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- **ZHONG, Jianfu**
Zhuhai City, Guangdong 519070 (CN)
- **YAO, Yuzhou**
Zhuhai City, Guangdong 519070 (CN)
- **GENG, Bin**
Zhuhai City, Guangdong 519070 (CN)
- **LIU, Jia**
Zhuhai City, Guangdong 519070 (CN)
- **SITU, Fuqi**
Zhuhai City, Guangdong 519070 (CN)
- **ZHU, Yandong**
Zhuhai City, Guangdong 519070 (CN)
- **CHEN, Mingyu**
Zhuhai City, Guangdong 519070 (CN)
- **LI, Qi**
Zhuhai City, Guangdong 519070 (CN)
- **CHEN, Qia**
Zhuhai City, Guangdong 519070 (CN)

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(71) Applicant: **Gree Electric Appliances, Inc. of Zhuhai**
Zhuhai, Guangdong 519070 (CN)

(72) Inventors:
• **YANG, Hongyong**
Zhuhai City, Guangdong 519070 (CN)
• **ZHU, Jing**
Zhuhai City, Guangdong 519070 (CN)
• **CHEN, Bo**
Zhuhai City, Guangdong 519070 (CN)

(74) Representative: **V.O.**
P.O. Box 87930
2508 DH Den Haag (NL)

(54) **WASHING MACHINE DOOR STRUCTURE AND WASHING MACHINE HAVING SAME**

(57) Some embodiments of the present invention provide a door structure for a washing machine and the washing machine with the door structure. The door structure for the washing machine includes a door body and a plurality of convex ribs. The plurality of convex ribs are connected with the door body, the plurality of convex ribs are disposed at intervals, and the plurality of convex ribs are configured to clean objects to be cleaned. The plurality of convex rib structures are disposed on the door body of the door structure for the washing machine, and the convex ribs are disposed at intervals, so that when the washing machine with the door structure works, the convex rib structures are rubbed with the objects to be cleaned in the washing machine, so as to realize the effect of further cleaning the objects to be cleaned by means of the convex rib structure. Moreover, the arrangement of the convex rib structure effectively avoids the situation that the objects to be cleaned are accumulated on the door body and do not be cleaned. By using

the structure, the door structure for the washing machine effectively improves the cleaning efficiency of the washing machine having the door structure and the use experience of users.

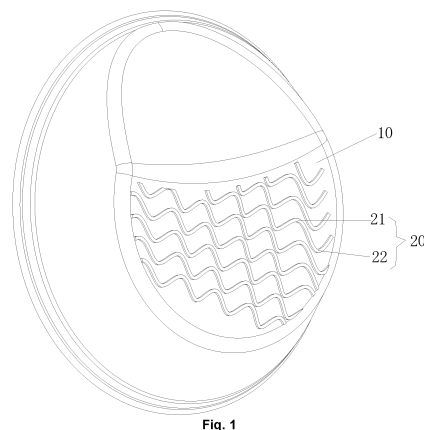


Fig. 1

Description

Technical Field

[0001] The present invention relates to a technical field of washing machine equipment, and more particularly to a door structure for a washing machine and a washing machine with the door structure.

Background

[0002] According to a relevant provisions of "GB12021.4-2013 Electric Washing Machine Energy Efficiency Water Efficiency Limit Value Level", the calculation of a unit power consumption washing ratio should be carried out according to a standard work cycle specified in the instruction manual for rated capacity and half-load capacity test, each capacity is tested three times, and an average of a cleaning ratio at rated capacity and half-load capacity is taken. Therefore, the main limitation of the cleaning ratio per unit power consumption is a cleaning ratio at half-load capacity and full-load capacity.

[0003] The principle of a drum washing machine is that an inner drum rotates to drive the laundry in the drum from a bottom of the drum to a top of the drum, and then the laundry falls from the top of the drum to the bottom of the drum due to gravity. This process simulates the process of beating the laundry during the washing to achieve the effect of washing and cleaning the laundry. When the washing machine is fully loaded, the drum is covered with fabrics, which abut against a glass bowl, and the beating effect does not be achieved. Therefore, the washing ratio at the full-load capacity of the washing machine in the art known to inventors is low, the unit power consumption cleaning ratio of the tested washing machine is limited, and a problem of poor use experience of the washing machine in the art known to inventors is caused.

Summary

[0004] Some embodiments of the present invention provide a door structure for a washing machine and a washing machine with the door structure, intended to solve the problem of poor use experience of a washing machine in the art known to inventors.

[0005] Some embodiments of the present invention provide a door structure for a washing machine, which includes: a door body; and a plurality of convex ribs, connected with the door body, the plurality of convex ribs being disposed at intervals, and each of the plurality of convex ribs being configured to clean objects to be cleaned.

[0006] In some embodiments, the plurality of convex ribs are disposed at intervals in a vertical direction.

[0007] In some embodiments, there is an angle between a central axis of each of the plurality of convex ribs in a longitudinal direction and a horizontal plane.

[0008] In some embodiments, central axes of the plurality of convex ribs are disposed parallel to each other.

[0009] In some embodiments, the angle between the central axis of each of the plurality of convex ribs and the horizontal plane is β , wherein $25^\circ \leq \beta \leq 35^\circ$.

[0010] In some embodiments, each of the plurality of convex ribs includes a crest portion that protrudes vertically upward and a trough portion that recesses downward toward a vertical direction, crest portions on two adjacent convex ribs of the plurality of convex ribs are in a same protrusion direction, and/or, trough portions on two adjacent convex ribs of the plurality of convex ribs are in a same recess direction.

[0011] In some embodiments, each of the plurality of convex ribs includes a crest portion that protrudes vertically upward and a trough portion that recesses downward toward a vertical direction, crest portions on two adjacent convex ribs of the plurality of convex ribs are in opposite protrusion directions, and/or, trough portions on two adjacent convex ribs of the plurality of convex ribs are in opposite recess directions.

[0012] In some embodiments, there are a plurality of crest portions and a plurality of trough portions, which are disposed alternately.

[0013] In some embodiments, the plurality of convex ribs have a same thickness, or a thickness of at least one of the plurality of convex ribs is different from a thickness of a remaining convex ribs in the plurality of convex ribs.

[0014] In some embodiments, the door body is made of glass.

[0015] In some embodiments, each of the plurality of convex ribs includes at least one crest portion protruding upward in a vertical direction, and/or each of the plurality of convex ribs includes at least one trough portion recessed downward in a vertical direction.

[0016] In some embodiments, each of the plurality of convex ribs is formed integrally with door body, and each of the plurality of convex ribs is formed by part of the door body recessed outwardly.

[0017] Some embodiments of the present invention provide a washing machine, which includes the above door structure for the washing machine.

[0018] By using the technical solution of some embodiments of the present invention, a plurality of convex rib structures are disposed on a door body of the washing machine door structure, and the convex ribs are disposed at intervals without intersecting. This arrangement enables the washing machine with the door structure to be in friction with objects to be washed inside the washing machine during operation, so as to achieve the function of further washing the objects to be washed through the convex rib structure. Meanwhile, the convex rib structure effectively avoids the situation that the objects to be cleaned are accumulated on the door body and the objects to be cleaned do not be cleaned. The door structure for the washing machine adopting this structure effectively improves the washing efficiency of the washing machine with the door structure and the use experience of

users.

Brief Description of the Drawings

[0019] The accompanying drawings, which constitute a part of this application, are used to provide a further understanding of the present invention, and the exemplary embodiments of the present invention and the description thereof are used to explain the present invention, but do not constitute improper limitations to the present invention. In the drawings:

Fig. 1 illustrates a structural schematic diagram of a first embodiment of a door structure for a washing machine according to the present invention;

Fig. 2 illustrates a structural schematic diagram of a second embodiment of a door structure for a washing machine according to the present invention;

Fig. 3 illustrates a structural schematic diagram of a third embodiment of a door structure for a washing machine according to the present invention;

Fig. 4 illustrates a structural schematic diagram of a fourth embodiment of a door structure for a washing machine according to the present invention;

Fig. 5 illustrates a structural schematic diagram of a fifth embodiment of a door structure for a washing machine according to the present invention;

Fig. 6 illustrates a structural schematic diagram of a sixth embodiment of a door structure for a washing machine according to the present invention; and

Fig. 7 illustrates a structural schematic diagram of an embodiment of a washing machine according to the present invention.

[0020] The drawings include the following reference signs:

10, door body;
20, convex rib; 21, crest portion; 22, trough portion;
30, housing; 40, shock absorbing structure; 50, door body component; 60, drum component; 70, driving component.

Detailed Description of the Embodiments

[0021] It is to be noted that in the case of no conflict, the features in the embodiments and the embodiments in the present application may be combined with each other. The present invention is described below with reference to the drawings and in conjunction with the embodiments in detail.

[0022] It is to be noted that terms used herein only aim to describe specific implementation manners, and are not intended to limit exemplar implementations of this application. Unless otherwise directed by the context, singular forms of terms used herein are intended to include plural forms. Besides, it will be also appreciated that when terms "contain" and/or "include" are used in

the description, it is indicated that features, steps, operations, devices, assemblies and/or a combination thereof exist.

[0023] It is to be noted that the specification and claims of the present application and the terms "first", "second" and the like in the drawings are used to distinguish similar objects, and do not need to describe a specific sequence or a precedence order. It will be appreciated that the terms used in such a way may be exchanged under appropriate conditions, in order that the embodiments of the present application described here are implemented in, for example, a sequence other than sequences graphically shown or described here. In addition, terms "include" and "have" and any variations thereof are intended to cover non-exclusive inclusions. For example, it is not limited for processes, methods, systems, products or devices containing a series of steps or units to clearly list those steps or units, and other steps or units which are not clearly listed or are inherent to these processes, methods, products or devices may be included instead.

[0024] For ease of description, spatial relative terms such as "over", "above", "on an upper surface" and "upper" may be used herein for describing a spatial position relation between a device or feature and other devices or features shown in the drawings. It will be appreciated that the spatial relative terms aim to contain different orientations in usage or operation besides the orientations of the devices described in the drawings. For example, if the devices in the drawings are inverted, devices described as "above other devices or structures" or "over other devices or structures" will be located as "below other devices or structures" or "under other devices or structures". Thus, an exemplar term "above" may include two orientations namely "above" and "below". The device may be located in other different modes (rotated by 90 degrees or located in other orientations), and spatial relative descriptions used herein are correspondingly explained.

[0025] Exemplary implementations in accordance with the present application will now be described in more detail with reference to the accompanying drawings. However, the exemplary implementations may be embodied in many different forms and should not be construed as being limited to the implementations set forth herein. It is to be understood that the implementations are provided so that the invention of the present application will be thorough and complete, and the concept of the exemplary implementations will be fully conveyed to those of ordinary skill in the art, in which the thicknesses of the layers and regions may be expanded for the sake of clarity, the same device is denoted by the same reference numerals, and the description thereof will be omitted.

[0026] In conjunction with Fig. 1 to Fig. 7, according to some embodiments of the present invention, a door structure for a washing machine is provided.

[0027] In some embodiments, as shown in Fig. 1, the door structure for the washing machine includes a door

body 10 and a plurality of convex ribs 20. The plurality of convex ribs 20 are connected with the door body 10. The plurality of convex ribs 20 are disposed at intervals. The convex ribs 20 are configured to clean objects to be cleaned.

[0028] In the present embodiment, multiple convex rib structures are disposed on a door body of the door structure for the washing machine, and the plurality of convex ribs are disposed at intervals without intersecting. This arrangement enables the washing machine with the door structure for the washing machine to be in friction with objects to be washed inside the washing machine during operation, so as to achieve a function of further washing the objects to be washed through the convex rib structure. Meanwhile, the convex rib structure effectively avoids a situation that the objects to be cleaned are accumulated on the door body and the objects to be cleaned do not be cleaned. The door structure for the washing machine adopting this structure effectively improves the washing efficiency of the washing machine with the door structure and the use experience of users.

[0029] As shown in Fig. 1 and Fig. 2, the plurality of convex ribs 20 are disposed at intervals in a vertical direction. This arrangement effectively increases a contact area between the convex ribs and the objects to be cleaned, and also causes foam generated during the cleaning process to flow back into a washing tub along the plurality of convex ribs. That is to say, the plurality of convex ribs are disposed at intervals, thereby avoiding a problem that the foam does not flow back along the convex ribs, and the foam is always immersed in the objects to be cleaned, and avoiding a problem that the washing machine in the art known to inventors does not completely remove the foam during the final cleaning and defoaming process due to the staggered manner of convex ribs in the art known to inventors.

[0030] As shown in Fig. 6, in some embodiments, there is an angle between a central axis of each of the plurality of convex ribs 20 in a longitudinal direction and a horizontal plane. In some embodiments, the angle between the central axis of each of the plurality of convex ribs 20 and the horizontal plane is β , where $25^\circ \leq \beta \leq 35^\circ$. An example of $\beta = 30^\circ$ is shown in Fig. 6. This arrangement makes the foam generated in the cleaning process flow back to the washing tub through the convex ribs in the shortest time, thereby further improving the washing efficiency of the washing machine.

[0031] As shown in Fig. 1 and Fig. 2, each of the plurality of convex ribs 20 includes a crest portion 21 that protrudes vertically upward and a trough portion 22 that recesses downward toward the vertical direction, crest portions 21 on two adjacent convex ribs 20 of the plurality of convex ribs 20 are in a same protrusion direction, and trough portions 22 on the two adjacent convex ribs 20 of the plurality of convex ribs 20 are in a same recess direction. Of course, in some embodiments, the protrusion directions of the crest portions 21 on the two adjacent convex ribs 20 are set to opposite directions, and the

recess directions of the trough portions 22 on the two adjacent convex ribs 20 are set to opposite directions. In some embodiments, there are a plurality of crest portions 21 and multiple trough portions 22, which are arranged alternately. This arrangement increases contact areas between the convex ribs and the objects to be cleaned, and improves the cleaning efficiency. In some embodiments, the plurality of convex ribs 20 have a same thickness, and a thickness of at least one of the plurality of convex ribs 20 is different from a thickness of a remaining convex ribs 20 in the plurality of convex ribs. In some embodiments, the door body 10 is made of glass.

[0032] Of course, in some embodiments, the convex rib 20 has at least one crest portion 21 protruding vertically upward, or the convex rib 20 has at least one trough portion 22 recessed downward in the vertical direction. That is, the bent shape of the convex rib is set according to an area of an arrangement area of the door body. As shown in Fig. 1, the convex rib 20 has only one trough portion 22.

[0033] As shown in Fig. 2 and Fig. 3, the convex rib 20 is formed integrally with the door body 10, and the convex rib 20 is formed by part of the door body 10 recessed outwardly. This arrangement reduces the material used to form the door structure for the washing machine, which in turn reduces the production cost. Of course, it is also possible to directly set the convex rib 20 into a solid structure on the door body.

[0034] The door structure for the washing machine in the above embodiments is used in the technical field of washing machine equipment, that is, according to another aspect of the present invention, a washing machine is provided. The washing machine includes the door structure for the washing machine. The door structure for the washing machine is the door structure for the washing machine in the above embodiment.

[0035] In some embodiments, some convex rib structures are designed on door glass of a door structure of a drum washing machine to simulate the role of a washboard. In the case of full load (multiple loads), fabric touches a glass bowl, and the convex rib structure on the glass is disposed in a corrugated shape to solve the problem of low washing ratio under full load (multiple loads). Meanwhile, by tilting the convex rib structure, the problem that the foam on the door glass is not easy to clean is solved.

[0036] When the drum washing machine is in full load (multiple loads) operation, when the laundry touches the door glass with a convex structure, the convex structure is used to simulate the washing effect of the washboard to wash the laundry, thereby achieving the effect of secondary cleaning of the laundry, and improving the cleaning ratio of the whole machine. Meanwhile, it is convenient for the washing foam to be washed out of the glass bowl by spray water, so that no foam remains on the glass bowl, and the user experience is improved.

[0037] The components of the drum washing machine mainly include a housing 30 that support the drum and

a shock absorbing structure 40, a drum component 60 for storing and washing the laundry, a driving component 70 that drives the drum to run forwardly and reversely, and a door component 50 that seals the drum. The middle part of the door body component 50 of the drum washing machine is a door glass part recessed into the drum of the washing machine, a part of the door glass extends into the drum to cooperate with a door seal to form a sealed washing environment, and also to push the laundry thrown out by the drum back into the drum to prevent from being caught in the door seal.

[0038] The ribbed protrusion on the door glass is a corrugated protrusion tilting to a bottom of the drum (an inclination angle of a central axis of the corrugated protrusion and the horizontal plane is 30°). During the laundry washing process, when the washing foam is brought to the glass bowl, under an action of spray water, the foam slides down along the downwardly inclined water ripple rib structure, so as to avoid the washing liquid foam remaining on the door glass.

[0039] When there are many loads (full load) in the drum, the cleaning efficiency is often not ideal. The water ripple convex structure is disposed on the door glass to improve a cleaning ratio when the drum is in operation and improve the washing efficiency. The door glass is different from the conventional glass bowl structure, and an inside of the door glass adopts a rib structure with water ripples. When the drum is fully loaded (multiple loads), too much laundry will be squeezed out of the drum and be pressed against the door glass. Under an action of a motor, the drum rotates continuously, which drives the laundry in the drum to rotate forwardly and reversely. The rotating laundry and the convex rib structure on the glass bowl rub against each other, which may play the role of simulating the washing board to achieve the effects of rubbing and washing laundry to improve the cleaning ratio of the whole machine. Meanwhile, the door glass is relatively smooth, and the wear on the laundry is limited, which will not cause the laundry to be damaged by washing and wearing, and the laundry is carried out with safety.

[0040] In addition to the above, it is also to be noted that "one embodiment", "another embodiment", "an embodiment" and the like referred to in the specification refers to specific features, structures or characteristics described in connection with the embodiment are included in at least one embodiment of the general description of the present application. The appearance of the same expression in various places in the specification does not necessarily refer to the same embodiment. Further, when a particular feature, structure, or characteristic is described in conjunction with any embodiment, it is claimed that such feature, structure, or characteristic is also included in the scope of the present invention.

[0041] In the above embodiment, descriptions of each embodiment are emphasized respectively, and parts which are not elaborated in detail in a certain embodiment may refer to relevant descriptions of other embodiments.

[0042] The above is only some embodiments of the present invention, not intended to limit the present invention. As will occur to those skilled in the art, the present invention is susceptible to various modifications and changes. Any modifications, equivalent replacements, improvements and the like made within the spirit and principle of the present invention shall fall within the scope of protection of the present invention.

Claims

1. A door structure for a washing machine, comprising:
 - a door body (10); and
 - a plurality of convex ribs (20), connected with the door body (10), the plurality of convex ribs (20) being disposed at intervals, and each of the plurality of convex ribs (20) being configured to clean objects to be cleaned.
2. The door structure for the washing machine according to claim 1, wherein the plurality of convex ribs (20) are disposed at intervals in a vertical direction.
3. The door structure for the washing machine according to claim 1, wherein there is an angle between a central axis of the each of the plurality of convex ribs (20) in a longitudinal direction and a horizontal plane.
4. The door structure for the washing machine according to claim 3, wherein central axes of the plurality of convex ribs (20) are disposed parallel to each other.
5. The door structure for the washing machine according to claim 3, wherein the angle between the central axis of the each of the plurality of convex ribs (20) and the horizontal plane is β , wherein $25^\circ \leq \beta \leq 35^\circ$.
6. The door structure for the washing machine according to claim 1, wherein the each of the plurality of convex ribs (20) comprises a crest portion (21) that protrudes vertically upward and a trough portion (22) that recesses downward toward a vertical direction, crest portions (21) on two adjacent convex ribs (20) of the plurality of convex ribs (20) are in a same protrusion direction, and/or, trough portions (22) on two adjacent convex ribs (20) of the plurality of convex ribs (20) are in a same recess direction.
7. The door structure for the washing machine according to claim 1, wherein the each of the plurality of convex ribs (20) comprises a crest portion (21) that protrudes vertically upward and a trough portion (22) that has a downward recess toward the vertical direction, crest portions (21) on two adjacent convex ribs (20) of the plurality of convex ribs (20) are in

opposite protrusion directions, and/or, trough portions (22) on two adjacent convex ribs (20) of the plurality of convex ribs (20) are in opposite recess directions.

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8. The washing machine door structure according to claim 6 or 7, wherein there are a plurality of crest portions (21) and a plurality of trough portions (22), which are disposed alternately.

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9. The door structure for the washing machine according to claim 1, wherein the plurality of convex ribs (20) have a same thickness, or a thickness of at least one of the plurality of convex ribs (20) is different from a thickness of a remaining convex ribs (20) in the plurality of convex ribs (20).

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10. The door structure for the washing machine according to claim 1, wherein the door body (10) is made of glass.

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11. The door structure for the washing machine according to claim 1, wherein the each of the plurality of convex ribs (20) comprises at least one crest portion (21) protruding upward in a vertical direction, and/or the each of the plurality of convex ribs (20) comprises at least one trough portion (22) recessed downward in a vertical direction.

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12. The door structure for the washing machine according to claim 1, wherein the each of the plurality of convex ribs (20) is formed integrally with the door body (10), and the each of the plurality of convex ribs (20) is formed by part of the door body (10) recessed outwardly.

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13. A washing machine, comprising the door structure for the washing machine according to any one of claims 1 to 12.

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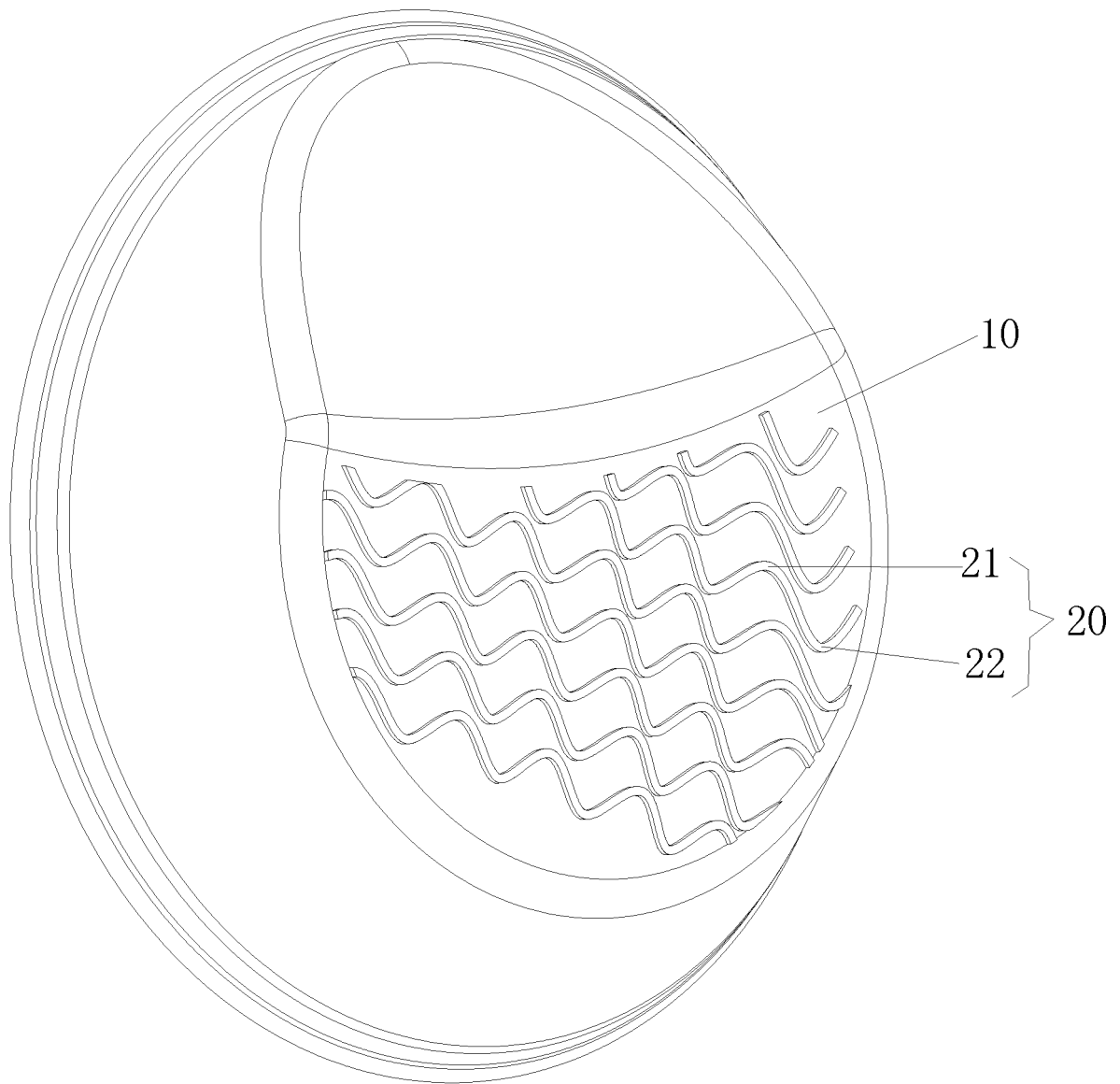


Fig. 1

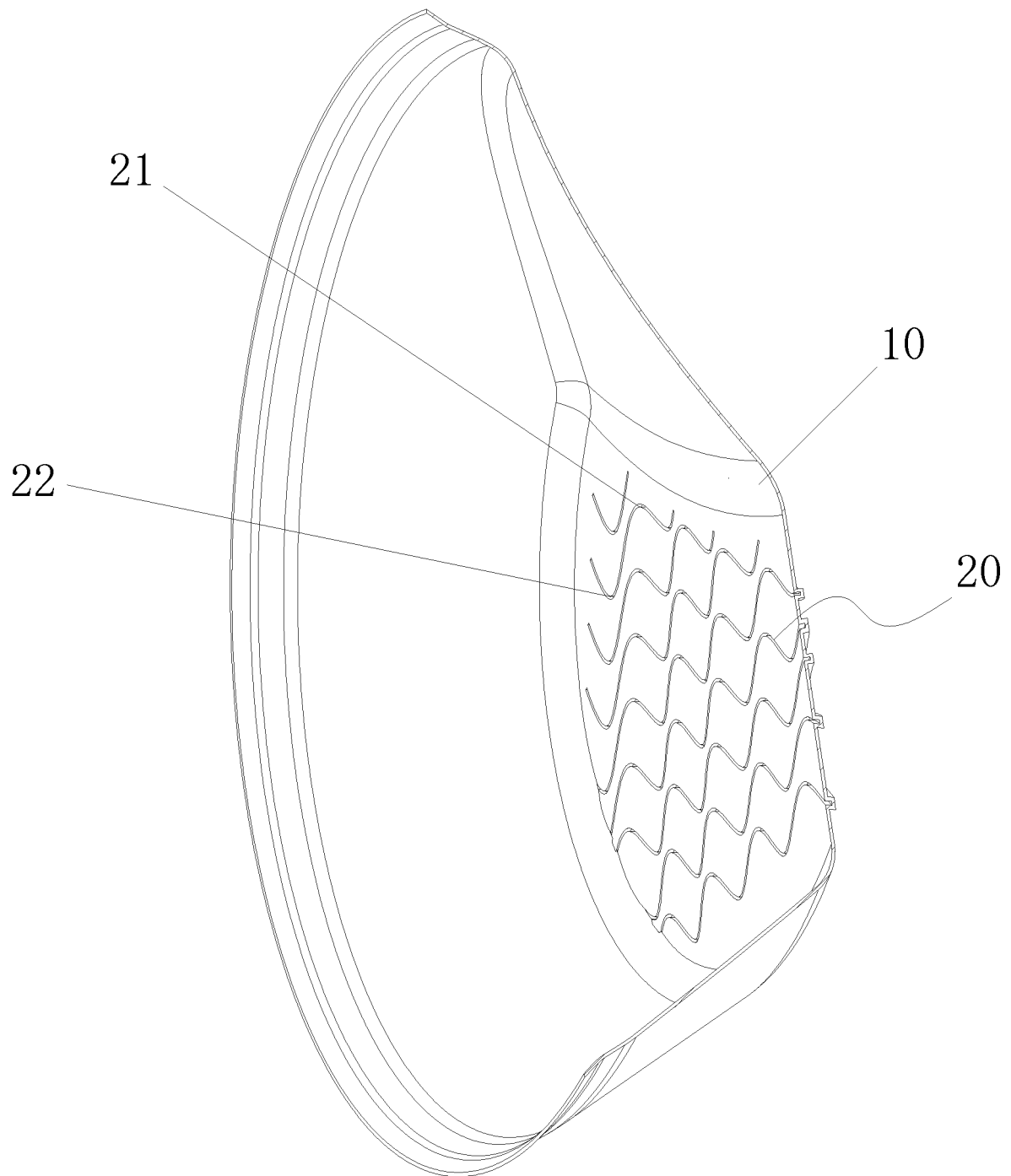


Fig. 2

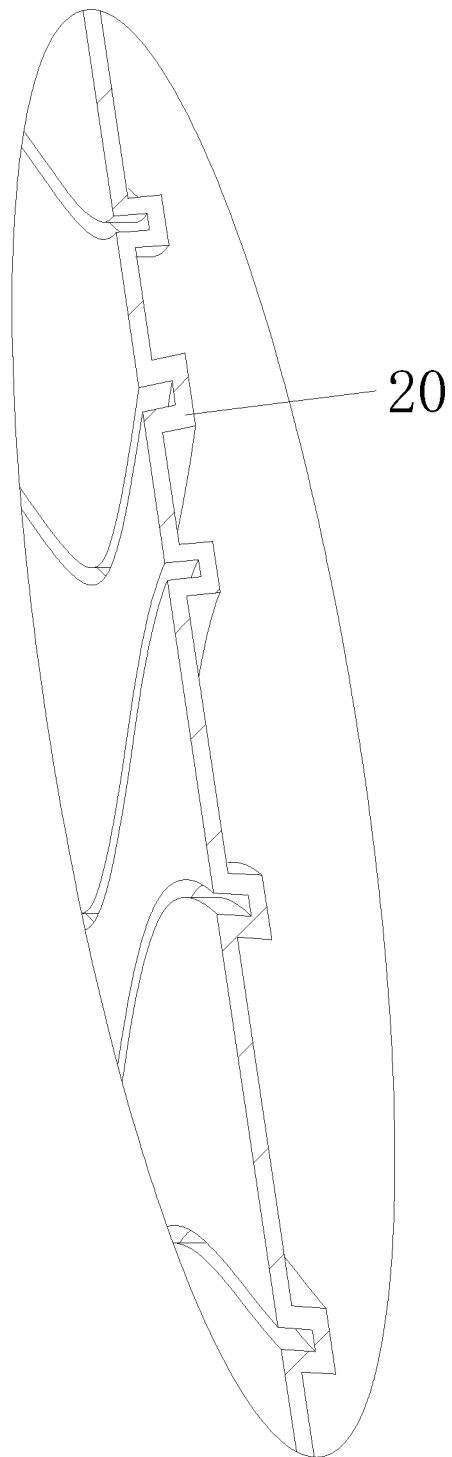


Fig. 3

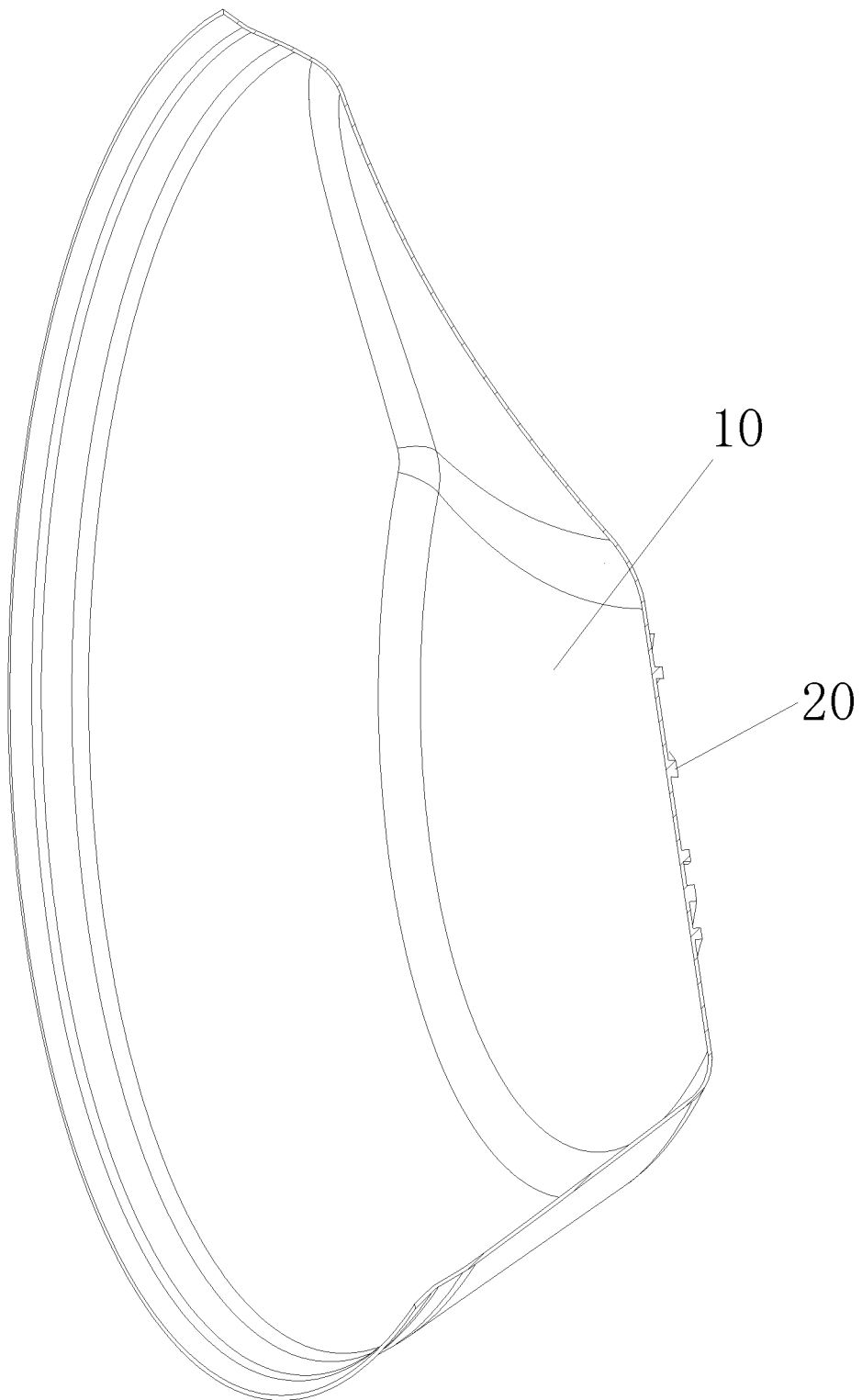


Fig. 4

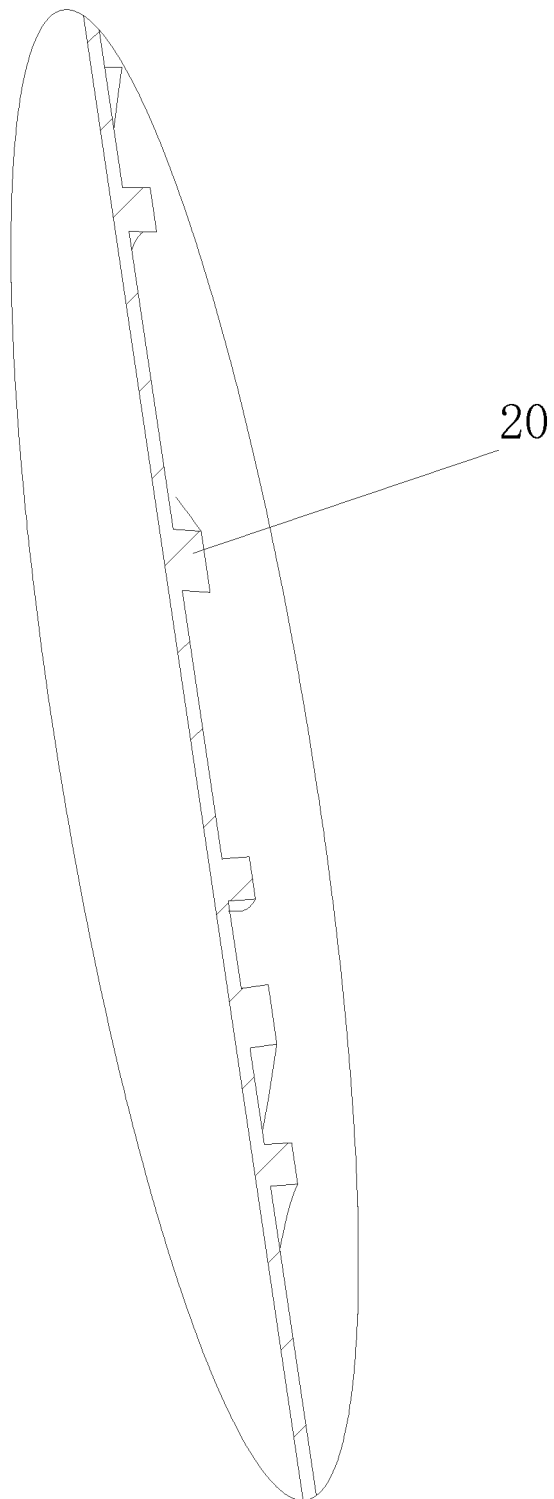


Fig. 5

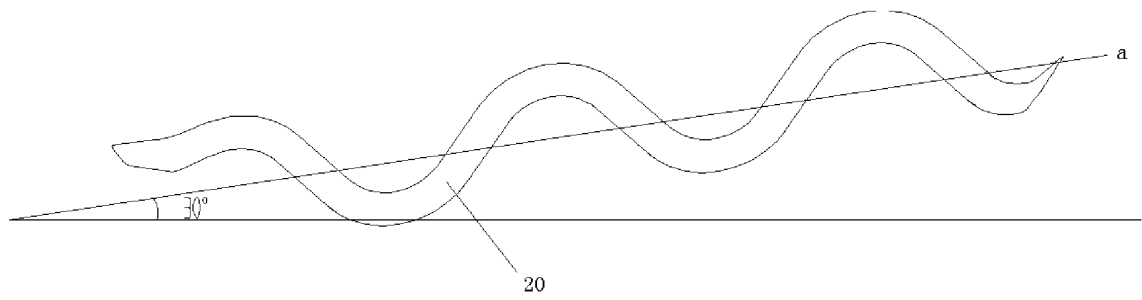


Fig. 6

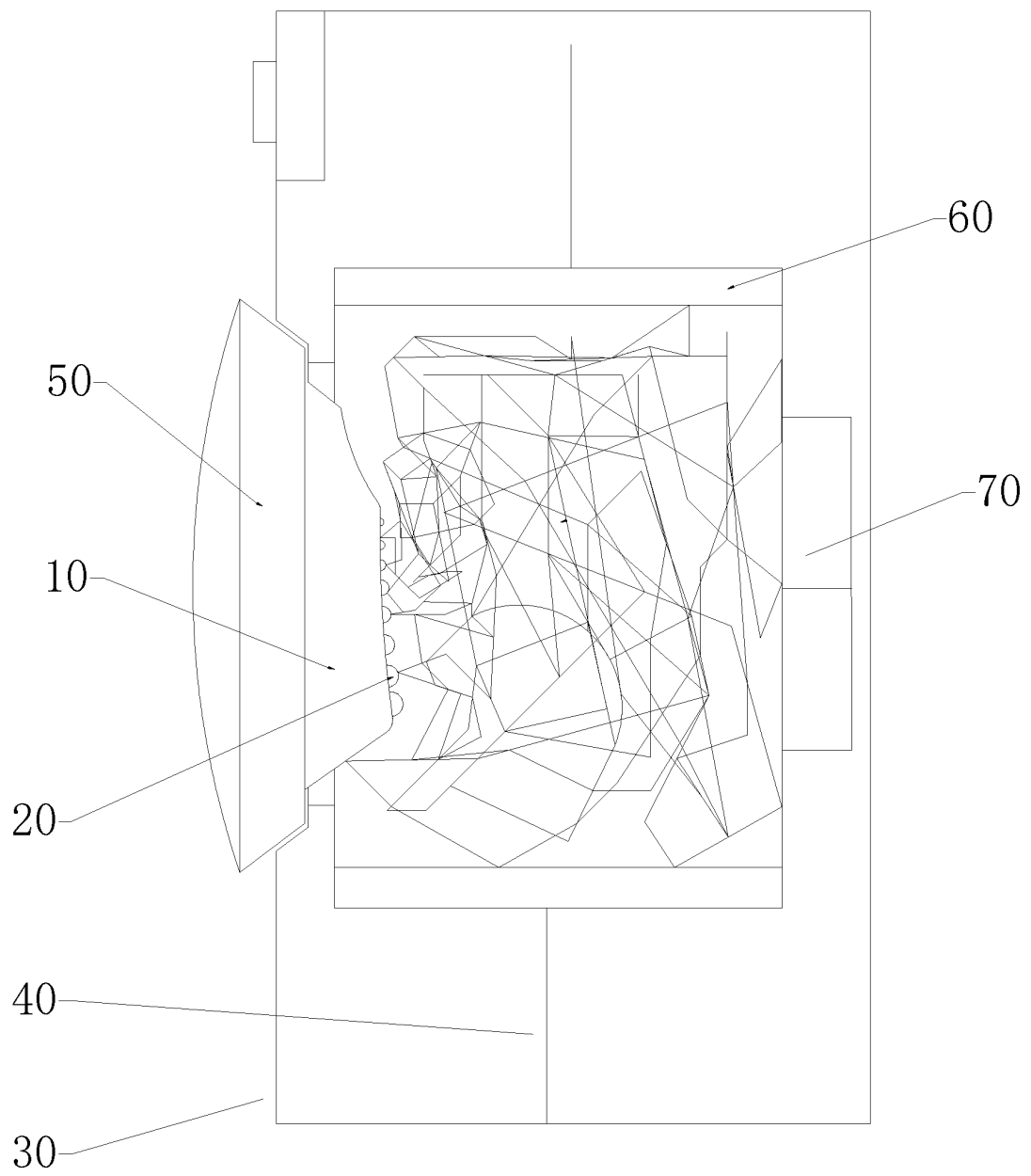


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/120942

5	A. CLASSIFICATION OF SUBJECT MATTER D06F 39/14(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC	
10	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	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS, CNTXT, DWPI, SIPOABS, CNKI: 门, 窗, 玻璃, 筋, 肋, 凸, 突, 清洗, 洗衣, 洗涤, 摩擦, door, lid, window, glass, rib?, bulge?, protrusion, projection, heave?, friction, wash, clean	
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.
	X	CN 204919101 U (SHANGHAI SHARP ELECTRONICS CO., LTD.) 30 December 2015 (2015-12-30) description, paragraphs [0005]-[0039], and figures 1-6 1-2, 4, 6-13
25	PX	CN 108411577 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 17 August 2018 (2018-08-17) claims 1-13 1-13
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40	☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.	
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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