



(11) **EP 2 834 403 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.05.2016 Bulletin 2016/20

(21) Application number: **13723215.3**

(22) Date of filing: **22.03.2013**

(51) Int Cl.:
D06F 37/42^(2006.01) D06F 39/14^(2006.01)

(86) International application number:
PCT/IB2013/052282

(87) International publication number:
WO 2013/150410 (10.10.2013 Gazette 2013/41)

(54) **WASHING MACHINE, AND CONTROL METHOD THEREOF**

WASCHMASCHINE UND STEUERUNGSVERFAHREN DAFÜR

MACHINE À LAVER ET PROCÉDÉ DE COMMANDE DE CETTE DERNIÈRE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **01.04.2012 CN 201210104142**

(43) Date of publication of application:
11.02.2015 Bulletin 2015/07

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Description

[0001] The present invention relates to a washing machine, comprising: a washing machine main body in which a main controller is disposed; a rotatable drum disposed in the washing machine main body and used for accommodating laundry; a washing machine door, connected to a shell of the washing machine main body, and used for closing a laundry input mouth of the rotatable drum formed on the washing machine main body shell; a hook, disposed at one of the washing machine main body shell and the washing machine door; and a door lock device, disposed at the other of the washing machine main body shell and the washing machine door, and used for locking or unlocking the washing machine door in cooperation with the hook, wherein the door lock device comprises: a door lock sliding block, disposed with a clipping hole at one end thereof, and used for latching in cooperation with the hook; a resetting spring disposed on the door lock sliding block, and used for resetting the door lock sliding block to an initial state; and a first latching part and a second latching part used for latching the door lock sliding block, wherein the first latching part and the second latching part are both controlled by the washing machine main controller; after washing of the washing machine ends, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, the door lock sliding block is restored to the initial state by the action of the resetting spring, and the hook is separated from the door lock device by the action of the door lock sliding block to automatically open the washing machine door. Further, the first latching part comprises a relay component, the relay component has an electromagnet with a hollow passage, a coil wound around the electromagnet, an iron core and an iron core spring disposed on the iron core, the iron core moves in the hollow passage of the electromagnet by the action of an electromagnetic force and the iron core spring. The invention also relates to a control method of such washing machine.

[0002] Particularly the invention relates to a washing machine whose door automatically opens and a control method thereof.

[0003] Such washing machine and control method are disclosed in EP 0 588 041 A1.

[0004] A washing machine is a device in which by the action of water and detergent, in order to remove contaminants stuck to laundry such as clothes, and a quilt cover in a rotary drum, the laundry is cleaned through a series of washing procedures such as washing, cleansing, dehydration, and drying. A washing machine generally includes: a shell, forming the outer appearance, and formed with a laundry input mouth at one side; a washing machine door, mounted on the shell, and used for opening/closing the laundry input mouth; a tub, disposed in the washing machine body, and used for being filled with washing liquid; a rotary drum, mounted in the tub in a rotatable manner, and used for accommodating laundry;

and a motor, used for rotating the drum. Moreover, a locking switch device is further mounted on the shell and the door of the washing machine, and may lock the washing machine door when the washing machine door should not be opened when the washing machine works.

[0005] According to the washing machine in the prior art, laundry is input through the laundry input mouth, the washing machine door is closed, and a corresponding program such as washing, cleansing, dehydration, or drying is selected, the washing machine starts the washing machine motor or drying device according to the selected corresponding program, and the locking switch device locks the washing machine door in a working state of the washing machine, so as to prevent the washing machine door from being randomly opened. For the washing machine, after running of any working program ends, if a user does not open the washing machine door in a long time, and the laundry is taken out, the laundry easily generates bacteria and a foul smell in a closed environment, so as to require performing the washing operation again.

[0006] Aiming at the above problem, an objective of the present invention lies in that, after washing programs of a washing machine end, a washing machine door can automatically pop open, so as to prevent bacteria or a foul smell from being generated because laundered clothes are left in the washing machine for a long time.

[0007] Aiming at the above objective, the technical solution adopted in the present invention is as defined in the attached independent claims. Preferred embodiments of the invention are defined in dependent claims, the subsequent description and the attached drawing. Preferred embodiments of the inventive washing machine correspond to preferred embodiments of the inventive method and vice versa, and this even if not indicated expressly herein.

[0008] Accordingly, a technical solution provided by the invention is as follows:

[0009] A washing machine, including: a washing machine main body in which a main controller is disposed; a rotatable drum disposed in the washing machine main body and used for accommodating laundry; a washing machine door, connected to a shell of the washing machine main body, and used for closing a laundry input mouth of the rotatable drum formed on the washing machine main body shell; a hook, disposed at one of the washing machine main body shell and the washing machine door; and a door lock device, disposed at the other of the washing machine main body shell and the washing machine door, and used for locking or unlocking the washing machine door in cooperation with the hook, where the door lock device includes: a door lock sliding block, disposed with a clipping hole at one end thereof, and used for latching in cooperation with the hook; a resetting spring disposed on the door lock sliding block, and used for resetting the door lock sliding block to an initial state; and a first latching part and a second latching part used for latching the door lock sliding block, where the first latching part and the second latching part are

both controlled by the washing machine main controller; after washing of the washing machine ends, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, the door lock sliding block is restored to the initial state by the action of the resetting spring, and the hook is separated from the door lock device by the action of the door lock sliding block to automatically open the washing machine door. In addition, the first latching part includes a relay component, the relay component has an iron core, a coil wound around the iron core and an iron core spring disposed on the iron core, a groove in cooperation with the iron core is disposed on the door lock sliding block, and when the iron core is inserted into the groove, the first latching part latches the door lock sliding block.

[0010] As a preferred development of the present invention, the hook is disposed on the washing machine door, and the door lock device is disposed on the washing machine shell.

[0011] As another preferred development of the present invention, a contact end face of the hook and the door lock sliding block is a smooth curve.

[0012] As a further preferred development of the present invention, the door lock device has three states as follows: a first state is an unlocking state, where neither the first latching part nor the second latching part latches the door lock sliding block, and the washing machine door is opened; a second state is a locking state, where the first latching part latches the door lock sliding block while the second latching part does not lock the door lock sliding block, and the washing machine door is closed but is capable of being manually opened; and a third state is a deadlock state, where both the first latching part and the second latching part latch the door lock sliding block, the washing machine works and the washing machine door is deadlocked.

[0013] As even a further preferred development of the present invention, a longitudinal section of a contact end of the iron core and the door lock sliding block is approximately trapezoidal, and a longitudinal section of the groove is also approximately trapezoidal.

[0014] As yet another preferred development of the present invention, the second latching part includes a PTC heater, a double-metal reed disposed on the PTC heater and a locking piece disposed on the double-metal reed, a notch in cooperation with the locking piece is disposed on the door lock sliding block, and when the PTC heater is heated so that the double-metal reed is deformed and the locking piece is inserted into the notch, the second latching part latches the door lock sliding block.

[0015] As yet a further preferred development of the present invention, a torsional spring device is disposed on a rotating shaft of the washing machine door, and is used for applying a force popping open outward to the washing machine door after the washing machine door is unlocked.

[0016] Moreover, the present invention further provides a control method of a washing machine: after washing programs are input and the washing machine is started, the washing machine main controller controls the first latching part and the second latching part to lock the door lock sliding block; after all of the washing programs end, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, the door lock sliding block returns to the initial state by the action of the resetting spring, and the washing machine door automatically pops open.

[0017] A preferred development of the invention is as follows: After all of the washing programs end, only through a predetermined time, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, and the washing machine door automatically pops open.

[0018] Compared with the prior art, the present invention includes beneficial effects as follows: After all the washing programs end, the washing machine can automatically open the washing machine door, so that after the washing of the laundry is completed, fresh air circulates, so as to avoid bacteria and the foul smell generated by the laundry because the washing machine door is not opened for a long time, and to be free of the trouble of performing the washing operation again.

[0019] Preferred embodiments of the invention are now explained in detail with reference to the Figures of the attached drawing. The implementation manners of the several washing machines are not shown in the accompanying drawings, but can doubtless be understood by persons of ordinary skill in the art through the above description. Additionally, other washing machines not specifically described above including a washing machine without drying function, a drying machine, a washing and drying machine, and other household washing machines fall within the protection scope of the present invention. In the drawing,

FIG. 1 is a three-dimensional diagram of a washing machine;

FIG. 2 shows a door lock device in an unlocking state;

FIG. 3 shows the door lock device of FIG. 2 in a locking state; and

FIG. 4 shows the door lock device of FIG. 2 in a deadlock state.

[0020] As shown in FIG. 1, a washing machine 100 in an embodiment of the present invention includes: a washing machine main body 10 in which a main controller 13 is disposed; a rotatable drum 60 disposed in the washing machine main body 10 and used for accommodating laundry; a washing machine door 20, connected to a shell 11 of the washing machine main body, and used for closing a laundry input mouth 61 of the rotatable drum 60

formed on the washing machine main body shell 11; a hook 21, disposed at one of the washing machine main body shell 11 and the washing machine door 20; and a door lock device 30, disposed at the other of the washing machine main body shell 11 and the washing machine door 20, and used for locking or unlocking the washing machine door 20 in cooperation with the hook 21, where the door lock device 30 includes: a door lock sliding block 31, disposed with a clipping hole 32 at one end thereof, and used for latching in cooperation with the hook 21; a resetting spring 35 disposed on the door lock sliding block 31, and used for resetting the door lock sliding block 31 to an initial state; and a first latching part 40 and a second latching part 50 used for latching the door lock sliding block 31, where the first latching part 40 and the second latching part 50 are both controlled by the washing machine main controller 13; after washing of the washing machine ends, the washing machine main controller 13 controls the first latching part 40 and the second latching part 50 to unlock the door lock sliding block 31, the door lock sliding block 31 is restored to the initial state by the action of the resetting spring 35, and the hook 21 is separated from the door lock device 30 by the action of the door lock sliding block 31 to automatically open the washing machine door 20.

[0021] The washing machine main body 10 includes a shell 11, and the shell 11 includes a top face 11a, a bottom face 11b, two side faces 11c, a back face 11d, and a front face 11e. In most cases, all the faces of the shell 11 are made of a conductive metal material, or all other faces except the top face 11 a are made of a metal material. Except that the bottom face 11b and the back face 11 d are uneasily contacted, all other faces are possibly contacted by a user. An operation panel area 12a, a detergent box area 12b, and a door and handle area 12c are disposed on the front face 11e of the washing machine main body shell 11, and the user generally performs an operation on these areas according to requirements. Different styles or types of washing machines differ from each other in locations and settings of the operation areas. For example, operation panels of some washing machines are located on the top face, the door and the handle for a pulsator washing machine are generally located on the top face, and some washing machines have no detergent box. Additionally, shells of some washing machines are not of a regular hexahedron, for example a smoothly transitional curve is formed between the top face and the front face, and may further be of some other irregular three-dimensional structures.

[0022] As shown in FIG. 1, the operation panel area 12a in the front face 11e of the washing machine main body shell 11 is disposed with a washing machine starting key 70 used for starting the washing machine to work, a program selection key 80 used for selecting a washing machine working program and a display panel 90 used for showing a washing machine working state. The detergent box area 12b in the front face 11e is used for storing some washing articles such as washing powder

or washing liquid. The door and handle area 12c in the front face 11e has a laundry input mouth 61, and meanwhile is mounted with the washing machine door 20 used for closing the laundry input mouth 61. A hook 21 is disposed on the washing machine door 20, and correspondingly a door lock device 30 used for locking or unlocking the hook 21 is mounted on the washing machine shell 11, so that the washing machine door 20 may be closed and opened. In another implementation manner, the hook 21 is disposed on the washing machine shell 11, while the door lock device 30 is mounted on the washing machine door 20, so the effect of locking or unlocking the washing machine door 20 may be achieved likewise.

[0023] As shown in FIG. 2, the door lock device 30 includes: A door lock sliding block 31, disposed with a clipping hole 32 at one end thereof, and used for latching in cooperation with the hook 21; a resetting spring 35 disposed on the door lock sliding block 31, and used for resetting the door lock sliding block 31 to an initial state; and a first latching part 40 and a second latching part 50 used for latching the door lock sliding block 31. A groove 33 used for accepting the first latching part 40 and a notch used for accepting the second latching part 50 are separately disposed on the door lock sliding block 31. One end of the resetting spring 35 is connected to the door lock sliding block 31, and the other end is connected to the washing machine shell 11. The first latching part 40 includes a relay component, the relay component has an electromagnet 42 with a hollow passage, a coil 43 wound around the electromagnet 42, an iron core 41 and an iron core spring 44 disposed on the iron core, and the iron core 41 moves in the hollow passage of the electromagnet by the action of an electromagnetic force and the iron core spring 44. When the iron core 41 is inserted into the groove 33, the first latching part 40 latches the door lock sliding block 31. The second latching part 50 includes a PTC heater 51, a double-metal reed 52 disposed on the PTC heater 51 and a locking piece 53 disposed on the double-metal reed 52. When the PTC heater 51 is heated so that the double-metal reed 52 is deformed and the locking piece 53 is inserted into the notch 34, the second latching part 50 latches the door lock sliding block 31.

[0024] The door lock device 30 includes three states as follows: a first state is an unlocking state, where as shown in FIG. 2, the iron core 41 abuts against the door lock sliding block 31 and is not inserted into the groove 33, the iron core spring 44 is in a shrinkage state, the PTC heater is not power-on, the double-metal reed 52 is not deformed, and the locking piece 53 is not inserted into the notch 34, so neither the first latching part 40 nor the second latching part 50 latches the door lock sliding block 31, and at this time the washing machine door 20 is opened.

[0025] A second state is a locking state, where as shown in FIG. 3, when the washing machine door 20 is closed, the hook 21 is inserted into the clipping hole 32 and interacts with the door lock sliding block 31, so the door lock sliding block 31 moves and compresses the

resetting spring 35 to shrink the resetting spring 35; as the door lock sliding block 31 moves, the iron core 41 is slowly inserted into the groove 33, the iron core spring 44 is restored to the natural state, the iron core 41 is inserted into the groove 33, and at this time the first latching part 40 latches the door lock sliding block 31 while the second latching part 50 does not lock the door lock sliding block 31, the washing machine door 20 is closed but is not deadlock, and the user may still open the washing machine door 20; a longitudinal section of a contact end of the iron core 41 and the door lock sliding block 31 is approximately trapezoidal, and a longitudinal section of the groove 33 is also approximately trapezoidal; in such design, in the state, when the washing machine door is opened with an external force, the iron core 41 is very easily separated from the groove 33, so that the washing machine door may be opened.

[0026] A third state is a deadlock state, where as shown in FIG. 4, in a case of the second state, when the washing machine works and the washing machine main controller 13 controls the second latching part 50 to work, the PTC heater is heated so that the double-metal reed 52 is deformed, the locking piece 53 disposed on the double-metal reed 52 is inserted into the notch 34 accordingly, and at this time, both the first latching part 40 and the second latching part 50 latch the door lock sliding block 31, the washing machine works and the washing machine door is deadlock. When all the washing programs of the washing machine end, the washing machine main controller 13 controls the first latching part 40 and the second latching part 50 to unlock the door lock sliding block 31, the iron core 41 is separated from the groove 33 by the action of an electromagnetic force, the locking piece 53 slowly quits the notch 34 as the double-metal reed 52 is restored to the original state, the door lock sliding block 31 returns to the initial state by the action of the resetting spring 35, and the washing machine door 20 automatically pops open. A contact end face of the hook 21 and the door lock sliding block 31 is a smooth curve, and in the procedure that the washing machine door 20 automatically pops open, the hook 21 is smoothly separated from the clipping hole 32 under the pushing of the door lock sliding block 31, so that the washing machine door smoothly pops open. In order that the washing machine door 20 automatically pops open with a good effect, in another implementation manner, a torsional spring device is disposed on the rotating shaft 22 of the washing machine door, and is used for applying a force popping open outward to the washing machine door 20 after the washing machine door 20 is unlocked.

[0027] In a novel control method of the washing machine, after washing programs are input and the washing machine is started, the washing machine main controller 13 controls the first latching part 40 and the second latching part 50 to lock the door lock sliding block 31; after all of the washing programs end, the washing machine main controller 13 controls the first latching part 40 and the second latching part 50 to unlock the door lock sliding

block 31, the door lock sliding block 31 returns to the initial state by the action of the resetting spring 35, and the washing machine door 20 automatically pops open. However, in order that the washing machine door is opened after the temperature in the washing machine rotatable drum 60 is reduced, the washing machine main controller 13 may control the first latching part 40 and the second latching part 50 to unlock the door lock sliding block 31 in a predetermined time, generally one minute, and at this time the washing machine door 20 automatically pops open.

[0028] Various specific embodiments described in the foregoing and shown in accompanying drawings are only used for illustrating the present invention, and are not entirety of the present invention. Within the scope of the basic technical thought of the present invention, any types of modifications for the present invention made by persons ordinarily skilled in the art fall within the scope of the present invention.

LIST OF REFERENCE NUMERALS

[0029]

25	100	washing machine
	10	washing machine main body
	11	washing machine shell
	11a	washing machine shell top face
	11b	washing machine shell bottom face
30	11c	washing machine shell side face
	11d	washing machine shell back face
	11e	washing machine shell front face
	12a	operation panel area-12a
	12b	detergent box area
35	12c	door and handle area
	13	main controller
	20	washing machine door
	21	hook
	22	door rotating shaft
40	30	door lock device
	31	sliding block
	32	clipping hole
	33	groove
	34	notch
45	35	resetting spring
	40	first latching part
	41	iron core
	42	electromagnet
	43	coil
50	44	iron core spring
	50	second latching part,
	51	PTC heater
	52	double-metal reed
	53	locking piece
55	60	rotatable drum
	61	laundry input mouth
	70	program selection key
	80	display panel

Claims

1. A washing machine (100), comprising: a washing machine main body (10) in which a main controller (13) is disposed; a rotatable drum (60) disposed in the washing machine main body (10) and used for accommodating laundry; a washing machine door (20), connected to a shell (11) of the washing machine main body (10), and used for closing a laundry input mouth (61) of the rotatable drum (60) formed on the washing machine main body shell (11); a hook (21), disposed at one of the washing machine main body shell (11) and the washing machine door (20); and a door lock device (30), disposed at the other of the washing machine main body shell (11) and the washing machine door (20), and used for locking or unlocking the washing machine door (20) in cooperation with the hook (21), wherein the door lock device (30) comprises:

a door lock sliding block (31), disposed with a clipping hole (32) at one end thereof, and used for latching in cooperation with the hook (21); a resetting spring (35) disposed on the door lock sliding block (31), and used for resetting the door lock sliding block (31) to an initial state; and a first latching part (40) and a second latching part (50) used for latching the door lock sliding block (31), wherein the first latching part (40) and the second latching part (50) are both controlled by the washing machine main controller (13); after washing of the washing machine ends, the washing machine main controller (13) controls the first latching part (40) and the second latching part (50) to unlock the door lock sliding block (31), the door lock sliding block (31) is restored to the initial state by the action of the resetting spring (35), and the hook (21) is separated from the door lock device (30) by the action of the door lock sliding block (31) to automatically open the washing machine door (20);

wherein the first latching part (40) comprises a relay component, the relay component has an electromagnet (42) with a hollow passage, a coil (43) wound around the electromagnet (42), an iron core (41) and an iron core spring (44) disposed on the iron core (41), the iron core (41) moves in the hollow passage of the electromagnet (42) by the action of an electromagnetic force and the iron core spring (41) **characterized in that** a groove (33) in cooperation with the iron core (41) is disposed on the door lock sliding block (31), and when the iron core (41) is inserted into the groove (33), the first latching part (40) latches the door lock sliding block (31).

2. The washing machine (100) according to claim 1, **characterized in that** the hook (21) is disposed on

the washing machine door (20), and the door lock device (30) is disposed on the washing machine shell (11).

3. The washing machine (100) according to claim 1 **characterized in that** an end face of the hook (21) which contacts the door lock sliding block (31) is smoothly curved.
4. The washing machine (100) according to claim 1, **characterized in that** the door lock device (30) has three states as follows: a first state is an unlocking state, wherein neither the first latching part (40) nor the second latching part (50) latches the door lock sliding block (30), and the washing machine door is opened; a second state is a locking state, wherein the first latching part (40) latches the door lock sliding block (30) while the second latching part (50) does not lock the door lock sliding block (30), and the washing machine door is closed but is capable of being manually opened; and a third state is a deadlock state, wherein both the first latching part (40) and the second latching part (50) latch the door lock sliding block (30), the washing machine works and the washing machine door is deadlocked.
5. The washing machine (100) according to claim 1, **characterized in that** a longitudinal section of a contact end of the iron core (41) and the door lock sliding block (31) is approximately trapezoidal, and a longitudinal section of the groove (33) is also approximately trapezoidal.
6. The washing machine (100) according to claim 1, **characterized in that** the second latching part (50) comprises a PTC heater (51), a double-metal reed (52) disposed on the PTC heater (51) and a locking piece (53) disposed on the double-metal reed (52), a notch (34) in cooperation with the locking piece (53) is disposed on the door lock sliding block (31), and when the PTC heater (51) is heated so that the double-metal reed (52) is deformed and the locking piece (53) is inserted into the notch (34), the second latching part (50) latches the door lock sliding block (30).
7. The washing machine (100) according to any one of above claims, **characterized in that** a torsional spring device is disposed on a rotating shaft (22) of the washing machine door, and is used for applying a force popping open outward to the washing machine door (20) after the washing machine door (20) is unlocked.
8. A control method for the washing machine according to claim 1, **characterized in that** after washing programs are input and the washing machine is started, the washing machine main controller controls the

first latching part and the second latching part to lock the door lock sliding block; after all of the washing programs end, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, the door lock sliding block returns to the initial state by the action of the resetting spring, and the washing machine door automatically pops open.

9. A control method according to claim 8 **characterized in that**, after all of the washing programs end, only through a predetermined time, the washing machine main controller controls the first latching part and the second latching part to unlock the door lock sliding block, and the washing machine door automatically pops open.

Patentansprüche

1. Waschmaschine (100), die Folgendes umfasst: einen Waschmaschinenhauptteil (10), in dem eine Hauptsteuerung (13) angeordnet ist, eine drehbare Trommel (60), die in dem Waschmaschinenhauptteil (10) angeordnet ist und zum Aufnehmen von Wäsche benutzt wird, eine Waschmaschinentür (20), die mit einem Gehäuse (11) des Waschmaschinenhauptteils (10) verbunden ist und zum Schließen einer an dem Waschmaschinenhauptteilgehäuse (11) ausgebildeten Wäscheeinlegeöffnung (61) der drehbaren Trommel (60) benutzt wird, einen Haken (21), der an dem Waschmaschinenhauptteilgehäuse (11) oder der Waschmaschinentür (20) angeordnet ist, und eine Türverriegelungsvorrichtung (30), die an dem jeweils anderen Bestandteil, d.h. der Waschmaschinentür (20) oder dem Waschmaschinenhauptteilgehäuse (11), angeordnet ist und zusammen mit dem Haken (21) zum Verriegeln oder Entriegeln der Waschmaschinentür (20) benutzt wird, wobei die Türverriegelungsvorrichtung (30) Folgendes umfasst:

einen Türverriegelungskulissenstein (31), der mit einem Einhakloch (32) an einem Ende versehen ist und zusammen mit dem Haken (21) zum Einrasten benutzt wird,

eine Rückstellfeder (35), die an dem Türverriegelungskulissenstein (31) angeordnet ist und zum Rückstellen des Türverriegelungskulissensteins (31) in einen Ausgangszustand benutzt wird, und

ein erstes Einrastteil (40) und ein zweites Einrastteil (50), die zum Einrasten in den Türverriegelungskulissenstein (31) benutzt werden, wobei sowohl das erste Einrastteil (40) als auch das zweite Einrastteil (50) von der Waschmaschinenhauptsteuerung (13) gesteuert wird, nach Beenden des Waschgangs der Waschma-

schine die Waschmaschinenhauptsteuerung (13) das erste Einrastteil (40) und das zweite Einrastteil (50) so steuert, dass der Türverriegelungskulissenstein (31) entriegelt wird, der Türverriegelungskulissenstein (31) durch die Einwirkung der Rückstellfeder (35) in den Ausgangszustand zurückgebracht und der Haken (21) durch die Einwirkung des Türverriegelungskulissensteins (31) von der Türverriegelungsvorrichtung (30) getrennt wird, so dass sich die Waschmaschinentür (20) automatisch öffnet, wobei das erste Einrastteil (40) Folgendes umfasst: eine Relaiskomponente, die einen Elektromagneten (42) mit einem hohlen Durchgang aufweist, eine um den Elektromagneten (42) gewickelte Spule (43), einen Eisenkern (41) und eine an dem Eisenkern (41) angeordnete Eisenkernfeder (44), wobei sich der Eisenkern (41) durch die Einwirkung einer elektromagnetischen Kraft und der Eisenkernfeder (41) in dem hohlen Durchgang des Elektromagneten (42) bewegt, **dadurch gekennzeichnet, dass** eine mit dem Eisenkern (41) zusammenwirkende Nut (33) an dem Türverriegelungskulissenstein (31) angeordnet ist und das erste Einrastteil (40), wenn der Eisenkern (41) in die Nut (33) eingeführt ist, in den Türverriegelungskulissenstein (31) einrastet.

2. Waschmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Haken (21) an der Waschmaschinentür (20) und die Türverriegelungsvorrichtung (30) an dem Waschmaschinengehäuse (11) angeordnet ist.

3. Waschmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Stirnfläche des Hakens (21), die den Türverriegelungskulissenstein (31) berührt, sanft gekrümmt ist.

4. Waschmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Türverriegelungsvorrichtung (30) die folgenden drei Zustände aufweist: einen ersten Zustand, bei dem es sich um einen Entriegelungszustand handelt, bei dem weder das erste Einrastteil (40) noch das zweite Einrastteil (50) in den Türverriegelungskulissenstein (30) einrastet und die Waschmaschinentür geöffnet ist, einen zweiten Zustand, bei dem es sich um einen Verriegelungszustand handelt, bei dem das erste Einrastteil (40) in den Türverriegelungskulissenstein (30) einrastet, während das zweite Einrastteil (50) den Türverriegelungskulissenstein (30) nicht verriegelt und die Waschmaschinentür geschlossen ist, sich aber manuell öffnen lässt, und einen dritten Zustand, bei dem es sich um einen Blockierzustand handelt, bei dem sowohl das erste Einrastteil (40) als auch das zweite Einrastteil (50) in den Türverriegelungs-

kulissenstein (30) einrastet, die Waschmaschine arbeitet und die Waschmaschinentür blockiert ist.

5. Waschmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Längsschnitt eines Kontaktendes des Eisenkerns (41) und des Türverriegelungskulissensteins (31) in etwa trapezförmig ist und ein Längsschnitt der Nut (33) ebenfalls in etwa trapezförmig ist.
6. Waschmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** das zweite Einrastteil (50) eine PTC-Heizvorrichtung (51), eine an der PTC-Heizvorrichtung (51) angeordnete Bimetallzunge (52) und ein an der Bimetallzunge (52) angeordnetes Verriegelungsstück (53) umfasst, eine mit dem Verriegelungsstück (53) zusammenwirkende Kerbe (34) an dem Türverriegelungskulissenstein (31) angeordnet ist und, wenn sich die PTC-Heizvorrichtung (51) erhitzt, so dass sich die Bimetallzunge (52) verformt und das Verriegelungsstück (53) in die Kerbe (34) eingeführt wird, das zweite Einrastteil (50) in den Türverriegelungskulissenstein (30) einrastet.
7. Waschmaschine (100) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Drehfedervorrichtung an einer Rotationsachse (22) der Waschmaschinentür angeordnet ist und zum Anlegen einer Kraft benutzt wird, die die Waschmaschinentür (20), nachdem sie entriegelt wurde, nach außen aufspringen lässt.
8. Steuerverfahren für die Waschmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** nach dem Eingeben von Waschprogrammen und dem Starten der Waschmaschine die Waschmaschinenhauptsteuerung das erste und das zweite Einrastteil so steuert, dass der Türverriegelungskulissenstein verriegelt wird, und nach dem Beenden aller Waschprogramme die Waschmaschinenhauptsteuerung das erste und das zweite Einrastteil so steuert, dass der Türverriegelungskulissenstein entriegelt wird, der Türverriegelungskulissenstein durch die Einwirkung der Rückstellfeder in den Ausgangszustand zurückkehrt und die Waschmaschinentür automatisch aufspringt.
9. Steuerverfahren nach Anspruch 8, **dadurch gekennzeichnet, dass** nach dem Beenden aller Waschprogramme die Waschmaschinenhauptsteuerung das erste und das zweite Einrastteil nur für einen vorgegebenen Zeitraum so steuert, dass der Türverriegelungskulissenstein entriegelt wird und die Waschmaschinentür automatisch aufspringt.

Revendications

1. Machine à laver (100), comprenant : un corps principal (10) de machine à laver dans lequel est disposé un dispositif de commande principal (13) ; un tambour tournant (60) disposé dans le corps principal (10) de machine à laver et utilisé pour recevoir du linge ; une porte (20) de machine à laver, reliée à une coque (11) du corps principal (10) de machine à laver et utilisée pour fermer une ouverture (61) d'introduction du linge du tambour tournant (60), constituée sur la coque (11) du corps principal de machine à laver ; un crochet (21) disposé soit sur la coque (11) du corps principal de machine à laver, soit sur la porte (20) de machine à laver ; et un dispositif de verrouillage de porte (30), disposé sur l'autre parmi la coque (11) du corps principal de machine à laver et la porte (20) de machine à laver, et utilisé pour verrouiller ou déverrouiller la porte (20) de machine à laver en coopération avec le crochet (21), dans laquelle le dispositif de verrouillage de porte (30) comprend :

un bloc coulissant de verrouillage de porte (31), pourvu d'un trou d'encliquetage (32) à une de ses extrémités, et utilisé pour verrouiller en coopération avec le crochet (21) ;

un ressort de réarmement (35) disposé sur le bloc coulissant de verrouillage de porte (31) et utilisé pour ramener le bloc coulissant de verrouillage de porte (31) dans un état initial ; et

une première pièce de verrouillage (40) et une deuxième pièce de verrouillage (50) utilisées pour verrouiller le bloc coulissant de verrouillage de porte (31), la première pièce de verrouillage (40) et la deuxième pièce de verrouillage (50) étant toutes deux commandées par le dispositif de commande principal (13) de machine à laver ; après que le lavage de la machine à laver se termine, le dispositif de commande principal (13) de machine à laver commande la première pièce de verrouillage (40) et la deuxième pièce de verrouillage (50) pour déverrouiller le bloc coulissant de verrouillage de porte (31), le bloc coulissant de verrouillage de porte (31) est ramené à l'état initial sous l'action du ressort de réarmement (35), et le crochet (21) est séparé du dispositif de verrouillage de porte (30) sous l'action du bloc coulissant de verrouillage de porte (31) pour ouvrir automatiquement la porte (20) de machine à laver ;

dans laquelle la première pièce de verrouillage (40) comprend un élément de relais, l'élément de relais comporte un électroaimant (42) avec un passage creux, une bobine (43) enroulée autour de l'électroaimant (42), un noyau en fer (41) et un ressort (44) de noyau en fer disposé sur le noyau en fer (41), le noyau en fer (41) se

- déplace dans le passage creux de l'électroaimant (42) sous l'action de la force électromagnétique et du ressort (44) de noyau en fer, **caractérisée en ce qu'**une rainure (33) coopérant avec le noyau en fer (41) est disposée sur le bloc coulissant de verrouillage de porte (31), et quand le noyau en fer (41) est engagé dans la rainure (33), la première pièce de verrouillage (40) verrouille le bloc coulissant de verrouillage de porte (31).
2. Machine à laver (100) selon la revendication 1, **caractérisée en ce que** le crochet (21) est disposé sur la porte (20) de machine à laver, et le dispositif de verrouillage de porte (30) est disposé sur la coque (11) de machine à laver.
 3. Machine à laver (100) selon la revendication 1, **caractérisée en ce qu'**une face terminale du crochet (21) qui entre en contact avec le bloc coulissant de verrouillage de porte (31) est légèrement incurvée.
 4. Machine à laver (100) selon la revendication 1, **caractérisée en ce que** le dispositif de verrouillage de porte (30) a les trois états suivants : un premier état est un état de déverrouillage, dans lequel ni la première pièce de verrouillage (40), ni la deuxième pièce de verrouillage (50) ne verrouille le bloc coulissant de verrouillage de porte (30), et la porte de la machine à laver est ouverte ; un deuxième état est un état de verrouillage, dans lequel la première pièce de verrouillage (40) verrouille le bloc coulissant de verrouillage de porte (30) tandis que la deuxième pièce de verrouillage (50) ne verrouille pas le bloc coulissant de verrouillage de porte (30), et la porte de la machine à laver est fermée mais peut être manuellement ouverte ; et un troisième état est un état de blocage, dans lequel à la fois la première pièce de verrouillage (40) et la deuxième pièce de verrouillage (50) verrouillent le bloc coulissant de verrouillage de porte (30), la machine à laver fonctionne et la porte de la machine à laver est bloquée.
 5. Machine à laver (100) selon la revendication 1, **caractérisée en ce qu'**une section longitudinale d'une extrémité de contact du noyau en fer (41) et du bloc coulissant de verrouillage de porte (31) est approximativement trapézoïdale, et une section longitudinale de la rainure (33) est aussi approximativement trapézoïdale.
 6. Machine à laver (100) selon la revendication 1, **caractérisée en ce que** la deuxième pièce de verrouillage (50) comprend un élément chauffant PTC (51), un double relais Reed en métal disposé sur l'élément chauffant PTC (51) et une pièce de verrouillage (53) disposée sur le double relais Reed en métal (52), une encoche (34) coopérant avec la pièce de verrouillage (53) est disposée sur le bloc coulissant de verrouillage de porte (31), et lorsque l'élément chauffant PTC (51) est chauffé de sorte que le double relais Reed en métal soit déformé et que la pièce de verrouillage (53) soit engagée dans l'encoche (34), la deuxième pièce de verrouillage (50) verrouille le bloc coulissant de verrouillage de porte (30).
 7. Machine à laver (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un dispositif à ressort de torsion est disposé sur un arbre tournant (22) de la porte de la machine à laver, et est utilisé pour appliquer une force d'ouverture déclenchée vers l'extérieur sur la porte (20) de machine à laver après que la porte (20) de machine à laver est déverrouillée.
 8. Procédé de commande pour la machine à laver selon la revendication 1, **caractérisé en ce qu'**après que les programmes de lavage sont entrés et que la machine à laver a démarré, le dispositif de commande principal de la machine à laver commande la première pièce de verrouillage et la deuxième pièce de verrouillage pour verrouiller le bloc coulissant de verrouillage de porte ; qu'après que tous les programmes de lavage sont terminés, le dispositif de commande principal de la machine à laver commande la première pièce de verrouillage et la deuxième pièce de verrouillage pour déverrouiller le bloc coulissant de verrouillage de porte, le bloc coulissant de verrouillage de porte revient à l'état initial sous l'action du ressort de réarmement, et l'ouverture de la porte de la machine à laver est automatiquement déclenchée.
 9. Procédé de commande selon la revendication 8, **caractérisé en ce qu'**après que tous les programmes de lavage sont terminés, seulement pendant un temps prédéterminé, le dispositif de commande principal de la machine à laver commande la première pièce de verrouillage et la deuxième pièce de verrouillage pour déverrouiller le bloc coulissant de verrouillage de porte, et l'ouverture de la porte de la machine à laver est automatiquement déclenchée.

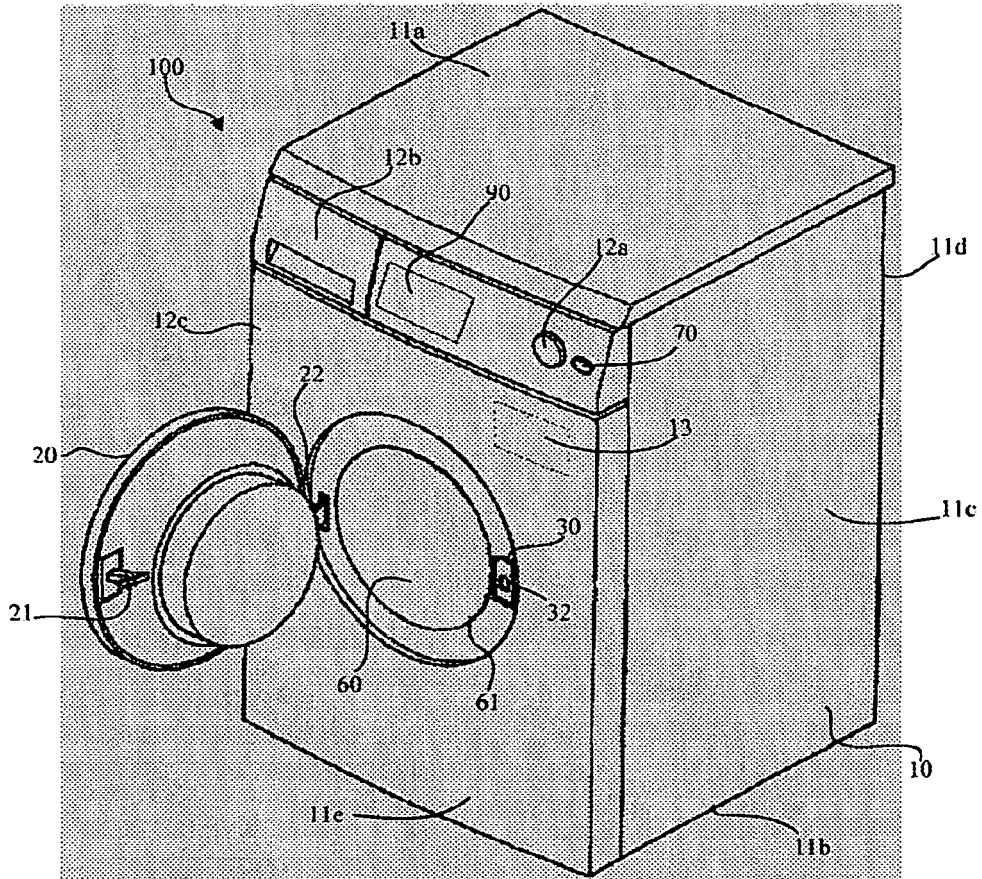


FIG. 1

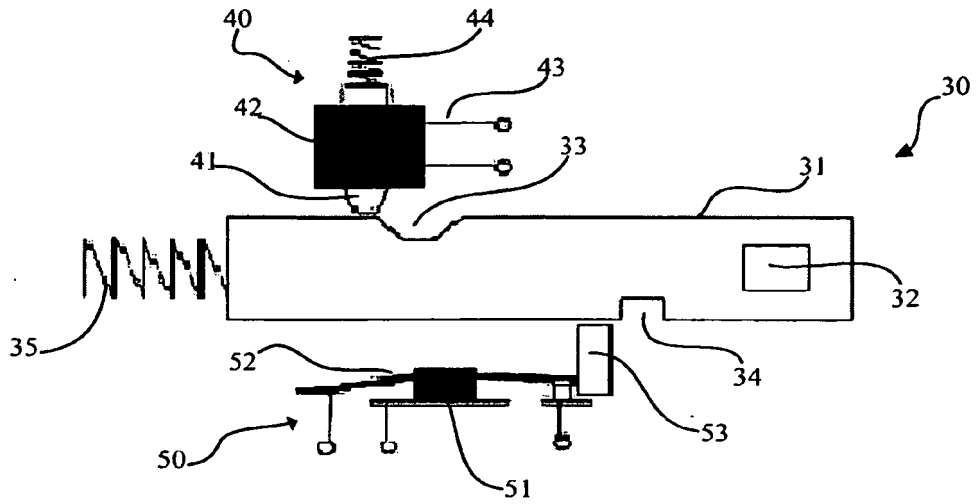


FIG. 2

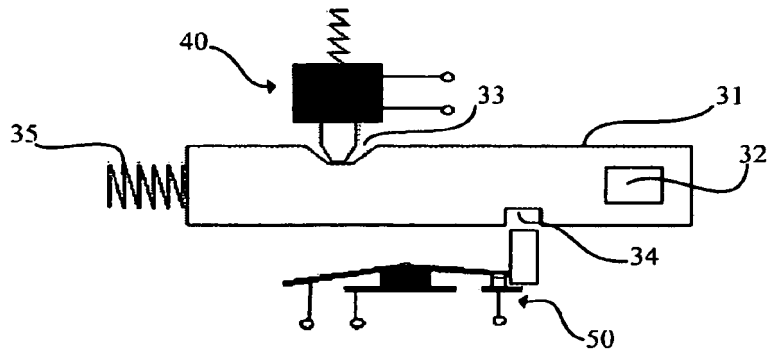


FIG. 3

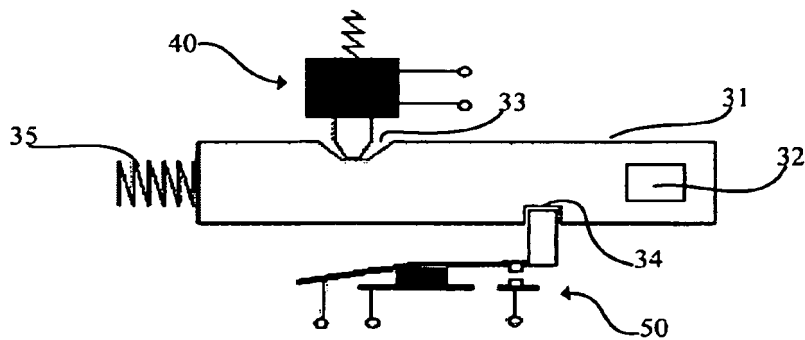


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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