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(54) **TOP LOAD DRUM WASHING MACHINE AND POSITIONING DEVICE THEREOF**

(57) A top load drum washing machine and a positioning device thereof, which relate to the field of laundry washing equipment and which aim to solve the problems in the existing technology wherein a belt is easily worn out by the edge of a groove, which is located on a pulley and which corresponds to a latch bolt of a drum locking device, and wherein the positional arrangement of the locking device is not flexible enough. For this purpose, the positioning device for use with a top load drum washing machine comprises: a locking position which is provided on a spoke (21) of a pulley (2); a locking device (1) which is provided on an outer cylinder, the locking device (1) being provided with a latch bolt (12); the position of the locking device (1) corresponds to the rotational path of the locking position such that the latch bolt (12) may form a locking fit with the locking position when a drum stops rotating. By means of said structure, the present solution may prevent a belt on the pulley (2) from con-

tacting a part of the locking position, thereby preventing the belt from being worn out and extending the service life of the belt, while the position of the locking device (1) may be selected with great flexibility.

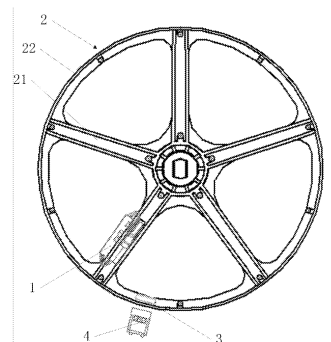


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present disclosure belongs to the field of laundry washing equipment, and particularly relates to a top load drum washing machine and a positioning device thereof.

BACKGROUND OF THE INVENTION

[0002] At present, commonly used drum washing machines are of a side door type which, however, requires a user to bend his/her body or squat down during use to put laundries into the drum via the side door of the washing machine or take out the laundries from the drum via the side door, thereby having an influence on the user's experience during use (especially for the elderly).

[0003] For this reason, top load drum washing machines (such as the drum washing machine disclosed in the application documents of Chinese patent No. CN1244730C) have emerged as the time requires. Corresponding to the top door of the washing machine, the drum is also provided with a drum door in a circumferential direction, and the drum is locked by a drum locking device when the washing machine stops rotating and the drum door corresponds to the top door of the washing machine. Specifically, the locking of the drum by the drum locking device is achieved by inserting a locking tongue of the drum locking device into a groove of a pulley.

[0004] However, in the existing technology, the groove corresponding to the locking tongue is usually disposed on a rim of the pulley, and an edge of a notch of the groove will cause a certain degree of wear on the belt during operation of the washing machine. If the edge of the groove has sharp burrs, the belt may even be cut, which reduces service life of the belt and increases a failure rate of the washing machine.

[0005] Accordingly, there is a need in the art for a new top load drum washing machine to solve the above problem.

SUMMARY OF THE INVENTION

[0006] In order to solve the above problem in the existing technologies, i.e., the problem that the edge of the groove on the pulley that corresponds to the locking tongue of the drum locking device may easily wear the belt in the existing technologies, a positioning device for a top load drum washing machine is provided by the present disclosure, wherein the washing machine includes an outer cylinder, an inner cylinder disposed inside the outer cylinder and a pulley connected to the inner cylinder; the positioning device includes: a locking structure disposed on a spoke of the pulley; and a locking device disposed on the outer cylinder, the locking device including a lock body and a locking tongue; a position of the locking device corresponds to a rotational path of the

locking structure so that when the inner cylinder stops rotating, the locking tongue is capable of forming a locking engagement with the locking structure.

[0007] In a preferred technical solution of the above positioning device, the locking structure is a groove disposed on the spoke.

[0008] In a preferred technical solution of the above positioning device, the locking tongue is a rocker type locking tongue, one end of which is connected to the lock body.

[0009] In a preferred technical solution of the above positioning device, the positioning device further includes a detecting device configured to detect a rotational position of the inner cylinder.

[0010] In a preferred technical solution of the above positioning device, the detecting device includes a signal transmitting device and a signal receiving device, the signal transmitting device is disposed on the pulley, and the signal receiving device is disposed on the outer cylinder or on a body of the washing machine.

[0011] In a preferred technical solution of the above positioning device, the signal transmitting device is disposed on a rim of the pulley.

[0012] In a preferred technical solution of the above positioning device, the detecting device includes a signal transmitting device and a signal receiving device, the signal transmitting device is disposed on the outer cylinder or a body of the washing machine, and the signal receiving device is disposed on the pulley.

[0013] In a preferred technical solution of the above positioning device, the signal transmitting device is a magnet, and the signal receiving device is a Hall element.

[0014] In another aspect, a top load drum washing machine is provided by the present disclosure, which includes the positioning device according to any one of the above technical solutions.

[0015] It can be understood by those skilled in the art that in a preferred technical solution of the present disclosure, by setting the positions of the locking structure corresponding to the locking device on one spoke of the pulley, the belt on the pulley can be prevented from contacting interfaces of the locking structure, thus avoiding wear of the belt and increasing the service life of the belt.

[0016] Further, unlike the existing technology in which the locking structure corresponding to the locking device is disposed on the rim of the pulley, the locking structure corresponding to the locking device is disposed on one spoke of the pulley in the present disclosure. Therefore, by changing the position of the locking structure in the lengthwise direction of the spoke, more choice on position of the locking device fixed to the outer cylinder in the lengthwise direction of the spoke are made available. Moreover, since the pulley has a plurality of spokes, the locking device can be disposed at any projection position of each spoke on the outer cylinder as long as the position of the drum door of the inner cylinder can correspond to the position of the washing machine door.

[0017] Further, since a gap between the pulley and the

outer cylinder is very small, it is impossible for the locking device in the existing technologies to be mounted between the pulley and the outer cylinder. However, in a preferred technical solution of the present disclosure, the lock tongue of the locking device is configured to have a rocker type structure, and the rocker type lock tongue has a smaller thickness in the axis direction of the pulley so that the locking device has a smaller thickness in the axis direction of the pulley when the rocker type lock tongue is received into the lock body. Therefore, when the rocker type lock tongue is received into the lock body, the locking device fixed to the outer cylinder will not come into contact with the rotating pulley, making the structure very compact.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a schematic view of a pulley portion of a top load drum washing machine according to an embodiment of the present disclosure; and

FIG. 2 is a side view of the pulley portion in FIG. 1 of the present disclosure.

List of reference numerals:

[0019] 1: locking device; 11: lock body; 12: lock tongue; 2: pulley; 21: rim; 22: spoke; 3: magnet; 4: Hall element.

DETAILED DESCRIPTION OF THE EMBODIMENT(S) OF THE INVENTION

[0020] Preferred embodiments of the present disclosure will be described below with reference to the accompanying drawings. It should be understood by those skilled in the art that these embodiments are only used to explain the technical principles of the present disclosure, and are not intended to limit the scope of protection of the present disclosure. For example, although the components in the figures are drawn in certain proportional relationships, such proportional relationships are not constant, and those skilled in the art may adjust them as required to adapt to specific scenes. The adjusted technical solution will still fall within the scope of protection of the present disclosure.

[0021] It should be noted that in the description of the present disclosure, directional or positional relationships indicated by terms such as "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inner" and "outer" are based on the directions or positions shown in the drawings. They are merely used for convenience of description, and do not indicate or imply that the device or component involved must have a specific orientation, or be configured or operated in a specific orientation, and therefore they should not be construed as limiting the present disclosure.

[0022] In addition, it should be noted that in the description of the present disclosure, terms such as "install", "connect" and "connection" should be understood in a broad sense, unless explicitly stated and defined otherwise; for example, they may indicate a fixed connection, a detachable connection or an integral connection, or may indicate a mechanical connection or an electrical connection; or may indicate a direct connection, or an indirect connection through an intermediate medium, or an internal communication between two elements. For those skilled in the art, the specific meanings of the above terms in the present disclosure may be interpreted according to the specific circumstances.

[0023] Further, it should be noted that although not shown in the drawings, the top load drum washing machine of the present disclosure mainly includes an outer cylinder, an inner cylinder, a positioning device, a pulley, and a motor for driving the pulley to rotate. The inner cylinder is disposed inside the outer cylinder, one end of the inner cylinder is coaxially fixed to the pulley, and the motor drives the pulley to rotate via a belt. Further, a washing machine door of the drum washing machine of the present disclosure is disposed at the top of the drum washing machine, and the inner cylinder is provided with a side-open drum door corresponding to the washing machine door. When the inner cylinder stops rotating and the drum door faces upward, the inner cylinder is locked by the positioning device, and the user can put laundries into the inner cylinder via the washing machine door or the drum door, or take out the laundries from the inner cylinder via the washing machine door or the drum door.

[0024] As shown in FIGS. 1 and 2, the positioning device of the present disclosure includes a locking device 1 and a detecting device. The locking device 1 is mainly composed of a lock body 11 and a lock tongue 12. The lock body 11 is fixed to the outer cylinder, and the lock tongue 12 is capable of abutting against a pulley 2 when it protrudes from the lock body 11. Preferably, one spoke 21 of the pulley 2 is provided with a locking structure (not shown) capable of accommodating the lock tongue 12. After the lock tongue 12 protrudes from the lock body 11, one end of the lock tongue 12 can be captured into the locking structure, and the locking device 1 can lock the pulley 2 through the lock tongue 12 so that the inner cylinder coaxially fixed to the pulley 2 is locked.

[0025] As shown in FIG. 2, in a preferred technical solution of the present disclosure, the lock tongue 12 is a rocker type lock tongue having a sheet-like structure, and when the lock tongue 12 is received into the lock body 11, a thickness direction of the lock tongue 12 is parallel or substantially parallel to an axis of the pulley 2. One end of the lock tongue 12 is pivotally connected to the lock body 11, and the other end of the lock tongue 12 can be rotated out of or into the lock body 11 around the pivotal joint of the lock tongue 12 and the lock body 11. Further, a driving device for driving the lock tongue 12 to rotate may be a micro motor disposed inside the lock body 11. In a possible embodiment, the micro motor is

connected to a pivotal end of the lock tongue 12, and when the micro motor rotates, the lock tongue 12 can be driven by a gear or belt to rotate so that the lock tongue 12 rotates out of or into the lock body 11. In another possible embodiment, a cam is fixed on an output shaft of the micro motor, and the micro motor is capable of pushing out a free end of the lock tongue 12 via the cam. When the free end of the lock tongue 12 needs to be retracted into the lock body 11, the micro motor drives the cam to rotate to the original position, and the lock tongue 12 is pulled into the lock body 11 by a spring disposed in the lock body 11. In addition, those skilled in the art may also anticipate rotating the free end of the lock tongue 12 out of or into the lock body 11 by other feasible driving means such as a solenoid valve.

[0026] It will be understood by those skilled in the art that the lock tongue 12 of the above structure (rocker type lock tongue) also enables the lock body 11 to have a thinner structure. Therefore, when the locking device 1 is fixed to the outer cylinder and the locking tongue 12 is received into the lock body 1, no part of the locking device 1 will come into contact with the pulley 2. Therefore, the locking device 1 of the present disclosure can make full use of the space between the pulley 2 and the outer cylinder.

[0027] In a preferred embodiment of the present disclosure, the locking structure is a groove disposed on one spoke 21 of the pulley 2, in order to prevent the free end of the lock tongue 12 from protruding so long as beyond the other side of the spoke 21 adjacent the inner cylinder. Alternatively, those skilled in the art may also anticipate setting the locking structure as a through hole in the spoke 21 of the pulley 2 as needed.

[0028] As shown in FIG. 1, the detecting device is configured to monitor the position of the drum door, and the detecting device mainly includes a magnet 3 as a signal transmitting device and a Hall element 4 as a signal receiving device. Preferably, the magnet 3 is disposed on the pulley 2, and the Hall element 4 is disposed on the outer cylinder. Further preferably, the magnet 3 is disposed on a rim 22 of the pulley 2, and the position of the Hall element 4 on the outer cylinder corresponds to a rotational path of the magnet 3 so that the Hall element 4 is capable of clearly receiving a signal from the magnet 3. It should be noted that the rotational path of the magnet 3 is a circular path in which the magnet 3 rotates around the axial center of the pulley 2 by one turn, and the Hall element 4 is located on the circular path. Therefore, the magnet 3 is always capable of reaching a position aligned with the Hall element 4 during one turn of rotation. Moreover, the magnet 3 may be any form of magnets, such as an electromagnetic coil.

[0029] Furthermore, those skilled in the art may also dispose the magnet 3 at other positions on the pulley 2 as needed, such as on the spokes 21. Alternatively, those skilled in the art may also dispose the Hall element 4 on the pulley 2, and dispose the magnet 3 on the outer cylinder as needed so that the magnet 3 corresponds to the

rotational path of the Hall element 4. Similarly, the rotational path of the Hall element 4 is a circular path in which the Hall element 4 rotates around the axial center of the pulley 2 by one turn, and the magnet 3 is located on the circular path. Therefore, the Hall element 4 is always capable of reaching a position aligned with the magnet 3 during one turn of rotation.

[0030] It can be understood by those skilled in the art that in addition to the combination of the magnet 3 and the Hall element 4, the detecting device may also be a combination of a light emitting element and a photosensitive sensor, an angle sensor disposed on the pulley 2, and a proximity switch disposed on the pulley 2 or the outer cylinder.

[0031] Further, although not shown in the drawings, the top load drum washing machine of the present disclosure further includes a washing machine controller and a motor controller, and the washing machine controller is communicatively connected to the motor controller and the Hall element 4 respectively. The washing machine controller is capable of sending an instruction to the motor controller, and after the motor controller receives the instruction, the motor controller is capable of controlling the motor to drive the pulley 2 to rotate.

[0032] A locking process of the inner cylinder of the top load drum washing machine of the present disclosure will be described in detail below with reference to FIGS. 1 and 2.

[0033] When the inner cylinder of the top load drum washing machine is stationary, the free end of the lock tongue 12 of the locking device 1 is captured into the groove on the spoke 21 of the pulley 2, and the positions of the washing machine door and the drum door coincide or substantially coincide with each other so that the user can put the laundries into the washing machine via the washing machine door and the drum door, or take out the laundries from the inner cylinder of the washing machine via the washing machine door and the drum door.

[0034] When the top load drum washing machine completes a spin-drying process, the washing machine controller sends an instruction to the motor controller, according to which the motor controller reduces a rotational speed of the motor connected to the pulley 2 and maintains a low-speed operation. When the Hall element 4 detects the magnet 3, the Hall element 4 sends a signal to the washing machine controller, the washing machine controller issues an instruction to the motor controller based on the signal, and the motor controller stops the motor from rotating. At the same time or after (for example, with a delay of 0.5S) the washing machine controller issues a motor rotation stop instruction to the motor controller, the washing machine controller controls the locking device 1 to cause the free end of the lock tongue 12 to be captured into the groove on the spoke 21 of the pulley 2. The inner cylinder is therefore locked, at which time the positions of the washing machine door and the drum door coincide or substantially coincide with each other.

[0035] It will be understood by those skilled in the art that in a preferred technical solution of the present disclosure, since a groove is disposed on one spoke 21 of the pulley 2, and the locking device 1 is disposed on the outer cylinder at a position corresponding to the rotational path of the groove so that the locking device 1 is within a projection area of the pulley 2, the structure of the washing machine is made more compact. It should be noted that the rotational path of the groove is a circular path in which the groove rotates around the axial center of the pulley 2 by one turn, and the locking device 1 is located on the circular path. Therefore, the groove is always capable of reaching a position aligned with the locking device 1 during one turn of rotation so that the lock tongue can be inserted into the groove.

[0036] Further, the present disclosure provides a technical solution in which a groove corresponding to the lock tongue 12 of the locking device 1 is disposed on one spoke 21 of the pulley 2. As compared to the technical solution in the existing technology in which the groove is disposed on the rim 22 of the pulley 2, a phenomenon that a notch of the groove contacts the belt on the pulley 2 to wear the belt is avoided.

[0037] Further, unlike the existing technology in which the locking structure corresponding to the locking device 1 is disposed on the rim 22 of the pulley 2, the locking structure corresponding to the locking device 1 is disposed on one spoke 21 of the pulley 2 in the present disclosure. Therefore, by changing positions of the locking structure in the lengthwise direction of the spoke 21, more choices on position of the locking device 1 fixed to the outer cylinder in the lengthwise directions of the spokes 21 are made available. Moreover, since the pulley 2 has a plurality of spokes 21, the locking device 1 can be disposed at any projection position of each spoke 21 on the outer cylinder as long as the position of the drum door of the inner cylinder can correspond to the position of the washing machine door, thus further improving choice flexibility of the position of the locking device 1 on the outer cylinder.

[0038] Heretofore, the technical solutions of the present disclosure have been described in conjunction with the preferred embodiments shown in the drawings, but it is obvious to those skilled in the art that the scope of protection of the present disclosure is obviously not limited to these specific embodiments. Those skilled in the art can make equivalent changes or replacements to the related technical features without departing from the principle of the present disclosure. The technical solutions after the modification or replacement will fall within the scope of protection of the present disclosure.

Claims

1. A positioning device for a top load drum washing machine, the washing machine comprising an outer cylinder, an inner cylinder disposed inside the outer

cylinder and a pulley connected to the inner cylinder; the positioning device comprising:

a locking structure disposed on one spoke of the pulley; and
a locking device disposed on the outer cylinder, the locking device comprising a lock body and a locking tongue;
wherein a position of the locking device corresponds to a rotational path of the locking structure so that when the inner cylinder stops rotating, the locking tongue is capable of forming a locking engagement with the locking structure.

2. The positioning device for a top load drum washing machine according to claim 1, wherein the locking structure is a groove disposed on the spoke.
3. The positioning device for a top load drum washing machine according to claim 2, wherein the locking tongue is a rocker type locking tongue, one end of which is connected to the lock body.
4. The positioning device for a top load drum washing machine according to any one of claims 1 to 3, wherein the positioning device further comprises a detecting device configured to detect a rotational position of the inner cylinder.
5. The positioning device for a top load drum washing machine according to claim 4, wherein the detecting device comprises a signal transmitting device and a signal receiving device, the signal transmitting device is disposed on the pulley, and the signal receiving device is disposed on the outer cylinder or on a body of the washing machine.
6. The positioning device for a top load drum washing machine according to claim 5, wherein the signal transmitting device is disposed on a rim of the pulley.
7. The positioning device for a top load drum washing machine according to claim 4, wherein the detecting device comprises a signal transmitting device and a signal receiving device, the signal transmitting device is disposed on the outer cylinder or a body of the washing machine, and the signal receiving device is disposed on the pulley.
8. The positioning device for a top load drum washing machine according to claim 5, wherein the signal transmitting device is a magnet, and the signal receiving device is a Hall element.
9. A top load drum washing machine, comprising the positioning device according to any one of claims 1 to 9.

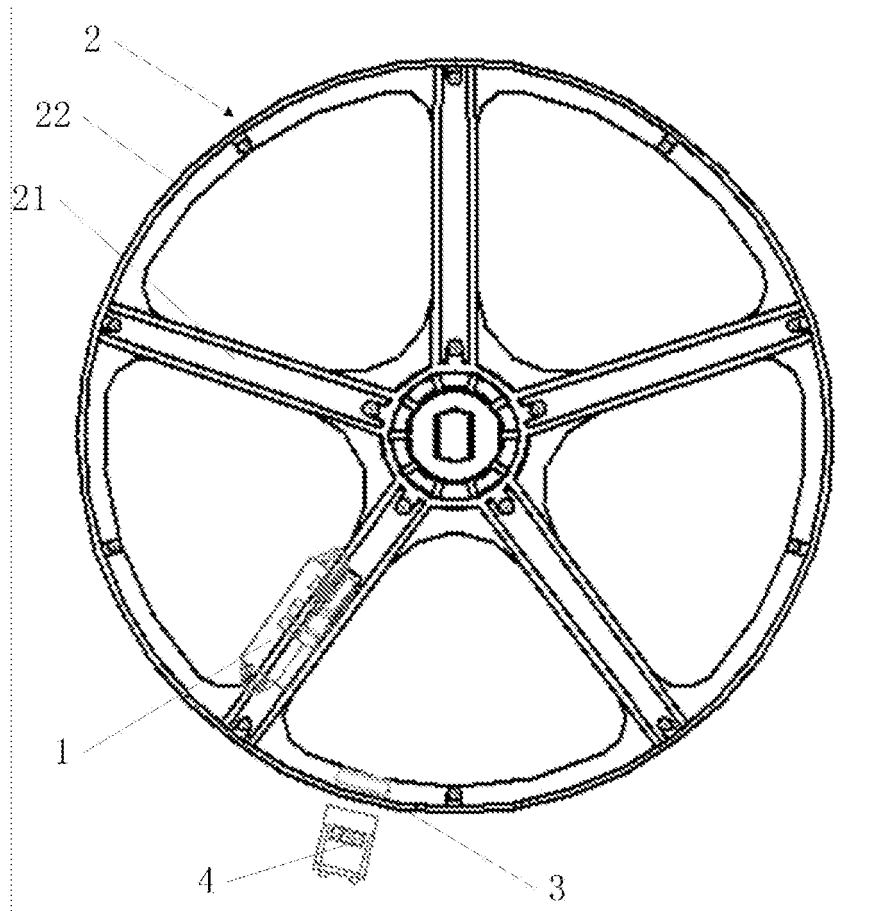


Fig. 1

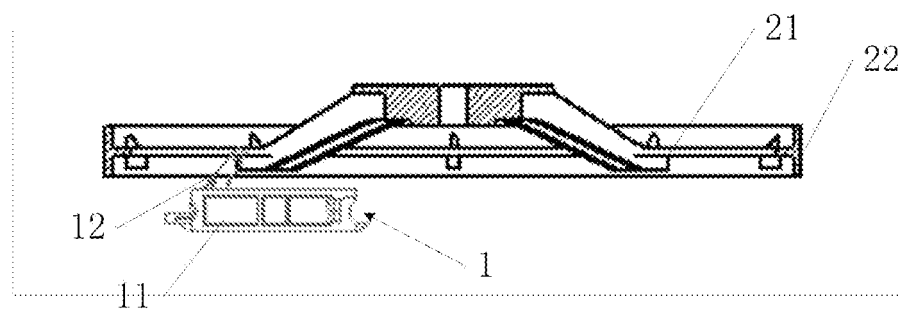


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/086750

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/30 (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)

WPI, EPODOC, CNPAT, CNKI: 滚筒, 洗衣机, 定位, 锁定, 皮带轮, 皮带, 磨损, 轮辐, 卡止, roller, drum, washing, machine,
locat+, belt, abrasion, pulley, spoke, block+, lock+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 1442533 A (SANYO ELECTRIC CO., LTD.) 17 September 2003 (17.09.2003), description, page 10, the last paragraph but one to page 19, paragraph 3, and figures 1-7	1-9
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A	EP 0073508 A1 (EATON GMBH & CO. KG) 09 March 1983 (09.03.1983), entire document	1-9

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search 10 July 2018	Date of mailing of the international search report 27 July 2018
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 TANG, Hexiang Telephone No. (86-10) 53961494

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

INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International application No.
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REFERENCES CITED IN THE DESCRIPTION

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