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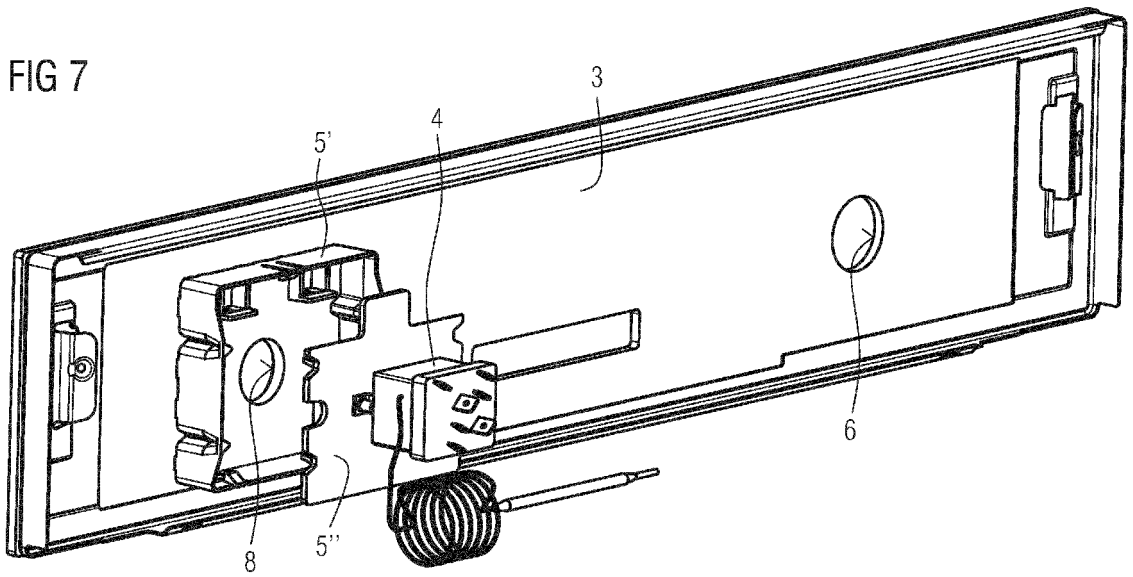
(54) **Appliance, especially domestic appliance, and method of mounting such an appliance**

(57) The invention relates to an appliance (1), especially to a domestic appliance, comprising a frame structure (2), a pane element (3) fixed to the frame structure (2) and at least one functional element (4), which functional element (4) is connected with the pane element (3). To facilitate the assembly of the appliance, the invention is characterized in that the functional element (4) is fixed to the pane element (3) by a supporting element (5), wherein the supporting element (5) consists of at least a first part (5') and a second part (5"), wherein the two parts (5', 5") of the supporting element (5) are removably connected, wherein the first part (5') of the supporting element (5) is connected with the pane element (3) by means of an adhesive. Furthermore, the invention relates to a method of mounting such an appliance.

FIG 7



EP 2 650 613 A1

Description

[0001] The invention relates to an appliance, especially to a domestic appliance, comprising a frame structure, a pane element fixed to the frame structure and at least one functional element, which functional element is connected with the pane element. Furthermore, the invention relates to a method of mounting such an appliance.

[0002] In many applications the domestic appliance, e. g. a domestic oven, has a frame structure on which a pane element being a glass pane is fixed. The pane bears the elements to control the domestic appliance. The glass pane has a flat front surface to fulfil demanding requirement concerning the appearance of the appliance. Thus, the different functional elements must be arranged in a hidden manner behind the glass pane but must be securely fastened at the pane element.

[0003] In the state of the art a plurality of possibilities are described how to design the pane element and the respective functional elements to obtain a pleasant appearance of the appliance and to ensure a proper fixation of the functional element on the pane element.

[0004] Functional elements can be connected by a snap connection as shown for example in DE 88 03 219 U1. For doing so the functional element can be mounted on a support plate which is then connected with the pane element by means of the snap connection. Also the direct fixation of the functional element is possible.

[0005] It is also possible to connect the functional element with the pane element by means of an adhesive.

[0006] In EP 2 390 577 A1 a functional element is removably attached directly to a supporting element. This requires an appropriate configuration of the first supporting element to the shape of the functional element. Here, the frame structure and the supporting element are fixed on opposite surfaces of the transparent pane element which is not desired in every case.

[0007] As similar solution is shown in EP 2 390 403 A1. Here, the functional element is permanently attached by means of an adhesive to the supporting element.

[0008] In EP 1 962 020 A1 a functional element is provided with a supporting element. This requires an appropriate configuration of the supporting element to the shape of the functional element. Here, the removal of the functional element is difficult because it is glued onto the glass pane element.

[0009] In the case of the fixation with a snap connection it is detrimental that possibly a plurality of receptions must be machined into the pane which is specifically problematic when the pane element consists of glass.

[0010] In the case of a fixation be means of an adhesive it is a problem to replace the functional element in the case of a defect of the same. In this case it is a busy work to remove all adhesive material before a new functional element can be fixed by glueing.

[0011] Thus, it is an object of the present invention to propose an appliance of the generic type as well as a method for mounting the same which overcomes the drawbacks of the known solutions. Thus, the fixation of the functional element should be possible in an easy manner. Also, the removing of a functional element should be easy and possible in a short time to guarantee a cost- efficient mounting.

[0012] The solution of this object according to the invention is characterized in that the functional element is fixed to the pane element by a supporting element, wherein the supporting element consists of at least a first part and a second part, wherein the two parts of the supporting element are removably connected, wherein the first part of the supporting element is connected with the pane element by means of an adhesive.

[0013] The functional element and the second part of the supporting element are preferably removably connected.

[0014] The connection between the at least two parts of the supporting element is preferably a snap connection or a screw connection.

[0015] Also, the connection between the functional element and the second part of the supporting element can be a snap connection.

[0016] The pane element can have at least one hole, preferably with a circular shape, for the passage of a shaft element of the functional element, wherein the first part of the supporting element is preferably equipped with alignment means for aligning the first part relatively to the hole. The alignment means can comprise a protruding edge which penetrates at least partially the pane element; preferably, the protruding edge penetrates the pane element only partially.

[0017] An actuator element, preferably a rotatable knob, can be fixed at the end of the shaft element of the functional element, wherein the actuator element covers completely the hole in the pane element.

[0018] The first part of the supporting element can be connected with the pane element by means of silicone which thus acts as an adhesive.

[0019] The pane element is preferably a full-glass pane.

[0020] Also, the pane element can be connected with the frame structure by means of an adhesive.

[0021] The second part of the supporting element can be formed as a modular element and can be designed to be connected with a plurality of different functional elements.

[0022] The method of mounting of an appliance, especially of a domestic appliance, comprising a frame structure, a pane element and at least one functional element, is characterized according to the invention in that is comprises the following steps:

a) Connecting of a first part of a supporting element with a surface of the pane element by means of an adhesive;

b) Connecting of the functional element with a second part of the supporting element;

c) Removably attaching the second part of the supporting element with the first part of the supporting element.

[0023] Preferably, the pane element is connected with the frame structure by means of an adhesive, wherein this connection process is carried out preferably simultaneously with mentioned step a) .

[0024] Above step a) and step b) are carried out preferably simultaneously. At least one of said step a) and step b) being preferably carried out by an automatic manipulator.

[0025] The pane element is preferably connected with the frame element by means of an adhesive. The frame element and the first part of the supporting element can be fixed on the same surface of the pane element.

[0026] The first and second part of the support element form preferably a modular unit adapted to receive a plurality of different functional devices. The functional element has preferably a portion passing through the frame structure and the pane element, wherein this portion is engaging an actuator (knob).

[0027] As described above, a positioning reference can be provided on the pane element so as to precisely determine the relative position of the first part of the supporting element and the pane element. The positioning reference can be formed by a pass-through hole formed on the pane element. The first part of the supporting element can then have a protruding portion complementary shaped to said pass-through hole formed on the pane element so at to be engaged or engageable to the latter.

[0028] The first and second part of the supporting element can be reciprocally fixed each other by a snap-in type fastening device; alternatively or additively the first and second parts can be slidably coupled.

[0029] The proposed method can also comprise the step of fixing a surface of the panel element onto the frame structure through an adhesive after providing the frame structure and the transparent pane element.

[0030] The frame structure and the first part of the supporting element can be fixed on the same surface of the pane element.

[0031] The fixation of the pane element onto the frame structure through an adhesive and the fixation of the first part of the supporting element on the pane element by means of an adhesive can be carried out simultaneously.

[0032] All assembly steps may be carried out by an automatic machine.

[0033] Thus, the invention proposes a new fastening system to fix functional elements on a (glass) pane. In the case of a removal of a functional element it can be easily substituted by separating the two parts of the supporting element. The functional element can be separated from the second part of the supporting element. Then, a new functional element can be attached to the second part of the supporting element, before the unit consisting of the functional element and the second part of the supporting element is clipped again together with the first part of the supporting elements which remains connected with the pane element by the adhesive.

[0034] The functional elements are e. g. thermostats, switches, timers etc.

[0035] An advantage of the proposed concept is the possibility of an easy modulation of the elements. Thus, identical supporting elements can be employed to attach different functional elements to the pane element. The proposal according to the invention can be applied to all existing configurations and components. With two modular components a large variety of functional devices can be installed on a full-glass front panel. Only the electronic Printed Control Board (PCB) needed to control the appliance, requires an appropriately shaped support because its shape may be largely different depending on the type of domestic appliance.

[0036] The assembly process can be improved because a parallel work is possible: During the fixation of the first part of the supporting element the mounting of the functional element and the second part of the supporting element can take place. Afterwards, both parts of the supporting element are clipped together. Thus, the revolution of the stages of assembly of the functional element is possible on a full-glass pane or plate. One component (part) is fixed on the glass, while the other part can be mounted in parallel; finally both parts are assembled e. g. by hand without the use of any special assembly devices.

[0037] The mentioned alignment means allow a quick and precise fixation of the first part of the supporting element at the glass pane.

[0038] The automation of the assembly process is relatively easy, so that the costs for assembly can be reduced due to the reduction of assembly time.

[0039] Furthermore, the proposed concept allows to use a relatively small hole in the glass pane and to completely cover the same by the actuator element (knob) . This leads to a pleasant aesthetic appearance. The first part of the supporting element has been developed in order to have a reference to the glass pane to get an optimal alignment between the actuator (knob) and the glass pane. The reference consists preferably in a protruding edge that fits into an opening formed on the glass panel. The edge remains contained in the glass thickness so as to be hardly visible.

[0040] So, since the proposed system is modular, i. e. suitable for all existing functional device configurations, and the support element to be siliconed has a reference for centering on the glass pane, the process of siliconing can be made by an automatic system, which significantly reduces the time of the assembly cycle.

[0041] So, a two- part supporting element is employed to fastening a functional element on the front of the full-glass pane. The first part of the supporting element is preferably siliconed to the glass pane and the second part is pre- assembled with the appropriate functional element. Then, the two part of the supporting element are removably fit together and retained on another pref-

erably by means of a snap- in fastening device.

[0042] In the drawings embodiments of the invention are depicted.

FIG 1 shows a perspective view of a domestic appliance, seen from the rear side and not completely assembled,

FIG 2 shows a front view onto a pane element of the domestic appliance,

FIG 3 shows the section A-A according to FIG 2,

FIG 4 shows the detail B according to FIG 3,

FIG 5 shows a perspective view of a functional element connected to a second part of a supporting element,

FIG 6 shows a perspective view the pane element seen from the rear side on which a first part of a supporting element is mounted,

FIG 7 shows the process of attaching a second part of the supporting element with a functional element to the first part of the supporting element,

FIG 8 shows the rear side of the pane element with the mounted functional element,

FIG 9 shows the rear side of the pane element with different functional element,

FIG 10 shows an alternative embodiment to FIG 9,

FIG 11 shows a further alternative embodiment to FIG 9,

FIG 12 shows the pane element from the front side with mounted functional elements but without actuators,

FIG 13 shows the detail A according to FIG 12,

FIG 14 shows a perspective view of the pane element with mounted functional element and

FIG 15 shows the front view of the appliance with completely mounted functional elements.

[0043] In FIG 1 a domestic appliance 1 being a domestic oven is shown. The appliance 1 has a frame structure 2. At the front side of the frame structure 2 a pane element 3 being a full-glass pane is arranged. The pane element 2 is presently mounted in such a manner that its perpendicular is horizontal. In FIG 1 the rear side of the pane element 3 can be seen. At said rear side of the pane element two functional elements 4 are fixed. The left functional element 4 is a thermostat, the right functional element 4 is a switch.

[0044] In FIG 2, 3, and 4 details of the construction can be seen. FIG 2 shows the front view onto the pane element 3. The full-glass pane has a flat surface. Only two actuators 9 being rotational knobs can be seen. In the section A-A of FIG 3 shown in FIG 4 it can be seen that each functional element 4 is carried by a supporting element 5, i. e. the connection between the functional element 4 and the pane element 2 is established by the supporting element 5. In FIG 3 it can also be seen that the pane element 2 has through-holes 6 for the passage of a shaft element 7 of the functional element 4 (see also the functional element 4 according to FIG 5). At the axial end of the shaft element 7 which is penetrating the pane element 3 the actuator (knob) 9 is fixed in a known manner.

[0045] That is, the functional element 4 is fixed to the pane element 3 by the supporting element 5. The supporting element 5 consists of a first part 5' and a second part 5" (see FIG 4, 5, 6, 7, and 8). The two parts 5', 5" of the supporting element 5 are removably connected. The first part 5' of the supporting element 5 is connected with the pane element 3 by means of an adhesive.

[0046] Referring to FIG 4 it can be seen that the first part 5' of the supporting element 5 has alignment means 8 which are designed as a protruding hollow-cylindrical edge which penetrates partially the pane element 3 when being mounted. That is, the first part 5' of the supporting element 5 is centered relatively to the pane element 3 when being glued by means of silicon in the position as shown in FIG 4.

[0047] The mounting sequence for mounting the functional element 4 onto the rear side of the pane element 3 becomes apparent from the three figures 6, 7 and 8:

In a first step - see FIG 6 - the first part 5' of the supporting element 5 is connected by means of silicone, i. e. by means of an adhesive, to the rear side of the pane element 3. By doing so, the alignment means 8, i. e. the protruding edge, is inserted into the hole 6, so that the desired position of the first part 5' relatively to the pane element 3 is given precisely.

[0048] The mentioned first step can be carried out while simultaneously the pane element 3 is mounted by itself onto the frame element 2 by means of an adhesive. For doing so, the pane element 3 and/or the frame element 2 is supplied in the contact area between the pane element 3 and the frame element 2 (see FIG 3) with an adhesive, preferably silicone, and pressed into the required position.

[0049] Simultaneously to this process a pre-assembly of the second part 5" and the functional element 4 is carried out: The second part 5" of the supporting element 5 and the functional element 4 are connected to another.

This is done in the present embodiment by means of a screw connection as shown in FIG 5 where screws are indicated with reference 11. It can be understood that the second part 5" of the supporting element 5 and the functional element 4 may be connected one to the other through a snap-in connection (details not shown, but well known in the art, see above mentioned citations). In FIG 7 it can be seen that the premounted unit consisting of the second part 5" and the functional element 4 is brought to the pane element 3, which bears the first part 5' of the supporting element 5.

[0050] Now, in a second step, the unit consisting of the second part 5" and the functional element 4 is pressed horizontally onto the first part 5'. A snap connection- see hooks 10 in FIG 6- allows a secure but removable connection between the two parts 5' and 5" of the supporting element 5. After snap- in of the second part 5" in the first part 5' the assembly of the functional element 4 is terminated.

[0051] As can be seen from the mounting sequence, it is quite easy to employ an automatic mounting system. Thus, the assembly of the appliance becomes insofar possible in a cost-efficient manner.

[0052] In FIG 9, 10, and 11 it is illustrated that the parts 5', 5" of the supporting element 5 are designed in a modular way. By this it becomes possible to mount different functional elements 4 onto the pane element 3 using basically the same supporting element. More specifically, the first part 5' of the supporting element 5 is always the same and is combined with a respective second part 5" which is designed in such a manner that a specific functional element 4 can be securely supported. The portion of the supporting element second part 5" that engages the first part 5' is the same for all parts 5" supporting different functional elements 4.

[0053] After the described mounting of the functional element 4 onto the rear side of the pane element 3 the shaft element 7 of the functional element 4 is penetrating the hole 6 of the pane element 3 as depicted in FIG 12 and FIG 13. An actuator 9 is now mounted onto the axial end of the shaft element 7 as shown in FIG 14.

[0054] Consequently, a pleasant appearance of the domestic appliance 1 is obtained as can be seen in FIG 15. The actuator, i.e. the rotational knob covers completely the hole 6 in the pane element 3, thereby enhancing the aesthetic effect of the front side of the appliance 1, and protects the functional elements from dirt.

List of reference numerals

[0055]

1 Appliance (domestic appliance)
2 Frame structure
3 Pane element
4 Functional element
5 Supporting element
5' First part of the supporting element
5" Second part of the supporting element
6 Hole
7 Shaft element
8 Alignment means
9 Actuator element
10 Hook
11 Screw

Claims

1. Appliance (1), especially domestic appliance, comprising a frame structure (2), a pane element (3) fixed to the frame structure (2) and at least one functional element (4), which functional element (4) is connected with the pane element (3),
characterized in
that the functional element (4) is fixed to the pane element (3) by a supporting element (5), wherein the supporting element (5) consists of at least a first part (5') and a second part (5"), wherein the two parts (5', 5") of the supporting element (5) are removably connected, wherein the first part (5') of the supporting element (5) is connected with the pane element (3) by means of an adhesive.

2. Appliance according claim 1, **characterized in that** the functional element (4) and the second part (5") of the supporting element (5) are removably connected.

3. Appliance according claim 1 or 2, **characterized in that** the connection between the at least two parts (5', 5") of the supporting element (5) is a snap connection.

4. Appliance according claim 2 or 3, **characterized in that** the connection between the functional element (4) and the second part (5") of the supporting element (5) is a screw or a snap connection.

5. Appliance according to one of claims 1 to 4, **characterized in that** the pane element (3) has at least one hole (6), preferably with a circular shape, for the passage of a shaft element (7) of the functional element (4), wherein the first part (5') of the supporting element (5) is equipped with alignment means (8) for aligning the first part (5') relatively to the hole (6).

6. Appliance according to claim 5, **characterized in that** the alignment means (8) comprise a protruding edge which penetrates at least partially the pane element (3).

7. Appliance according to claim 6, **characterized in that** the protruding edge (8) penetrates the pane element (3) only partially.

8. Appliance according to one of claims 5 to 7, **characterized in that** an actuator element (9), preferably a rotatable knob, is fixed at the end of the shaft element (7) of the functional element (4), wherein the actuator element (9) covers completely the hole (6) in the pane element (3).

9. Appliance according to one of claims 1 to 8, **characterized in that** the first part (5') of the supporting element (5) is connected with the pane element (3) by means of silicone.

10. Appliance according to one of claims 1 to 9, **characterized in that** the pane element (3) is a glass pane.

11. Appliance according to one of claims 1 to 10, **characterized in that** the pane element (3) is connected with the frame structure (2) by means of an adhesive.

12. Appliance according to one of claims 1 to 11, **characterized in that** the second part (5") of the supporting element (5) is formed as a modular element and designed to be connected with a plurality of different functional elements (4).

13. Method of mounting of an appliance (1), especially of a domestic appliance, comprising a frame structure (2), a pane element (3) and at least one functional element (4), **characterized in that** the method comprises the steps of:

    a) Connecting of a first part (5') of a supporting element (5) with a surface of the pane element (3) by means of an adhesive;
    b) Connecting of the functional element (4) with a second part (5") of the supporting element (5);
    c) Removably attaching the second part (5") of the supporting element (5) with the first part (5') of the supporting element (5).

14. Method according to claim 13, **characterized in that** the pane element (3) is connected with the frame structure (2) by means of an adhesive, wherein this connection process is carried out preferably simultaneously with step a) of claim 13.

15. Method according to claim 13 or 14, **characterized in that** step a) of claim 13 and step b) of claim 13 are carried out simultaneously, at least one of said step a), b) being preferably carried out by an automatic manipulator.

FIG 1

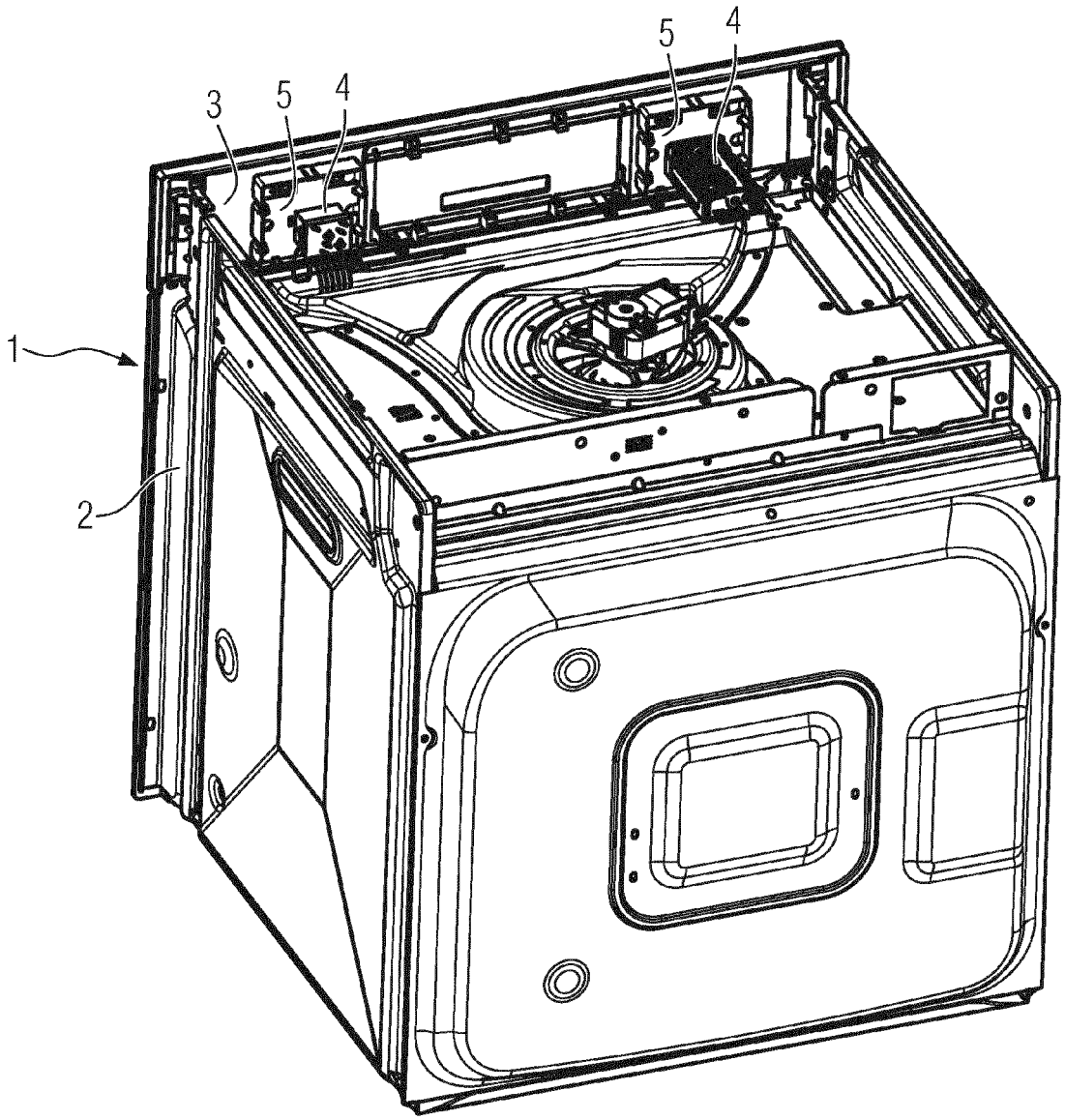


FIG 2

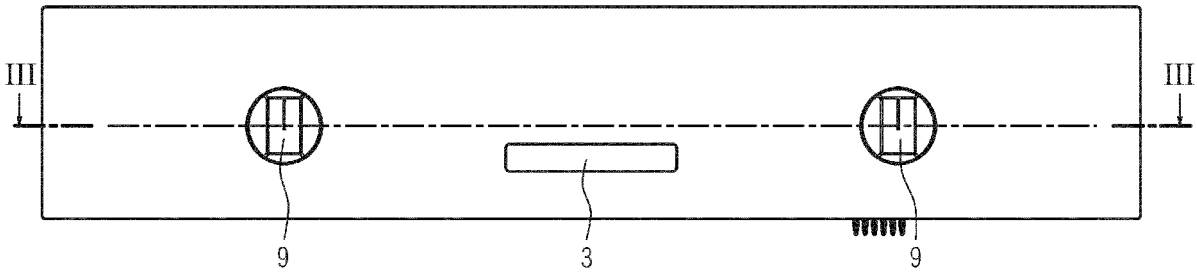


FIG 3

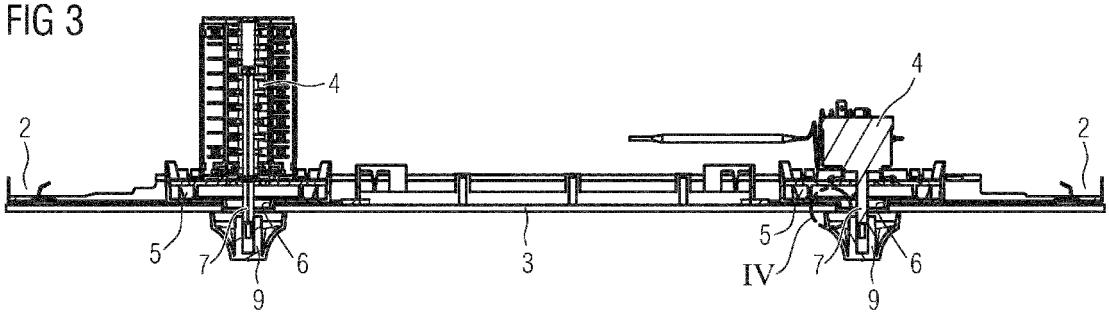


FIG 4

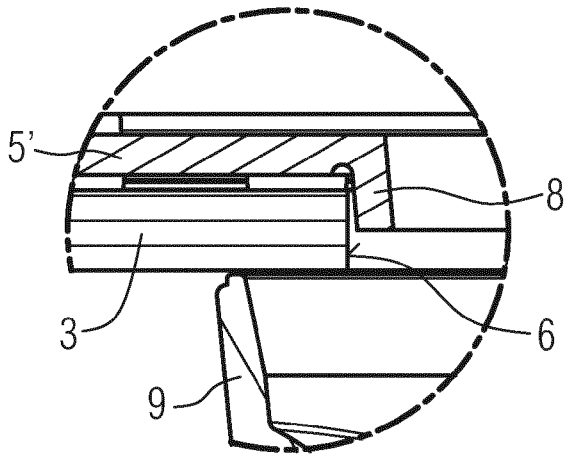


FIG 5

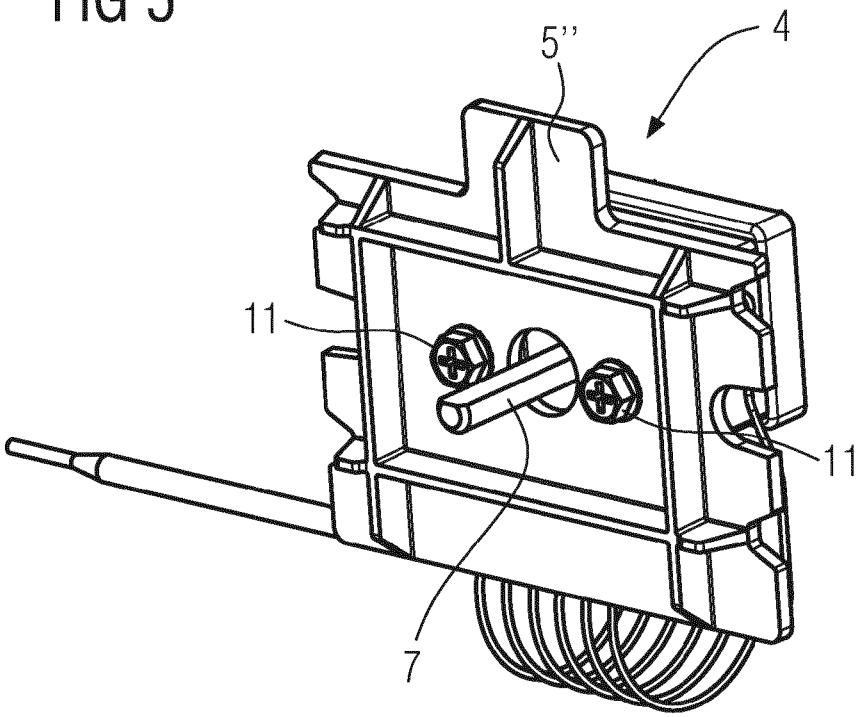


FIG 6

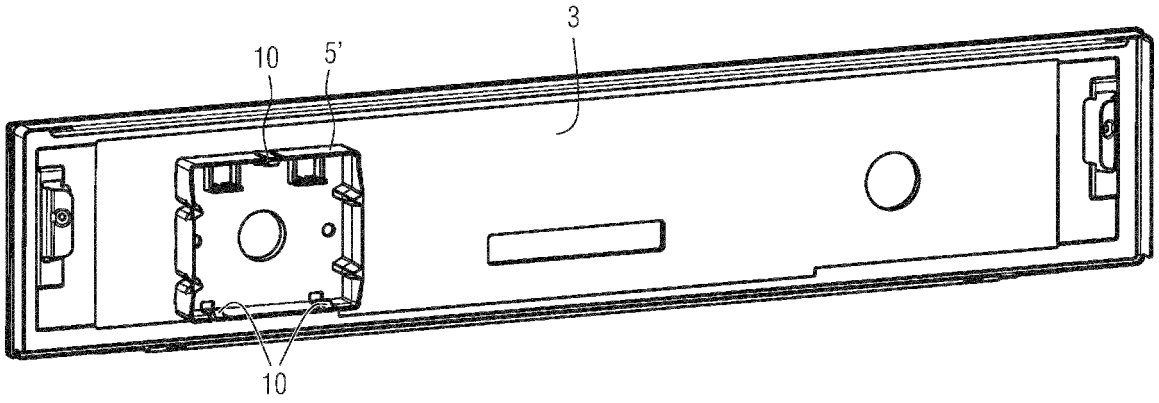


FIG 7

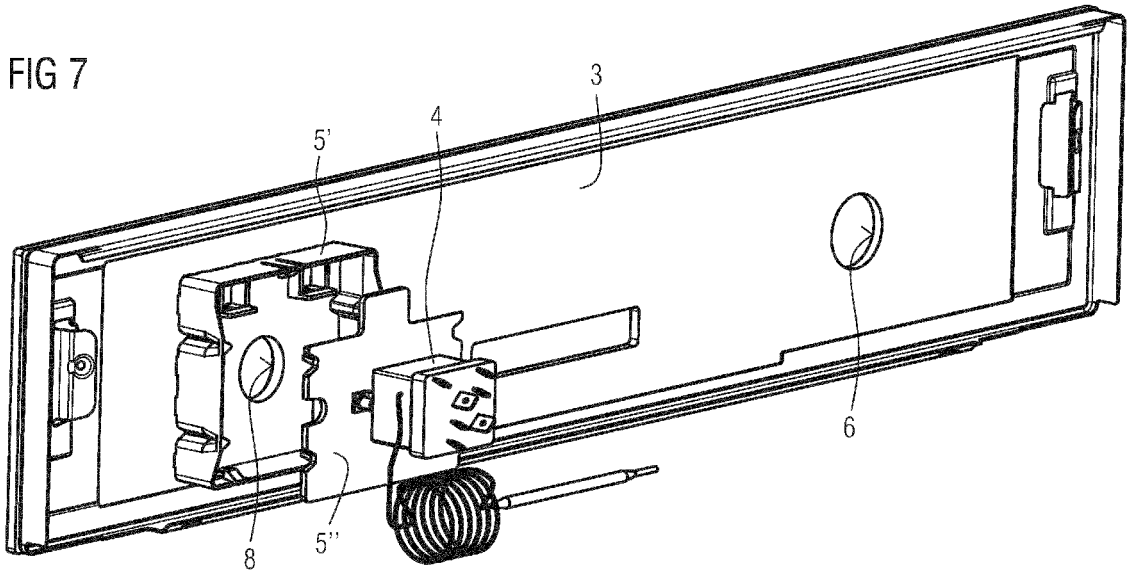


FIG 8

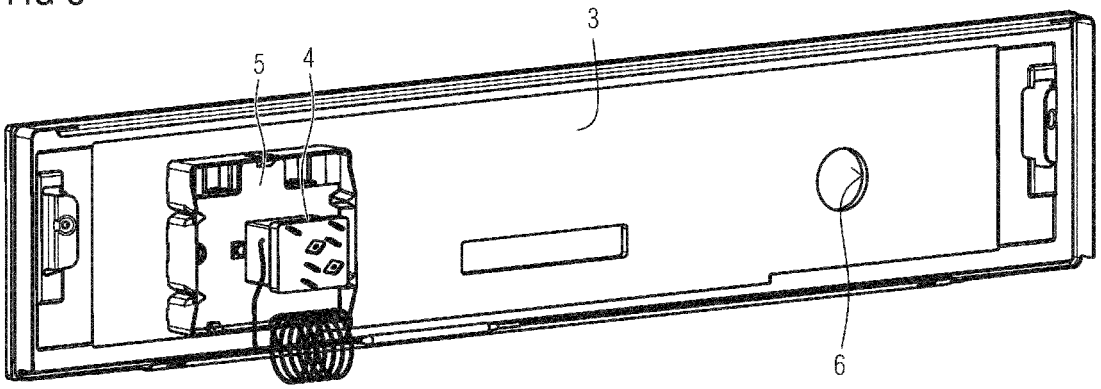


FIG 9

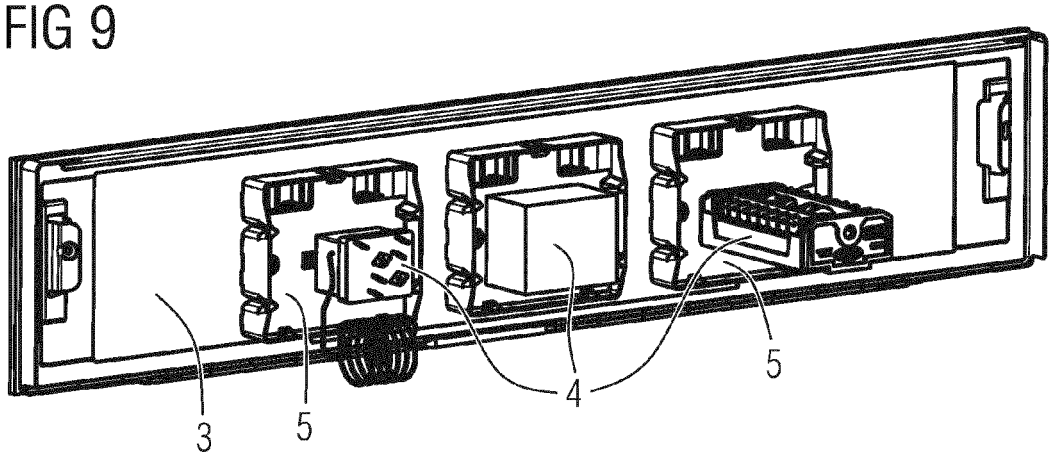


FIG 10

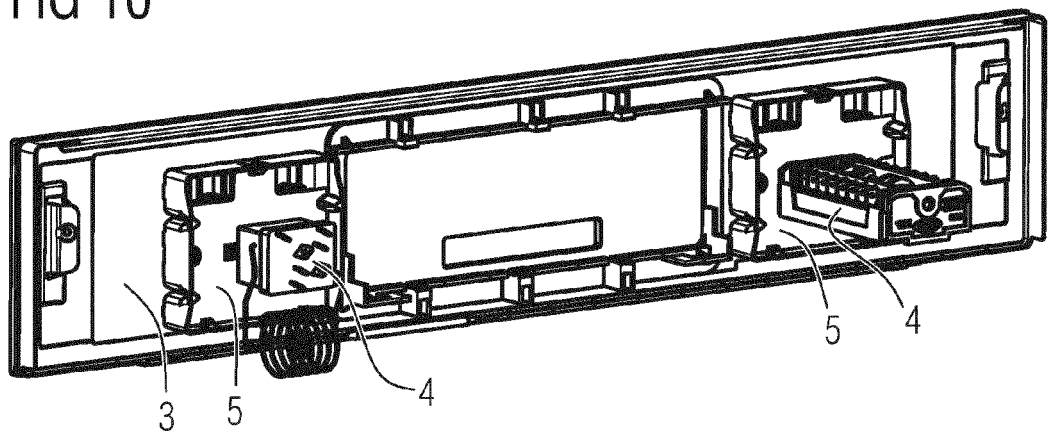


FIG 11

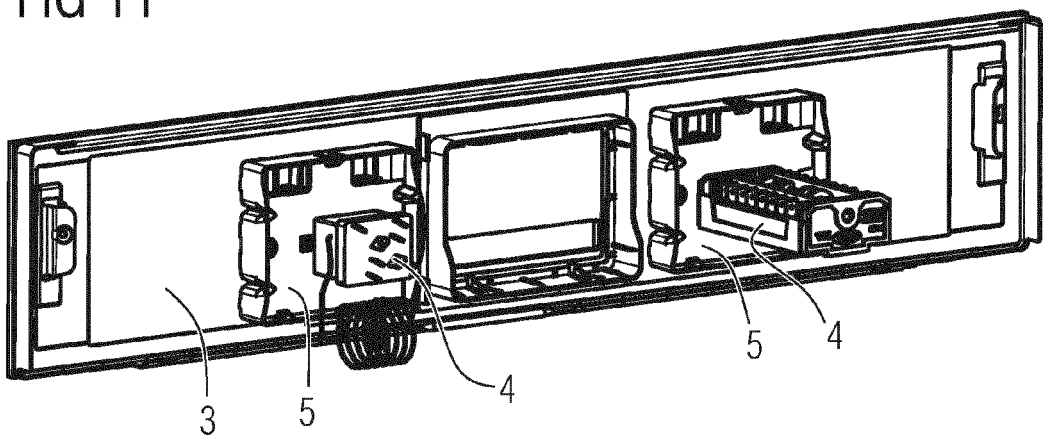


FIG 12

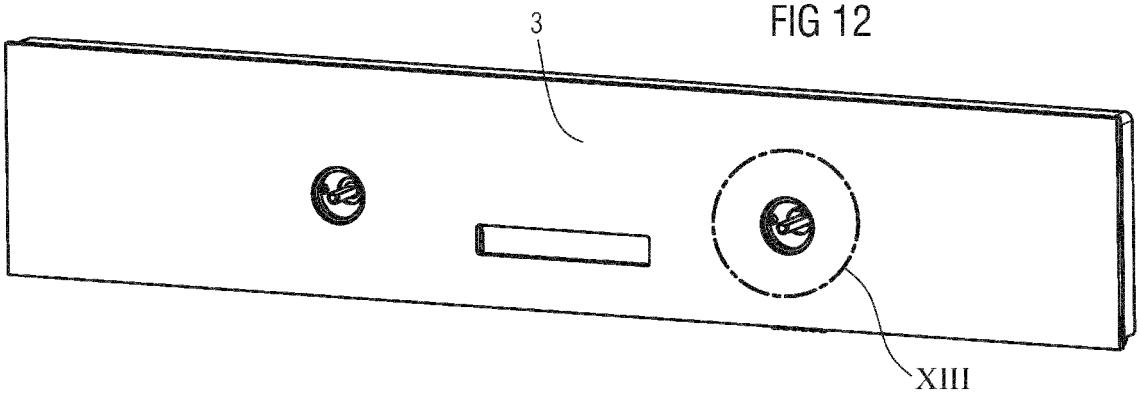


FIG 13

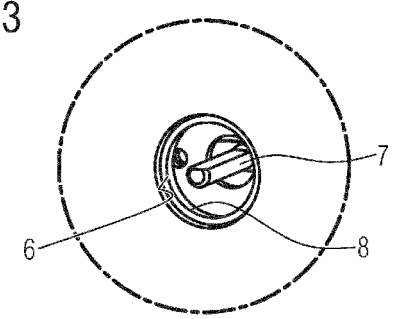


FIG 14

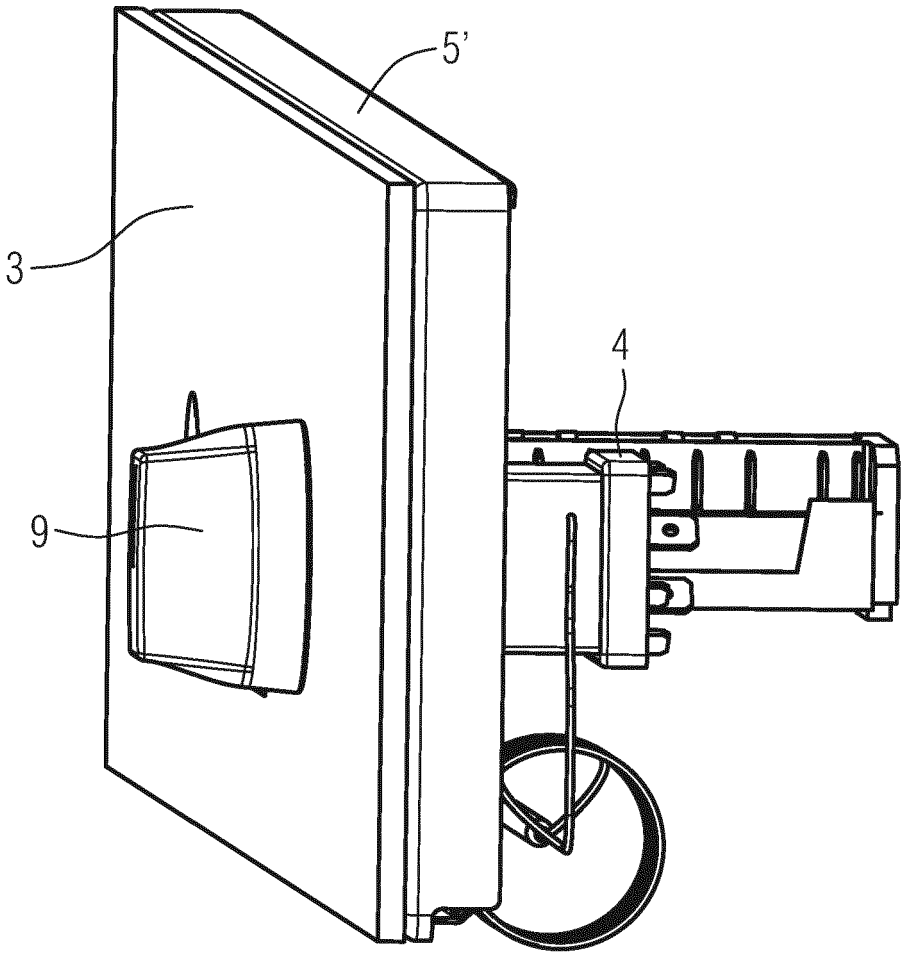
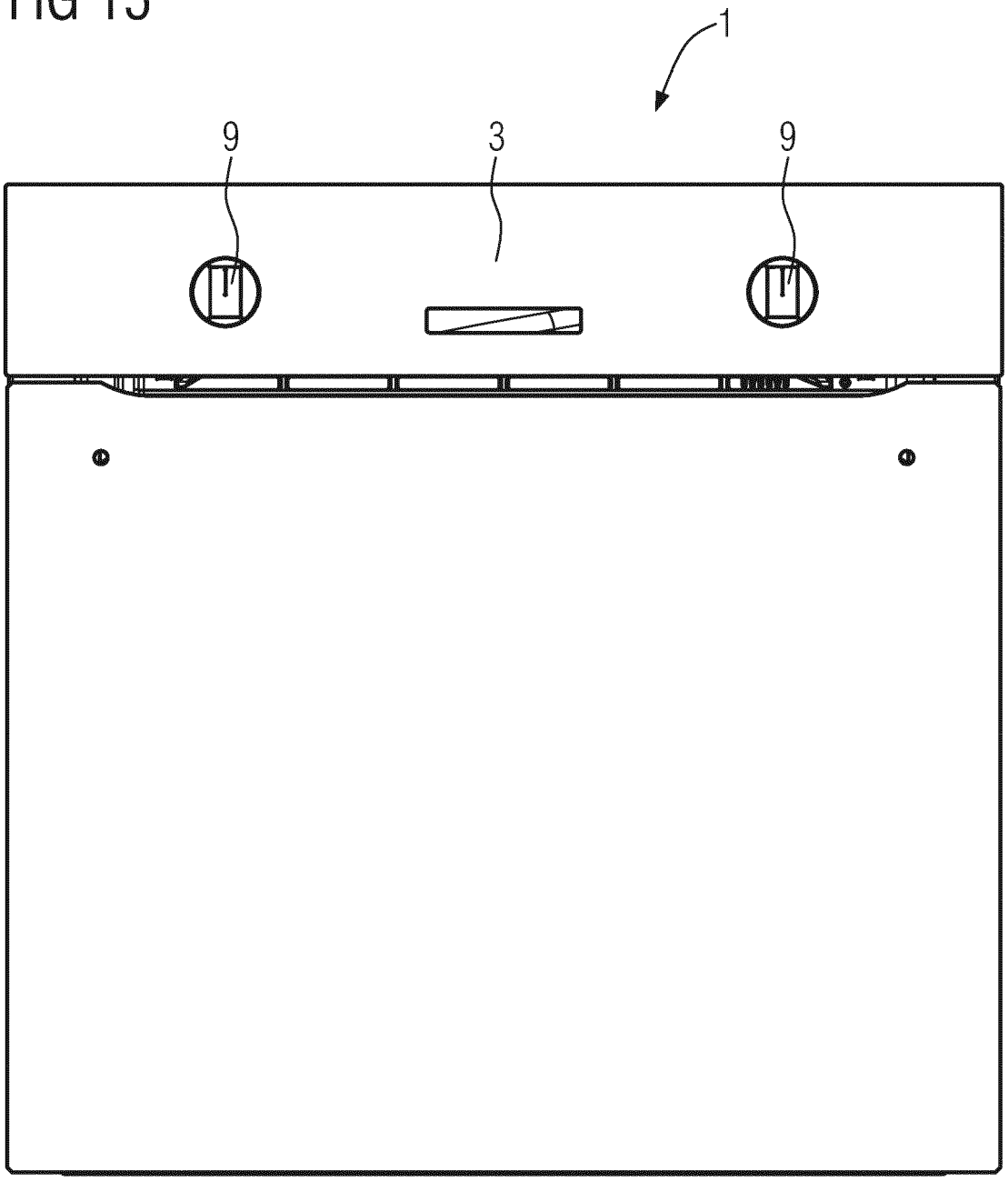


FIG 15



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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 4180

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,D Y	EP 2 390 577 A1 (ELECTROLUX HOME PROD CORP [BE]) 30 November 2011 (2011-11-30) * the whole document *	1-5,8, 10-15 6,7,9	INV. F24C7/08
Y,D	DE 88 03 219 U1 (LICENTIA GMBH [DE]) 6 April 1989 (1989-04-06) * figures 1,2 *	6,7	
Y,D	EP 2 390 403 A1 (ELECTROLUX HOME PROD CORP [BE]) 30 November 2011 (2011-11-30) * paragraph [0055] *	9	
A,D	EP 1 962 020 A1 (ELECTROLUX HOME PROD CORP [BE]) 27 August 2008 (2008-08-27) * the whole document *	1,13	

TECHNICAL FIELDS SEARCHED (IPC)
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 August 2012	Rodriguez, Alexander

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 4180

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15-08-2012

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