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(54) **DISHWASHER ANTI-SPLASH DEVICE AND DISHWASHER COMPRISING THE SAME**

(57) The present invention provides a dishwasher anti-splash device (20). The device (20) at least comprises at least one attachment point (3, 4) for attaching the device (20) to an inner surface of a door (14) of a dishwasher (10), and a water-impermeable membrane (22) having a depth (d) of at least 150 mm in a first dimension away from the at least one attachment point (3, 4). The water-impermeable membrane (22) is able to bridge a gap between the top of the dishwasher door (14) and the top of a main body portion (12) of the dishwasher as the door is opened. Thus if the door of the dishwasher is

accidentally or deliberately opened during operation of the dishwasher, a person standing in front of the door is protected from being splashed with water from within the dishwasher until the flow of water has at least partially died down as a result of the operation of the dishwasher being interrupted. The invention also provides a dishwasher comprising such a dishwasher anti-splash device and a method of operating a dishwasher using such a dishwasher anti-splash device to protect against splashes in case the door of the dishwasher is accidentally or deliberately opened during operation of the dishwasher.

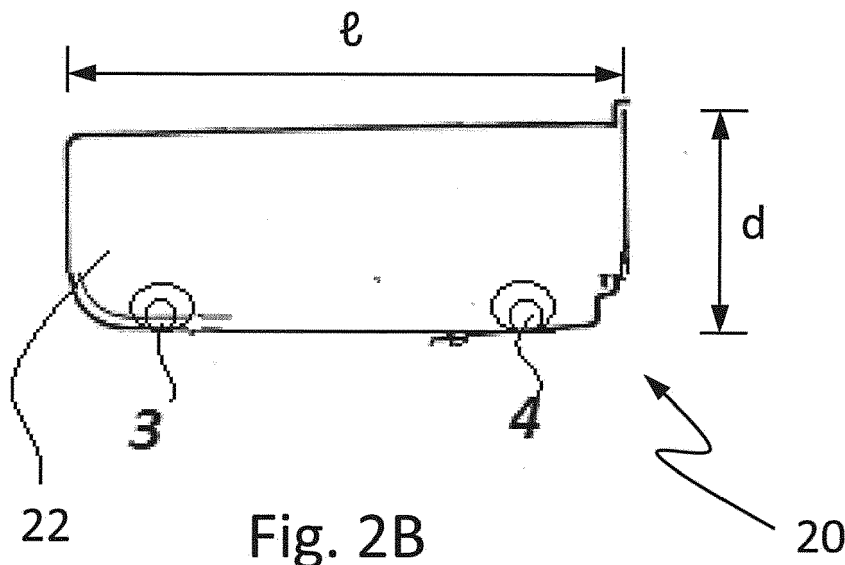


Fig. 2B

Description

[0001] The present invention relates to a dishwasher anti-splash device according to claim 1, a dishwasher according to claim 14 and a method of operating a dishwasher according to claim 15.

Background of the Invention

[0002] Dishwashers are well known as domestic kitchen appliances for washing crockery, cutlery, pots and pans, cooking utensils and/or other items. Dishwashers operate by spraying water onto such items to be cleaned in association with the use of a cleaning product, such as a dishwasher detergent.

[0003] A problem exists, however, in that a person may accidentally or deliberately open the door of a dishwasher during its operation and be undesirably splashed with water from within the dishwasher. In order to mitigate this problem, many dishwashers are already designed to interrupt their operation and to trigger an alarm, such as by sounding an audible beep, if they are opened during operation. However, even if they do so, water generally continues to be sprayed from within the dishwasher for some seconds after it has been opened and its operation has been interrupted because it takes time for the flow of water to die down. In addition, the water is usually sprayed around within the dishwasher by a water spraying apparatus, which is driven to rotate by the flow of water. If operation of the dishwasher is interrupted, the water spraying apparatus will therefore continue to rotate and will continue to direct water in different directions until the flow of water has died down, thereby increasing the likelihood that the person will be undesirably splashed.

Object of the Invention

[0004] It is therefore an object of the invention to provide a dishwasher anti-splash device, a dishwasher comprising such an anti-splash device, and a method of operating a dishwasher.

Description of the Invention

[0005] The object of the invention is solved by a dishwasher anti-splash device according to claim 1. The dishwasher anti-splash device preferably at least comprises at least one attachment point for attaching the device to an inner surface of a door of a dishwasher, and a water-impermeable membrane having a depth, d , of at least 150 mm in a first dimension away from the at least one attachment point.

[0006] This solution is beneficial because the water-impermeable membrane is able to bridge a gap between the top of the dishwasher door and the top of a main body portion of the dishwasher as the door is opened, so that a person standing in front of the door is protected from being splashed with water until the flow of water has at least partially died down.

[0007] Advantageous embodiments of the invention may be configured according to any claim and/or part of the following description.

[0008] Preferably, the depth, d , of the water-impermeable membrane is at least 210 mm, so that the person is protected from being splashed with water until the flow of water has substantially died down. More preferably still, the depth (d) of the water-impermeable membrane is at least 300 mm, so that the person is protected from being splashed with water until the flow of water has completely died down.

[0009] Preferably, the water-impermeable membrane has a length (ℓ) in a second dimension perpendicular to the first dimension which is substantially equal to the width of an opening in a main body portion of the dishwasher. This is beneficial, since the person is then protected from being splashed with water wherever the person stands in front of the dishwasher.

[0010] If so, the length (ℓ) of the water-impermeable membrane is preferably at least 400 mm. Such a length is suitable to provide protection against splashing across substantially the whole width of a slimline dishwasher, having an exterior width of from 450 to 550 mm.

[0011] If so, the length (ℓ) of the water-impermeable membrane is more preferably at least 520 mm. Such a length is suitable to provide protection against splashing across substantially the whole width of a standard sized dishwasher, having an exterior width of 600 mm.

[0012] Preferably, the dishwasher anti-splash device further comprises an elastomeric sucker at each attachment point.

[0013] Preferably, the dishwasher anti-splash device is resistant to temperatures of up to 100 degrees Celsius. By "resistant to temperatures" is meant that the device does not deform in shape or sustain damage at such temperatures.

[0014] If so, the device may comprise one or more thermoset plastics materials.

[0015] Preferably, the dishwasher anti-splash device may bear at least one of an ornamental design and user information, such as dishwasher operating instructions or information on different cleaning cycles of the dishwasher.

[0016] Preferably, the device is resilient, in other words, it can return to its original shape if deformed.

[0017] Preferably, the water-impermeable membrane is at least partially elastic. This is beneficial because it allows the water-impermeable membrane to absorb the energy of water hitting it, rather than to reflect the water in a different direction, which improves its anti-splash properties.

[0018] In one possible preferred embodiment, the dishwasher anti-splash device is configured to adopt a substantially horizontal orientation, parallel with and adjacent to an inner upper surface of a main body portion of the dishwasher, when attached to the inner surface of the door and the door is closed. This is beneficial because the anti-splash device then does not interfere with operation of the water spraying apparatus of the dishwasher when the door is closed, but also provides protection against splashes when the door is opened.

[0019] In another possible preferred embodiment, the dishwasher anti-splash device is resilient and is configured to adopt a substantially vertical orientation, parallel with and adjacent to the inner surface of the door, when attached to the inner surface of the door and the door is closed. This is beneficial because the anti-splash device then does not interfere with operation of the water spraying apparatus of the dishwasher or with that of a compartment on the inner surface of the door for containing cleaning products when the door is closed, but can then spring up from this substantially vertical orientation as the door is opened until it reaches a substantially horizontal orientation parallel with the inner upper surface of the main body portion of the dishwasher, in order to provides protection against splashes when the door is opened.

[0020] The present invention further relates to a dishwasher comprising a dishwasher anti-splash device as described above.

[0021] The present invention also relates to a method of operating a dishwasher, wherein the method at least comprises loading the dishwasher with items to be cleaned, attaching a dishwasher anti-splash device as described above to an inner surface of a door of the dishwasher, closing an opening in a main body portion of the dishwasher with the door, and operating a water spraying apparatus of the dishwasher to commence washing of the items to be cleaned.

[0022] Further features, goals and advantages of the present invention will now be described in association with the accompanying drawings, in which exemplary components of the invention are illustrated. Components of the devices and methods according to the invention which are at least essentially equivalent to each other with respect to their function can be marked by the same reference numerals, wherein such components do not have to be marked or described in all of the drawings.

[0023] In the following description, the invention is described by way of example only with respect to the accompanying drawings.

Brief Description of the Drawings

[0024]

Fig. 1 is a perspective view of a water spraying apparatus of a dishwasher;

Fig. 2A is a perspective view of a representative example of a dishwasher, shown open and with some elements thereof removed from inside; and

Fig. 2B is a plan view of an embodiment of an anti-splash device to inhibit the splashing of water from within the dishwasher of Fig. 2A.

Detailed Description

[0025] Fig. 1 shows a water spraying apparatus 5 of a dishwasher. The water spraying apparatus 5 comprises one or more pipes 6 for conveying water, and one or more rotor arms 7, each of which is rotatably mounted at a respective end of one of the pipes 6. The rotor arms 7 are each perforated by a respective plurality of holes 8. Whereas Fig. 1 shows the pipes 6, rotor arms 7 and holes 8 having a particular shape and configuration, the size, shape and configuration of these components of the water spraying apparatus 5 may vary widely between different dishwashers.

[0026] During operation of the dishwasher, clean water passes along pipes 6 in the direction indicated by arrows w to rotor arms 7. The water exits the rotor arms 7 through the holes 8, and the pressure of the water exiting the holes 8 causes the rotor arms 7 to rotate in the direction indicated in Fig. 1 by the arrows r. Whereas Fig. 1 shows the rotor arms 7 all rotating in a clockwise direction when viewed from above, in other dishwashers, they may instead all rotate in a counterclockwise direction or in a mixture of clockwise and counterclockwise directions.

[0027] The clean water exiting the holes 8 strikes any crockery, cutlery, pots and pans, cooking utensils and/or other items previously loaded into the dishwasher, and is inevitably deflected by these various different items in a wide variety of different directions during the cleaning process.

[0028] Fig. 2A shows a representative example of a dishwasher 10. The dishwasher 10 comprises a main body portion

12 having an opening 18, and a door 14. The door 14 is hinged to the main body portion 12 of the dishwasher 10 along a lower edge of the door 14 so as to cover the opening 18 of the main body portion 12 when the door 14 is closed. Such a hinged articulation of the door to the main body portion of a dishwasher is typical for many different types of dishwasher to enable loading and unloading of the dishwasher. Inside the main body portion 12 of the dishwasher 10 is a water spraying apparatus 5, which is similar in function but different in size, shape and configuration to that shown in Fig. 1. On an inner surface of the door 14 is a compartment 16 for holding a cleaning product, such as a tablet of dishwasher detergent. The dishwasher 10 further comprises one or more shelves and/or baskets for receiving crockery, cutlery, pots and pans, cooking utensils and/or other items to be cleaned. In Fig. 2A, these shelves and/or baskets have been removed for improved clarity of representation, but are normally contained within the main body portion 12.

[0029] During operation, a user loads these shelves and/or baskets with items to be cleaned, fills the compartment 16 with a cleaning product, closes the door 14 and starts the dishwasher 10, so that water is sprayed onto the items to be cleaned by the water spraying apparatus 5. The cleaning product is released from the compartment 16 as the water is being sprayed, in order to enable the cleaning process. Often, the dishwasher 10 will let the user know when the cleaning process has finished, for example by emitting a beeping noise.

[0030] Fig. 2B shows an embodiment of an anti-splash device 20 to inhibit the splashing of water from within the dishwasher 10 of Fig. 2A if a person accidentally or deliberately opens the door 14 of the dishwasher 10 during its operation. The anti-splash device 20 comprises two attachment points 3, 4 and a water-impermeable membrane 22. The attachment points 3, 4 of the device 20 respectively attach to locations 1, 2 on the door 14 of the dishwasher 10. In other words, attachment point 3 attaches to location 1 and attachment point 4 attaches to location 2. The device 20 is removable from and remountable to these locations, so that it does not present an obstacle to the user during loading and unloading of the dishwasher with items to be cleaned, so that it may be individually and separately cleaned, replaced if worn out or damaged, and so on. Attachment of the anti-splash device 20 to the door 14 of the dishwasher 10 may, for example, be achieved by the provision of a pair of elastomeric suckers provided on the device 20 at attachment points 3, 4. In other possible embodiments, however, the number and/or location of the attachment points, as well as the manner of attachment, may vary.

[0031] The anti-splash device 20 is also heat resistant, so that it may withstand elevated water temperatures during operation of the dishwasher 10. It may, for example, be made of one or more thermoset plastics materials. The device 20 may also be provided with an ornamental design and/or bear information, for example about different cleaning cycles of the dishwasher. The anti-splash device 20 is also resilient, and the water-impermeable membrane 22 thereof may be at least partially elastic.

[0032] During operation, once a user has loaded the dishwasher 10 with items to be cleaned and has closed the opening 18 with door 14, the device 20 adopts a substantially horizontal orientation, parallel with and adjacent to an inner upper surface of the main body portion 12 of the dishwasher 10, so that it does not interfere with operation of the water spraying apparatus 5. If a person (who may be the user or may be someone else) then accidentally or deliberately opens the door 14, the water-impermeable membrane 22 acts as a splash guard against water being sprayed by the water spraying apparatus 5, as well as against water deflected by the items previously loaded into the dishwasher to be cleaned, thereby protecting the person from being splashed with water.

[0033] In an alternative possible embodiment, during operation, once a user has loaded the dishwasher 10 with items to be cleaned and has closed the opening 18 with door 14, the anti-splash device 20 may instead adopt a substantially vertical orientation, parallel with and adjacent to the inner surface of the door 14, so that it does not interfere with the operation of the water spraying apparatus 5 or with that of the compartment 16. If a person (for example, the user) then accidentally or deliberately opens the door 14, since the device 20 is resilient, it may then spring up from this substantially vertical orientation as the door is opened until it reaches a substantially horizontal orientation parallel with the inner upper surface of the main body portion 12 of the dishwasher 10. In either possible embodiment, however, the water-impermeable membrane 22 of the device 20 bridges the gap between the top of the door 14 and of the main body portion 12 of the dishwasher 10 as the door is opened, so that a person standing in front of the door 14 is protected from being splashed with water.

[0034] The device 20 has a size, shape and configuration which are adapted to suit the design of the dishwasher 10. Thus in different possible alternative embodiments, the device 20 may have one of several different possible sizes, shapes and configurations, each of which is suited to a different design of dishwasher. In all such cases, however, it is preferable that a length (ℓ) of the water-impermeable membrane 22, as indicated in Fig. 2B, is substantially equal to the width of the opening 18 in the main body portion 12 of the dishwasher 10.

[0035] Furthermore, a depth (d) of the water-impermeable membrane 22, as indicated in Fig. 2B, should be sufficiently large that it will continue to protect a person who accidentally or deliberately opens the door of the dishwasher from being undesirably splashed with water until the flow of water from the water spraying apparatus 5 has substantially died down. For example, if the flow of water from the water spraying apparatus 5 takes 3 seconds to die down, and if the person opens the door of the dishwasher such that a gap between the top of the door 14 and the main body portion 12 of the dishwasher increases at a rate of 100 millimetres per second, the depth (d) of the device 20 should preferably be

at least $3 \times 100 = 300$ millimetres. Even if the depth (d) of the device 20 is only 200 millimetres, this will still substantially reduce the likelihood of the person being undesirably splashed, since the flow of water from the water spraying apparatus 5 will die down most rapidly immediately after it has been interrupted, and then will reduce more slowly thereafter. In other words, the rate at which the flow of water from the water spraying apparatus 5 dies down also itself decays. The rate at which the flow of water from the water spraying apparatus 5 dies down will depend upon the particular design of the water spraying apparatus 5 in any given case, but it might, for example, be exponential. In such a case, the flow of water will exhibit a "half-life", according to which the flow of water halves over substantially equal intervals of time, which may typically each be less than a second in length. In such a case, if the depth (d) of the device 20 is 200 millimetres and if the person opens the dishwasher at a rate of 100 millimetres per second, the flow of water will already have reduced to less than a quarter of its initial flow rate by the time that the door is 200 millimetres open.

[0036] In summary, therefore, the present invention provides a dishwasher anti-splash device. The device at least comprises at least one attachment point for attaching the device to an inner surface of a door of a dishwasher, and a water-impermeable membrane having a depth (d) of at least 150 mm in a first dimension away from the at least one attachment point. The water-impermeable membrane is able to bridge a gap between the top of the dishwasher door and the top of a main body portion of the dishwasher as the door is opened. Thus if the door of the dishwasher is accidentally or deliberately opened during operation of the dishwasher, a person standing in front of the door is protected from being splashed with water from within the dishwasher until the flow of water has at least partially died down as a result of the operation of the dishwasher being interrupted. The invention also provides a dishwasher comprising such a dishwasher anti-splash device and a method of operating a dishwasher using such a dishwasher anti-splash device to protect against splashes in case the door of the dishwasher is accidentally or deliberately opened during operation of the dishwasher.

Reference Numerals:

[0037]

1, 2	Locations on dishwasher door for attachment of anti-splash device	12	Main body portion of dishwasher
3, 4	Attachment points on anti-splash device	14	Door of dishwasher
5	Water spraying apparatus	16	Compartment for cleaning product
6	Water pipes	18	Opening in main body portion of dishwasher
7	Rotor arms	20	Anti-splash device
8	Water exit holes	22	Water-impermeable membrane
10	Dishwasher	d	Depth of water-impermeable membrane
		ℓ	Length of water-impermeable membrane

Claims

1. A dishwasher anti-splash device (20), at least comprising:

at least one attachment point (3, 4) for attaching the device (20) to an inner surface of a door (14) of a dishwasher (10); and
a water-impermeable membrane (22) having a depth (d) of at least 150 mm in a first dimension away from the at least one attachment point (3, 4).

2. A dishwasher anti-splash device according to claim 1, wherein the depth (d) of the water-impermeable membrane (22) is at least 210 mm.

3. A dishwasher anti-splash device according to claim 1 or claim 2, wherein the water-impermeable membrane (22) has a length (ℓ) in a second dimension perpendicular to the first dimension which is substantially equal to the width of an opening (18) in a main body portion (12) of the dishwasher (10).

4. A dishwasher anti-splash device according to claim 3, wherein the length (ℓ) of the water-impermeable membrane (22) is at least 400 mm.
5. A dishwasher anti-splash device according to claim 4, wherein the length (ℓ) of the water-impermeable membrane (22) is at least 520 mm.
6. A dishwasher anti-splash device according to any one of the preceding claims, further comprising an elastomeric sucker at each attachment point (3, 4).
7. A dishwasher anti-splash device according to any one of the preceding claims, wherein the device (20) is resistant to temperatures of up to 100 degrees Celsius.
8. A dishwasher anti-splash device according to claim 7, wherein the device (20) comprises one or more thermoset plastics materials.
9. A dishwasher anti-splash device according to any one of the preceding claims, bearing at least one of an ornamental design and user information.
10. A dishwasher anti-splash device according to any one of the preceding claims, wherein the device (20) is resilient.
11. A dishwasher anti-splash device according to any one of the preceding claims, wherein the water-impermeable membrane (22) is at least partially elastic.
12. A dishwasher anti-splash device according to any one of the preceding claims, configured to adopt a substantially horizontal orientation, parallel with and adjacent to an inner upper surface of a main body portion (12) of the dishwasher (10), when attached to the inner surface of the door (14) and the door is closed.
13. A dishwasher anti-splash device according to claim 10 or claim 11, configured to adopt a substantially vertical orientation, parallel with and adjacent to the inner surface of the door (14), when attached to the inner surface of the door (14) and the door is closed.
14. A dishwasher (10) comprising a dishwasher anti-splash device (20) according to any one of the preceding claims.
15. A method of operating a dishwasher (10), the method at least comprising:
 - loading the dishwasher (10) with items to be cleaned;
 - attaching a dishwasher anti-splash device (20) according to any one of claims 1 to 13 to an inner surface of a door (14) of the dishwasher (10);
 - closing an opening (18) in a main body portion (12) of the dishwasher (10) with the door (14); and
 - operating a water spraying apparatus (5) of the dishwasher (10) to commence washing of the items to be cleaned.

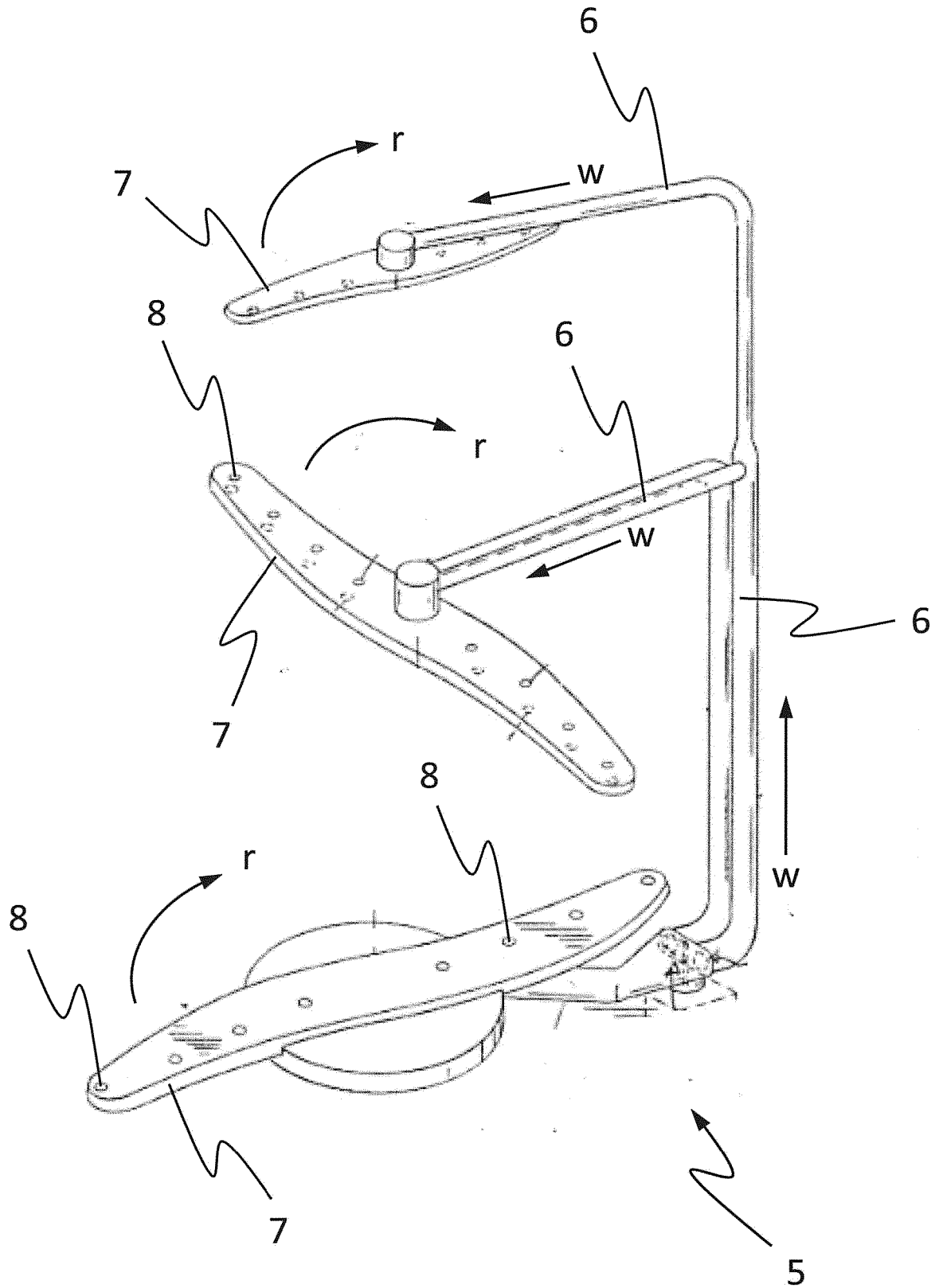
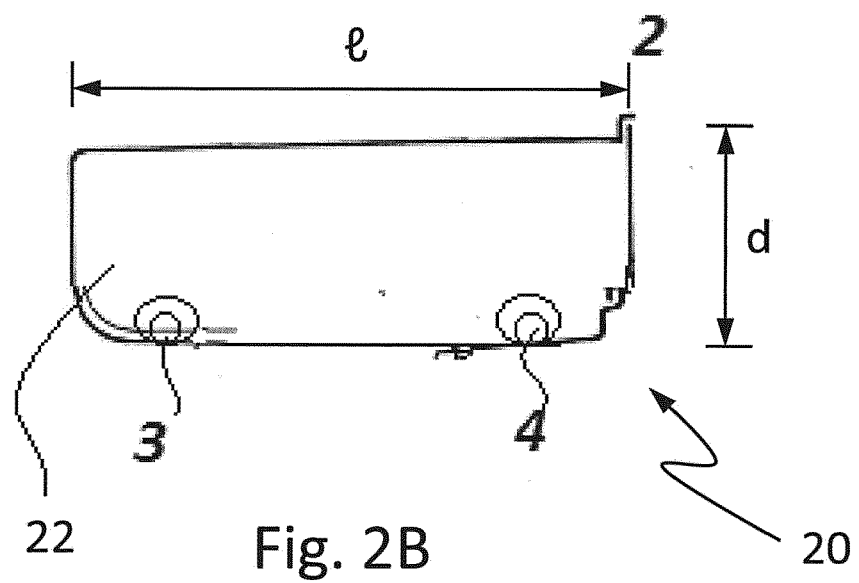
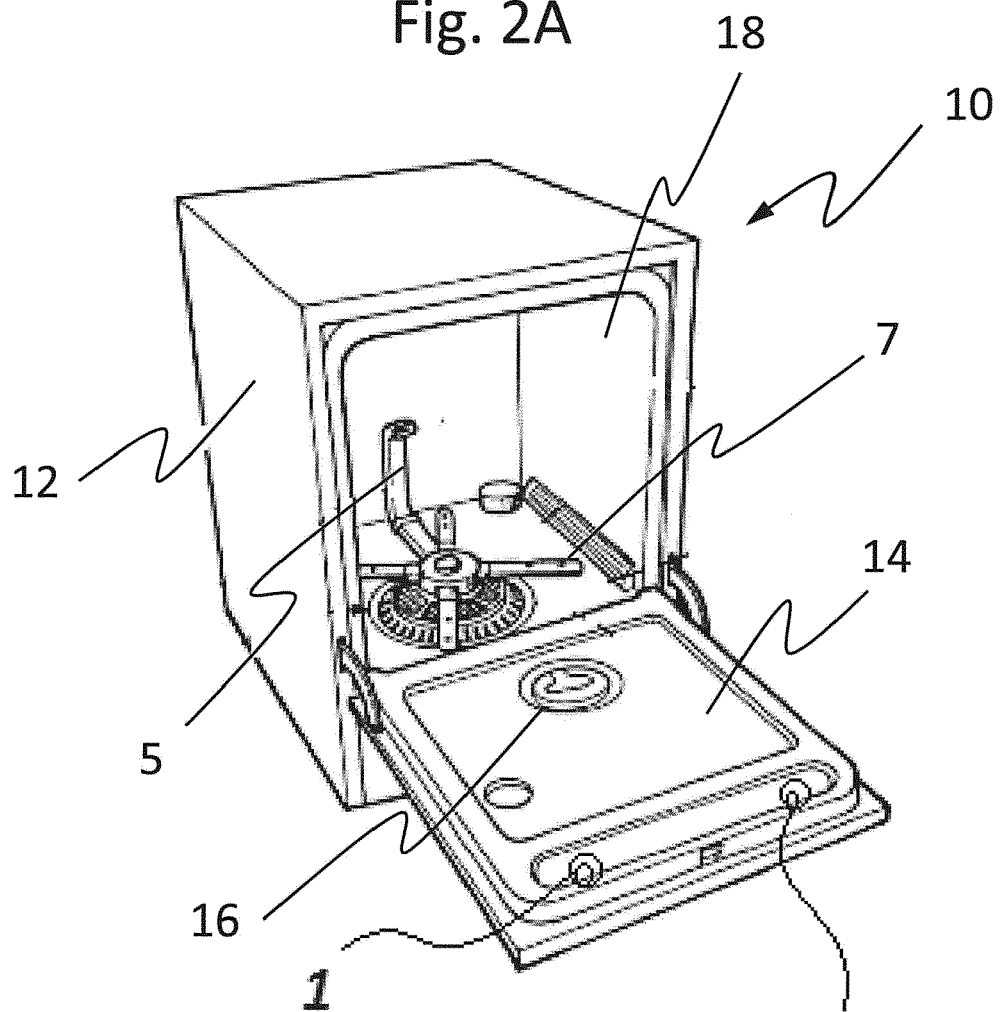


Fig. 1

Fig. 2A





EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	US 5 282 547 A (MURRAY JOSEPH A [US]) 1 February 1994 (1994-02-01) * column 1, line 41 - column 4, line 68 *	1-15	
X	DE 20 2013 104596 U1 (HAFKE MICHAEL [DE]) 21 October 2013 (2013-10-21) * paragraph [0001] - paragraph [0008] *	1-15	
			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 4 April 2017	Examiner Jezierski, Krzysztof
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82