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(54) WASHING MACHINE INNER DRUM AND WASHING MACHINE

(57) A washing machine inner drum and a washing machine. The inner drum comprises a hollow cylinder-shaped inner drum body (1), at least one counterweight body (2) being arranged fixedly on the inner drum body (1); when the inner drum body (1) rotates, the counterweight body (2) rotates therewith, and the centre of mass of the counterweight body (2) is positioned on the axis of the inner drum (1). The washing machine comprises a shell and an outer drum, the present washing machine inner drum being arranged within said outer drum. The washing machine inner drum has good damping effects, and when vibration occurs, functions quickly and reduces the vibration. The outer drum and the outer shell of the washing machine do not require other counterweights, damping effects are good, and the structure is simple and compact, production efficiency is high, costs are low, and the difficulty of maintenance is reduced.

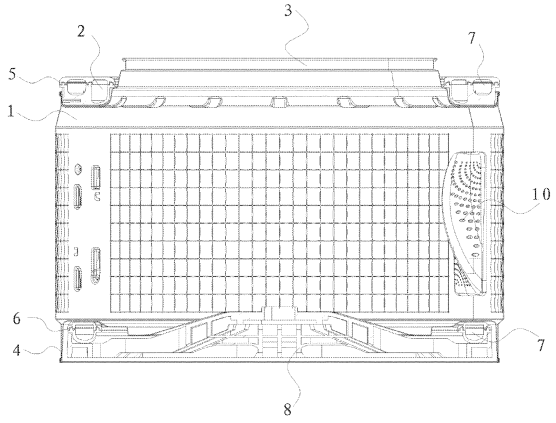

FIG.1

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Description

[0001] This application claims priority to Chinese Patent Application No. 201410510619.7 filed September 28, 2014, entitled "WASHING MACHINE INNER DRUM AND WASHING MACHINE", and under the applicant of Qingdao Hairer Drum Washing Machine Co. Ltd., the entirety of which is incorporated herein by reference.

Field of the Invention

[0002] The present invention relates to a washing machine inner drum and a washing machine that is provided with the inner drum.

Background of the Invention

[0003] Washing machine is commonly used household appliances that take advantage of the high speed rotation of an inner drum to wash and spin-dry clothes. While the inner drum itself is disposed with respect to its axis in a state of balance, the positions of the clothes cannot be controlled accurately. As a result, the whole structure constituted by the inner drum and the clothes is prone to eccentricity relative to the axis of the inner drum. The inner drum is likely to vibrate sharply during the high speed rotation, and thus causes the entire washing machine to vibrate sharply.

[0004] To mitigate the vibration, both a balancing ring and a counterweight are needed to be disposed in the existing washing machine at the same time. The balancing ring includes at least two cavities in which at least one cavity is filled with liquid and at least one cavity is filled with spherical shaped solid fillings. Particularly, the cavity in which the solid fillings are located has grease and silicone oil mixed therein for the purpose of lubrication, and the total amount of solid fillings is less than half of the entire circumference of the cavity. The counterweight is provided in an outer drum or in a shell.

[0005] The drawbacks of the prior structures of the washing machine lie in that: (i) the privision of an independent counterweight leads to a less compact structure of the whole washing machine, which results in difficulties in design, manufacture and after-sale service, and (ii) a damping effect of the balancing ring is limited.

Summary of the Invention

[0006] An object of the present invention is to provide a washing machine inner drum having better damping effects.

[0007] Another object the present invention is to provide a washing machine having a simpler and more compact structure and a higher efficiency of manufacture.

[0008] In order to achieve the above mentioned objects, on one hand, the present invention adopts the following technical solutions:

[0009] A washing machine inner drum includes a hollow cylinder-shaped inner drum body, and at least one counterweight body is disposed fixedly to the inner drum body. When the inner drum body rotates, the counterweight body is capable of rotating with the inner drum body; and a center of mass of the counterweight body is positioned in an axis of the inner drum body.

[0010] In particular, the counterweight body is disposed fixedly on an outside edge and/or an inside edge of the inner drum body.

[0011] In particular, each of the counterweight body includes at least two counterweight blocks, and a total center of mass of the at least two counterweight blocks is positioned in the axis, or each of the counterweight body is an annular solid counterweight ring, and a center of mass of the counterweight ring is positioned in the axis.

[0012] In particular, the counterweight body is made from cement, concrete, cast iron and/or lead.

[0013] In particular, a guard shell is disposed at an outer side of the counterweight body.

[0014] Further, the guard shell includes at least two cavities that are arranged radially outwardly or sided by side axially with respect to the inner drum body.

[0015] In particular, the guard shell includes at least two cavities, wherein the counterweight body is arranged inside at least one cavity, and a mixture including steel balls and silicone oil is filled inside at least one other cavity.

[0016] In particular, the guard shell includes at least two cavities, wherein the counterweight body is arranged inside at least one cavity, and liquid is filled inside at least one other cavity.

[0017] In particular, a front-end flange is disposed at an opening of the inner drum body, and the counterweight body is fixedly disposed at an outer peripheral face of the front-end flange.

[0018] On the other hand, the present invention adopts the following technical solution:

[0019] A washing machine includes a shell and an outer drum, in which the outer drum is provided with the washing machine inner drum as described abovetherein.

[0020] The washing machine inner drum of the present invention is provided with the counterweight body that is symmetric with the axis of the inner drum body. When the inner drum body rotates, the center of mass (total center of mass) of the counterweight is positioned in the axis, thereby obtaining a better damping effect. A balancing device and a counterweight device are disposed integrally, which can take effect more rapidly upon occurance of vibration so as to mitigate the vibration.

[0021] The washing machine of the present invention is provided with the washing machine inner drum as mentioned above. No other counterweight is required at the outer drum and the outer shell after the counterweight body is disposed in the inner drum. The present invention has a better damping effect, a simpler and more compact structure, a higher efficiency of manufacture, and a lower cost, and can reduce the difficulty of maintenance.

Brief Description of the Drawings

[0022]

Fig. 1 is a sectional view of a washing machine inner drum according to a preferred Embodiment 1 of the present invention;
Fig. 2 is a sectional view of structure of a guard shell according to a preferred Embodiment 1 of the present invention;
Fig. 3 is a sectional view of structure of a guard shell according to a preferred Embodiment 2 of the present invention.

Reference numerals in the drawings:

[0023]

1.Inner drum body; 2. Counterweight body; 3. Front-end flange; 4. Rear-end flange; 5. Guard shell; 6. Balancing ring; 7. Mixture including steel balls and silicone oil; 8. Inner drum hexagonal bracket; 10. Water stirring leaf; 51. First cavity; 52. Second cavity.

Detailed Description of the Embodiments

[0024] The technical solution of the present invention will be further described below with reference to the accompanying drawings and by means of the specific embodiments.

Preferred Embodiment 1:

[0025] The present preferred embodiment discloses a washing machine inner drum. As illustrated in Figs. 1 and 2, the inner drum includes a hollow cylinder-shaped inner drum body 1, and a front-end flange 3 and a rear-end flange 4 are disposed at front and rear openings of the inner drum body 1, respectively. A hollow annular guard shell 5 is disposed at an outer peripheral face of the front-end flange 3. The guard shell 5 includes two cavities, namely a first cavity 52 and a second cavity 52, which are arranged radially inwardly and outwardly relative to the inner drum body 1. A counterweight body 2 is provided inside one cavity, and a mixture 7 including steel balls and silicone oil is filled inside the other cavity. A balancing ring 6 is disposed at an outer peripheral face of the rear-end flange 4 and is filled with the mixture 7 including steel balls and silicone oil. A water stirring leaf 10 is disposed inside the inner drum body 1. An inner drum hexagonal bracket 8 is provided at an outer side of the rear-end flange 4. The counterweight body 2 is made from cement.
[0026] A balancing ring that is originally provided at the front-end flange 3 is replaced with the counterweight body 2 and the mixture 7 including the steel balls and the silicone oil functioning as a balancing by the inner drum. The counterweight body 2 is disposed symmetrically with respect to the axis of the inner drum body 1. When the inner drum body 1 rotates, the counterweight body 2 can rotate therewith. Furthermore, the center of mass of the counterweight body 2 is located in the axis and has a better damping effect during the rotation of high speed thereon.
[0027] When the amount of eccentricity is smaller, the mixture 7 including the steel balls and the silicone oil can take effect more rapidly so as to suppress the unbalanced force caused by an eccentric load. When the eccentric load is greater, the mixture 7 including the steel balls and the silicone oil plays its role firstly, and then as the rotation speed increases, the centrifugal force created by the eccentric load increases, thus the counterweight body 2 starts taking effect to enable the inner drum to increase its speed smoothly.

Preferred Embodiment 2:

[0028] The present preferred embodiment discloses a washing machine inner drum which has substantially the same structure as that of the preferred Embodiment 1. The inner drum includes a hollow cylinder-shaped inner drum body on which at least one counterweight body is fixedly disposed. Each counterweight body is disposed symmetrically with respect to the axis of the inner drum body. When the inner drum body rotates, the center of mass of the counterweight body is positioned in the axis.
[0029] The differences between the preferred embodiment 2 and the preferred embodiment 1 lie in that: the counterweight body is not limited to an integral counterweight ring, and it may also be a separated type structure. Namely, each counterweight body includes at least two counterweight blocks, the total center of mass of the at least two counterweight blocks is located in the axis. The material of the counterweight body is not limited to cement and may also be concrete, cast iron and/or lead. The position of the counterweight body is not limited to the outer peripheral face of the front-end flange of the inner drum body, instead, the counterweight body may also be disposed at outer peripheral face of the rear-end flange or other positions, as long as it can mitigate the vibration effectively as the inner drum body rotates at a higher speed. The number of the cavities of the guard shell is not limited to two, and it may be one or more. When there are two or more cavities, at least one of the cavities is provided with the counterweight body therein, and at least other one of the cavity is filled with liquid or the mixture including steel balls and silicone oil.
[0030] Multiple guard shells are not limited to be arranged radially and may also be arranged axially. As shown in Fig. 3, the first cavity 52 and the second cavity 52 are axially arranged side by side with respect to the inner drum body 1.

Preferred Embodiment 3:

[0031] The present preferred embodiment discloses a drum washing machine which includes a shell, an outer

drum and a washing machine inner drum as described above in the preferred Embodiment 1 or Embodiment 2, in which at least one counterweight body that is symmetrically disposed with respect to the axis is arranged on a inner drum body. When the inner drum body rotates, the center of mass of the counterweight body is positioned in the axis, and thus the vibration of the inner drum body can be reduced, thereby improving the stability of the washing machine during use. No other counterweights are needed to be arranged on the outer drum and the shell such that the structure can be more compact.

Preferred Embodiment 4:

[0032] The present preferred embodiment discloses a washing machine wholse structure is substantially the same as that of the preferred Embodiment 3. The washing machine includes a shell, an outer drum and a washing machine inner drum as described above in the preferred Embodiment 1 or Embodiment 2, in which at least one counterweight body that is symmetrically disposed with respect to the axis is arranged on the inner drum body.

[0033] The difference between the preferred embodiment 4 and the preferred embodiment 3 lies in that the washing machine is not limited to be the drum washing machine, and it may also be a pulsator washing machine or other types of washing machine.

Claims

1. A washing machine inner drum, comprising a hollow cylinder-shaped inner drum body (1), wherein at least one counterweight body (2) is disposed fixedly to the inner drum body (1); when the inner drum body (1) rotates, the counterweight body (2) is capable of rotating with the inner drum body (1); and a center of mass of the counterweight body (2) is positioned in an axis of the inner drum body (1).

2. The washing machine inner drum of claim 1, wherein the counterweight body (2) is disposed fixedly on an outside edge and/or an inside edge of the inner drum body (1).

3. The washing machine inner drum of claim 1, wherein each counterweight body (2) comprises at least two counterweight blocks, and a total center of mass of the at least two counterweight blocks is positioned in the axis; or
each counterweight body (2) is an annular solid counterweight ring, and a center of the counterweight ring is positioned in the axis.

4. The washing machine inner drum of any one of claims 1-3, wherein the counterweight body (2) is made from cement, concrete, cast iron and/or lead.

5. The washing machine inner drum of any one of claims 1-3, wherein a guard shell (5) is disposed at an outer side of the counterweight body (2).

6. The washing machine inner drum of claim 5, wherein the guard shell (5) comprises at least two cavities that are arranged radially outwardly or sided by side axially with respect to the inner drum body (1).

7. The washing machine inner drum of claim 5, wherein the guard shell (5) comprises at least two cavities, wherein the counterweight body (2) is arranged inside at least one cavity, and a mixture (7) including steel balls and silicone oil is filled inside at least one other cavity.

8. The washing machine inner drum of claim 5, wherein the guard shell (5) comprises at least two cavities, wherein the counterweight body (2) is arranged inside at least one cavity, and liquid is filled inside at least one other cavidy.

9. The washing machine inner drum of any one of claims 1-3, wherein a front-end flange (3) is disposed at an opening of the inner drum body (1), and the counterweight body (2) is fixedly disposed at an outer peripheral face of the front-end flange (3).

10. A washing machine comprising a shell and an outer drum, wherein the outer drum is provided with the washing machine inner drum according to any one of claims 1-9.

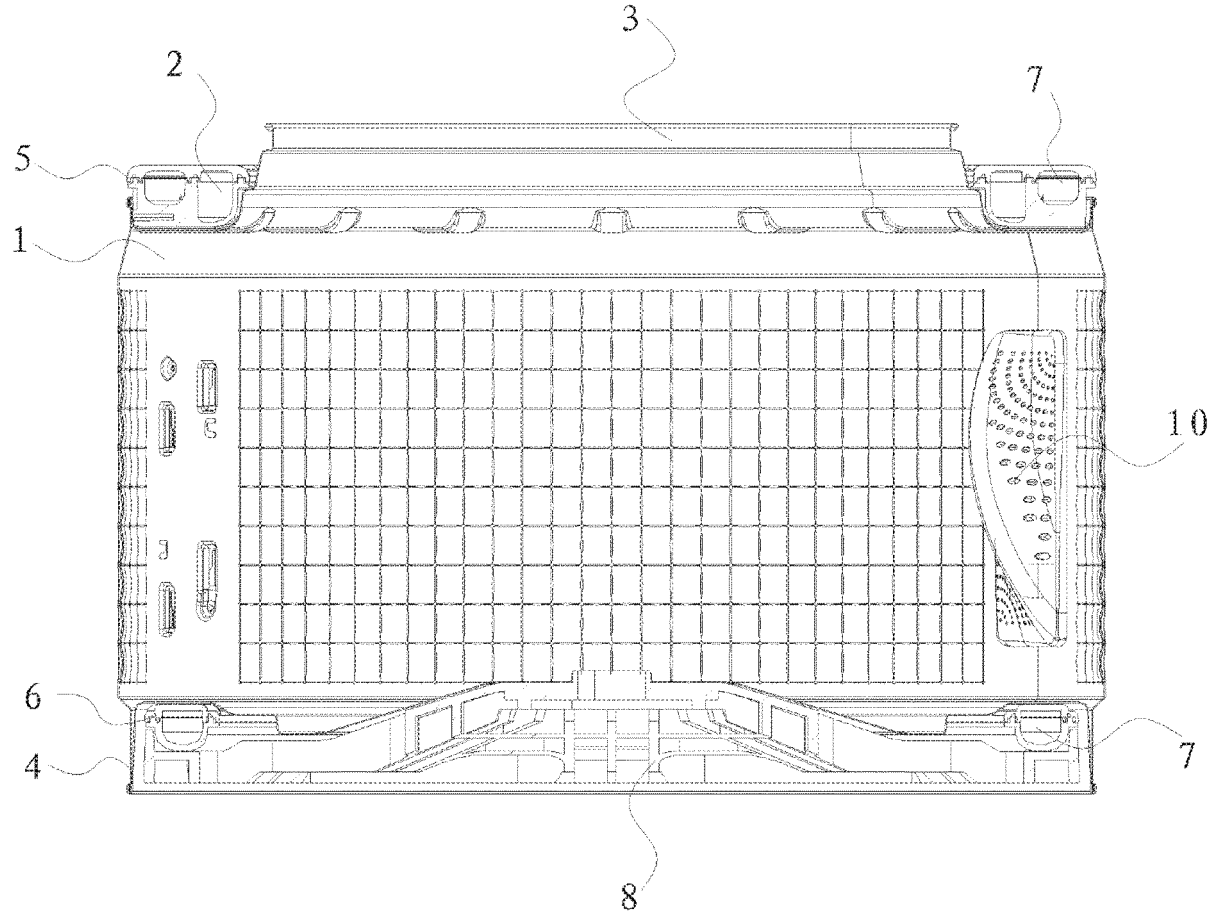

FIG.1

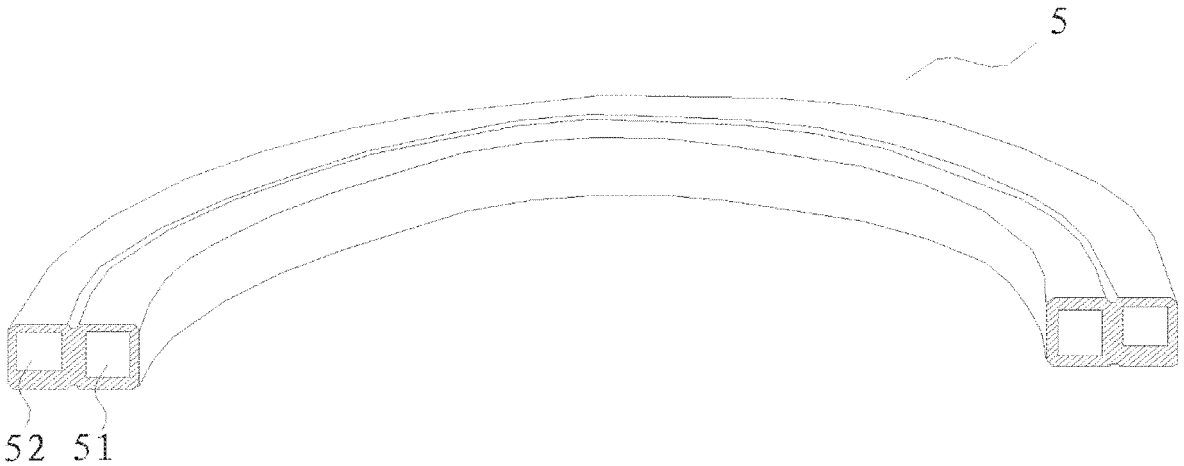

FIG.2

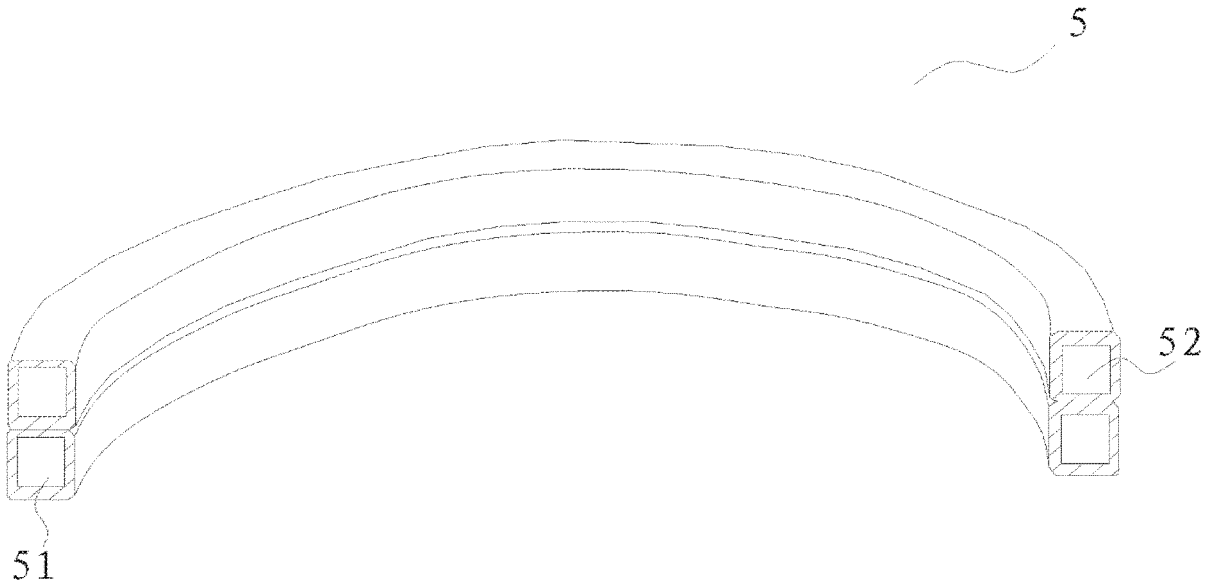

FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/091305

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/02 (2006.01) i; D06F37/20 (2006.01) i
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)

CNABS; VEN: weight, balancer, weight block, inner drum, dehydrating drum, inner drum, drum, dehydrating drum, tub, rolling drum, dehydrating drum, drum, balance, mass, cylinder, +weight, buffer, drum, basket, balancer?, roller, tumble

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 204199045 U (QINGDAO HAIER WASHING MACH CO) 11 March 2015 (11.03.2015) claims 1-10	1-10
X	CN 2347990 Y (CHINA JINAN WASHING MACHINE FA) 10 November 1999 (10.11.1999) description, page 1, lines 1, 2, 16, 24-26, page 2, lines 1, 2, and figures	1-10
X	CN 103628278 A (SHENZHEN HAIPUCHUANG TECHNOLOGY DEV CO LTD) 12 March 2014 (12.03.2014) description, paragraphs [0026]-[0034], and figures 3-5	1-10
X	JP 10258199 A (MITSUBISHI ELECTRIC CORP.) 29 September 1998 (29.09.1998) claims 1-8, description, paragraphs [0011], [0020], [0023], [0026], and figures 1-9	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 April 2015	22 May 2015
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer BAI, Ying Telephone No. (86-10) 62084625

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/091305

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 204199045 U	11 March 2015	None	
CN 2347990 Y	10 November 1999	None	
CN 103628278 A	12 March 2014	None	
JP 10258199 A	29 September 1998	None	

Form PCT/ISA /210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201410510619 **[0001]**