(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 December 2015 (17.12.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/188973 A1

(51) International Patent Classification:
D06F 39/00 (2006.01) *F25D 29/00* (2006.01)
A47L 15/42 (2006.01)

(21) International Application Number:
PCT/EP2015/059115

(22) International Filing Date:
28 April 2015 (28.04.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
A 2014/06806 12 June 2014 (12.06.2014) TR

(71) Applicant: **ARCELIK ANONIM SIRKETI** [TR/TR]; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).

(72) Inventors: **CETINKAYA, Bugra**; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR). **YILDIRIM, Salih**; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR). **SEKER, Zeki**; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).

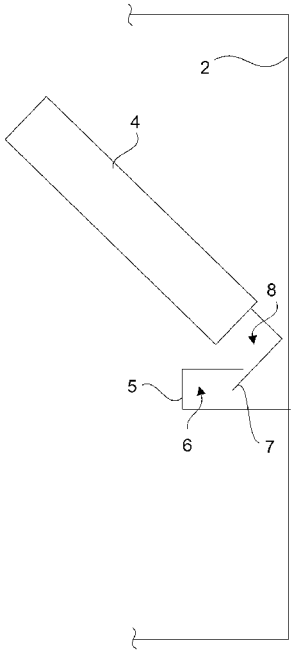
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: A HOUSEHOLD APPLIANCE COMPRISING A PRINTED CIRCUIT BOARD

Figure 2a



(57) Abstract: The present invention relates to a household appliance (1) comprising a front panel (2), a printed circuit board (3), and a board housing (4) fixed to the back side of the front panel (2) and wherein the printed circuit board (3) is disposed, further described by the board housing (4) having a first position wherein the board housing (4) is inclined with respect to the surface of the front panel (2) and a second position wherein the board housing (4) is almost parallel to the front panel (2), at least one hook-shaped first extension (5) that is disposed on the inner surface of the front panel (2), the end of which faces the inner surface of the front panel (2), a first housing (6) that is situated between the first extension (5) and the inner surface of the front panel (2), at least one hook shaped second extension (7), disposed on the side of the board housing (4) opposite to the first extension (5), when the board housing (4) is rotated around the axis of the said side, that passes from the gap between the end of the first extension (5) and the inner surface of the front panel (2) and the end of which is inserted into the first housing (6), and a second housing (8) disposed between the second extension (7) and the side of the board housing (4), where into the first extension (5) is inserted when the board housing (4) is changed from the first position to the second position, providing the board housing (4) to be mounted to the front panel (2) so as to be suspended.

WO 2015/188973 A1

Published:

— *with international search report (Art. 21(3))*

Description

A HOUSEHOLD APPLIANCE COMPRISING A PRINTED CIRCUIT BOARD

[0001] The present invention relates to a household appliance comprising a printed circuit board.

[0002] Household appliances comprise a front panel that enables the user to control the household appliance and printed circuit boards disposed behind the front panel. On these printed circuit boards a large number of electronic circuit elements, for example, switches, light sources, resistors, diodes and capacitors are used. While using the household appliance, the said electronic elements may heat up and may damage the front panel that is mostly produced from plastic. Moreover, a spark that may occur on the printed circuit board can even start a fire. In order to prevent the said situation, the printed circuit boards are wrapped by elements called board retainers or board housings produced from nonflammable material. The board housing is mounted to the rear surface of the front panel by the state of the art fixing means. For example, the board housing is fixed to the rear of the front panel by screwing; however, this method increases costs and labor time. Another fixing means is the snap-fitting method realized by clawed structures. In this method, the claw and the claw housing facing each other so as to be inserted into one another realize the fixing in the position the board housing is almost parallel to the surface of the front panel. By means of the clawed fixing, the strength of the fixing between the board housing and the front panel is increased, on the other hand the disadvantage of the method is that once the assembly of the board housing is completed, it becomes difficult to dismount, and after dismounted, the initial strength cannot be provided and the clawed structures can be broken due to vibrations.

[0003] In the state of the art European Patent Application No. EP0943283, a domestic appliance is disclosed that comprises a protector cover that is closed by a latch lock system.

[0004] In the state of the art United States Patent Application No. US2012169193 and the European Patent Application No. EP1970479, a washer is disclosed wherein the protector cover is fixed to the front panel by the

screwing method.

[0005] In the state of the art United States Patent Application No.US2013058060, a washer is disclosed wherein a hook member is used for fixing the printed circuit board to the protector cover.

[0006] The aim of the present invention is the realization of a household appliance comprising a board housing that is easily attachable/detachable on the rear surface of the front panel.

[0007] The household appliance realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a front panel; a printed circuit board positioned behind the front panel; a board housing wherein the printed circuit board is placed; a first extension that is disposed on the inner surface of the front panel, that enables the board housing to be fixed to the front panel in a suspended manner and that is shaped as hooks to be inserted into one another; a first housing that is surrounded by the first extension and the inner surface of the front panel; a second extension that is disposed on the side of the board housing opposite the first extension and that is seated into the first housing by rotating the board housing around this side, and a second housing wherein the first extension is seated, that is surrounded by the second extension and the side of the board housing. The board housing has a first position wherein the board housing is inclined with respect to the front panel by being rotated around the axis of the side where the second extension is located, and a second position wherein the board housing is almost coplanar with the front panel. The board housing is first changed to the first position, thus the second extension is passed over the first extension and is inserted into the first housing, then the board housing is rotated and changed to the second position and the first extension is enabled to be seated into the second housing. By means of the present invention, fixing of the board housing to the front panel is facilitated and damage is prevented during mounting/dismounting operation.

[0008] In an embodiment of the present invention, the second housing is configured to widen towards its orifice. The second housing with wide orifice and the second extension that forms a wall of the second housing

can be inserted easily through the gap between the first extension and the front panel when the board housing is in the first position. Moreover, while the board housing is changed from the first position to the second position, the first extension slides over the second extension and is seated into the second housing. Thus, the rotational movement of the board housing is guided and aligning the printed circuit board with the front panel is facilitated.

[0009] In an embodiment of the present invention, the first extension has a cross-section that is wide enough to occupy the base of the second housing. After the second extension is inserted into the first housing, the first extension is seated entirely into the second housing when the board housing is changed from the first position to the second position and the board housing is prevented from moving parallel to the front panel surface.

[0010] In an embodiment of the present invention, two supports are provided, that extend from the inner surface of the front panel towards two sides of the first extension, that support the first extension and that make the first housing a closed volume. The supports prevent the movement of the board housing along the side where the second extension is located when the second extension is seated into the first housing. At the same time, the first extension is protected from external factors like impacts and prevented from damage by means of the supports.

[0011] In an embodiment of the present invention, in the household appliance, the second housing has side walls and cut-outs are provided between the first extension and the supports wide enough for the side walls of the second housing to pass through. By means of this embodiment, the board housing is fixed to the front panel so as to be suspended in a firm manner.

[0012] In an embodiment of the present invention, additional fixing means that provides locking of the board housing to the front panel are used. After the second extension is seated into the first housing and the first extension into the second housing, the board housing, fixed to the front panel by being suspended, is entirely fixed by additional fixing means so as not to be dislodged. The additional fixing means can be state of the art screw – screw socket or latch – housing pairs.

[0013] In the household appliance of the present invention, the fixing of the board housing to the front panel is facilitated by means of the extensions and the assembly time becomes shorter. Furthermore, maintenance costs decrease since the board housing can be easily dislodged when required. Since the extensions do not deform one another while being seated into the housings, they can be used again and again safely.

[0014] The model embodiments that relate to the household appliance realized in order to attain the aim of the present invention are illustrated in the attached figures, where:

[0015] Figure 1 – is the front schematic view of the household appliance related to an embodiment of the present invention.

[0016] Figure 2a – is the schematic view of the front panel and the board housing in the first position in an embodiment of the present invention.

[0017] Figure 2b – is the schematic view of the front panel and the board housing in the second position in an embodiment of the present invention.

[0018] Figure 3a – is the perspective view of the front panel in an embodiment of the present invention.

[0019] Figure 3b – is the view of detail A in Figure 3a.

[0020] Figure 4 – is the perspective view of the front panel and the board housing in an embodiment of the present invention.

[0021] Figure 5 – is the perspective view of the front panel and the board housing in the first position in an embodiment of the present invention.

[0022] Figure 6 – is the perspective view of the front panel and the cross-section of the board housing in an embodiment of the present invention.

[0023] Figure 7a – is the detailed view of the front panel and the board housing in the first position in an embodiment of the present invention.

[0024] Figure 7b – is the detailed view of the front panel and the board housing in the second position in an embodiment of the present invention.

[0025] Figure 8 – is the cross-sectional view of the front panel and the board housing in an embodiment of the present invention.

[0026] Figure 9 – is the detailed view of the first extension, the first housing, the second extension and the second housing in an embodiment of the present invention.

[0027] The elements illustrated in the figures are numbered as follows:

[0028] 1. Household appliance

[0029] 2. Front panel

[0030] 3. Printed circuit board

[0031] 4. Board housing

[0032] 5. First extension

[0033] 6. First housing

[0034] 7. Second extension

[0035] 8. Second housing

[0036] 9. Support

[0037] 10. Side wall

[0038] 11. Cut out

[0039] 12. Additional fixing means

[0040] The household appliance (1) comprises a front panel (2), a printed circuit board (3), and a board housing (4) fixed to the back side of the front panel (2) and wherein the printed circuit board (3) is disposed (Figure 1).

[0041] In the household appliance (1), the printed circuit board (3) is placed into the board housing (4) and the board housing (4) is fixed to the back side of the front panel (2). The board housing (4) is preferably produced from a nonflammable material and prevents the sparks that may occur on the printed circuit board (3) from spreading to the household appliance (1). On the printed circuit board (3), electronic components (not shown in the figures) like light source, switch, diode, resistor can be disposed.

[0042] The household appliance (1) of the present invention enables the board housing (4) to be mounted to the front panel (2) in a suspended manner and comprises

- the board housing (4) having a first position wherein the board housing (4) is inclined with respect to the surface of the front panel (2) and a second position wherein the board housing (4) is almost parallel to the front panel (2),
- at least one hook-shaped first extension (5) that is disposed on the inner surface of the front panel (2), the end of which faces the inner surface of the front panel (2),

- a first housing (6) that is situated between the first extension (5) and the inner surface of the front panel (2),
- at least one hook-shaped second extension (7) that is disposed on the side of the board housing (4) opposite to the first extension (5), the end of which passes through the gap between the end of the first extension (5) and the inner surface of the front panel (2) and is inserted into the first housing (6) when the board housing (4) is rotated around the axis of the said side, and
- a second housing (8) that is disposed between the second extension (7) and the side of the board housing (4), wherein the first extension (5) is inserted when the board housing (4) is changed from the first position to the second position.

[0043] In the household appliance (1) of the present invention, the printed circuit board (3) is seated into the board housing (4) such that its effective surface faces the front panel (2). The board housing (4) is fixed to the front panel (2) in a suspended manner by changing the board housing (4) to the first position by aligning the side where the second extension (7) is located and the first extension (5) on the front panel (2) so as to face each other and by being rotated around the side where the second extension (7) is located; moving the board housing (4) near the inner surface of the front panel (2) and seating the end of the second extension (7) into the first housing (6) by passing through the gap between the first extension (5) and the front panel (2); after the second extension (7) is inserted through the orifice of the first housing (6), rotating the board housing (4) around the axis where the second extension is located so that the opposite side of the board housing (4) moves near the front panel (2) and changing the board housing (4) to the second position, and seating the first extension (5) into the second housing (8) as the board housing (4) changes to the second position. The board housing (4) is fixed to the front panel (2) in a suspended manner by means of the structure that is inserted into one another. The board housing (4) is dislodged by changing the board housing (4) from the second position to the first position, releasing the first extension (5) from the second housing (8) and then releasing the second

extension (7) from the first housing (6). The second extension (7) of the present invention can either be located at the upper side or the lower side of the board housing (4) and when the board housing (4) is fixed so as to be suspended, the board housing (4) is partially movable with respect to the front panel (2). Since the first extension (5) is seated into the second housing (8) and the second extension (7) into the first housing (6) loosely, deformation does not occur. By the present invention, the board housing (4) is prevented from being dislodged in the vertical direction from the front panel (2). Moreover, while the board housing (4) is fixed to the front panel (2), the electronic components disposed on the printed circuit board (3) are prevented from being damaged (Figure 2a, Figure 2b, Figure 5, Figure 7a, Figure 7b).

[0044] In an embodiment of the present invention in the household appliance (1), the second housing (8) is configured to become narrower towards its base. By means of this embodiment, the second extension (7) is enabled to be seated easily into the first housing (6). Furthermore, by means of guiding the first extension (5) by resting against the second extension (7) while the first extension (5) is seated into the second housing (8), it becomes easy to align the electronic components on the printed circuit board (3) with the corresponding members on the front panel (2) surface, for example the switches and light holes.

[0045] In an embodiment of the present invention in the household appliance (1), the first extension (5) with a cross-section that occupies the base of the second housing (8) is used. In this embodiment, when the board housing (4) is changed to the second position after the second extension (7) is seated into the first housing (6), and when the first extension (5) is seated into the second housing (8), the end of the first extension (5) completely occupies the base of the second housing (8) and thus the board housing (4) is prevented from moving. The board housing (4) is enabled to remain firm and the electronic components on the printed circuit board (3) are prevented from losing their functions when the electronic components on the printed circuit board (3) are aligned with the front panel (2) and the board housing (4) is fixed.

[0046] In an embodiment of the present invention, the household appliance (1) comprises two supports (9) that extend almost perpendicularly to the inner surface of the front panel (2) and that support the first extension (5) by closing around the first housing (6). In this embodiment, the strength of the first extension (5) against external factors is increased and is prevented from breaking. Furthermore, the supports (9) make the first housing (6) a closed volume by closing around the first housing (6) (Figure 3a, Figure 3b).

[0047] In an embodiment of the present invention, the household appliance (1) comprises a second housing (6) having side walls (10) and cut-outs (11) disposed between the supports (9) and the end of the first extension (5), wherein the side walls of the second housing (8) are inserted. By means of this embodiment, the board housing (4) is prevented from being dislodged during transportation or due to vibrations originating from external effects (Figure 9).

[0048] In an embodiment of the present invention, the household appliance (1) comprises an additional fixing means (12) that enables the board housing (4) to be locked on the inner surface of the front panel (2). The additional fixing means (12) in this embodiment can be latch – housing pair or screw – screw socket pair that are snap fitted to one another. In this embodiment, the board housing (4) that is suspended on the front panel (2) is enabled to be locked onto the front panel (2) (Figure 4).

[0049] In the household appliance (1) of the present invention, fixing of the board housing (4) to the inner surface of the front panel (2) can be realized securely in a plug-and-use manner and can be performed over and over again by means of the first extension (5) and the second extension (7) pair. By means of the present invention, the number of components (for example screws) used in the fixing process is decreased, the assembly process is facilitated, saving in time is provided and most importantly the household appliance (1) is prevented from becoming defective due to dislodgement of the board housing (4) during transportation of the household appliance (1) from the factory to the user.

Claims

1. A household appliance (1) **comprising** a front panel (2), a printed circuit board (3) and a board housing (4) fixed to the back side of the front panel (2) and wherein the printed circuit board (3) is disposed **characterized in that**
   - the board housing (4) having a first position wherein the board housing (4) is inclined with respect to the surface of the front panel (2) and a second position wherein the board housing (4) is almost parallel to the front panel (2),
   - at least one hook-shaped first extension (5) that is disposed on the inner surface of the front panel (2), the end of which faces the inner surface of the front panel (2),
   - a first housing (6) that is situated between the first extension (5) and the inner surface of the front panel (2),
   - at least one hook shaped second extension (7), disposed on the side of the board housing (4) opposite to the first extension (5), when the board housing (4) is rotated around the axis of the said side, that passes from the gap between the end of the first extension (5) and the inner surface of the front panel (2) and the end of which is inserted into the first housing (6),
   - and a second housing (8) disposed between the second extension (7) and the side of the board housing (4), where into the first extension (5) is inserted when the board housing (4) is changed from the first position to the second position,
   - providing the board housing (4) to be mounted to the front panel (2) so as to be suspended.
2. A household appliance (1) as in Claim 1, **characterized by** the second housing (8) which is configured to become narrower towards its base.
3. A household appliance (1) as in any one of the above claims, **characterized by** the first extension (5), the end of which has a cross-section that almost entirely occupies the base of the second housing (8).
4. A household appliance (1) as in any one of the above claims, **characterized by** two supports (9) that extend almost vertically to the inner surface of the front panel (2) and that support the first extension (5) by closing around the first housing (6).
5. A household appliance (1) as in Claim 4, **characterized by** a second housing

(6) having side walls (10) and by cut-outs (11) disposed between the supports (9) and the end of the first extension (5), wherein the side walls (10) of the second housing (8) are inserted.

6. A household appliance (1) as in any one of the above claims, characterized by an additional fixing means (12) that enables the board housing (4) to be locked to the inner surface of the front panel (2).

Figure 1

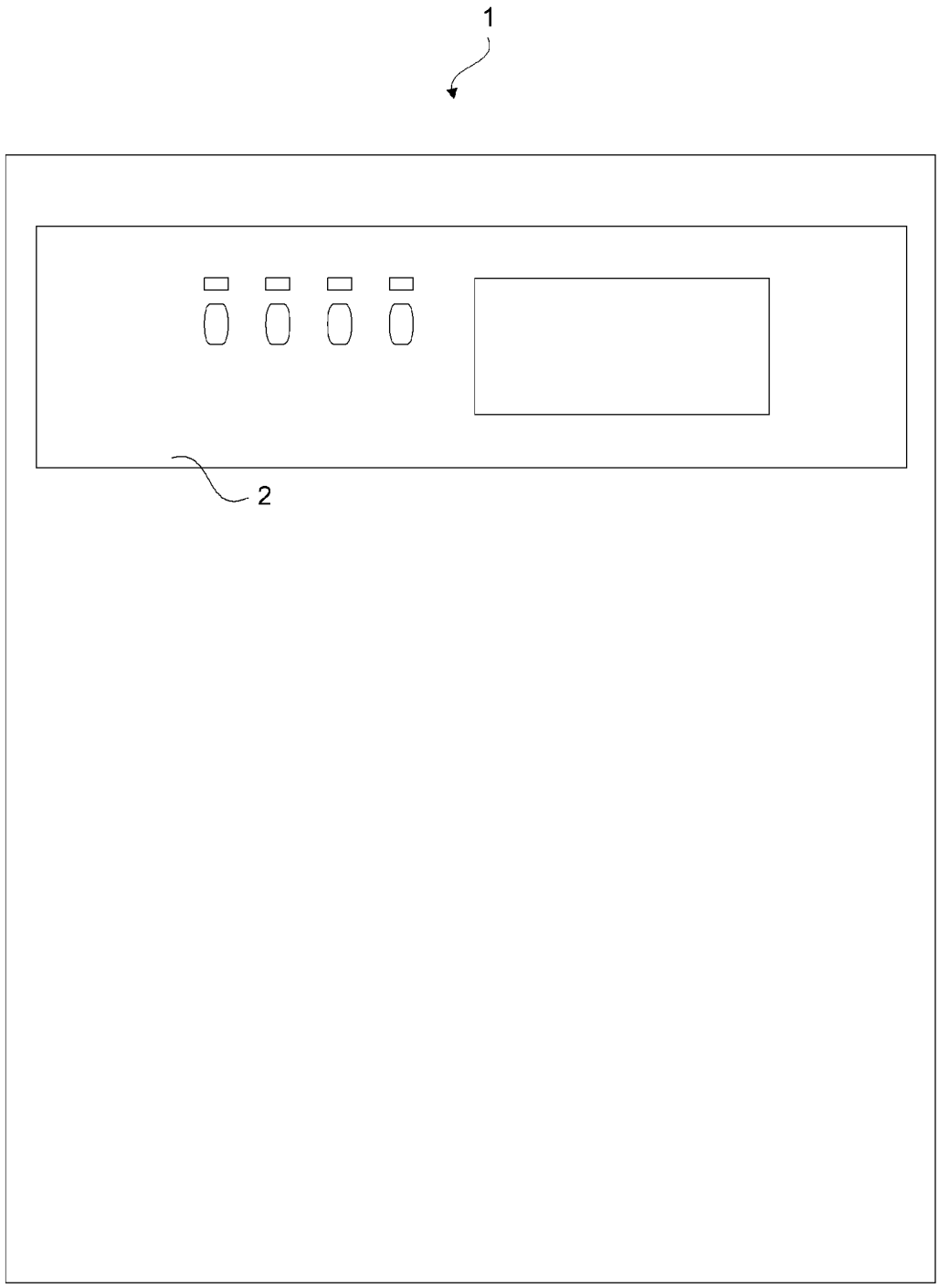


Figure 2a

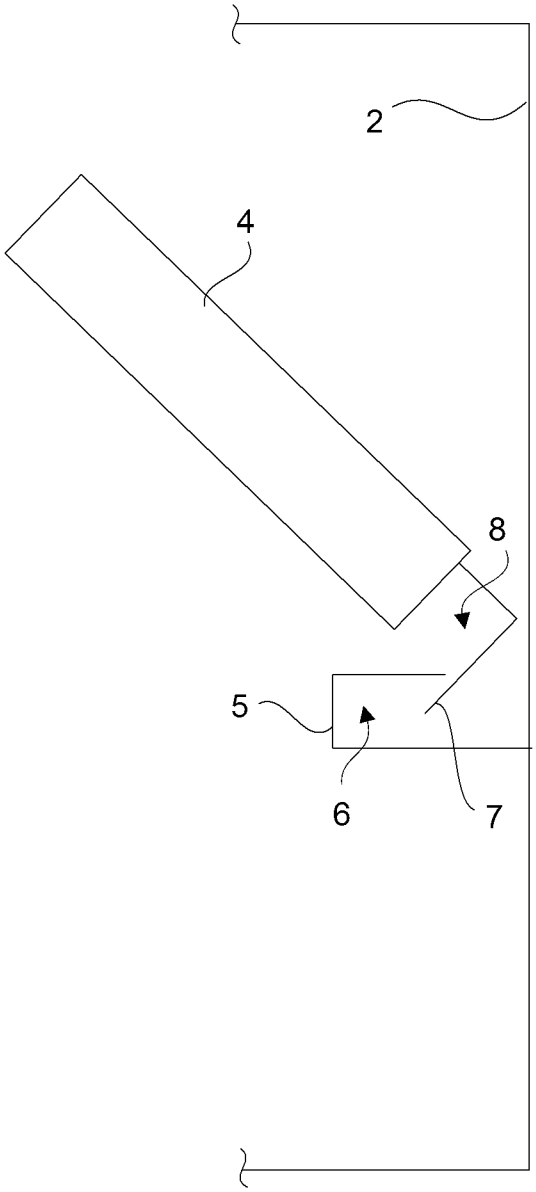


Figure 2b

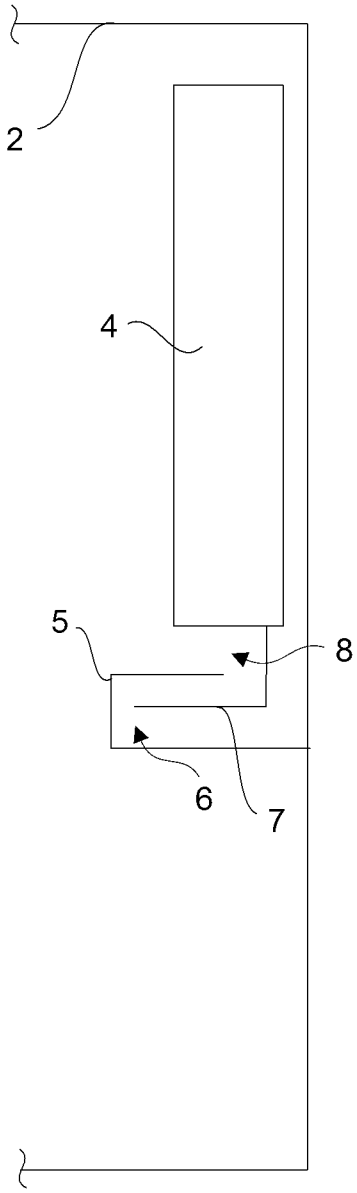


Figure 3a

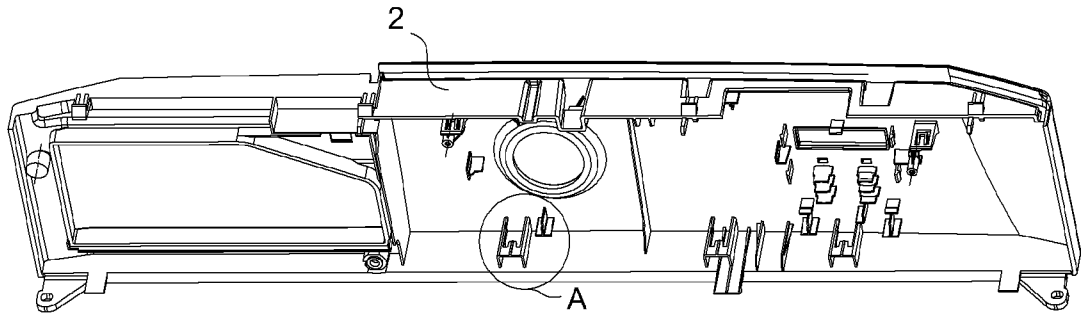


Figure 3b

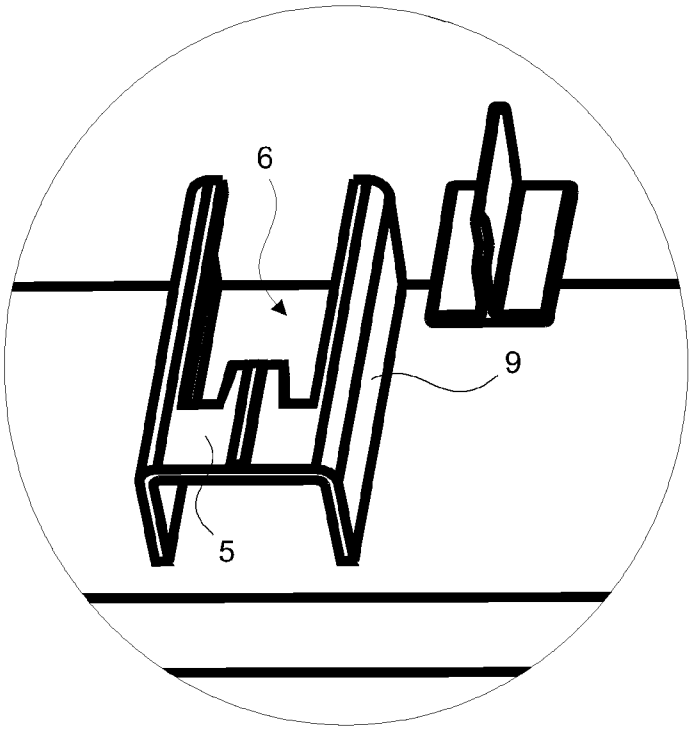


Figure 4

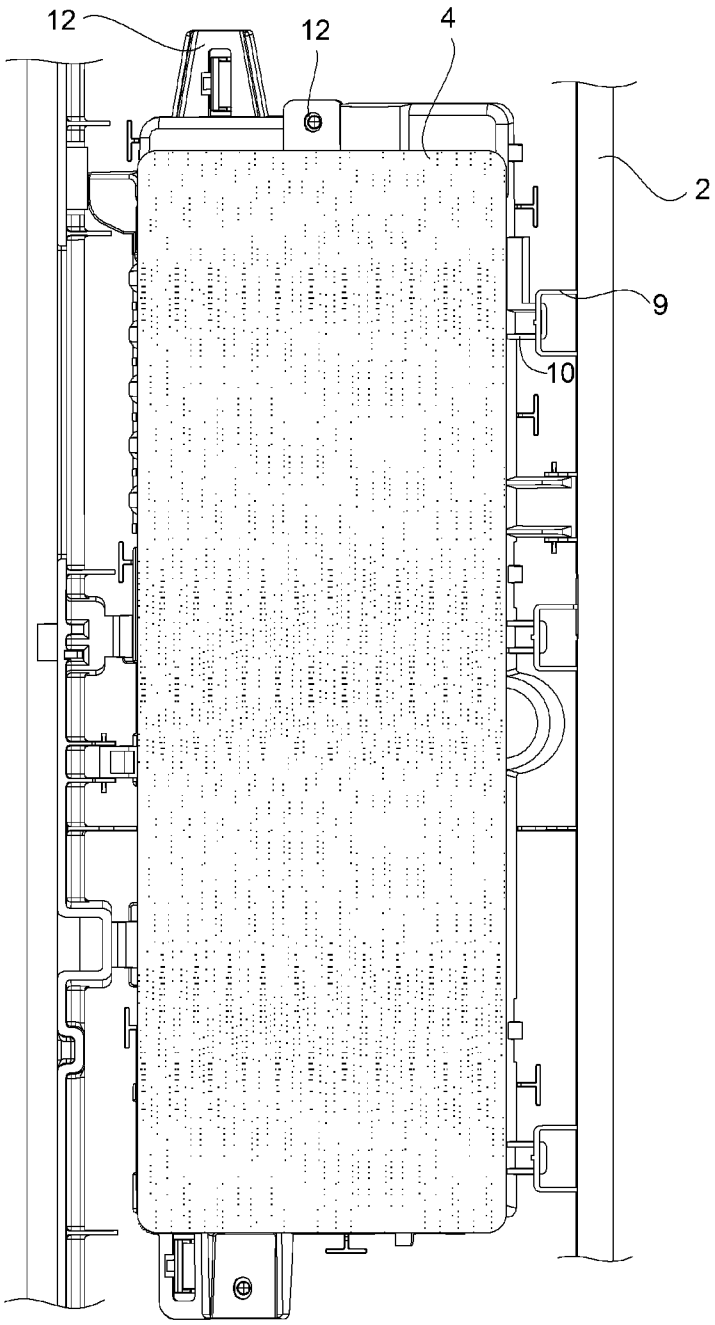


Figure 5

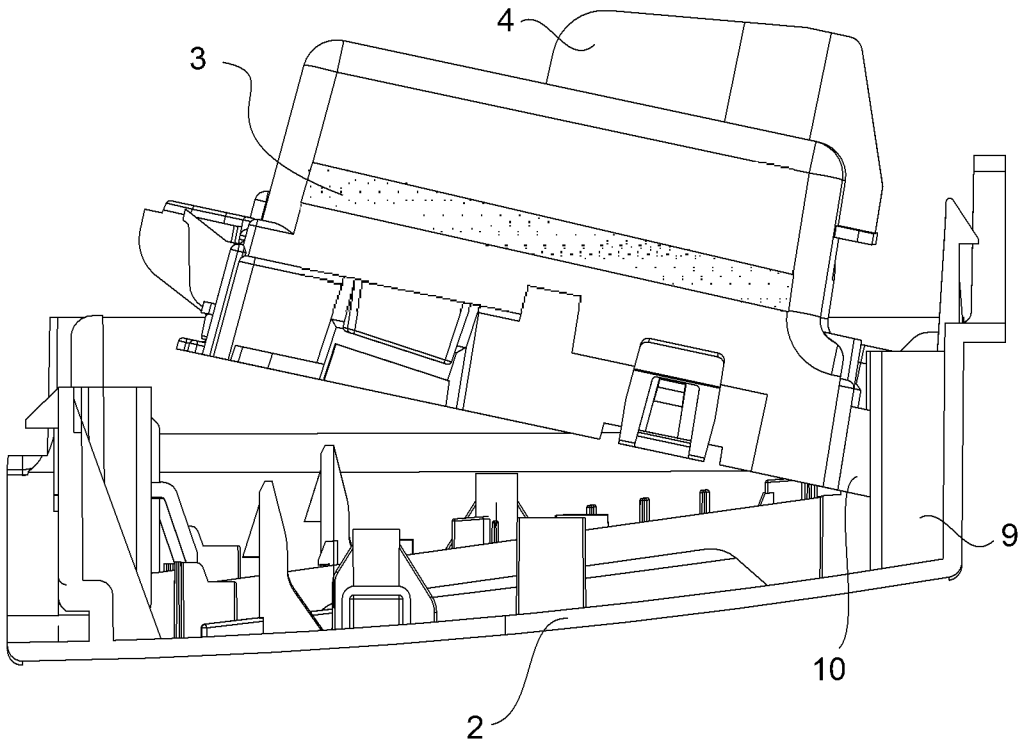


Figure 6

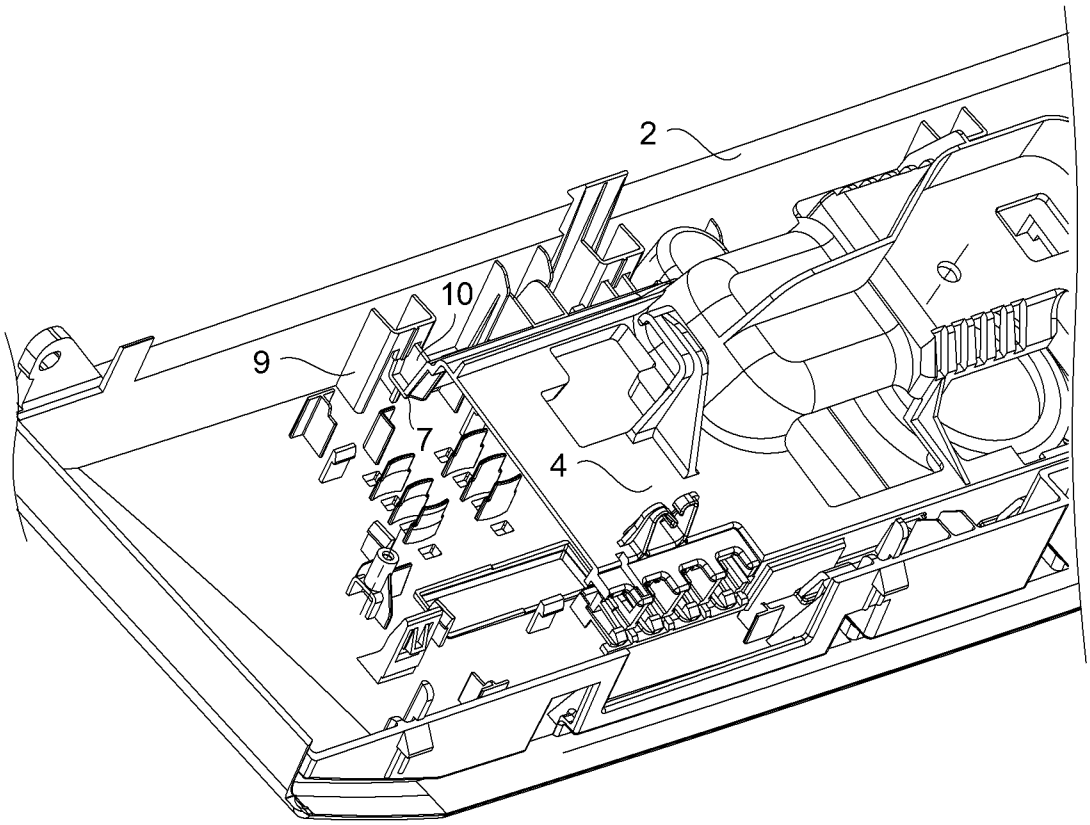


Figure 7a

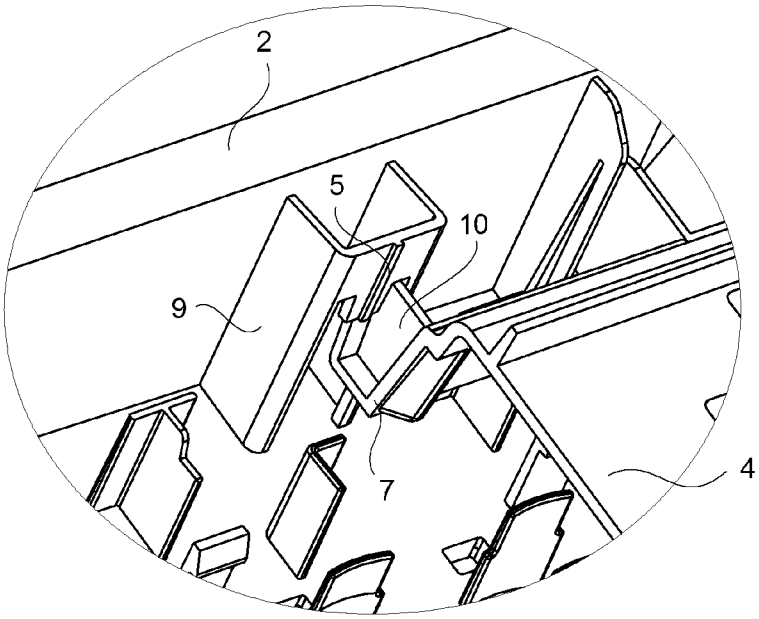


Figure 7b

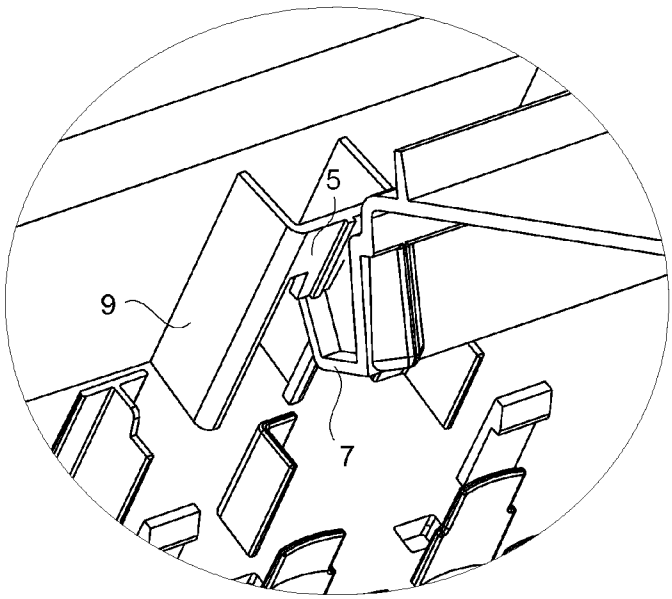


Figure 8

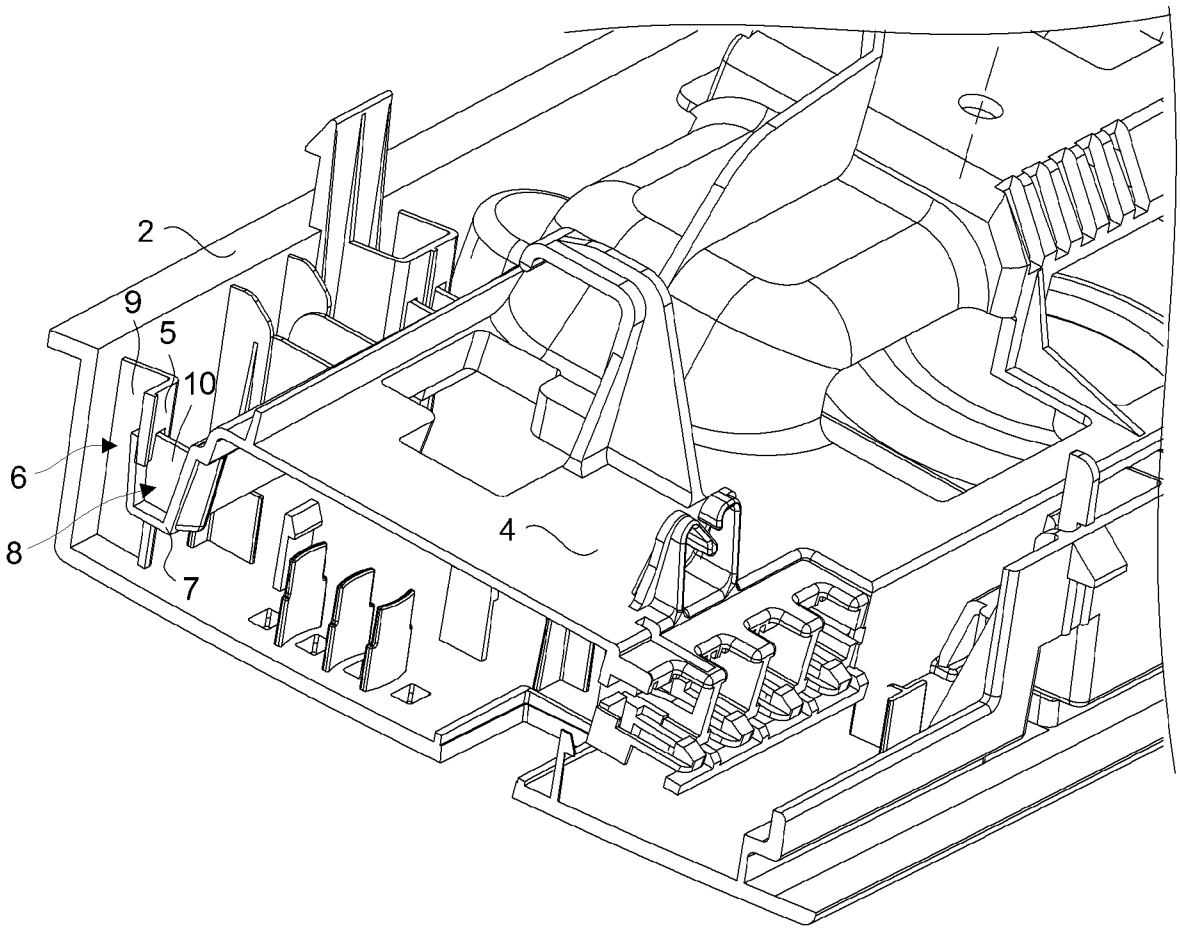
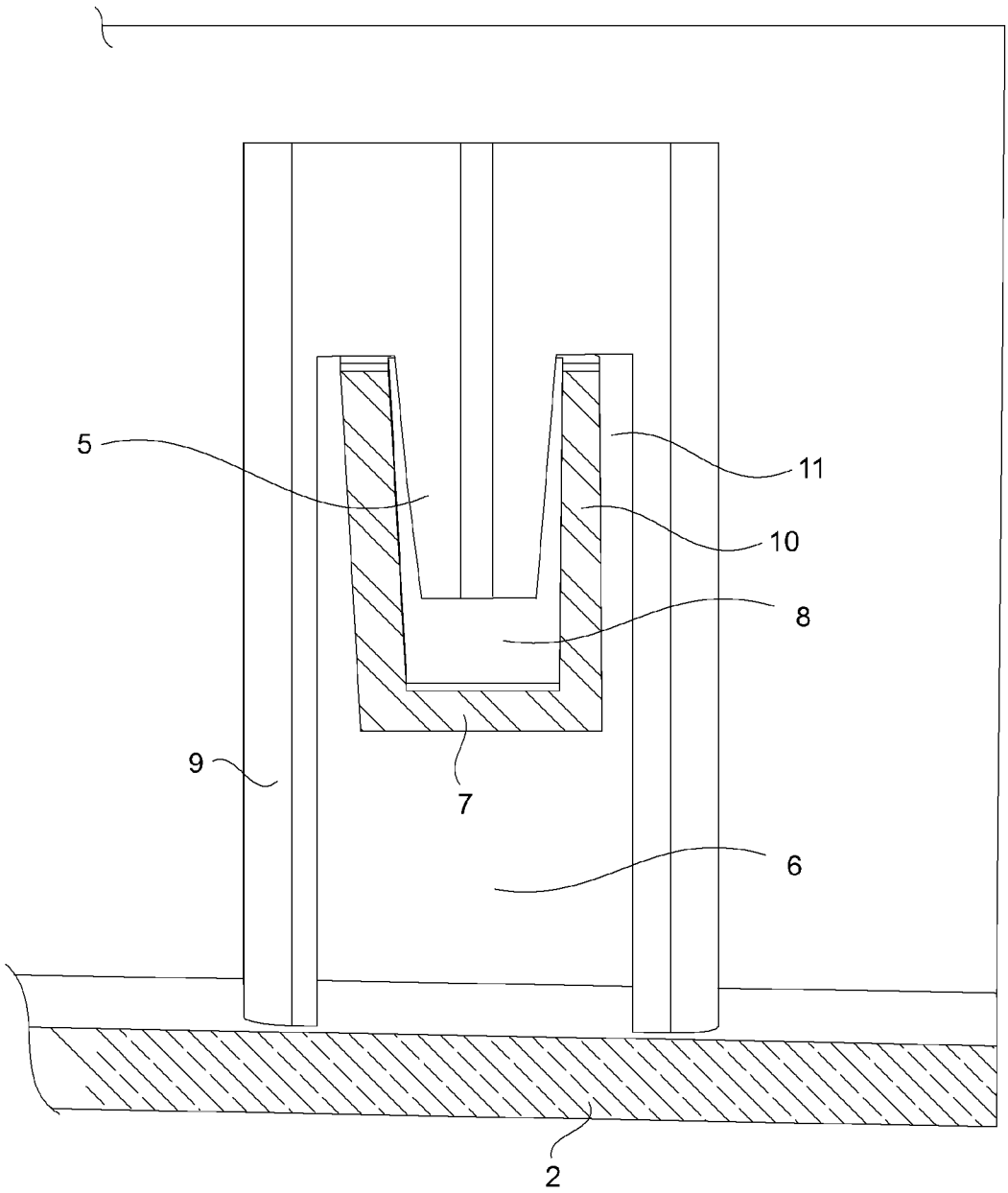


Figure 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/059115

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F39/00 A47L15/42 F25D29/00
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)
D06F A47L F25D 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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 596 134 A2 (DIEHL AKO STIFTUNG GMBH & CO [DE]) 16 November 2005 (2005-11-16) paragraphs [0008] - [0009] paragraphs [0017] - [0027] figures 1-3	1-6
Y	DE 10 2006 039188 A1 (LG ELECTRONICS INC [KR]) 1 March 2007 (2007-03-01) paragraph [0011] paragraphs [0031] - [0049] figures 1-3	1-6
A	DE 37 39 998 C1 (BOSCH SIEMENS HAUSGERAETE) 16 February 1989 (1989-02-16) column 2, line 39 - column 3, line 23 figures 1-8	1,6

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 June 2015	22/07/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Weidner, Maximilian

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/059115

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/122011 A1 (HWANG SUNG G [KR] ET AL) 9 June 2005 (2005-06-09) paragraphs [0027] - [0035] figures 1-4	1,6
A	KR 2007 0028152 A (LG ELECTRONICS INC [KR]) 12 March 2007 (2007-03-12) the whole document	1,6

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2015/059115

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1596134 A2	16-11-2005	DE 102004022978 A1	08-12-2005
		EP 1596134 A2	16-11-2005
DE 102006039188 A1	01-03-2007	DE 102006039188 A1	01-03-2007
		US 2007180867 A1	09-08-2007
DE 3739998 C1	16-02-1989	NONE	
US 2005122011 A1	09-06-2005	KR 20050054201 A	10-06-2005
		US 2005122011 A1	09-06-2005
KR 20070028152 A	12-03-2007	NONE	