(12) UK Patent Application (19) GB (11) 2627965 (13) A

(43) Date of A Publication 11.09.2024

(21) Application No: 2303475.4

(22) Date of Filing: 09.03.2023

(71) Applicant(s):
Active Food Systems Limited
(Incorporated in the United Kingdom)
Units 7 to 10 Greenewable Business Park,
Station Lane, Offord Cluny, Cambridgeshire,
PE19 5ZA, United Kingdom

(72) Inventor(s):
Sam O'Rourke
Andrew Norman Edwards
George Justin Peter Cadbury

(74) Agent and/or Address for Service:
Boult Wade Tennant LLP
Salisbury Square House, 8 Salisbury Square,
LONDON, EC4Y 8AP, United Kingdom

(51) INT CL:
A47J 37/06 (2006.01)

(56) Documents Cited:
EP 3295841 A1
EP 0908129 A1
CN 206303779 U
US 20130333576 A1
US 20120118172 A1

(58) Field of Search:
INT CL **A47J, H05B**
Other: **WPI, EPODOC**

(54) Title of the Invention: **Cooking appliance**
Abstract Title: **Cooking appliance with conductive upper surface and lower insulating surface**

(57) A cooking appliance (10,fig.1) comprising griddle plate assembly (12,fig.1) with upper surface and lower surface. At least one square or rectangular cross-section channel (28,fig.5b) is defined between upper and lower surfaces. An electrically powered heating element 24 is placed within each channel. The heating element may also be square or rectangular in cross section such that all four sides of the heating element are in contact with the walls of the channel. Upper surface may be a first conductive material plate 18, with lower surface may be a second insulating material plate 22. The griddle assembly may include a third plate 20 which is conductive and is placed between first and second plates. The third plate then defines at least one slot (26,fig.3) extending through the second plate, the first and third plates respectively closing the top and bottom of the or each slot to define the or each channel. Two or more adjacently separated third plates may be included and separated by gap (32,fig.3). Second plate may define openings to enable heating elements to be connected to a source of power.

Figure 4

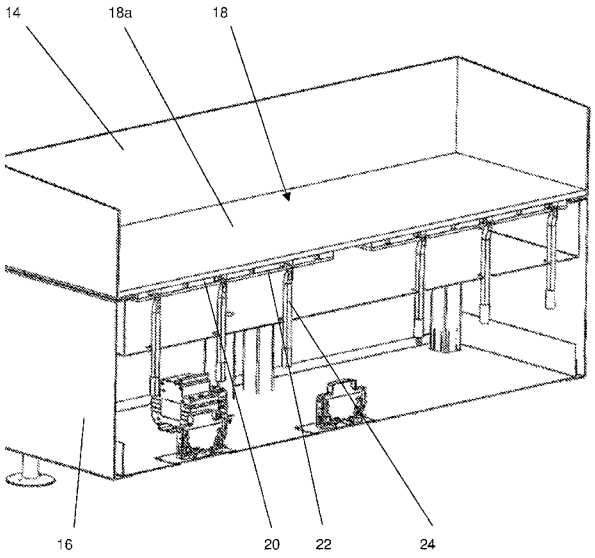

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Figure 1

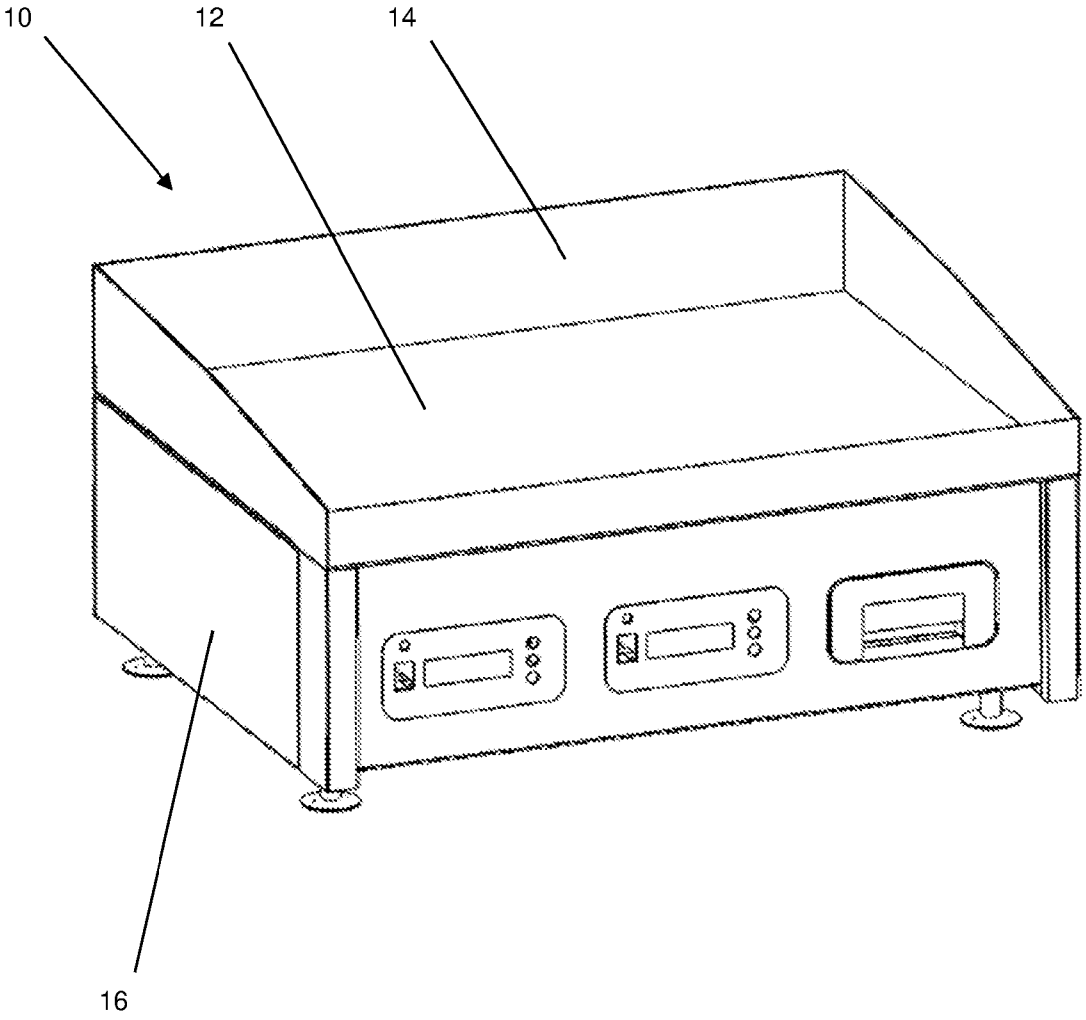


Figure 2

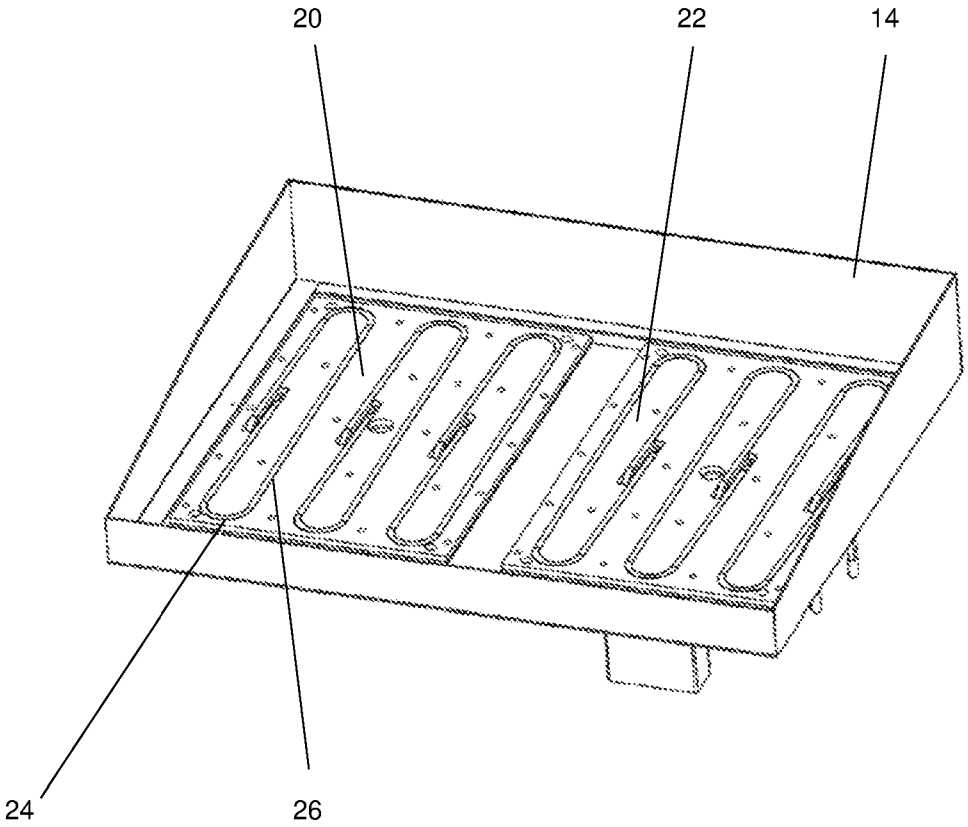


Figure 3

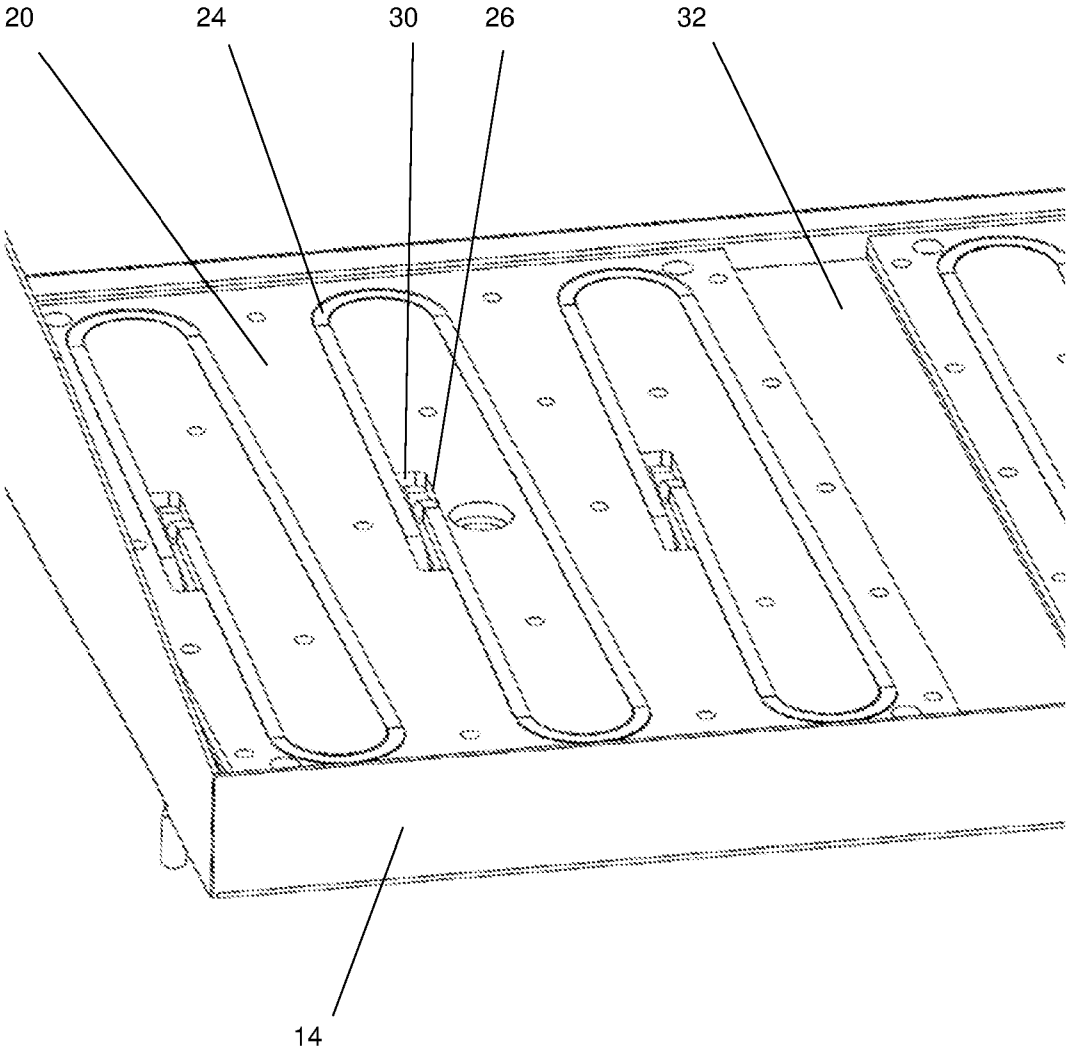


Figure 4

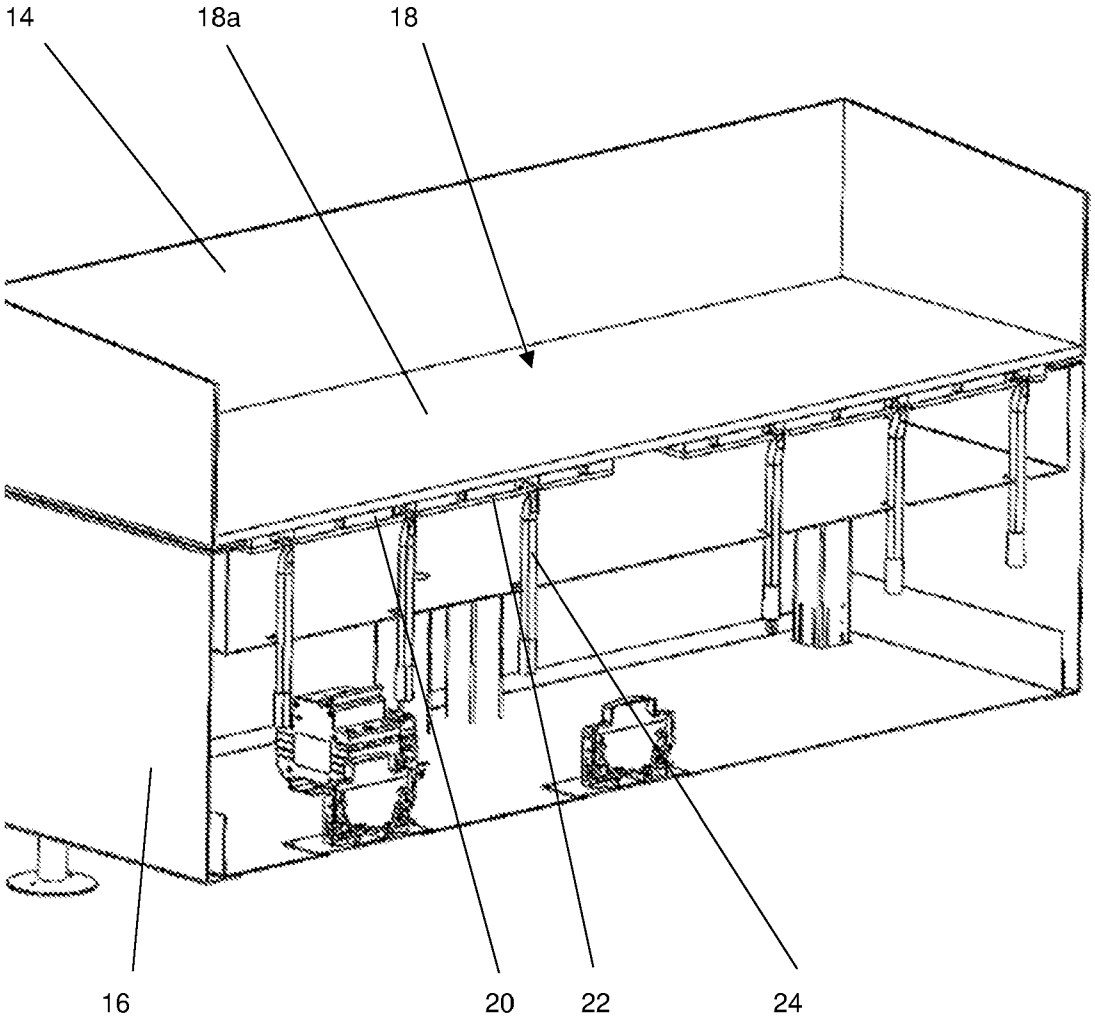


Figure 5a

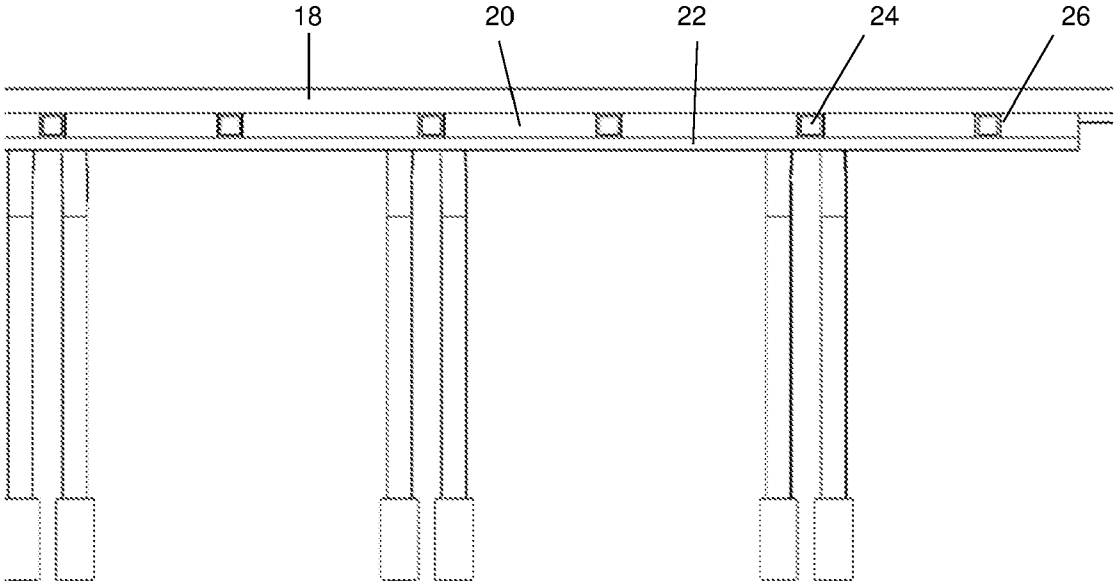


Figure 5b

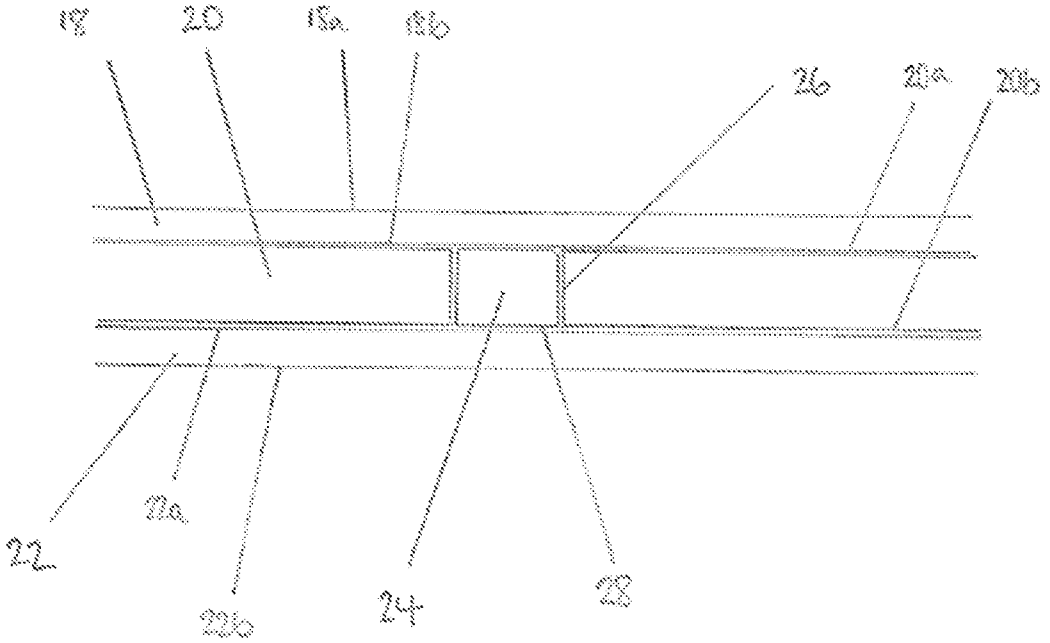


Figure 6a

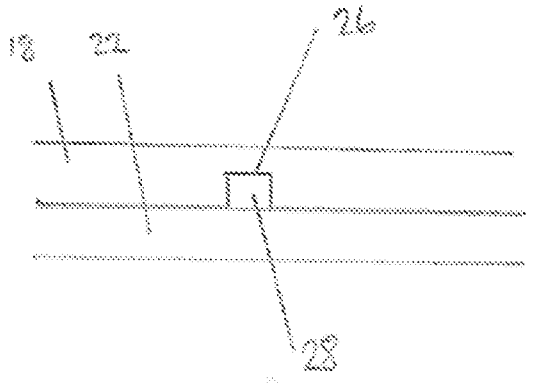
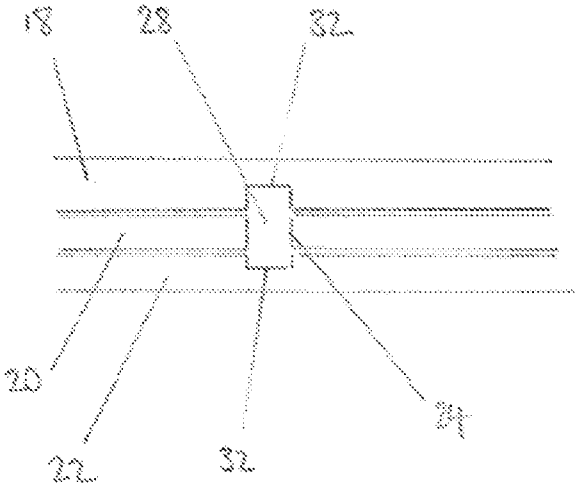


Figure 6b



Cooking Appliance

The present invention relates to an electrically heated cooking appliance.

Numerous forms of electrically heated cooking appliances are available. In a traditional electric hob, a pan can be placed directly onto an electrically powered heating element. Alternatively, a heating element may heat a top plate on which a pan is placed. Another form of cooking appliance is a griddle plate in which a heated plate is provided onto which food is placed directly.

In a conventional electrically heated griddle plate cooking appliance, the heating elements are usually circular in cross section and are located underneath a conductive plate on to which the food is placed. Therefore, heat transfer to the conductive plate can be poor, heat losses can be significant, and the appliance is not particularly energy efficient.

The present invention provides a cooking appliance as set out in claim 1. Further features are set out in the dependent claims.

The invention will now be described in detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of one embodiment of a cooking appliance in accordance with the present invention;

Figure 2 is a perspective view of the top section of the cooking appliance with the upper plate removed;

Figure 3 is another perspective view of the upper part of a cooking appliance with the top plate removed;

Figure 4 is a cross-section through the cooking appliance of Figure 1; and

Figure 5a is a cross-section through one embodiment of the griddle plate assembly;

Figure 5b is an enlarged view of part of the cross section of the griddle plate assembly; and

Figures 6a and 6b illustrate cross sections through other embodiments of griddle plate assembly.

A cooking appliance 10 in accordance with one embodiment of the present invention comprises a griddle plate assembly 12 which may be surrounded by a perimeter wall 14

and mounted on a base 16. The base 16 may be placed on top of an existing worktop, or the cooking appliance 10 may be designed to be built into a worktop.

The griddle plate assembly 12 has an upper surface, on which food items are placed in use for cooking, and a lower surface. The upper surface of the griddle plate assembly 12 is a smooth, flat, continuous surface. One or more electrically powered heating elements 24 are located within the griddle plate assembly 12 between the upper and lower surfaces.

The griddle plate assembly 12 comprises a plurality of layers. In a preferred embodiment, griddle plate assembly 12 comprises a first plate 18 with an upper surface 18a and a lower surface 18b. The first plate is uppermost in the griddle plate assembly 12 and its upper surface 18a forms the upper surface of the griddle plate assembly 12 on to which food is placed in use for cooking. Thus, the first plate 18 can be referred to as the top plate of the griddle plate assembly 12. A second plate 22 is provided with an upper surface 22a and a lower surface 22b. The second plate 22 is lowermost in the griddle plate assembly 12 and its lower surface 22b forms the lower surface of the griddle plate assembly 12. Thus, the second plate 22 can be referred to as the bottom plate of the griddle plate assembly 12. Preferably, a third plate 20 is provided, with an upper surface 20a and a lower surface 20b. The third plate 20 is sandwiched between the first and second plates 18,22 and thus can be referred to as the middle plate of the griddle plate assembly 12.

The plates 18, 20, 22 are in contact with one another so that the lower surface 18b of the first (top) plate 18 contacts the upper surface 20a of the third (middle) plate 20, and the lower surface 20b of the third (middle) plate 20 contacts the upper surface 22a of the second (bottom) plate 22. In use, food items are placed directly onto the upper surface 18a of the first plate 18.

The top and middle plates 18, 20 are formed of a conductive material, such as a metal. The heating elements 24 are located in the middle plate 20 as described below. The bottom plate 22 is formed of an insulating material and therefore prevents or reduces heat loss from the lower surface of the griddle plate assembly 12.

As shown in Figure 2, two (or more) middle plates 20 may be provided, horizontally adjacent to one another and with a gap 32 between them. These middle plates 20 may be sandwiched between a single top plate 18 and one or more bottom plates 22. The heating

elements 24 in one middle plate 20 may be controlled separately from the heating elements 24 in another middle plate 20. This allows heat to be supplied to only one part of the top plate 18 if a smaller cooking area is required. This also allows one part of the top plate 18 to be heated to a different temperature to another part. This increases efficiency and allows for flexibility in the cooking conditions provided.

The middle plate 20 is formed with one or more slots 26 in which the heating elements 24 are located. Each slot 26 is formed with straight, vertical sides and may extend right through the plate 20 from the upper surface 20a to the lower surface 20b. When the three plates 18, 20, 22 are sandwiched together, the lower surface 18a of the top plate 18 closes the top of the slot 24. Similarly, the upper surface 22a of the bottom plate 22 closes the bottom of the slot 24. In this way, an enclosed channel 28 is provided. Preferably, the width of the slot 24 is equal to the depth of the slot (i.e. thickness of the middle plate 20) so that the enclosed channel 28 has a square cross-section. However, the channel 28 could be defined such that the width of the slot 24 is not equal to the depth of the slot and the cross-sectional shape is rectangular. This is shown in Figures 5a and 5b, although some small gaps are illustrated between the various components for the sake of clarity and to show the various surfaces.

Each heating element 24 comprises an elongate bar of conductive material which is shaped and dimensioned to fit closely into a slot 26. Therefore, the heating element 24 is also formed with a square or rectangular cross section so that the heating element 24 contacts the walls defining the enclosed channel 28. The sides of the heating element 24 contact the sides of the slot 24 in the middle plate 20. The top of the heating element 24 contacts the lower surface 18b of the top plate 18. The bottom of the heating element 24 contacts the upper surface 22a of the bottom plate 22. Thus, there is a large contact area between the heating element 24 and the top and middle plates 18, 20 to increase the efficiency of heat transfer.

The slot 26 may be formed in any convenient shape. In the embodiment illustrated, the slot 26 is shaped as an elongated loop with two straight sides joined by arcuate ends. There may be a plurality of such loops across the area of the second plate 20. As in the example of Figure 2, three such loops may be provided. Alternatively, the slot 26 may follow a serpentine path which extends across the area of the second plate 20. A heating element 24 is provided in each slot 26 so that even heating can be provided across the area of the

top plate 18. Each heating element 24 conforms to the looped shape (or other relevant shape) of the slot 26 to fully occupy the slot 26. A widened area 30 of the slot 26 may be provided to receive the ends of the heating element 24 and openings may be formed in the bottom plate 22 beneath the widened area 30 to allow for connection of the heating element 24 to an electrical power supply and the controls of the cooking appliance 10, which may be provided in the base 16.

Due to the square or rectangular cross-sectional shape of the heating elements 24 and the close fit into the channels 28, there is a large contact area between the heating elements 24 and the conductive parts of the griddle plate assembly 12, in particular the top and middle plates 18, 20. This ensures optimum heat transfer to the first plate 18, ensuring greater efficiency of the cooking appliance 10 and a lower energy input requirement to achieve a given temperature on the upper surface of the top plate 18. The bottom plate 22 prevents heat losses below the griddle plate assembly 12, further increasing efficiency.

It will be appreciated that the precise configuration of the griddle plate assembly 12 can be varied. In the example above, three layers are provided. However, in one variation illustrated in Figure 6a it would be possible to have only two layers, an upper conductive plate 18 and a lower insulating plate 22. In this case, a slot 26 could be provided in the lower surface of the upper plate 18 to house the heating elements 24, with the slot 26 being closed by the upper surface of the lower plate 22 to form an enclosed channel 28.

Alternatively, in a three-plate construction as shown in Figure 6b, in addition to the slot 24 through the thickness of the middle plate 20, a corresponding shallow slot 32 may be provided in the lower surface 18b of the upper plate 18 and/or in the upper surface 22a of the lower plate 22, to create a deeper channel 28. In use a heating element 24 may extend a short distance above and/or below the middle plate 20 and into the or each additional shallow slot 32.

Thus, the present invention provides an improved electrically heated cooking appliance which requires less energy to achieve a desired cooking temperature on the upper surface of the griddle plate.

CLAIMS:

1. A cooking appliance comprising a griddle plate assembly having an upper surface, on which food items are placed in use, and a lower surface, at least one channel defined within the griddle plate assembly between the upper surface and the lower surface, and an electrically powered heating element located in the or each channel, wherein the channel is square or rectangular in cross section.

2. A cooking appliance as claimed in claim 1, wherein the or each heating element is square or rectangular in cross section and is dimensioned such that in use all four sides of the heating element contact the walls of the channel.

3. A cooking appliance as claimed in claim 1 or claim 2, wherein the griddle plate assembly further comprises a first plate of conductive material with an upper surface and a lower surface, wherein the upper surface of the first plate forms the upper surface of the griddle plate assembly, and a second plate of insulating material with an upper surface and a lower surface, wherein the lower surface of the second plate forms the lower surface of the griddle plate assembly, and wherein the or each channel is defined between the first plate and the second plate.

4. A cooking appliance as claimed in claim 3, wherein the griddle plate assembly further comprises a third plate of conductive material with an upper surface and a lower surface, wherein the third plate is sandwiched between the first plate and the second plate, and wherein the third plate defines at least one slot extending through the second plate from the upper surface to the lower surface, and wherein the first and third plates respectively close the top and bottom of the or each slot to define the or each channel.

5. A cooking appliance as claimed in claim 4, wherein the middle plate comprises two or more middle plates located adjacent to one another.

6. A cooking appliance as claimed in any of claims 3 to 5, wherein the second plate defines openings through which the or each heating element is connectable to a source of electrical power.

Amendments to the claims have been filed as follows

CLAIMS:

1. A cooking appliance comprising a griddle plate assembly having an upper surface, on which food items are placed in use, and a lower surface, at least one channel defined within the griddle plate assembly between the upper surface and the lower surface, and an electrically powered heating element located in the or each channel, wherein the griddle plate assembly comprises a first plate of conductive material with an upper surface and a lower surface, and the upper surface of the first plate forms the upper surface of the griddle plate assembly;

a second plate of insulating material with an upper surface and a lower surface, and the lower surface of the second plate forms the lower surface of the griddle plate assembly; and

a third plate of conductive material with an upper surface and a lower surface, the third plate sandwiched between the first plate and the second plate, and wherein the third plate defines at least one slot extending through the third plate from its upper surface to its lower surface, and the first and second plates respectively close the top and bottom of the or each slot to define the or each channel, and the or each channel is square or rectangular in cross section and the or each heating element is square or rectangular in cross section and is dimensioned such that all four sides of the heating element contact the walls of the channel.

2. A cooking appliance as claimed in claim 1, wherein the third plate comprises two or more third plates located adjacent to one another.

3. A cooking appliance as claimed in claim 2, wherein there is a gap between each adjacent third plate.

4. A cooking appliance as claimed in any preceding claim, wherein the second plate defines openings through which the or each heating element is connectable to a source of electrical power.

5. A cooking appliance as claimed in any preceding claim, wherein at least one slot is formed in the lower surface of the first plate and/or in the upper surface of the second plate, corresponding to the at least one slot in the third plate.

Intellectual Property Office

Application No:	GB2303475.4	**Examiner:**	Joe Mahoney
Claims searched:	1-6	**Date of search:**	12 July 2023

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-6	US 2012/0118172 A1 (LEE) See figures 2, 3 and 6 along with paragraphs [0039] and [0056]
X	1-3	EP 3295841 A1 (A UTILITY TOOL CO LTD) See figures 3 and 7 and EPO abstract and paragraph [0036], paying particular attention to iron plate section 110, heat insulation mechanism 140 and heating material 130.
X	1,3,6	CN 206303779 U (KANG) See figures 5 and 7 and WPI abstract
X	1,3,6	US 2013/0333576 A1 (TASSAN) See figure 1 and paragraph [0040]
X	1,3	EP 0908129 A1 (TIPPMANN) See figure 1 and paragraph [0021].

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A47J; H05B

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A47J	0037/06	01/01/2006