(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 522 680 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.08.2019 Bulletin 2019/32

(21) Application number: **18154909.8**

(22) Date of filing: **02.02.2018**

(51) Int Cl.:
H05B 3/00 *(2006.01)* ***F27D 11/04*** *(2006.01)*
H05B 3/60 *(2006.01)* ***H05B 6/12*** *(2006.01)*
F24C 7/08 *(2006.01)* ***H01H 13/70*** *(2006.01)*

(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
Designated Validation States:
MA MD TN

(71) Applicant: **ELECTROLUX APPLIANCES AKTIEBOLAG**
105 45 Stockholm (SE)

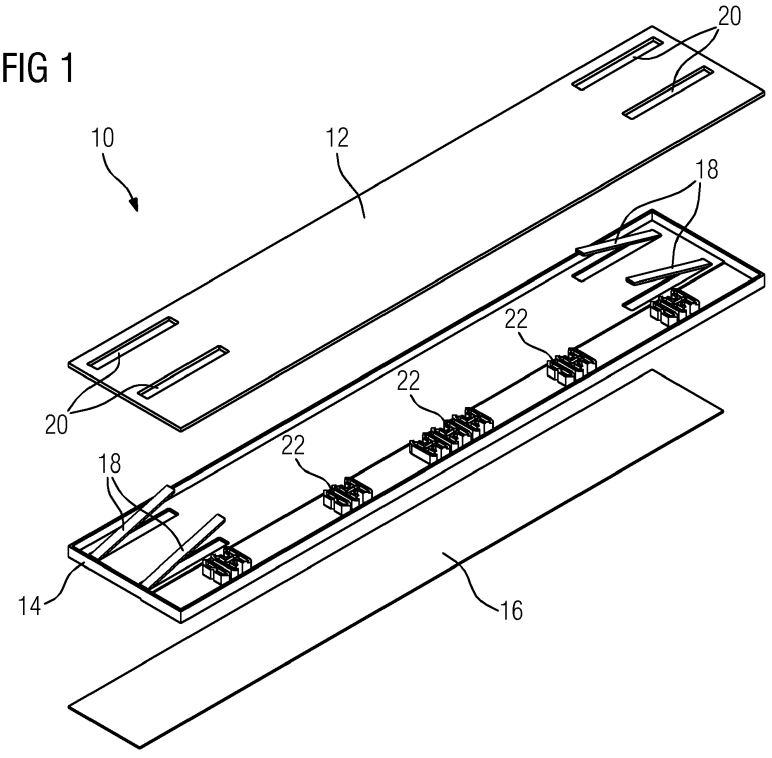
(72) Inventors:
- **HOLZINGER, Jochen**
  91541 Rothenburg ob der Tauber (DE)
- **WUNDLING, Holger**
  91541 Rothenburg ob der Tauber (DE)
- **MEIDER, Claus**
  91541 Rothenburg ob der Tauber (DE)

(74) Representative: **Electrolux Group Patents**
AB Electrolux
Group Patents
105 45 Stockholm (SE)

(54) USER INTERFACE FOR A DOMESTIC APPLIANCE

(57) The present invention relates to a user interface (10) for a domestic appliance, in particular for a cooking hob and/or cooking oven. The user interface (10) comprises a printed circuit board (12) for supporting at least one illuminating element. The user interface (10) comprises a lighting mask (14) arranged at least partially within a radiation area of the illuminating element on the printed circuit board (12). The lighting mask (14) includes at least one spring element (18). The spring element (18) of the lighting mask (14) penetrates and/or passes by the printed circuit board (12), so that the user interface (10) can be supported between a substructure and a cover element of the domestic appliance.

FIG 1



EP 3 522 680 A1

Description

[0001] The present invention relates to a user interface for a domestic appliance. In particular, the present invention relates to a user interface for a cooking hob and/or cooking oven. Further, the present invention relates to a domestic appliance with a transparent or semi-transparent cover element and a user interface.

[0002] A user interface for a domestic appliance comprises usually a printed circuit board, on which electric and electronic elements and illuminating elements, e.g. light emitting diodes, are soldered. Further, a lighting mask is arranged above said printed circuit board guiding light from the illuminating elements to a customised symbol. The user interface requires a carrier that presses said user interface against a panel of the domestic appliance. For example, the carrier presses the user interface against a glass ceramic panel of a cooking hob.

[0003] However, such kind of user interface is very complex.

[0004] It is an object of the present invention to provide a user interface for a domestic appliance with a reduced complexity.

[0005] The object is achieved by the user interface for the domestic appliance according to claim 1.

[0006] According to the present invention a user interface for a domestic appliance, in particular for a cooking hob and/or cooking oven, is provided, wherein:

- the user interface comprises a printed circuit board for supporting at least one illuminating element,
- the user interface comprises a lighting mask arranged at least partially within a radiation area of the illuminating element on the printed circuit board,
- the lighting mask includes at least one spring element, and
- the spring element of the lighting mask penetrates and/or passes by the printed circuit board, so that
- the user interface can be supported between a substructure and a cover element of the domestic appliance.

[0007] The core of the present invention is that the at least one spring element is a part of the lighting mask and penetrates or passes by the printed circuit board. The user interface itself does not require any rear or bottom casing, respectively, for carrying the spring elements. In particular, a conventional carrier, which presses the user interface against the cover element of the cooking hob, is not required. By this way, a substantial component of the user interface is not necessary. This reduces the costs and the complexity for said user interface. Further, the printed circuit board may be provided for supporting electric and/or electronic elements.

[0008] Preferably, the printed circuit board includes at least one cut-out, wherein the spring element of the lighting mask penetrates the corresponding cut-out of the printed circuit board.

[0009] In particular, the user interface can be pressed against the cover element of the domestic appliance by the at least one spring element, wherein preferably said cover element is a transparent or semi-transparent panel, in particular a glass ceramic panel.

[0010] Preferably, the user interface comprises at least one user input device arranged above or in front of the lighting mask, respectively, so that a touch surface can be formed on the panel of the domestic appliance, wherein said touch surface is arranged on the opposite side of the user interface, and wherein preferably the user input device includes at least one touch sensitive sheet and/or at least one touch sensitive key or sensor.

[0011] In particular, the lighting mask and the at least one spring elements are formed as a single-piece part. This allows an easy manufacturing, since no further separate spring elements are required. The at least one spring element at the lighting mask is sufficient.

[0012] Alternatively, the lighting mask and the at least one spring element are formed as separate parts.

[0013] For example, the lighting mask and the spring elements are made of plastic. This contributes to an easy manufacturing by low costs, since no further spring element or spring loaded carrier is required.

[0014] According to the preferred embodiment of the present invention, at least one of the spring elements is formed as a leaf spring, preferably as a tongue-shaped leaf spring.

[0015] Alternatively, at least one of the spring elements has a Z-shape, C-shape, O-shape, spherical shape and/or helical shape.

[0016] Preferably, the tongue-shaped leaf spring or otherwise shaped spring elements are inclined and extend downward or rearward, respectively.

[0017] Further, the cut-outs of the printed circuit board may be formed as elongated slots.

[0018] Moreover, the cut-out of the printed circuit board may extend parallel to the projection of the corresponding leaf spring in the plane of said printed circuit board.

[0019] In particular, the at least one spring element can be supported by a base plate and/or a chassis of the domestic appliance. Moreover, the at least one spring element can be supported by any other supporting element of the domestic appliance, which generates a force toward the cover element.

[0020] For example, at least a part of the illuminating elements are light emitting diodes.

[0021] Further, the lighting mask may include at least one light guide for transmitting light from the illuminating elements of the printed circuit board to at least one indicator of said lighting mask.

[0022] Said indicator may be arranged on an upper side or at a front side, respectively, of the lighting mask, wherein preferably the indicator is or includes at least one seven-segment display, a dot matrix or any other display element. In general, the indicator may be or include arbitrary symbols.

[0023] Preferably, the at least one indicator is arranged

beside the at least one touch sensitive sheet. In general, the user interface may comprise any other kind of touch sensitive keys or sensors.

[0024] Further, the present invention relates to a domestic appliance, in particular a cooking hob and/or coking oven, having a transparent or semi-transparent panel, preferably a glass ceramic panel, and a user interface, wherein the user interface is aligned at the panel, and wherein the domestic appliance comprises at least one user interface mentioned above.

[0025] Novel and inventive features of the present invention are set forth in the appended claims.

[0026] The present invention will be described in further detail with reference to the drawing, in which

FIG 1 illustrates a schematic exploded perspective bottom view of a user interface for a domestic appliance according to a preferred embodiment of the present invention,

FIG 2 illustrates a schematic exploded perspective top view of the user interface for the domestic appliance according to the preferred embodiment of the present invention,

FIG 3 illustrates a schematic perspective bottom view of the user interface for the domestic appliance according to the preferred embodiment of the present invention, and

FIG 4 illustrates a schematic perspective top view of the user interface for the domestic appliance according to the preferred embodiment of the present invention.

[0027] FIG 1 illustrates a schematic exploded perspective bottom view of a user interface 10 for a domestic appliance according to a preferred embodiment of the present invention. In particular, the user interface 10 is provided for a cooking hob and/or cooking oven. Preferably, the user interface 10 is provided for an induction cooking hob.

[0028] The user interface 10 is provided for a panel of the domestic appliance, wherein the user interface 10 is arranged beneath or behind the panel and opposite to a touch surface of said panel.

[0029] In particular, the user interface 10 is provided for a glass ceramic panel of a cooking hob, wherein the user interface 10 is arranged beneath the glass ceramic panel and opposite to the touch surface above said glass ceramic panel. In general, the user interface 10 is provided for a cover element suitable for a touch surface on said cover element. Terms like "up", "down", "upper" and "lower" relate to the user interface arranged beneath a horizontal panel.

[0030] The user interface 10 comprises a printed circuit board 12, a lighting mask 14 and a touch sensitive sheet 16. Instead of said touch sensitive sheet 16, the user interface 10 may comprise any other kind of touch sensitive keys or sensors. The printed circuit board 12 forms the bottom of the user interface 10. The printed circuit board 12 is provided for supporting electric and electronic elements. In particular, the circuit board 12 supports illuminating elements, e.g. light emitting diodes.

[0031] The lighting mask 14 is arranged above the printed circuit board 12. Light guides 22 for indicators 24 are formed on the lower side of the lighting mask 14, while indicators 24 are formed on the upper side of said lighting mask 14. Substantially, the light guides 22 are arranged opposite to the corresponding indicators 24. In this example, the indicators 24 are seven-segment displays. In general, the indicators 24 may be arbitrary symbols.

[0032] The lighting mask 14 includes spring elements 18. Said spring elements 18 extend downwards from the lighting mask 14. In other words, the spring elements 18 extend away from the touch surface of the panel. In this example, the lighting mask 14 includes four spring elements 18 arranged close to the four corners, respectively, of said lighting mask 14. In general, the lighting mask 14 includes at least one spring element 18. Preferably, the lighting mask 14 and the spring elements 18 form a single-piece part. In this example, the spring elements 18 are tongue-shaped leaf springs. Alternatively, the spring elements 18 may have a Z-shape, C-shape, O-shape, spherical shape or helical shape, for example. Said leaf springs are inclined and extend downwards. Alternatively, the spring elements 18 may be formed as separate parts and permanently or removably fixed at the lighting mask 14.

[0033] The spring elements 18 are provided for pressing the user interface 10 against the panel, so that the user interface 10 is arranged opposite to the touch surface of said panel. The spring elements 18 are supported by a base plate, a chassis, any device with suitable supporting geometry or the like of the domestic appliance or cooking hob, respectively.

[0034] Further, the printed circuit board 12 includes cut-outs 20, wherein each cut-out 20 corresponds with one spring element 18 of the lighting mask 14. Each spring element 18 of the lighting mask 14 penetrates one cut-out 20 of the printed circuit board 12. In this example, the cut-outs 20 are formed as elongated slots. Further, the projection of the spring element 18 in the plane of the printed circuit board 12 extends parallel to said elongated cut-out 20 of the printed circuit board 12. Alternatively, the spring elements 18 may be arranged outside the printed circuit board 12, so that no cut-outs 20 are required.

[0035] Preferably, the lighting mask 14 is made of plastics. In particular, the lighting mask 14 with the spring elements 18 is made of plastics and formed as the single-piece part. For example, the lighting mask 14 with the spring elements 18 is made of PC, PPT, PE, PTEE and the like. Further, the spring elements 18 may be made of metal, wherein said spring elements 18 are inserted inside the mould of the lighting mask 14 by 2K-technol-

ogies or clamped into the lighting mask 14. Alternatively, the lighting mask 14 may be made of a metal sheet and light guides 22 made of plastic. In general, the lighting mask 14 may be made of any material suitable for directing and/or reflecting the light from the illuminating elements to the panel.

[0036] The touch sensitive sheet 16 is arranged upon the lighting mask 14. The touch sensitive sheet 16 is directly aligned at the panel, when the user interface 10 is pressed against said panel by the spring elements 18. For example, the touch sensitive sheet 16 includes capacitive and/or proximity sensors. In general, arbitrary types of touch sensitive elements, e.g. metal spring touches, infra-red sensors, foam touch keys or silicon touch keys, are suitable.

[0037] FIG 2 illustrates a schematic exploded perspective top view of the user interface 10 for the domestic appliance according to the preferred embodiment of the present invention.

[0038] The user interface 10 comprises the printed circuit board 12, the lighting mask 14 and the touch sensitive sheet 16. The printed circuit board 12 forms the bottom of the user interface 10 and is provided for supporting electric and electronic elements. Moreover, the circuit board 12 supports the illuminating elements, preferably the light emitting diodes.

[0039] The lighting mask 14 is arranged above the printed circuit board 12. The indicators 24 are formed on the upper side of the lighting mask 14, while the light guides 22 for said indicators 24 are formed on the lower side of the lighting mask 14. Substantially, the light guides 22 are arranged opposite to the corresponding indicators 24. In this example, the indicators 24 are seven-segment displays. In general, the indicators 24 may be arbitrary symbols.

[0040] The spring elements 18 extend downwards from the lighting mask 14. Preferably, the lighting mask 14 with the spring elements 18 is formed as single-piece part. Alternatively, the lighting mask 14 and the spring elements 18 are formed as separate parts. The printed circuit board 12 includes the cut-outs 20 formed as elongated slots, wherein each cut-out 20 corresponds with one spring element 18 of the lighting mask 14. Each spring element 18 of the lighting mask 14 penetrates one cut-out 20 of the printed circuit board 12.

[0041] The spring elements 18 are provided for pressing the user interface 10 against the panel, so that the user interface 10 is arranged opposite to the touch surface of said panel. The spring elements 18 are supported by the base plate of the domestic appliance or cooking hob, respectively.

[0042] FIG 3 illustrates a schematic perspective bottom view of the user interface 10 for the domestic appliance according to the preferred embodiment of the present invention. FIG 3 shows the user interface 10 in the assembled state. In FIG 3 the user interface 10 is inverted.

[0043] FIG 3 clarifies how the spring elements 18 penetrate the corresponding cut-outs 20 of the printed circuit board 12. The user interface 10 in the assembled state is ashlar-formed. Alternatively, other shapes for the user interface 10 are also possible. The spring elements 18 project downwards.

[0044] FIG 4 illustrates a schematic perspective top view of the user interface 10 for the domestic appliance according to the preferred embodiment of the present invention. FIG 4 shows the user interface 10 in the assembled state, wherein said user interface 10 is in the same orientation as arranged beneath the glass ceramic panel of the cooking hob.

[0045] The user interface 10 according to the present invention has a compact form. Further, the user interface 10 substantially consists of three components, i.e. the printed circuit board 12, the lighting mask 14 and the touch sensitive sheet 16.

[0046] 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

[0047]

10	user interface
12	printed circuit board
14	lighting mask
16	touch sensitive sheet
18	spring element
20	cut-out
22	light guide
24	indicator, seven-segment display

Claims

1. A user interface (10) for a domestic appliance, in particular for a cooking hob and/or cooking oven, wherein:

   - the user interface (10) comprises a printed circuit board (12) for supporting at least one illuminating element,
   - the user interface (10) comprises a lighting mask (14) arranged at least partially within a radiation area of the illuminating element on the printed circuit board (12),
   - the lighting mask (14) includes at least one spring element (18), and
   - the spring element (18) of the lighting mask

(14) penetrates and/or passes by the printed circuit board (12), so that
- the user interface (10) can be supported between a substructure and a cover element of the domestic appliance.

2. The user interface according to claim 1,
characterised in that
the printed circuit board (12) includes at least one cut-out (20), wherein preferably the spring element (18) of the lighting mask (14) penetrates the corresponding cut-out (20) of the printed circuit board (12).

3. The user interface according to claim 1 or 2,
characterised in that
the user interface (10) can be pressed against the cover element of the domestic appliance by the at least one spring element (18), wherein preferably said cover element is a transparent or semi-transparent panel, in particular a glass ceramic panel.

4. The user interface according to any one of the preceding claims,
characterised in that
the user interface (10) comprises at least one user input device (16) arranged above or in front of the lighting mask (14), respectively, so that a touch surface can be formed on the panel of the domestic appliance, wherein said touch surface is arranged on the opposite side of the user interface (10), and wherein preferably the user input device includes at least one touch sensitive sheet (16) and/or at least one touch sensitive key or sensor.

5. The user interface according to any one of the preceding claims,
characterised in that
the lighting mask (14) and the at least one spring element (18) are formed as a single-piece part.

6. The user interface according to any one of the claims 1 to 4,
characterised in that
the lighting mask (14) and the at least one spring element (18) are formed as separate parts.

7. The user interface according to any one of the preceding claims,
characterised in that
at least one of the spring elements (18) is formed as a leaf spring, preferably as a tongue-shaped leaf spring being inclined and extending downward or rearward, respectively.

8. The user interface according to any one of the preceding claims,
characterised in that
at least one of the spring elements (18) has a Z-shape, C-shape, O-shape, spherical shape and/or helical shape.

9. The user interface according to any one of the claims 2 to 8,
characterised in that
the cut-outs (20) of the printed circuit board (12) are formed as elongated slots, wherein preferably the cut-out (20) of the printed circuit board (12) extends parallel to the projection of the corresponding leaf spring in the plane of said printed circuit board (12).

10. The user interface according to any one of the preceding claims,
characterised in that
the at least one spring element (18) can be supported by a base plate and/or a chassis of the domestic appliance.

11. The user interface according to any one of the preceding claims,
characterised in that
at least a part of the illuminating elements are light emitting diodes.

12. The user interface according to any one of the preceding claims,
characterised in that
the lighting mask (14) includes at least one light guide (22) for transmitting light from the illuminating elements of the printed circuit board (12) to at least one indicator (24) of said lighting mask (14).

13. The user interface according to claim 12,
characterised in that
the indicator (24) is arranged on an upper side or at a front side, respectively, of the lighting mask (14), wherein preferably the indicator (24) is or includes at least one seven-segment display (24), a dot matrix or any other display element.

14. The user interface according to any one of the claims 2 to 13,
characterised in that
the at least one indicator (24) is arranged beside the at least one touch sensitive sheet (16).

15. A domestic appliance, in particular a cooking hob and/or coking oven, having a transparent or semi-transparent cover element, preferably a glass ceramic panel, and a user interface (10), wherein the user interface (10) is aligned at the panel,
characterised in that
the domestic appliance comprises at least one user interface (10) according to any one of the claims 1 to 13.

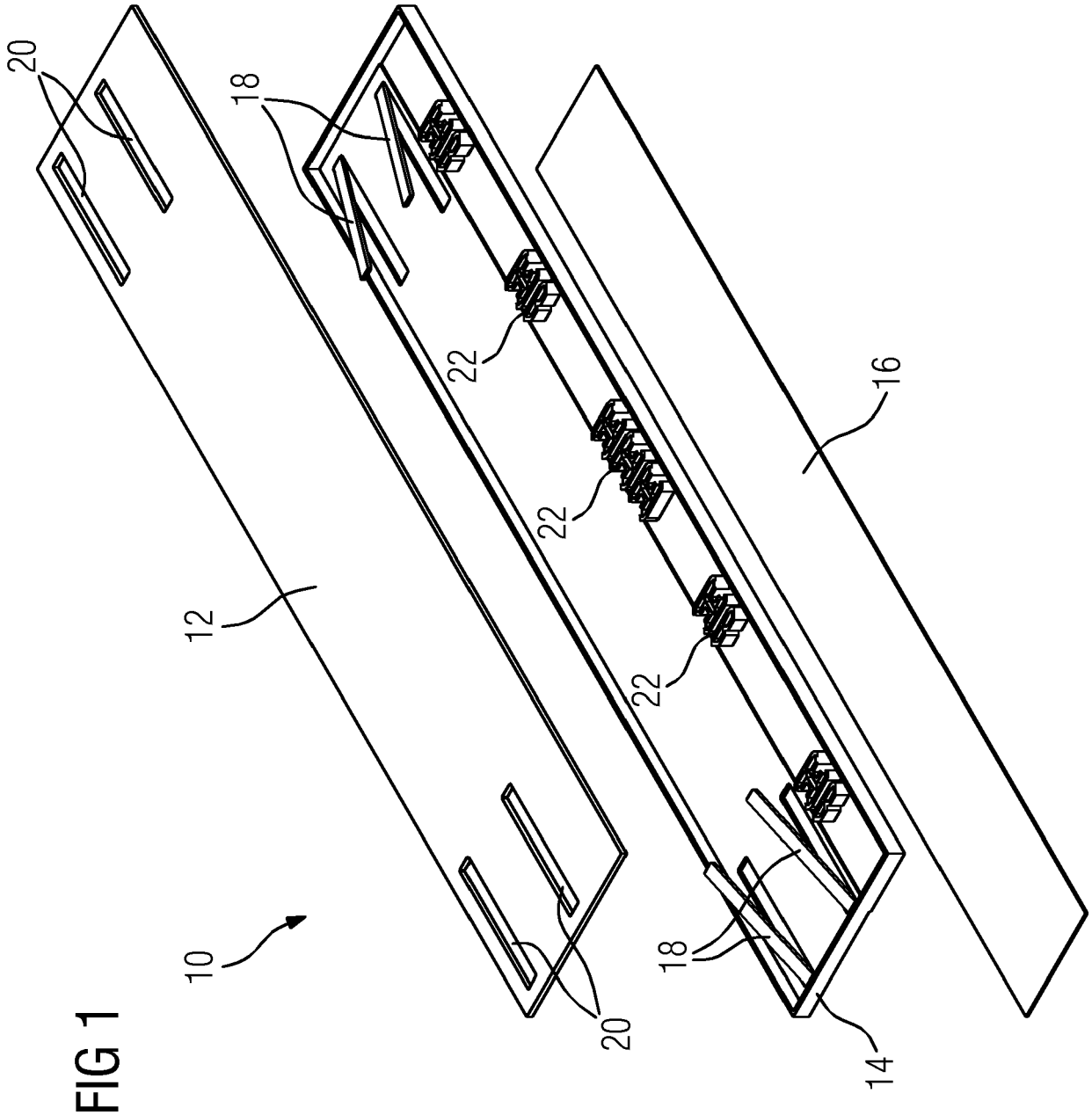


FIG 1

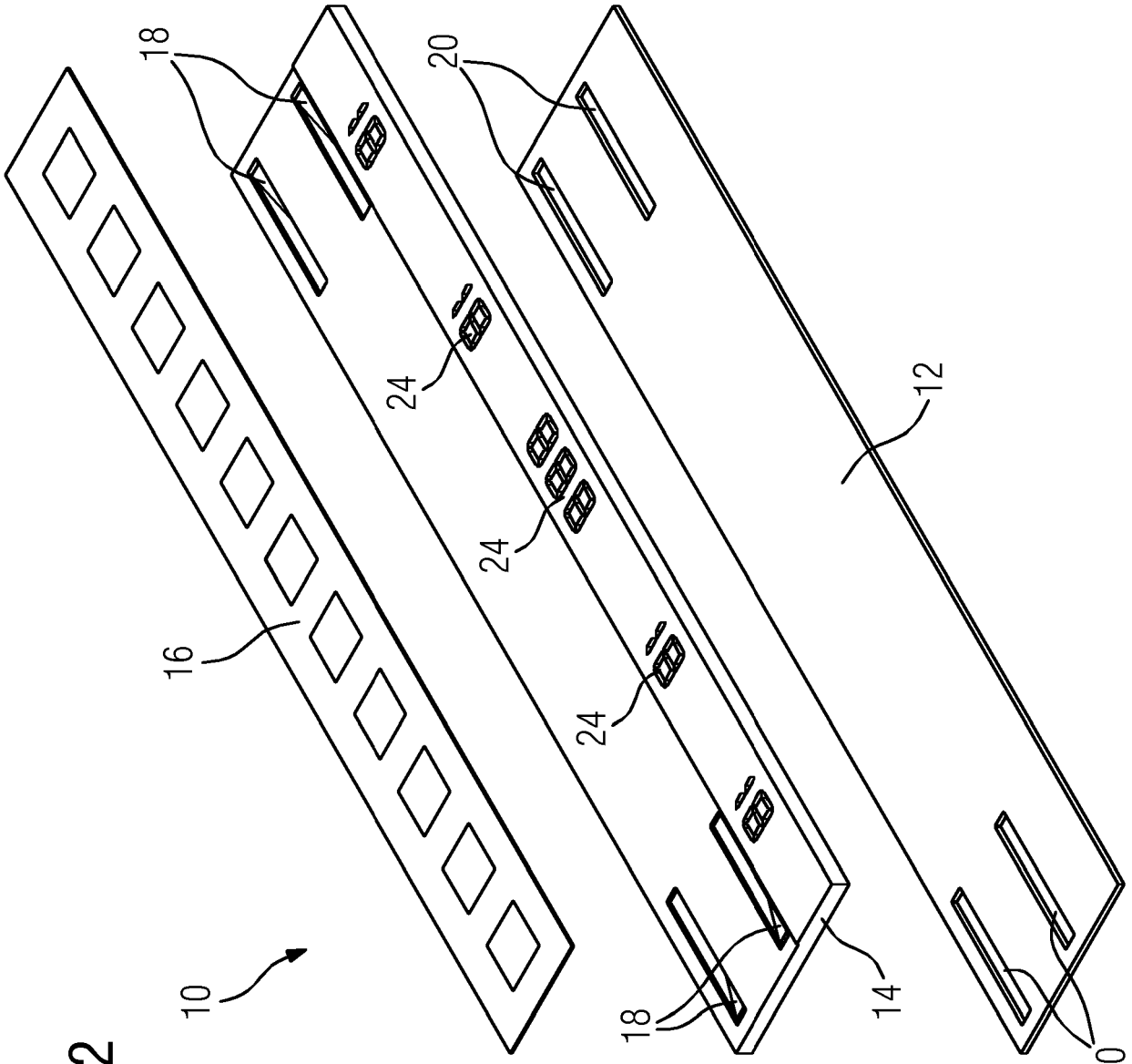


FIG 2

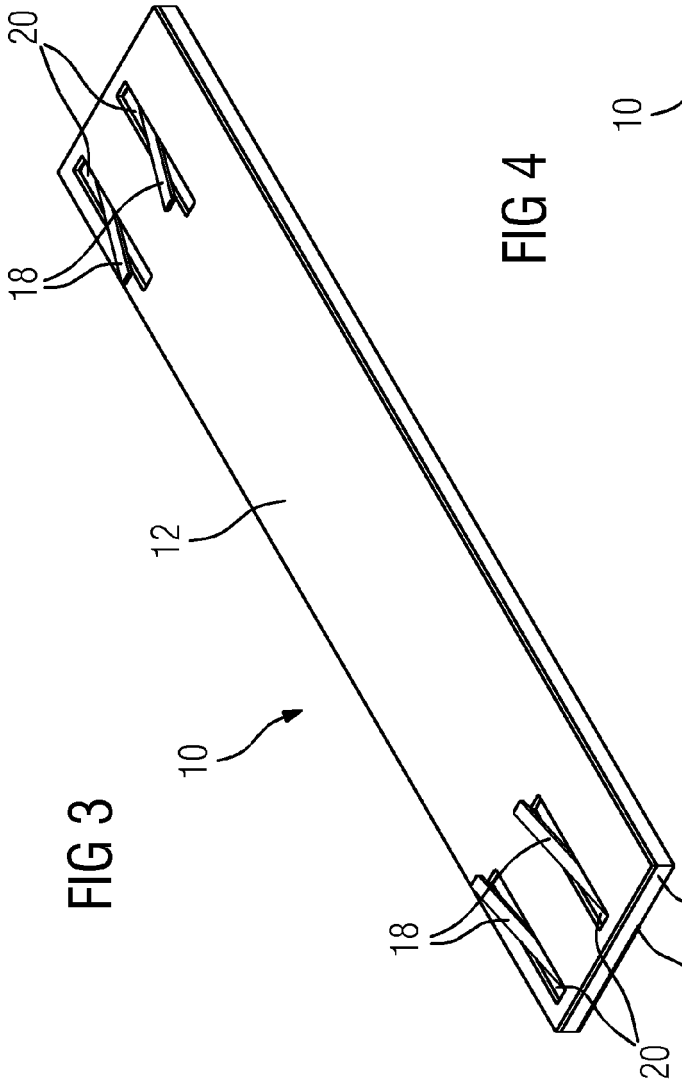


FIG 3

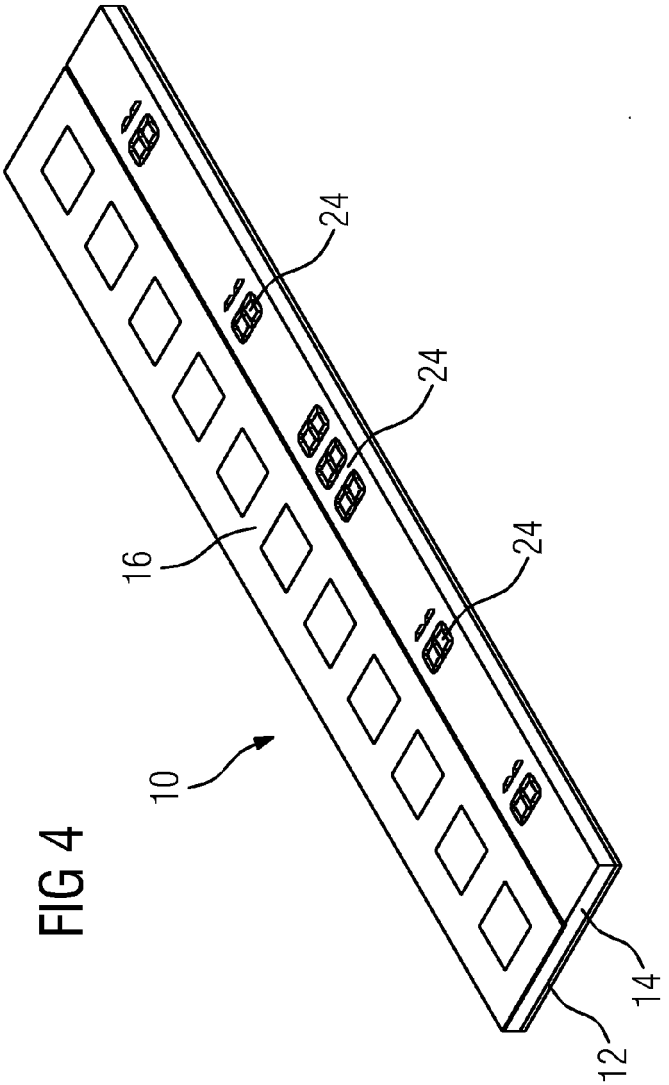


FIG 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 15 4909

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 2 057 738 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 13 May 2009 (2009-05-13) * abstract * * paragraphs [0001], [0009], [0030] - [0039] * * claims 1,2,4-10 * * figures 1,2,3 * -----	1-5, 7-12,14, 15	INV. H05B3/00 F27D11/04 H05B3/60 H05B6/12 F24C7/08 H01H13/70
X	US 5 917 165 A (PLATT NILS [DE] ET AL) 29 June 1999 (1999-06-29) * abstract * * figures 1,2a,3a,4a,6,7 * * column 1, lines 19-60 * * column 3, lines 19-36 * * column 4, lines 20-38 * * column 5, line 44 - column 6, line 11 * * claims 1,5,7,11,19 * -----	1-3,6, 9-15	
A	WO 2009/068518 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; WAN XIU [CN]; ZHANG SHURONG [CN]) 4 June 2009 (2009-06-04) * abstract * * figure 3 * * page 5, line 1 - page 6, line 10 * * claim 1 * -----	1-15	TECHNICAL FIELDS SEARCHED (IPC) H05B F27D F24C H01H
A	US 6 403 904 B1 (SCHILLING WILFRIED [DE]) 11 June 2002 (2002-06-11) * abstract * * figures 1,2 * * page 3, line 45 - page 4, line 21 * -----	1-15	
A	EP 0 687 131 A2 (EGO ELEKTRO BLANC & FISCHER [DE]) 13 December 1995 (1995-12-13) * abstract * * figures 4-6 * * column 8, lines 21-38 * -----	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 July 2018	de la Tassa Laforgue

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 18 15 4909

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.

24-07-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2057738 A1	13-05-2009	CN 101507114 A	12-08-2009
		DE 102006039133 A1	06-03-2008
		EP 2057738 A1	13-05-2009
		ES 2455502 T3	15-04-2014
		RU 2009104743 A	27-09-2010
		WO 2008022883 A1	28-02-2008
US 5917165 A	29-06-1999	AT 216541 T	15-05-2002
		EP 0859467 A1	19-08-1998
		ES 2174342 T3	01-11-2002
		JP H10241491 A	11-09-1998
		US 5917165 A	29-06-1999
WO 2009068518 A1	04-06-2009	AT 511687 T	15-06-2011
		CN 101878496 A	03-11-2010
		CN 201129642 Y	08-10-2008
		EA 201070642 A1	30-12-2010
		EP 2218064 A1	18-08-2010
		US 2010218565 A1	02-09-2010
		WO 2009068518 A1	04-06-2009
US 6403904 B1	11-06-2002	AT 254384 T	15-11-2003
		DE 19907226 A1	24-08-2000
		EP 1030536 A2	23-08-2000
		ES 2209691 T3	01-07-2004
		JP 2000243171 A	08-09-2000
		PL 338410 A1	28-08-2000
		US 6403904 B1	11-06-2002
EP 0687131 A2	13-12-1995	DE 4419866 A1	14-12-1995
		EP 0687131 A2	13-12-1995
		US 5717189 A	10-02-1998

EPO FORM P0459

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