



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.11.2022 Bulletin 2022/44

(51) International Patent Classification (IPC):
D06F 37/04 ^(2006.01) **D06F 37/26** ^(2006.01)

(21) Application number: **22163859.6**

(52) Cooperative Patent Classification (CPC):
D06F 37/04; D06F 37/26

(22) Date of filing: **23.03.2022**

(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
Designated Validation States:
KH MA MD TN

(71) Applicant: **Care Applications, S.L.U.**
03801 Alcoy, Alicante (ES)

(72) Inventor: **CAMPESE, Romano**
03801 Alcoy, Alicante (ES)

(74) Representative: **Mitola, Marco**
Jacobacci & Partners S.p.A.
Piazza Mario Saggin, 2
35131 Padova (IT)

(30) Priority: **28.04.2021 IT 202100010757**

(54) **WASHING MACHINE WITH ROTATING DRUM**

(57) A washing machine (4), comprising a containment housing (8), a basket (12) being rotatable around a rotation axis (X-X), arranged within the containment housing (8), defining an interspace (24) between the rotating basket (12) and the containment housing (8), the side wall (16) of the rotating basket (12) having through holes (32) fluidly connecting the interspace (24) with the cavity (20). The rotating basket (12) is axial-symmetrical with respect to the rotation axis (X-X) and, on a cross-section plane passing through said rotation axis (X-X), the side wall (16) has at least one recess (36) with respect to a bottom wall (40) of said basket (12) having a maximum radius with respect to the rotation axis (X-X), said recess (36) having a radial depth (44) with respect to the bottom wall (40) and defining with the bottom wall (40) a radial seat (48) suitable to collect liquid. The containment housing (8) is counter-shaped with respect to said side wall (16).

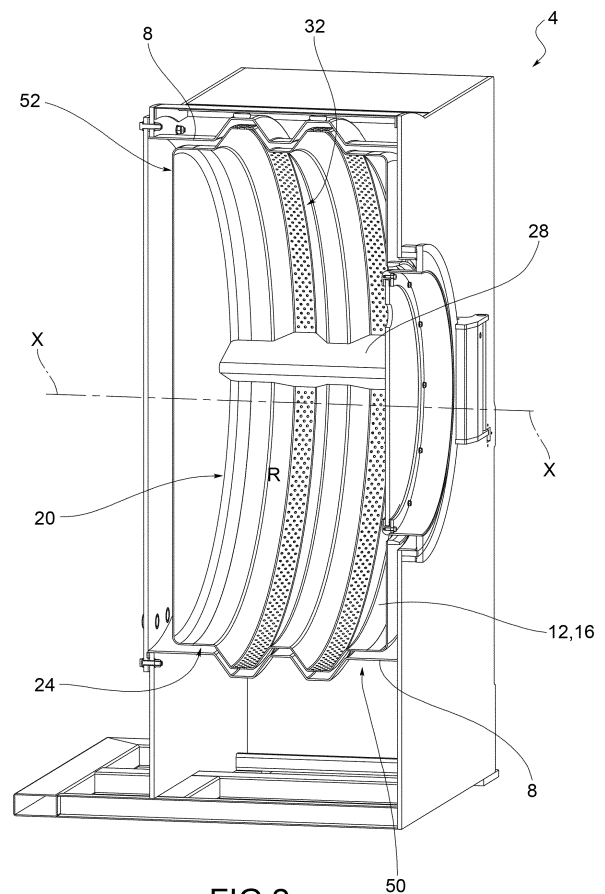


FIG.2

Description

FIELD OF APPLICATION

[0001] The present invention relates to a washing machine for wet textile processes provided with a rotating basket and an improved housing thereof.

PRIOR ART

[0002] The present invention relates to a washing machine for wet textile processes, typically, but not exclusively, dyeing processes.

[0003] As is known, there are various washing machines for wet textile treatments. At present, the existing washing machines are composed of a housing with a rotating basket inside in which the textile material to be treated is inserted. The water used must reach the inside of the rotating basket in order to treat the textile material.

[0004] The rotating basket is equipped with multiple holes that allow the continuous interchange of water between the inside and outside of the basket (housing). Further, an indeterminate number of blades are fixed inside the rotating basket, which during rotation move the water and the textile material, causing the correct wetting and continuously changing the position.

[0005] One of the most important parameters in textile processes is the so-called liquor ratio R:B, i.e., the ratio between the volume of water and the weight of the material to be treated. For example, a liquor ratio R:B of 1:10 means that 10 liters of water are used for every kilogram of material to be treated, likewise a liquor ratio R:B of 1:5 means that 5 liters of water are used for every kilogram of material to be treated.

[0006] Obviously, the larger the liquor ratio, the more water is consumed for textile treatment; the direct result is an increase in the quantity of all the chemical products that must be calculated on the volume of water in use, an increase in the energy used to heat the water, and a lengthening of the overall process time.

[0007] The points that affect the minimum amount of water to be used in washing machines are (see Fig. 1 - solution of the prior art):

- a) housing diameter
- b) rotating basket diameter
- c) housing depth
- d) rotating basket depth
- e) space between the housing and rotating basket (interspace)
- f) the minimum working level, which is the amount of water inside the rotating basket that ensures the uniform wetting of the textile material during rotation
- g) any washing machine blades that, when the basket rotates, allow the garment and water to move properly during the application process.

[0008] All of the points described determine the mini-

mum liters of water to be used in each washing machine.

[0009] The distance between the outer housing and the rotating basket results in a space (interspace) to be filled with water that is not directly involved in wetting the textile material. In fact, said interspace does not house the textile material but only the water. This space may be larger or smaller and consequently the amount of water that fills it will be more or less. The diameter and depth of the rotating basket and the diameter and depth of the housing containing it will determine the volume of water within this space.

[0010] The water directly involved in the wetting of the textile material is the water present inside the rotating basket and is added to the external water contained in the interspace.

[0011] The prior art discloses a rectilinear rotating basket and housing geometry, as shown in Fig. 1.

[0012] Although widely used, the prior art, described in Fig. 1, in order to ensure that the predetermined level of water necessary for the proper treatment of the fabric is reached inside the rotating basket, first the housing and then the basket must be filled completely up to the required level.

[0013] The solutions of the prior art, such as the one shown in Fig. 1, do not allow for any significant optimization or reduction of the volume of filling water necessary to reach said predetermined level of water inside the rotating basket.

DISCLOSURE OF THE INVENTION

[0014] There is therefore a need to solve the drawbacks and limitations mentioned with reference to the prior art.

[0015] Thus, there is a need to provide a washing machine with a different structure and optimized with respect to those of the prior art, which allows for the amount of water used to be reduced, while maintaining inside the rotating basket the volume necessary for the proper wetting of the textile material (garments and otherwise). Said requirement must also be met in both production washing machines and sample washing machines, so that the liquor ratio and overall consumption of the application process may be reduced.

[0016] This need is satisfied by a washing machine according to claim 1.

DESCRIPTION OF THE DRAWINGS

[0017] Further features and advantages of this invention will become more apparent from the following detailed description of preferred, non-limiting embodiments thereof, wherein:

Fig. 1a is a perspective view, in partial cross section, of a washing machine solution according to the prior art;

Fig. 1b is two comparative schematic views, in cross

section, of a washing machine of the prior art (left) and a washing machine according to an embodiment of the present invention (right);

Fig. 2 shows a cross section of the washing machine of the present invention, wherein the rotating basket and the housing have a non-rectilinear shape that is complementary with each other;

Fig. 3 shows a portion of the cross section of the interspace with the non-rectilinear shape of the housing and basket of the present invention;

Fig. 4 shows the enlarged detail IV indicated in Fig. 3.

DETAILED DESCRIPTION

[0018] With reference to the aforesaid figures, reference numeral 4 globally denotes an overall view of a washing machine according to the present invention.

[0019] The washing machine 4 is a washing machine for wet textile processes, for example for washing garments but also for dyeing garments.

[0020] Thus, for the purposes of the present invention, the washing machine 4 is to be considered in its most general, non-restrictive sense for both domestic and industrial/professional applications.

[0021] The washing machine 4 comprises a containment housing 8, and a basket 12 having a side wall 16 delimiting a cavity 20, suitable for containing inside it textile materials to be treated and a solution containing water. It should be noted that the term "textile materials" should be understood in a broad sense, comprising fabrics, ready-made garments, and even non-woven fabrics.

[0022] The basket 12 rotates about a rotation axis X-X, and is arranged within the containment housing 8, so as to define an interspace 24 between the rotating basket 12 and the containment housing 8.

[0023] According to a possible embodiment, the basket 12 comprises within it, i.e., within the cavity 20, at least one blade that, with the basket 12 rotating, allows the garment and the water to move properly during the application process.

[0024] Thus, the blade 28 is integral with the side wall 16 of the basket 12, on the internal side bordering the cavity 20.

[0025] Preferably, the minimum water level to use for the textile process is normally equal to the maximum height or apex of the blade 28 in its lowest position in the rotating basket 12. The use of the blades 28 is however optional and not mandatory for the purposes of the present invention.

[0026] The side wall 16 of the rotating basket 12 is provided with through holes 32, which fluidly connect the interspace 24 with the cavity 20.

[0027] On the other hand, the containment housing 8 is hermetically sealed so as to ensure the volume of liquid within the basket 12 and the cavity 24.

[0028] The rotating basket 12 is axial-symmetrical with respect to the rotation axis X-X and, on a cross-section plane passing through said rotation axis X-X, the side

wall 16 presents at least one recess 36 with respect to a bottom wall 40 of said basket 12 having a maximum radius R with respect to the rotation axis X-X.

[0029] In particular, said recess 36 has a radial depth 44 with respect to the bottom wall 40 and defines with the bottom wall 40 a radial seat 48 suitable to collect liquid.

[0030] The containment housing 8 is counter-shaped with respect to said side wall 16, at least at a half-portion located below the rotation axis X-X.

[0031] More specifically, the containment housing 8 is counter-shaped with respect to the side wall 16 at said at least one recess 36.

[0032] The side wall 16 of the basket 12 may have different geometric shapes.

[0033] For example, the side wall 16 of the basket 12 exhibits an overall non-rectilinear pattern, moving from a front end 50 to a rear end 52, parallel to the rotation axis X-X.

[0034] In particular, the front end 50 of the basket 12 is also the open loading end through which the garments to be processed are inserted into the basket 12, while the rear end 52 is closed.

[0035] Preferably, the side wall 16 has a plurality of recesses 36.

[0036] According to a possible embodiment, the side wall 16 has an overall serrated or sinusoidal pattern.

[0037] For example, said at least one recess 36 has a tapered geometry towards the rotation axis X-X.

[0038] According to a possible embodiment, said at least one recess 36 has an isosceles trapezoid geometry with a lesser base 54 placed on the minimum radius R of the basket 12.

[0039] It is also possible to envisage at least one recess 36 having a curvilinear shape, for example sinusoidal.

[0040] According to a possible and non-limiting embodiment, said at least one recess 36 has a radial depth 44, with respect to said rotation axis X-X, that is not less than a water level necessary for the wet textile treatment or process to be performed.

[0041] According to a possible and non-limiting embodiment, said recess 36 is equal to the height of the blades 28 extending within the cavity 20. In any event, as shown, the blades 28 are optional.

[0042] According to an embodiment, the at least one recess 36 has a maximum axial breadth 58, measured parallel to the rotation axis X-X, greater than or equal to said radial depth 44.

[0043] According to a possible and non-limiting embodiment, the rotating basket 12 has a plurality of regular and equal recesses 36 along the axial extension of the basket 12, parallel to the rotation axis X-X.

[0044] Preferably, the containment housing 8 is counter-shaped with respect to the side wall 16 of the rotating basket 12, in such a way that the interspace 24 has a substantially constant thickness 62, measured perpendicular to the rotation axis X-X, at the half-portion of the containment housing 8 located below the rotation axis X-

X.

[0045] Preferably, said interspace 24 has a thickness 62 which is smaller at the half-portion of the containment housing 8 located below the rotation axis X-X and larger at the half-portion of the containment housing 8 located above the rotation axis X-X.

[0046] According to a possible embodiment, the containment housing 8 is counter-shaped with respect to the side wall 16 of the rotating basket 12, in such a way that the interspace 24 has a thickness 62 of at least 1 cm, measured perpendicular to the rotation axis X-X, at the half-portion of the containment housing 8 located below the rotation axis X-X.

[0047] This minimum thickness value 62 serves, on the one hand, to ensure the maximum possible reduction in the volume of the interspace 24 and, on the other hand, to prevent collisions between the basket 12 and the containment housing 8 during the operation of the washing machine 4.

[0048] According to a possible and non-limiting embodiment, the radial depth 44 of the recess 36 is at least 2 times the thickness 62 of the interspace 24, measured perpendicular to the rotation axis X-X, at the half-portion of the containment housing 8 located below the rotation axis X-X.

[0049] Obviously, the geometric features described above, such as, for example, the shape, number, and size of the cavities 20, of the interspace 24, of the radial seats 28, and of the thicknesses 62, which are rectilinear, non-rectilinear and complementary to each other may vary depending on and in relation to the size of the washing machine 4; such shapes will preferably be repeated in the axial depth of the rotating basket 12.

[0050] As may be appreciated from what is described, the present invention overcomes the drawbacks of the prior art.

[0051] Advantageously, the washing machine according to the present invention has a rotating basket and related housing with an innovative morphology, said basket and housing being complementary and not rectilinear.

[0052] The objective, of the present invention, as shown is to minimize water consumption during textile treatments for garments and otherwise. The particular design of the basket and of the housing reduces the quantity of water in use; it makes the production machines more flexible in minimum loads, without reducing maximum loads, and solves or improves the problems of reproducibility between the sample machine and the production machine.

[0053] Advantageously, the washing machine according to the present invention makes it possible to reduce the amount of water used as much as possible, while maintaining within the rotating basket the volume necessary for the proper wetting of the textile material (garments and otherwise). This requirement is also met in both production and sample washing machines, so that the liquor ratio and overall consumption of the application process may be reduced.

[0054] In other words, the design of the rotating basket and its containment housing, due to the presence of recesses with respect to the maximum radius of the basket and the complementary non-rectilinear geometry of the housing, reduces the amount of water in use in any diameter and depth of the basket and housing, while maintaining the necessary level inside the rotating basket, for the correct wetting of the textile material.

[0055] The resulting water savings reduce energy and chemicals in use. It also increases the flexibility of the washing machine, allowing for the reduction of minimum loads of textile material without losing capacity in maximum loads.

[0056] The tangible water savings may be clearly seen from Fig. 1b, in which a basket-housing assembly of the prior art is shown on the left and the solution according to an embodiment of the present invention is shown on the right. It is evident that, for the same level of water L reached in the basket (necessary to carry out the wet treatment) the solution according to the present invention allows a considerable water savings.

[0057] The reproducibility between the sample machine and the production machine is also solved or improved.

[0058] Those skilled in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the solutions described above, said modifications and variations all being contained within the scope of the invention as defined in the following claims.

[0059] * *The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825647.*

Claims

1. Washing machine (4) for wet textile processes, comprising:

- a containment housing (8),
- a basket (12) having a side wall (16) delimiting a cavity (20), suitable to contain inside it textile materials to be treated and a solution containing water, the basket (12) rotating around a rotation axis (X-X), arranged inside the containment housing (8), so as to identify an interspace (24) between the rotating basket (12) and the containment housing (8),
- the side wall (16) of the rotating basket (12) being provided with through holes (32) that fluidly connect the interspace (24) with the cavity (20), the containment housing (8) being hermetically closed,
- wherein the rotating basket (12) is axial-symmetrical with respect to the rotation axis (X-X) and, on a cross-section plane passing through

- said rotation axis (X-X), the side wall (16) presents at least one recess (36) with respect to a bottom wall (40) of the basket (12) having a maximum radius with respect to the rotation axis (X-X), said recess (36) having a radial depth (44) with respect to the bottom wall (40) and defining with the bottom wall (40) a radial seat (48) suitable to collect liquid,
- wherein the containment housing (8) is counter-shaped with respect to said side wall (16), at least at a half-portion located below the rotation axis (X-X).
2. The washing machine (4) according to claim 1, wherein the containment housing (8) is counter-shaped with respect to the side wall (16), at said at least one recess (36).
 3. The washing machine (4) according to claim 1 or 2, wherein the side wall (16) has an overall non-rectilinear pattern, moving from a front end (50) to a rear end (52), parallel to the rotation axis (X-X).
 4. The washing machine (4) according to claim 1, 2 or 3, wherein the side wall (16) has a plurality of recesses (36).
 5. The washing machine (4) according to claim 4, wherein the side wall (16) has an overall serrated or sinusoidal pattern.
 6. The washing machine (4) according to any of the claims from 1 to 5, wherein said at least one recess (36) has a tapered geometry towards the rotation axis (X-X).
 7. The washing machine (4) according to any of the claims from 1 to 6, wherein said at least one recess (36) has an isosceles trapezoid geometry with a lesser base (54) placed on the minimum radius (R) of the basket (12).
 8. The washing machine (4) according to any of the claims from 1 to 6, wherein said at least one recess (36) has a curved pattern.
 9. The washing machine (4) according to any of the claims from 1 to 8, wherein said at least one recess (36) has a radial depth (44), with respect to said rotation axis (X-X), not less than a level of water needed for the wet textile treatment or process to be performed.
 10. The washing machine (4) according to any of the claims from 1 to 9, wherein said at least one recess (36) has a maximum axial breadth (58), parallel to the rotation axis (X-X), greater than or equal to said radial depth (44).
 11. The washing machine (4) according to any of the claims from 1 to 10, wherein the rotating basket (12) has a plurality of recesses (36), regular and the same as each other, along the axial extension of the basket (12), parallel to the rotation axis (X-X).
 12. The washing machine (4) according to any of the claims from 1 to 11, wherein the containment housing (8) is counter-shaped with respect to the side wall (16) of the rotating basket (12), in such a way that the interspace (24) has a substantially constant thickness (62), measured perpendicular to the rotation axis (X-X), at the half-portion of the containment housing (8) located below the rotation axis (X-X).
 13. The washing machine (4) according to any of the claims from 1 to 12, wherein said cavity (24) has a lesser thickness (62) at the half-portion of the containment housing (8) located below the rotation axis (X-X) and greater thickness at the half-portion of the containment housing (8) located above the rotation axis (X-X).
 14. The washing machine (4) according to any of the claims from 1 to 13, wherein the containment housing (8) is counter-shaped with respect to the side wall (16) of the rotating basket (12), so that the interspace (24) has a thickness (62), measured perpendicular to the rotation axis (X-X), at the half-portion of the containment housing (8) located below the rotation axis (X-X), of at least 1 cm.
 15. The washing machine (4) according to any of the claims from 1 to 14, wherein the radial depth (44) of the recess (36) is at least 2 times a thickness (62) of the gap (24), measured perpendicular to the rotation axis (X-X), at the half-portion of the containment housing (8) located below the rotation axis (X-X).

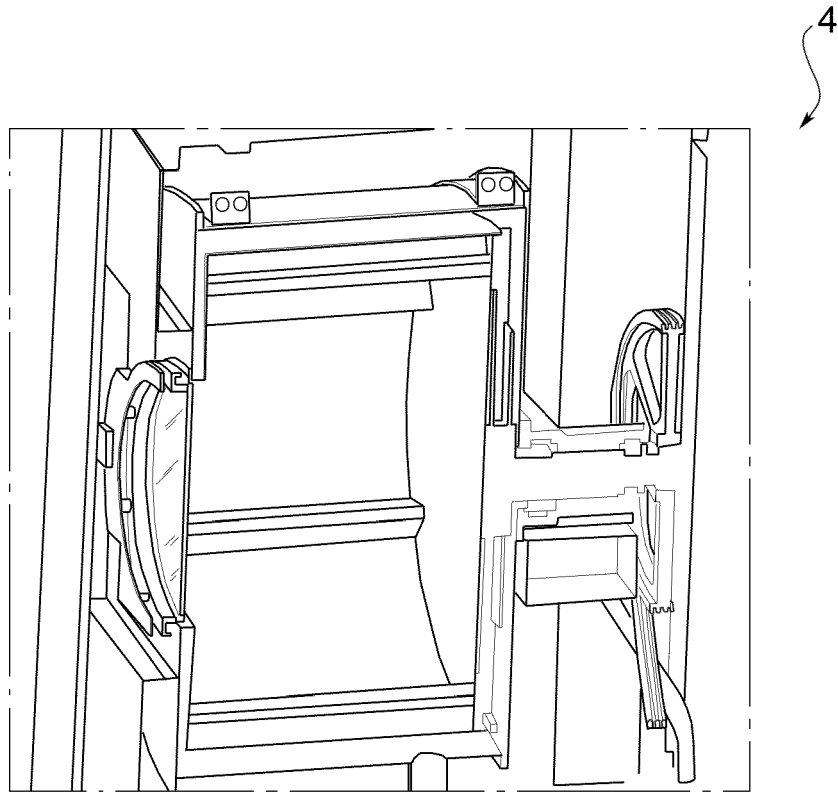


FIG.1

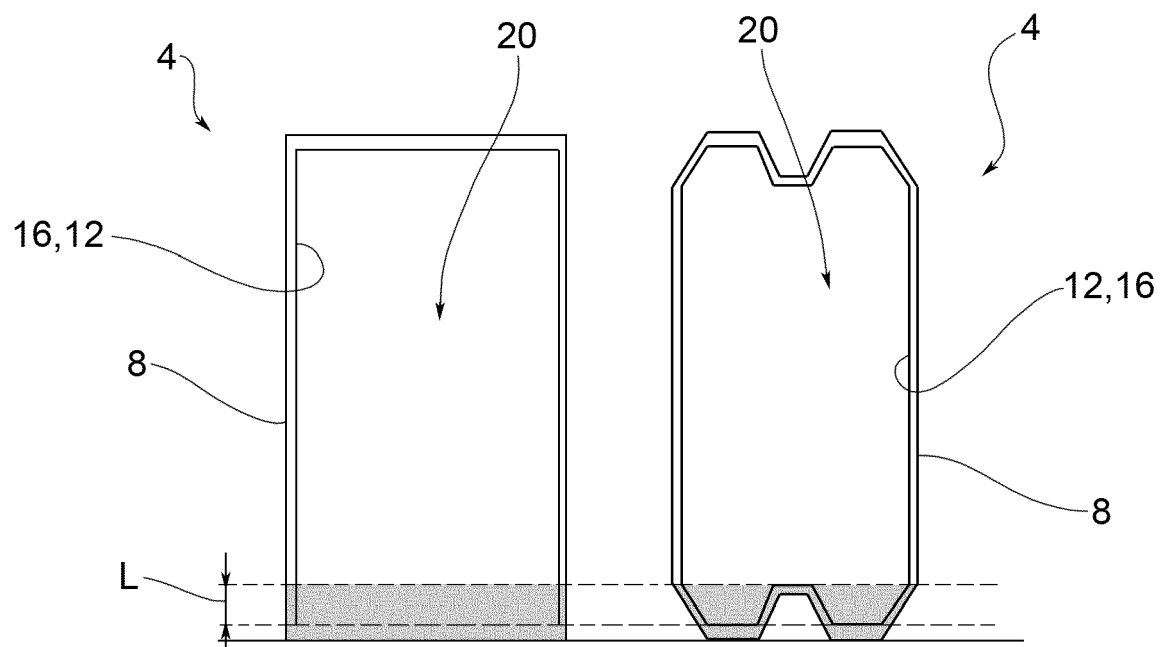


FIG.1b

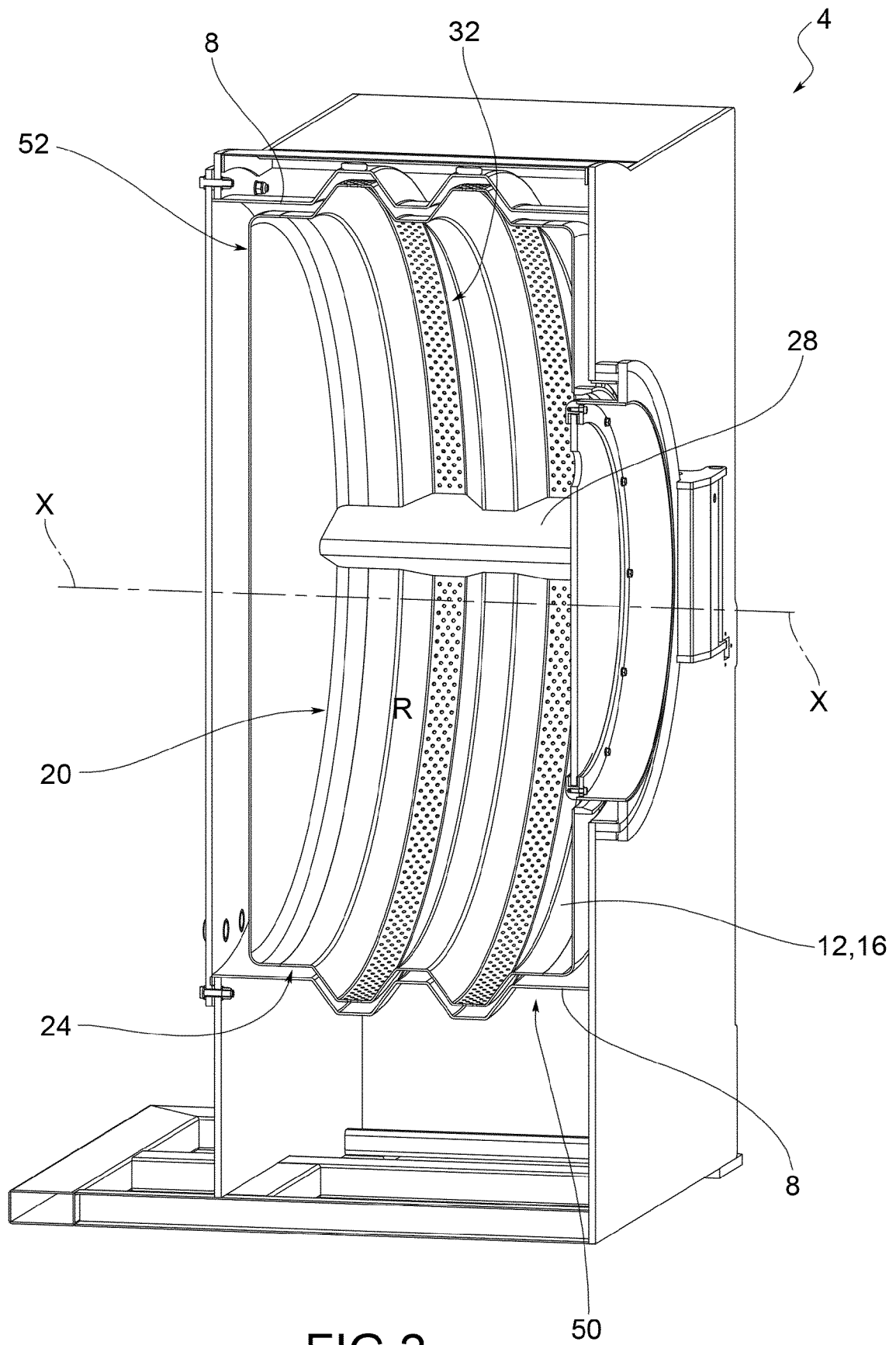


FIG.2

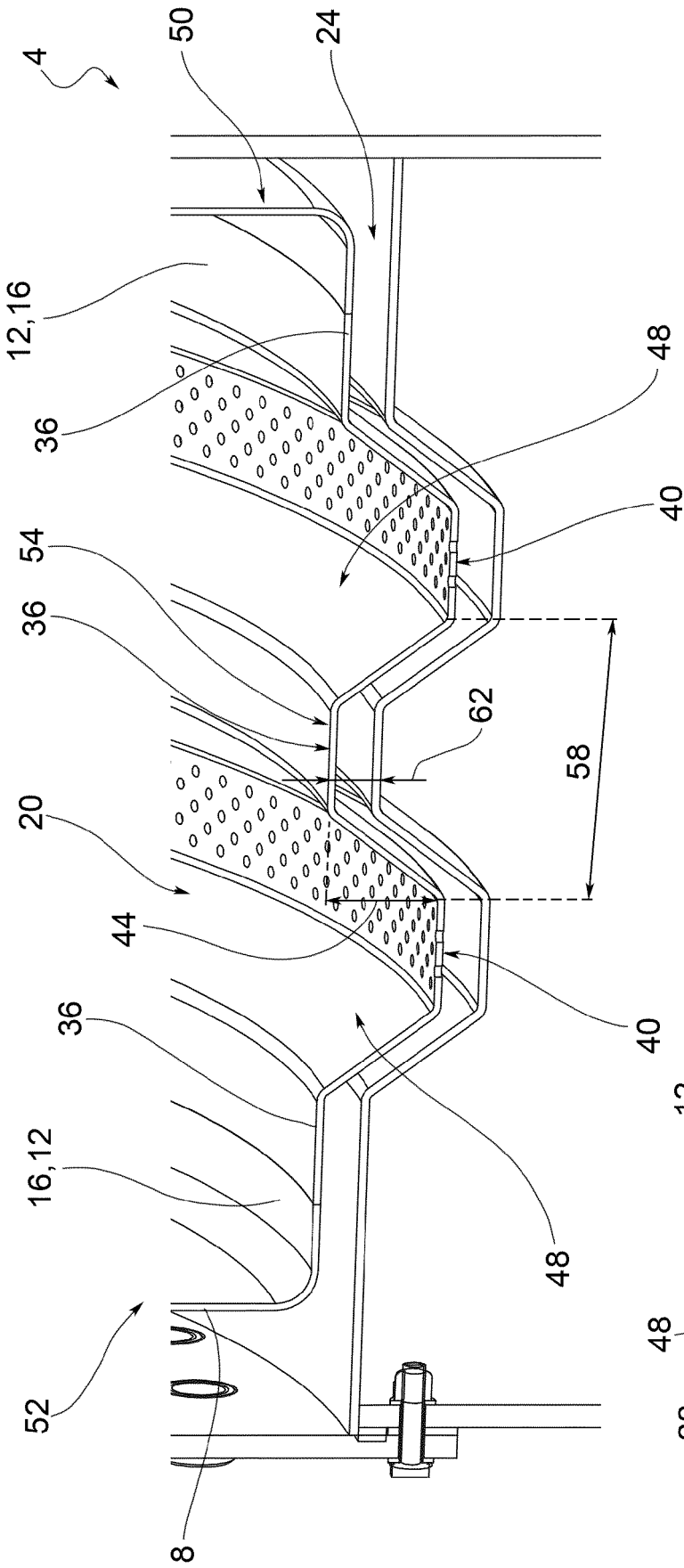


FIG.3

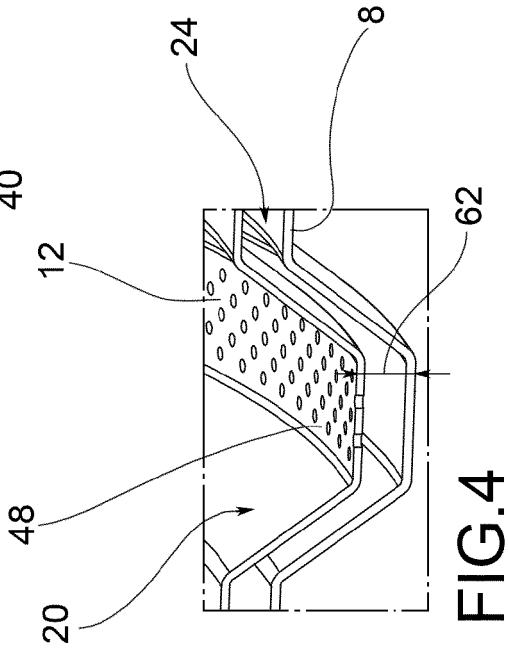


FIG.4



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 3859

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

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	EP 1 619 285 A1 (CANDY SPA [IT]) 25 January 2006 (2006-01-25)	1-6, 8-10	INV.
A	* paragraph [0019] - paragraph [0044]; figures *	7, 11-15	D06F37/04 D06F37/26

A	KR 2010 0008673 A (LG ELECTRONICS INC [KR]) 26 January 2010 (2010-01-26) * abstract; figures *	1-15	

A	EP 1 484 440 A1 (LG ELECTRONICS INC [KR]) 8 December 2004 (2004-12-08) * paragraph [0041] - paragraph [0068]; figures *	1-15	

A	KR 2005 0060129 A (DAEWOO ELECTRONICS CORP [KR]) 22 June 2005 (2005-06-22) * the whole document *	1-15	

			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 August 2022	Examiner Sangiorgi, Massimo
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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

EP 22 16 3859

5

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-08-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1619285 A1	25-01-2006	EP 1619285 A1	25-01-2006
		ES 2339348 T3	19-05-2010
		RU 2370581 C2	20-10-2009
		US 2006016229 A1	26-01-2006
KR 20100008673 A	26-01-2010	NONE	
EP 1484440 A1	08-12-2004	AU 2003271371 A1	23-12-2004
		CN 1572416 A	02-02-2005
		CN 1701144 A	23-11-2005
		EP 1484440 A1	08-12-2004
		JP 3822206 B2	13-09-2006
		JP 2004358554 A	24-12-2004
		KR 100444556 B1	16-08-2004
		KR 200349444 Y1	10-05-2004
		US 2004244168 A1	09-12-2004
KR 20050060129 A	22-06-2005	NONE	