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(54) **OVEN**

(57) The invention relates to an oven for preparing food,
wherein the oven comprises at least one interface for receiving food treatment step instructions, wherein the oven comprises a memory for jointly storing a plurality of food treatment step instructions received through the at least one interface, and wherein the oven is configured to execute the plurality of food treatment step instructions jointly stored in the memory.

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## Description

### Technical field

**[0001]** The invention relates to an oven for preparing food capable of executing a sequence of food treatment instructions.

### Background art

**[0002]** To improve a cooking experience for users, modern ovens provide quality-of-life features such as automated replay of a sequence of food treatment step instructions. To optimally prepare a whole chicken in the oven, for example, in a first food treatment step a lower temperature of a cavity of the oven in which the whole chicken is received might be selected, and once a suitable core temperature of the whole chicken is reached, the temperature of the cavity might be increased in a second food treatment step to provide a desired browning of the whole chicken. By suitably stacking a sequence of food treatment steps, flavorful dishes might be created; furthermore, once the automatic replay is started, the user does not need to pay close attention to the cooking process since the oven automatically executes the different steps of the cooking process.

**[0003]** Ovens known in the prior art are typically constructed such that they may receive food treatment step instructions one at a time, for example, from a remote network/cloud in which the sequence of food treatment step instructions is stored. In case of connection problems to the remote network, for example due to issues at the network provider, local WiFi problems, noisy operating conditions in frequency bands in which the oven is configured to communicate etc., a food treatment step instruction might not be received by the oven, a consequence of which may be a suboptimal cooking result. In particular, a user of such ovens as known in the prior art might be frustrated if the whole chicken, for example, is not browned as a consequence of the oven not having received the food treatment step instruction related to browning.

### Summary of the invention

**[0004]** It is the object of the invention to provide an oven which mitigates at least some of the disadvantages of ovens as known in the prior art.

**[0005]** A solution of the invention is specified by the features of claim 1. The invention relates to an oven for preparing food, wherein the oven comprises at least one interface for receiving food treatment step instructions, wherein the oven comprises a memory for jointly storing a plurality of food treatment step instructions received through the at least one interface, and wherein the oven is configured to execute the plurality of food treatment step instructions jointly stored in the memory.

**[0006]** An oven according to the invention is configured to store a plurality of received food treatment step instructions in a local memory of the oven. This way, even in case of network problems, the oven may still access the entirety of food treatment step instructions that should be followed to arrive at a desired quality of food preparation, as all food treatment step instructions are available up front to the oven before execution of the food treatment step instructions commences. An oven according to the invention is therefore more robust against network outages and glitches such as temporary loss of WiFi connection of the oven and therefore advantageously provides an improved user experience for users of the oven compared to ovens known in the prior art. Semi-cooked food is therefore advantageously avoided if using an oven according to the invention.

**[0007]** The term oven may be used for ovens using dry heat, in particular with or without convection, and/or for ovens using steam. The term oven may also be used for ovens comprising microwave functionality. The term oven may also apply to a cooking facility using any known food treatment technology for treating food, in particular enabling both heating and/or cooling of the treated food. A food treatment step instruction may refer, for example, to a desired temperature of a cavity of the oven in which food is received, or to a desired temperature as well as humidity in the cavity; a food treatment step instruction may also refer to more complex conditions within the cavity or within or on a surface of the food being prepared in the oven.

**[0008]** The memory of the oven may be such that a jointly stored plurality of food treatment step instructions may be deleted or overwritten in case new food treatment step instructions are received via the at least one interface.

**[0009]** In an embodiment of the oven according to the invention, a first interface of the at least one interface is embodied as a network interface, and the oven is configured to receive food treatment step instructions through the network interface from a remote network.

**[0010]** The oven is therefore capable of receiving food treatment step instructions from outside. A complete set of food treatment step instructions may be sent, for example, in one data package to the oven from a cloud and received by the network interface of the oven.

**[0011]** In a further embodiment of the oven according to the invention, the network interface is configured to receive food treatment step instructions inputted by a user through an application program on a mobile device connected to the remote network.

**[0012]** The application program may store inputted food treatment step instructions in a cloud storage, possibly in a suitably coded format. Later, food treatment step instructions stored in a cloud storage may be sent in one data package to an oven according to the invention for executing a desired cooking process. Alternatively, inputted food treatment step instruction in the application program may be directly sent to an oven according to the invention in one data package for executing a desired

cooking process. The oven may also receive food treatment step instructions through a Bluetooth connection. In general, the food treatment step instructions may be provided to the oven through a remote control connection, and the oven may in particular receive automatically generated food treatment step instructions.

**[0013]** In a further embodiment of the oven according to the invention, a second interface of the at least one interface is embodied as a user interface which is directly accessible to a user of the oven, and wherein the user interface is configured to receive food treatment step instructions directly inputted by the user of the oven.

**[0014]** A user interface may also be directly embedded in the oven, for example in the form of a small touch screen, or in the form of a small display in which text inputted via suitable input elements such as capacitive sensors, buttons, etc. is displayed. The user interface may be embodied in such a way that it converts expressions typed in by a user in human-readable form into a data format suitable for machine execution.

**[0015]** In a further embodiment of the oven according to the invention, the memory is embodied as a random-access memory (R_AM). Other forms of memory are, however, also feasible.

**[0016]** In a further embodiment of the oven according to the invention, the oven is configured to receive, via the at least one interface, ordering sequence information on the order in which the jointly stored plurality of food treatment step instructions is to be executed.

**[0017]** In the ordering sequence information, it may be specified in which order the food treatment step instructions are to be executed by the oven once the oven begins with the entire cooking process specified by the plurality of jointly stored food treatment step instructions. The execution of the food treatment step instructions may start based on a dedicated "Start"-instruction provided to the oven or may be programmed into the oven to occur at a prespecified time. The execution of the food treatment steps may end once a dedicated "End"-instruction is read, or it may automatically end once a last food treatment step instruction is executed and once a time-out condition of the last food treatment step instruction is fulfilled.

**[0018]** In a further embodiment of the oven according to the invention, each food treatment step instruction comprises a time-out condition, wherein the oven is configured to stop executing the respective food treatment step instruction once the respective time-out condition is fulfilled, and wherein each food treatment step instruction further comprises oven control information.

**[0019]** In the respective time-out condition, it may be specified when the oven should stop executing the food treatment step described in the food treatment step instruction. The time-out condition may be embodied, for example, as a duration, e.g., as a duration of five minutes. Suitable cooking step instructions are, e.g., the following: 1) "STEAM, 99°C, 70°C core temperature", or 2) "GRILL, 240°C, 10 minutes", the time-out condition in example 1) being "70° core temperature", and the time-out condition in example 2) being "10 minutes", while the oven control information in example 1) is "STEAM" and "99°C" and in example 2) is "GRILL" and "240°C".

**[0020]** In a further embodiment of the oven according to the invention, the oven control information comprises information on a cavity temperature to which a cavity of the oven in which food to be prepared is received should be heated.

**[0021]** The oven control information may in general comprise nominal target conditions inside a food treatment chamber of the oven which are to be reached or applied. The oven control information may comprise microwave power, for example, or a certain level of steam saturation in the cavity of the oven.

**[0022]** In the above two examples, the cavity temperature in example 1) is set to "99°C", while in example 2) the cavity temperature is set to "240°C".

**[0023]** In a further embodiment of the oven according to the invention, the time-out condition is embodied as a condition on a duration of how long the respective cooking step instruction is to be executed, or the time-out condition is embodied as a condition on a core temperature of the food in the oven being prepared, or the time-out condition is embodied as a condition on a degree of browning of the food in the oven being prepared.

**[0024]** The core temperature and/or the degree of browning may be measured using dedicated sensors which may be an integral part of the oven or which may be separately added to the oven, wherein in the latter case both oven and separate sensors are configured to communicate with each other and to exchange information.

**[0025]** The time-out condition of a food treatment step such as heating may be fulfilled, for example, if a food probe temperature measurement crosses a pre-defined, in particular configurable, temperature threshold. The time-out condition of a food treatment step such as heating may also be fulfilled, for example, if an amount of browning of the treated food crosses a pre-defined, in particular configurable, browning threshold. The time-out condition of a food treatment step such as heating may also be fulfilled, for example, if a volume of a treated food crosses a pre-defined, in particular configurable, volume threshold either from below or from above. The time-out condition of a food treatment step such as heating may also be fulfilled, for example, if two or more sub-conditions are fulfilled: a time-out condition of a food treatment step such as heating may be fulfilled, for example, in case both a desired amount of browning of the treated food as well as a desired core food temperature is reached.

**[0026]** In a further embodiment of the oven according to the invention, the oven is configured to execute a second food treatment step instruction of the jointly stored plurality of food treatment step instructions after the time-out condition of a first food treatment step instruction of the jointly stored plurality of food treatment step instructions is fulfilled, wherein with respect to the

ordering sequence information the second food treatment step instruction follows the first food treatment step instruction.

**[0027]** In a further embodiment of the oven according to the invention, the oven comprises at least one power board for controlling heating elements of the oven, and the oven is configured to convert each received food treatment step instruction into a data format suitable for execution by the at least one power board of the oven.

**[0028]** The food treatment step instructions inputted by a human user may not be directly executable by the oven. To increase temperature using dry heat in the oven, a current flowing through a thick wire in the cavity of the oven may need to be increased, for example. An intermediate power board may take over control over heating elements of the oven, and the food treatment step instructions may therefore first need to be converted to a data format that can be understood and executed by the power board. Specifically, the food treatment step instructions may first be converted into commands understood by the at least one power board, and the power board subsequently provides detailed control signals, e.g. in the form of voltages and current, to the heating elements. The at least one power board may also monitor if a time-out condition of a currently executed food treatment step instruction is fulfilled.

**[0029]** In a further embodiment of the oven according to the invention, the food treatment step instructions received by the network interface are coded food treatment step instructions, and the user interface is configured to convert the coded food treatment step instructions into the data format suitable for execution by the at least one power board.

**[0030]** Food treatment step instructions remotely stored in a cloud may be stored in a format that cannot be directly understood by the at least one power board. The user interface may therefore convert coded food treatment step instructions received by the network interface into a data format understood by the at least one power board.

**[0031]** In a further embodiment of the oven according to the invention, the user interface is configured to convert a coded food treatment step instruction into the data format on the fly.

**[0032]** The plurality of food treatment step instructions jointly stored in the memory of the oven may be converted on the fly into the data format understood by the at least one power board. Once or just before a specific food treatment step instruction is fully executed, i.e., once or just before its time-out condition is fulfilled, a subsequent food treatment step instruction may be converted into the data format of the at least one power board and transmitted to the at least one power board for execution. Alternatively, all food treatment step instructions may be converted into the data format understood by the at least one power board at once and sequentially transmitted to the at least one power board.

**[0033]** In a further embodiment of the oven according to the invention, the application program and/or the user interface are configured to provide predefined food treatment step instructions to the user that the user can select.

**[0034]** Providing pre-defined food treatment step instructions may help a user to optimally configure a cooking process which may be later executed in the oven.

## Claims

1. Oven for preparing food, wherein the oven comprises at least one interface for receiving food treatment step instructions, wherein the oven comprises a memory for jointly storing a plurality of food treatment step instructions received through the at least one interface, and wherein the oven is configured to execute the plurality of food treatment step instructions jointly stored in the memory.

2. Oven according to claim 1, wherein a first interface of the at least one interface is embodied as a network interface, and wherein the oven is configured to receive food treatment step instructions through the network interface from a remote network.

3. Oven according to claim 2, wherein the network interface is configured to receive food treatment step instructions inputted by a user through an application program on a mobile device connected to the remote network.

4. Oven according to any one of claims 1 to 3, wherein a second interface of the at least one interface is embodied as a user interface which is directly accessible to a user of the oven, and wherein the user interface is configured to receive food treatment step instructions directly inputted by the user of the oven.

5. Oven according to any one of claims 1 to 4, wherein the memory is embodied as a random-access memory (RAM).

6. Oven according to any one of the preceding claims, wherein the oven is configured to receive, via the at least one interface, ordering sequence information on the order in which the jointly stored plurality of food treatment step instructions is to be executed.

7. Oven according to claim 6, wherein each food treatment step instruction comprises a time-out condition, wherein the oven is configured to stop executing the respective food treatment step instruction once the respective time-out condition is fulfilled, and wherein each food treatment step instruction further comprises oven control information.

8. Oven according to claim 7, wherein the oven control information comprises information on a cavity tem-

perature to which a cavity of the oven in which food to be prepared is received should be heated.

**9.** Oven according to claim 7 or 8, wherein the time-out condition is embodied as a condition on a duration of how long the respective food treatment step instruction is to be executed, or wherein the time-out condition is embodied as a condition on a core temperature of the food in the oven being prepared, or wherein the time-out condition is embodied as a condition on a degree of browning of the food in the oven being prepared.

**10.** Oven according to any one of claims 7 to 9, wherein the oven is configured to execute a second food treatment step instruction of the jointly stored plurality of food treatment step instructions after the time-out condition of a first food treatment step instruction of the jointly stored plurality of food treatment step instructions is fulfilled, wherein with respect to the ordering sequence information the second food treatment step instruction follows the first food treatment step instruction.

**11.** Oven according to any one of the preceding claims, wherein the oven comprises at least one power board for controlling heating elements of the oven, and wherein the oven is configured to convert each received food treatment step instruction into a data format suitable for execution by the at least one power board of the oven.

**12.** Oven according to claim 11, wherein the food treatment step instructions received by the network interface are coded food treatment step instructions, and wherein the user interface is configured to convert the coded food treatment step instructions into the data format suitable for execution by the at least one power board.

**13.** Oven according to claim 12, wherein the user interface is configured to convert a coded food treatment step instruction into the data format on the fly.

**14.** Oven according to any one of claims 2 to 13, wherein the application program and/or the user interface are configured to provide predefined food treatment step instructions to the user that the user can select.

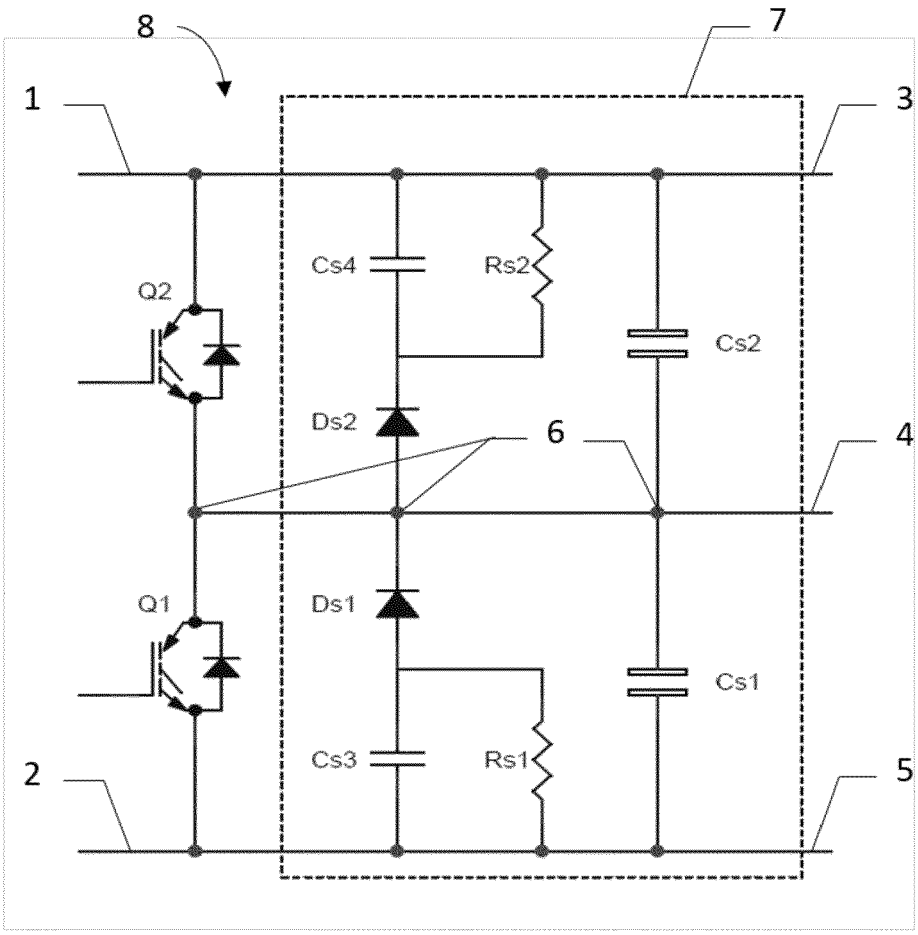


Fig. 1

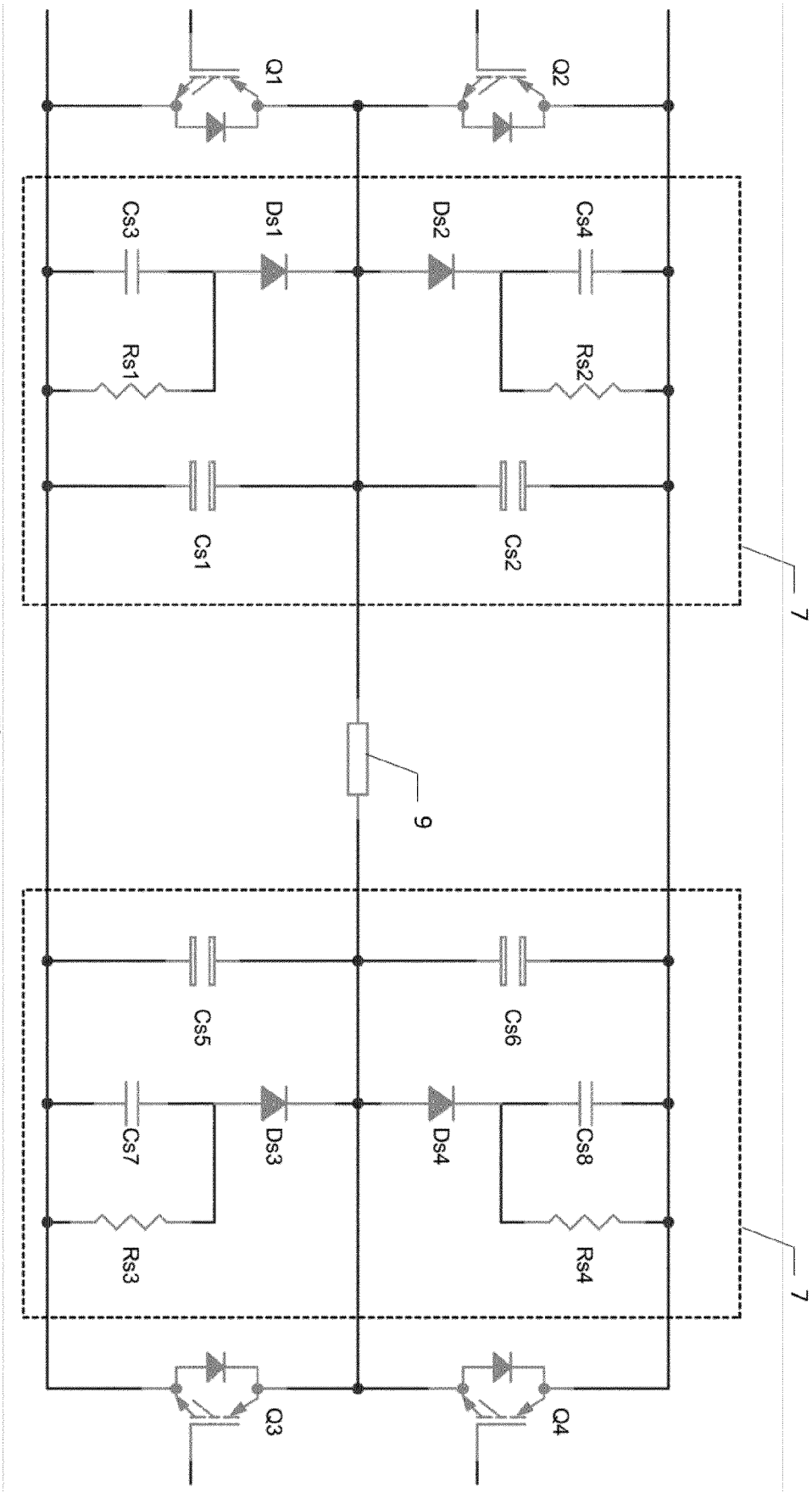
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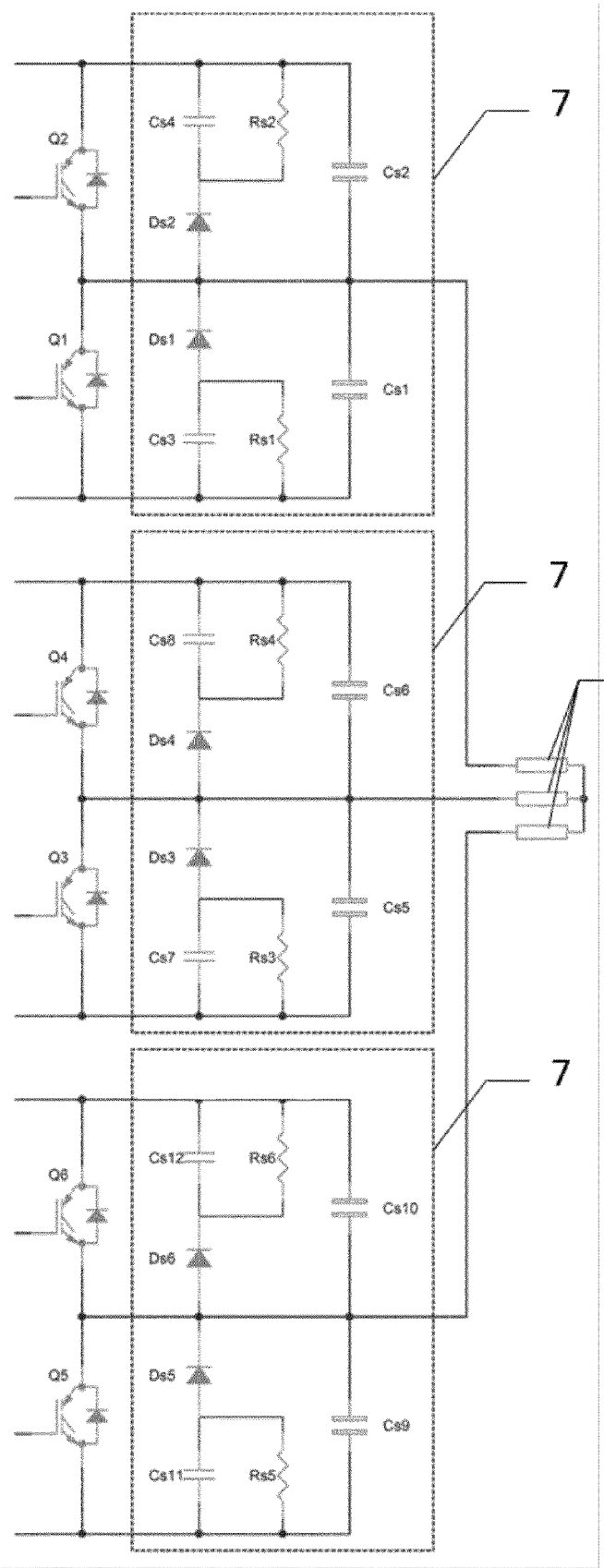
Fig. 2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Rs5

Fig. 3

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# EUROPEAN SEARCH REPORT

Application Number
EP 23 20 2509

## 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<br>Y | WO 2014/205878 A1 (LEE WEN-CHING [CN])<br>31 December 2014 (2014-12-31)<br>* figures 1, 2 *<br>* the whole document * | 1-6,<br>11-14<br>7-10 | INV.<br>F24C7/08 |
| A | US 2018/180293 A1 (HOLZINGER JOCHEN [DE] ET AL) 28 June 2018 (2018-06-28)<br>* the whole document * | 1-14 | |
| Y | EP 3 477 206 B1 (WHIRLPOOL CO [US])<br>7 October 2020 (2020-10-07)<br>* paragraphs [0016], [0036], [0047] * | 7-10 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC)<br>F24C |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 27 February 2024 | Jalal, Rashwan |

CATEGORY OF CITED DOCUMENTS

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# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 20 2509

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
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27-02-2024

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 2014205878 A1 | 31-12-2014 | CN 103336454 A | 02-10-2013 |
| | | WO 2014205878 A1 | 31-12-2014 |
| US 2018180293 A1 | 28-06-2018 | AU 2016293964 A1 | 23-11-2017 |
| | | CN 107810366 A | 16-03-2018 |
| | | EP 3115697 A1 | 11-01-2017 |
| | | EP 3320270 A1 | 16-05-2018 |
| | | US 2018180293 A1 | 28-06-2018 |
| | | WO 2017008964 A1 | 19-01-2017 |
| EP 3477206 B1 | 07-10-2020 | EP 3477206 A1 | 01-05-2019 |
| | | US 2019128531 A1 | 02-05-2019 |
| | | US 2020166216 A1 | 28-05-2020 |
| | | US 2022412568 A1 | 29-12-2022 |

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