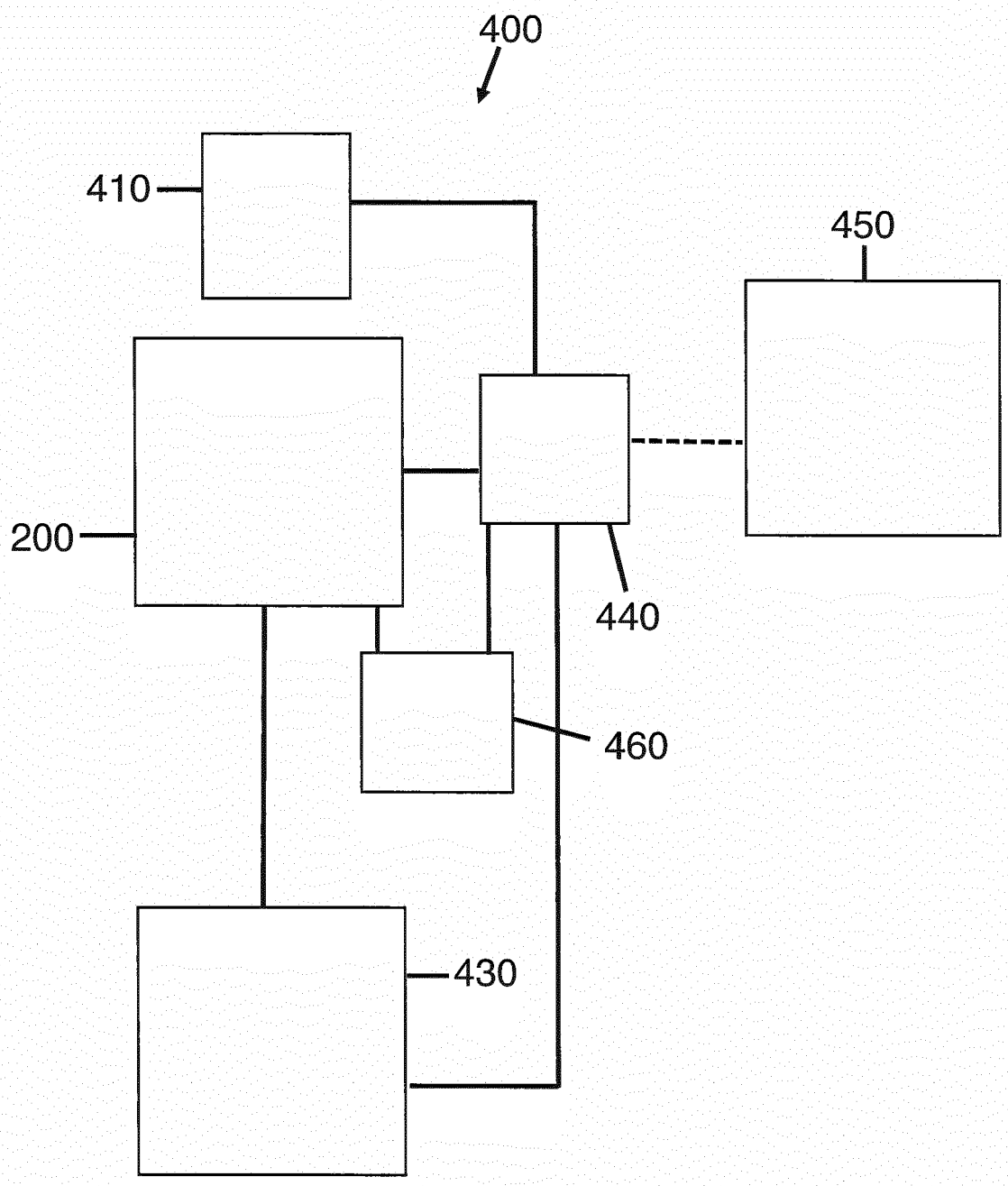

Fig. 4

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PARTIAL EUROPEAN SEARCH REPORT

under Rule 62a and/or 63 of the European Patent Convention. This report shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number
EP 17 20 4513

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 Y	EP 2 911 249 A1 (4 BOX S R L [IT]) 26 August 2015 (2015-08-26) * figures 1-6 *	1,7-15 2-5,11	INV. H01R13/447
Y	DE 10 2008 063110 A1 (MERTEN GMBH & CO KG [DE]) 1 July 2010 (2010-07-01) * figure 3 *	2-5,11	
X	US 8 399 765 B1 (BALDWIN JEFFREY P [US] ET AL) 19 March 2013 (2013-03-19) * figure 25 *	1,10	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
The Hague	5 July 2018	Ferreira, João

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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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INCOMPLETE SEARCH
SHEET C

Application Number
EP 17 20 4513

Claim(s) completely searchable:
1-5, 7-15

Claim(s) not searched:
6

Reason for the limitation of the search:

After reading the full application and the letter from 5-06-2018 replying to a communication under Rule 63(1) EPC, the Examiner maintains the previously referred objections, that is, the Examiner does not find any disclosure in the description nor in the drawings, on how, in claims 1 to 15, the skilled man would without undue burden apply some of the disclosed technical features to achieve the corresponding technical solutions.

Image processing using a camera

The justification of the applicant written in the letter from 5-06-2018, page 3, 1st to 6th paragraphs, does not reply to any of the previously cited issues and questions regarding Article 83 EPC.

There is no disclosure at all in the present application how the camera performs the distinction between two different types of plugs. That would involve image processing and pattern recognition, Markov chains and/or homography computation with the corresponding algorithms and 3D mathematical models, considering that the plugs may be presented in different perspectives and orientation with respect to the camera 3D point, which the present application doesn't not reveal at all.

In the field of computer vision, any two images of the same planar surface in space are related by a homography. This has many practical applications, such as image rectification, image registration, or computation of camera motion, rotation and translation, between two images. Once camera rotation and translation have been extracted from an estimated homography matrix, this information may be used for navigation, or to insert models of 3D objects into an image or video, so that they are rendered with the correct perspective and appear to have been part of the original scene.

By merely referring in the in the letter from 5-06-2018, page 3, 1st to 6th paragraphs, that image processing and machine learning are well known in the art, does not resolve any of the previously cited issues, thus demanding undue burden to the skilled person.

Facial recognition, as the applicant suggest, uses a planar image of a face, where a face is faced against a camera. Pattern recognition, such as OCR, involves the presentation of the pattern to be recognized in a certain defined fashion, that is, an image correlation between the pattern and the camera. By merely and vaguely citing certain techniques known in the art, one does not avoid the undue burden to the skilled person, because the skilled person has no knowledge on how to apply such techniques to electrical plugs, such electrical plugs being movable with several possible dimensional orientations with respect to the camera.

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INCOMPLETE SEARCH
SHEET C

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For example, the following questions arise:
a) what are the angles between the camera and the plug to be detected?
b) what is the preferred tridimensional orientation of the plug with respect to the camera point of view?
c) Is image homography involved?
d) what is the exact position of the camera in the socket with respect to the plug?
e) which pattern recognition technique is used, since there are many available in the art? Markov chains?
f) which machine learning technique is used, since there are many available in the art?

Therefore the present application doesn't reveal at all how the camera and the corresponding process detecting unit would work, thus demanding undue burden to the skilled person. Therefore the present application violates Article 83 EPC.

According to Rule 137(5) EPC "amended claims may not relate to unsearched subject-matter which does not combine with the originally claimed invention or group of inventions to form a single general inventive concept. Nor may they relate to subject-matter not searched in accordance with Rule 62a or Rule 63."

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 20 4513

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-07-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		WO 2010072202 A1	01-07-2010
US 8399765 B1	19-03-2013	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82