



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.08.2013 Bulletin 2013/35

(51) Int Cl.:
F24C 15/10 (2006.01)
H05B 6/06 (2006.01)
H05B 3/74 (2006.01)

(21) Application number: **12156428.0**

(22) Date of filing: **22.02.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Electrolux Home Products Corporation N.V.**
1130 Brussel (BE)

(72) Inventors:
• **Dehnert, Thomas**
91541 Rothenburg o. d. Tauber (DE)
• **Häutle, Ulrich**
91541 Rothenburg o. d. Tauber (DE)
• **Brahm, Rainer**
91541 Rothenburg o. d. Tauber (DE)

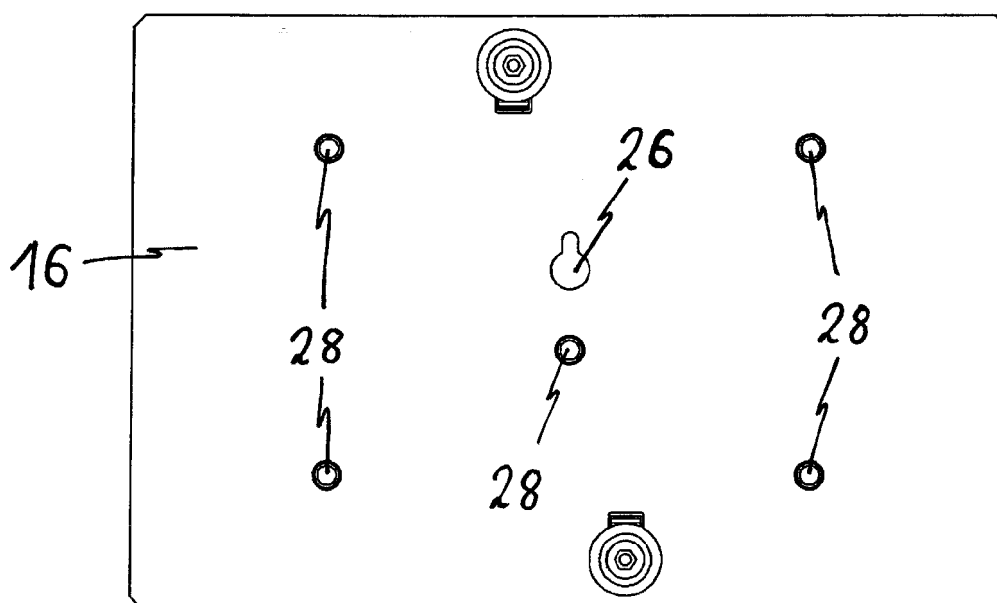
(74) Representative: **Baumgartl, Gerhard Willi**
Electrolux Dienstleistungs GmbH
Group Intellectual Property
90327 Nürnberg (DE)

(54) **A heating plate including at least one temperature sensor element**

(57) The present invention relates to a heating plate including at least one temperature sensor element (20). The heating plate comprises a top panel (10) forming a top side of the heating plate, and a supporting plate (16) arranged below the top panel (10). The heating plate comprises a heating panel (14) arranged between the

top panel (10) and the supporting plate (16), and at least one shaped hole (26) formed in the supporting plate (16). The shaped hole (26) comprises a bigger portion for inserting the temperature sensor element (20) and a smaller portion for fixing said temperature sensor element (20). In particular, the present invention relates to a heating plate for cooking appliances.

FIG 2



Description

[0001] The present invention relates to a heating plate with at least one temperature sensor element. In particular, the present invention relates to a heating plate for cooking appliances.

[0002] In a conventional heating plate the temperature sensor is arranged out of a heating element. Sometimes the temperature sensor is fixed at fastening means of said heating element. Thus, the distance between the temperature sensor and the heating element is relative large. The detection of the temperature on the heating plate is improper. Further, the latency of the detection of the temperature is relative high.

[0003] US 3,684,862 discloses an electric hot plate of cooking purposes including an insert for securing a temperature sensor. The temperature sensor is provided to contact the bottom of a cooking vessel placed on the hot plate. The insert is in an opening within a central unheated portion of the hot plate. The insert comprises a thin peripheral wall by which said insert is fitted in the opening. The temperature sensor is secured by a snap-in mechanism.

[0004] It is an object of the present invention to provide a heating plate with an improved arrangement of the temperature sensor element in order to obtain an exact detection of the temperature with reduced latency, wherein the temperature sensor element can be easily installed at the heating plate.

[0005] The object of the present invention is achieved by the heating plate according to claim 1.

[0006] The heating plate according to the present invention includes at least one temperature sensor element, wherein the heating plate comprises:

- a top panel forming a top side of the heating plate,
- a supporting plate arranged below the top panel,
- a heating panel arranged between the top panel and the supporting plate, and
- at least one shaped hole formed in the supporting plate, wherein
- the shaped hole comprises a bigger portion for inserting the temperature sensor element and a smaller portion for fixing said temperature sensor element.

[0007] The main idea of the present invention is the shaped hole in the supporting plate, wherein the temperature sensor element can be inserted into the bigger portion of said shaped hole and fixed in the smaller portion of the same shaped hole. No additional fastening means are required for fixing the temperature sensor element. Further, no tools are necessary for the installation of the temperature sensor element at the heating plate.

[0008] In particular, the temperature sensor element is pressed against the top panel. This ensures an exact detection of the temperature. Further, the latency for the detection of the temperature is reduced.

[0009] Preferably, the shaped hole is formed as a key-

hole. The keyhole is easy to handle, when the temperature sensor element is installed.

[0010] According to a preferred embodiment of the present invention a graphite layer is arranged between the heating panel and the top panel. The graphite layer support the heat transfer from the heating panel to the top panel.

[0011] Further, the at least one shaped hole may be also formed in the heating panel, wherein the shaped hole in the heating panel is congruent with the corresponding shaped hole in the supporting panel.

[0012] In particular, at least one slot or long hole is formed in the graphite layer, wherein the slot or long hole in the graphite layer is congruent with the corresponding shaped hole in the supporting panel. The temperature sensor element can be moved along the longitudinal axis of the slot or long hole and fixed in the smaller portion of the shaped hole, after being inserted into the bigger portion of said shaped hole.

[0013] Preferably, the heating plate comprises at least one pressing disc arranged below the supporting plate.

[0014] The at least one pressing disc may be provided for pressing the supporting plate against the top panel. In this way the temperature sensor element is also indirectly pressed against the top panel.

[0015] For example, the at least one pressing disc is fixed or fixable at the heating plate by at least one fastening bolt and at least one screw nut.

[0016] In particular, the temperature sensor element has the form of a mushroom, wherein the head of the mushroom-shaped temperature sensor element is pressed against the top panel and the shaft of the mushroom-shaped temperature sensor element is fixed in the smaller portion of the shaped hole.

[0017] At last, the heating plate is provided for cooking appliances.

[0018] Novel and inventive features of the present invention are set forth in the appended claims.

[0019] The present invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a schematic view from below at a heating plate according to a preferred embodiment of the present invention,

FIG 2 illustrates a schematic view from below at a supporting plate of the heating plate according to the preferred embodiment of the present invention,

FIG 3 illustrates a schematic sectional side view of the heating plate according to the preferred embodiment of the present invention,

FIG 4 illustrates a detailed schematic perspective view from below at a temperature sensor element of the heating plate according to the preferred embodiment of the present invention,

and

FIG 5 illustrates a detailed schematic perspective top view of the temperature sensor element of the heating plate according to the preferred embodiment of the present invention.

[0020] FIG 1 illustrates a schematic view from below at a heating plate according to a preferred embodiment of the present invention. In particular, the heating plate is provided for cooking appliances.

[0021] The heating plate includes a top panel 10, a graphite layer 12, a heating panel 14 and a supporting plate 16. The heating panel 14 is arranged above the supporting plate 16. The graphite layer 12 is arranged above the heating panel 14 again. At last, the top panel 10 is arranged above the graphite layer 12. The top panel 10, the graphite layer 12, the heating panel 14 and the supporting plate 16 are formed as sheets and have substantially the same base area.

[0022] The heating panel 14 may be formed as a single heating element or subdivided into several heating elements. In the latter case, the heating elements may have different heating powers.

[0023] A temperature sensor element 20 is arranged in the centre of the heating plate. The temperature sensor element 20 is fixed within the heating panel 14 of the heating plate. The temperature sensor element 20 is indirectly pressed against the top panel 10 of the heating plate by a number of pressing discs 18. In this example, the heating plate comprises five pressing discs 18, wherein a central pressing disc 18 is arranged very close to the temperature sensor element 20. Further, the pressing discs 18 guarantees the correct position of the temperature sensor element 20.

[0024] FIG 2 illustrates a schematic view from below at the supporting plate 16 of the heating plate according to the preferred embodiment of the present invention.

[0025] The supporting plate 16 comprises a keyhole 26 and five round holes 28. The round holes 28 are provided for receiving a fastening bolt 22 in each case in order to fasten the corresponding pressing disc 18. The keyhole 26 is provided for receiving the temperature sensor element 20.

[0026] The keyhole 26 includes a bigger portion and a smaller portion. The bigger portion is provided for introducing the temperature sensor element 20 into the supporting plate 16. The smaller portion is provided for fastening the temperature sensor element 20.

[0027] Instead of the keyhole 26, the supporting plate 16 may comprise an arbitrary hole with at least one bigger portion and at least one smaller portion, wherein the bigger portion allows the introducing of the temperature sensor element 20 into the supporting plate 16 and the smaller portion allows the fastening of the temperature sensor element 20.

[0028] FIG 3 illustrates a schematic sectional side view of the heating plate according to the preferred embodi-

ment of the present invention. The sectional side view relates to the plane A-A on FIG 1.

[0029] FIG 3 clarifies the structure of the heating plate. The top panel 10, the graphite layer 12, the heating panel 14 and the supporting plate 16 are arranged one upon the other.

[0030] The temperature sensor element 20 is formed as a mushroom. The head of the mushroom-shaped temperature sensor element 20 is pressed against the bottom side of the top panel 10. The shaft of the mushroom-shaped temperature sensor element 20 penetrated through the heating panel 14 and the supporting plate 16. Thus, the temperature sensor element 20 is directly pressed by the by the heating panel 14, and indirectly pressed by the pressing disc 18 via the supporting plate 16 against the top panel 10. The pressing discs 18 are fastened at the supporting plate 16 by the fastening bolt 22 and a screw nut 24 in each case, wherein the fastening bolts 22 penetrates through the corresponding round holes 28 in the supporting plate 16. A head of the fastening bolt 22 is inside a round hole of the heating panel 14. Said round hole of the heating panel 14 corresponds with the round hole 28 of the supporting plate 16.

[0031] FIG 4 illustrates a detailed schematic perspective view from below at the temperature sensor element 20 of the heating plate according to the preferred embodiment of the present invention. FIG 4 clarifies the arrangement of the temperature sensor element 20 at the heating plate.

[0032] The keyhole 26 is formed in the supporting plate 16 as well as in the heating panel 14. Thus, the head of the mushroom-shaped temperature sensor element 20 is arranged above the supporting plate 16 and heating panel 14, when the temperature sensor element 20 is fixed at the heating plate. Since the supporting plate 16 and heating panel 14 are pressed against the top panel 10, the temperature sensor element 20 is also pressed against the top panel 10.

[0033] FIG 5 illustrates a detailed schematic perspective top view of the temperature sensor element 20 of the heating plate according to the preferred embodiment of the present invention. FIG 5 clarifies the arrangement of the head of the mushroom-shaped temperature sensor element 20.

[0034] Unlike the supporting plate 16 and the heating panel 14 comprising the keyhole 26, the graphite layer 12 comprises a long hole or slot provided for the head of the mushroom-shaped temperature sensor element 20. The height of the head of the mushroom-shaped temperature sensor element 20 is adapted to the thickness of the graphite layer 12. Thus, the head of the mushroom-shaped temperature sensor element 20 is clamped between the top panel 10 and the heating panel 14. The temperature sensor element 20 is from-locked and friction-locked fasted at the heating plate.

[0035] The arrangement of the temperature sensor element 20 allows a direct and exact measuring of temperature at the top panel 10. The temperature sensor

element 20 does not require any special fastening means. The temperature sensor element 20 is clamped by the pressing discs 18, which are already provided for fastening the heating panel 14 or the heating elements, respectively.

[0036] The heating plate according to the present invention allows a simple installation of the temperature sensor element 20. The temperature sensor element 20 may be fixed, after the graphite layer 12 and the heating panel 14 have been already installed. The sizes and the arrangements of the pressing discs 18 is dimensioned in such a way that the contact between the temperature sensor element 20 and the top panel 10 is guaranteed, if one conjunction of the screw nut 24 and fastening bolt 22 fails.

[0037] Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to that precise embodiment, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0038]

10	top panel
12	graphite layer
14	heating panel
16	supporting plate
18	pressing disc
20	temperature sensor element
22	fastening bolt
24	screw nut
26	keyhole
28	round hole

Claims

1. A heating plate including at least one temperature sensor element (20), comprising:
 - a top panel (10) forming a top side of the heating plate,

- a supporting plate (16) arranged below the top panel (10),
- a heating panel (14) arranged between the top panel (10) and the supporting plate (16), and
- at least one shaped hole (26) formed in the supporting plate (16), wherein
- the shaped hole (26) comprises a bigger portion for inserting the temperature sensor element (20) and a smaller portion for fixing said temperature sensor element (20).

2. The heating plate according to claim 1, **characterized in, that** the temperature sensor element (20) is pressed against the top panel (10).
3. The heating plate according to claim 1 or 2, **characterized in, that** the shaped hole is formed as a keyhole (26).
4. The heating plate according to any one of the preceding claims, **characterized in, that** a graphite layer (12) is arranged between the heating panel (14) and the top panel (10).
5. The heating plate according to any one of the preceding claims, **characterized in, that** the at least one shaped hole (26) is also formed in the heating panel (14), wherein the shaped hole (26) in the heating panel (14) is congruent with the corresponding shaped hole (26) in the supporting panel (16).
6. The heating plate according to any one of the preceding claims, **characterized in, that** at least one slot or long hole (28) is formed in the graphite layer (12), wherein the slot or long hole (28) in the graphite layer (12) is congruent with the corresponding shaped hole (26) in the supporting panel (16).
7. The heating plate according to any one of the preceding claims, **characterized in, that** the heating plate comprises at least one pressing disc (18) arranged below the supporting plate (16).
8. The heating plate according to claim 7, **characterized in, that** the at least one pressing disc (18) is provided for pressing the supporting plate (16) against the top panel (10).
9. The heating plate according to claim 7 or 8, **characterized in, that**

the at least one pressing disc (18) is fixed or fixable at the heating plate by at least one fastening bolt (22) and at least one screw nut (24).

10. The heating plate according to any one of the preceding claims, 5

characterized in, that

the temperature sensor element (20) has the form of a mushroom, wherein the head of the mushroom-shaped temperature sensor element (20) is pressed 10 against the top panel (10) and the shaft of the mushroom-shaped temperature sensor element (20) is fixed in the smaller portion of the shaped hole (26).

11. The heating plate according to any one of the preceding claims, 15

characterized in, that

the heating plate is provided for cooking appliances.

20

25

30

35

40

45

50

55

FIG 1

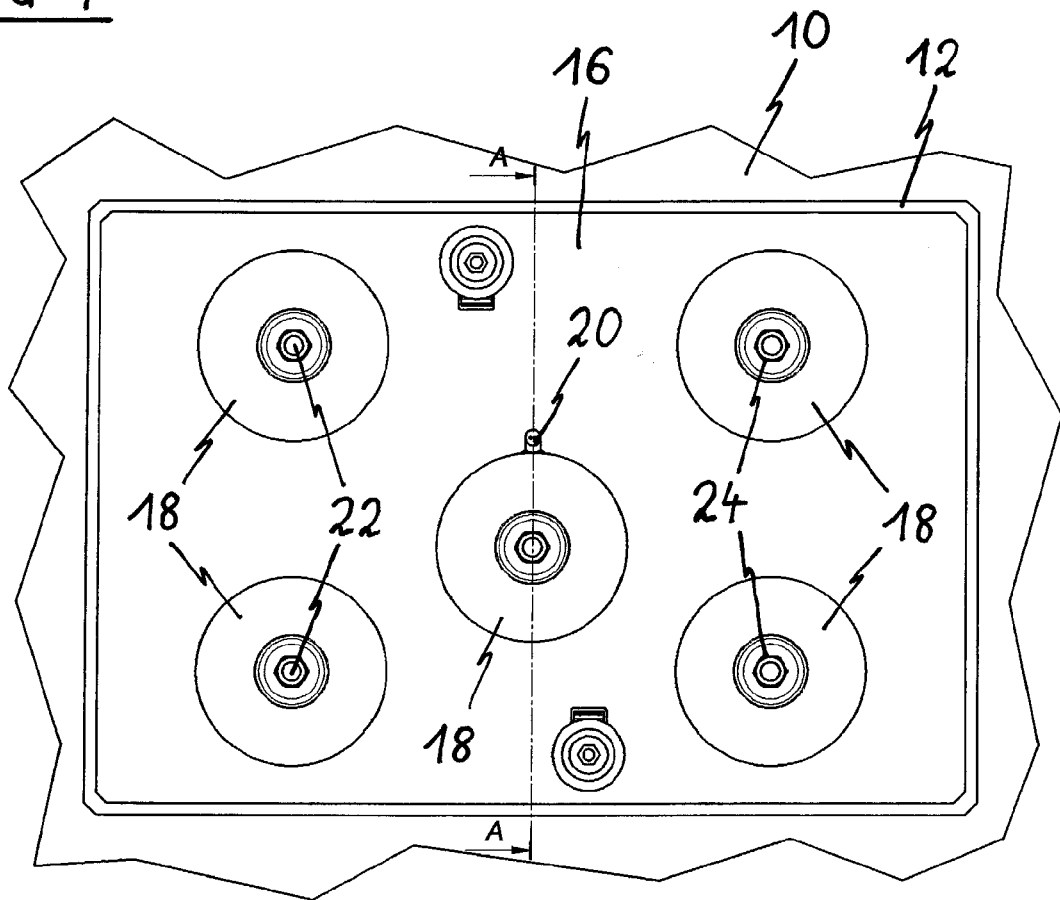


FIG 2

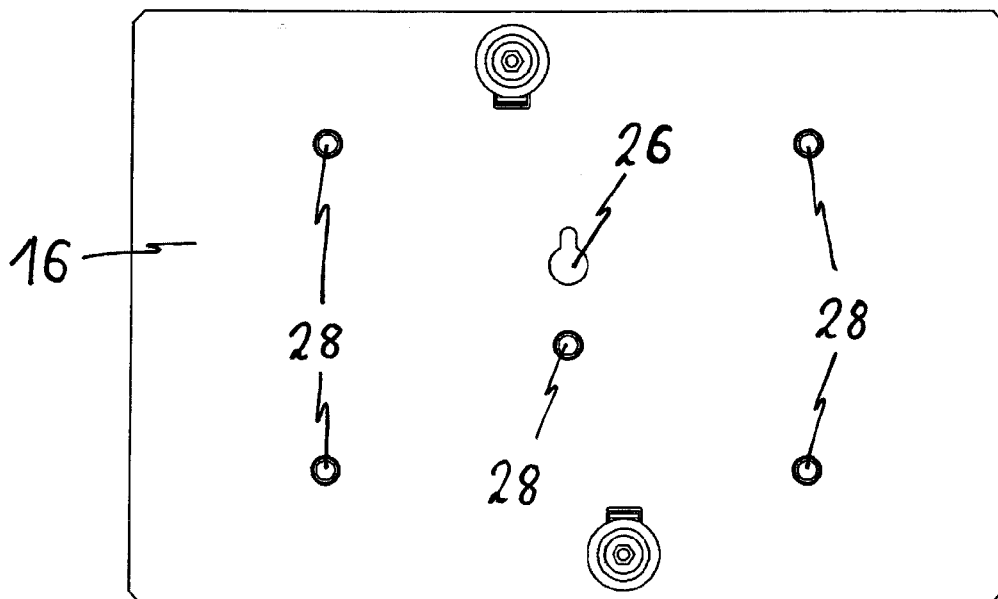


FIG 3

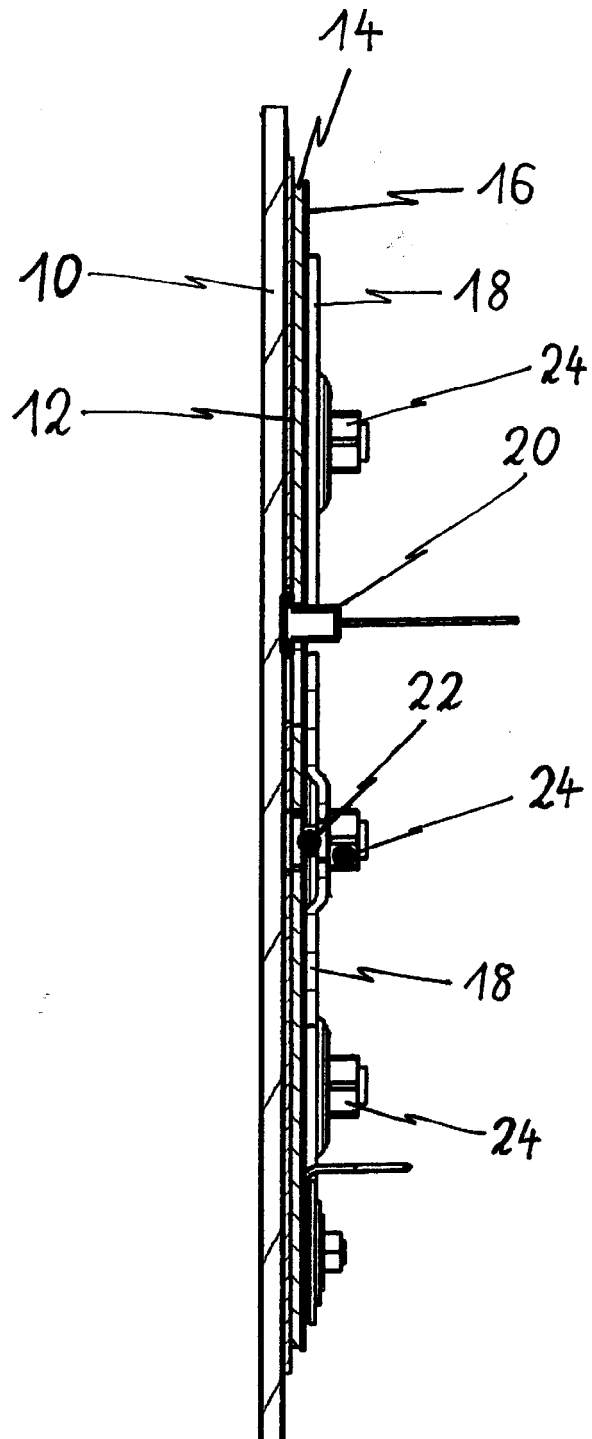


FIG 5

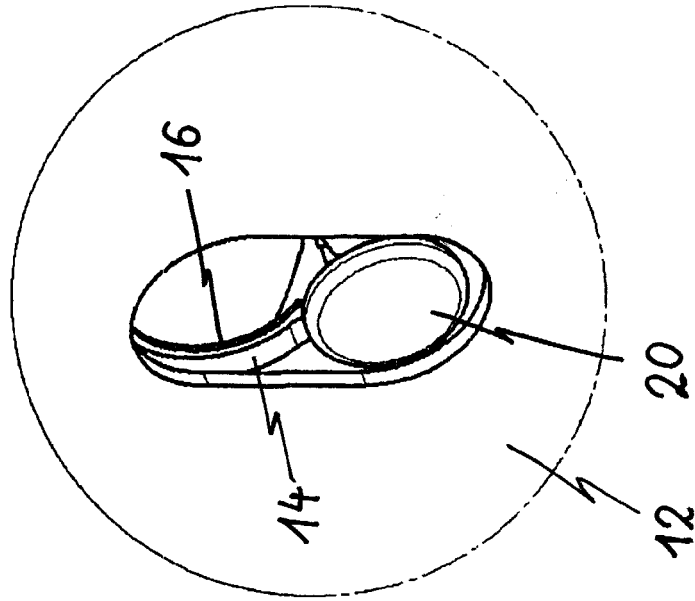
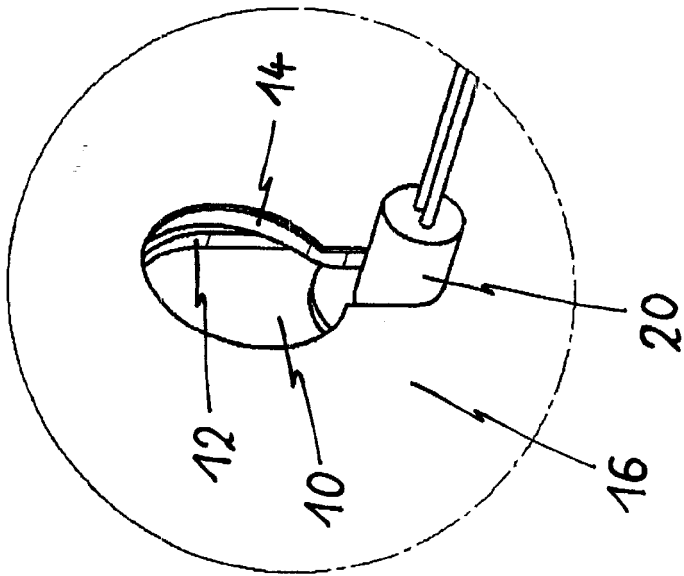


FIG 4





EUROPEAN SEARCH REPORT

Application Number
EP 12 15 6428

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	EP 2 131 625 A1 (RATIONAL AG [DE]; FRIMA S A [FR]) 9 December 2009 (2009-12-09) * claims 10,18; figures 1,2,4,5 *	1-11	INV. F24C15/10 H05B3/74 H05B6/06
A	US 2007/084457 A1 (WIEDEMANN PETER [DE]) 19 April 2007 (2007-04-19) * figure 1 *	1-11	
A	DE 10 2010 063224 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 30 June 2011 (2011-06-30) * figures 1-6 *	1-11	
A	WO 01/62049 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; NEUMAYER DAN [DE]) 23 August 2001 (2001-08-23) * figure 4 *	1-11	
A	DE 10 2005 030555 A1 (EGO ELEKTRO GERAETEBAU GMBH [DE]) 4 January 2007 (2007-01-04) * figure 1 *	1-11	
A	JP 2009 259608 A (HITACHI APPLIANCES INC) 5 November 2009 (2009-11-05) * figure 2 *	1-11	
A	EP 0 789 503 A2 (AKO WERKE GMBH & CO [DE] EIKA S COOP [ES]) 13 August 1997 (1997-08-13) * figures 4-6 *	1-11	TECHNICAL FIELDS SEARCHED (IPC) H05B H01R F24C A47J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 June 2012	Examiner Adant, Vincent
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 15 6428

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

15-06-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2131625 A1	09-12-2009	NONE	
US 2007084457 A1	19-04-2007	DE 10347222 A1	21-04-2005
		EP 1671520 A2	21-06-2006
		FR 2859867 A1	18-03-2005
		JP 2007506234 A	15-03-2007
		US 2007084457 A1	19-04-2007
		WO 2005032214 A2	07-04-2005
DE 102010063224 A1	30-06-2011	NONE	
WO 0162049 A1	23-08-2001	AT 339867 T	15-10-2006
		DE 10006974 A1	23-08-2001
		EP 1258172 A1	20-11-2002
		US 2003019863 A1	30-01-2003
		WO 0162049 A1	23-08-2001
DE 102005030555 A1	04-01-2007	AT 541434 T	15-01-2012
		AU 2006261197 A1	28-12-2006
		CN 101283625 A	08-10-2008
		DE 102005030555 A1	04-01-2007
		EP 1894441 A1	05-03-2008
		ES 2378464 T3	12-04-2012
		JP 2008546979 A	25-12-2008
		US 2008093355 A1	24-04-2008
		WO 2006136363 A1	28-12-2006
JP 2009259608 A	05-11-2009	CN 101562918 A	21-10-2009
		JP 2009259608 A	05-11-2009
EP 0789503 A2	13-08-1997	DE 19604306 A1	14-08-1997
		EP 0789503 A2	13-08-1997
		ES 2227630 T3	01-04-2005
		US 5877475 A	02-03-1999

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3684862 A [0003]