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(54) LAUNDRY-TREATING MACHINE AND METHOD FOR CONTROLLING SUCH A LAUNDRY-TREATING MACHINE

WÄSCHEBEHANDLUNGSMASCHINE UND VERFAHREN ZUR STEUERUNG EINER SOLCHEN WÄSCHEBEHANDLUNGSMASCHINE

MACHINE DE TRAITEMENT DU LINGE ET PROCÉDÉ DE COMMANDE D'UNE TELLE MACHINE DE TRAITEMENT DU LINGE

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Description

[0001] The present invention relates to a laundry-treating machine, which can be switched to and from, between a standby state and a waiting/operative state.

[0002] More specifically, the present invention concerns the reduction of the standby-state energy consumption of a domestic laundry-treating machine, such as for example, a laundry washing machine, or a laundry dryer machine, or a washing-dryer machine, during a standby state; to which the following description refers purely by way of example.

[0003] As is known, some new-generation laundry-treating machines are designed to switch automatically at the end of a laundry treating cycle, from a waiting state in which machines remain at rest waiting a new command by user, to a standby state, wherein the energy consumption of machine is minimal. i.e. lower than the energy consumption of the machine in the waiting state.

[0004] Indeed, to reduce energy consumption of the laundry-treating machines, electronic control devices have been devised over the past few years to switch the machine to the standby state, by automatically opening a number of switches between the electric power network and the appliance devices, to cut off power to the devices, and which, on receiving an enabling signal, close the switches to power the devices in order to be ready to perform another operating cycle.

[0005] Though undoubtedly reducing standby-state energy consumption of the laundry-treating machines, the reduction afforded by such electronic control devices fails to comply with recent regulations governing the energy consumption of new-generation appliances, wherein it is required to have power consumption below 0,3 watt energy threshold.

[0006] It is also known the solution disclosed in US 2013/088098 A1.

[0007] The aim of the present invention is hence to provide a laundry-treating machine designed to perform as described above, while maintaining standby state consumption of the electric household appliance, preferably, below a 0,3 watt energy threshold. The above aim is achieved by the present invention, which relates to a laundry-treating machine comprising a casing, a drum mounted inside said casing and designed to receive laundry, a porthole door to give access to the drum, a main power line designed to have a main prefixed supply voltage, a door power line, a door-lock switching device, which is configured to be switched to and from, between a close state and open state to respectively connect and disconnect said door power line to said main power line, one or more first electronic/electric loads connected to said main power line upstream of said door-lock switching device, one or more second electronic/electric loads connected to said door power line downstream of said door-lock switching device, one or more electronic sensing circuits, which are connected to said main power line upstream of said door-lock switching device and are configured to detect one or more parameters indicative of the operating of said first electronic/electric loads and/or of said second electronic/electric loads, said laundry-treating machine being designed to switch from an active state associated to an active energy consumption to a standby state associated to a minimal energy consumption lower than said active energy consumption, wherein said door-lock switching device is in the open state, said laundry-treating machine being characterized by comprising: a first switch, which connects said first electronic/electric loads and said sensing circuits to said main power line upstream said door-lock switching device, and electronic control means configured to switch said first switch from a close state to the open state to electrically disconnect said first electronic/electric loads and said sensing circuits from said main power line when said laundry-treating machine is in said standby state.

[0008] Preferably, the laundry-treating machine according comprises an electric motor designed to rotate said drum, said second electronic/electric loads comprising a motor control device, which is configured to control said electric motor , a current line, which electrically connects said motor control device to said main said power line through said first switch, said electronic control means are further configured to switch said first switch from the open state to the close state, before the door-lock switching device is switched from the open state to the close state, when said laundry-treating machine passes from a switched-off state to a switched- on state, in order to supply a current to said motor control device via said current line.

[0009] Preferably, the laundry-treating machine comprises a current limiter circuit, which is connected to said current line and is designed to limit the current supplied to said motor control device to a value lower than a prefixed current threshold.

[0010] Preferably, said motor control device comprises a capacitor; said current limiter circuit being designed to limit the current used to electrically charge said capacitor.

[0011] Preferably, said first electronic loads comprise one or more electric motor pumps; the opening of said first switch causes the disconnection of the electronic sensing circuits associated with said electric motor pumps from said main power line.

[0012] Preferably, electric motor pumps are controlled by respective switch devices; the electronic sensing circuits are designed to detect a malfunction of said switch devices. Preferably, the second electronic/electric loads comprise a heating device which is connected between said door power line and a reference line having a prefixed voltage, through a command line, said electronic sensing circuits comprising a heating device sensing circuit, which is electrically connected between said heating device and said main power line, through said first switch, the opening of said first switch causing the heating device sensing circuit to be disconnected from said main power line.

[0013] Preferably, the electronic control means are

further configured to switch said first switch from said close state to said open state, after the door-lock switching device is switched from the close state to the open state, when said laundry-treating machine passes from a switched-on mode to a switched-off mode.

[0014] Preferably, the laundry-treating is designed to switch to and from, between an operative state associated to an high energy consumption, and a waiting state associated to an intermediate energy consumption being lower than said high energy consumption; said active state corresponding to said waiting state and said active energy consumption corresponding to said intermediate energy consumption.

[0015] Preferably, the electronic control means are configured to switch said door-lock switching device from the close state to the open state when said laundry-treating machine switches from the operative state to said waiting state.

[0016] Preferably, said electronic control means are configured to check one or more control parameters of said machine in said waiting state, and switches said door-lock switching device from the close state to the open state based on the result of said check.

[0017] The present invention further relates to a method for controlling a laundry-treating machine comprising: a casing, a drum mounted inside said casing and designed to receive laundry, a porthole door to give access to the drum, a main power line designed to have a main prefixed supply voltage, a door power line,a door-lock switching device, which is configured to be switched to and from, between a close state and open state to respectively connect and disconnect said door power line to said main power line, one or more first electronic/-electric loads connected to said main power line, upstream of said door-lock switching device, one or more second electronic/electric loads connected to said door power line downstream of said door-lock switching device, one or more electronic sensing circuits, which are connected to said main power line upstream of said door-lock switching device and are configured to detect one or more parameters indicative of the operating of said first electronic/electric loads and/or of said second electronic/electric loads, a first switch, which connects said first electronic/electric loads and said sensing circuits to said main power line upstream said door-lock switching device, said laundry-treating machine being designed to switch from an active state associated to an active energy consumption to a standby state associated to a minimal energy consumption being lower than said active energy consumption, in which said door-lock switching device is in the open state, said method comprising the step of switching said first switch from a close state to the open state to electrically disconnect said first electronic/electric loads and said sensing circuits from said main power line when said laundry-treating machine is in said standby state.

[0018] Preferably, said laundry treating machine comprises an electric motor designed to rotate said drum, said second electronic/electric loads comprising a motor control device, which is configured to control said electric motor, a current line, which electrically connects said motor control device to said main said power line through said first switch; the method comprising the step of switching said first switch from the open state to the close state, before the door-lock switching device is switched from the open state to the close state, when said laundry-treating machine passes from a switched-off state to a switched-on state, in order to supply a current to said motor control device via said current line.

[0019] Preferably, said method comprises the step of switching said first switch from said close state to said open state, after the door-lock switching device is switched from the close state to the open state, when said laundry-treating machine passes from a switched-on mode to a switched-off mode.

[0020] Preferably, said method comprises the step of switching to and from, between an operative state associated to an high energy consumption, and a waiting state associated to an intermediate energy consumption being lower than said high energy consumption; said active state corresponding to said waiting state and said active energy consumption corresponding to said intermediate energy consumption. Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of some of its preferred embodiments, provided with reference to the enclosed drawings.

[0021] In the drawings, corresponding characteristics and/or components are identified by the same reference numbers.

[0022] In particular:

Figure 1 is a schematic view illustrating a laundry-treating machine provided with a standby power saving system, according to an example embodiment of the present disclosure; and

Figure 2 schematically shows a circuit of the standby power saving system shown in Fig 1.

[0023] Configurations shown in embodiments enumerated in the present specification and the drawings are just exemplary embodiments of the present disclosure, and it should be understood that there are various modified examples capable of replacing the embodiments of the present specification and the drawings at the time of filling the present application.

[0024] The present invention has proved to be particularly advantageous when applied to a laundry treatment machine, such as laundry washing machines, as described below.

[0025] It should be understood that although the method is described with reference to a laundry washing machine, other applications are contemplated. As can be appreciated, the present invention can be conveniently applied to other laundry treatment appliances, like for example laundry washing and drying machines

(called also washer/dryers).

[0026] With reference to Figure 1, reference number 1 indicates as a whole a home laundry-treating machine, which is configured to perform a laundry treating washing cycle selectable by a user via a control panel 50 among a number of prefixed laundry treating washing cycles.

[0027] The home laundry-treating machine 1 comprises: a preferably, though not necessarily, substantially parallelepiped-shaped, rigid outer boxlike casing 2, which is structured for resting on the floor; a preferably substantially cylindrical, bell-shaped hollow washing tub (not shown), which is arranged inside the casing 2 with its opening or mouth directly facing a laundry loading/unloading pass-through opening realized in the front wall 2a of boxlike casing 2.

[0028] The home laundry-treating machine further comprises: a preferably substantially cylindrical, elastically-deformable bellows (not shown) watertight connecting the front opening or mouth of the washing tub to the laundry loading/unloading opening realized in the front wall 2a of casing 2; and a substantially cylindrical, bell-shaped revolving perforated drum 4 structured for housing the laundry to be washed, and which is housed in axially rotating manner inside the washing tub so as to be able to freely rotate about its longitudinal reference axis preferably, though not necessarily, an horizontal rotation axis. In an alternative embodiment not shown, rotation axis may be vertical or inclined.

[0029] According to one embodiment, the revolving drum 4 is housed in axially rotating manner inside the washing tub with its front opening directly faced/aligned to the laundry loading/unloading opening on the front wall 2a of casing 2, and the drum rotation axis is preferably arranged locally substantially coincident with the substantially horizontally-oriented longitudinal reference axis of washing tub.

[0030] Furthermore, the hollow washing tub is preferably suspended in floating manner inside the casing 2 via a suspension system preferably, though not necessarily, comprising a couple of upper coil springs (not shown) connecting the upper portion of the washing tub to the top of the boxlike casing 2, and a couple of lower vibration dampers (not shown) connecting the bottom portion of the washing tub to the bottom of the boxlike casing 2.

[0031] With reference to Figure 1, the laundry-treating machine 1 furthermore comprises a porthole door 5, which is hinged to the front wall 2a of casing 2 to rotate about a preferably, though not necessarily, vertically-oriented reference axis to and from a closing position in which the peripheral border of the porthole door 5 rests completely on front wall for closing the laundry loading/unloading opening and watertight sealing the washing tub; and an electrically-powered motor assembly (not shown) which comprises an electrical motor 6 and is structured for driving into rotation the revolving drum 4 about its longitudinal reference axis inside the washing tub, by means of a belt/pulley system (not shown). In a different embodiment of the invention, the electrically-powered motor assembly 6 may be directly associated with the shaft of the revolving drum 4.

[0032] With reference to Figures 1 and 2, the laundry washing machine 1 is furthermore provided with an electronic/electric system 7, which controls the operating of the laundry-treating machine 1.

[0033] The laundry-treating machine 1 is configured to selectively operate at least in the following states: switch-on state, switch-off state, operative state, waiting state, standby state.

[0034] It is understood that switch-on state and switch-off state mean that the laundry-treating machine 1 has been switched-on and respectively switched-off by the user, i.e. by the control panel 5.

[0035] It is further understood that "operative state" means an "active state", wherein the laundry-treating machine 1 performs a laundry-treating cycle. During the operative state, the machine 1 has an active energy consumption corresponding to a high energy consumption.

[0036] It is further understood that "waiting state" means an "active state" in which the machine temporarily remains at rest, waiting a command by user.

[0037] According to the present invention, the laundry-treating machine 1 may be configured to automatically switch to and from, between the operative state and the waiting state. During the waiting state, some electric loads are not electrically supplied, and the laundry-treating machine 1 has an active energy consumption corresponding to an intermediate energy consumption, which is lower than the high energy consumption of the operative state.

[0038] Preferably the laundry-treating machine 1 may be configured to automatically switch from the operative state to the waiting state, following the end of a laundry treating cycle.

[0039] Preferably, the laundry-treating machine 1 may be configured to automatically switch from the operative state to the waiting state based on a user command, i.e. a pause command, or any similar commands.

[0040] It is further understood that "standby state" means the state wherein the machine 1 has a minimal energy consumption lower than intermediate energy consumption of the waiting active state. According to the present invention, the laundry-treating machine 1 may be configured to automatically switch to and from, between the waiting state and the standby state.

[0041] With reference to Figure 2, the electronic/electric system 7 comprises: a first terminal 8 and second terminal 9 designed to be connected to an external power line F having a main voltage V1 corresponding to an alternating high voltage, (220/110 Volt AC) and to a neutral line N, respectively.

[0042] The electronic/electric system 7 further comprises a main power line 10 electrically connected to the first terminal 8 and designed to provide the main voltage V1, a reference line 3 connected to the second terminal 9 and having a reference low voltage, i.e. the

voltage of the neutral line N.

[0043] The electronic/electric system 7 further comprises a door power line 11 and a door-lock switching device 12, which is electrically connected between the door power line 11 and the main power line 10 and is configured to electrically connect or alternately disconnect the door power line 11 to the main power line 10 based on a command signal.

[0044] The door-lock switching device 12 is associated to a door-lock mechanism (not illustrated) that locks and alternately unlocks the porthole door 5 on command.

[0045] The door-lock switching device 12 may comprise an electro-mechanical switch specifically a relay, which may be commanded by an electronic switch, specifically a triac (TRIode for Alternating Current).

[0046] The electronic/electric system 7 further comprises an electronic control device 13, i.e. a microcontroller, which is configured to generate the command signal to open/close the door-lock switching device 12.

[0047] The electronic control device 13 may be configured to provide the command signal in order to open the door-lock switching device 12 based on the state of the laundry-treating machine 1 and based on the result of some control procedures.

[0048] For example, when the laundry-treating machine 1 changes from the operative state to the waiting state, the electronic control device 13 may perform some control procedures wherein it checks some control parameters of the machine, i.e. water level in the tub, temperature of the water, speed of the drum, voltages, etc.

[0049] If the results of the control procedure are positive, i.e. there are not critical/dangerous conditions for accessing the inner space of the drum 4, the electronic control device 13 may unlock the door 5 and switch the door-lock switching device 12 to the open state. Furthermore, the electronic control device 13 may be configured to provide the command signal in order to switch the door-lock switching device 12 to the close state, when the laundry-treating machine 1 is in the operative state or in the waiting state and the porthole door 5 is locked/closed.

[0050] In this case, the command signal may be generated by the electronic control device 13 in response of a starting command of the laundry treating cycle, i.e. a command entered by the user for starting the laundry treating course.

[0051] When the door-lock switching device 12 is in the close state, the door power line 11 is electrically connected to the main power line 10 and is energized with the main voltage V1.

[0052] The electronic control device 13 may be further configured to provide the command signal in order to switch the door-lock switching device 12 to the open state so as to electrically isolate the door power line 11 from the main power line 10, when the laundry-treating machine 1 is in the waiting state and the porthole door 5 has been unlocked.

[0053] The laundry-treating machine 1 further comprises one or more electronic/electric loads, which are configured to perform respective laundry treating functions during the laundry treating phases of the laundry treating cycle.

[0054] According to a preferred embodiment, the electronic/electric loads may comprise a motor controlled pump 14, which may comprise an electric motor and is associated to a drain hydraulic circuit (not shown) of the laundry-treating machine 1.

[0055] According to a preferred embodiment, the electronic/electric loads may further comprise a motor controlled pump 15, which may comprise an electric motor and is associated to a water-detergent hydraulic circuit (not shown).

[0056] With reference to the exemplary embodiment shown in Figure 2, the motor controlled pump 14 and motor controlled pump 15 are electrically connected between the reference line 3 and the main power line 10. Preferably, the motor controlled pump 14 and motor controlled pump 15 are connected to/disconnected from the main power line 10 by a switch 16.

[0057] The switch 16 may be an electronic switch or an electro-mechanical switch specifically a relay. The switch 16 may comprise a terminal connected to the main power line 10, upstream the door-lock switching device 12, and a terminal connected to the motor controlled pumps 14 and 15 by an electric supply line 18.

[0058] With reference to an exemplary embodiment shown in Figure 2, the motor controlled pump 14 and motor controlled pump 15 may be connected to the reference line 3 through switches 14a 15a respectively.

[0059] Switches 14a and 15a are configured to be controlled by the electronic control device 13 during the implementation of the laundry treating cycle, in order to selectively command the switching on/off the relative motor controlled pumps 14, 15.

[0060] Switches 14a and 15a may comprise electronic/electric switches such as TRIAC or similar.

[0061] With reference to an exemplary embodiment shown in Figure 2, the electronic/electric loads of the laundry-treating machine 1 may further comprise a heating device 20. The heating device 20 may be electrically connected to the door power line 11 and to the reference line 3 by a switch 21.

[0062] Preferably, the switch 21 is connected to the heating device 20 by a power line 22. The heating device 20 may comprise one or more electric resistive component/s, i.e. one or more resistor/s. The heating device 20 may be selectively switched on/off by the electronic control device 13 by means of the switch 21. The commutation on/off of the switch 21 may be controlled by the electronic control device 13 based on the implemented laundry treating phase.

[0063] Preferably, the heating device 20 may be configured to heat the water to be used during one or more phases of the laundry treating course. It is understood that in a dryer machine configuration the heating device 20 may be configured to heat the air.

[0064] The electronic/electric load of the laundry-treat-

ing machine 1 further comprise a motor control unit 23. The motor control unit 23 may be configured to control the electric motor 6 of the electrically-powered motor assembly. The electric motor 6 may be controlled by the motor control unit 23 based on one or more commands provided by the electronic control device 13.

[0065] The motor control unit 23 may be connected between the door power line 11 and the reference line 3.

[0066] With reference to an exemplary embodiment shown in Figure 2, the motor control unit 23 is connected to the door power line 11 through a switch 24. The motor control unit 23 may comprise a printed circuit board provided with one or more capacitive components 23a.

[0067] Capacitive components 23a may comprise for example an electrolytic motor capacitor/condenser.

[0068] With reference to the exemplary embodiment shown in Figure 2, a number of additional electronic/-electric loads (only one of which is indicated with 35 in Figure 2) may be connected between the door power line 11 and the reference line 3 downstream of the door-lock switching device 12. Electronic/electric loads 35 may be controlled by the electronic control device 13 thorough respective switches 34.

[0069] The electronic/electric system 7 further comprises one or more sensing circuits, which are associated with respective electronic/electric loads and are configured to provide signals indicating the operating of the respective electronic/electric load.

[0070] With reference to an exemplary embodiment shown in Figure 2, sensing circuits comprise a sensing circuit 14b, which is associated with the motor controlled pump 14 and provide signal indicating the operating of the switching device 14a and/or of the motor controlled pump 14. The sensing circuit 14b may be configured to provide the electronic control device 13 a signal containing a parameter, i.e. and electric parameter, indicative of a malfunction of the switching device 14a and/or of the motor pump sensing circuit 14b.

[0071] With reference to an exemplary embodiment shown in Figure 2, sensing circuits comprise a sensing circuit 15b, which is associated with the motor controlled pump 15 and provides signal indicating the operating of the switching device 15a and/or of the motor controlled pump 15. The sensing circuit 15b may be configured to provide the electronic control device 13 a signal containing a parameter, i.e. and electric parameter, indicative of a malfunction of the switching device 15a and/or of the motor pump sensing circuit 15b.

[0072] The electronic/electric system 7 further comprises a heater sensing line 26 connected between the electric supply line 18 and the power line 22. The heater sensing line 26 may comprise for example a resistive divider 27 provided with two resistive components. A first resistive component R1 is connected along the heater sensing line 26 and the second resistive component R2 is placed along a branch line which, in turn, connects the heater sensing line 26 downstream the first resistive component R1 to the electronic control device 13.

[0073] The electronic control device 13 may be configured to determine a malfunction condition of the heating device 20 based on the signal received via the branch line. For example the signal in the branch line may be a voltage signal being indicative of the malfunction condition of the heating device 20, i.e. caused by the breakdown of the electric resistor.

[0074] The electronic/electric system 7 further comprises an inrush current limiter line 28, which is connected between the electric supply line 18 and the line connecting the switching device 24 to the motor control unit 23.

[0075] The inrush current limiter line 28 may comprise a limiter circuit 29 configured to limit the current supplied to the motor control unit 23.

[0076] According to an embodiment, the limiter circuit 29 may comprise a diode (not shown) and a resistive component (not shown) placed in series along the inrush current limiter line 28.

[0077] Preferably, the diode may comprise the cathode connected to the electric supply line 18 and the anode connected to motor control unit 23 through the resistive component. The inrush current limiter line 28 is advantageously configured to, on the one side, electrically charge the capacitor 23a of the motor control unit 23 before the door line 11 is energized by the closure of the door look switching device 12, and on the other side, it limits the current supplied to the motor control unit 23 to a prefixed safety value which does not damage the printed circuit board 23 and/or the capacitor 23a. The electronic/-electric system 7 may further comprise a sensing circuit 32 which is connected between the inrush current limiter line 28, downstream of the electronic limiter circuit 29 and the electronic control device 13.

[0078] Preferably, the sensing circuit 32 provides the electronic control device 13 a signal indicative of the malfunction of the motor control unit 23.

[0079] The electronic/electric system 7 may further comprise a plurality of sensing circuit (one of which is shown in Figure 2 and numbered with 33) being associated with respective electric loads 35 which are connected to the door power line 11.

[0080] Sensing circuit 33 are configured to provide to the electronic control device 13 a signal indicative of a malfunction of the respective sensed load 35.

[0081] The control method is described more in detail in the following wherein it is supposed that the laundry-treating machine 1 is initially in the switch-off state, i.e. inactive.

[0082] It is further supposed that: the door 5 is unlocked, and the door-lock switching device 12 is in the open state so that the door power line 11 and the electrical loads connected to door power line 11 are electrically isolated from the main power line 10. Furthermore, the switch 16 is in the open state so that electric supply line 18, the heater sensing line 26 and the inrush current limiter line 27 are electrically isolated from the main power line 10.

[0083] It is understood that, according to the exemplary

embodiment illustrated in Figure 2, in the waiting state, the switch 14a, the switch 15a, the sensing circuit 14b, the sensing circuit 15b, the motor control unit 23, the switches 34, the sensing circuits 33 are electrically supplied. Vice-versa in the standby state the switch 14a, the switch 15a, the sensing circuit 14b, the sensing circuit 15b, the motor control unit 23, the switches 34, the sensing circuits 33 are not electrically supplied.

[0084] The user can close the porthole door 5 and activate, i.e. switches on, the treating-laundry machine 1 by selecting a laundry treating cycle and entering the starting command via the control panel 50.

[0085] In this step, the laundry treating machine 2 is in the waiting state.

[0086] The electronic control unit 13 detects that porthole door 5 is closed, receives the command of the user, locks the door 5, switches from the waiting state to the operative state for starting the laundry treating cycle selected by the user.

[0087] Before commanding the closure of the door look switching device 12 and starting the laundry treating cycle, the electronic control unit 13 closes the switch 16 for energizing the command line 18 with the main voltage V1. The closed switch 16 causes the supplying of the current to the motor control unit 23 through the inrush current limiter line 28. The current charges the capacitor 23a of the motor control unit 23 beforehand the door look switching device 12 is closed. This means that when the laundry treating cycle is actually started, the motor control unit 23 can switch on the electric motor 6 instantaneously, i.e. without any delay due to the capacitor recharging. In other words, the Applicant has found that performing the pre-charging of the capacitor 23a of the motor control unit 23, as above disclosed, has the technical effect of reducing delays of the first switching-on the electric motor 6 and thereby eliminating delay in starting the cycle.

[0088] Taking into account the limiter circuit 29 on the inrush current limiter line 28, it is further prevented the risks of damaging the motor control unit 23 during the charging of the capacitor 23a.

[0089] Furthermore, the energization of the command line 18 activates the sensing circuits 14b, 15b, 32 and the heater sensing line 26, which can be sensed by the electronic control unit 13.

[0090] After having closed the switch 16, the electronic control unit 13 can check the sensing signals and determine malfunctions caused by the switches 14a, 15a of the motor controlled pumps 14, 15, or the heating device 20, or the motor control unit 23.

[0091] Afterwards, the electronic control unit 13 closes the door-lock switching device 12 in order to energize the door supply line 11, and starts performing the laundry treating cycle.

[0092] It is understood that in this phase, the laundry-treating machine 1 is in the operative state and the electronic control unit 13 controls the switches 14a, 15a, 21, 24 and 34 based on laundry treating phase to be implemented.

[0093] At the end of the laundry treating cycle and/or on in response to a command , i.e., when the user selects a interruption/pause command, the laundry treating machine 1 automatically changes from the operative state to the waiting state.

[0094] The laundry-treating machine 1 may change to the waiting state, and the electronic control unit 13 may perform some control procedures and based on the positive results of procedure controls the door-lock switching device 12 thereby commutating it from the close state to the open state in order to isolate the door power line 11 from the main power line 10 and unlocks the door 5. This means that during the waiting state, the loads 20 and 23 connected to the door power line 11 downstream of said door-lock switching device 12 are not energized and do not consume electrical energy. Indeed when the machine 1 changes from the operative state to the waiting state its energy consumption is reduced from the high energy consumption to the intermediate energy consumption.

[0095] After a prefixed time, the laundry treating machine 1 may automatically changes from the waiting state to the standby state, when no commands has been entered in the control panel by user in such time.

[0096] When the laundry-treating machine 1 changes to the standby state, the electronic control unit 13 switches the switch 16 to the open state. This means that during the standby state, the sensing circuits 14b, 15b, 27, 32, 34 of the laundry-treating machine 1 are not energized and do not consume electrical energy. Indeed, when the machine 1 changes from the waiting state to the standby state, its energy consumption is reduced from the intermediate energy consumption to the minimal energy consumption being lower than the intermediate energy consumption.

[0097] More specifically, the opening of the switch 16 during the standby state, allows to electrically disconnect the sensing circuits 14b, 15b, the heater sensing line 26 and of the inrush current limiter line 28 from the main power line 10.

[0098] The Applicant has found that the disconnection of the sensing circuits 14b, 15b, the heaters sensing line 26 and the inrush current limiter line 27 from the main power line 10 reduces the minimal energy consumption of the laundry-treating machine 1 during the standby state to a value lower than 0,3 Watt.

[0099] Vice-versa, when the laundry-treating machine 1 switches from the standby state to the waiting state, the electronic control unit 13 closes the switch 16 in order to connect the electric supply line 18 to the main power line 10. This means that sensing circuits 14b, 15b, the heater sensing line 26 and of the inrush current limiter line 28 are energized and newly operating. The switch from the standby state to the waiting state can be operated once the user inputs a command via the control panel 50, preferably, by pressing/touching one or more button(s).

[0100] The electronic control unit 13 further controls the door-lock switching device 12 thereby commutating it

from the open state to the close state in order to newly supplying the main voltage V1 to the door power line 11.

[0101] In this step, the user may input a starting command via the control panel 50. The electronic control unit 13 detects the command of the user, and starts the laundry treating cycle.

[0102] In this step, the laundry treating machine 1 changes from the waiting state to the operative state. When, at the end of the laundry treating course, the electronic control unit 13 receives a switching-off command, i.e. from the user, it opens the switch 16 and afterwards opens the door-lock switching device 12.

[0103] The advantages of the present invention are the following:

Firstly, the presence of the switching device upstream of the door look switching device makes it possible to obtain, during the standby operation, the electrical disconnection of all the sensing circuits of the machine from the main power line, thus heavily reducing the consumption of the machine.

[0104] Moreover, the electrical connection of the motor control unit to the main power line through the inrush current limiter line and by the switching device, and the closing of the switching device before the closing of the door-lock switching device conveniently causes on the one side a reduction of the delay of switching non of the motor assembly when the latter is activated for the first time during the laundry treating course, and on the other side prevents the damaging of the motor control board and/or of the electrolytic motor condenser.

[0105] Clearly, changes and variations may be made to the laundry-treating machine and the control method without, however, departing from the scope of the present invention.

Claims

1. Laundry-treating machine (1) comprising:

- a casing (2),
- a drum (4) mounted inside said casing (2) and designed to receive laundry,
- a porthole door (5) to give access to the drum (4),
- a main power line (10) designed to have a main prefixed supply voltage (V1),
- a door power line (11),
- a door-lock switching device (12), which is configured to be switched to and from, between a close state and open state to respectively connect and disconnect said door power line (11) to said main power line (10),
- one or more first electronic/electric loads (14,15) connected to said main power line (11), upstream of said door-lock switching device (12),
- one or more second electronic/electric loads (20, 23) connected to said door power line (11) downstream of said door-lock switching device (12),
- one or more electronic sensing circuits (14b, 15b, 27, 32), which are connected to said main power line (10) upstream of said door-lock switching device (12) and are configured to detect one or more parameters indicative of the operating of said first electronic/electric loads (14, 15) and/or of said second electronic/electric loads (20, 23),

said laundry-treating machine being designed to switch from an active state associated to an active energy consumption to a standby state associated to a minimal energy consumption lower than said active energy consumption, in which said door-lock switching device (12) is in the open state,

said laundry-treating machine being **characterized by** comprising:

- a first switch (16), which connects said first electronic/electric loads (14, 15) and said sensing circuits (14b, 15b, 27, 32) to said main power line (11) upstream said door-lock switching device (12), and
- electronic control means (13) configured to switch said first switch (16) from a close state to the open state to electrically disconnect said first electronic/electric loads (14)(15) and said sensing circuits (14b, 15b, 27, 32) from said main power line (11) when said laundry-treating machine is in said standby state.

2. Laundry-treating machine according to claim 1 comprising:

- an electric motor (6) designed to rotate said drum (4),
- said second electronic/electric loads (20, 23) comprising a motor control device (23), which is configured to control said electric motor (6) ,
- a current line (28), which electrically connects said motor control device (23) to said main said power line (10) through said first switch (16),
- said electronic control means (13) are further configured to switch said first switch (16) from the open state to the close state, before the door-lock switching device (12) is switched from the open state to the close state, when said laundry-treating machine passes from a switched-off state to a switched-on state, in order to supply a current to said motor control device (23) via said current line (28).

3. Laundry-treating machine according to claim 2, comprising a current limiter circuit (29), which is con-

nected to said current line (28) and is designed to limit the current supplied to said motor control device (23) to a value lower than a prefixed current threshold.

4. Laundry-treating machine according to claim 3, wherein said motor control device (23) comprises a capacitor (23a); said current limiter circuit (29) being designed to limit the current used to electrically charge said capacitor (23a).

5. Laundry-treating machine according to any of the previous claims, wherein:

- said first electronic loads (14, 15) comprise one or more electric motor pumps;
- the opening of said first switch (16) causes the disconnection of the electronic sensing circuits (14b, 15b) associated with said electric motor pumps from said main power line (10).

6. Laundry-treating machine according to claim 5, wherein:

- said more electric motor pumps are controlled by respective switch devices (14a, 15a);
- said electronic sensing circuits (14b, 15b) are designed to detect a malfunction of said switch devices (14a,15a).

7. Laundry-treating machine according to any of the previous claims, wherein

- said second electronic/electric loads (20, 23) comprise a heating device, which is connected between said door power line (11) and a reference line (3) having a prefixed voltage,
- said electronic sensing circuits comprising a heating device sensing circuit (26) which is electrically connected between said heating device and said main power line (10), through said first switch (16),
- the opening of said first switch (16) causing the heating device sensing circuit (26) to be disconnected from said main power line (10).

8. Laundry-treating machine according to any of the previous claims, wherein said electronic control means (13) are further configured to switch said first switch (16) from said close state to said open state, after the door-lock switching device (12) is switched from the close state to the open state, when said laundry-treating machine passes from a switched-on state to a switched-off state.

9. Laundry-treating machine according to any of the previous claims, designed to switch to and from, between an operative state associated to an high energy consumption, and a waiting state associated to an intermediate energy consumption being lower than said high energy consumption; said active state corresponding to said waiting state; said active energy consumption corresponding to said intermediate energy consumption; the operative state is an active state wherein the laundry-treating machine (1) performs a laundry-treating cycle, the waiting state is an active state in which the machine temporarily remains at rest, waiting a command by user.

10. Laundry-treating machine according to claim 9, wherein said electronic control means (13) are configured to switch said door-lock switching device (12) from the close state to the open state when said laundry-treating machine switches from the operative state to said waiting state.

11. Laundry-treating machine according to claim 10, wherein said electronic control means (13) are configured to check one or more control parameters of said laundry treating machine in said waiting state, and switches said door-lock switching device (12) from the close state to the open state based on the result of said check.

12. Method for controlling a laundry-treating machine (1) comprising:

- a casing (2),
- a drum (4) mounted inside said casing (2) and designed to receive laundry,
- a porthole door (5) to give access to the drum (4),
- a main power line (10) designed to have a main prefixed supply voltage (V1),
- a door power line (11),
- a door-lock switching device (12), which is configured to be switched to and from, between a close state and open state to respectively connect and disconnect said door power line (11) to said main power line (10),
- one or more first electronic/electric loads (14,15) connected to said main power line (11), upstream of said door-lock switching device (12),
- one or more second electronic/electric loads (20, 23) connected to said door power line (11) downstream of said door-lock switching device (12),
- one or more electronic sensing circuits (14b, 15b, 27, 32), which are connected to said main power line (10) upstream of said door-lock switching device (12) and are configured to detect one or more parameters indicative of the operating of said first electronic/electric loads (14, 15) and/or of said second electronic/electric loads (20, 23),

- a first switch (16), which connects said first electronic/electric loads (14, 15) and said sensing circuits (14b, 15b, 27, 32) to said main power line (11) upstream said door-lock switching device (12),
said laundry-treating machine being designed to switch from an active state associated to an active energy consumption to a standby state associated to a minimal energy consumption being lower than said active energy consumption, in which said door-lock switching device (12) is in the open state,
said method being **characterized by** comprising the step of switching said first switch (16) from a close state to the open state to electrically disconnect said first electronic/electric loads (14)(15) and said sensing circuits (14b, 15b, 27, 32) from said main power line (11) when said laundry-treating machine is in said standby state.

13. Method according to claim 12, wherein said laundry treating machine (1) comprises an electric motor (6) designed to rotate said drum (4),

- said second electronic/electric loads (20, 23) comprising a motor control device (23), which is configured to control said electric motor (6) ,
- a current line (28), which electrically connects said motor control device (23) to said main said power line (10) through said first switch (16),

said method comprising the step of switching said first switch (16) from the open state to the close state, before the door-lock switching device (12) is switched from the open state to the close state, when said laundry-treating machine passes from a switched-off state to a switched-on state, in order to supply a current to said motor control device (23) via said current line (28).

14. Method according to any of the previous claims 12 or 13, comprising the step of switching said first switch (16) from said close state to said open state, after the door-lock switching device (12) is switched from the close state to the open state, when said laundry-treating machine passes from a switched-on state to a switched-off state.

15. Method according to any of the previous claims from 12 to 14, comprising the step of switching the laundry treating machine 1 to and from, between an operative state associated to an high energy consumption, and a waiting state associated to an intermediate energy consumption being lower than said high energy consumption; said active state corresponding to said waiting state and said active energy consumption corresponding to said intermediate energy consumption, the operative state is an active state wherein the laundry-treating machine (1) performs a laundry-treating cycle, the waiting state is an active state in which the machine temporarily remains at rest, waiting a command by user.

Patentansprüche

1. Wäschebehandlungsmaschine (1), die Folgendes umfasst:

- ein Gehäuse (2),
- eine Trommel (4), die in dem Gehäuse (2) montiert und dazu ausgestaltet ist, Wäsche aufzunehmen,
- eine Bullaugentür (5), um einen Zugang zu der Trommel (4) bereitzustellen,
- eine Hauptleistungsleitung (10), die dazu ausgestaltet ist, eine voreingestellte Hauptversorgungsspannung (V1) aufzuweisen,
- eine Türleistungsleitung (11),
- eine Türverriegelungsschaltvorrichtung (12), die dazu ausgelegt ist, zwischen einem geschlossenen Zustand und einem geöffneten Zustand hin und her geschaltet zu werden, um die Türleistungsleitung (11) mit der Hauptleistungsleitung (10) zu verbinden bzw. davon zu trennen,
- eine oder mehrere erste elektronische/elektrische Lasten (14, 15), die stromaufwärts der Türverriegelungsschaltvorrichtung (12) mit der Hauptleistungsleitung (11) verbunden sind,
- eine oder mehrere zweite elektronische/elektrische Lasten (20, 23), die stromabwärts der Türverriegelungsschaltvorrichtung (12) mit der Türleistungsleitung (11) verbunden sind,
- eine oder mehrere elektronische Erfassungsschaltungen (14b, 15b, 27, 32), die stromaufwärts der Türverriegelungsschaltvorrichtung (12) mit der Hauptleistungsleitung (10) verbunden und dazu ausgelegt sind, einen oder mehrere Parameter zu detektieren, die den Betrieb der ersten elektronischen/elektrischen Lasten (14, 15) und/oder der zweiten elektronischen/elektrischen Lasten (20, 23) anzeigen,

wobei die Wäschebehandlungsmaschine dazu ausgestaltet ist, von einem aktiven Zustand, der mit einem aktiven Energieverbrauch assoziiert ist, in einen Bereitschaftszustand zu schalten, der mit einem minimalen Energieverbrauch assoziiert ist, der niedriger als der aktive Energieverbrauch ist, in dem sich die Türverriegelungsschaltvorrichtung (12) in dem geöffneten Zustand befindet,
wobei die Wäschebehandlungsmaschine **dadurch gekennzeichnet ist, dass** sie

Folgendes umfasst:

- einen ersten Schalter (16), der die ersten elektronischen/elektrischen Lasten (14, 15) und die Erfassungsschaltungen (14b, 15b, 27, 32) mit der Hauptleistungsleitung (11) stromaufwärts der Türverriegelungsschaltvorrichtung (12) verbindet, und
- elektronische Steuermittel (13), die dazu ausgelegt sind, den ersten Schalter (16) von einem geschlossenen Zustand in den geöffneten Zustand zu schalten, um die ersten elektronischen/elektrischen Lasten (14) (15) und die Erfassungsschaltungen (14b, 15b, 27, 32) elektrisch von der Hauptleistungsleitung (11) zu trennen, wenn sich die Wäschebehandlungsmaschine in dem Bereitschaftszustand befindet.

2. Wäschebehandlungsmaschine nach Anspruch 1, die Folgendes umfasst:

- einen Elektromotor (6), der dazu ausgestaltet ist, die Trommel (4) zu drehen,
- wobei die zweiten elektronischen/elektrischen Lasten (20, 23) eine Motorsteuervorrichtung (23) umfassen, die dazu ausgelegt ist, den Elektromotor (6) zu steuern,
- eine Stromleitung (28), die die Motorsteuervorrichtung (23) durch den ersten Schalter (16) elektrisch mit der Hauptleistungsleitung (10) verbindet,
- wobei die elektronischen Steuermittel (13) ferner dazu ausgelegt sind, den ersten Schalter (16) von dem geöffneten Zustand in den geschlossenen Zustand zu schalten, bevor die Türverriegelungsschaltvorrichtung (12) von dem geöffneten Zustand in den geschlossenen Zustand geschaltet wird, wenn die Wäschebehandlungsmaschine von einem ausgeschalteten Zustand in einen eingeschalteten Zustand übergeht, um der Motorsteuervorrichtung (23) über die Stromleitung (28) einen Strom zuzuführen.

3. Wäschebehandlungsmaschine nach Anspruch 2, umfassend eine Strombegrenzerschaltung (29), die mit der Stromleitung (28) verbunden und dazu ausgestaltet ist, den der Motorsteuervorrichtung (23) zugeführten Strom auf einen Wert zu begrenzen, der kleiner als eine vorgegebene Stromschwelle ist.

4. Wäschebehandlungsmaschine nach Anspruch 3, wobei die Motorsteuervorrichtung (23) einen Kondensator (23a) umfasst; wobei die Strombegrenzerschaltung (29) dazu ausgestaltet ist, den Strom zu begrenzen, der zum elektrischen Laden des Kondensators (23a) verwendet wird.

5. Wäschebehandlungsmaschine nach einem der vorhergehenden Ansprüche, wobei:

- die ersten elektronischen Lasten (14, 15) eine oder mehrere Elektromotorpumpen umfassen;
- das Öffnen des ersten Schalters (16) die Trennung der mit den Elektromotorpumpen assoziierten elektronischen Erfassungsschaltungen (14b, 15b) von der Hauptleistungsleitung (10) bewirkt.

6. Wäschebehandlungsmaschine nach Anspruch 5, wobei:

- die mehreren Elektromotorpumpen durch jeweilige Schaltvorrichtungen (14a, 15a) gesteuert sind;
- die elektronischen Erfassungsschaltungen (14b, 15b) dazu ausgestaltet sind, eine Fehlfunktion der Schaltvorrichtungen (14a, 15a) zu detektieren.

7. Wäschebehandlungsmaschine nach einem der vorhergehenden Ansprüche, wobei

- die zweiten elektronischen/elektrischen Lasten (20, 23) eine Heizvorrichtung umfassen, die zwischen die Türleistungsleitung (11) und einer Referenzleitung (3) mit einer vorab festgelegten Spannung geschaltet ist,
- die elektronischen Erfassungsschaltungen eine Heizvorrichtungserfassungsschaltung (26) umfassen, die durch den ersten Schalter (16) elektrisch zwischen die Heizvorrichtung und die Hauptleistungsleitung (10) geschaltet ist,
- das Öffnen des ersten Schalters (16) bewirkt, dass die Heizvorrichtungserfassungsschaltung (26) von der Hauptleistungsleitung (10) getrennt wird.

8. Wäschebehandlungsmaschine nach einem der vorhergehenden Ansprüche, wobei die elektronischen Steuermittel (13) ferner dazu ausgelegt sind, den ersten Schalter (16) von dem geschlossenen Zustand in den geöffneten Zustand zu schalten, nachdem die Türverriegelungsschaltvorrichtung (12) von dem geschlossenen Zustand in den geöffneten Zustand geschaltet wird, wenn die Wäschebehandlungsmaschine von einem eingeschalteten Zustand in einen ausgeschalteten Zustand übergeht.

9. Wäschebehandlungsmaschine nach einem der vorhergehenden Ansprüche, die dazu ausgestaltet ist, zwischen einem Betriebszustand, der mit einem ho-

hen Energieverbrauch assoziiert ist, und einem Wartezustand, der mit einem Zwischenenergieverbrauch assoziiert ist, der niedriger als der hohe Energieverbrauch ist, hin und her zu schalten; wobei der aktive Zustand dem Wartezustand entspricht; wobei der aktive Energieverbrauch dem Zwischenenergieverbrauch entspricht; wobei der Betriebszustand ein aktiver Zustand ist, in dem die Wäschebehandlungsmaschine (1) einen Wäschebehandlungszyklus durchführt, wobei der Wartezustand ein aktiver Zustand ist, in dem die Maschine vorübergehend im Ruhezustand verbleibt und auf einen Befehl von dem Benutzer wartet.

10. Wäschebehandlungsmaschine nach Anspruch **9,** wobei die elektronischen Steuermittel (13) dazu ausgelegt sind, die Türverriegelungsschaltvorrichtung (12) von dem geschlossenen Zustand in den geöffneten Zustand zu schalten, wenn die Wäschebehandlungsmaschine von dem Betriebszustand in den Wartezustand schaltet.

11. Wäschebehandlungsmaschine nach Anspruch 10, wobei die elektronischen Steuermittel (13) dazu ausgelegt sind, einen oder mehrere Steuerparameter der Wäschebehandlungsmaschine in dem Wartezustand zu überprüfen, und die Türverriegelungsschaltvorrichtung (12) basierend auf dem Ergebnis der Überprüfung von dem geschlossenen Zustand in den geöffneten Zustand schalten.

12. Verfahren zum Steuern einer Wäschebehandlungsmaschine (1), die Folgendes umfasst:

- ein Gehäuse (2),
- eine Trommel (4), die in dem Gehäuse (2) montiert und dazu ausgestaltet ist, Wäsche aufzunehmen,
- eine Bullaugentür (5), um einen Zugang zu der Trommel (4) bereitzustellen,
- eine Hauptleistungsleitung (10), die dazu ausgestaltet ist, eine voreingestellte Hauptversorgungsspannung (V1) aufzuweisen,
- eine Türleistungsleitung (11),
- eine Türverriegelungsschaltvorrichtung (12), die dazu ausgelegt ist, zwischen einem geschlossenen Zustand und einem geöffneten Zustand hin und her geschaltet zu werden, um die Türleistungsleitung (11) mit der Hauptleistungsleitung (10) zu verbinden bzw. davon zu trennen,
- eine oder mehrere erste elektronische/elektrische Lasten (14, 15), die stromaufwärts der Türverriegelungsschaltvorrichtung (12) mit der Hauptleistungsleitung (11) verbunden sind,
- eine oder mehrere zweite elektronische/elektrische Lasten (20, 23), die stromabwärts der Türverriegelungsschaltvorrichtung (12) mit der Türleistungsleitung (11) verbunden sind,
- eine oder mehrere elektronische Erfassungsschaltungen (14b, 15b, 27, 32), die stromaufwärts der Türverriegelungsschaltvorrichtung (12) mit der Hauptleistungsleitung (10) verbunden und dazu ausgelegt sind, einen oder mehrere Parameter zu detektieren, die den Betrieb der ersten elektronischen/elektrischen Lasten (14, 15) und/oder der zweiten elektronischen/elektrischen Lasten (20, 23) anzeigen,
- einen ersten Schalter (16), der die ersten elektronischen/elektrischen Lasten (14, 15) und die Erfassungsschaltungen (14b, 15b, 27, 32) mit der Hauptleistungsleitung (11) stromaufwärts der Türverriegelungsschaltvorrichtung (12) verbindet,

wobei die Wäschebehandlungsmaschine dazu ausgestaltet ist, von einem aktiven Zustand, der mit einem aktiven Energieverbrauch assoziiert ist, in einen Bereitschaftszustand zu schalten, der mit einem minimalen Energieverbrauch assoziiert ist, der niedriger als der aktive Energieverbrauch ist, in dem sich die Türverriegelungsschaltvorrichtung (12) in dem geöffneten Zustand befindet,

wobei das Verfahren **dadurch gekennzeichnet ist, dass** es den Schritt Schalten des ersten Schalters (16) von einem geschlossenen Zustand in den geöffneten Zustand umfasst, um die ersten elektronischen/elektrischen Lasten (14) (15) und die Erfassungsschaltungen (14b, 15b, 27, 32) elektrisch von der Hauptleistungsleitung (11) zu trennen, wenn sich die Wäschebehandlungsmaschine in dem Bereitschaftszustand befindet.

13. Verfahren nach Anspruch 12, wobei die Wäschebehandlungsmaschine (1) einen Elektromotor (6) umfasst, der dazu ausgestaltet ist, die Trommel (4) zu drehen,

- wobei die zweiten elektronischen/elektrischen Lasten (20, 23) eine Motorsteuervorrichtung (23) umfassen, die dazu ausgelegt ist, den Elektromotor (6) zu steuern,
- eine Stromleitung (28), die die Motorsteuervorrichtung (23) durch den ersten Schalter (16) elektrisch mit der Hauptleistungsleitung (10) verbindet,

wobei das Verfahren den Schritt Schalten des ersten Schalters (16) von dem geöffneten Zustand in den geschlossenen Zustand umfasst, bevor die Türverriegelungsschaltvorrichtung (12) von dem geöffneten Zustand in den geschlossenen Zustand geschaltet wird, wenn die Wäschebehandlungsmaschine von einem ausgeschalteten Zustand in einen eingeschalteten Zustand übergeht, um der Motorsteuervorrichtung (23) über die Stromleitung (28) einen

Strom zuzuführen.

14. Verfahren nach einem der vorhergehenden Ansprüche 12 oder 13, umfassend den Schritt Schalten des ersten Schalters (16) von dem geschlossenen Zustand in den geöffneten Zustand, nachdem die Türverriegelungsschaltvorrichtung (12) von dem geschlossenen Zustand in den geöffneten Zustand geschaltet wird, wenn die Wäschebehandlungsmaschine von einem eingeschalteten Zustand in einen ausgeschalteten Zustand übergeht.

15. Verfahren nach einem der vorhergehenden Ansprüche 12 bis 14, umfassend den Schritt Hin- und Herschalten der Wäschebehandlungsmaschine 1 zwischen einem Betriebszustand, der mit einem hohen Energieverbrauch assoziiert ist, und einem Wartezustand, der mit einem Zwischenenergieverbrauch assoziiert ist, der niedriger als der hohe Energieverbrauch ist; wobei der aktive Zustand dem Wartezustand entspricht und der aktive Energieverbrauch dem Zwischenenergieverbrauch entspricht, wobei der Betriebszustand ein aktiver Zustand ist, in dem die Wäschebehandlungsmaschine (1) einen Wäschebehandlungszyklus durchführt, wobei der Wartezustand ein aktiver Zustand ist, in dem die Maschine vorübergehend in einem Ruhezustand verbleibt und auf einen Befehl von dem Benutzer wartet.

Revendications

1. Machine de traitement du linge (1) comprenant :

- un boîtier (2),
- un tambour (4) monté à l'intérieur dudit boîtier (2) et conçu pour recevoir du linge,
- une porte à hublot (5) pour donner accès au tambour (4),
- une ligne d'alimentation principale (10) conçue pour présenter une tension d'alimentation principale fixée au préalable (V1),
- une ligne d'alimentation de porte (11),
- un interrupteur de verrouillage de porte (12), qui est conçu pour être commuté aller et retour entre un état fermé et un état ouvert pour respectivement connecter et déconnecter ladite ligne d'alimentation de porte (11) à et de ladite ligne d'alimentation principale (10),
- une ou plusieurs premières charges électroniques/électriques (14, 15) connectées à ladite ligne d'alimentation principale (11), en amont dudit interrupteur de verrouillage de porte (12),
- une ou plusieurs secondes charges électroniques/électriques (20, 23) connectées à ladite ligne d'alimentation principale (11), en aval dudit interrupteur de verrouillage de porte (12),
- un ou plusieurs circuits de détection électroniques (14b, 15b, 27, 32), qui sont connectés à ladite ligne d'alimentation principale (10) en amont dudit interrupteur de verrouillage de porte (12) et sont configurés pour détecter un ou plusieurs paramètres indiquant le fonctionnement desdites premières charges électroniques/électriques (14, 15) et/ou desdites secondes charges électroniques/électriques (20, 23), ladite machine de traitement du linge étant conçue pour passer d'un état actif associé à une consommation **d'énergie** active à un état de veille associé à une consommation d'énergie minimale inférieure à ladite consommation d'énergie active dans lequel ledit interrupteur de verrouillage de porte (12) est dans l'état ouvert,

ladite machine de traitement du linge étant **caractérisée en ce qu'**elle comprend :

- un premier commutateur (16), qui connecte lesdites premières charges électroniques/électriques (14, 15) et lesdits circuits de détection (14b, 15b, 27, 32) à ladite ligne d'alimentation principale (11) en amont dudit interrupteur de verrouillage de porte (12), et
- des moyens de commande électroniques (13) configurés pour commuter ledit premier commutateur (16) d'un état fermé à l'état ouvert pour la déconnexion électrique desdites premières charges électroniques/électriques (14) (15) et desdits circuits de détection (14b, 15b, 27, 32) de ladite ligne d'alimentation principale (11) lorsque ladite machine de traitement du linge est dans ledit état de veille.

2. Machine de traitement du linge selon la revendication 1 comprenant :

- un moteur électrique (6) conçu pour faire tourner ledit tambour (4),
- lesdites secondes charges électroniques/électriques (20, 23) comprenant un dispositif de commande de moteur (23), qui est configuré pour commander ledit moteur électrique (6),
- une ligne de courant (28), qui connecte électriquement ledit dispositif de commande de moteur (23) à ladite ligne d'alimentation principale (10) par l'intermédiaire dudit premier commutateur (16),
- lesdits moyens de commande électroniques (13) sont en outre configurés pour commuter ledit premier commutateur (16) de l'état ouvert à l'état fermé, avant que l'interrupteur de verrouillage de porte (12) soit commuté de l'état ouvert à l'état fermé, lorsque ladite machine de traitement du linge passe d'un état hors tension à un état sous tension, afin de fournir un courant audit dispositif de commande de moteur (23) par

le biais de ladite ligne de courant (28).

3. Machine de traitement du linge selon la revendication 2, comprenant un circuit limiteur de courant (29), qui est connecté à ladite ligne de courant (28) et qui est conçu pour limiter le courant fourni audit dispositif de commande de moteur (23) à une valeur inférieure à un seuil de courant fixé au préalable.

4. Machine de traitement du linge selon la revendication 3, dans lequel ledit dispositif de commande de moteur (23) comprend un condensateur (23a) ; ledit circuit limiteur de courant (29) étant conçu pour limiter le courant utilisé pour charger électriquement ledit condensateur (23a).

5. Machine de traitement du linge selon l'une quelconque des revendications précédentes, dans laquelle :

- lesdites premières charges électroniques (14, 15) comprennent une ou plusieurs électropompes ;
- l'ouverture dudit premier commutateur (16) entraîne la déconnexion des circuits de détection électroniques (14b, 15b) associés auxdites électropompes de ladite ligne d'alimentation principale (10).

6. Machine de traitement du linge selon la revendication 5, dans laquelle :

- lesdites plusieurs électropompes sont commandées par des interrupteurs respectifs (14a, 15a) ;
- lesdits circuits de détection électroniques (14b, 15b) sont conçus pour détecter un dysfonctionnement desdits interrupteurs (14a, 15a).

7. Machine de traitement du linge selon l'une quelconque des revendications précédentes, dans laquelle

- lesdites secondes charges électroniques/électriques (20, 23) comprennent un dispositif de chauffage, qui est connecté entre ladite ligne d'alimentation de porte (11) et une ligne de référence (3) ayant une tension fixée au préalable,
- lesdits circuits de détection électronique comprenant un circuit de détection de dispositif de chauffage (26) qui est connecté électriquement entre ledit dispositif de chauffage et ladite ligne d'alimentation principale (10), par l'intermédiaire dudit premier commutateur (16),
- l'ouverture dudit premier commutateur (16) entraînant la déconnexion du circuit de détection de dispositif de chauffage (26) de ladite ligne d'alimentation principale (10).

8. Machine de traitement du linge selon l'une quelconque des revendications précédentes, dans laquelle lesdits moyens de commande électroniques (13) sont en outre configurés pour commuter ledit premier commutateur (16) dudit état fermé audit état ouvert, après que l'interrupteur de verrouillage de porte (12) est commuté de l'état fermé à l'état ouvert, lorsque ladite machine de traitement du linge passe d'un état sous tension à un état hors tension.

9. Machine de traitement du linge selon l'une quelconque des revendications précédentes, conçue pour être commutée aller et retour entre un état de fonctionnement associé à une consommation d'énergie élevée, et un état d'attente associé à une consommation d'énergie intermédiaire inférieure à ladite consommation d'énergie élevée ; ledit état actif correspondant audit état d'attente ; ladite consommation d'énergie active correspondant à ladite consommation d'énergie intermédiaire ; l'état de fonctionnement est un état actif dans lequel la machine de traitement du linge (1) exécute un cycle de traitement du linge, l'état d'attente est un état actif dans lequel la machine reste temporairement au repos, attendant l'instruction d'un utilisateur.

10. Machine de traitement du linge selon la revendication 9, dans laquelle lesdits moyens de commande électroniques (13) sont configurés pour commuter ledit interrupteur de verrouillage de porte (12) de l'état fermé à l'état ouvert lorsque ladite machine de traitement du linge passe de l'état de fonctionnement audit état d'attente.

11. Machine de traitement du linge selon la revendication 10, dans laquelle lesdits moyens de commande électroniques (13) sont configurés pour contrôler un ou plusieurs paramètres de ladite machine de traitement du linge dans ledit état d'attente, et commutent ledit interrupteur de verrouillage de porte (12) de l'état fermé à l'état ouvert sur la base du résultat dudit contrôle.

12. Procédé de commande d'une machine de traitement du linge (1), comprenant :

- un boîtier (2),
- un tambour (4) monté à l'intérieur dudit boîtier (2) et conçu pour recevoir du linge,
- une porte à hublot (5) pour donner accès au tambour (4),
- une ligne d'alimentation principale (10) conçue pour présenter une tension d'alimentation principale fixée au préalable (V1),
- une ligne d'alimentation de porte (11),
- un interrupteur de verrouillage de porte (12),

qui est conçu pour être commuté aller et retour entre un état fermé et un état ouvert pour respectivement connecter et déconnecter ladite ligne d'alimentation de porte (11) à et de ladite ligne d'alimentation principale (10),
- une ou plusieurs premières charges électroniques/électriques (14, 15) connectées à ladite ligne d'alimentation principale (11), en amont dudit interrupteur de verrouillage de porte (12),
- une ou plusieurs secondes charges électroniques/électriques (20, 23) connectées à ladite ligne d'alimentation principale (11), en aval dudit interrupteur de verrouillage de porte (12),
- un ou plusieurs circuits de détection électroniques (14b, 15b, 27, 32), qui sont connectés à ladite ligne d'alimentation principale (10) en amont dudit interrupteur de verrouillage de porte (12) et sont configurés pour détecter un ou plusieurs paramètres indiquant le fonctionnement desdites premières charges électroniques/électriques (14, 15) et/ou desdites secondes charges électroniques/électriques (20, 23),
- un premier commutateur (16), qui connecte lesdites premières charges électroniques/électriques (14, 15) et lesdits circuits de détection (14b, 15b, 27, 32) à ladite ligne d'alimentation principale (11) en amont dudit interrupteur de verrouillage de porte (12),

ladite machine de traitement du linge étant conçue pour passer d'un état actif associé à une consommation d'énergie active à un état de veille associé à une consommation d'énergie minimale inférieure à ladite consommation d'énergie active dans lequel ledit interrupteur de verrouillage de porte (12) est dans l'état ouvert,

- ledit procédé étant **caractérisé en ce qu'**il comprend l'étape de commutation dudit premier commutateur (16) d'un état fermé à l'état ouvert pour la déconnexion électrique desdites premières charges électroniques/électriques (14)(15) et desdits circuits de détection (14b, 15b, 27, 32) de ladite ligne d'alimentation principale (11) lorsque ladite machine de traitement du linge est dans ledit état de veille.

13. Procédé selon la revendication 12, dans lequel ladite machine de traitement du linge (1) comprend un moteur électrique (6) conçu pour faire tourner ledit tambour (4),

- lesdites secondes charges électroniques/électriques (20, 23) comprenant un dispositif de commande de moteur (23), qui est configuré pour commander ledit moteur électrique (6),
- une ligne de courant (28), qui connecte électriquement ledit dispositif de commande de moteur (23) à ladite ligne d'alimentation principale (10) par l'intermédiaire dudit premier commutateur (16),
- ledit procédé comprenant l'étape de commutation dudit premier commutateur (16) de l'état ouvert à l'état fermé, avant que l'interrupteur de verrouillage de porte (12) soit commuté de l'état ouvert à l'état fermé, lorsque ladite machine de traitement du linge passe d'un état hors tension à un état sous tension, afin de fournir un courant audit dispositif de commande de moteur (23) par le biais de ladite ligne de courant (28).

14. Procédé selon l'une quelconque des revendications 12 ou 13, comprenant l'étape de commutation dudit premier commutateur (16) dudit état fermé audit état ouvert, après que l'interrupteur de verrouillage de porte (12) est commuté de l'état fermé à l'état ouvert, lorsque ladite machine de traitement du linge passe d'un état sous tension à un état hors tension.

15. Procédé selon l'une quelconque des revendications 12 à 14, comprenant l'étape de commutation de la machine de traitement du linge (1) aller et retour entre un état de fonctionnement associé à une consommation d'énergie élevée, et un état d'attente associé à une consommation d'énergie intermédiaire inférieure à ladite consommation d'énergie élevée ; ledit état actif correspondant audit état d'attente et ladite consommation d'énergie active correspondant à ladite consommation d'énergie intermédiaire ; l'état de fonctionnement est un état actif dans lequel la machine de traitement du linge (1) exécute un cycle de traitement du linge, l'état d'attente est un état actif dans lequel la machine reste temporairement au repos, attendant l'instruction d'un utilisateur.

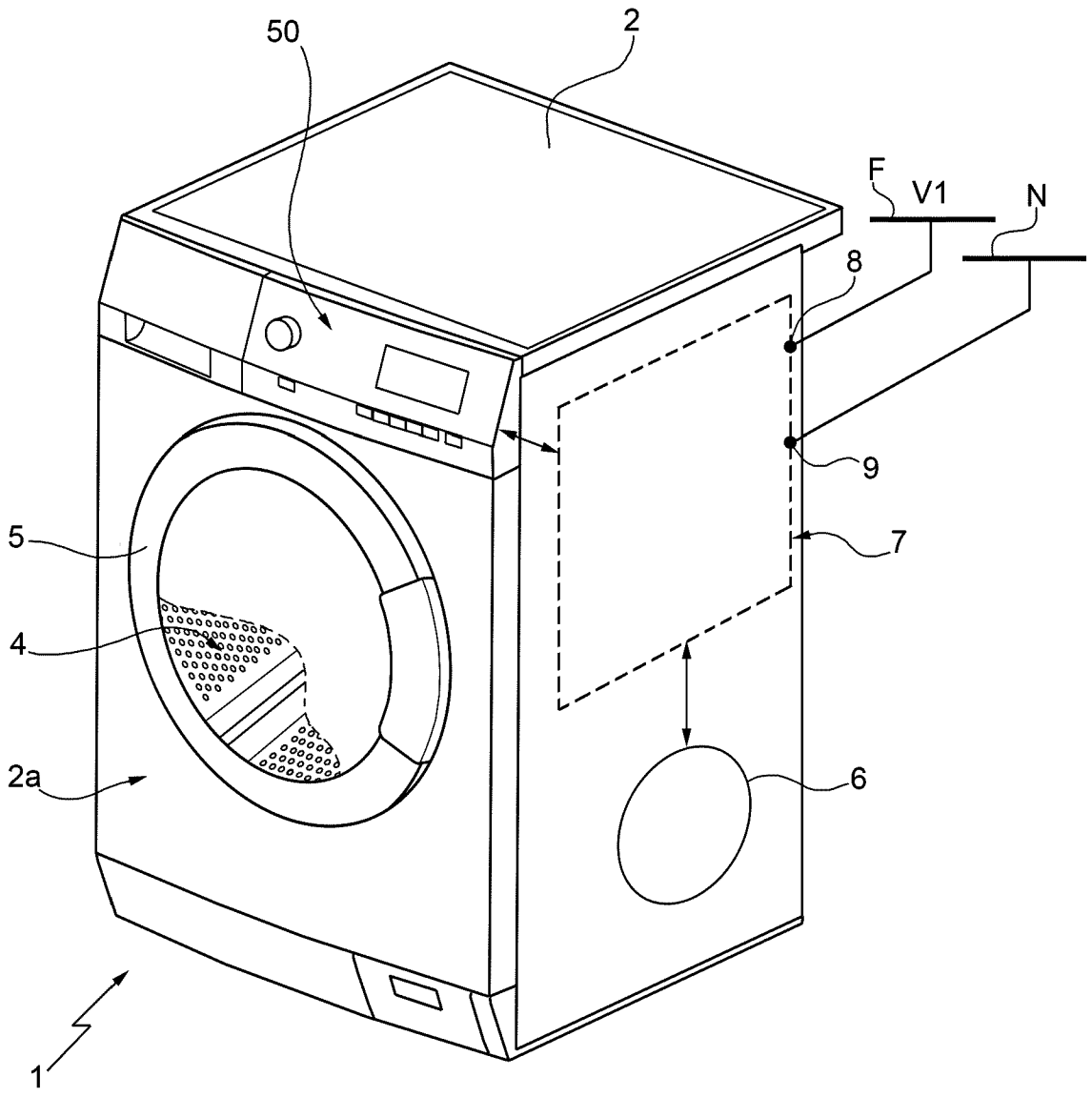
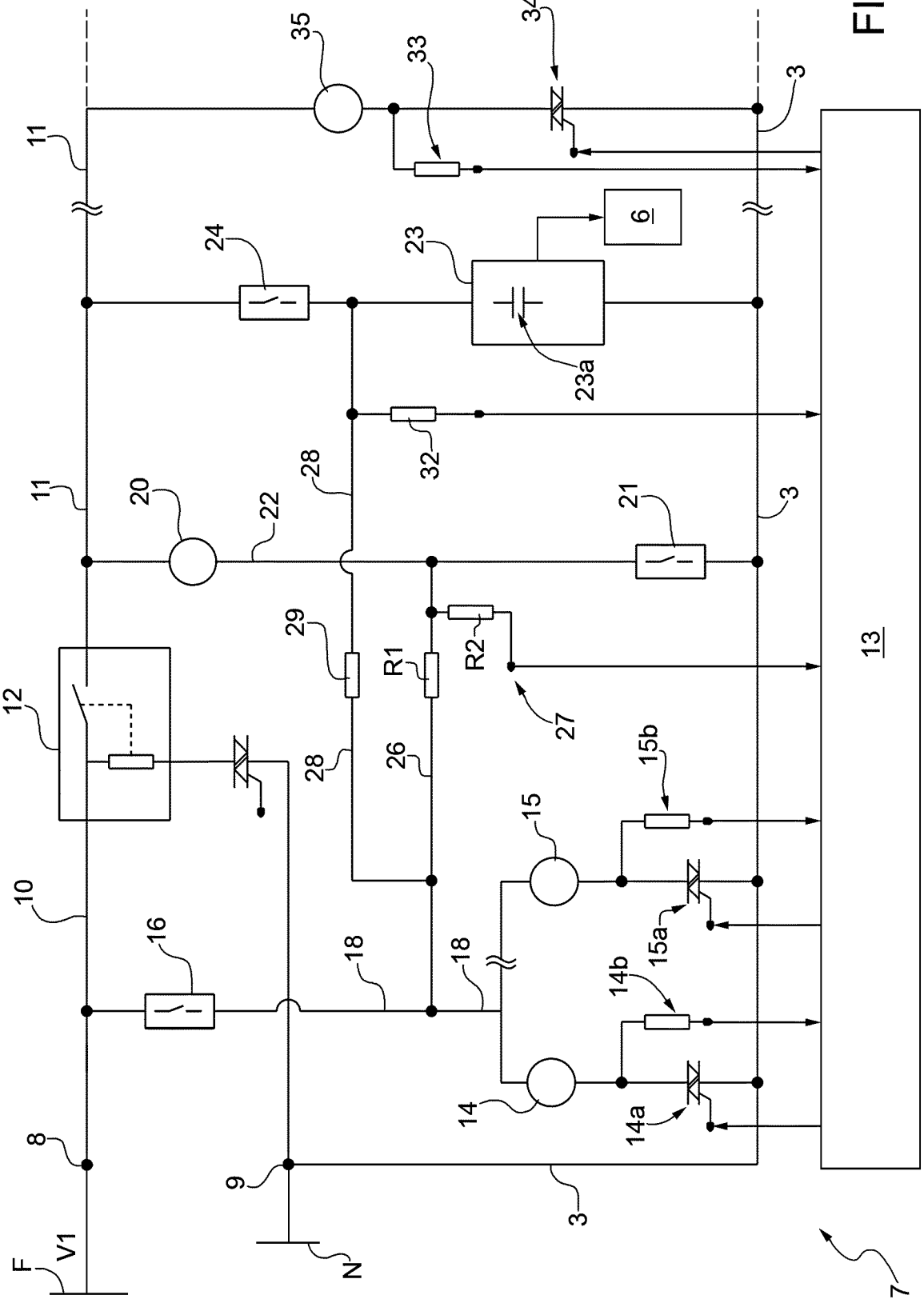


FIG.1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34
3
11
6
24
23
23a
32
28
20
22
21
29
R1
R2
27
12
26
15b
15
10
16
18
15a
14b
14
14a
8
9
3
F
V1
N
13
7

FIG.2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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