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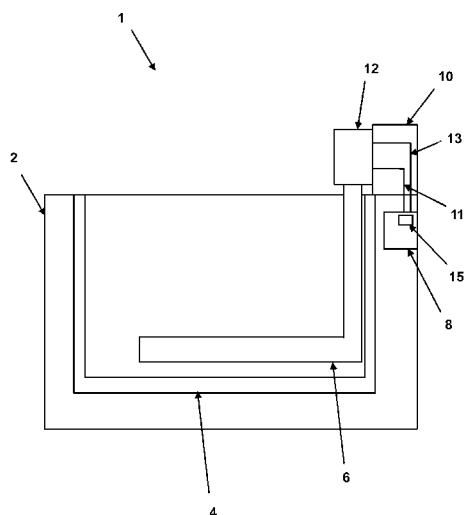


FIG 1

(57) Abstract: An apparatus and method for deep fat frying. The deep fat fryer comprises a housing. The deep fat fryer comprises a cooking vessel mounted to the housing. The deep fat fryer comprises an electric heating element. The deep fat fryer comprises a first electric connector part and a second electric connector part. The first electric connector part is mounted to the housing and configured to be in electric connection with power control electronics configured for controlling and supplying electric power to the electric heating element. The second electric connector part is configured for mating with the first electric connector part, and mounted to the electric heating element for removably mechanically connecting the electric heating element to the housing and for removably electrically connecting the electric heating element to the power control electronics.



Title: An apparatus and method for deep fat frying

FIELD OF THE INVENTION

The present invention relates to the field of deep fat frying. In particular, the invention relates to the field of deep fat frying food products. More in particular, the invention relates to a deep fat fryer, a method for servicing a deep fat fryer, a method for disconnecting an electric heating element from a housing of
5 a deep fat fryer and a method for powering an electric heating element of a deep fat fryer.

BACKGROUND

10 It is known to deep fry food products by dipping them in deep-frying fat and/or oil. As a result, on the outside of the food products a crispy crust can be formed. A deep fat fryer requires a user to add fat and/or oil, and to subsequently heat up the deep fat fryer prior to the deep-frying process. The fat and/or oil needs to have a high temperature of at least 100 degrees Celsius for deep fat frying. There
15 are deep fat fryers available for at-home use, for use in catering industry, as well as industrial deep fat fryers.

For hygienic reasons, a deep fat fryer needs to be cleaned regularly. The cleaning can include replacing the fat and/or oil with fresh fat and/or oil. Prior to cleaning, the deep fat fryer is switched off and the parts of the deep fat fryer that
20 are to be cleaned may need to have cooled due to safety reasons. Some parts of the deep fat fryer are not as easily reached by a service provider, such as a cleaner or maintenance person. For employees of restaurants, and in particular snackbars and cafés, cleaning of their deep fat frying apparatus causes undesired downtime of their deep-fryer. Particularly waiting for the deep fat fryer to have cooled is time
25 consuming, wherein the employee often cannot meet catering consumer demand due to a diminished deep-frying capacity.

SUMMARY

It is an object to provide a deep fat fryer, a method for servicing, such as cleaning, a deep fat fryer, a method for disconnecting an electric heating element from a housing of a deep fat fryer and a method for powering an electric heating element of a deep fat fryer. More in general, it is an object to provide an improved
5 deep fat fryer, and/or a method for handling/servicing a deep fat fryer.

There to, according to a first aspect is provided a deep fat fryer. The deep fat fryer comprises a housing. The housing can be manufactured from metal, such as stainless steel. The deep fat fryer comprises a cooking vessel mounted to the housing. The cooking vessel can at least partially be positioned in the housing. The
10 cooking vessel can be integral with the housing. The deep fat fryer can comprise more than one cooking vessel, wherein the plurality of cooking vessels can be positioned, in e.g. a side-by-side arrangement, in the housing. The deep fat fryer comprises an electric heating element. The electric heating element can comprise a curved heat-conductor.

The deep fat fryer can comprise power control electronics, e.g. housed in the housing. The power control electronics can comprise one or more processors, a controller, communication circuitry, a power supply and/or a memory. One or more electrical components and/or circuits may perform some of or all the roles of the various components described herein. Although described separately, it is to be
20 appreciated that electrical components need not be separate structural elements. The power control electronics are configured for controlling and supplying electric power to the electric heating element. Programmable instructions may be stored in the power control electronics to execute algorithms for controlling and supplying electric power to the electric heating element.

The deep fat fryer comprises a first electric connector part and a second electric connector part. The first electric connector part is mounted to the housing and configured to be in electric connection with the power control electronics. Alternatively, the first electric connector part can be integral with the housing. The second electric connector part is configured for mating with the first electric
30 connector part. Mating the electric connector parts can comprise engaging, e.g. using interlocking shapes, the first and second electric connector parts. The second electric connector part is mounted to the electric heating element for removably

mechanically connecting the electric heating element to the housing and for
removably electrically connecting the electric heating element to the power control
electronics. Alternatively, the second electric connector part can be integral with
the electric heating element. Removably connecting, i.e. mechanically and/or
5 electrically, the electric heating element to the respective housing and/or power
control electronics can comprise removably attaching the parts while a user is still
capable of separating them. Removably connecting and separating can preferably
be performed by a user using nothing but hand power or a hand tool. Removably
connecting and separating can include overcoming a holding force between the first
10 and second connector part, wherein the holding force can be overcome by use of
hand power or a hand tool. The first and/or second electric connector part can
comprise securing means for removably mechanically and/or electrically
connecting the electric heating element to the respective housing and/or power
control electronics.

15 The deep fat fryer can be a stand-alone deep fat fryer. The housing of
the stand-alone deep fat fryer can be configured such that the stand-alone deep fat
fryer can be positioned and operated in a work place, such as a restaurant kitchen,
without further modification to the deep fat fryer and/or the work place. The
housing of the stand-alone deep fat fryer can be configured such that the housing
20 shields a user from internal parts of the deep fat fryer, such as potentially
dangerous electric or electronic components.

The deep fat fryer can be a so-called drop-in deep fat fryer. The drop-in
deep fat fryer is configured to be installed into a countertop. Hence, the housing of
the drop-in deep fat fryer can be a partial housing configured such that the housing
25 shields a user from internal parts of the deep fat fryer, such as potentially
dangerous electric or electronic components, only after installation into the
countertop. The installation into the countertop can e.g. include welding the
housing of the deep fat fryer to the countertop, e.g. into an aperture in the
countertop.

30 Optionally, the first electric connector part comprises two first power
contacts and the second electric connector part comprises two second power
contacts. The first and second electric power contacts are configured for, when the

first and second connector part are connected, conducting electric power for powering the electric heating element to the electric heating element. There can be more than two first power contacts in the first electric connector part. Similarly, the second electric connector part can comprise more than two second power contacts. For instance the first electric connector part comprises three or four first power contacts and the second electric connector part comprises three or four second power contacts, e.g. for using two or three phase AC power. The number of first power contacts is preferably equal to the number of second power contacts. The first power contacts can be electrically connected to the power control electronics. When the first and second connector part are connected, the first and second power contacts can be in electrically conducting engagement for allowing electric power transfer therebetween for powering the electric heating element. The electric power for powering the electric heating element can be supplied to the electric heating element by the power control electronics when the first and second connector part are connected.

Optionally, the deep fat fryer comprises a detector for detecting that the first and second connector part are connected. The detector can be positioned integral with the power control electronics.

Optionally, the detector is configured for detecting that the first and second power contacts are in electrically conducting engagement.

Optionally, the power control electronics are configured for supplying electric power for powering the electric heating element to the first power contacts if the detector detects that the first and second power contacts are in electrically conducting engagement. The power control electronics can be configured for refraining from supplying electric power for powering the electric heating element to the first power contacts if the detector detects that the first and second power contacts are not in electrically conducting engagement. Thus, it can be avoided that electric power for powering the electric heating element is supplied to the first power contacts while the second power contacts are not in electrically conducting engagement with the first electric power contacts yet. Hence, electric arcing, e.g. during mating of the first and second electric connector parts, can be avoided.

Optionally, the power control electronics are configured for detecting that the first and second power contacts are in electrically conducting engagement on the basis of measurement of an electric parameter at one or all of the first power contacts. The electric parameter can e.g. comprise current, voltage and/or electric resistance.

Optionally, an electric signal can be provided to at least one of the first power contacts for detecting whether the first and second power contacts are in an electrically conducting engagement. A power or a voltage of the electric signal can be lower than electric power or voltage for powering the electric heating element. When the power control electronics refrain from supplying electric power for powering the electric heating element to the first power contacts the electric signal can nevertheless be supplied to the first power contacts to detect whether the first and second power contacts are electrically connected. The electric signal preferably has a power and/or voltage insufficient for powering the electric heating element. A power of the electric signal can e.g. be less than 10% of the power rating of the electric heating element. A voltage of the electric signal can be lower than the voltage for powering the electric heating element. The electric heating element can e.g. be rated for powering at 400V. The electric signal can e.g. have a voltage of 100V or less, preferably 48V or less, such as 24V or less. The low power and/or low voltage electric signal, or a signal representative thereof, can e.g. be detected, when the first and second power contacts are in electrically conducting engagement, by the detector directly or by the detector via the power control electronics.

Optionally, the detector is part of the first electric connector part. The detector can be electrically connected to the first power contacts. The detector can be positioned between two or more of the first power contacts.

Optionally, the first electric connector part comprises two first sensing contacts and the second electric connector part comprises two second sensing contacts for, when the first and second connector part are connected, detecting that the first and second connector part are connected. The first sensing contacts can be electrically connected to the power control electronics. The electric signal, as described above, can be supplied to at least one of the first sensing contacts for

detecting whether the first and second sensing contacts are in electrically conducting engagement.

Optionally, the deep fat fryer is configured for detecting that the first and second connector part are connected if the first and second sensing contacts are in an electrically conducting engagement. The electric signal, or a signal representative thereof, can be detected, when the first and second sensing contacts are in electrically conducting engagement. The electric signal can be supplied to the first sensing contacts by the power control electronics for detecting that the first and second sensing contacts are electrically connected.

Optionally, when the power control electronics refrain from supplying electric power for powering the electric heating element to the first power contacts, the electrical signal can be transferred to the first sensing contacts to detect whether the first and second sensing contacts are electrically connected.

Optionally, the first power contacts comprise conducting sockets and the second power contacts comprise conducting pens. Optionally, the first sensing contacts comprise conducting sockets and the second sensing contacts comprise conducting pens. The pens and sockets are positioned such that, when mating the first electric connector part and the second electric connector part, the pens and sockets of the first and second power contacts are in electrically conducting engagement prior to the pens and sockets of the first and second sensing contacts are in electrically conducting engagement. At least one of the pens of the second power contacts can be longer than the pens of the second sensing contacts. Thus, while mating the first electric connector part and the second electric connector part, when the first and second sensing contacts allow detection of the electric signal the first and second power contacts are already in electrically conducting engagement, and electric power for powering the electric heating element can safely be activated.

Optionally, the detector comprises an optical detector configured for detecting a connected position of the first and second connector part. The optical detector can comprise a Light-Emitting Diode (LED) and a light detector. The LED and light detector can be mounted in, e.g. a recessed part of, the first electric connector part. The optical detector can comprise a vane mounted in the second

electric connector part. When the first and second connector parts are disconnected, the light detector can detect at least part of the light emitted by the LED. When the first and second connector parts are connected, the vane can block at least part of the light, such that the light detector can detect substantially no light emitted by the LED. The optical detector can be positioned such that detecting that the first and second connector part are connected implies that the first and second power contacts are in electrically conducting engagement.

Optionally, the detector comprises a mechanical detector, such as a switch, configured for detecting a connected position of the first and second connector part. The mechanical detector can be positioned in, e.g. a recessed part of, the first electric connector part, e.g. at a proximal end thereof. The mechanical detector can also comprise a protrusion of the second electric connector part. When the first and second connector parts are disconnected, the mechanical detector can be in the neutral position. When the first and second connector parts are connected, the mechanical detector can be in the activated position, e.g. by the protrusion pressing against the mechanical detector part, e.g. the switch, of the first connector part. The mechanical detector can be positioned such that detecting that the first and second connector part are connected implies that the first and second power contacts are in electrically conducting engagement.

Optionally, the detector comprises an inductive, capacitive, and/or magnetic detector, configured for detecting a connected position of the first and second connector part. At least part of the inductive, capacitive, and/or magnetic detector can be positioned in, e.g. a recessed part of, the first electric connector part. At least part of the inductive, capacitive, and/or magnetic detector can be positioned at, e.g. a protrusions of, the second electric connector part. Regarding the inductive detector, e.g. an inductive sensor can be positioned in, e.g. a recessed part of, the first electric connector part and a detectable, e.g. a metallic, part can be positioned at, e.g. a protrusion of, the second electric connector part, wherein the detectable part is positioned for being sensed by the inductive sensor upon connection of the first and second electric connector parts. Regarding the capacitive detector, e.g. a capacitive sensor can be positioned in, e.g. a recessed part of, the first electric connector part and a detectable, e.g. a conductive or dielectric, part

can be positioned at, e.g. a protrusion of, the second electric connector part, wherein the detectable part is positioned for being sensed by the capacitive sensor upon connection of the first and second electric connector parts. Regarding the magnetic detector, e.g. a Hall sensor can be positioned in, e.g. a recessed part of, the first electric connector part and a magnet can be positioned at, e.g. a protrusion of, the second electric connector part, wherein the magnet is positioned for being sensed by the Hall sensor upon connection of the first and second electric connector parts. The inductive, capacitive, and/or magnetic detector can be positioned such that detecting that the first and second connector part are connected implies that the first and second power contacts are in electrically conducting engagement.

Optionally, the second connector part comprises an identifier and the detector comprises a reader configured for reading the identifier, and wherein the power control electronics are configured for detecting that the first and second connector part are connected if an identifier is read by the reader. The reader and identifier can be positioned such that detecting that the first and second connector part are connected implies that the first and second power contacts are in electrically conducting engagement. The identifier can comprise a machine readable code, such as a barcode, 2D barcode, color code, QR code, or the like. The reader can comprise a reader configured to read a machine readable code, such as a barcode reader, 2D barcode reader, color code reader, QR-code reader, or the like. The identifier can comprise a chip, and the reader can comprise a NFC reader.

Optionally, the detector is configured for identifying an identifier of the second connector part of a plurality of different identifiers associated with different types of electrical heating elements, and the power control electronics are configured for adjusting electric power parameters, such as voltage, current, phase, of electric power to be supplied to the heating element on the basis of the identified identifier. The identifier can indicate the deep fat frying temperature of the corresponding electrical heating element.

Optionally, the deep fat fryer further comprises a detachable handle for selectively removing the electric heating element from the housing. The detachable handle can comprise a not thermally-conductive part for safely holding the detachable handle by a user, even when the electric heating element is still hot.

Optionally, a first one of the first and second electric connector parts comprises at least one load bearing protrusion and a second one of the first and second electric connector part comprises at least one load bearing recess configured for mating with the respective load bearing protrusion(s). The load bearing
5 recesses and protrusions can be configured for not taking part in electrical conduction. The load bearing protrusion(s) and recess(es) of the first and second electric connector parts can be configured to support at least 75% of the load and/or force of the electric heating element at the first and second connector parts. The load bearing recesses and protrusions can be configured for centering the first and
10 second electric connector parts.

According to a second aspect is provided a method for servicing, such as cleaning, a deep fat fryer as described. The method comprises disconnecting the electric heating element from the housing. The electric heating element can be disconnected from the housing by a user, optionally using a detachable handle. The
15 method comprises servicing at least part of the deep fat fryer. Servicing can comprise removing fat/oil from the cooking vessel, cleaning, and/or filling the cooking vessel with fat and/or oil. The method comprises connecting the electric heating element to the housing after servicing. The electric heating element can be connected to the housing by a user, optionally using the detachable handle.

According to a third aspect is provided a method for disconnecting an electric heating element from a housing of a deep fat fryer. The deep fat fryer can comprise a deep fat fryer as described. The method comprises attaching a detachable handle to an electric heating element. The method comprises disconnecting the electric heating element from the housing by moving the electric
25 heating element away from the housing using the handle. The handle can be moved by a user.

According to a fourth aspect is provided a method for powering an electric heating element of a deep fat fryer. The deep fat fryer can comprise a deep fat fryer as described. The method comprises removably mechanically connecting
30 an electric heating element to a housing of the deep fat fryer. The method comprises detecting whether the electric heating element is electrically conducting connected to power control electronics in the housing. After detecting that the

electric heating element is electrically conducting connected to the power control electronics, the method comprises supplying, by the power control electronics, electric power to the electric heating element for powering the electric heating element. Detecting whether the electric heating element is electrically conducting
5 connected to the power control electronics can be performed in the method using the detectors as described. The method can comprise preventing supplying, by the power control electronics, electric power to the electric heating element for powering the electric heating element prior to detecting that the electric heating element is electrically conducting connected to the power control electronics.

10 It will be appreciated that any of the aspects, features and options described in view of the deep fat fryer apply equally to the method for handling/servicing a deep fat fryer, and vice versa. It will also be clear that any one or more of the above aspects, features and options can be combined.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described in detail with reference to the accompanying drawings in which:

Figure 1 shows an illustration of a schematic representation of an example of a cross section of a side view of a deep fat fryer, wherein the electric
20 heating element and the housing are connected;

Figure 2 shows an illustration of a schematic representation of an example of a cross section of a side view of a deep fat fryer, wherein the electric heating element and the housing are disconnected;

Figure 3 shows an illustration of a schematic representation of an example of a cross section of a side view of a housing and a first electric connector
25 part of a deep fat fryer;

Figure 4 shows an illustration of a schematic representation of an example of a cross section of a side view of a deep fat fryer, wherein the electric heating element and the housing are connected;

30 Figure 5 shows an illustration of a schematic representation of an example of a perspective view of an electric heating element and a second electric connector part;

Figure 6 shows an illustration of a schematic representation of an example of a perspective view of a first electric connector part;

Figure 7 shows an exemplary flow chart of a method for servicing, such as cleaning, a deep fat fryer;

5 Figure 8 shows an exemplary flow chart of a method for disconnecting an electric heating element from a housing of a deep fat fryer; and

Figure 9 shows an exemplary flow chart of a method for powering an electric heating element of a deep fat fryer.

10 DETAILED DESCRIPTION

Figure 1 shows an illustration of a schematic representation of an example of a cross section of a side view of a deep fat fryer 1, wherein the electric heating element 6 and the housing 2 are connected. The deep fat fryer 1 comprises a housing 2, a cooking vessel 4, an electric heating element 6 and power control
15 electronics 8. The deep fat fryer 1 further comprises a first electric connector part 10 and a second electric connector part 12. The cooking vessel 4 is mounted to the housing 2. The power control electronics 8 are positioned in the housing 2, and configured for controlling and supplying electric power to the electric heating
20 element 6. The first electric connector part 10 is mounted to the housing 2 and in electric connection with the power control electronics 8. Here, the electric connection between the first electric connector part 10 and the power control
electronics 8 comprises a power supply wiring 11 and optionally a sensing wiring
13.

The second electric connector part 12 is mounted to the electric heating
25 element 6. The first and second electric connector parts 10,12 are configured for mating with each other. In Figure 1, the second electric connector part 12 is connected to the first electric connector part 10. The second electric connector part 12 is configured for removably mechanically connecting the electric heating
element 6 to the housing 2 and for removably electrically connecting the electric
30 heating element 6 to the power control electronics 8.

The deep fat fryer 1 in this example comprises a detector 15 for detecting that the first and second connector part 10,12 are connected. The detector 15 is in

this example positioned integral with the power control electronics 8 in the housing 2. It will be appreciated that the detector 15 can alternatively be positioned in the housing 2 outside of the power control electronics 8, or the detector 15 can be positioned in the first electric connector part 10. In this example, the detector 15 is connected to the power supply wiring 11 and the power control electronics 8, and optionally to the sensing wiring 13. The power control electronics 8 can then be configured for supplying electric power for powering the electric heating element 6 if the detector 15 detects that the first and second electric connector parts 10,12 are in an electrically conducting engagement. The power control electronics 8 can be configured for refraining from supplying electric power for powering the electric heating element 6 to power control electronics 8 if the detector 15 detects that the first and second electric connector parts 10,12 are not in electrically conducting engagement.

Figure 2 shows an illustration of a schematic representation of an example of a side view of a cross section of a deep fat fryer 1, wherein the electric heating element 6 and the housing 2 are disconnected. In this Figure 2, the second electric connector part 12 is disconnected from the first electric connector part 10. Here, the first electric connector part 10 comprises two first power contacts 14 and the second electric connector part 12 comprises two second power contacts 16. The first electric connector part 10 comprises two first sensing contacts 18 and the second electric connector part 12 comprises two second sensing contacts 20 in this example. It will be appreciated that the first and second electric connector parts 10,12 can each comprise more than two respective first and second power contacts 14,16 and/or more than two respective first and second sensing contacts 18,20. The number of first sensing contacts 18 can be equal to the number of second sensing contacts 20. The number of first power contacts 14 can be equal to the number of second power contacts 16. The first and second power contacts 14,16 are configured for, when the first and second connector part 10,12 are connected, conducting electric power for powering the electric heating element 6 to the power control electronics 8 via power supply wiring 11. Here, the first and second sensing contacts 18,20 are configured for, when the first and second connector part 10,12 are connected, detecting that the first and second connector part 10,12 are

connected, e.g. via the sensing wiring 13. Here, the first and second sensing contacts 18,20 are configured for detecting that the first and second power contacts 14,16 are in an electrically conducting engagement. The deep fat fryer 1 is in this example configured for detecting that the first and second connector part 10,12 are connected if the first and second sensing contacts 18,20 are in an electrically conducting engagement.

In this example, the deep fat fryer 1 comprises a detachable handle 22 for selectively removing the electric heating element 6 from the housing 2. Here, the detachable handle 22 comprises a distal part 24 for engaging the electric heating element 6 and/or the second connector part 12. The detachable handle 22 in this example comprises a proximal part 26 for holding the detachable handle 22 by a user. The proximal part 26 is preferably not thermally-conductive, such that the detachable handle 22 can be used while the electric heating element 6 is still hot.

The first power contacts 14 and first sensing contacts 18 in this example comprise conducting sockets in the first electric connector part 10. The second power contacts 16 and the second sensing contacts 20 in this example comprise conducting pens on the second electric connector part 12. The conducting pens and sockets are in this example positioned such that, when mating the first and second electric connector parts 10,12, the pens and sockets of the first and second power contacts 14,16 are at least partially in mechanical engagement with each other prior to the pens and sockets of the first and second sensing contacts 18,20 are in mechanical engagement with each other. Here, the conducting pens and sockets are also positioned such that, when mating the first and second electric connector parts 10,12, the pens and sockets of the first and second sensing contacts 18,20 are in electrically conducting engagement with each other prior to the pens and sockets of the first and second power contacts 14,16 are in electrically conducting engagement with each other. Here, the conducting pens of the second power contacts 16 are longer than the conducting pens of the second sensing contacts 20.

The deep fat fryer 1 in this example comprises a detector 15 for detecting that the first and second connector part 10,12 are connected. Here, the detector 15 is configured for detecting that the first and second power contacts 14,16 are in

electrically conducting engagement. The detector 15 is in this example positioned integral with the power control electronics 8 in the housing 2. It will be appreciated that the detector 15 can alternatively be positioned in the housing 2 outside of the power control electronics 8, or the detector 15 can be positioned in the first electric connector part 10.

The second sensing contacts 20 can, in the second connector part or in the electric heating element, e.g. be electrically connected via a circuit 17, such as a short, a resistor or the like. By supplying an electric signal to at least one of the first sensing contacts 18, and detecting a resulting electric signal at at least one of the first sensing contacts, it can be detected whether the first sensing contacts 18 are in contact with the circuit via the second sensing contacts 20, or not. The detector 15 can e.g. determine a current flowing through the sensing wiring 11, a voltage at one or more of the sensing contacts 20, a resistance measured across the sensing contacts 20, or the like, representative of the first and second sensing contacts 18,20 being in electrically conducting engagement. Hence, it can be detected whether the first connector part is connected to the second connector part or not. Since in this example the conducting pens and sockets are also positioned such that, when mating the first and second electric connector parts 10,12, the pens and sockets of the first and second sensing contacts 18,20 are in electrically conducting engagement with each other prior to the pens and sockets of the first and second power contacts 14,16 are in electrically conducting engagement with each other, it applies that while mating the first electric connector part 10 and the second electric connector part 12 the first and second sensing contacts 18,20 first allow detection of the resulting electric signal while the first and second power contacts 14,16 are already in electrically conducting engagement. Hence, electric power for powering the electric heating element can safely be activated upon detection of the resulting electric signal.

The power control electronics 8 can thus be configured for supplying electric power for powering the electric heating element 6 to the first power contacts 14 if the detector 15 detects that the first and second power contacts 14,16 are in electrically conducting engagement. The power control electronics 8 can be configured for refraining from supplying electric power for powering the electric

heating element 6 to the first power contacts 14,16 if the detector 15 detects that the first and second power contacts 14,16 are not in electrically conducting engagement.

5 In an alternative example, the detector 15 can be positioned in contact with the first and/or second power contacts 14,16. In such case the sensing contacts 18,20 and sensing wiring 12 may be omitted if desired. An electric signal can then be provided to at least one of the first power contacts 14 for detecting whether the first and second power contacts 14,16 are in an electrically conducting engagement. A power or a voltage of the electric signal can be lower than electric power or
10 voltage for powering the electric heating element 6. When the power control electronics 8 refrain from supplying electric power for powering the electric heating element 6 to the first power contacts 14, the electric signal can nevertheless be supplied to the first power contacts 14 to detect whether the first and second power contacts 14,16 are electrically connected. In this example, the electric signal has a
15 power and/or voltage insufficient for powering the electric heating element. A power of the electric signal can e.g. be less than 10% of the power rating of the electric heating element. A voltage of the electric signal can be lower than the voltage for powering the electric heating element. The electric heating element can e.g. be rated for powering at 400V. The electric signal can e.g. have a voltage of
20 100V or less, preferably 48V or less, such as 24V or less. The low power and/or low voltage electric signal, or a signal representative thereof, can e.g. be detected, when the first and second power contacts are in electrically conducting engagement. When the electric signal is applied to one of the first power contacts 18, the detector 15 can e.g. determine a current flowing through the power supply wiring 11, a
25 voltage at one or more of the power contacts 14, a resistance measured across the power contacts 14, or the like, representative of the first and second power contacts 14,16 being in electrically conducting engagement.

The power control electronics 8 can be configured for supplying electric power for powering the electric heating element 6 to the first power contacts 14
30 only after the detector 15 has detected that the first and second power contacts 14,16 are in electrically conducting engagement. The power control electronics 8 can be configured for refraining from supplying electric power for powering the

electric heating element 6 to the first power contacts 14,16 if the detector 15 detects that the first and second power contacts 14,16 are not in electrically conducting engagement.

5 Figure 3 shows an illustration of a schematic representation of an example of a cross section of a side view of a housing 2 and a first electric connector part 10 of a deep fat fryer 1. The detector 15 is in this example positioned in the first electric connector part 10. Here, the detector 15 is connected to power control electronics 8.

10 The detector 15 can comprise an optical detector configured for detecting a connected position of the first and second electric connector part 10,12. The detector 15 can comprise a mechanical detector, such as a switch, configured for detecting a connected position of the first and second electric connector part 10,12. The detector 15 comprises an inductive, capacitive, and/or magnetic detector, configured for detecting a connected position of the first and second connector part
15 10,12.

The optical detector 15 can comprise a Light-Emitting Diode (LED) and a light detector. The LED and light detector can be mounted in, e.g. a recessed part of, the first electric connector part 10. The optical detector can comprise a vane mounted in the second electric connector part 12. When the first and second
20 connector parts 10,12 are disconnected, the light detector can detect at least part of the light emitted by the LED. When the first and second connector parts 10,12 are connected, the vane can block at least part of the light, such that the light detector can detect substantially no light emitted by the LED. The optical detector 15 can be positioned such that detecting that the first and second connector part
25 10,12 are connected implies that the first and second power contacts 14,16 are in electrically conducting engagement.

The mechanical detector 15 can be positioned in, e.g. a recessed part of, the first electric connector part 10, e.g. at a proximal end thereof. The mechanical
30 detector 15 can also comprise a protrusion of the second electric connector part 12. When the first and second connector parts 10,12 are disconnected, the mechanical detector can be in the neutral position. When the first and second connector parts 10,12 are connected, the mechanical detector 15 can be in the activated position,

e.g. by the protrusion pressing against the mechanical detector part, e.g. the switch, of the first connector part 10. The mechanical detector 15 can be positioned such that detecting that the first and second connector part 10,12 are connected implies that the first and second power contacts 14,16 are in electrically conducting engagement.

The inductive detector 15 can comprise an inductive sensor positioned in, e.g. a recessed part of, the first electric connector part 10 and a detectable, e.g. a metallic, part positioned at, e.g. a protrusion of, the second electric connector part 12. The detectable part is positioned for being sensed by the inductive sensor upon connection of the first and second electric connector parts 10,12. The inductive detector 15 can be positioned such that detecting that the first and second connector part 10,12 are connected implies that the first and second power contacts 14,16 are in electrically conducting engagement.

The capacitive detector 15 can comprise a capacitive sensor positioned in, e.g. a recessed part of, the first electric connector part 10 and a detectable, e.g. a conductive or dielectric, part positioned at, e.g. a protrusion of, the second electric connector part 12. The detectable part is positioned for being sensed by the capacitive sensor upon connection of the first and second electric connector parts 10,12. The capacitive detector 15 can be positioned such that detecting that the first and second connector part 10,12 are connected implies that the first and second power contacts 14,16 are in electrically conducting engagement.

The magnetic detector 15 can comprise a Hall sensor positioned in, e.g. a recessed part of, the first electric connector part 10 and a magnet positioned at, e.g. a protrusion of, the second electric connector part 12. The magnet is positioned for being sensed by the Hall sensor upon connection of the first and second electric connector parts 10,12. The magnetic detector 15 can be positioned such that detecting that the first and second connector part 10,12 are connected implies that the first and second power contacts 14,16 are in electrically conducting engagement.

The deep fat fryer 1 can comprise a plurality of interchangeable heating elements 6. The heating elements 6 can be of different types. The different types of heating elements 6 can e.g. differ in a power rating, maximum temperature,

geometry or the like. The heating elements 6 can all have a second electric connector part 12 compatible with the first electric connector part 10 of the housing 2. Hence, the user can select a heating element 6 from the plurality of heating elements according to the deep frying task at hand, and attach the selected heating element 6 to the housing 2.

The second connector part 12 can comprise an identifier and the detector 15 can comprise a reader configured for reading the identifier. The power control electronics 8 can be configured for detecting that the first and second connector part 10,12 are connected if an identifier is read by the reader.

Each of the heating elements 6 of the plurality of heating elements 6 can have an identifier. The detector 15 can be configured for identifying an identifier of the second connector part 12 of the heating element 6 connected to the housing 2 from among the plurality of different identifiers associated with the plurality of electrical heating elements 6. The power control electronics 8 can be configured for adjusting electric power parameters of electric power to be supplied to the connected heating element 6 on the basis of the identified identifier.

Figure 4 shows an illustration of a schematic representation of an example of a side view of a cross section of a deep fat fryer 1, wherein the electric heating element 6 and the housing 2 are connected. The power control electronics 8 are in this example configured for detecting that the first and second power contacts 14,16 are in an electrically conducting engagement on the basis of measurement of an electric parameter at one or all of the first sensing contacts 18. Measurement of the electric parameter can be performed using the electric signal on one or all of the first sensing contacts 18. Here, the deep fryer 1 is configured for providing electric power for powering the electric heating element 6 to the first power contacts 18, as the electric heating element 6 is connected to the housing 2. The electric voltage of the electric signal is lower than an electric voltage of the electric power for powering the electric heating element 6. Here, the first electric connector part 10 comprises a cover 28 for, when the first and second electric connector part 10,12 are disconnected, covering the first power contacts 14 and

first sensing contacts 18. In this example, the cover 28 is movably, here hingedly, connected to the main part 19 of the first electric connector part 10.

Figure 5 shows an illustration of a schematic representation of an example of a perspective view of an electric heating element 6 and a second electric connector part 12. In this example, the electric heating element 6 comprises a heater connector part 38 and a curved heat-conductor 40. Here, the second electric connector part 12 comprises four second power contacts 16. The four second power contacts are in this example provided for providing three-phase electric power to the heating element 6. The second electric connector part 12 in this example comprises two second sensing contacts 20, but a different number is also possible. Here, the second electric connector part 12 comprises second load bearing protrusions 30. It will be appreciated that the second load bearing protrusions are configured to mate with corresponding first load bearing recesses 36 of the first connector part 10. It will also be appreciated that alternatively, or additionally, the second electric connector part 12 can comprise second load bearing recesses configured to mate with corresponding first load bearing protrusions of the first connector part 10.

Figure 6 shows an illustration of a schematic representation of an example of a perspective view of a first electric connector part 10. Here, the first electric connector part 10 comprises four first power contacts 14. The first electric connector part 10 in this example comprises two first sensing contacts 18. The first electric connector part 10 comprises the first load bearing protrusions 34 as mentioned. The load bearing protrusions 30 and the load bearing recesses 36 can be configured to support at least 75% of the load and/or force of the electric heating element 6. It will be appreciated that in this example the load bearing protrusions 30 and the load bearing recesses 36 are not configured for electrical conduction. Further, the load bearing protrusions 30 and the load bearing recesses 36 can be configured for centering the first and second electric connector parts 10,12. Here, the first electric connector part 10 further comprises a cover 28 hingedly connected to the main part 19 of the first electric connector 10.

Figure 7 shows an example of a flow chart of a method 100 for servicing, such as cleaning, a deep fat fryer 1. In these examples of the method 100 the steps

are performed in the following order. In a first step 102, the electric heating element 6 is disconnected from the housing 2. At least part of the deep fat fryer 1 is serviced in step 104. Servicing can comprise cleaning and/or maintenance. After completing step 104, the electric heating element 6 is connected to the housing 2 in step 106.

Figure 8 shows an example of a flow chart of a method 200 for disconnecting an electric heating element 6 from a housing 2 of a deep fat fryer 1. In these examples of the method 200 the steps are performed in the following order. In a first step 202, a detachable handle 22 is attached to the electric heating element 6. The electric heating element 6 is disconnected from the housing 2 by moving the electric heating element 6 away from the housing 2 using the detachable handle 22.

Figure 9 shows an example of a flow chart of a method 300 for powering an electric heating element 6 of a deep fat fryer 1. In these examples of the method 300 the steps are performed in the following order. The deep fat fryer 1 can in this example comprise a detector 15 configured for detecting that the first and second power contacts 14,16 are in an electrically conducting engagement. In a first step 302, the electric heating element 6 is removably mechanically connected to a housing 2 of the deep fat fryer 1. In step 304, it is detected whether the electric heating element 6 is electrically conducting connected to power control electronics 8 in the housing 2. After detecting that the electric heating element 6 is electrically conducting connected to the power control electronics 8 in step 304, electric power is supplied to the electric heating element 6 by the power control electronics 8 for powering the electric heating element 6 in step 306.

Herein, the invention is described with reference to specific examples of embodiments of the invention. It will, however, be evident that various modifications and changes may be made therein, without departing from the essence of the invention. For the purpose of clarity and a concise description features are described herein as part of the same or separate embodiments, however, alternative embodiments having combinations of all or some of the features described in these separate embodiments are also envisaged.

However, other modifications, variations, and alternatives are also possible. The specifications, drawings and examples are, accordingly, to be regarded in an illustrative sense rather than in a restrictive sense.

5 For the purpose of clarity and a concise description features are described herein as part of the same or separate embodiments, however, it will be appreciated that the scope of the invention may include embodiments having combinations of all or some of the features described.

10 In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word 'comprising' does not exclude the presence of other features or steps than those listed in a claim. Furthermore, the words 'a' and 'an' shall not be construed as limited to 'only one', but instead are used to mean 'at least one', and do not exclude a plurality. The mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot be used to an advantage.

Claims

1. A deep fat fryer comprising:
a housing;
a cooking vessel mounted to the housing;
an electric heating element;

5

a first electric connector part mounted to the housing and configured to be in electric connection with power control electronics configured for controlling and supplying electric power to the electric heating element;

- a second electric connector part configured for mating with the first electric connector part, and mounted to the electric heating element for removably mechanically connecting the electric heating element to the housing and for removably electrically connecting the electric heating element to the power control electronics.

2. The deep fat fryer of claim 1, wherein the first electric connector part comprises two first power contacts and the second electric connector part comprises two second power contacts for, when the first and second connector part are connected, conducting electric power for powering the electric heating element to the electric heating element.

20

3. The deep fryer of claim 1 or 2, comprising a detector for detecting that the first and second connector part are connected.

4. The deep fryer of claim 3, wherein the detector is configured for detecting that the first and second power contacts are in electrically conducting engagement.

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5. The deep fryer of any of claims 4, wherein the power control electronics are configured for supplying electric power for powering the electric heating element to the first power contacts if the detector detects that the first and second power

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contacts are in electrically conducting engagement, and for refraining from supplying electric power for powering the electric heating element to the first power contacts if the detector detects that the first and second power contacts are not in electrically conducting engagement.

5

6. The deep fryer of any of claims 2-5, wherein the power control electronics are configured for detecting that the first and second power contacts are in electrically conducting engagement on the basis of measurement of an electric parameter at one or all of the first power contacts.

10

7. The deep fryer of any of claims 3-6, wherein the detector is part of the first electric connector part.

[The detector can be positioned integral with the first and/or second power contacts]

15

8. The deep fat fryer of any of claims 1-7, wherein the first electric connector part comprises two first sensing contacts and the second electric connector part comprises two second sensing contacts for, when the first and second connector part are connected, detecting that the first and second connector part are connected.

20

9. The deep fryer of claim 8, configured for detecting that the first and second connector part are connected if the first and second sensing contacts are in an electrically conducting engagement.

25

10. The deep fryer of claim 8 or 9, when dependent from claim 2, wherein the deep fryer is configured for providing an electric signal to at least one of the first sensing contacts, and for providing electric power for powering the electric heating element to the first power contacts, wherein an electric voltage of the electric signal is smaller than an electric voltage of the electric power for powering the electric heating element.

30

11. The deep fryer of claim 9 or 10, when dependent from claim 2,
wherein the first power contacts comprise conducting sockets and the
second power contacts comprise conducting pens,
wherein the first sensing contacts comprise conducting sockets and the
5 second sensing contacts comprise conducting pens, and
wherein the pens and sockets are positioned such that, when mating the
first electric connector part and the second electric connector part, the pens and
sockets of the first and second power contacts are in electrically conducting
engagement prior to the pens and sockets of the first and second sensing contacts
10 are in electrically conducting engagement.
12. The deep fryer of claim 3 or any of claims 4-11 as far as dependent from
claim 3, wherein the detector comprises an optical detector configured for
detecting a connected position of the first and second connector part.
15
13. The deep fryer of claim 3 or any of claims 4-12 as far as dependent from
claim 3, wherein the detector comprises a mechanical detector, such as a switch,
configured for detecting a connected position of the first and second connector
part.
20
14. The deep fryer of claim 3 or any of claims 4-13 as far as dependent from
claim 3, wherein the detector comprises an inductive, capacitive, and/or magnetic
detector, configured for detecting a connected position of the first and second
connector part.
25
15. The deep fryer of claim 3 or any of claims 4-14 as far as dependent from
claim 3, wherein the second connector part comprises an identifier and the
detector comprises a reader configured for reading the identifier, and wherein the
power control electronics are configured for detecting that the first and second
30 connector part are connected if an identifier is read by the reader.

16. The deep fryer of claim 15, wherein the detector is configured for identifying an identifier of the second connector part of a plurality of different identifiers associated with different types of electrical heating elements, and the power control electronics are configured for adjusting electric power parameters of electric power to be supplied to the heating element on the basis of the identified identifier.
17. The deep fryer of any of the preceding claims, further comprising a detachable handle for selectively removing the electric heating element from the housing.
18. The deep fryer of any of the preceding claims, wherein a first one of the first and second electric connector part comprises a load bearing protrusion and a second one of the first and second electric connector part comprises a load bearing recess configured for mating with the respective load bearing protrusion. [not for electrical conduction, and supports at least 75% of the load/force of the heater]
[configured for centering the first and second electric connector]
19. A method for servicing, such as cleaning, a deep fat fryer, the deep fat fryer according to any of the preceding claims, the method comprising:
disconnecting the electric heating element from the housing;
servicing at least part of the deep fat fryer; and
connecting the electric heating element to the housing.
20. A method for disconnecting an electric heating element from a housing of a deep fat fryer, such as according to any of claims 1-18, comprising:
attaching a detachable handle to an electric heating element; and
disconnecting the electric heating element from the housing by moving the electric heating element away from the housing using the handle.

21. A method for powering an electric heating element of a deep fat fryer, such as according to claim 4, or any of claims 5-18 when at least dependent on claim 4:
- removably mechanically connecting an electric heating element to a housing of the deep fat fryer;
- 5 detecting whether the electric heating element is electrically conducting connected to power control electronics; and
- after detecting that the electric heating element is electrically conducting connected to the power control electronics, supplying, by the power control electronics, electric power to the electric heating element for powering the electric
- 10 heating element.

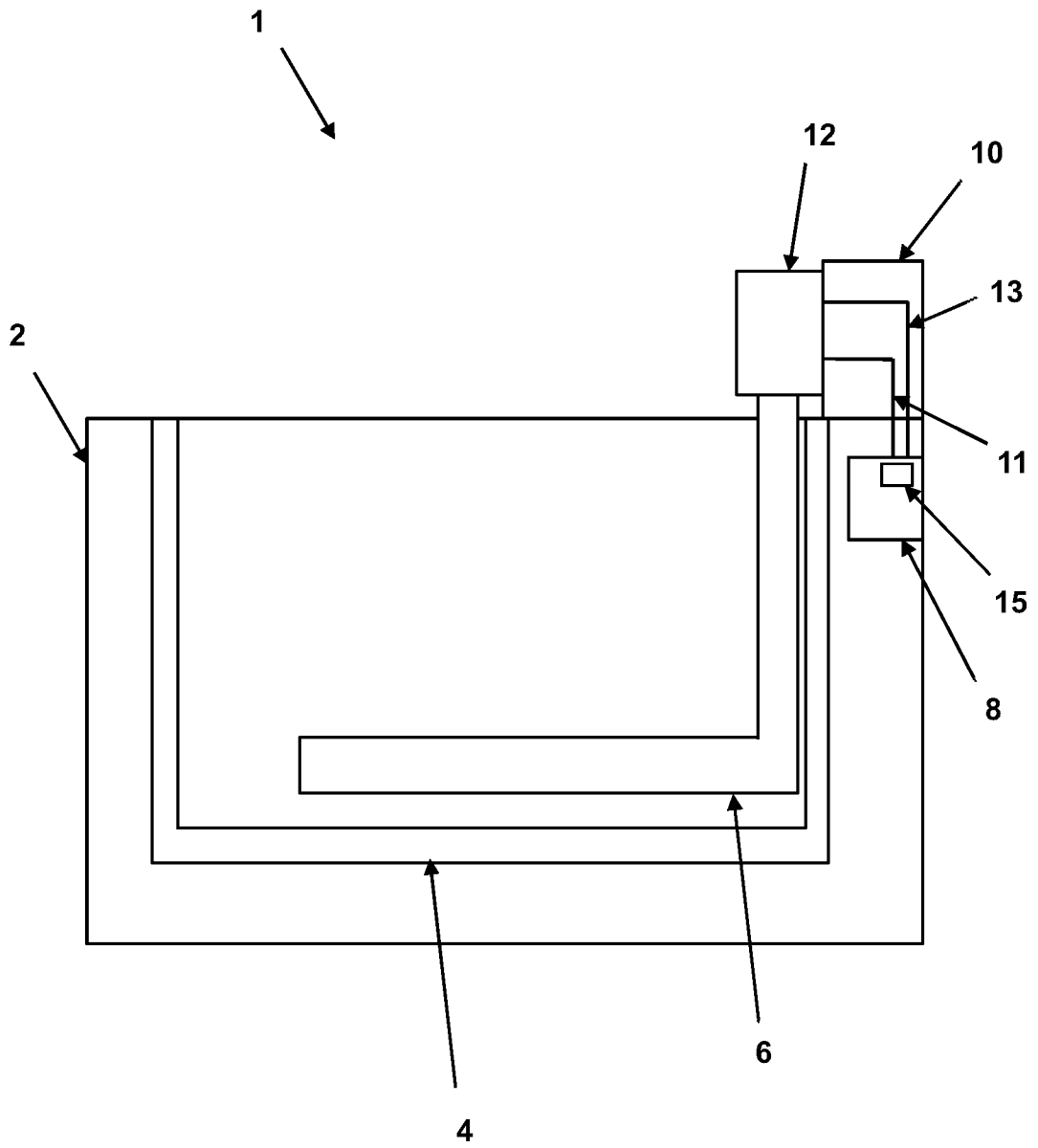


FIG 1

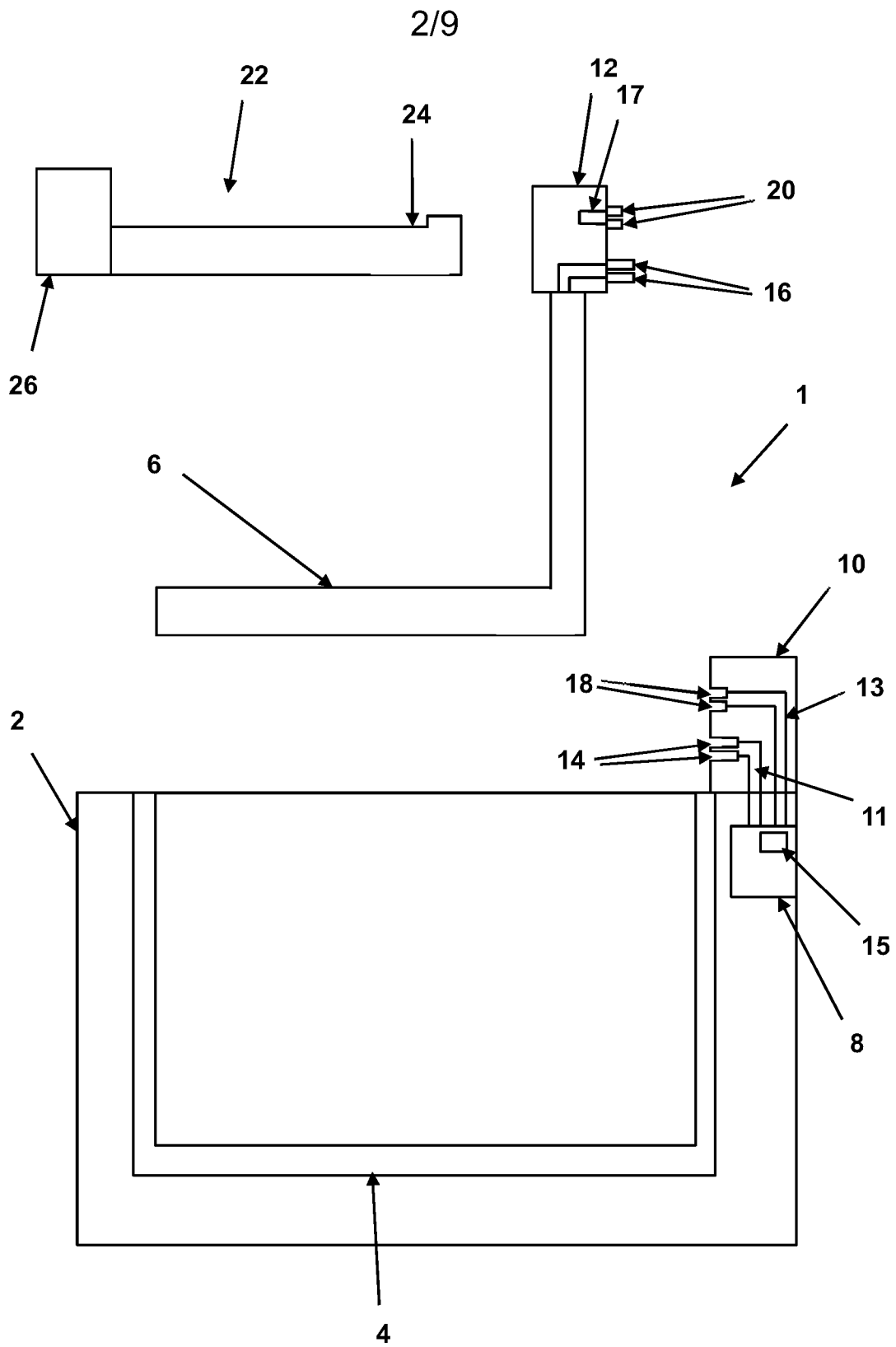


FIG 2

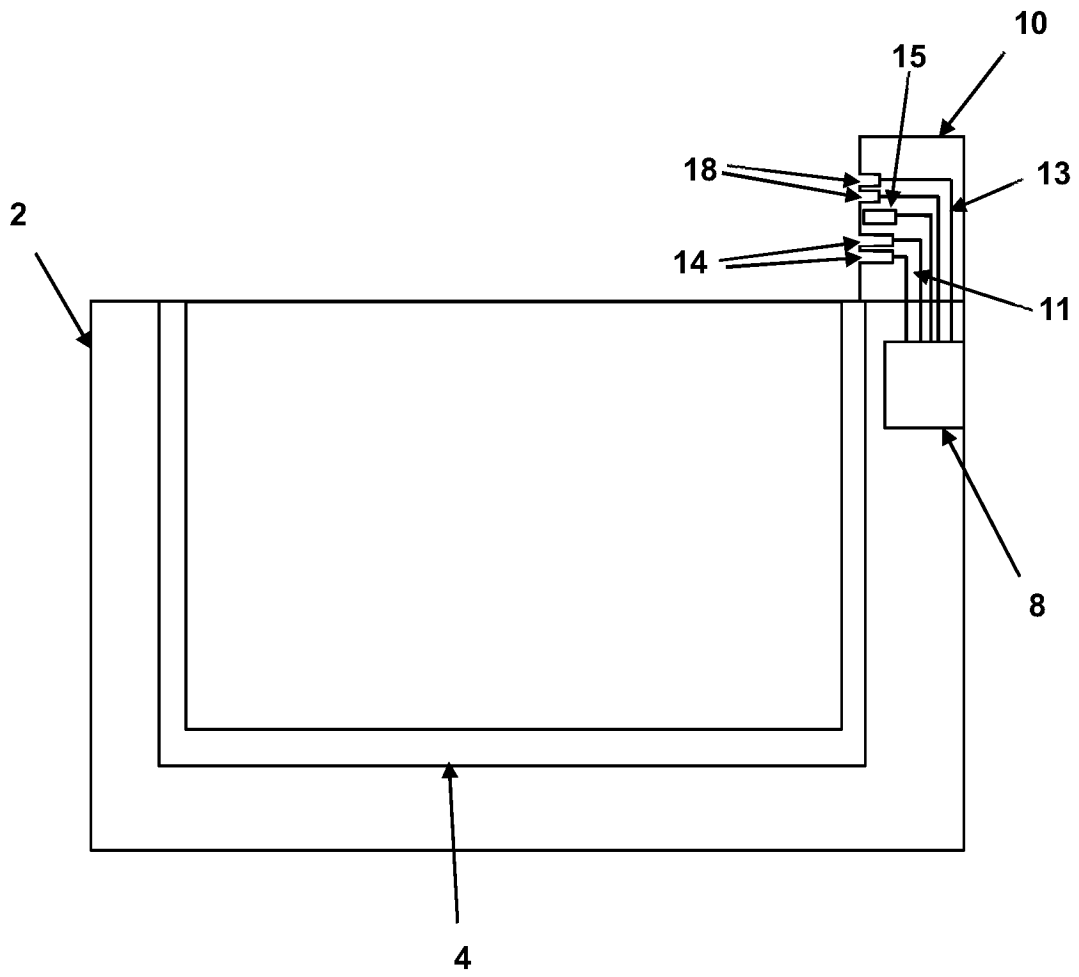


FIG 3

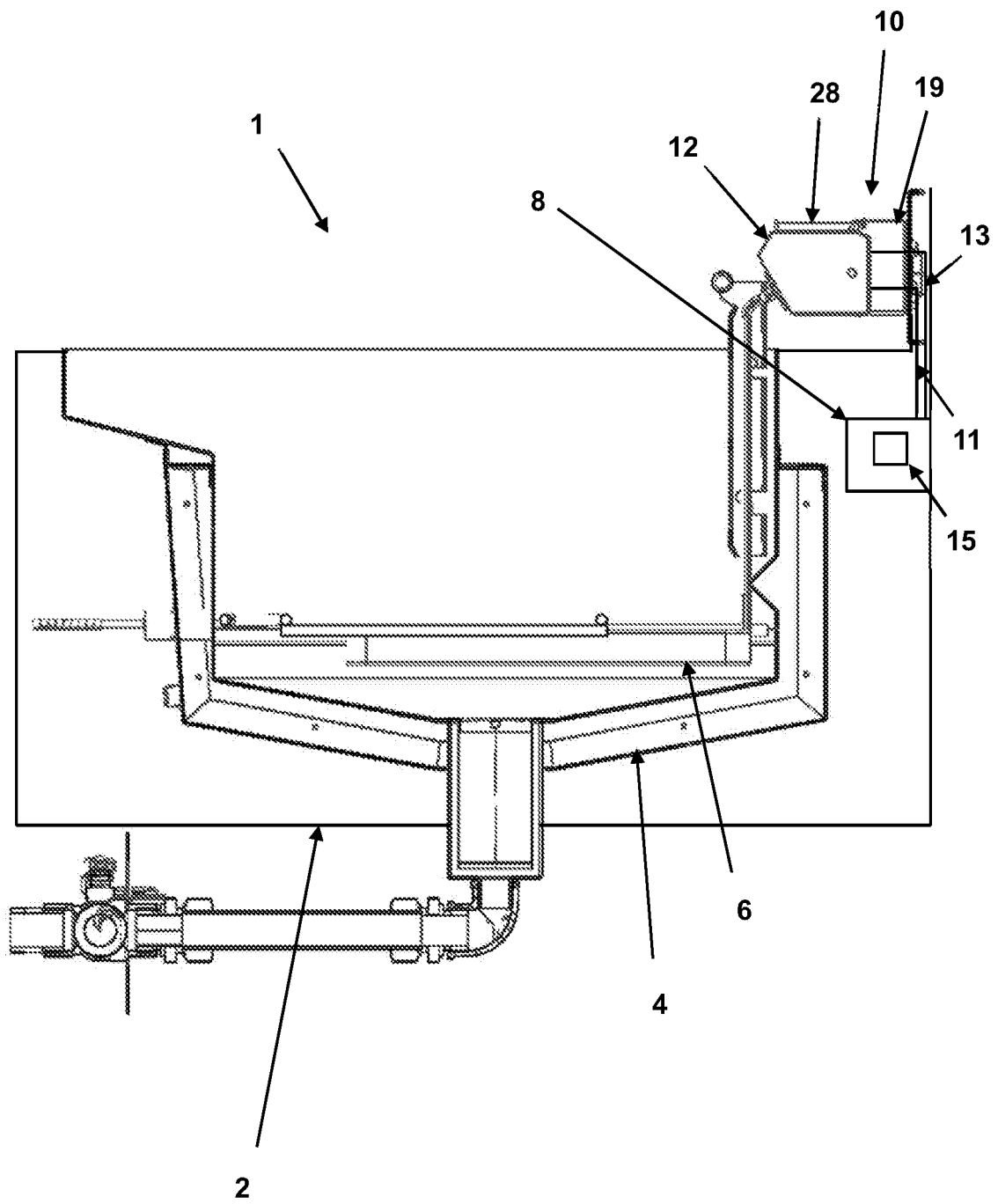


FIG 4

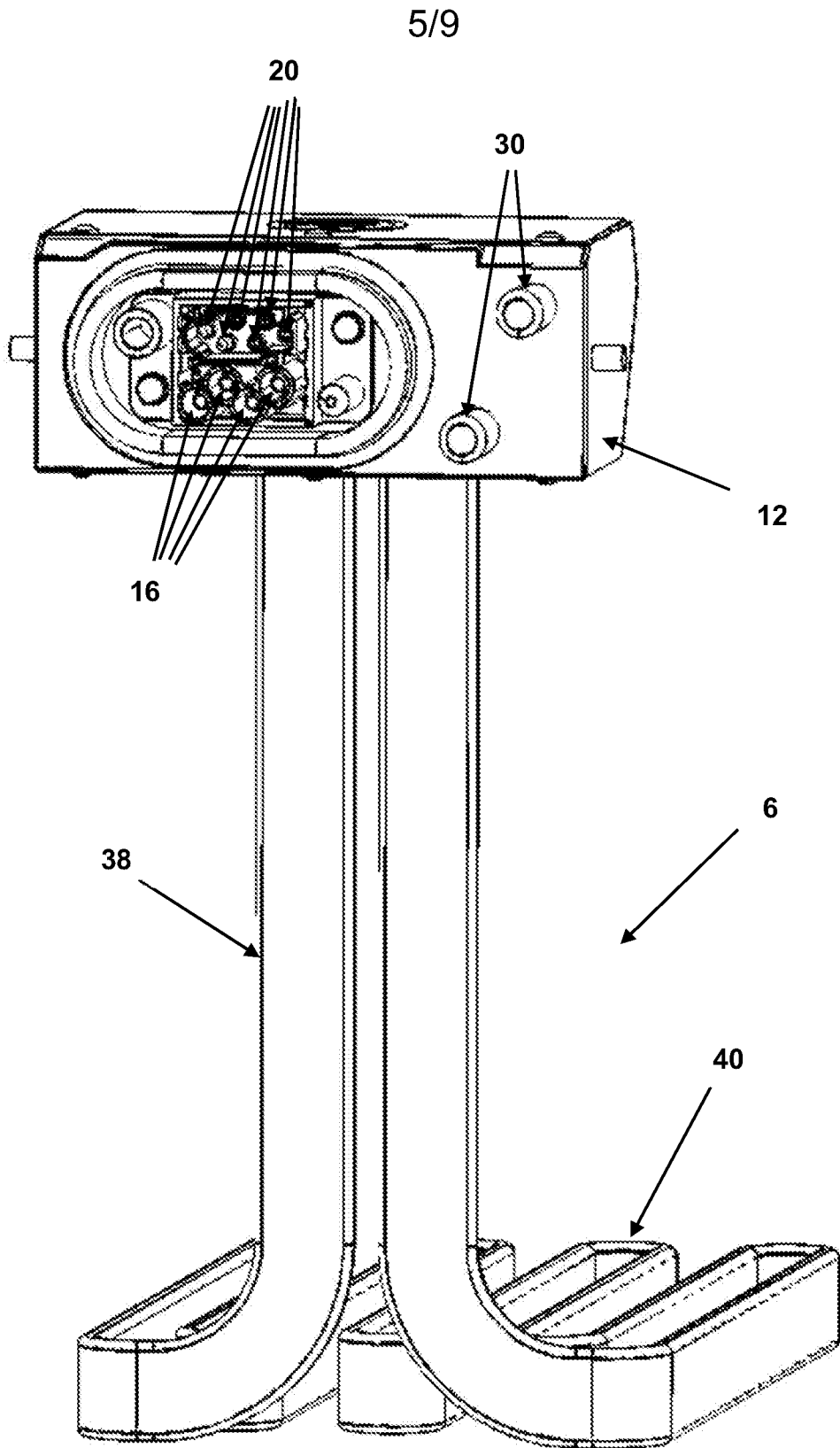


FIG 5

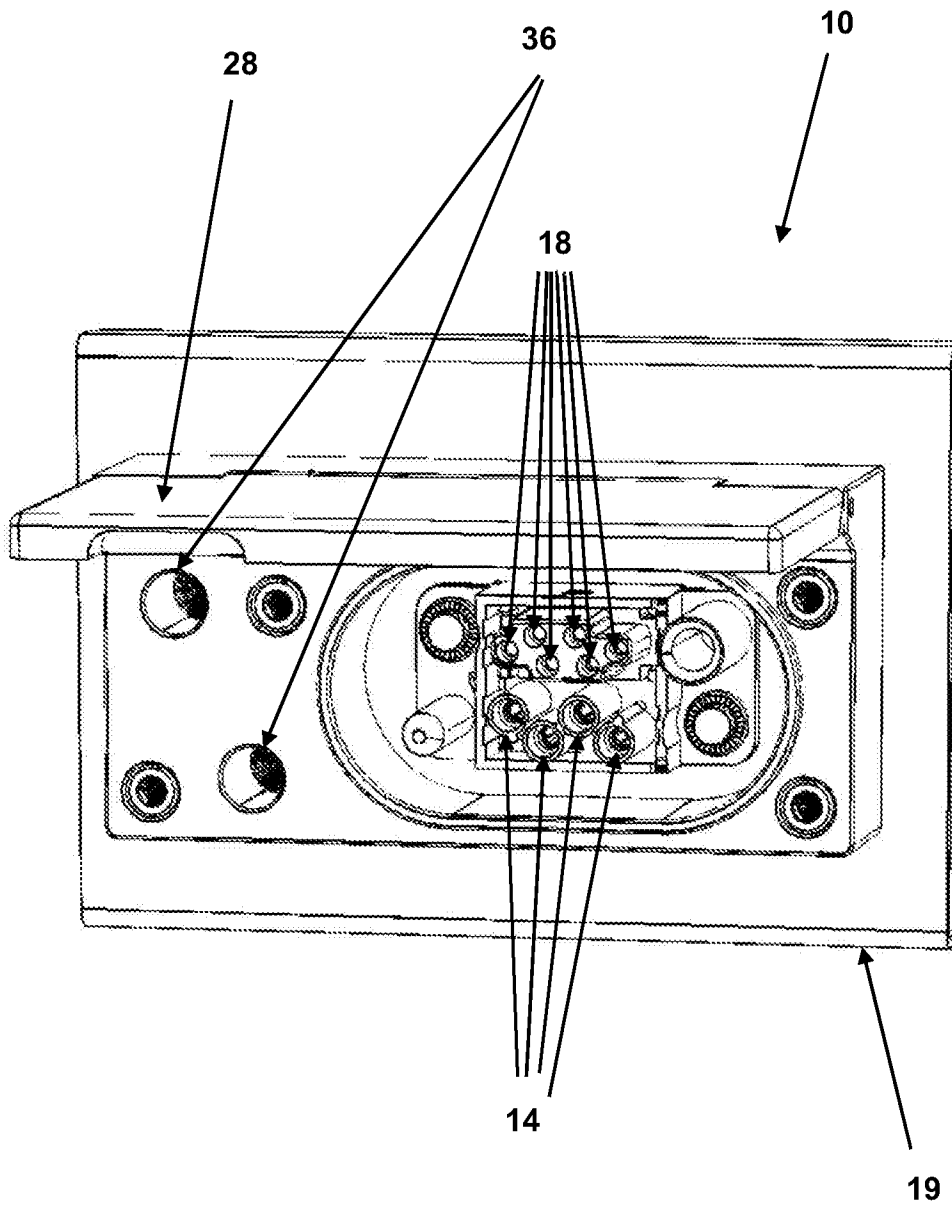


FIG 6

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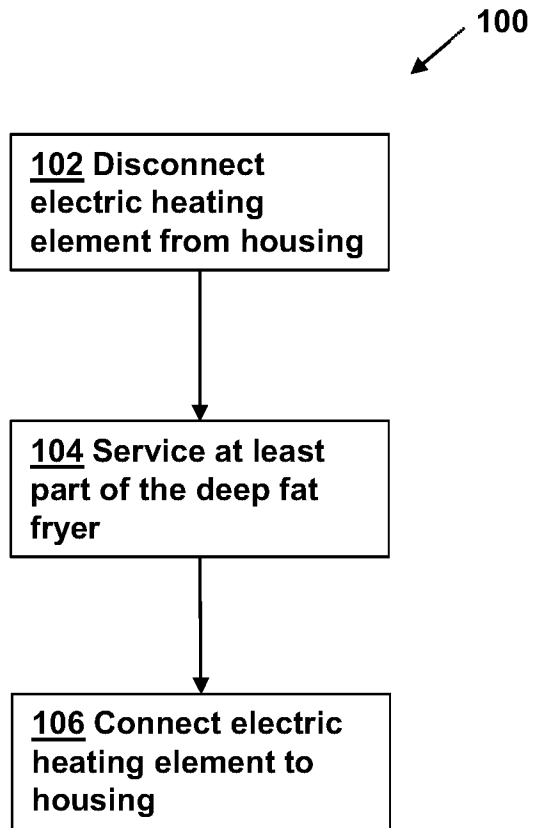


FIG 7

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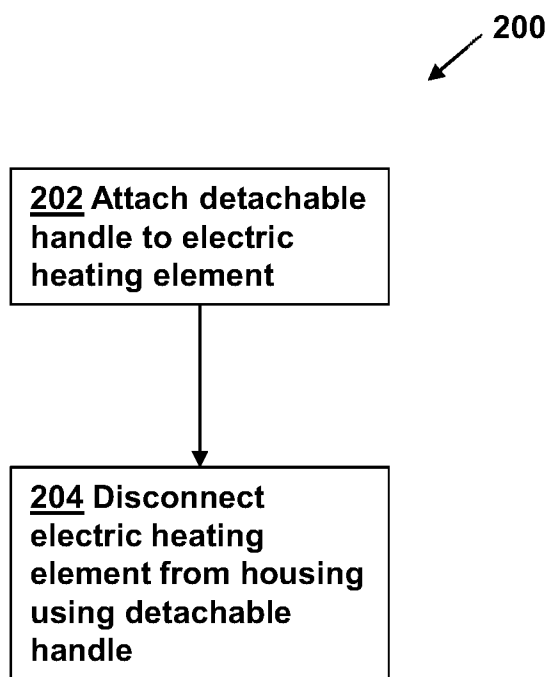


FIG 8

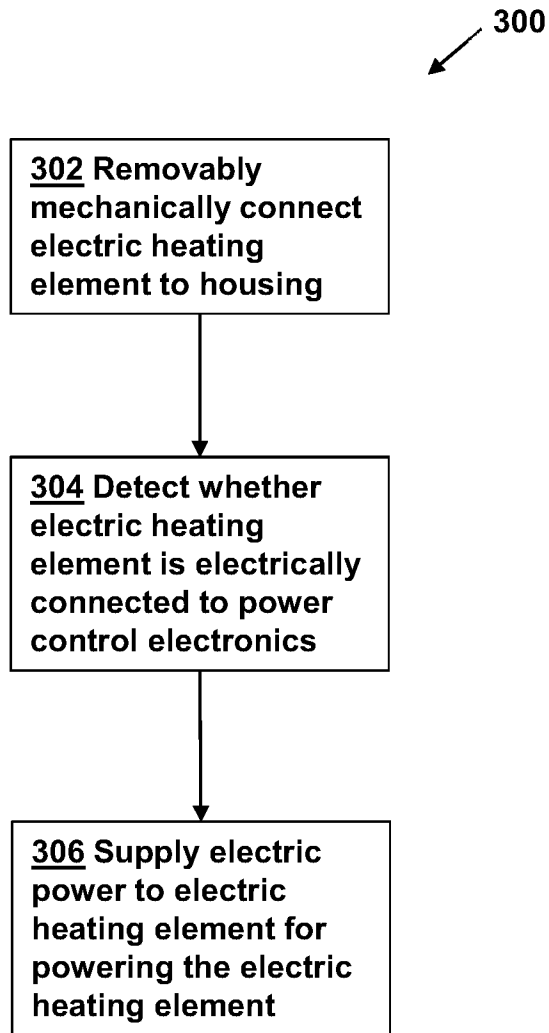


FIG 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2024/050291

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47J37/12
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)
A47J

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

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X	EP 0 587 300 B1 (MORPHY LTD RICHARDS [GB]) 31 January 1996 (1996-01-31)	1,2, 17-20
Y	abstract; figures 2,3 column 1, line 35 - line 54	3,13,14, 21
A		4-12,15, 16

Y	CN 104 540 427 B (BBBL INNOVATION AB) 17 August 2016 (2016-08-17)	3,13,14, 21
	abstract; figures 4,5 switch; paragraph [0093]	

X	EP 1 087 685 B1 (SEB SA [FR]) 21 July 2004 (2004-07-21)	1,2,18, 19
A	abstract; claim 1; figures 1,2	3-17,20, 21

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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- "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
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Date of the actual completion of the international search

18 July 2024

Date of mailing of the international search report

29/07/2024

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Authorized officer

Schnitzhofer, Markus

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2024/050291

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No

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