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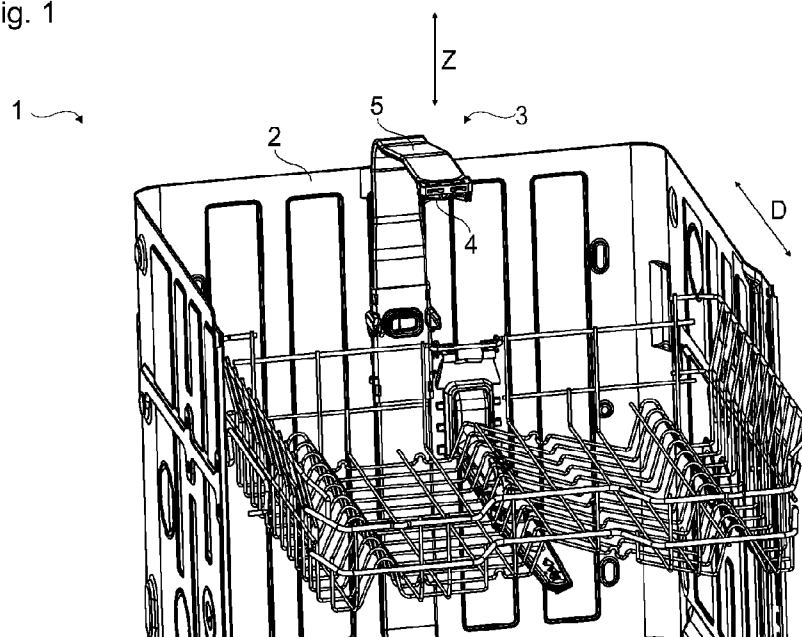
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(54) Title: DISHWASHER HAVING A TOP SPRAYING DEVICE WITH IMPROVED ASSEMBLAGE

Fig. 1



(57) Abstract: The present invention relates to a dishwasher (1) comprising: a tub (2); a top spraying device (3) which includes an impeller (4); a conduit (5) for supplying the washing liquid to the top spraying device (3).

Description**DISHWASHER HAVING A TOP SPRAYING DEVICE WITH IMPROVED ASSEMBLAGE**

- [0001] The present invention relates to a dishwasher. The present invention more particularly relates to the top spraying device of the dishwasher.
- [0002] Dishwashers are commonly known in the art. A dishwasher generally comprises: a tub for receiving the articles to be cleaned; an upper article rack and a lower article rack which are extendably disposed along the inward-outward direction into the tub; a top spraying device which comprises an impeller that is adapted to rotate about the vertical axis and to radially spray the washing liquid into the tub, in particular onto the upper extendable article rack; a conduit for supplying the washing liquid to the top spraying device, wherein the front end of the conduit is disposed onto the ceiling of the tub.
- [0003] US2010/0116301A1 discloses a prior art dishwasher which has a top spraying device.
- [0004] A problem with the prior art dishwasher is that the assemblage of the top spraying device with the front end of the conduit is generally cost intensive both in terms of material and labor.
- [0005] An objective of the present invention is to provide a dishwasher that solves the aforementioned problems of the prior art in a cost effective way and which enables an improved production and assemblage of the top spraying device.
- [0006] This objective has been achieved by the dishwasher as defined in claim 1. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.
- [0007] The dishwasher of the present invention further comprises a mounting assembly which comprises a socket member and a plug member which are adapted to engage and disengage respectively along the inward-outward direction of the tub. One of the socket member and The plug member is formed onto the front end of the conduit and the other one is formed onto the top spraying device and has a pivot that is adapted to rotatably bear the hub of the impeller. The uppermost level of the mounting

assembly does not exceed the uppermost level of the front end of the conduit.

[0008] A major advantageous effect of the present invention is that the top spraying device can be quickly and securely engaged with or disengaged from the front end of the conduit through the assembly operator by means of the mounting assembly. In particular, the assembly operator can easily see the plug member that is disposed onto the front end of the conduit, and subsequently engage it with the socket member that is disposed onto the top spraying device without any difficulty. Thereby, the assembly operator can save time. Another major advantageous effect of the present invention is that the top spraying device can be easily removed for maintenance through the service person. Another major advantageous effect of the present invention is that the mounting assembly can be provided as narrow as the conduit or even narrower than conduit since it engages mainly with the front end of the conduit and not the lateral sides of the conduit. Thereby, the top spraying device can be rendered compact. Thereby, also the production costs can be further reduced both in terms of material and labor. Another major advantageous effect of the present invention is that the space utilization efficiency in the vertical direction of the tub can be increased since the mounting assembly is flush with the upper surface of the conduit. Thereby, also the articles can be more effectively sprayed with the washing liquid, and thus the cleaning performance can be improved.

[0009] In an embodiment, the washing liquid is discharged downwards through an opening of the conduit towards the upper surface of the impeller. In this embodiment, the pivot is jointly formed onto one or more L-shaped arms of the top spraying device which extend outside the region between the opening and the impeller. This embodiment is particularly advantageous as the L-shaped arms do not block the flow of the washing liquid towards the impeller, and thus the articles can be cleaned more effectively.

[0010] In another embodiment, the pivot and the hub are joined through a swivel that is adapted to rotate both relative to the hub and the pivot. This embodiment is particularly advantageous as the swivel improves the

smooth rotation of the impeller, and thus prevents the impeller from jamming. Thereby, the washing performance can be further improved.

- [0011] In another embodiment, the mounting assembly comprises a releasable force-fitting and/or releasable form-fitting connection which connects the plug member and the socket member in the inward-outward direction of the tub. This embodiment is particularly advantageous as the plug member and the socket member can be securely connected with each other.
- [0012] In other alternative embodiments, the pivot in the L-shaped arms of the top spraying device is respectively provided as a cylindrical hole and a cylindrical shaft. In these alternative embodiments, the hub of the impeller is respectively provided as cylindrical pin and a cylindrical recess. These embodiments are particularly advantageous as the pivot and the hub can be designed in various different ways, and thus can be easily assembled with each other.
- [0013] In other alternative embodiments, the top spraying device consists of two pieces and three pieces respectively. In the former case, the top spraying device consists of the impeller and the socket member that rotatably bears the impeller by means of the pivot in the L-shaped arms. In the latter case, the top spraying device consists of the impeller, the swivel and the socket member that bears the swivel and the impeller by means of the pivot in the L-shaped arms. These embodiments are particularly advantageous as the number of parts can be reduced, and the overall costs can be further saved both in terms of labor and material. These embodiments are also particularly advantageous as the pieces of the top spraying device can be easily assembled with each other, and subsequently mounted to the conduit.
- [0014] Additional features and additional advantageous effects of the dishwasher according to the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:
- [0015] Figure 1 – is a schematic partial perspective view of a dishwasher which has a top spraying device according to an embodiment of the present invention;

- [0016] Figure 2 – is a schematic partial side view of the dishwasher of Fig. 1;
- [0017] Figure 3 – is a schematic perspective top view of the top spraying device of Fig. 1;
- [0018] Figure 4 – is a schematic perspective top view of the top spraying device of Fig. 1, prior to mounting the same to the front end of the conduit;
- [0019] Figure 5 – is a schematic partial perspective exploded view of the dishwasher of Fig. 1;
- [0020] Figure 6 – is a schematic perspective bottom view of the top spraying device of Fig. 1;
- [0021] Figure 7 – is a schematic bottom view of the top spraying device of Fig. 1;
- [0022] Figure 8 – is a schematic exploded side view of the top spraying device of Fig. 1;
- [0023] Figure 9 – is a schematic perspective side view of the top spraying device of Fig. 1, prior to mounting the same to the front end of the conduit;
- [0024] Figure 10 – is a schematic partial sectional view of the dishwasher of Fig. 1;
- [0025] Figure 11 – is a schematic partial side view of a dishwasher which has a top spraying device according to another embodiment of the present invention;
- [0026] Figure 12 – is a schematic perspective bottom view of the top spraying device of Fig. 11;
- [0027] Figure 13 – is a schematic perspective top view of the top spraying device of Fig. 11, prior to mounting the same to the front end of the conduit;
- [0028] Figure 14 – is a schematic partial perspective exploded view of the dishwasher of Fig. 11;
- [0029] Figure 15 – is a schematic bottom view of the top spraying device of Fig. 11;
- [0030] Figure 16 – is a schematic partial sectional view of the dishwasher of Fig. 11.
- [0031] The reference signs appearing on the drawings relate to the following technical features.
1. Dishwasher
 2. Tub

3. Top spraying device

4. Impeller

5. Conduit

6. Mounting assembly

7. Socket member

[0032] 7a. Slot

[0033] 7b. Recess

8. Plug member

[0034] 8a. Claw

[0035] 8b. Tongue

[0036] 9. Pivot

[0037] 9a. Cylindrical hole

[0038] 10. Hub

[0039] 10a. Cylindrical pin

[0040] 11. Opening

[0041] 12. L-shaped arm

[0042] 13. Swivel

[0043] 13a. Inner diameter section

[0044] 13b. Outer diameter section

[0045] 13c. Seating flange

[0046] The dishwasher (1) comprises: a tub (2) for receiving the articles to be cleaned; a top spraying device (3) which comprises an impeller (4) that is adapted to rotate about the vertical axis (Z) and to radially spray the washing liquid into the tub (2); a conduit (5) for supplying the washing liquid to the top spraying device (3), wherein the front end of the conduit (5) is disposed onto the ceiling (not shown) of the tub (2) (Fig. 1, Fig. 2, Fig. 11).

[0047] The dishwasher (1) of the present invention further comprises: a mounting assembly (6) which comprises a socket member (7) and a plug member (8) which are adapted to engage and disengage respectively along the inward-outward direction (D) of the tub (2) (Fig. 4 and Fig. 13). One of the socket member (7) and the plug member (8) is formed onto the front end of the conduit (5) and the other one is formed onto the top spraying device

(3) and has a pivot (9) that is adapted to rotatably bear the hub (10) of the impeller (4) (Fig. 5, Fig. 6, Fig. 12, Fig. 14). The uppermost level (L) of the mounting assembly (6) does not exceed the uppermost level (L') of the front end of the conduit (5) (Fig. 10 and Fig. 16).

- [0048] In an embodiment, the front end of the conduit (5) comprises an opening (11) which faces the bottom of the tub (2) and is adapted to discharge the washing liquid onto the upper surface of the impeller (4) (Fig. 10 and Fig. 16). In this embodiment, the upper surface of the impeller (4) is separated from the opening (11) through a gap (G) along the vertical axis (Z) (Fig. 10 and Fig. 16). In this embodiment, the top spraying device (3) comprises one or more L-shaped arms (12) which are formed onto the respective one of the socket member (7) and the plug member (8) (Fig. 8 and Fig. 14). In addition, the pivot (9) is formed onto the said one or more L-shaped arms (12) and adapted to rotatably bear the lower end of the hub (10) (Fig. 8 and Fig. 15). In this embodiment, the L-shaped arms (12) extend outside the region (R) between the opening (11) and the impeller (4) (Fig. 10 and Fig. 16).
- [0049] In another embodiment, the top spraying device (3) comprises a swivel (13) which is rotatably disposed between the pivot (9) and the hub (10) (Fig. 14 and Fig. 16). In this embodiment, the swivel (13) stably supports the impeller (4) (Fig. 16). The swivel (13) rotates around itself relative to the pivot (9) and the hub (10). Relative motion of the swivel (13) provides the ease rotation of the impeller (4).
- [0050] In another embodiment, the socket member (7) has one or more slots (7a) (Fig. 5 and Fig. 13). In this embodiment, the plug member (8) has one or more claws (8a) which resiliently snap into slots (7a) respectively (Fig. 5 and Fig. 13).
- [0051] In another embodiment, the pivot (9) is provided as a cylindrical hole (9a) which is formed into the L-shaped arms (12) (Fig. 8 and Fig. 14). In this embodiment, the hub (10) is provided as a cylindrical pin (10a) which freely engages with cylindrical hole (9a) (Fig. 8 and Fig. 14).
- [0052] In another embodiment, the swivel (13) comprises: an inner diameter section (13a) which rotatably receives the cylindrical pin (10a); an outer

diameter section (13b) which is rotatably received by the cylindrical hole (9a); and a seating flange (13c) which rotatably abuts onto the periphery of the cylindrical hole (9a) (Fig. 14 and Fig. 16).

- [0053] In another embodiment, the plug member (8) is provided as a tongue (8b) which is formed onto the front end of the conduit (5) (Fig 5 and Fig. 13). In this embodiment, the socket member (7) has a matching recess (7b) that is adapted to receive the tongue (8b) (Fig 5 and Fig. 13).
- [0054] In another embodiment, the socket member (7), including the slots (7a), the recess (7b), the cylindrical hole (9a), and the L-shaped arms (12) are provided as a single piece which is manufactured from plastic material.
- [0055] In the subsequent description, the assemblage of the top spraying device (3) with the conduit (5) will be briefly explained by way of example.
- [0056] The top spraying device (3) comprises three pieces, namely the impeller (4), the swivel (13), and the socket member (7) (Fig. 14). First, the swivel (13) is engaged with the pivot (9) in the L-shaped arms (12) of the socket member (7). Next, the hub (10) of the impeller (4) is engaged with the swivel (13) that is seated on the L-shaped arms (12) of the socket member (7) (Fig. 13). Next, the tongue (8b) is inserted into the recess (7b), and the claws (8a) are resiliently snapped into the slots (7a) by pushing the socket member (7) towards the plug member (8) along the inward-outward direction (D). Thereby, the socket member (7), including the impeller (4) and the swivel (13) is assembled with the plug member (8) of the conduit (5) (Fig. 12).
- [0057] A major advantageous effect of the present invention is that the top spraying device (3) can be quickly and securely engaged with or disengaged from the front end of the conduit (5) through the assembly operator by means of the mounting assembly (6) (Fig. 4 and Fig. 13). In particular, the assembly operator can easily see the respective one of the socket member (7) and the plug member (8) that is disposed onto the front end of the conduit (5), and subsequently engage it with the other one that is disposed onto the top spraying device (3) without any difficulty. Thereby, the assembly operator can save time. Another major advantageous effect of the present invention is that the top spraying device (3) can be easily

removed for maintenance through the service person. Another major advantageous effect of the present invention is that the mounting assembly (6) can be provided as narrow as the conduit (5) or even narrower than conduit (5) since it engages mainly with the front end of the conduit (5) and not the lateral sides of the conduit (5). Thereby, the top spraying device (3) can be rendered compact. Thereby, also the production costs can be further reduced both in terms of material and labor. Another major advantageous effect of the present invention is that the space utilization efficiency in the vertical direction of the tub (2) can be increased since the mounting assembly (6) is flush with the upper surface of the conduit (5) (Fig. 10 and Fig. 16). Thereby, also the articles can be more effectively sprayed with the washing liquid, and thus the cleaning performance can be improved (Fig. 2 and Fig. 11). Other advantageous effects of the present invention can be taken from the above-described embodiments.

Claims

1. A dishwasher (1) comprising: a tub (2) for receiving the articles to be cleaned; a top spraying device (3) which comprises an impeller (4) that is adapted to rotate about the vertical axis (Z) and to radially spray the washing liquid into the tub (2); a conduit (5) for supplying the washing liquid to the top spraying device (3), wherein the front end of the conduit (5) is disposed onto the ceiling of the tub (2), characterized by further comprising: a mounting assembly (6) which comprises a socket member (7) and a plug member (8) which are adapted to engage and disengage respectively along the inward-outward direction (D) of the tub (2), wherein one of the socket member (7) and the plug member (8) is formed onto the front end of the conduit (5) and the other one is formed onto the top spraying device (3) and has a pivot (9) that is adapted to rotatably bear the hub (10) of the impeller (4), and wherein the uppermost level (L) of the mounting assembly (6) does not exceed the uppermost level (L') of the front end of the conduit (5).
2. The dishwasher (1) according to claim 1, characterized in that the front end of the conduit (5) comprises an opening (11) which faces the bottom of the tub (2) and is adapted to discharge the washing liquid onto the upper surface of the impeller (4), wherein the upper surface of the impeller (4) is separated from the opening (11) through a gap (G) along the vertical axis (Z); and the top spraying device (3) comprises one or more L-shaped arms (12) which are formed onto the respective one of the socket member (7) and the plug member (8), wherein the pivot (9) is formed onto the said one or more L-shaped arms (12) and adapted to rotatably bear the lower end of the hub (10), wherein the L-shaped arms (12) extend outside the region (R) between the opening (11) and the impeller (4).
3. The dishwasher (1) according to claim 1 or 2, characterized in that the top spraying device (3) comprises a swivel (13) which is rotatably disposed between the pivot (9) and the hub (10).

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Fig. 1

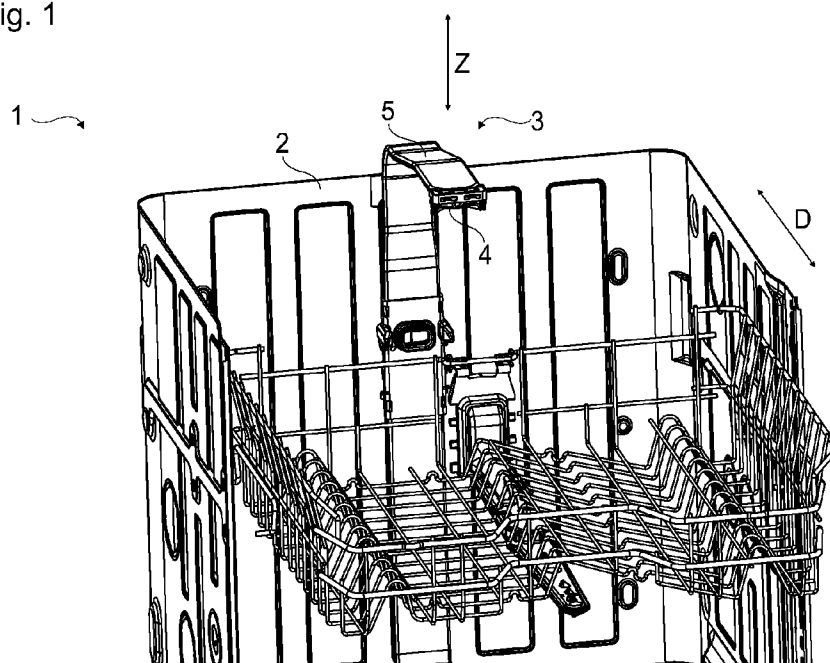


Fig. 2

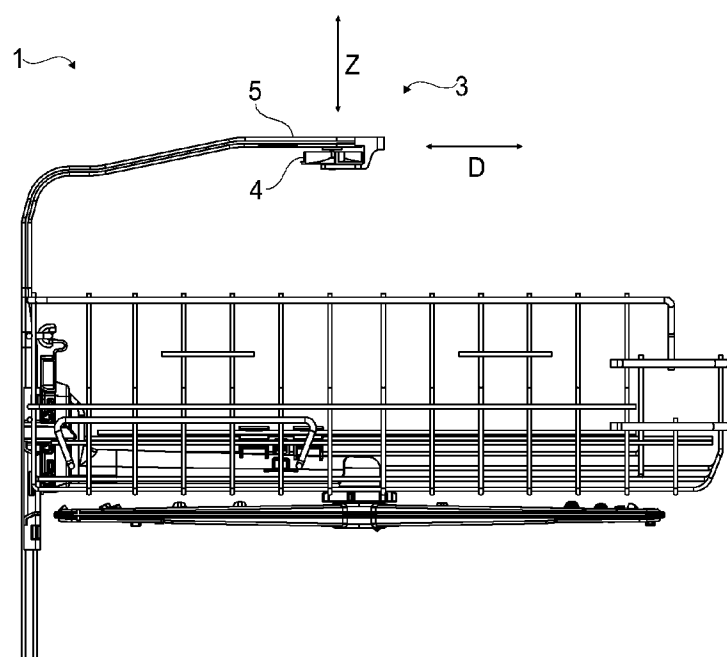


Fig. 3

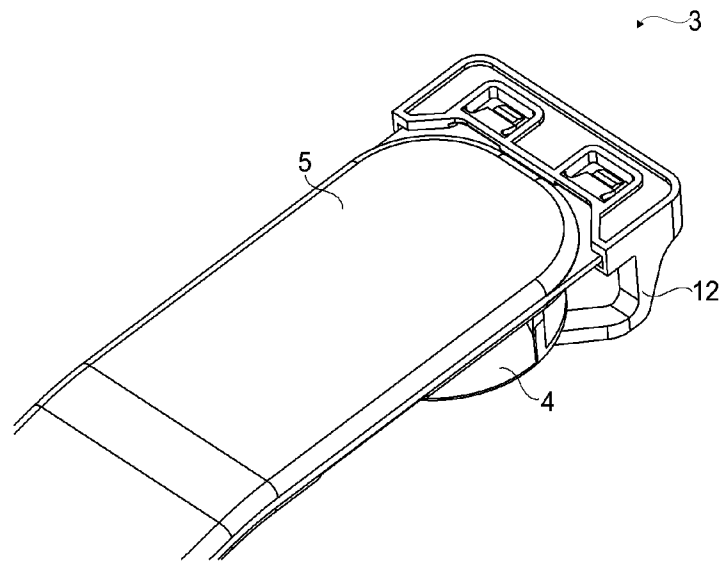


Fig. 4

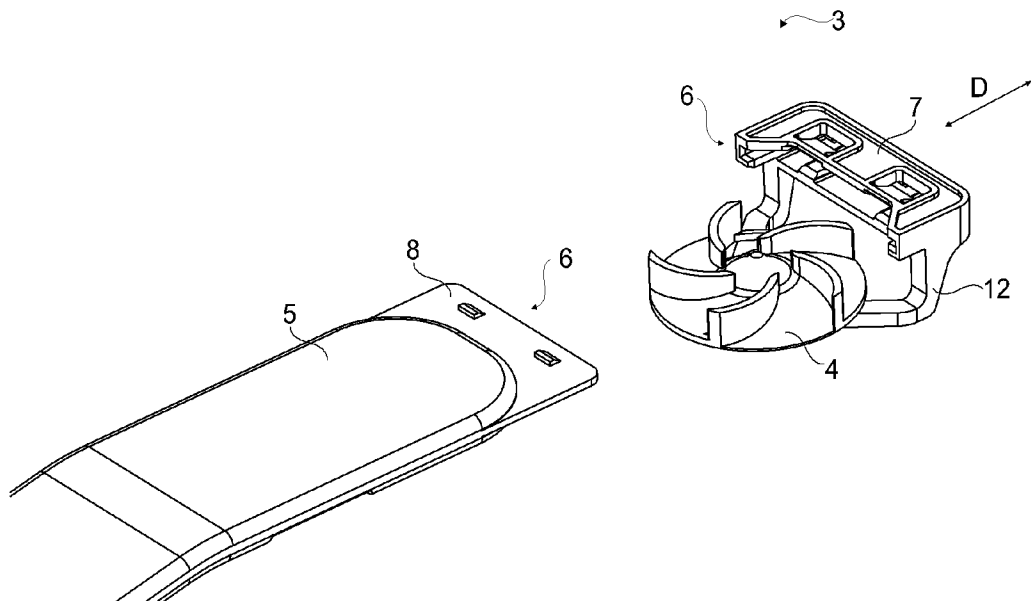


Fig. 5

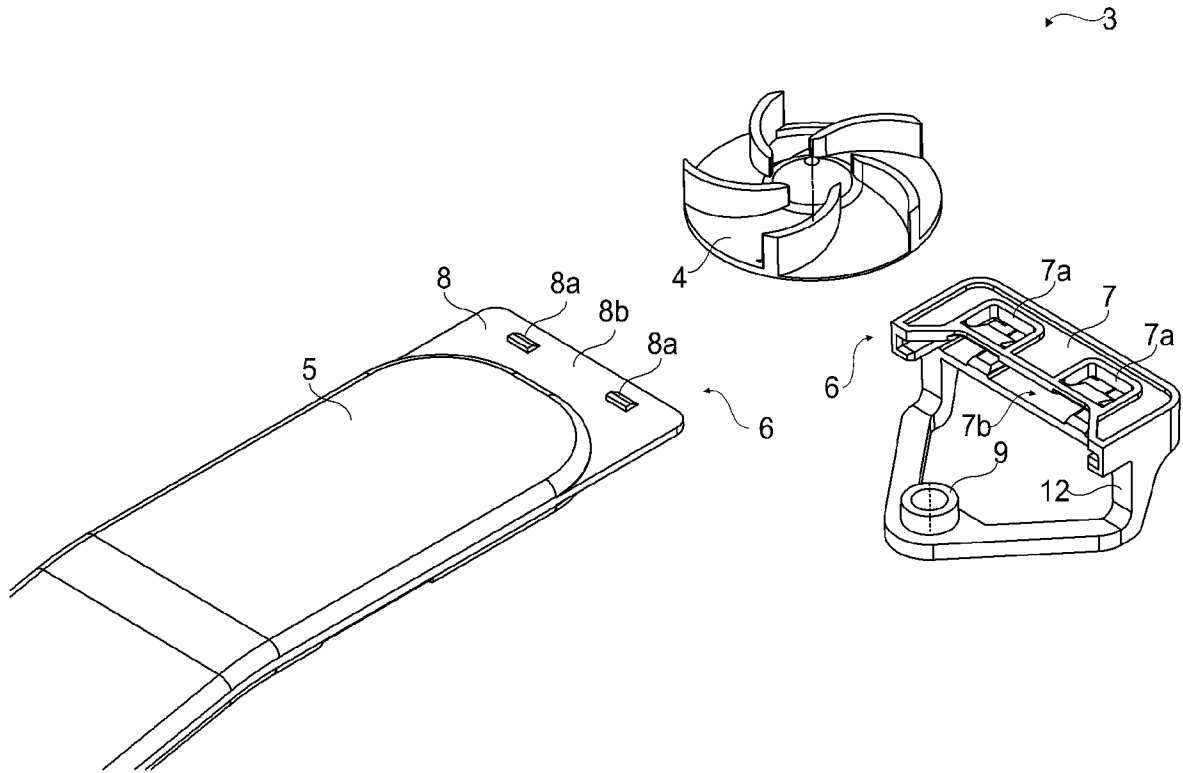


Fig. 6

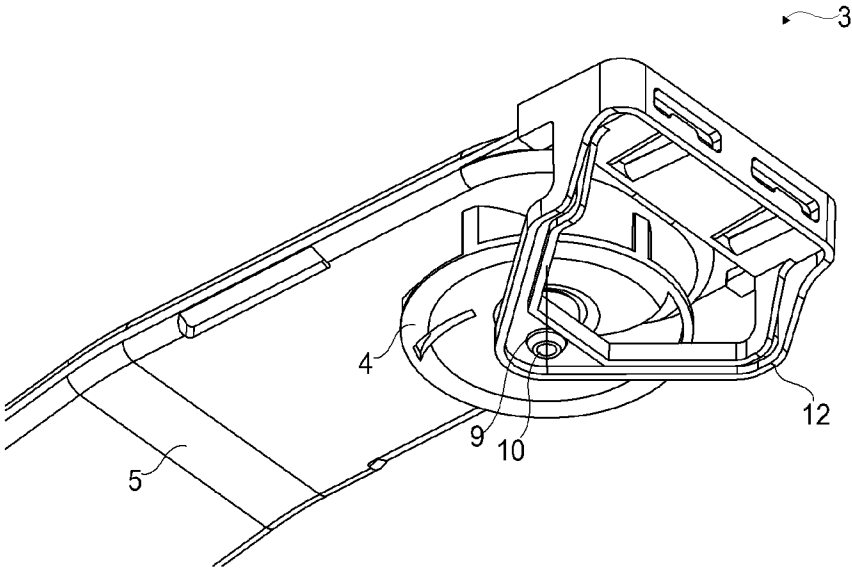


Fig. 7

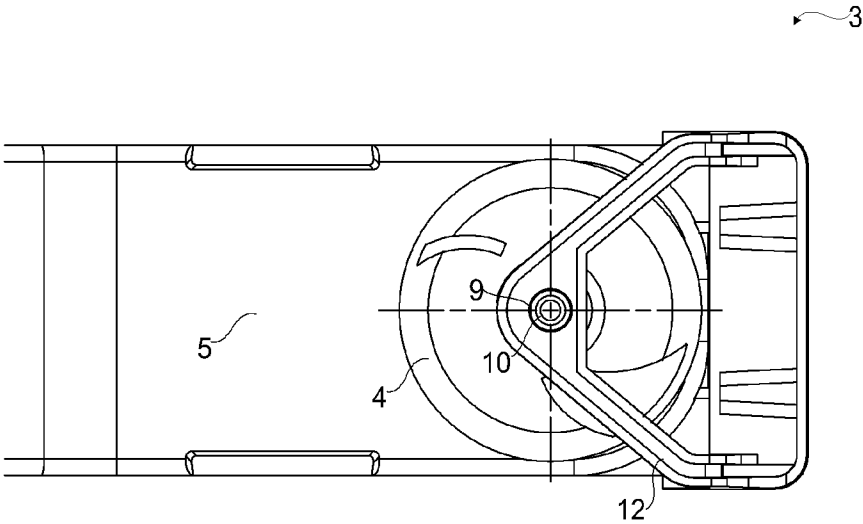


Fig. 8

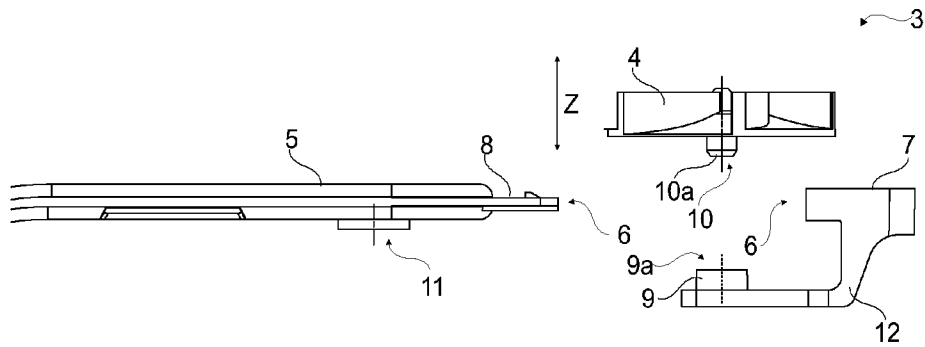


Fig. 9

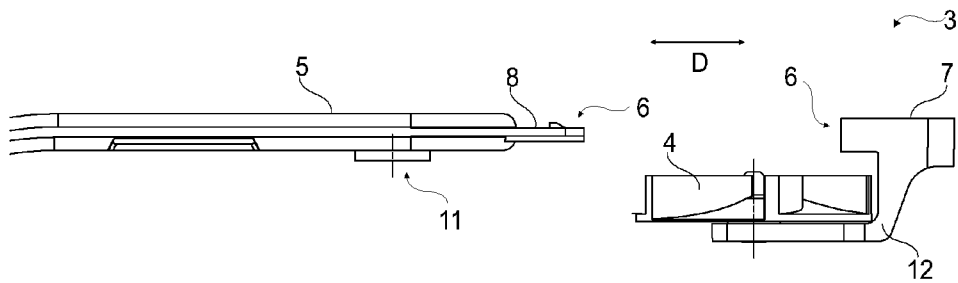


Fig. 10

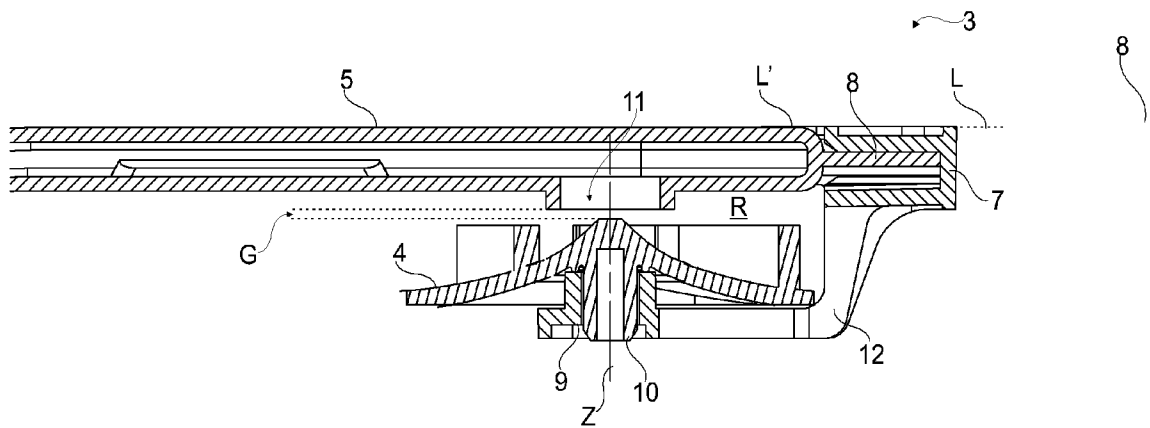


Fig. 11

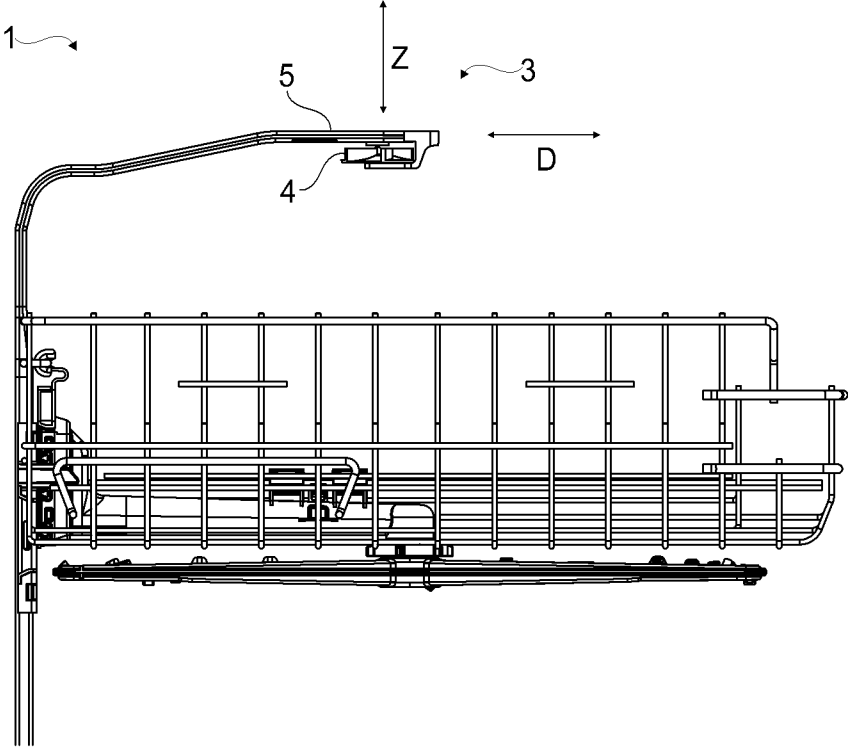


Fig.12

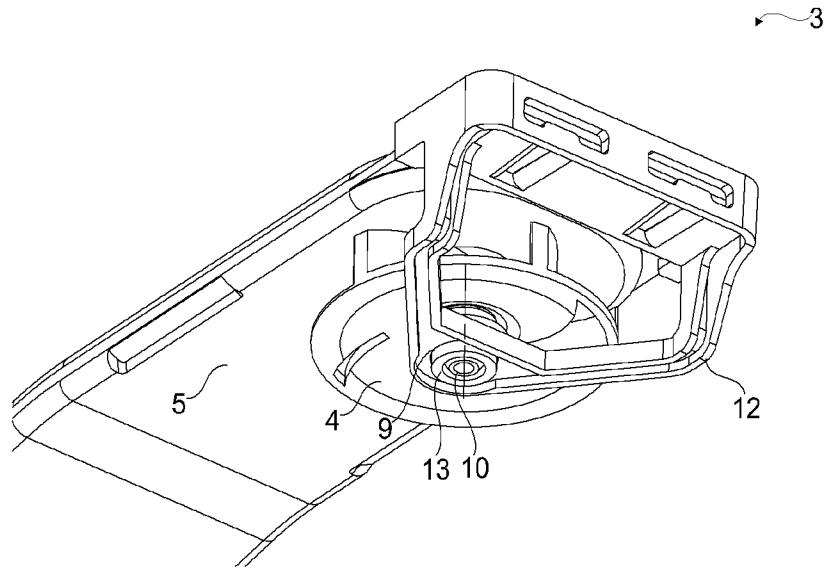


Fig. 13

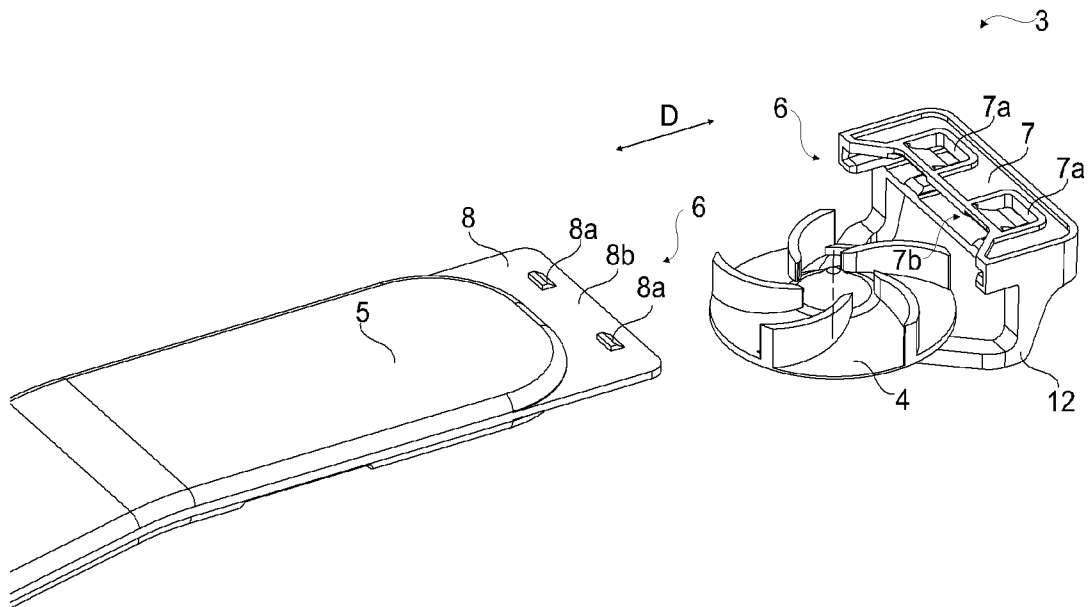


Fig. 14

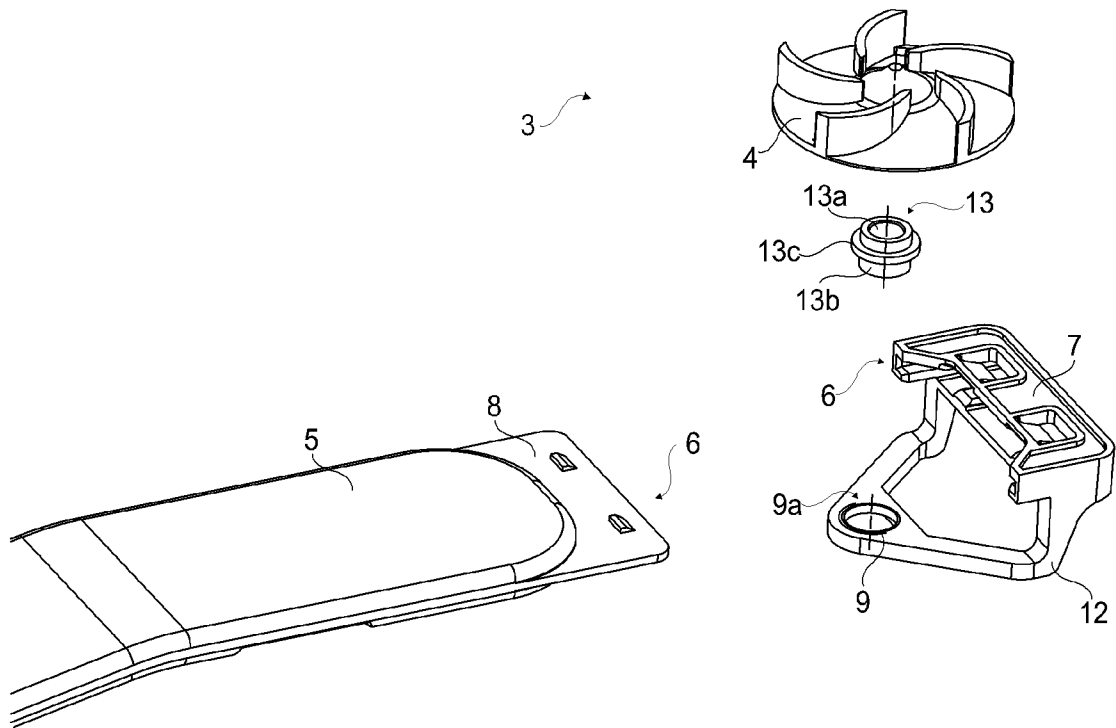


Fig. 15

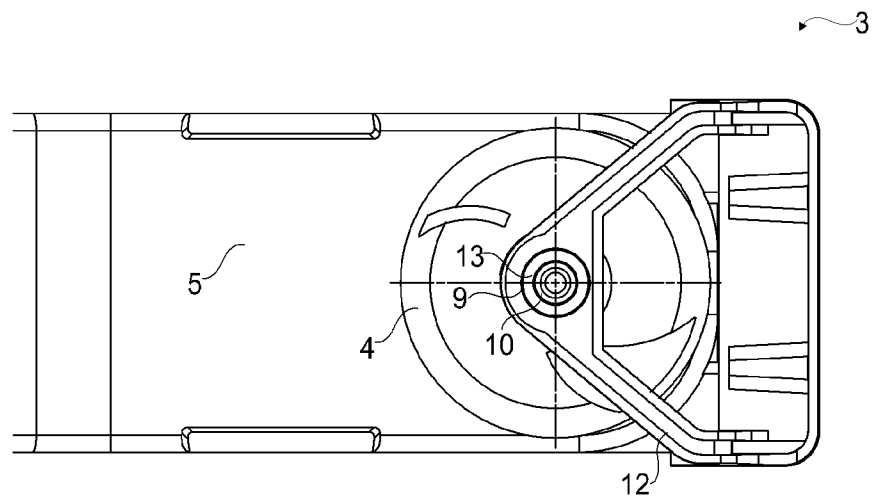
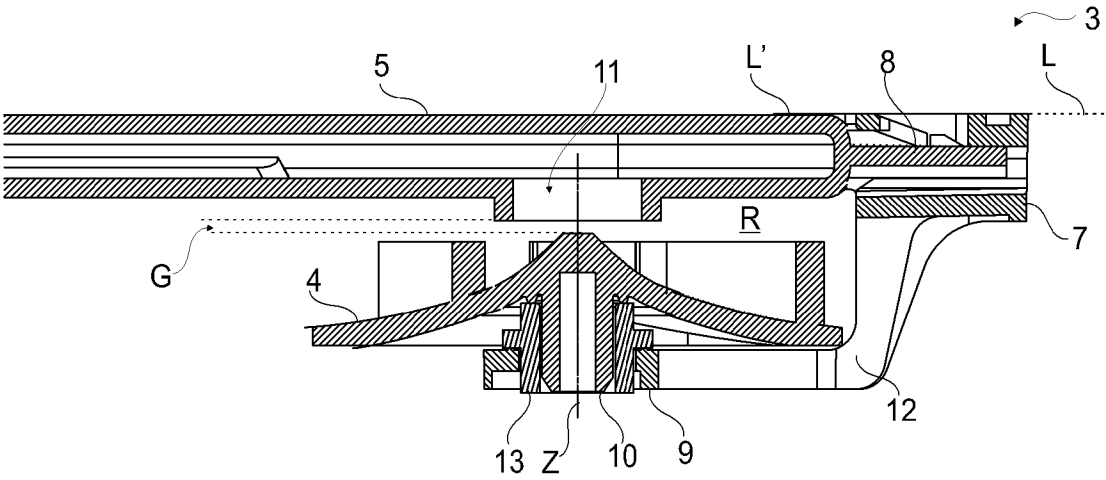


Fig. 16



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/178414 A1 (KANG MYUNG H [KR]) 18 August 2005 (2005-08-18) paragraph [0044] - paragraph [0056] paragraph [0077]; figures 4,5 -----	1-3
A	US 2010/116301 A1 (HEISELE BERND [DE] ET AL) 13 May 2010 (2010-05-13) cited in the application the whole document -----	1-3
A	US 1 997 450 A (ROBERT BURKLE) 9 April 1935 (1935-04-09) the whole document -----	3



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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/057730

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005178414 A1	18-08-2005	KR 20050081449 A US 2005178414 A1	19-08-2005 18-08-2005
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