



- (51) **International Patent Classification:**
D06F 37/14 (2006.01) *D06F 17/10* (2006.01)
- (21) **International Application Number:**
PCT/EP2015/065497
- (22) **International Filing Date:**
7 July 2015 (07.07.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
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- (81) **Designated States** (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

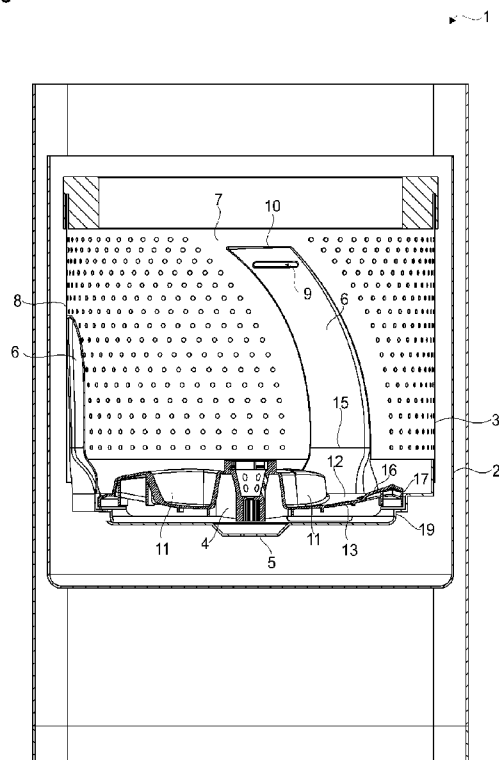
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
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PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) **Title:** TOP LOADING TYPE LAUNDRY WASHING MACHINE

Fig. 1



(57) **Abstract:** The present invention relates to a top loading type laundry washing machine (1) comprising a tub (2), a perforated drum (3), wherein the drum (3) is vertically or obliquely rotatably disposed into the tub (2), a separate impeller (4) for agitating the washing fluid and the laundry, wherein the impeller (4) is coaxially rotatably disposed onto the base section (5) of the drum (3) and a driving mechanism for rotating the drum (3) and the impeller (4). The top loading type laundry washing machine (1) of the present invention comprises one or more wings (6) which are disposed onto the inner surface (7) of the circumferential section (8) of the drum (3) so as to additionally agitate the washing fluid and the laundry inside the tub (2), wherein said one or more wings (6) each continuously and smoothly spans the entire height of the drum (3).

Description**TOP LOADING TYPE LAUNDRY WASHING MACHINE**

- [0001] The present invention relates to the treatment of clothes in a top loading type laundry washing machine.
- [0002] Top loading type laundry washing machines are commonly known in the art. A top loading type laundry washing machine generally includes a perforated drum which is vertically rotatably or obliquely rotatably disposed into the tub. The top loading type laundry washing machine generally includes a separate impeller for agitating the washing fluid and the laundry inside the tub. Thereby, the detergent can be dissolved and the dirt can be removed from the laundry. The impeller is generally coaxially rotatably disposed onto the base section of the drum. A driving mechanism rotates the drum and the impeller. During the washing/rinsing cycle, the impeller is generally oscillated back and forth. During the spin-drying cycle, the drum and the impeller are generally jointly rotated. A common problem with the prior art top loading type laundry washing machine is that the laundry may not be sufficiently agitated and remain dirty after the completion of the washing/rinsing cycle. Another common problem with the prior art top loading type laundry washing machine is that the laundry may become entangled during the oscillatory movement. In general, the poor washing results decrease the user satisfaction. In such incidents the user needs to wash the unclean laundry again. It is commonly known to the top loading type laundry washing machine manufacturers that an increased amount washing liquid inside the tub can increase the washing performance and prevent entanglement of the laundry. However, this increases the water consumption and the detergent consumption. Moreover, the overall energy consumption of the top-loader increases as well.
- [0003] US 5,297,403 discloses a prior art top loading type laundry washing machine.
- [0004] An objective of the present invention is to provide a top loading type washing machine which solves the aforementioned problems of the prior art in a cost effective way and which enables an improved washing performance.

- [0005] This objective has been achieved by the top loading type washing machine as defined in claim 1. Additional achievements have been attained by the subject-matters as defined in the dependent claims respectively.
- [0006] The top loading type washing machine of the present invention comprises one or more wings which are disposed onto the inner surface of the circumferential section of the drum so as to additionally agitate the washing/rinsing fluid and the laundry inside the tub. Each wing continuously and smoothly spans the entire height of the drum.
- [0007] A major advantageous effect of the present invention is that each wing stirs the laundry as the impeller is oscillated or rotated. Thereby, the laundry can be prevented from entangling at the center region of the drum. Thereby also the detergent can be quickly and uniformly dissolved and thus the washing performance can be improved. Another major advantageous effect of the present invention is that the water and detergent consumption can be reduced and the energy efficiency of the laundry washing machine can be improved. Thereby, the user satisfaction can be increased.
- [0008] In an embodiment, at least one wing is curved. In this embodiment, the curved wing extends axially upwards and circumferentially rearwards in the anticlockwise direction or alternatively in the clockwise direction. This embodiment is particularly advantageous as the laundry is centrifuged by the impeller from the center of the drum towards the periphery of the drum and, subsequently lifted upwards through the special shape of the curved wing. Subsequently, the lifted laundry falls under the action gravity to the bottom of the drum. Thereby, the laundry can be more effectively stirred and also more effectively prevented from entangling. Thereby also the washing performance can be further improved.
- [0009] In other alternative embodiments, the curved wing follows a spiral course or alternatively a helical course. These embodiments are particularly advantageous as the spiral/helical shape of the wing causes the laundry to be more gently stirred while simultaneously being lifted upwards along its continuous and smooth contour. Thereby the laundry is subjected to

comparatively less abrasion and more gently washed and rinsed.

- [0010] In another embodiment, the drum has at least three curved wings. This embodiment is particularly advantageous as the three wings cause the laundry to be successively lifted upwards. Thereby, the laundry can be effectively kept in a continual up and down movement and thus the washing performance can be further improved.
- [0011] In another embodiment, each wing has one or more openings which are exclusively formed into its upper end. This embodiment is particularly advantageous as the laundry can be more effectively lifted upwards by the wing when the washing fluid is allowed to float between the wing and the laundry.
- [0012] In another embodiment, the impeller has one or more vanes for agitating the washing fluid and the laundry inside the tub. This embodiment is particularly advantageous as the vanes can effectively stir the washing/rinsing fluid and laundry.
- [0013] In another embodiment, at least one vane is curved. In this embodiment, the curved vane extends radially outwardly and circumferentially rearwards in the anticlockwise direction or alternatively in the clockwise direction. This embodiment is particularly advantageous as the curved vanes effectively move the laundry towards the periphery of the drum where the wings are located.
- [0014] In other alternative embodiments, the curved vane follows a spiral course or a helical course. These embodiments are particularly advantageous as the spiral/helical shape of the vanes cause the laundry to be more gently stirred.
- [0015] In another embodiment, the impeller has at least three vanes. This embodiment is particularly advantageous as the three vanes can uniformly stir the washing/rinsing fluid and the laundry.
- [0016] In another embodiment, the vanes and the wings are arranged in one-to-one angular correspondence. This embodiment is particularly advantageous as the vanes and the wings can cooperate in a more constructive way.
- [0017] In another embodiment, the impeller has at least one blade which

intervenes two neighboring vanes. This embodiment is particularly advantageous as the laundry can be additionally agitated by the blade.

[0018] In another embodiment, the impeller is concave and covers the bottom of the drum. In this embodiment, the impeller has one or more apertures for the passage of the washing/rinsing fluid. This embodiment is particularly advantageous as the concave shape improves the centrifugation of the laundry towards the wings.

[0019] According to the present invention the drum and the impeller can be each selectively and individually oscillated or rotated in the clockwise/anticlockwise direction. The driving mechanism has a plurality of user selectable modes for washing/rinsing and spin-drying of the laundry. In another embodiment, in the washing/rinsing mode, the drum and the impeller are jointly oscillated back and forth. In another embodiment, in the spin-drying mode the drum and the impeller are jointly rotated.

[0020] Additional features and additional advantageous effects of the top loading type laundry washing machine according to the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

[0021] Figure 1 – is a schematic vertical sectional partial view of a top loading type laundry washing machine according to an embodiment of the present invention;

[0022] Figure 2 – is a schematic partial top view of the top loading laundry washing machine of Fig. 1;

[0023] Figure 3 – is a schematic perspective cutaway view of the drum and the impeller of Fig. 1;

[0024] Figure 4 – is another schematic perspective cutaway view of the drum and the impeller of Fig. 1.

[0025] The reference signs appearing on the drawings relate to the following technical features.

1. Washing machine
2. Tub
3. Drum
4. Impeller

5. Base section
6. Wing
7. Inner surface
8. Circumferential section
9. Opening
10. Upper end
11. Vane
12. Bottom surface
13. Base section
14. Tip
15. Lower end
16. Blade
17. Outer edge
18. Aperture
19. Depression

[0026] The top loading type laundry washing machine (1) (hereinafter shortly referred to as “washing machine”) comprises a tub (2), a perforated drum (3) for receiving the laundry (not shown) to be washed, wherein the drum (3) is vertically rotatably or obliquely rotatably disposed into the tub (2), a separate impeller (4) for agitating the washing fluid and the laundry inside the tub (2), wherein the impeller (4) is coaxially rotatably disposed onto the base section (5) of the drum (3) and a driving mechanism (not shown) for rotating the drum (3) and the impeller (4) in a first rotational direction or a second rotational direction opposite to the first rotational direction.

[0027] The washing machine (1) of the present invention comprises one or more wings (6) which are disposed onto the inner surface (7) of the circumferential section (8) of the drum (3) so as to additionally agitate the washing fluid and the laundry inside the tub (2). Said one or more wings (6) each continuously and smoothly spans the entire height of the drum (3).

[0028] In an embodiment, the drum (3) is vertically rotatably disposed into the tub (2).

[0029] In another embodiment, the top loading type laundry washing machine (1)

comprises three wings (6) which are each curved. In this embodiment, each curved wing (6) extends axially upwards and also circumferentially rearwards in the first rotational direction i.e., the anticlockwise direction.

[0030] In another embodiment, the circumferential section (8) of the drum (3) has a substantially constant diameter. In this embodiment, each curved wings (6) follows a helical course.

[0031] In another embodiment, the three wings (6) are evenly disposed onto the inner surface (7) of the circumferential section (8) of the drum (3) at about 120 degrees separations respectively.

[0032] In another embodiment, the washing machine (1) comprises three openings (9) which are respectively formed closely into the upper end (10) of the three curved wings (6).

[0033] In another embodiment, the washing machine (1) comprises three vanes (11) which are disposed onto the bottom surface (12) of the base section (13) of the impeller (4) so as to agitate the washing fluid and the laundry inside the tub (2). Said one or more vanes (11) each continuously and smoothly span the entire radius of the impeller (4).

[0034] In another embodiment, each vane (11) is curved. In this embodiment, each curved vane (11) extends radially outwardly and also circumferentially rearwards in the first rotational direction, i.e., the anticlockwise direction.

[0035] In another embodiment, each curved vane (11) follows a helical course.

[0036] In another embodiment, the three curved vanes (11) are evenly disposed onto the bottom surface (12) of the base section (13) of the impeller (4) at about 120 degrees separations respectively.

[0037] In another embodiment, the curved vanes (11) and the curved wings (6) are arranged in one-to-one angular correspondence such that the tip (14) of the vane (11) points to the lower end (15) of the respective wing (6).

[0038] In another embodiment, the washing machine (1) comprises three blades (16) which are evenly disposed onto the bottom surface (12) of the base section (13) of the impeller (4) so as to agitate the washing fluid and the laundry inside the tub (2). In this embodiment, each blade (16) has a ship's hull shape such that the blade (16) extends radially inwardly from the outer

edge (17) of the impeller (4) and intervenes two neighboring curved vanes (11).

- [0039] In another embodiment, the washing machine (1) further comprises a plurality of apertures (18) which are formed into the impeller (4). In addition, a circular depression (19) is formed into the base section (5) of the drum (3). In this embodiment, the bottom surface (12) of the base section (13) of the impeller (4) is concave and covers the depression (19) of the drum (3).
- [0040] In another embodiment, at least one aperture (18) is formed closely into the tip (14) of each vane (11). In this embodiment, also at least one aperture (18) is formed into each blade (16). In this embodiment, also plurality apertures (18) are formed into bottom surface (12) of the base section (13) of the impeller (4), particularly between each blade (16) and the respective neighboring vanes (11).
- [0041] In another embodiment, each wing (6) has an arc-shaped horizontal cross section that protrudes radially inwards to the rotational axis of the drum (3).
- [0042] In another embodiment, the driving mechanism has a plurality of washing/rinsing modes and a plurality of spin-drying modes. In at least one washing/rinsing mode, the driving mechanism jointly oscillates the drum (3) and the impeller (4) back and forth. In at least one spin-drying mode, the driving mechanism jointly rotates the drum (3) and the impeller (4) in the second rotational direction i.e., the clockwise direction. The driving mechanism has an electric motor (not shown) which is coupled to the drum (3) and the impeller (4).
- [0043] A major advantageous effect of the present invention is that each wing (6) stirs the laundry as the impeller (4) is rotated or oscillated. Thereby, the laundry can be prevented from entangling in the center region of the drum (3). Thereby also the detergent can be quickly and uniformly dissolved and thus the washing performance can be improved. Another major advantageous effect of the present invention is that the water and detergent consumption can be reduced and the energy efficiency of the washing machine (1) can be improved. Thereby, the user satisfaction can

be increased. Other advantageous effects of the present invention can be taken from the aforementioned particular embodiments.

Claims

1. A washing machine (1) comprising a tub (2); a perforated drum (3) for receiving the laundry to be washed, wherein the drum (3) is vertically rotatably or obliquely rotatably disposed into the tub (2); a separate impeller (4) for agitating the washing fluid and the laundry inside the tub (2), wherein the impeller (4) is coaxially rotatably disposed onto the base section (5) of the drum (3) and a driving mechanism for rotating the drum (3) and the impeller (4) in a first rotational direction or a second rotational direction opposite to the first rotational direction, **characterized in that** one or more wings (6) which are disposed onto the inner surface (7) of the circumferential section (8) of the drum (3) so as to additionally agitate the washing fluid and the laundry inside the tub (2), wherein said one or more wings (6) each continuously and smoothly spans the entire height of the drum (3).
2. The washing machine (1) according to claim 1, **characterized in that** said one or more wings (6) are each curved such that each curved wing (6) extends axially upwards and also circumferentially rearwards in the first rotational direction.
3. The washing machine (1) according to claim 2, **characterized in that** said one or more curved wings (6) each follows a spiral course or a helical course.
4. The washing machine (1) according to any one of the claims 1 to 3, **characterized in that** three wings (6) which are disposed onto the inner surface (7) of the circumferential section (8) of the drum (3) at about 120 degrees separations respectively.
5. The washing machine (1) according to any one of the claims 1 to 3, **characterized in that** one or more openings (9) which are each formed exclusively closely into the upper end (10) of the wings (6).
6. The washing machine (1) according to claim 1, **characterized in that** one or more vanes (11) which are disposed onto the bottom surface (12) of the base section (13) of the impeller (4) so as to agitate the washing fluid and the laundry inside the tub (2), wherein said one or more vanes (11) each continuously and smoothly span the entire radius of the impeller (4).
7. The washing machine (1) according to claim 6, **characterized in that** said one or more vanes (11) are each curved such that each curved vane (11) extends

radially outwardly and also circumferentially rearwards in the first rotational direction.

8. The washing machine (1) according to claim 7, **characterized in that** said one or more curved vanes (11) each follow a spiral course or a helical course.
9. The washing machine (1) according to any one of the claims 6 to 8, **characterized in that** three vanes (11) which are disposed onto the bottom surface (12) of the base section (13) of the impeller (4) at about 120 degrees separations respectively.
10. The washing machine (1) according to any one of the claims 6 to 8, characterized in that the vanes (11) and the wings (6) are arranged in one-to-one angular correspondence such that the tip (14) of the vane (11) points to the lower end (15) of the respective wing (6).
11. The top loading type laundry washing machine (1) according to claim 1, **characterized in that** one or more blades (16) which are evenly disposed onto the bottom surface (12) of the base section (13) of the impeller (4) so as to agitate the washing fluid and the laundry inside the tub (2), wherein each blade (16) has a ship's hull shape such that the blade (16) extends radially inwardly from the outer edge (17) of the impeller (4) and intervenes two neighboring vanes (11).
12. The top loading type laundry washing machine (1) according to claim 1, **characterized in that** one or more apertures (18) which are formed into the impeller (4) and a circular depression (19) which is formed into the base section (5) of the drum (3), wherein the bottom surface (12) of the base section (13) of the impeller (4) is concave and covers the depression (19) of the drum (3).
13. The top loading type laundry washing machine (1) according to claim 1, **characterized in that** the wings (6) each has an arc-shaped horizontal cross section that protrudes radially inwards to the rotational axis of the drum (3).
14. The top loading type laundry washing machine (1) according to claim 1, **characterized in that** the driving mechanism has a washing/rinsing mode for jointly oscillating the drum (3) and the impeller (4) back and forth and a spin-drying mode for jointly rotating the drum (3) and the impeller (4) in the second rotational direction.

Fig. 1

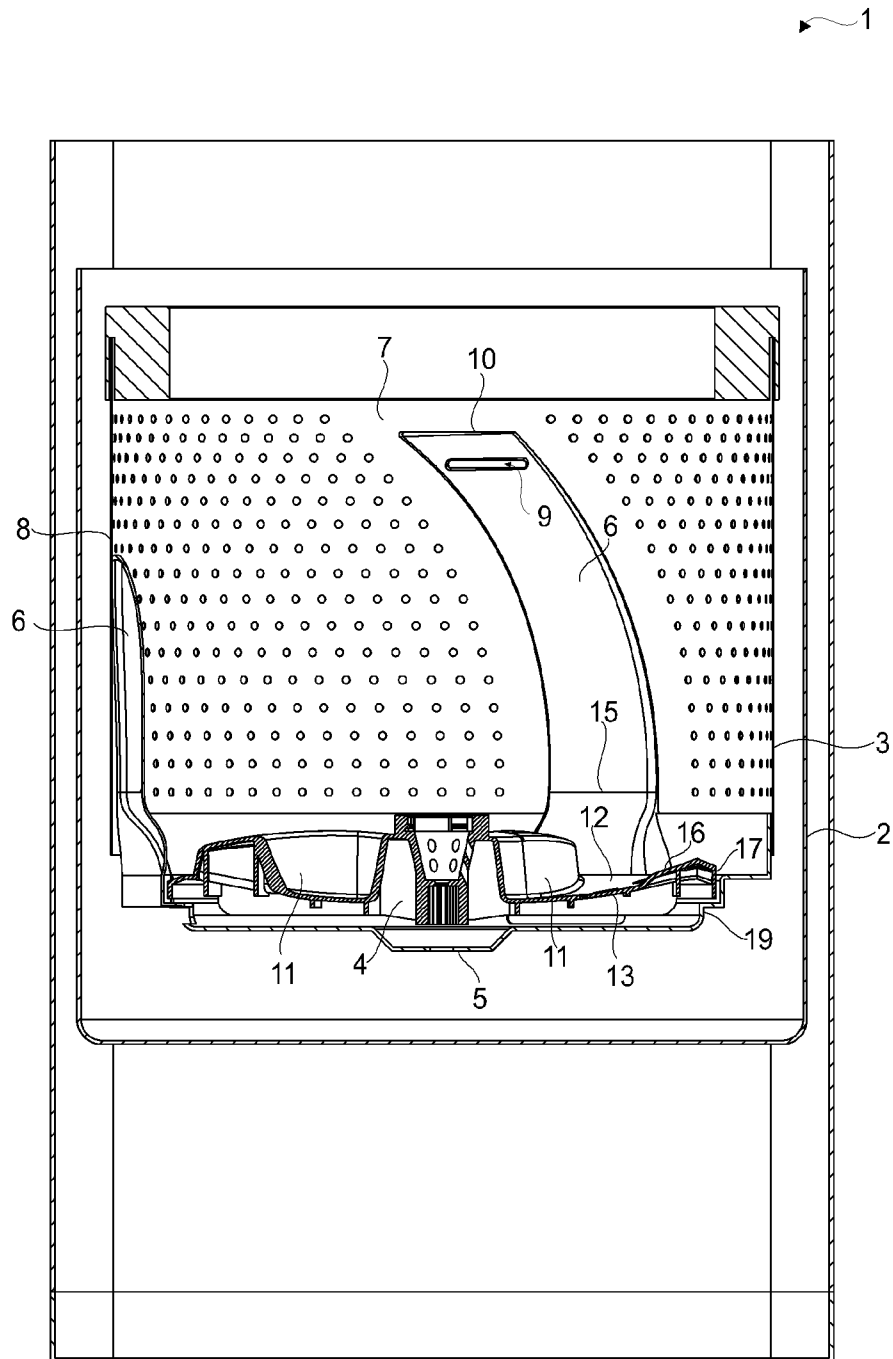


Fig. 2

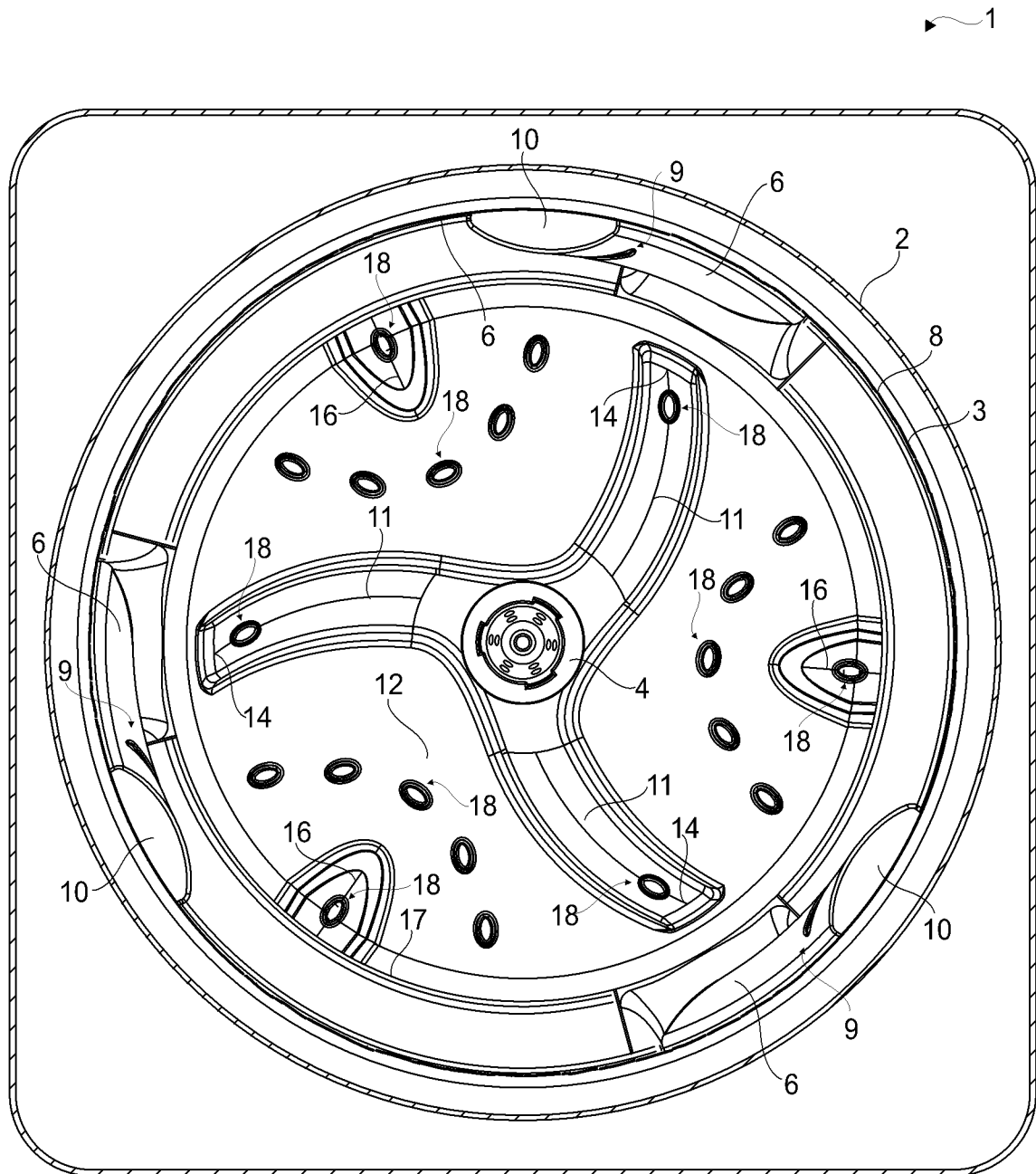


Fig. 3

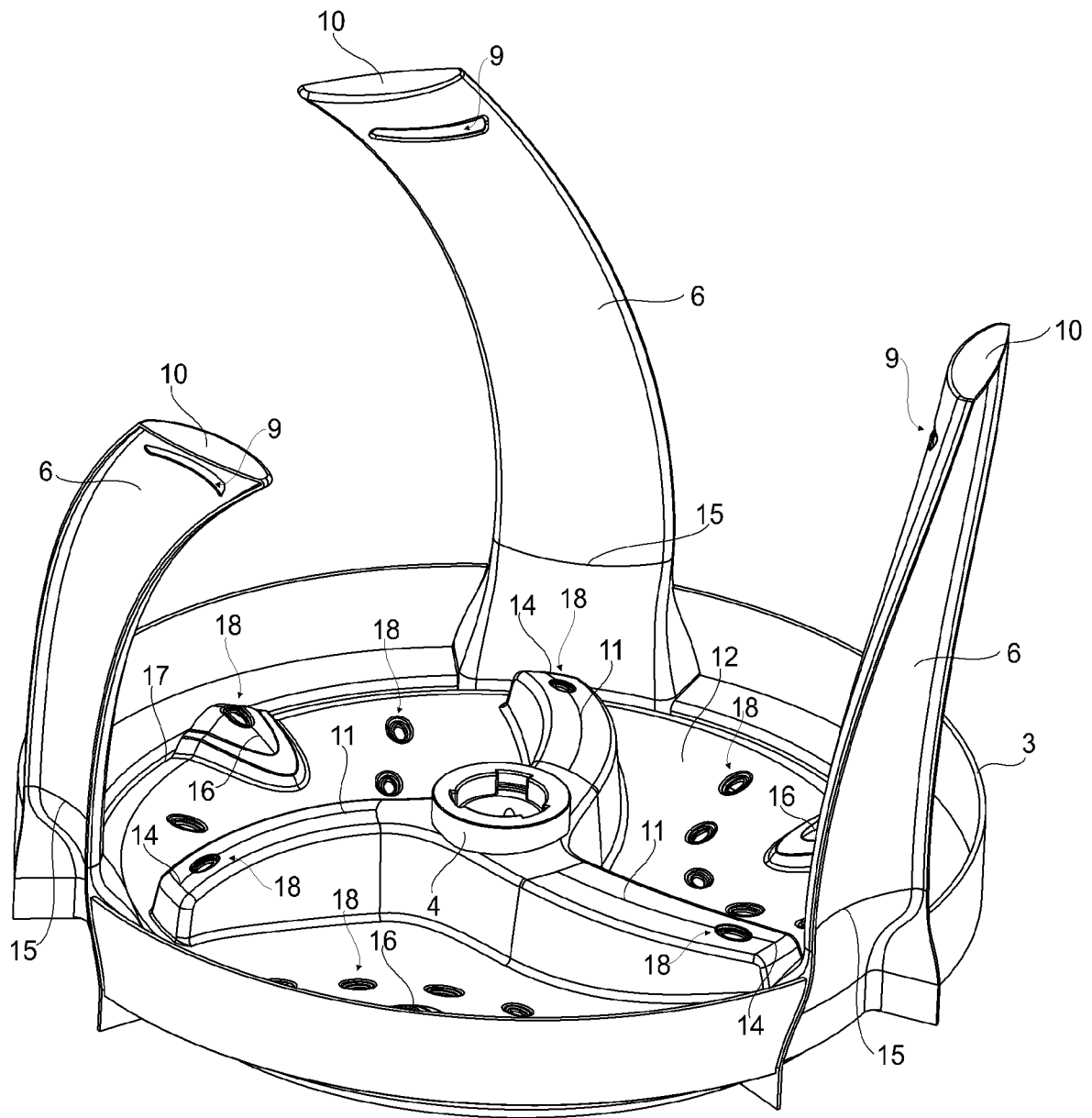
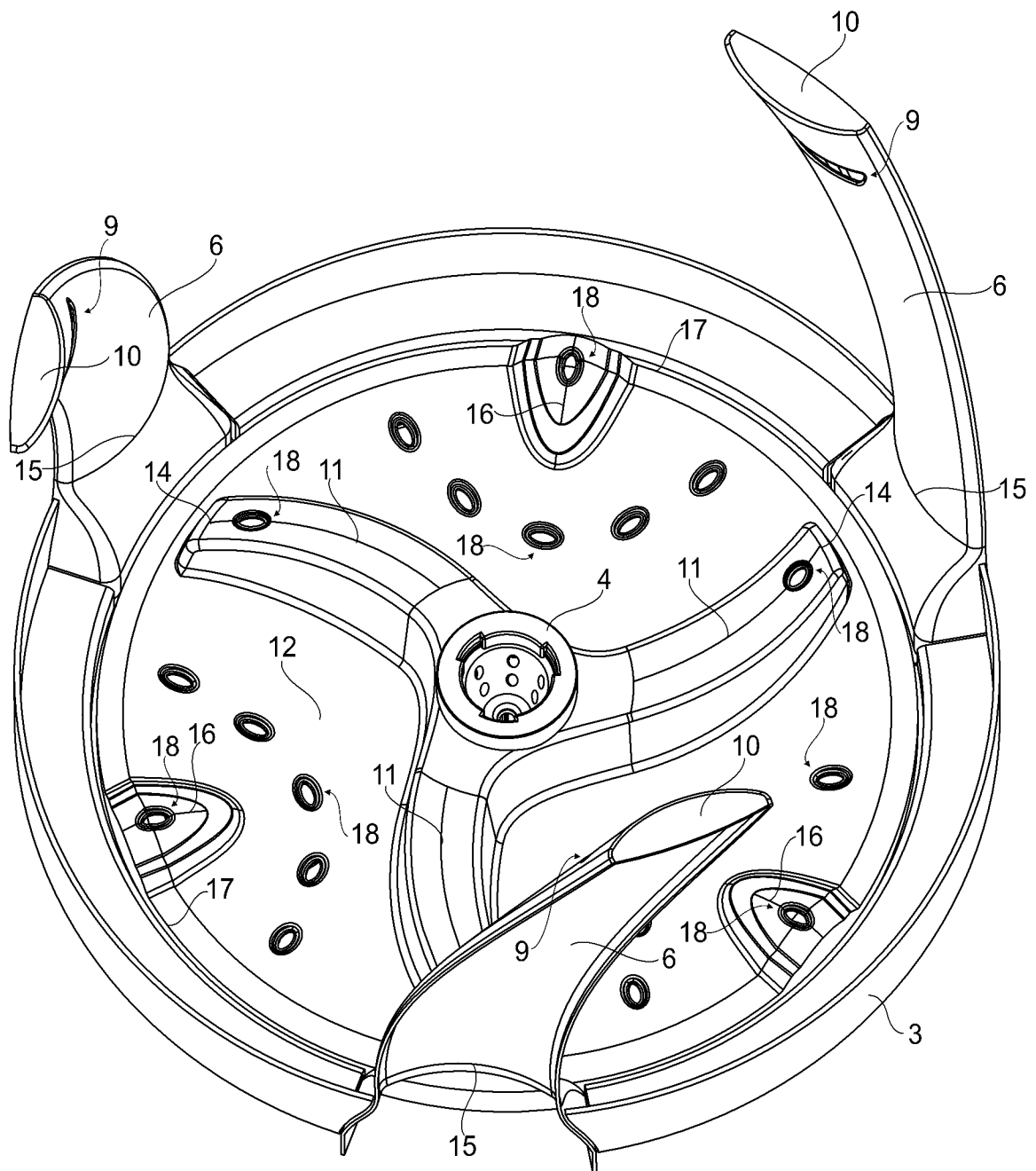


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065497

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F37/14 D06F17/10
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)
D06F

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 A	WO 2015/071962 A1 (HAIER ASIA INT CO LTD [JP]) 21 May 2015 (2015-05-21) - & WO 2015/071962 K1 (HAIER ASIA INT CO LTD [JP]) 21 May 2015 (2015-05-21) paragraph [0018] - paragraph [0042]; figures 1, 2a, 2b, 3a, 3b paragraph [0046] - paragraph [0049] -----	1-3,5-8, 11-14 4,9,10
X	US 5 823 019 A (PARK KWAN-CHEOL [KR]) 20 October 1998 (1998-10-20) column 3, line 4 - column 4, line 15; figures 3, 4 -----	1,13,14
A	US 2014/076004 A1 (LEE JU DONG [KR]) 20 March 2014 (2014-03-20) paragraph [0009] paragraph [0035] - paragraph [0043]; figures 1, 2 -----	6-8,11, 12



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

20 August 2015

Date of mailing of the international search report

28/08/2015

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/065497

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