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(54) **METHOD AND DEVICE FOR CONTROLLING LAUNDRY TREATMENT DEVICE, AND LAUNDRY TREATMENT DEVICE AND MEDIUM**

(57) A method and device for controlling a laundry treatment apparatus, and a laundry treatment apparatus and a medium. The method comprises: controlling a first laundry treatment module and a second laundry treatment module of a laundry treatment apparatus to run, wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference there between. By means of the method, the running time length of a user washing program can be saved on, and the situation where beat vibration occurs when a first laundry treatment module and a second laundry treatment module run at the same time is avoided, thereby preventing the situation where a laundry treatment apparatus shakes, and improving the usage experience of a user.

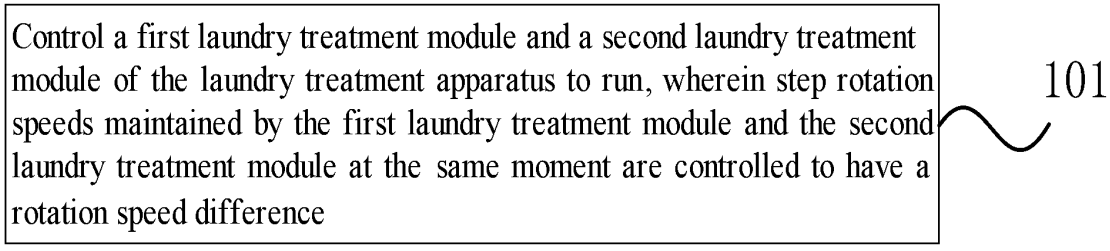

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to Chinese Patent Application NO. 201911031436.6, filed on October 28, 2019 by WUXI LITTLE SWAN ELECTRIC CO., LTD. and entitled "method and device for controlling laundry treatment device, and laundry treatment device and medium".

FIELD

[0002] The present disclosure relates to the technical field of electrical appliances, in particular to a control method for a laundry treatment apparatus, a control device of a laundry treatment apparatus, a laundry treatment apparatus and medium.

BACKGROUND

[0003] At present, a laundry treatment apparatus having double washing tubs is welcomed by more and more users, based on which the users can perform partition washing to improve washing efficiency. However, during the rotation of the laundry treatment apparatus, such as in the process of high-speed rotary tub washing, dewatering, or the like, the two washing tubs in the laundry treatment apparatus may have a same excitation frequency when operated at a high speed at the same time, and thus beat vibration would be generated due to the same excitation frequency, which causes periodic shaking of the laundry treatment apparatus, thereby reducing user experience.

[0004] In the related technologies, in order to avoid shaking of the laundry treatment apparatus having double washing tubs, one of the two washing tubs is controlled to firstly rotate until it stops and then the other is controlled to rotate during the operation of the laundry treatment apparatus. That is, the two washing tubs cannot run at the same time.

[0005] In this manner, the running time for the user's laundry program is greatly extended, and thus the user experience is reduced.

SUMMARY

[0006] The present disclosure at least solves one of technical problems existing in the related art.

[0007] The present disclosure proposes a control method for a laundry treatment apparatus, a control device of a laundry treatment apparatus, a laundry treatment apparatus and medium, such that the running time of the user's laundry program is saved on and the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module is avoided, thereby improving the user experience. Accordingly, the technical problem that the two washing tubs cannot run at the same time, which causes longer running time of the user's laundry program, is solved.

[0008] A first aspect of embodiments of the present disclosure provides a control method for a laundry treatment apparatus. The control method comprises controlling a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run, wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

[0009] As a possible implementation of embodiments of the first aspect of the present disclosure, controlling a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run comprises controlling the first laundry treatment module to run according to a first operation curve and controlling the second laundry treatment module to run according to a second operation curve, wherein the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

[0010] As a further possible implementation of embodiments of the first aspect of the present disclosure, the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

[0011] As a still further possible implementation of embodiments of the first aspect of the present disclosure, the set condition comprises that:

the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio;
optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio;
optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first

step rotation speed and a respective second step rotation speed with a set ratio.

[0012] As a still further possible implementation of embodiments of the first aspect of the present disclosure, the set ratio ranges from 5% to 20%.

[0013] As a still further possible implementation of embodiments of the first aspect of the present disclosure, the set ratio ranges from 9% to 11%.

[0014] According to the control method for the laundry treatment apparatus in embodiments of the present disclosure, a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled to run, and step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0015] A second aspect of embodiments of the present disclosure provides a control device of a laundry treatment apparatus, comprising:

a control module, configured to control a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run,
wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

[0016] As a possible implementation of embodiments of the second aspect of the present disclosure, the control module comprises:

a first control unit, configured to control the first laundry treatment module to run according to a first operation curve, and
a second control unit, configured to control the second laundry treatment module to run according to a second operation curve,
wherein the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

[0017] As a further possible implementation of embodiments of the second aspect of the present disclosure, the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

[0018] As a still further possible implementation of embodiments of the second aspect of the present disclosure, the set condition comprises that:

the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio;
optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio;
optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first step rotation speed and a respective second step rotation speed with a set ratio.

[0019] As a still further possible implementation of embodiments of the second aspect of the present disclosure, the set ratio ranges from 5% to 20%.

[0020] As a still further possible implementation of embodiments of the second aspect of the present disclosure, the set ratio ranges from 9% to 11%.

[0021] According to the control device of the laundry treatment apparatus in embodiments of the present disclosure, a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled to run, and step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation

speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0022] A third aspect of embodiments of the present disclosure provides a laundry treatment apparatus, comprising: a first laundry treatment module, a second laundry treatment module, and control units connected to the first laundry treatment module and the second laundry treatment module. The control units comprise: a memory, a processor, and a computer program, stored in the memory and executable by the processor, wherein when the processor executes the computer program, a control method for a laundry treatment apparatus proposed in foregoing embodiments of the first aspect of the present disclosure is implemented.

[0023] A fourth aspect of embodiments of the present disclosure provides a non-transitory computer-readable storage medium, having stored therein a computer program that, when executed by a processor, performs a control method for a laundry treatment apparatus proposed in foregoing embodiments of the first aspect of the present disclosure.

[0024] The additional aspects and advantages of the present disclosure are partly shown in the following description, and some will become obvious from the following description or be understood through the practice of the present disclosure.

DESCRIPTION OF DRAWINGS

[0025] The above and/or additional aspects and advantages of the present disclosure become apparent and easy to understand from the following description of the embodiments in combination with the drawings, in which:

FIG. 1 is a schematic flow chart showing a control method for a laundry treatment apparatus according to Embodiment 1 of the present disclosure;

FIG. 2 is a schematic diagram showing the curve of dewatering rotation speed of a washing tub over time in an embodiment of the present disclosure;

FIG. 3 is a schematic diagram showing dewatering curves corresponding to double drums in an embodiment of the application;

FIG. 4 is a schematic flow chart showing a control method for a laundry treatment apparatus according to Embodiment 2 of the present disclosure;

FIG. 5 is a schematic diagram showing the structure of a control device of a laundry treatment apparatus according to Embodiment 3 of the present disclosure;

FIG. 6 is a schematic diagram showing the structure of a control device of a laundry treatment apparatus according to Embodiment 4 of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0026] Embodiments of the present disclosure are described in detail and examples are shown in the drawings. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to drawings are illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

[0027] The present disclosure proposes a control method for a laundry treatment apparatus, mainly to solve the technical problem that the two washing tubs cannot be operated at the same time, which causes longer running time of the user's laundry program.

[0028] According to the control method for the laundry treatment apparatus in embodiments of the present disclosure, a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled to run, and step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0029] Hereinafter, a control method for a laundry treatment apparatus, a control device of a laundry treatment apparatus, a laundry treatment apparatus and medium in embodiments of the present disclosure are described with reference to the drawings.

[0030] FIG. 1 is a schematic flow chart showing a control method for a laundry treatment apparatus according to Embodiment 1 of the present disclosure.

[0031] The control method for the laundry treatment apparatus in embodiments of the present disclosure may be applied to a laundry treatment apparatus. The laundry treatment apparatus may be a laundry treatment apparatus having double tubs or a plurality of tubs. For example, the laundry treatment apparatus may be a double-drum or multiple-drum washing machine, a pulsator washing machine, a washer-dryer, or other types of laundry treatment apparatus, which is not limited.

[0032] In the embodiment of the present disclosure, the laundry treatment apparatus may include a first laundry treatment module and a second laundry treatment module. The first laundry treatment module and the second laundry treatment module may be arranged up and down. The first laundry treatment module and the second laundry treatment module may be arranged left and right. The first laundry treatment module and the second laundry treatment module may be arranged back and forth. There is no restriction on this.

[0033] As shown in FIG. 1, the control method for the laundry treatment apparatus includes the following steps.

[0034] Step 101 a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled to run. Step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

[0035] In the embodiment of the present disclosure, the step rotation speed refers to the rotation speed maintained by the laundry treatment apparatus within a preset time period. During the preset time period, the rotation speed of the washing tub is fixed and presents in a step shape. As an example, referring to FIG. 2, which is a schematic diagram showing the curve of rotation speed of a washing tub over time in an embodiment of the present disclosure. Among them, in the time period [t1, t2], the washing tub is driven by a motor and the rotation speed value is maintained at R1 revolution per minute (rpm), and thus the rotation speed value of the washing tub maintained within [t1, t2] is called a step rotation speed. Alternatively, in the time period [t3, t4], the washing tub is driven by a motor and the rotation speed value is maintained at R2 revolution per minute (rpm), and thus the rotation speed value of the washing tub maintained within [t3, t4] is also called a step rotation speed.

[0036] In the embodiment of the present disclosure, relative operation curves may be defined for the first laundry treatment module and the second laundry treatment module respectively. For example, the operation curve corresponding to the first laundry treatment module may be defined as a first operation curve (Operation curve 1), and the operation curve corresponding to the second laundry treatment module may be defined as a second operation curve (Operation curve 2). The first operation curve and the second operation curve are different. In the first and second operation curves, the first and second step rotation speeds maintained at the same moment have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0037] Among them, the operation curve can indicate the corresponding washing cycle, rinsing cycle, dewatering cycle or the like. For example, the operation curve can indicate a rotation period or a stop period of the motor, such as a respective rotation duration of the motor within the rotation period, a respective stalling duration of the motor within the stop period, a ratio of the rotation duration and the stalling duration of the motor (or called the ratio of rotation to stalling of the motor). For example, the operation curve can indicate the change of the rotation speed (or speed) and/or the acceleration speed of the motor over time in each period, such as the change of the rotation speed and/or the acceleration speed of the motor over time within the rotation period. It should be understood that when the rotation speed and/or the acceleration speed of the motor changes, the rotation speed and/or the acceleration speed corresponding to the washing tub also changes accordingly since the motor drives the washing tub to rotate. For example, a first motor can drive the washing tub in the first laundry treatment module to rotate according to the first operation curve, and a second motor can drive the washing tub in the second laundry treatment module to rotate according to the second operation curve.

[0038] As an application scenario, in the high-speed rotary tub washing process, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to wash simultaneously, the running time of the washing program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous washing of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0039] As another application scenario, in the dewatering process, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to dewater simultaneously, the problem that the two washing tubs cannot be dewatered at the same time can be solved, and thus the running time of dewatering is saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during

the simultaneous dewatering of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0040] As an example, the laundry treatment apparatus is a double-drum washing machine. The operation curve can include a dewatering curve during the dewatering process. When the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus are arranged up and down, the drum in the first laundry treatment module arranged up (hereinafter referred to as an upper drum) corresponds to a first dewatering curve and the drum in the second laundry treatment module arranged down (hereinafter referred to as a lower drum) corresponds to a second dewatering curve, which may be as shown in FIG. 3. The step rotation speed in the first dewatering curve and the step rotation speed in the second dewatering curve maintained at the same moment have a rotation speed difference. For example, within the time period [120s, 150s], the step rotation speed B1 in the first dewatering curve is higher than the step rotation speed A1 in the second dewatering curve maintained at the corresponding time. For example, within the time period [370s,380s], the step rotation speed B2 in the first dewatering curve is higher than the step rotation speed A2 in the second dewatering curve maintained at the corresponding time. Therefore, by defining different dewatering curves for the upper drum and the lower drum and controlling the step rotation speed of the upper drum and the step rotation speed of the lower drum maintained at the same moment to have a rotation speed difference, the problem that the upper drum and the lower drum cannot be dewatered at the same time can be solved, and the beat vibration generated during the simultaneous dewatering of the upper drum and the lower drum can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience. Further, by controlling the simultaneous dewatering of the two drums of the laundry treatment apparatus, the dewatering time can be saved on.

[0041] Among them, the dewatering curve can indicate the corresponding dewatering cycle. For example, the dewatering curve can also indicate the rotation period and the stop period of the motor, such as a respective rotation duration of the motor within the rotation period, a respective stalling duration of the motor within the stop period, or a ratio of the rotation duration and the stalling duration of the motor. For example, the dewatering curve can also indicate the change of the rotation speed and/or the acceleration speed of the motor over time in each period, such as the change of the rotation speed and/or the acceleration speed of the motor over time within the rotation period.

[0042] According to the control method for the laundry treatment apparatus in embodiments of the present disclosure, a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled to run, and step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0043] As a possible implementation, when the first laundry treatment module and the second laundry treatment module are running simultaneously, they are controlled to run according to their respective operation curves. Among them, the step rotation speeds maintained at the same moment, in the operation curves corresponding to the first and second laundry treatment modules have a rotation speed difference. Further, the rotation speed difference meets a set condition. The above process is described in detail in combination with the Embodiment 2.

[0044] FIG. 4 is a schematic flow chart showing a control method for a laundry treatment apparatus according to Embodiment 2 of the present disclosure.

[0045] As shown in FIG. 4, the control method for the laundry treatment apparatus includes the following steps.

[0046] Step 201 the first laundry treatment module is controlled to run according to a first operation curve.

[0047] Step 202 the second laundry treatment module is controlled to run according to a second operation curve.

[0048] In the embodiment of the present disclosure, the first operation curve and the second operation curve are preset and they are different. The rotation speed difference between the first step rotation speed in the first operation curve and the second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

[0049] As an example, referring to FIG. 3, the operation curve may include a dewatering curve during the dewatering process. The dewatering curve corresponding to the upper drum is defined as the first dewatering curve (Dewatering curve 1), and the dewatering curve corresponding to the lower drum is defined as the second dewatering curve (Dewatering curve 2). A plurality of first step rotation speeds in the first dewatering curve respectively are B1 (430rpm), B1, B1, B2 (650rpm), B3 (850rpm). The upper drum has three different step rotation speeds, that is, B1, B2 and B3 respectively. A plurality of second step rotation speeds in the second dewatering curve respectively are A1 (370rpm), A1, A1, A2 (540rpm), A3 (750rpm), A4 (960rpm), A5 (1120rpm). The lower drum has five different step rotation speeds, that is, A1, A2, A3, A4 and A5 respectively.

[0050] It can be seen from FIG. 3 that the rotation speed difference between B1 and A1 (430-370=60rpm) is greater than both 10%*B1 and 10%*A1; similarly, the rotation speed difference between B2 and A2 (650-540=90rpm) is greater

than both 10%*B2 and 10%*A2; similarly, the rotation speed difference between B3 and A3 (850-750=100rpm) is greater than both 10%*B3 and 10%*B3. Thus, in the dewatering process, the two drums can realize simultaneous dewatering, and thus the dewatering time is saved on and user's complaint caused by the dewatering delay is avoided. Further, among all dewatering rotation speeds of the two drums, the rotation speed difference between the first and second step rotation speeds maintained at the corresponding moment meets the set condition. Thus, the beat vibration generated during the simultaneous dewatering of the two drums can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0051] As a possible implementation of the embodiment of the present disclosure, the set condition includes that: the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first step rotation speed and a respective second step rotation speed with a set ratio.

[0052] Among them, the set ratio is preset. For example, the set ratio ranges from 5% to 20%. As an example, referring to FIG. 3, the set ratio ranges from 9% to 11%.

[0053] It should be noted that this embodiment only takes the dewatering process as an example. The control method can also be applied to other operation processes, such as high-speed rotary tub washing or the like. In other operation processes, it is also ensured that the rotation speed difference between the first step rotation speed in the first operation curve corresponding to the first laundry treatment module and the second step rotation speed in the second operation curve corresponding to the second laundry treatment module maintained at the same moment meets the set condition. As such, the vibration generated during the running of the laundry treatment apparatus is reduced and the user experience is improved.

[0054] According to the control method for the laundry treatment apparatus in embodiments of the present disclosure, the first laundry treatment module is controlled to run according to the first operation curve and the second laundry treatment module is controlled to run according to the second operation curve, in which the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition. Therefore, the first laundry treatment module and the second laundry treatment module can realize simultaneous running, such that the running time of the user's laundry program is saved on and user's complaint caused by extended washing time is avoided. Further, the rotation speed difference between the first and second step rotation speeds maintained by the first and second laundry treatment modules at the same moment meets the set condition, such that the beat vibration generated during the simultaneous operation of the first and second laundry treatment modules is avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0055] As a possible implementation, on the basis of the embodiment shown in FIG. 4, the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition. Further, the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

[0056] Among them, the set condition includes that: the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first step rotation speed and a respective second step rotation speed with a set ratio.

[0057] As an example, the operation curve may include a dewatering curve during the dewatering process. Referring to FIG. 3, when the first step rotation speed is defined as B1, the rotation speed difference between B1 and A1 (430-370=60rpm) is greater than both 10%*B1 and 10%*A1; the rotation speed difference between B1 and A2 (540-430=110rpm) is greater than both 10%*B1 and 10%*A2; the rotation speed difference between B1 and A3 is greater than both 10%*B1 and 10%*A3; the rotation speed difference between B1 and A4 is greater than both 10%*B1 and 10%*A4; and the rotation speed difference between B1 and A5 is greater than both 10%*B1 and 10%*A5. Similarly, it can be obtained that the rotation speed difference between B2 and A1, A2, A3, A4 or A5 is greater than 10%*B2, and respectively greater than 10%*A1, 10%*A2, 10%*A3, 10%*A4 or 10 %*A5. It can be obtained that the rotation speed difference between B3 and A1, A2, A3, A4 or A5 is greater than 10%*B3, and respectively greater than 10%*A1, 10%*A2, 10%*A3, 10%*A4 or 10%*A5.

[0058] For example, Table 1 can be summarized according to FIG. 3. Among all step rotation speeds corresponding to the dewatering rotation speeds of the upper drum and the lower drum, the rotation speed difference between any step rotation speed of the upper drum and any step rotation speed of the lower drum meets the set condition.

Table 1

upper drum	B1	B2	B3		
dewaterin g rotation speed	430	650	850		
lower drum	A1	A2	A3	A4	A5
dewaterin g rotation speed	370	540	750	960	1120
	A1*1.1≤B1≤A2*0.9	A2*1.1≤B2≤A3*0.9	A3*1.1≤B3≤A4*0.9	B3*1.1≤A4	

[0059] Therefore, by setting dewatering curves respectively corresponding to the two drums and controlling the rotation speed difference between any step rotation speed in all dewatering rotation speeds of one drum and any step rotation speed in all dewatering rotation speeds of the other drum to meet the set condition, the two drums can realize simultaneous dewatering, and thus the dewatering time is saved on and user's complaint caused by the dewatering delay is avoided. Further, by controlling the rotation speed difference between any step rotation speed in all dewatering rotation speeds of one drum and any step rotation speed in all dewatering rotation speeds of the other drum to meet the set condition, the beat vibration can be avoided, thereby improving the user experience.

[0060] In the control method for the laundry treatment apparatus in embodiments of the present disclosure, by defining that the rotation speed difference between each first step rotation speed in the first operation curve corresponding to the first laundry treatment module and any second step rotation speed in the second operation curve corresponding to the second laundry treatment module meets the set condition, the two laundry treatment modules can realize simultaneous running, thereby saving the running time of the user's laundry program. Further, by controlling the rotation speed difference between any step rotation speed in all dewatering rotation speeds of one laundry treatment module and any step rotation speed in all dewatering rotation speeds of the other laundry treatment module to meet the set condition, the beat vibration can be avoided, thereby improving the user experience.

[0061] To realize the embodiment described above, the present disclosure further proposes a control device of a laundry treatment apparatus.

[0062] FIG. 5 is a schematic diagram showing the structure of a control device of a laundry treatment apparatus according to Embodiment 3 of the present disclosure.

[0063] As shown in FIG. 5, the control device of the laundry treatment apparatus includes a control module 110.

[0064] Among them, the control module 110 is configured to control a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run. The step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

[0065] Further, in a possible implementation of the embodiment of the present disclosure, referring to FIG. 6, based on the embodiment shown in FIG. 5, the control module 110 includes a first control unit 111 and a second control unit 112.

[0066] The first control unit 111 is configured to control the first laundry treatment module to run according to a first operation curve.

[0067] The second control unit 112 is configured to control the second laundry treatment module to run according to a second operation curve.

[0068] The rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

[0069] As a possible implementation, the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

[0070] As a possible implementation, the set condition includes that: the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio; optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first step rotation speed and a respective second step rotation speed with a set ratio.

[0071] As a possible implementation, the set ratio ranges from 5% to 20%.

[0072] As a possible implementation, the set ratio ranges from 9% to 11%.

[0073] It should be noted that the foregoing description on embodiments of the control method for the laundry treatment apparatus is also applicable to the control device of the laundry treatment apparatus in this embodiment, which is not repeated.

[0074] According to the control device of the laundry treatment apparatus in embodiments of the present disclosure, a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus is controlled

to run, and step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference. Therefore, by controlling the first laundry treatment module and the second laundry treatment module of the laundry treatment apparatus to run simultaneously, the running time of the user's laundry program can be saved on. Further, by controlling step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment to have a rotation speed difference, the beat vibration generated during the simultaneous operation of the first laundry treatment module and the second laundry treatment module can be avoided, thereby avoiding the shaking of the laundry treatment apparatus and improving the user experience.

[0075] To realize the embodiment as described above, the present disclosure further proposes a laundry treatment apparatus. The laundry treatment apparatus includes a first laundry treatment module, a second laundry treatment module, and control units connected to the first laundry treatment module and the second laundry treatment module. The control units include a memory, a processor, and a computer program stored in the memory and executable by the processor. When the processor executes the computer program, a control method for a laundry treatment apparatus proposed in foregoing embodiments of the present disclosure is implemented.

[0076] It should be noted that the foregoing description on embodiments of the control method for the laundry treatment apparatus is also applicable to the laundry treatment apparatus in this embodiment, which is not repeated.

[0077] To realize the embodiment described above, the present disclosure still further proposes a non-transitory computer-readable storage medium, having stored therein a computer program that, when executed by a processor, performs a control method for a laundry treatment apparatus proposed in foregoing embodiments of the present disclosure.

[0078] It should be noted that the foregoing description on embodiments of the control method for the laundry treatment apparatus is also applicable to the non-transitory computer-readable storage medium in this embodiment, which is not repeated.

[0079] In the description of this specification, reference to terms "an embodiment", "some embodiments", "one embodiment", "an example", "an illustrative example", "some examples" or the like means that a particular feature, structure, material or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the illustrative representations of the terms are not necessarily directed to the same embodiment or example in this specification. Moreover, the specific features, structures, materials or characteristics as described can be combined in any one or more embodiments or examples in a suitable manner. In addition, those skilled persons in the art can combine different embodiments or examples or the features of the different embodiments or examples described in this specification without contradicting each other.

[0080] In addition, the terms "first" and "second" are only used for descriptive purposes and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features defined with "first" and "second" may explicitly or implicitly include at least one of the features. In the description of the present disclosure, unless specifically defined otherwise, "a plurality of" means at least two, such as two, three or the like.

[0081] The description to any process or method in the flow chart or described in other ways can be understood as a module, a segment or a part of codes of one or more executable instructions for implementing customized logic functions or steps of a process. The scope of the preferred embodiments of the present disclosure includes additional implementations, which may not be in the order shown or discussed, including implementing functions in a substantially simultaneous manner or in a reverse order according to the functions involved. This should be understood by those skilled in the art to which the embodiments of the present disclosure belong.

[0082] The logic and/or steps represented in the flow chart or described herein in other ways, for example, can be regarded as a sequence table of executable instructions for realizing logic functions, and can be implemented in any computer-readable medium, for use by an instruction execution system, equipment or device (such as a computer-based system, a system including a processor, or other systems that can fetch instructions from the instruction execution system, equipment or device and execute the instructions), or for use by a combination of the instruction execution system, equipment or device. In this specification, the "computer-readable medium" can be any device that can contain, store, communicate, propagate, or transmit a program for use by an instruction execution system, equipment or device or for use by a combination of the instruction execution system, equipment or device. More specific examples (non-exhaustive list) of the computer-readable medium include the following: an electrical connection (electronic device) with one or more wirings, a portable computer disk case (magnetic device), Random access memory (RAM), Read-only memory (ROM), erasable and editable read-only memory (EPROM or flash memory), a fiber optic device, and portable compact disk read-only memory (CDROM). In addition, the computer-readable medium may even be a paper or other suitable medium on which the program can be printed, because the program can be obtained electronically, for example, by optically scanning the paper or other medium, and then editing, interpreting, or other suitable processing ways if necessary, which is then stored in the computer memory.

[0083] It should be understood that each part of the present disclosure can be implemented by hardware, software,

firmware, or a combination thereof. In the above embodiments, multiple steps or methods can be implemented by software or firmware stored in a memory and executed by a suitable instruction execution system. For example, if it is implemented by hardware as in another embodiment, it can be implemented by any one or a combination of the following technologies known in the art: discrete logic circuits with a logic gate circuit realizing logic functions for data signals, specific integrated circuits with suitable combined logic gate circuits, programmable gate array (PGA), field programmable gate array (FPGA), or the like.

[0084] An ordinary skilled person in the art can understand that all or part of the steps carried in the method of the foregoing embodiments can be implemented by a program which instructs relevant hardware to implement. The program can be stored in a computer-readable storage medium. The program when executed performs one of the steps of the method embodiments or a combination thereof.

[0085] In addition, the functional units in the various embodiments of the present disclosure may be integrated into one processing module, or each unit may physically exist alone or two or more units may be integrated into one module. The integrated module mentioned as above can be implemented in the form of hardware or in the form of software functional module. If the integrated module is implemented in the form of a software function module and is sold or used as an independent product, it can also be stored in a computer readable storage medium.

[0086] The storage medium described above may be a read-only memory, a magnetic disk, an optical disk, or the like. Although the embodiments of the present disclosure have been shown and described above, it can be understood that the embodiments described above are exemplary and should not be construed as limiting the present disclosure. An ordinary skilled person in the art could make changes, modifications, substitutions, and modifications to the embodiments within the scope of the present disclosure.

Claims

1. A control method for a laundry treatment apparatus, comprising:

   controlling a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run,
   wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

2. The control method according to claim 1, wherein controlling a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run comprises:

   controlling the first laundry treatment module to run according to a first operation curve, and
   controlling the second laundry treatment module to run according to a second operation curve, wherein the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

3. The control method according to claim 2, wherein the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

4. The control method according to claim 2 or 3, wherein the set condition comprises that:

   the rotation speed difference is greater than or equal to the product of a respective first step rotation speed with a set ratio or the product of a respective second step rotation speed with a set ratio;
   optionally the rotation speed difference is greater than or equal to the product of the larger one of a respective first step rotation speed and a respective second step rotation speed with a set ratio;
   optionally the rotation speed difference is greater than or equal to the product of the smaller one of a respective first step rotation speed and a respective second step rotation speed with a set ratio.

5. The control method according to claim 4, wherein the set ratio ranges from 5% to 20%.

6. The control method according to claim 5, wherein the set ratio ranges from 9% to 11%.

7. A control device of a laundry treatment apparatus, comprising:

a control module, configured to control a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run,
wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference.

8. The control device according to claim 7, wherein the control module comprises:

a first control unit, configured to control the first laundry treatment module to run according to a first operation curve, and
a second control unit, configured to control the second laundry treatment module to run according to a second operation curve,
wherein the rotation speed difference between a first step rotation speed in the first operation curve and a second step rotation speed in the second operation curve maintained at the same moment meets a set condition.

9. The control device according to claim 8, wherein the rotation speed difference between each first step rotation speed in the first operation curve and any second step rotation speed in the second operation curve meets the set condition.

10. A laundry treatment apparatus, comprising:

a first laundry treatment module,
a second laundry treatment module, and
control units connected to the first laundry treatment module and the second laundry treatment module,
wherein the control units comprise:

a memory,
a processor, and
a computer program, stored in the memory and executable by the processor,
wherein when the processor executes the computer program, a control method for a laundry treatment apparatus according to any one of claims 1 to 6 is implemented.

11. A non-transitory computer-readable storage medium, having stored therein a computer program that, when executed by a processor, performs a control method for a laundry treatment apparatus according to any one of claims 1 to 6.

Control a first laundry treatment module and a second laundry treatment module of the laundry treatment apparatus to run, wherein step rotation speeds maintained by the first laundry treatment module and the second laundry treatment module at the same moment are controlled to have a rotation speed difference

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FIG. 1

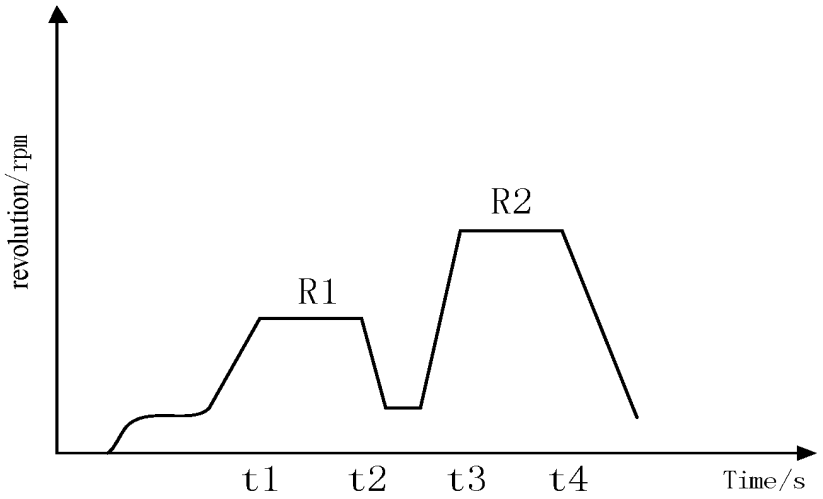

FIG. 2

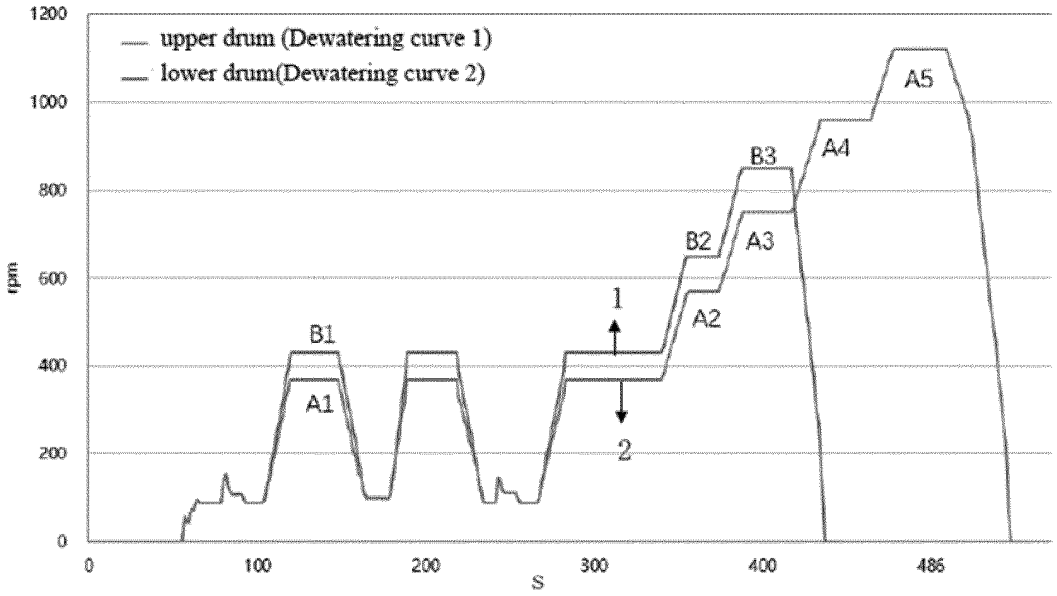

FIG. 3

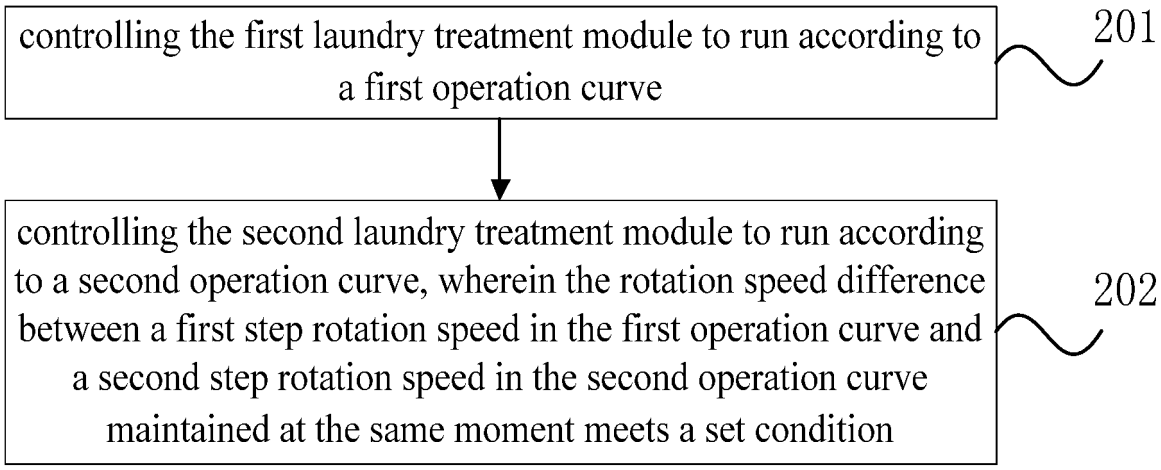

FIG. 4

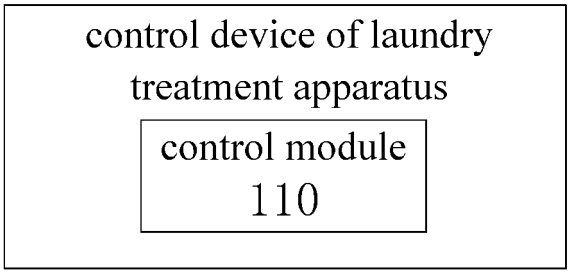

FIG. 5

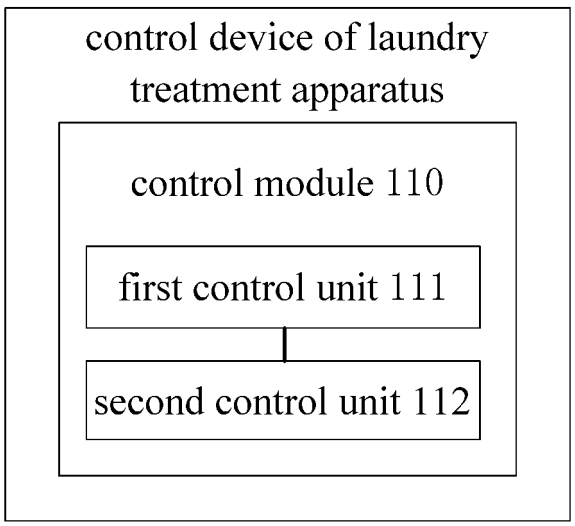

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/128034

A. CLASSIFICATION OF SUBJECT MATTER

D06F 33/30(2020.01)i; D06F 105/48(2020.01)i; D06F 31/00(2006.01)i; D06F 37/36(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; 无锡小天鹅电器有限公司, 双筒, 多筒, 洗衣机, 洗干一体机, 拍振, 抖动, 振动, 振幅, 转速, 不相同, 不同, 台阶, 转速差, double, two, multi, drum?, wash+ w machine, beat+, shak+, vibrat+, amplitude, speed, different, difference, step.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 110195311 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 03 September 2019 (2019-09-03) description, specific embodiments, figures 1-2	1-11
A	CN 110130043 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 16 August 2019 (2019-08-16) entire document	1-11
A	CN 201908220 U (NANJING LG PANDA APPLIANCES CO., LTD.) 27 July 2011 (2011-07-27) entire document	1-11
A	CN 108221268 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 29 June 2018 (2018-06-29) entire document	1-11
A	CN 104862923 A (SAMSUNG ELECTRONICS CO., LTD.) 26 August 2015 (2015-08-26) entire document	1-11

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

* Special categories of cited documents:
"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
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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
03 July 2020	**24 July 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/128034

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2018190488 A1 (SAMSUNG ELECTRONICS CO., LTD.) 18 October 2018 (2018-10-18) entire document	1-11

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/128034

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	110195311	A	03 September 2019	WO	2019161737	A1	29 August 2019
CN	110130043	A	16 August 2019	CN	110130044	A	16 August 2019
				CN	110130076	A	16 August 2019
				WO	2019154266	A1	15 August 2019
CN	201908220	U	27 July 2011		None		
CN	108221268	A	29 June 2018	EP	3564424	A1	06 November 2019
				US	2020087833	A1	19 March 2020
				CN	108221268	B	01 May 2020
				EP	3564424	A4	26 February 2020
				WO	2018113715	A1	28 June 2018
CN	104862923	A	26 August 2015	CN	104862923	B	12 October 2018
				US	10017892	B2	10 July 2018
				US	2015240404	A1	27 August 2015
				KR	20150099386	A	31 August 2015
WO	2018190488	A1	18 October 2018	US	2018291548	A1	11 October 2018
				CN	110520566	A	29 November 2019
					AU2017409625	A1	17 October 2019
				KR	20180114810	A	19 October 2018
				EP	3585931	A1	01 January 2020
					CA3059536	A1	18 October 2018
				EP	3585931A4	A4	19 February 2020
					IN201947045255	A	15 November 2019

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- NO 201911031436 **[0001]**