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

(11) **EP 3 841 947 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.06.2021 Bulletin 2021/26

(51) Int Cl.:
A47L 15/42 *(2006.01)* *A47L 15/48* *(2006.01)*

(21) Application number: **20210347.9**

(22) Date of filing: **27.11.2020**

(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
KH MA MD TN

(30) Priority: **25.12.2019 TR 201921412**

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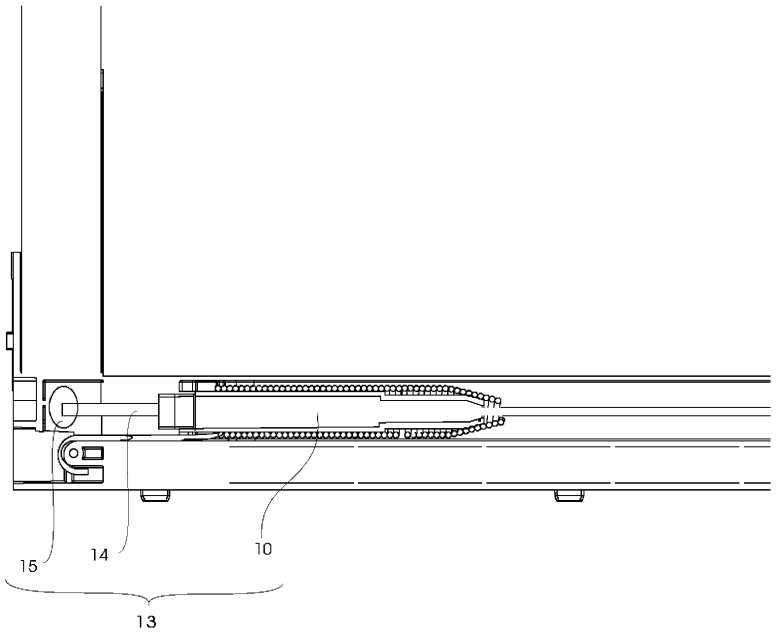
(54) **A DISHWASHER COMPRISING AN AUTOMATIC DOOR OPENING MECHANISM**

(57) The present invention relates to a dishwasher (1) comprising a body (2); a washing tub (3) which is provided in the body (2) and wherein the washing process is performed; a door (4) which enables the washing tub (3) to be isolated from the outer environment and which is opened downwards by rotating around the horizontal axis; a locking mechanism (5) which enables the door (4) to be locked onto the body (2); a control unit (6) which enables the door (4) to be pushed and opened partially upon the completion of the washing and drying processes such that there is a gap between the door (4) and the body (2); a hinge (7) which enables the door (4) to be movably connected onto the body (2); a hinge arm (8) which extends from the door (4) towards the lower section of the washing tub (3); and at least one spool (9) which is provided under the hinge arm (8).

Figure 3



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Description

[0001] The present invention relates to a dishwasher comprising an automatic door opening mechanism.

[0002] In dishwashers, the drying process is performed after the washing process. In some embodiments, upon the completion of the washing and drying processes, the door of the dishwasher can be partially opened automatically, the hot vapor therein is discharged to the outer environment and the washed items are enabled to dry faster. In dishwashers wherein the door is partially opened automatically at the end of the washing and drying processes, applying lower temperatures in the drying process is sufficient and thus, energy is saved. Opening of the dishwasher door automatically, furthermore, prevents the vapor getting cold from condensing and leaving stains on the washed items. In the state of the art, in order for the door to open automatically, door opening mechanisms are used, which extend from the body towards the door and which enable the door to be partially opened by pushing the door with the activation of devices such as solenoid or electric motor. However, in order to effectively discharge the steam in the dishwasher, only the opening of the door is not sufficient, and a certain gap must remain between the door and the body to enable discharging of the steam outside.

[0003] In the state of the art European Patent No. EP1909631, a spring which balances the weight of the door by applying a force on the door of the dishwasher and an adjustment mechanism which adjusts the tension of the spring are disclosed.

[0004] The aim of the present invention is the realization of a dishwasher comprising a door opening mechanism which enable the door thereof to be partially opened automatically and enable the same to stay open for a predetermined time period.

[0005] The dishwasher realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a body; a washing tub which is provided on the body; a door which enables the washing tub to be isolated from the outer environment; a locking mechanism which enables the door to be locked on the body; a control unit which enables the door to be partially opened upon the completion of the washing and drying processes; a hinge which enables the door to be connected to the body; a hinge arm connected to the hinge; and at least one spool provided under the hinge arm. The kitchen items to be washed are placed into the washing tub. The door is closed such that the washing tub is isolated from the outer environment and the washing process is enabled to be performed. By means of the locking mechanism provided on the door, the door is fixed onto the body. By opening the door partially upon the completion of the main washing and drying steps, the humidity in the washing tub is enabled to be discharged. Thus, the drying process is performed more effectively. Furthermore, energy saving is provided. Upon the completion of the main washing and drying steps, the locking mechanism is triggered by means of the control unit such that the door is enabled to be opened partially. The door is connected onto the body by means of a hinge via the lower edge thereof. The door opens by rotating around the horizontal axis as connected to the body via the lower edge thereof, and the upper edge thereof moves away from the body.

[0006] The dishwasher of the present invention comprises a movement mechanism having a transmission member which extends so as to be connected to the hinge arm and which is connected to the movement member by passing through the spool, and an actuation member which is provided between the movement member and the body. Said actuation member, by means of its variable length, enables the door to be opened and closed. The length of the actuation member can be adjusted by the user or can be changed automatically by means of the control unit.

[0007] In an embodiment of the present invention, the dishwasher comprises a thermal actuation member. The length of the actuation member increases as the temperature of the washing tub rises above a predetermined temperature value saved into the control unit by the producer, and decreases as the temperature of the washing tub drops below said predetermined temperature. Thereby, the door is enabled to be opened in the drying step wherein the temperature is high and the vapor in the washing tub is enabled to be discharged. When the temperature of the washing tub decreases as a result of the ambient temperature, the actuation member shortens and the door is closed. Thus, the microorganisms in the environment are prevented from accumulating on the kitchen items.

[0008] In an embodiment of the present invention, the dishwasher comprises a shaft which is connected to the body at one end and to the actuation member at the other end, a motor which enables the power to be transmitted to the shaft, and the control unit which controls the movement of the actuation member. Upon the completion of the drying step, the motor is activated by the control unit and the shaft is enabled to move forward. Thus, the actuation member moves forward and pushes the movement member, and the door is enabled to be opened. The door maintains its position unless the actuation member moves into the body.

[0009] In an embodiment of the present invention, the dishwasher comprises the actuation member which moves in the horizontal plane by means of a gear mechanism activated by the motor. The motor is powered by means of the control unit and the gear mechanism is activated. Thereby, the actuation member is enabled to be moved in the horizontal plane and the door is enabled to be opened.

[0010] In an embodiment of the present invention, the dishwasher comprises the actuation member which enables the door to rest at different positions depending on the amount of increase in the length thereof. Depending on the length of the actuation member, the door has a

half-open position wherein the contact between the body and the door is partially interrupted and a closed position wherein the door contacts the body completely.

[0011] In an embodiment of the present invention, the dishwasher comprises the control unit which contains the humidity level data predetermined by the producer for the washing tub and which enables the door to be opened and closed at predetermined time intervals in order to decrease the humidity in the washing tub upon the completion of the drying step. By means of the control unit which opens and closes the door at predetermined time intervals, the humidity in the washing tub decreases gradually and thus the dishes are enabled to dry faster.

[0012] In an embodiment of the present invention, the dishwasher comprises the control unit which enables the door to be opened in a controlled manner by detecting the objects at a certain distance by means of a proximity sensor provided on the body. When the user or a child is near the dishwasher, the door is not opened and the opening of the door is delayed for a predetermined time. Thus, the safety of the user is ensured.

[0013] In an embodiment of the present invention, the dishwasher comprises a dampening member which is positioned between the actuation member and the movement member. Thus, the door is enabled to be closed in a controlled manner. Thereby, user safety is provided and the quality perception is improved.

[0014] By means of the present invention, a dishwasher is realized, comprising a movement mechanism which enables the door to be opened and closed upon the completion of the washing and drying processes. Thus, the drying effectiveness is improved and ease of use is provided.

[0015] A dishwasher realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the sideways view of the dishwasher.

Figure 2 - is the schematic view of the actuation member and the movement member.

Figure 3 - is the schematic view of the motor, the shaft, the actuation member and the movement member.

Figure 4 - is the schematic view of the motor, the gear mechanism, the actuation member and the movement member.

[0016] The elements illustrated in the figures are numbered as follows:

1. Dishwasher
2. Body
3. Washing tub
4. Door
5. Locking mechanism
6. Control unit
7. Hinge
8. Hinge arm
9. Spool
10. Movement member
11. Transmission member
12. Actuation member
13. Movement mechanism
14. Shaft
15. Motor
16. Gear mechanism
17. Sensor
18. Dampening means

[0017] The dishwasher (1) comprises a body (2); a washing tub (3) which is provided in the body (2) and wherein the washing process is performed; a door (4) which enables the washing tub (3) to be isolated from the outer environment and which is opened downwards by rotating around the horizontal axis; a locking mechanism (5) which enables the door (4) to be locked onto the body (2); a control unit (6) which enables the door (4) to be pushed and opened partially upon the completion of the washing and drying processes such that there is a gap between the door (4) and the body (2); a hinge (7) which enables the door (4) to be movably connected onto the body (2); a hinge arm (8) which extends from the door (4) towards the lower section of the washing tub (3); and at least one spool (9) which is provided under the hinge arm (8). The door (4) enables the washing tub (3) to be isolated from the outer environment. By means of the locking mechanism (5), the door (4) is enabled to be locked onto the body (2). In the drying step, the door (4) is opened to a certain extent in order to enable the humidity generated to be discharged from the washing tub (3). Thus, the drying process can be completed in a shorter period of time.

[0018] The dishwasher (1) of the present invention comprises a movement mechanism (13) having a transmission member (11) one end of which is connected to the hinge arm (8) and passes through the spool (9), the other end of which is connected to a movement member

(10) which moves by sliding in the horizontal plane, and an actuation member (12) which provided between the movement member (10) and the rear wall of the body (2), the length of which can be changed based on the preferences of the user or by the control unit (6) so as to actuate the transmission member (11) and enable the door (4) to be opened and closed. One end of the actuation member (12) is fixed onto the rear wall of the body (2). The other end thereof is positioned on the movement member (10), and the movement member (10) is enabled to move in the horizontal plane. The door (4) is enabled to be opened and kept open as the length of the actuation member (12) increases. As the length of the actuation member (12) decreases, the door (4) gets closer to the body (4) and the door (4) is closed. Thereby, the opening and closing of the door (4) is controlled.

[0019] In an embodiment of the present invention, the dishwasher (1) comprises the thermal actuation member (12) which expands when the temperature exceeds a predetermined value and enables the door (4) to be opened and contracts when the temperature drops below said predetermined value, enabling the door (4) to be closed. The length of the actuation member (12) changes based on the temperature. The length of the actuation member (12) increases after the drying process and the door (4) is enabled to be opened. When the length of the actuation member (12) decreases, the door (4) is closed.

[0020] In an embodiment of the present invention, the dishwasher (1) comprises a shaft (14) which is connected to the rear wall of the body (2) at one end and to the actuation member (12) at the other end, a motor (15) which enables the shaft to be moved, and the control unit (6) which enables the shaft (14) to be moved backwards and forwards such that the actuation member (12) moves. By means of the control unit (6), the motor (15) is enabled to be energized after the completion of the drying step, and the door (4) is enabled to be opened and closed by means of the shaft (14) which moves in the horizontal plane.

[0021] In an embodiment of the present invention, the dishwasher (1) comprises a gear mechanism (16) which is moved by means of the motor (15) and which enables the actuation member (12) to be moved forwards and backwards. By moving the gear mechanism (16) by means of the motor (15), the actuation member (12) moves in the vertical plane.

[0022] In an embodiment of the present invention, the dishwasher (1) comprises the actuation member (12) which, depending on the length thereof, enables the door (4) to be kept in a half-open position wherein the contact between the door (4) and the body (2) is at least partially interrupted and a closed position wherein the door (4) fully contacts the body (2). The door (4) stays in the half-open position or switches to closed position depending on the length of the actuation member (12). Thus, the door (4) is prevented from staying open.

[0023] In an embodiment of the present invention, the dishwasher (1) comprises the control unit (6) wherein a predetermined humidity value for the washing tub (3) is saved and which enables the door (4) to be opened and closed at predetermined time intervals in order to decrease the humidity level in a predetermined time period. The door (4) is enabled to be opened and closed at time intervals predetermined and saved into the control unit (6) by the producer. The time the door (4) stays open and the number of times the door (4) is opened and closed change based on the temperature and humidity in the washing tub (3). Thus, the steam in the washing tub (3) is discharged slowly and the kitchen items are prevented from getting stained.

[0024] In an embodiment of the present invention, the dishwasher (1) comprises the control unit (6) which enables the door (4) to be opened in a controlled manner by detecting the objects at a certain distance by means of a sensor (17) provided on the body (2). The control unit (6) scans the area near the dishwasher (1) by means of the sensor (17) and when an object is detected, the door (4) is prevented from opening. Thus, when there is a child or a user present in the environment, the hot vapor is prevented from being discharged from the washing tub (3). Thus, possible accidents are eliminated.

[0025] In an embodiment of the present invention, the dishwasher (1) comprises a dampening member (18) which is positioned between the actuation member (12) and the movement member (10). By means of the dampening member (18), the door (4) is prevented from hitting the body (2) while being closed.

[0026] By means of the present invention, a dishwasher (1) is realized, comprising a movement mechanism (13) which enables the door (4) to be opened and closed upon the completion of the drying process. Thus, the door (4) is opened to discharge the intense humidity from the washing tub (3), and closed after a certain amount of time. By preventing the door (4) from staying open, the dust and dirt in the outer environment is prevented from sticking onto the kitchen items.

Claims

1. A dishwasher (1) **comprising** a body (2); a washing tub (3) which is provided in the body (2) and wherein the washing process is performed; a door (4) which enables the washing tub (3) to be isolated from the outer environment and which is opened downwards by rotating around the horizontal axis; a locking mechanism (5) which enables the door (4) to be locked onto the body (2); a control unit (6) which enables the door (4) to be pushed and opened partially upon the completion of the washing and drying processes such that there is a gap between the door (4) and the body (2); a hinge (7) which enables the door (4) to be movably connected onto the body (2); a hinge arm (8) which extends from the door (4) towards the lower section of the washing tub (3); and at least one spool (9) which is provided under the

hinge arm (8), **characterized by** a movement mechanism (13) having a transmission member (11) one end of which is connected to the hinge arm (8) and passes through the spool (9), the other end of which is connected to a movement member (10) which moves by sliding in the horizontal plane, and an actuation member (12) which provided between the movement member (10) and the rear wall of the body (2), the length of which can be changed based on the preferences of the user or by the control unit (6) so as to actuate the transmission member (11) and enable the door (4) to be opened and closed.

2. A dishwasher (1) as in Claim 1, **characterized by** the thermal actuation member (12) which expands when the temperature exceeds a predetermined value and enables the door (4) to be opened and contracts when the temperature drops below said predetermined value, enabling the door (4) to be closed.

3. A dishwasher (1) as in Claim 1, **characterized by** a shaft (14) which is connected to the rear wall of the body (2) at one end and to the actuation member (12) at the other end, a motor (15) which enables the shaft to be moved, and the control unit (6) which enables the shaft (14) to be moved backwards and forwards such that the actuation member (12) moves.

4. A dishwasher (1) as in Claim 3, **characterized by** a gear mechanism (16) which is moved by means of the motor (15) and which enables the actuation member (12) to be moved forwards and backwards.

5. A dishwasher (1) as in any one of the above claims, **characterized by** the actuation member (12) which, depending on the length thereof, enables the door (4) to be kept in a half-open position wherein the contact between the door (4) and the body (2) is at least partially interrupted and a closed position wherein the door (4) fully contacts the body (2).

6. A dishwasher (1) as in any one of the above claims, **characterized by** the control unit (6) wherein a predetermined humidity value for the washing tub (3) is saved and which enables the door (4) to be opened and closed at predetermined time intervals in order to decrease the humidity level in a predetermined time period.

7. A dishwasher (1) as in any one of the above claims, **characterized by** the control unit (6) which enables the door (4) to be opened in a controlled manner by detecting the objects at a certain distance by means of a sensor (17) provided on the body (2).

8. A dishwasher (1) as in any one of the above claims, **characterized by** a dampening member (18) which is disposed between the actuation member (12) and the movement member (10).

Figure 1

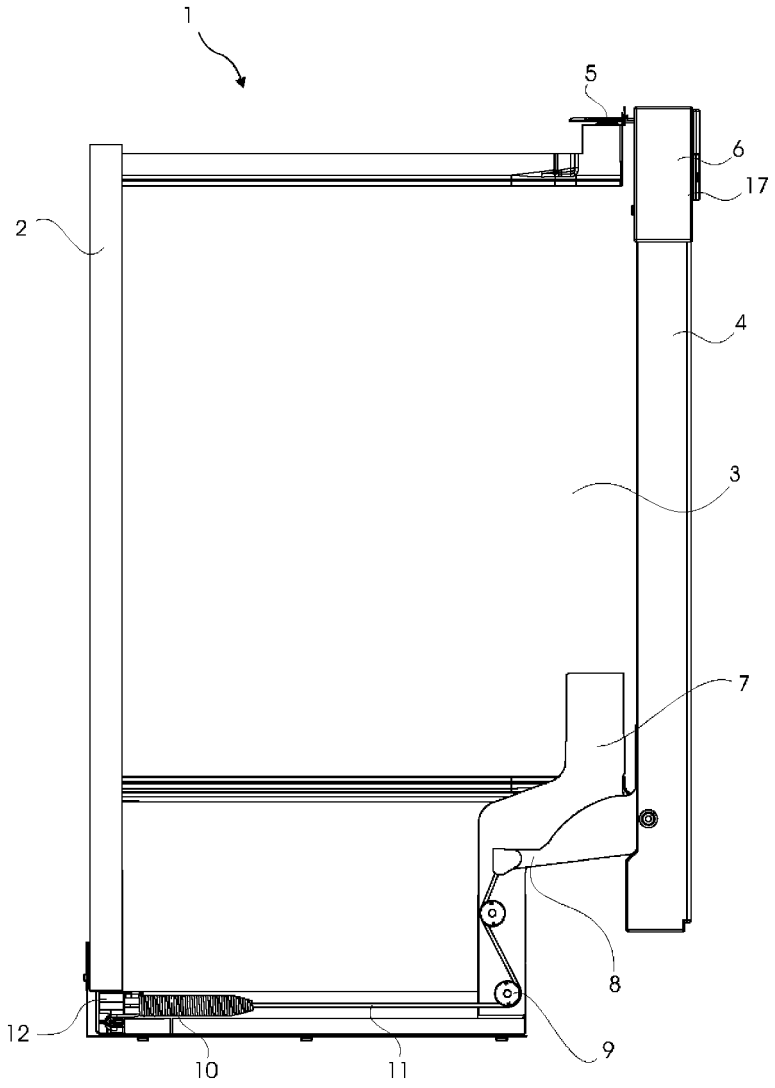


Figure 2

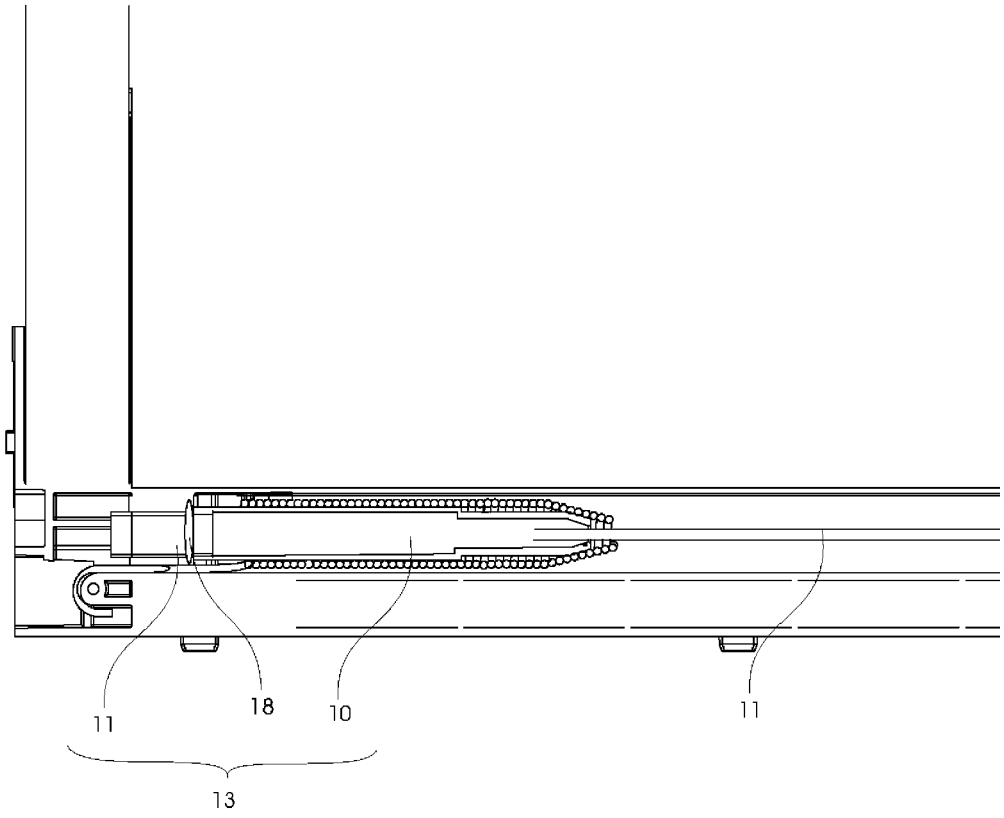


Figure 3

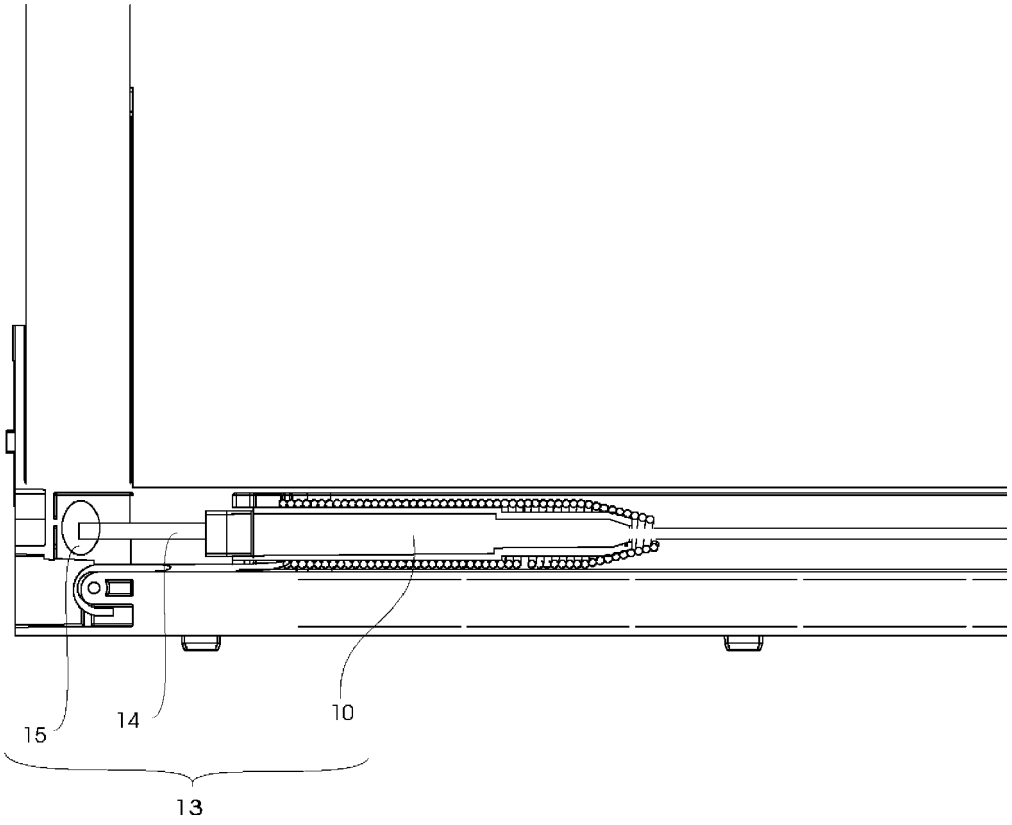
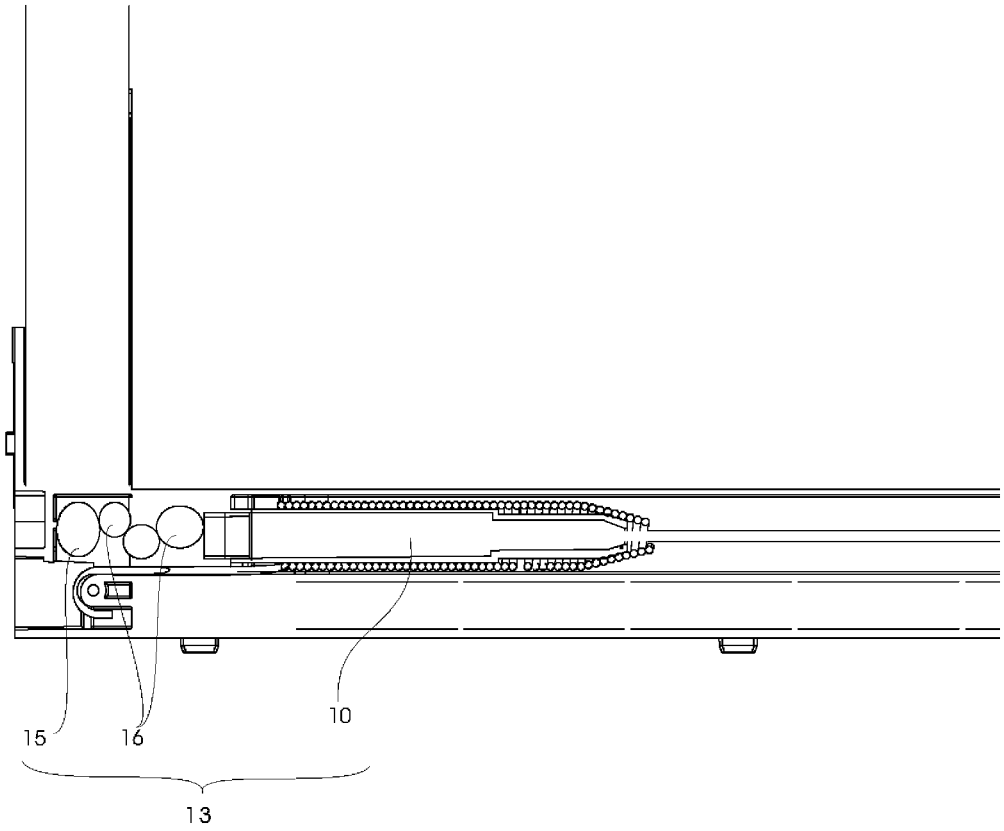


Figure 4



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EUROPEAN SEARCH REPORT

Application Number
EP 20 21 0347

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 Y	DE 10 2017 218501 A1 (BSH HAUSGERAETE GMBH [DE]) 18 April 2019 (2019-04-18) * abstract * * paragraphs [0040] - [0060]; figures *	1,3-5 2,6-8	INV. A47L15/42 ADD. A47L15/48
Y	AU 2013 229 660 B2 (BSH HAUSGERAETE GMBH [DE]) 21 January 2016 (2016-01-21) * abstract * * page 9, paragraph 3-4; figures *	2,7	
Y	US 2006/283482 A1 (BERENDS ERIK [DE] ET AL) 21 December 2006 (2006-12-21) * abstract * * paragraphs [0012], [0028]; claims 1,9,10 *	6	
Y	US 2013/099715 A1 (FUHGE BRUNO [DE]) 25 April 2013 (2013-04-25) * abstract * * paragraphs [0008], [0028] - [0042]; figures *	7	
Y	KR 2001 0093962 A (LG ELECTRONICS INC [KR]) 31 October 2001 (2001-10-31) * abstract; figures *	8	TECHNICAL FIELDS SEARCHED (IPC) A47L D06F
X A	CN 104 688 159 A (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG CO LTD) 10 June 2015 (2015-06-10) * abstract * * paragraphs [0022] - [0040]; figures *	1,5 2-4,6-8	
A	US 2010/225211 A1 (KARA SEYFETTIN [DE] ET AL) 9 September 2010 (2010-09-09) * the whole document *	1-8	
A	CN 110 528 986 A (QINGDAO HAIER DISHWASHER CO) 3 December 2019 (2019-12-03) * the whole document *	1-8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 May 2021	Prosig, Christina

CATEGORY OF CITED DOCUMENTS

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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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04-05-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102017218501 A1	18-04-2019	CN 111246787 A	05-06-2020
		DE 102017218501 A1	18-04-2019
		EP 3697280 A1	26-08-2020
		EP 3757337 A1	30-12-2020
		US 2020284083 A1	10-09-2020
		WO 2019076635 A1	25-04-2019
AU 2013229660 B2	21-01-2016	AU 2013229660 A1	28-08-2014
		CN 104159494 A	19-11-2014
		DE 102012203484 A1	12-09-2013
		EP 2822442 A2	14-01-2015
		PL 2822442 T3	31-01-2019
		RU 2014136790 A	27-04-2016
		WO 2013131822 A2	12-09-2013
US 2006283482 A1	21-12-2006	AT 408366 T	15-10-2008
		DE 102005028449 A1	21-12-2006
		EP 1733675 A2	20-12-2006
		ES 2309860 T3	16-12-2008
		PL 1733675 T3	31-12-2008
		US 2006283482 A1	21-12-2006
US 2013099715 A1	25-04-2013	CN 103061639 A	24-04-2013
		DE 102011116600 A1	25-04-2013
		EP 2584271 A1	24-04-2013
		US 2013099715 A1	25-04-2013
KR 20010093962 A	31-10-2001	NONE	
CN 104688159 A	10-06-2015	NONE	
US 2010225211 A1	09-09-2010	AT 548960 T	15-03-2012
		DE 102009014023 B3	12-08-2010
		EP 2233061 A1	29-09-2010
		ES 2379599 T3	27-04-2012
		PL 2233061 T3	31-07-2012
		US 2010225211 A1	09-09-2010
CN 110528986 A	03-12-2019	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1909631 A **[0003]**