



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.09.2010 Bulletin 2010/36

(51) Int Cl.:
A47L 15/42 (2006.01)

(21) Application number: **09154372.8**

(22) Date of filing: **05.03.2009**

(84) Designated Contracting States:
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 SE SI SK TR
Designated Extension States:
AL BA RS

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(54) **Connection apparatus for dishwasher doors**

(57) A connection apparatus (A) for mounting hinged doors on dishwashers (1) comprises a mounting arm (2) to which the door is connected, a bearing part (4) and a fixation element (5) which connects said bearing part (4) and said mounting arm (2) together. The mounting arm (2) contains a channel (23), extending from the side of the arm (2) to the interior, with one end open and with

the opposite bottom part (24) having the form of a semicircle. A projection (41) on the bearing part (4) is introduced into the channel (23) of the mounting arm (2), and the side of the projection (41) facing the bottom part (24) of the channel (23) is provided with a leaning surface (42) of a semicircle form. A cylindrical door pin (3) of the dishwasher (1) is borne between said bottom part (24) and said leaning surface (42).

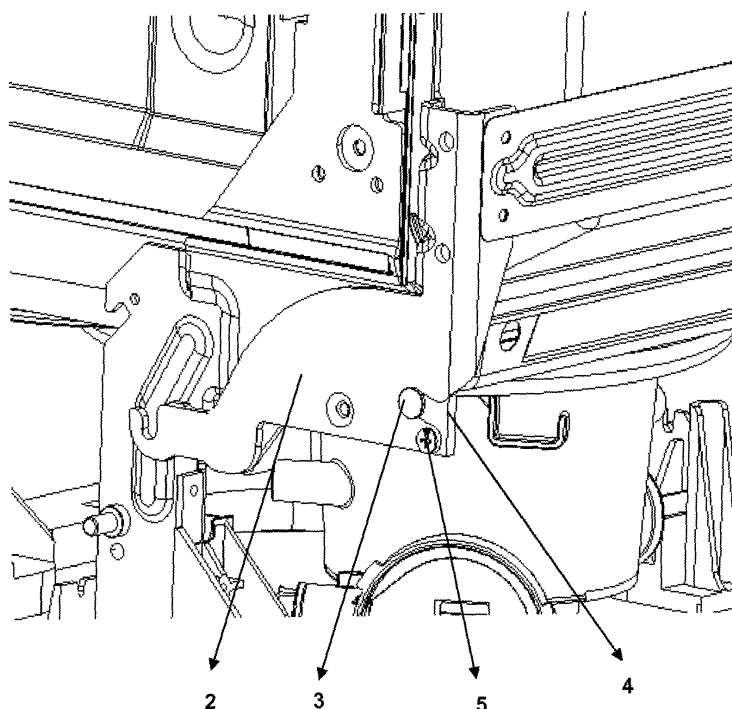


FIGURE – 2

Description

Technical Field

[0001] The present invention relates to door connection apparatuses used for mounting hinged doors in dishwashers.

Prior Art

[0002] Dishwashers widely used nowadays are front-loaded white goods equipped with hinged door systems. In such type of machines, in which kitchen utensils to be cleaned are placed in lower and upper dish racks disposed in the machine, the door situated at the front side of machine is sized so as to completely expose the front of the washing compartment with respect to placing and removing the kitchen utensils. These doors rotate around a single axis by means of a hinge mechanism and this axis is parallel to the ground. When the door is completely opened, it comes parallel to the ground and the lower dish rack is pulled and brought over the door for placing/removing kitchen utensils. Therefore the doors of dishwashers sustain the weight of filled lower dish racks.

[0003] Additionally, dishwasher doors are frequently opened and closed within a day, since they are used frequently. Therefore, the hinge mechanisms of doors become subjected to loads and resultantly to wearing-out. The complex structures of hinge mechanisms in turn bring about difficulties with respect to assembly and service.

[0004] Another problem encountered in said hinge mechanisms are the loosening, which occurs in time, and the running clearances, which occur on moving components. These clearances cause the dishwasher door to close incompletely, so that water leaks out of dishwasher as the latter is in operation.

[0005] There have been various improvement efforts made for door hinge mechanisms of dishwashers according to the prior art. The published patent application DE10259065 may be referred to as a relevant example. In the embodiment according to this application is disclosed a connection apparatus for mounting the dishwasher door and the connection of this apparatus to the door pin. For this purpose, a slot is formed on one side of the connection apparatus, wherein this slot is placed a bearing bush. The door is mounted to said apparatus and this apparatus is attached to the door pin by means of the bearing bush.

[0006] An open slot is provided at one side of the bearing bush described in DE10259065, so that the assembly is made by introducing the door pin into the slot. While the bearing bush is placed on the pin, the spring arms in said slot are flexed, such that the pin is settled into the slot fully. While in this position, the spring arms are released from the pin and restored, and prevent the removal of the pin from the slot. In this connection manner, however, the pin may exert pressure on spring arms in

a counter direction and the spring arms may become flexed back, resulting in a running clearance between the pin and the bearing bush that is larger than the normal running clearance. This is an unwanted case for mounting the door. Additionally, due to the structure of the bearing bush, it may not provide full surface contact with the pin.

Brief Description of Invention

[0007] The subject door connection apparatus is likewise developed for mounting hinged doors in dishwashers. Said apparatus comprises a mounting arm on which the door is connected, a bearing part, and a fixation element which connects these two parts together. The mounting arm contains a channel, extending from the side of the arm to the interior, with one end open, and the opposite bottom part having the form of a semicircle. A projection on the bearing part is introduced into the channel at the mounting arm, and the side of projection facing the bottom part of the channel, is provided with a leaning surface with a semicircle form. The cylindrical door pin of the dishwasher is supported between said bottom part and the leaning surface.

[0008] When the bearing part is attached to the mounting arm, the bottom part with the semicircle form and the leaning surface come together, resulting in a full-circle gap. This gap is the gap where the door pin is disposed. Bearing the door pin in said full-circle gap provides full surface contact between the door pin and the door connection apparatus. In other words, the door pin becomes born within a uniform surface.

Objective of Invention

[0009] The objective of the present invention is to provide a connection apparatus to be used for mounting the doors of dishwashers to the latter.

[0010] Another objective of the present invention is to ensure the placement of the door connection apparatus to the door pin in a rapid and practical manner.

[0011] A further objective of the present invention is to form a structure to provide full surface contact between the door pin and the connection apparatus.

[0012] Still a further objective of the present invention is to form an inexpensive, reliable, and robust structure for connecting the door connection apparatus to the door pin.

Description of Figures

[0013] An exemplary dishwasher according to the present invention and the respective exemplary door connection apparatus are illustrated in annexed figures briefly described hereunder.

Figure 1 is a side view of the interior of an exemplary dishwasher.

Figure 2 is a perspective view of the dishwasher door connection apparatus in a mounted form.

Figure 3 is a perspective view of the dishwasher door connection apparatus prior to being mounted to the dishwasher.

[0014] The parts in said figures are individually enumerated as following:

Door connection apparatus (A)
Dishwasher (1)
Door placement region (1a)
Mounting arm (2)
Door pin (3)
Bearing part (4)
Fixation element (5)
End of the mounting arm (21, 22)
Channel (23)
Bottom part (24)
Side surface (25)
Orifice (26)
Surface (40)
Projection (41)
Leaning surface (42)
Orifice (46)

Description of Invention

[0015] Figure 1 illustrates the side view of the interior of an exemplary dishwasher (1). As is known, the dishwasher's door (not illustrated in figures) is placed onto the placement region (1a) at the front of the dishwasher (1). At the lower part of the door is disposed the door connection apparatus (A) according to the present invention. Said door connection apparatus (A) is developed for mounting the hinged doors in/of dishwasher. (The apparatus (A) is used in both ends of the dishwasher door for providing the door with a balanced movement.)

[0016] In figures 2 and 3 are given perspective illustrations of the connection apparatus (A), in mounted form and prior to mounting, respectively. The door connection apparatus (A) comprises a mounting arm (2), a bearing part (4), and a fixation element (5). Said mounting arm (2) has a plate-shaped structure, with one end (21) used for connecting the dishwasher door directly, and the other end (22) used for coupling a mechanism which prevents the door from falling down (this mechanism, which is usually equipped with a spring, is not illustrated in figures).

[0017] At the edge of the mounting arm (2) is provided a channel (23), extending from outside to the interior, with one end open, and the opposite bottom part (24) having the form of a semicircle. The channel (23) is formed so that the cylindrically-structured door pin (3) is passed through it (23). When the door pin (3) rests against the bottom part (24) of the channel (23), the pin (3) and the mounting arm (2) become relatively rotating in each other. This rotation motion is required for opening

and closing the door coupled to the arm (2). The door pin (3) is fixed in the machine body, whereas the central axis of the cylindrical pin (3) constitutes the rotational axis of both the mounting arm (2) and the door.

[0018] As for the bearing part (4), it is used for preventing the removal or dislocation of the mounting arm (2) over the door pin (3) and for bearing the door pin (3) together with the mounting arm (2). The bearing part (4) in turn has a plate-shaped structure, with one surface (40) leaning against the side surface of the mounting arm (2) (against the surface, which is opposite to the side surface (25) illustrated in Figure 3). The bearing part (4) is provided with a projection (41), extending out of said surface (40) thereof, this projection (41) becoming introduced into the channel (23) in the mounting arm (2).

[0019] The projection (41) is introduced to perform only linear movement within the channel (23) and closes the channel. For this reason, the bearing element (4) and the mounting arm (2) are prevented from making rotation motion relative to each other. At the side of the projection (41) that faces the bottom part (24) of the channel (23) is in turn formed a leaning surface (42) with a semicircle form. When the bearing part (4) is attached to the mounting arm (2), the bottom part (24) with the semicircle form and the leaning surface (42) come together, resulting in a full-circle gap. This gap is the gap where the door pin (3) is disposed. Bearing the door pin (3) in said full-circle gap provides full surface contact between the door pin (3) and the door connection apparatus (A). In other words, the door pin (3) becomes born within a uniform surface.

[0020] As referred to *supra*, once the mounting arm (2) is attached to the door pin (3), the bearing part (4) is attached to the mounting arm (2), such that the removal of arm (2) from the pin (3) is prevented. This structure is also used for bearing the door pin (3). For fixing the bearing part (4) to the mounting arm (2), one orifice (26, 46) is provided on each of both parts (2, 4), these orifices (26, 46) becoming coaxial when the parts (2, 4) are attached to each other. Both parts (2, 4) are fixed to each other by introducing into these orifices (26, 46) a fixation element (5), such as a screw, rivet, or other standard fixation elements. Screws or rivets are preferably used with respect to convenience of assembly.

Claims

1. A door connection apparatus (A) for dishwashers; **characterized by comprising**

- a plate-shaped mounting arm (2), onto which the dishwasher door is coupled, said mounting arm containing a channel (23), extending from one edge of the mounting arm into its interior, with one end open, and the opposite bottom part (24) having the form of a semicircle;
- a plate-shaped bearing part (4), with a surface

- (40) leaning against a side surface of the mounting arm (2); a projection (41) extending outward from this surface (40) being introduced into the channel (23) at the mounting arm (2); said projection (41) being provided with a semicircular leaning surface (42) at the side thereof facing the bottom part (24) of the channel (23);
- and a fixation element (5) connecting the mounting arm (2) and bearing part (4) together, and in that the cylindrical door pin (3) of the dishwasher is born or supported between the bottom part (24) and the leaning surface (42). 5
2. A door connection apparatus (A) according to Claim 1, **characterized in that** the door pin (3) is born or supported in a full circular gap left between the bottom part (24) and the leaning surface (42). 10 15
3. A door connection apparatus (A) according to Claim 1, **characterized in that** one orifice (26, 46) is provided on each of the mounting arm (2) and bearing element (4), said orifices (26, 46) becoming coaxial when these parts (2, 4) are attached to each other. 20
4. A door connection apparatus (A) according to Claim 3, **characterized in that** the fixation element (5) is attached to said orifices (26, 46). 25
5. A door connection apparatus (A) according to Claim 1, **characterized in that** the dishwasher door is connected directly to one end (21) of the mounting arm (2). 30
6. A door connection apparatus (A) according to Claim 1, **characterized in that** a mechanism, which prevents the dishwasher door from falling down, is attached to the other end (22) of the mounting arm (2). 35
7. A door connection apparatus (A) according to Claim 1, **characterized in that** the projection (41) is introduced into the channel (23) so as to make linear motion only. 40

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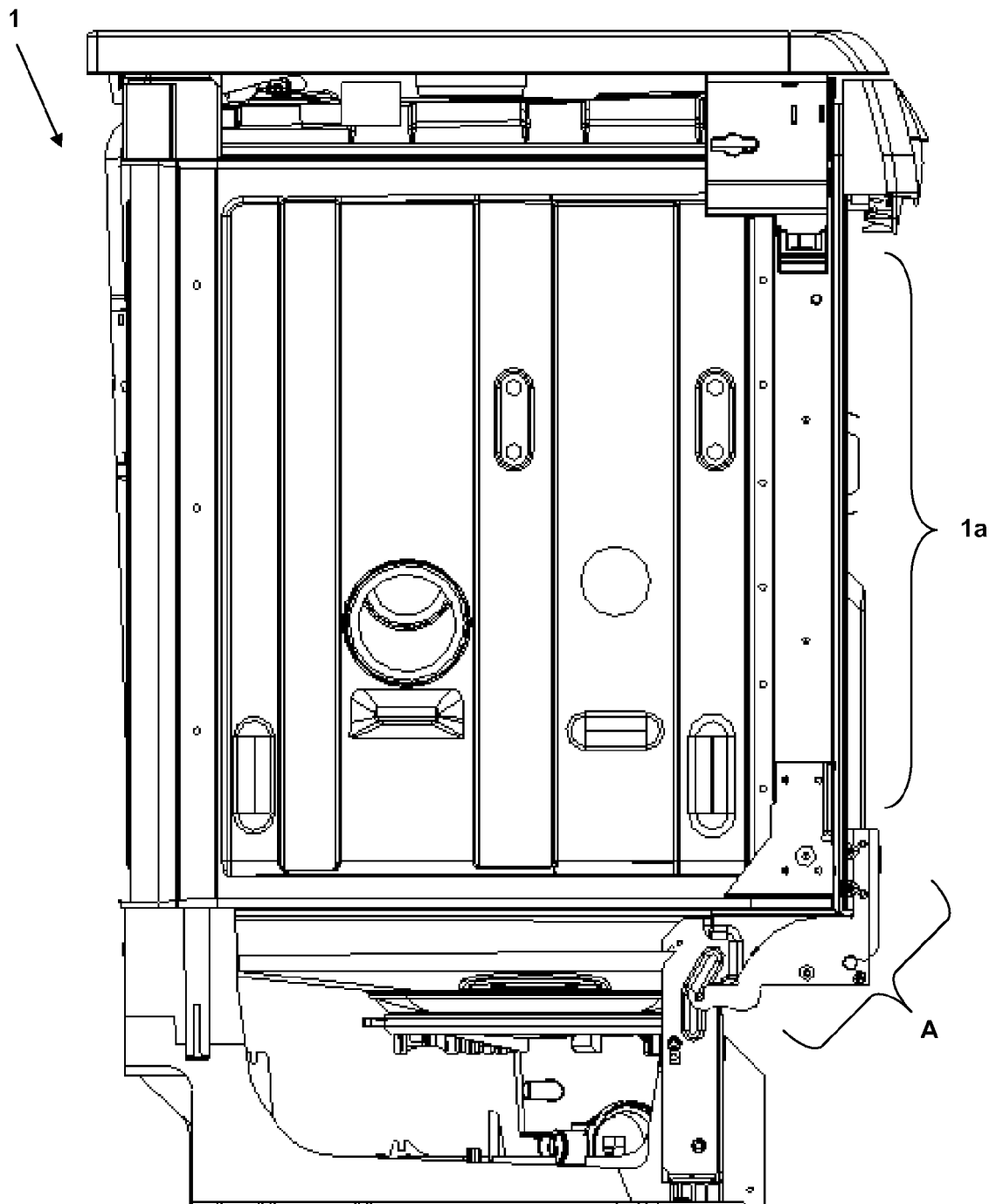


FIGURE - 1

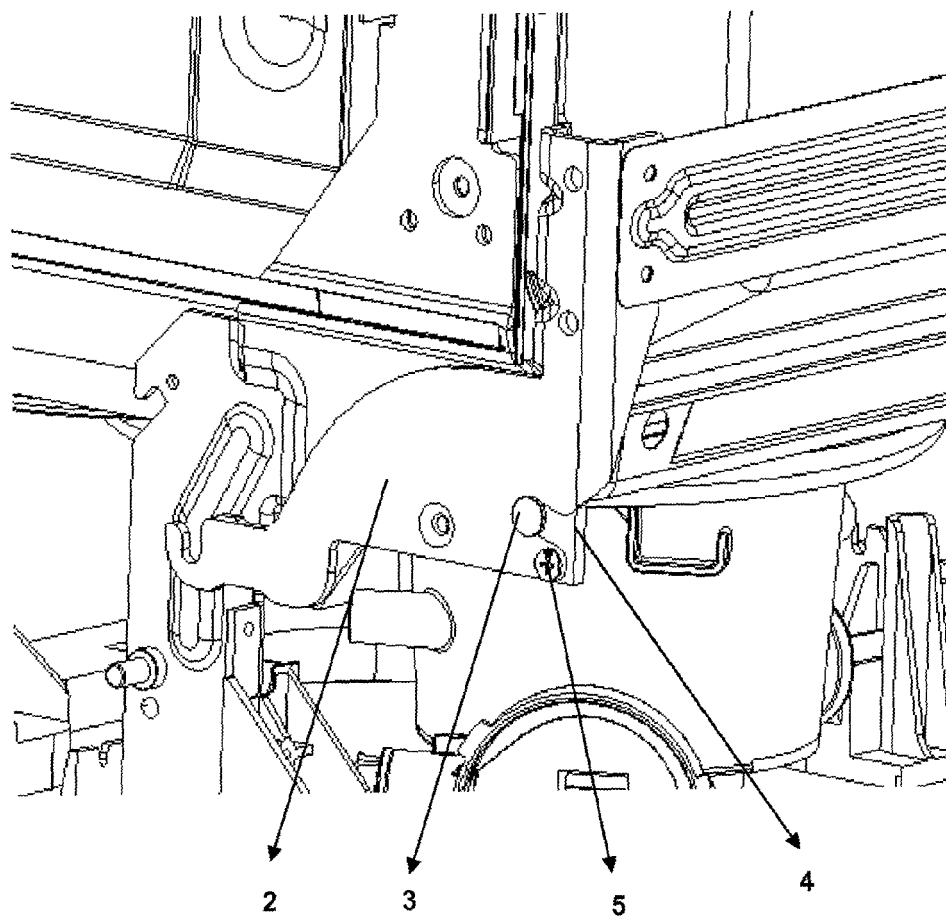


FIGURE - 2

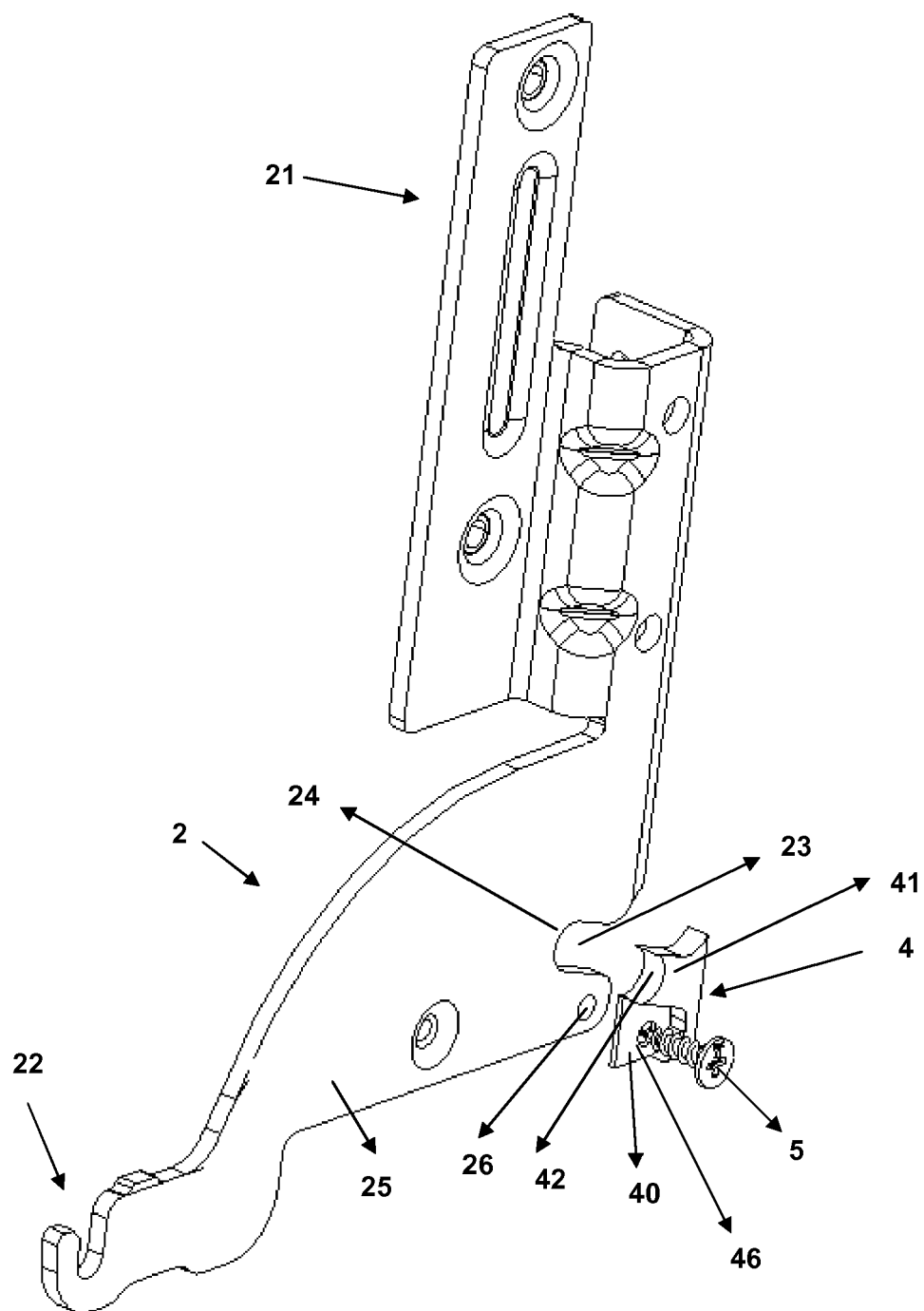


FIGURE - 3



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 4372

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	DE 296 21 599 U1 (BOSCH SIEMENS HAUSGERAETE [DE]) 27 February 1997 (1997-02-27) * the whole document *	1,2,5-7	INV. A47L15/42
D,A	DE 102 59 065 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 1 July 2004 (2004-07-01) * abstract * * figures 1,3 *	1,5-7	
A	WO 2007/097577 A (LG ELECTRONICS INC [KR]; SHIN GAP SU [KR]; KIM YONG HYUN [KR]) 30 August 2007 (2007-08-30) * abstract * * figures 3-7,9,10 *	1,5,6	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 July 2009	Examiner Baumgärtner, Ruth
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			

2

EPO FORM 1503 03-02 (P04C01)

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

EP 09 15 4372

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
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17-07-2009

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DE 29621599	U1	27-02-1997	NONE	
DE 10259065	A1	01-07-2004	NONE	
WO 2007097577	A	30-08-2007	DE 112007000423 T5	27-11-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 10259065 [0005] [0006]