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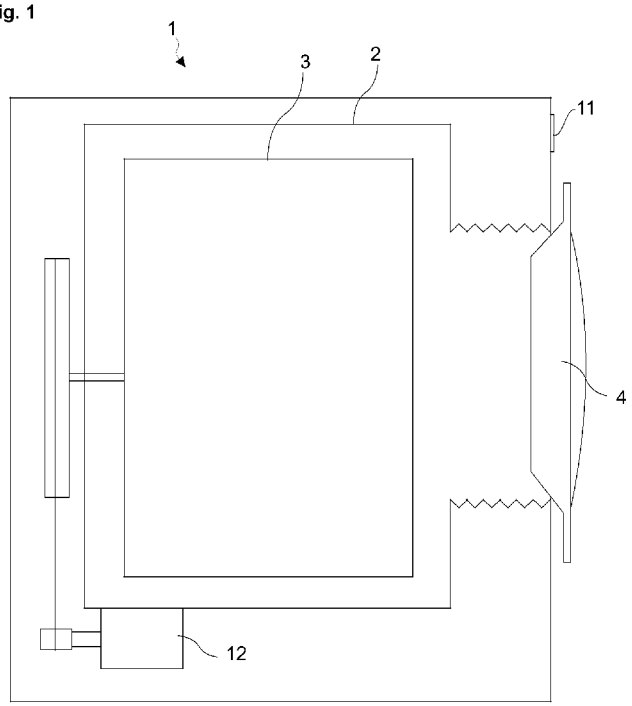
(54) Title: LAUNDRY TREATMENT APPLIANCE HAVING IMPROVED DOOR SAFETY

Fig. 1



(57) Abstract: The present invention relates to a laundry treatment appliance (1) comprising a rotary drum (3) wherein the laundry to be treated is placed, an electric motor (12) rotating the rotary drum (3), a control interface for operating the laundry treatment appliance (1) and a door (4) allowing access into the drum (3) for loading or unloading laundry. The present invention more particularly relates to a laundry washing and drying appliance having a restarting control mechanism ensuring that the restarting operation is initiatable when the door (4) of the laundry treatment appliance is closed.

Description

LAUNDRY TREATMENT APPLIANCE HAVING IMPROVED DOOR SAFETY

[0001] The present invention relates to a laundry washing and/or drying appliance comprising a door and having an operation initiation control mechanism ensuring that the operation is initiatable only when the door of the appliance is closed.

The doors of laundry treatment appliances are automatically locked during the washing process for the safety of the user. Typically, a microprocessor oversees the open or closed states of the door so as to prevent any attemps to access into the drum when the latter is in rotation.

[0002] It is to be noted that laundry treatment appliances are attractive devices for toddlers and kids for the unique reason that such appliances' control panels and doors get readily accessible to them as they grow up. Further, as more recent appliances have an increased load capacity, a direct result associated therewith is that larger doors are being designed.

Unfortunately, a plurality of tragic occurrences is reported in the country of the applicant, such occurrences involving death of children entering in the drum while playing. It is therefore of utmost importance to diversify safety measures to help avoid such tragic occurrences.

[0003] Situations which may pose serious risks include automatic restarting of the appliance after the door is opened during operation and reclosed with a certain period in between and pressing the start button without the door being closed. The latter situation is especially dangerous as a considerable amount of time may have passed since the start button is pressed, during which the door remained open, or the button may have in the first place been pressed by a child. In the first situation where an adult deliberately stops the appliance's operation by opening the door and leaves his/her children unattended for a while, it is more likely that he/she will return soon and complete the washing and/or drying process, so a shorter risk time can be predicted.

[0004] The present invention therefore proposes an arrangement according to which starting or restarting of the washing/drying process is not affected if the condition of the door is not sensed as closed when the start button was

pressed.

[0005] Further, it is known that an electronic control system is vulnerable in the sense that various problems including software based problems as well as environmental impacts such as noise, irregularity in the mains voltage or the electromagnetic field in the air may affect the operation. The present invention also addresses this issue and proposes a more reliable control approach for eliminating risks stemming from environmental conditions.

[0006] A prior art publication in the technical field of the present invention may be referred to as WO2008148788 among others, the document disclosing a washer/dryer with a microprocessor that allows the door lock to be opened only after ensuring that the electric motor has halted before the door is opened, and an extra control circuit that cuts off the energy of the relay operating the electric motor in the case the microprocessor is in error.

[0007] The present invention provides an arrangement in relation to laundry treatment appliances having a starting control mechanism, which is defined by the characterizing features as defined in Claim 1.

[0008] Primary object of the present invention is hence to provide a laundry treatment appliance with a starting control mechanism ensuring that the starting operation is initiatable when the front door of the appliance is closed.

[0009] The present invention proposes a laundry treatment appliance with a control unit which initiates rotation of the appliance's drum only upon completion of a prescribed sequence of actions and in a predetermined time duration in the following situations:

[0010] a) In a first situation where the appliance is stopped and restarted after the door is left open for instance more than three seconds,

[0011] b) In a second situation where a starting signal is given while the door is not closed.

[0012] The prescribed sequence of actions to be fulfilled in three seconds comprises reopening and subsequent closing of the door. A mechanical door switch is provided, whose contacts being opened and closed in response to the open and closed position of the door. The laundry treatment appliance further comprises a door lock driven by the control

unit as of starting of the operation. Said door lock is energized by way of closing a relay that is a microprocessor controlled switch.

[0013] Another microprocessor controlled switch is provided to be closed in order for applying a control voltage to the mechanical door switch, in response to which a voltage value that is indicative of the state of the mechanical door switch is communicated to the control unit by means of a position verification feed-back circuit.

[0014] Accompanying drawings are given solely for the purpose of exemplifying a laundry treatment appliance, whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0015] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in said claims without recourse to the technical disclosure in the description of the present invention.

[0016] Fig. 1 demonstrates a general cross-sectional view of a laundry treatment appliance according to the present invention.

[0017] Fig. 2 demonstrates the main embodiment according the present invention in the form of block elements involved.

[0018] Fig. 3 demonstrates a further embodiment according the present invention in the form of block elements involved.

[0019] The following numerals are used in the detailed description of the invention:

1. Laundry treatment appliance
2. Water tub
3. Rotary drum
4. Door
5. Control unit
6. First microprocessor controlled switch
7. Door lock
8. Second microprocessor controlled switch
9. Mechanical door switch
10. Position verification feed-back circuit
11. Control interface

12. Electric motor

[0020] The present invention relates to a laundry treatment appliance (1) comprising a water tub (2) and a rotary drum (3), in which the laundry is to be placed, a door (4) typically allows access into the drum (3) for loading or unloading laundry and a control interface (11) for operating the laundry treatment appliance (1)

[0021] The laundry treatment appliance (1) comprises an electric motor (12) rotating the drum (3) wherein the laundry is placed. In a situation where the laundry treatment appliance (1) is stopped and restarted after the door (4) is left open a certain period of time or the start button was pressed while the door (4) is not closed and the door (4) is closed at a later moment, a serious risk may occur due to the fact that the door (4) may have remained open during an unknown period. Therefore, it is necessary to ensure that the door (4) is opened and closed in the presence of an adult.

[0022] A door lock (7) is conventionally provided in order for preventing opening of the door (4) during washing and/or drying processes. Said door lock (7) is typically driven by means of a first relay or a triac, that is a first microprocessor controlled switch (6). In the event that the door lock (7) is unlocked by the user by stopping an ongoing washing/drying process, restarting of the process is not affected if the door (4) is not closed within a certain amount of time. If the door (4) is closed after such predetermined amount of time is exceeded, the user is required to subsequently reopen and reclose the door (4) within the prescribed time.

[0023] Likewise, if the start button was pressed while the door (4) is not closed and the door (4) is closed at a later moment, the user is again required to follow the prescribed sequence of actions, i.e. reopen and reclose the door (4) for the respective laundry treatment program to be initiated. Therefore, in both cases it is ensured that the door (4) is opened and subsequently closed in a prescribed time, for instance 3 seconds.

[0024] The present invention further proposes an arrangement in which a control unit (5), i.e. a microprocessor communicates with a second relay or a triac that is a microprocessor controlled switch (8). Said microprocessor

controlled switch (8) is closed in order for applying a control voltage to a mechanical door switch (9) which changes to active and passive modes in response to the actual open and closed condition of the door (4). More precisely, if the door (4) is closed, contacts of said mechanical door switch (9) are closed and said control voltage applied on the mechanical door switch (9) is read by the control unit (5) by means of a position verification feed-back circuit (10). Therefore, while the microprocessor controlled switch (8) being energized, the mechanical door switch's (9) actual state is read by the control unit (5) in order for verifying the state of the door (4).

[0025] It is to be noted that the control unit (5) verifies the state of the door (4) by closing the microprocessor controlled switch (8) each time the electric motor (12) is to be energized. Therefore, in the event that the prescribed sequence of actions is fulfilled in response to a first situation where the laundry treatment appliance (1) is stopped and restarted after the door (4) is left open a certain period of time or a second situation where the start button was pressed while the door (4) is not closed and the door is closed at a later moment, the control unit (5) checks whether the information received from the mechanical door switch (9) is corresponding to the information received from the position verification feed-back circuit (10) by closing the microprocessor controlled switch (8).

[0026] In a nutshell, the present invention proposes a laundry treatment appliance (1) comprising a rotary drum (3) wherein the laundry to be treated is placed, the electric motor (12) rotating the rotary drum (3), a control interface (11) for operating the laundry treatment appliance (1) and a door (4) allowing access into the drum (3) for loading or unloading laundry. The laundry treatment appliance (1) comprises a control unit (5) which energizes the electric motor (12) only upon completion of a prescribed sequence of actions in a predetermined time duration, in response to a first situation where operation of the laundry treatment appliance (1) is stopped and then restarted after the door (4) is left open a certain period of time longer than said predetermined time duration or in response to a second situation where a starting signal is produced by means of the control interface (11) while the door (4) is not closed and the (4) door is

closed at a later moment.

Claims

1. A laundry treatment appliance (1) comprising a rotary drum (3) wherein the laundry to be treated is placed, an electric motor (12) rotating the rotary drum (3), a control interface (11) for operating the laundry treatment appliance (1) and a door (4) allowing access into the drum (3) for loading or unloading laundry, **characterized in that** a control unit (5) which energizes said electric motor (12) only upon completion of a prescribed sequence of actions in a predetermined time duration, in response to a first situation where operation of the laundry treatment appliance (1) is stopped and then restarted after the door (4) is left open a certain period of time longer than said predetermined time duration or in response to a second situation where a starting signal is produced by means of said control interface (11) while the door (4) is not closed and the door (4) is closed at a later moment.
2. The laundry treatment appliance (1) as in Claim 1, **characterized in that** said prescribed sequence of actions comprises opening and subsequent closing of the door (4).
3. The laundry treatment appliance (1) as in Claim 1 or 2, **characterized in that** a mechanical door switch (9) which changes to active and passive modes in response to actual open and closed condition of the door (4).
4. The laundry treatment appliance (1) as in Claim 1, **characterized in that** a door lock (7) preventing opening of the door (4) during washing and/or drying processes.
5. The laundry treatment appliance (1) as in Claim 4, **characterized in that** said door lock (7) is driven by means of a relay in the form of a first microprocessor controlled switch (6).
6. The laundry treatment appliance (1) as in Claim 5, **characterized in that** said door lock (7) is driven by means of a triac in the form of a first microprocessor controlled switch (6).
7. The laundry treatment appliance (1) as in Claim 3, **characterized in that** a second microprocessor controlled switch (8) is provided to be closed in order for applying a control voltage to said mechanical door switch (9).
8. The laundry treatment appliance (1) as in Claim 7, **characterized in that** the second microprocessor controlled switch (8) is a relay.

9. The laundry treatment appliance (1) as in Claim 7, **characterized in that** the second microprocessor controlled switch (8) is a triac.
10. The laundry treatment appliance (1) as in Claim 3, **characterized in that** the control voltage applied on the mechanical door switch (9) is read by the control unit (5) by means of a position verification feed-back circuit (10).

Fig. 1

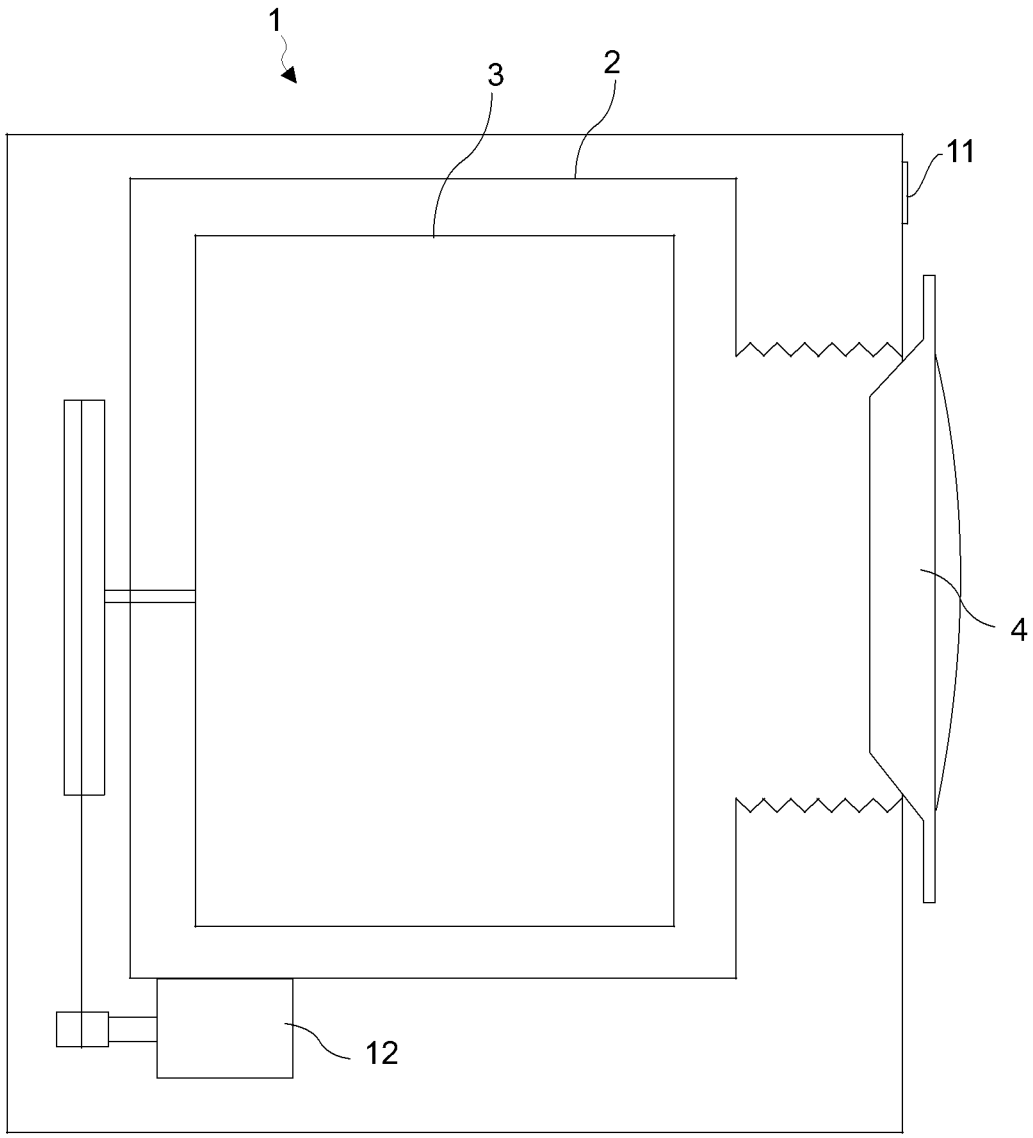


Fig. 2

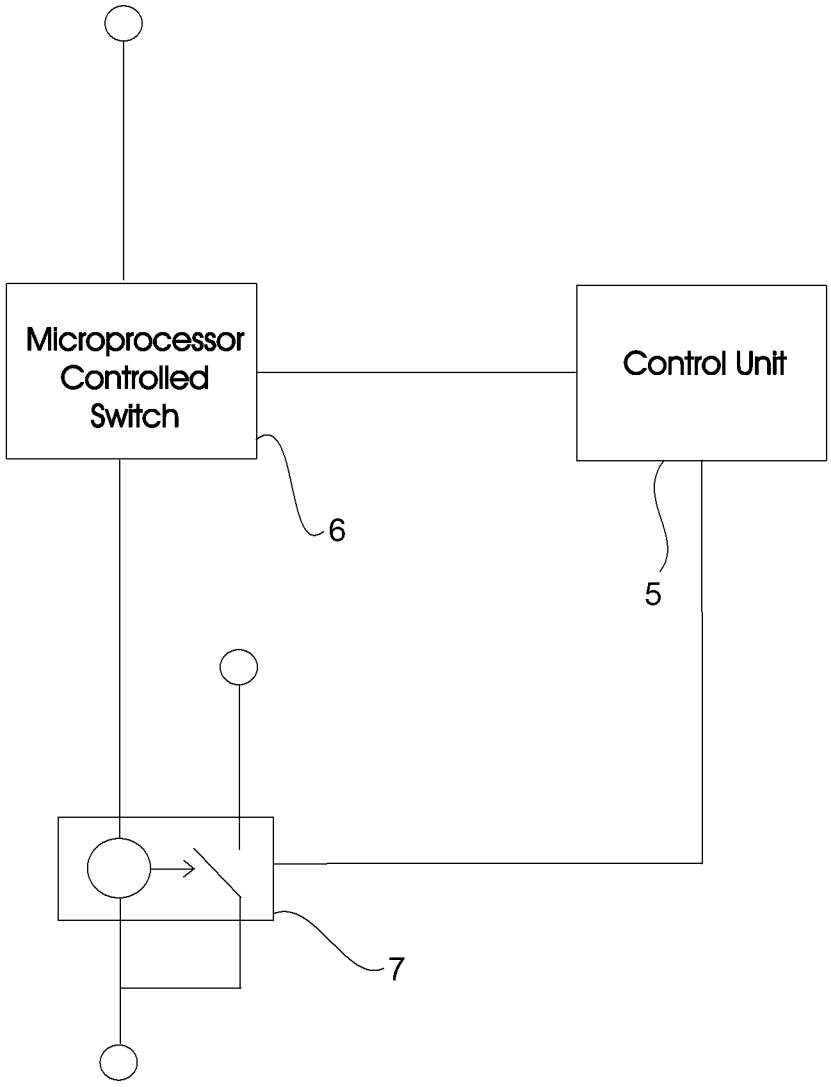
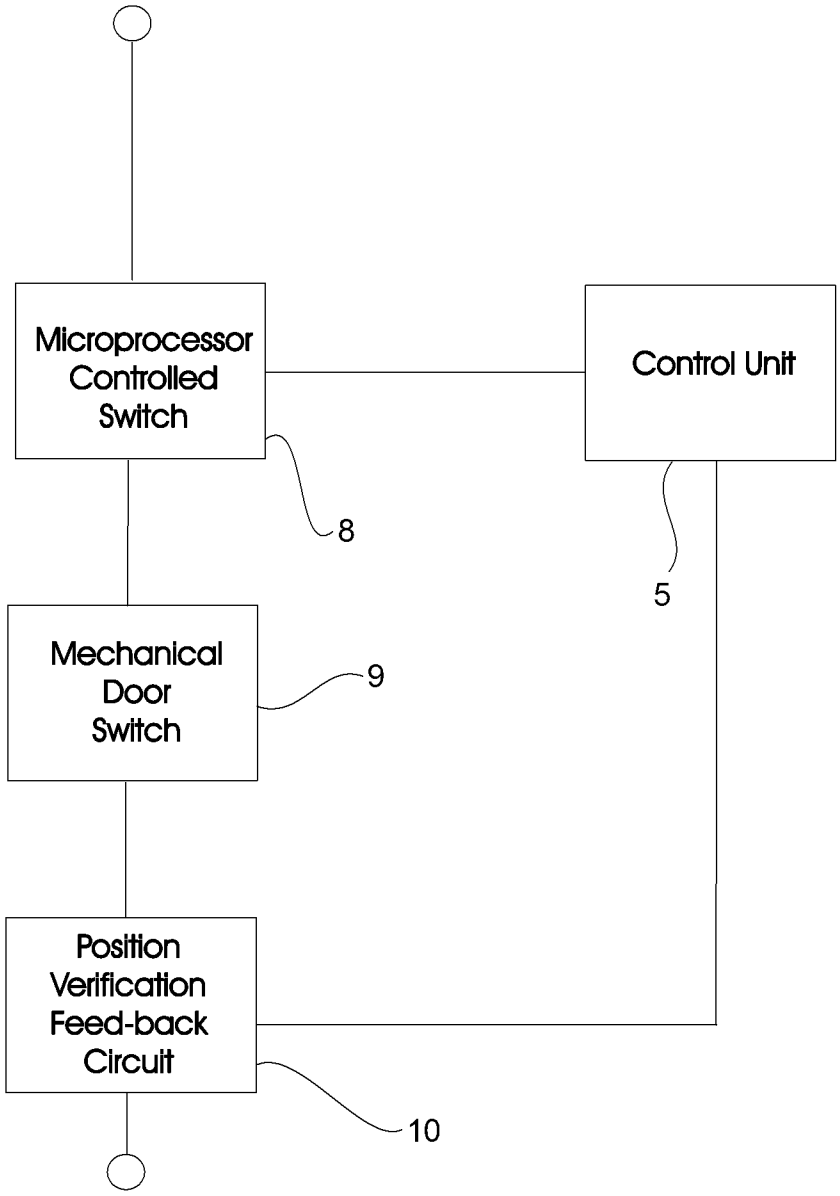


Fig. 3


Microprocessor Controlled Switch
Control Unit
8
5
Mechanical Door Switch
9
Position Verification Feed-back Circuit
10

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/064260

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F37/42 D06F33/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 123 819 A1 (ELECTROLUX HOME PROD CORP [BE]) 25 November 2009 (2009-11-25) paragraphs [0005] - [0007], [0010], [0011]; figures	1-10
A	US 2003/197387 A1 (DIRNBERGER ALBERT [DE]) 23 October 2003 (2003-10-23) paragraphs [0012], [0016], [0037] - [0043]; figures	1-10
A	WO 2008/148788 A2 (ARCELIK AS [TR]; OZKAHRAMAN HAKAN [TR]; YILMAZ NAMIK [TR]; EFECIK BULE) 11 December 2008 (2008-12-11) cited in the application paragraphs [0004], [0015] - [0018]; claim 1; figures	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/064260

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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