

(19)



(11)

EP 3 428 337 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
19.02.2020 Bulletin 2020/08

(51) Int Cl.:
D06F 37/10 ^(2006.01) **D06F 37/26** ^(2006.01)
D06F 37/28 ^(2006.01)

(21) Application number: **17180755.5**

(22) Date of filing: **11.07.2017**

(54) WASHING MACHINE DOOR LOCKING AND SEALING MECHANISM

WASCHMASCHINE MIT TÜRSCHLIESS- UND DICHTUNGSMECHANISMUS

LAVE-LINGE AVEC UN MÉCANISME DE VERROUILLAGE ET DE JOINT

(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**

(43) Date of publication of application:
16.01.2019 Bulletin 2019/03

(73) Proprietor: **Vestel Elektronik Sanayi ve Ticaret A.S.**
45030 Manisa (TR)

(72) Inventor: **TÜNAY, Erkan**
45030 Manisa (TR)

(74) Representative: **Ascherl, Andreas et al**
KEHL, ASCHERL, LIEBHOFF & ETTMAYR
Patentanwälte - Partnerschaft
Emil-Riedel-Strasse 18
80538 München (DE)

(56) References cited:
CN-U- 202 986 773 CN-U- 204 403 367
US-A1- 2015 361 690

EP 3 428 337 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] This invention refers to a washing machine according to claim 1, which provides an efficient and long-lasting door locking and sealing mechanism.

Background of the Invention

[0002] Generally, most of the washing machine models include a mechanical door switch for effectuating closing and opening of the door of the washing machine. When the door is closed or opened, a mechanical switch is contacted or non-contacted and a microcontroller can sense the door state for allowing further usage of the washing machine accordingly. Also, frame of the door contains a plastic, circular shape material, i.e., a gasket for preventing water leakage when the machine is performing the washing function. These types of washing machine cause two problems separately. First one is that the mechanical switch can cause electrical arc while opening or closing, and can be damaged in the course of time due to the mechanical friction. The second problem is with respect to the gasket of the frame of the door plastic. This gasket sticks with the help of vacuum to the cabin wall of the washing machine and prevents the liquid to leak. This gasket is damaged in the course of time due to regular opening and closing of the door for using the washing machine. These two parts of the washing machine door are weak parts.

[0003] Chinese Patent No. CN2639340 discloses a single-row airbag bidirectional inclined type of a washing machine, which comprises a washing machine main body, a washing machine base located under the main body of the washing machine, a damping airbag arranged between the washing machine main body and the washing machine base, characterized in that the outer cylinder of the washing machine main body, the front cover of the main body of the washing machine is also tapered with the outer cylinder of the tapered outlet; an inflatable sealing device is arranged in the door of the washing machine; the base of the washing machine is composed of the lower base and the inclined base; and a tilting base is arranged between the base and the inclined base, which comprises a single row of inclined airbags arranged on the left and right sides, the lower end hinged to the front and rear sides of the lower base and the upper and the rear ends are hinged with the inclined base, hook hinge front and rear cylinder.

[0004] UK Patent Application No. GB890947 discloses a washing and spin-drying machine having a perforated drum, has a latch-bolt on the frame door kept in the locked position by fluid under pressure. The source of fluid pressure is coupled with the latch bolt and is opened up only when the bolt is in door-holding position and when a control member is in position to energize the drum-rotation means.

[0005] Chinese Patent Publication No. CN201586655 discloses a hopper cleaning machine equipped with an

inflatable sealing device, which comprises a machine body, a door body, and a lock and a sealing device which are arranged between the machine body and the door body. The machine body and the door body are connected via a hinge, and the lock is formed by a lock handle and a locking piece. The machine is mainly characterized in that the door body is formed by wrapping stainless steel plates on the outside of a door body frame, and a machine body frame is arranged on the periphery of a door of the machine body; a sealing groove is manufactured on the outer side of the periphery of the door body frame, an inflatable sealing ring is mounted inside the sealing groove, and a sealing working face of the inflatable sealing ring is in a large arc inwardly concave shape in natural state; and an inflation switch is mounted on the machine body frame. The inflatable sealing ring is inflated by an air source in sealed state, the sealing working face of the inflatable sealing ring projects towards the machine body frame direction and realizes sealing with the same without adding pressure on the lock, the lock has the advantages of being light and convenient in opening, fine in sealing performance and the like, and the machine is suitable in pharmaceutical container washing equipment.

Description of the Invention

[0006] US Patent US20150361690 (D1) discloses a lock system for an appliance providing multiple detection switches for lid closure and lid locking encodes the switch states as different voltages on a single signal line to reduce wiring harness costs. The invention provides a door lock for a door of an appliance and a door locking element movable between an unlock position and lock position to lock the door. A door position switch is positioned to sense a closure of the door and a lock sensing switch is positioned to sense the door locking element being in the lock position. A first and second resistor each having different unique values are each attached to a corresponding one of the door position switch and the lock sensing switch so that corresponding switches control current through the corresponding attached resistors, the first, and second resistor communicating with a signal wire to provide a unique current through a signal wire as a function of the states of the door position switch and the lock sensing switch.

[0007] Chinese Patent No CN204403367 (D2) discloses a sealing ring applicable to a fuel oil evaporation measurement closed chamber door. The sealing ring adopts a closed annular structure; a cavity used for inflating is formed in the sealing ring; the sealing ring comprises an inner side, an outer side, an upper side and a lower side; the side, facing the center of the sealing ring, of the sealing ring, is the inner side; the inner side is a plane; the side opposite to the inner side is the outer side; the outer side is a concave surface which is sunken inwards; the upper side and the lower side are planes; an air inlet is formed in the inner side; the sealing ring is made of a silicone rubber material. The sealing ring disclosed by

the utility model is made of the silicon rubber material, so that permeation and release of hydrocarbons are avoided, and the sealing ring is not in chemical reaction with the hydrocarbons and sulfides, and is long in service life; the accuracy of a measurement result of a closed type method is ensured; the concave surface contact is adopted, the sealing rings deforms after being inflated to achieve a sealing effect. Compared with the surface contact in the prior art, the concave surface contact has the advantages that the service life is long, and an air leakage phenomenon does not occur easily.

Object of the Invention

[0008] It is therefore the object of the present invention to overcome shortcomings of the known washing machines due to mechanical door lock and gasket of the door frame, and to provide an efficient and long lasting locking and sealing mechanism for a washing machine door.

Description of the Invention

[0009] The before mentioned object is solved by a washing machine according to claim 1.

[0010] A washing machine comprising a washing drum for holding clothes while the clothes are being washed, and a locking door for allowing access through an opening in a cabinet wall of the washing machine to inside of the washing drum for putting or taking out the clothes, wherein the locking door of the washing machine comprises: a tubular air bagel having a perimeter and being affixed to the locking door on a side facing the washing drum; and an air pump which is adapted to pumps in air into the tubular air bagel for expanding the tubular air bagel into the expanded position or adapted to suck out air from the tubular air bagel to compress from the expanded position to the normal position, wherein when the locking door is closed and the tubular air bagel is expanded to be in the expanded position, the tubular air bagel compresses the locking door and the cabinet wall, such that a part of the surrounding cabinet wall is sandwiched between the tubular bagel and the locking door of the washing machine for locking the locking door, and when the tubular air bagel compresses to be in the normal position, the locking door is unlocked.

[0011] This provides a mechanism for locking the locking door of the washing machine due to the pressure exerted by the tubular air bagel onto the cabinet wall after being in expanded position. Additionally, in the expanded position, the tubular air bagel does not leave any space for water to seep out of the opening via the locking door.

[0012] Further preferred embodiments are subject-matter of dependent claims and/or of the following specification parts.

[0013] According to a preferred embodiment of the washing machine, the washing machine comprises a user input device adapted to provide an input for locking or

unlocking the locking door of the washing machine, and based on the input the tubular air bagel is adapted to move into the expanded position to normal position, and vice-versa.

5 [0014] This embodiment is beneficial as it provides an automatic and regulated mechanism for locking and unlocking the locking door by the usage of the user input device.

10 [0015] According to a further embodiment of the washing machine, the user input device is a touch sense device or a gesture recognition device, and is adapted to receive the input based on a specific finger movement onto the touch sense device or recognized by the gesture recognition device.

15 [0016] This embodiment is helpful, as it provides an user friendly mechanism for locking and unlocking the locking door.

[0017] According to another embodiment of the invention, the specific finger movement for locking the locking door is a movement of thumb along with at least one of the fingers of one hand together at same time in same direction representative of pushing the locking door.

20 [0018] This embodiment is beneficial, as it makes usage of the user input device easier and simple, which requires less effort for learning the functionality provided by the user input device.

25 [0019] According to a further embodiment of the washing machine, the user input device is attached to the locking door at the other side of the locking door which is not facing the washing drum when closed.

30 [0020] This embodiment is beneficial, as it provides a convenient location for using the user input device.

35 [0021] According to a preferred embodiment of the washing machine, the tubular air bagel is made of a composite material comprising elastic plastic.

[0022] This embodiment is beneficial, as it provides a suitable material for the tubular air bagel, so that it can be timely inflated or deflated to be in expanded position or the normal not expanded position.

40 [0023] According to another embodiment of the device, the tubular air bagel is of variable thickness at various parts of the tubular air bagel, in such a way that the thickness of the material shall be lesser at the parts where the tubular air bagel is compressing the locking door against the cabinet wall when being in the expanded position.

45 [0024] This embodiment is beneficial, as it provides a further efficient mechanism for locking and sealing the locking door.

50 [0025] According to the invention the washing machine comprises an air pump for pumping in air into the tubular air bagel for expanding the tubular air bagel into the expanded position or sucks in air from the tubular air bagel to compress from the expanded position to the normal position.

55 [0026] This embodiment is beneficial, as it provides for easy way for pumping in and pumping out air from the tubular air bagel.

[0027] According to another embodiment of the washing machine, the washing machine comprises a micro-controller adapted to receive the input and to process the input, and to accordingly actuate the air pump for expanding or compressing the tubular air bagel.

[0028] This embodiment is beneficial, as it provides a further automatic and precise mechanism for locking and unlocking of the locking door. Use of microcontroller reduces manual and mechanical intervention in locking and unlocking of the locking door, hence the locking mechanism further becomes error free with less false positives.

[0029] According to a further preferred embodiment of the washing machine, the washing machine comprises an air duct attached to the tubular air bagel and the air moves into and moves out of the tubular air bagel through the air duct when the air duct connects to the air pump, wherein the microcontroller is adapted to receive a feed-back from the air pump based on the connection of the air duct to the air pump and raise an alarm if there is a fault in connection between the air duct and the air pump.

[0030] This embodiment is beneficial, as it provides a mechanism to identify, if the air pump is properly connected to the tubular air bagel. If the connection is improper, the microcontroller shall identify it due to the feed-back received from air pump, and shall accordingly alarm the user of the washing machine.

[0031] According to another embodiment of the washing machine, the washing machine comprises a motor for providing a driving power, and a switch adapted to switch the driving power either to the air pump for pumping in or out the air with respect to the tubular air bagel or to the washing drum for performing the washing function onto the clothes.

[0032] This embodiment is beneficial, as it provides for a cost-effective way for locking and unlocking the locking door, as this embodiment eliminates requirement for any additional driving source for pumping the air into or out of the tubular air bagel.

[0033] According to a further embodiment of the washing machine, the microcontroller is adapted to trigger the switch to switch the driving power to the air pump when the microcontroller receives the input from the user input device relating to locking or unlocking of the locking door, and to switch the driving power to the washing drum when the locking door is locked.

[0034] This embodiment is beneficial, as it provides an automatic handling of the switch and reduces the requirement for any human intervention for handling the switch to change driving direction of the motor.

[0035] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the devices and method according to the inventions, which match at least essentially with respect to their function, can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0036] The invention is just exemplarily described with respect to the attached figure in the following.

Brief Description of the Drawings

[0037]

Fig. 1A illustrates a front side of the locking door of the washing machine.

Fig. 1B illustrates a back side of the locking door which shall be facing a washing drum of the washing machine, when a tubular air bagel is in normal position.

Fig. 1C illustrates the back side of the locking door which shall be facing the washing drum of the washing machine, when the tubular air bagel is in expanded position.

Fig. 2A illustrates an intersection of the locking door area of the washing machine, when the tubular air bagel is in expanded position.

Fig. 2B illustrates the intersection of the locking door area of the washing machine, when the tubular air bagel is in normal position.

Fig. 3 illustrates a schematic diagram of the washing machine explaining one of the embodiment of the invention.

Detailed Description of the Drawings

[0038] The present invention focuses on providing a locking mechanism for a door of a washing machine, which eliminates the requirement of traditional mechanical switches, and also provides an efficient sealing mechanism, which eliminates requirement for traditional gasket which is used for sealing the door of the washing machine for any outflow of the water, and any air leak inside a washing drum, when the washing machine is being used for washing the clothes.

[0039] Fig. 1A-1C illustrates a locking door 3 of the washing machine with prominent elements of the locking door 3 used for locking and sealing the locking door 3 when the washing machine 1 is about to be used or being used for washing the clothes.

[0040] Fig. 1A shows a front side of the locking door 3 of the washing machine, which is the other side 20 of the locking door 3 other than the one facing the washing drum. The locking door shown is circular whose central part is made of see-through glass which allows a user to see inside of the washing drum, so that the user can notice the movements of clothes inside the drum. The locking door 3 also includes the user input device 9. The user of the machine can provide an input on the user input device 9 for locking or unlocking of the locking door

3.

[0041] Fig. 1B illustrates a side 19 of the locking door 3 which shall be facing the washing drum of the washing machine, when a tubular air bagel 6 is in normal position 8. The tubular air bagel 6 is having a perimeter and is affixed to the locking door 3 on the side 19 facing the washing drum. The tubular air bagel 6 is affixed around the central see through region, so as to provide view through the see-through glass unrestricted. When the locking door 3 is not expanded, it remains in the normal position 8, which is a resting position of the tubular air bagel 6. An air duct 15 is also provided through which the air can be filled in and compressed out of the tubular air bagel 6.

[0042] Fig. 1C illustrates the side 19 of the locking door which shall be facing the washing drum of the washing machine, when the tubular air bagel 6 is in expanded position 7. When the air is filled into the tubular air bagel 6 through the air duct 15, the tubular air bagel 6 expands to be in expanded position 7. The tubular air bagel 6 compresses the locking door 3 and the cabinet wall of the washing machine for locking the locking door 3, and when the tubular air bagel 6 compresses to be in a normal position 8, the locking door 3 is unlocked.

[0043] FIG 2A-2B explains about expanding of the tubular air bagel 6 to be in expanded and compressed form.

[0044] Fig. 2A illustrates an intersection of the locking door area of the washing machine, when the tubular air bagel 6 is in expanded position. The figure shows the locking door 3 which is closed and locked. The locking door 3 is locking access to an opening 4 of the washing machine, which further provide access to inside of the washing drum. The tubular air bagel 6 is in expanded position 7, and compressing the locking door 3 and a cabinet wall 5 of the washing machine. To provide a strong and efficient locking, the tubular air bagel 6 is of variable thickness at various parts of the tubular air bagel 6, in such a way that the thickness of the material shall be lesser at the parts where the tubular air bagel 6 is compressing the locking door 3 against the cabinet wall 5 when being in the expanded position 7. In an alternate embodiment, the tubular air bagel 6 is of uniform thickness at every part for providing locking and unlocking mechanism for the locking door 3.

[0045] Fig. 2B illustrates the intersection of the locking door area of the washing machine, when the tubular air bagel 6 is in normal position 8. The figure shows the locked door 3 closed, however in the unlocked position. When an input is received on the user input device 9, the tubular air bagel 6 moves from the expanded position to the normal position 8. When the user input device 9 receives input for locking the locking door 3 from a user, the tubular air bagel 6 expands to the expanded position 7 as in Fig. 2A.

[0046] Fig. 3 illustrates a schematic diagram of the washing machine 1 explaining one of the embodiment of the invention.

[0047] The washing machine 1 includes a washing

drum 2 used for washing the clothes. Access to the washing drum 2 is through an opening in a cabinet wall 5 of the washing machine 1. For using the washing machine 1, a locking door 3 of the washing machine 1 should be closed and locked to disallow access to the washing drum 1 when the washing machine is being used. Further, for the purpose of cleanliness and efficiency, the locking door 3 should also be sealed to make it leak proof for air or liquid leak from inside of the washing drum 2 to outside, or vice-versa.

[0048] To help out with the locking and sealing functionality, traditionally used mechanical door switches and gasket of the door is replaced with a tubular air bagel 6. The tubular air bagel 6 has a perimeter and is affixed to the locking door 3 on a side facing the washing drum 2. The perimeter of the tubular air bagel 6 should not restrict see through view of the locking door, and hence the perimeter of the tubular air bagel should be greater than perimeter of the see-through part of the locking door 3. When the locking door 3 is closed and the tubular air bagel 6 is expanded to be in an expanded position 7, the tubular air bagel 6 compresses the locking door 3 and the cabinet wall 5 of the washing machine 1 for locking the locking door 3, and when the tubular air bagel 6 compresses to be in a normal position 8, the locking door 3 is unlocked.

[0049] The washing machine also includes a user input device 9 which receives an input 10 for either locking or unlocking of the locking door 3, and based on the input 10 the tubular air bagel 6 expands into the expanded position 7 from the normal position 8, and compresses to the normal position 8 from the expanded position 7. In one embodiment, the user input device 9 is a touch sense device or a gesture recognition device, and receives the input 10 based on a specific finger movement onto the touch sense device or recognized by the gesture recognition device. In one embodiment, where the specific finger movement for locking the locking door 3 is movement of thumb along with at least one of the fingers of one hand together at same time in same direction representative of pushing the locking door 3.

[0050] The user input device 9 is attached to the locking door 3 at the other side of the locking door 3 which is not facing the washing drum 2 when closed. In an alternate embodiment, the user input device 9 need not be a part of the locking door 3, rather it can be provided at any other part of the washing machine 1, or the user input device 9 can be a remote device which can provide the input 10 remotely through any communication means.

[0051] The tubular air bagel 6 is made of a composite material comprising elastic plastic, and can have variable thickness at different parts of the tubular air bagel 6, as well as uniform thickness at all parts of the tubular air bagel 6. Variable thickness of the tubular air bagel 6, where the thickness is more towards exterior with respect to interior parts of the bagel, provides better pressure exertion onto the locking door 3, which means better locking and sealing of the locking door 3. In an alternate em-

bodiment, the tubular bagel 6 can be of any other material which can efficiently and effectively compress and expands for providing locking and sealing functionality of the locking door 3.

[0052] The washing machine 1 also includes an air pump 13 for pumping in air into the tubular air bagel 6 for expanding the tubular air bagel 6 into the expanded position 7 or sucks in air from the tubular air bagel 6 to compress from the expanded position 7 to the normal position 8. In an alternate embodiment, the air pump 13 need not be provided, rather the expansion and compression of the tubular air bagel 6 can be provided through any other mechanism known in the art.

[0053] The washing machine 1 also includes a microcontroller 14 which receives the input 10 and processes the input 10, and if the input 10 is for locking the locking door 3, the microcontroller 14 actuates the air pump 13 for expanding the tubular air bagel 6, and if the input 10 is for unlocking the locking door 3, the microcontroller 14 actuates the air pump 13 for compressing the tubular air bagel 6 from the expanded position 7 to the normal position 8. In one embodiment, the microcontroller is not required, rather the air pump 13 can be handled manually by a user for expanding or compressing the tubular air bagel 6.

[0054] The washing machine 1 also includes an air duct 15 which is attached to the tubular air bagel 6. When the tubular air bagel 6 is expanded, the air is filled into the tubular air bagel 6 via the air duct, and when the tubular air bagel 6 is to be compressed, the air is moved out of the tubular air bagel 6 via the air duct 15. In one embodiment, the air duct 15 is not required, rather the expansion and compression of the tubular air bagel 6 is carried out with other known technologies in prior art which do not require transition of air into or from the air pump 13. The microcontroller 14 receives a feedback 16 from the air pump 13 based on the connection of the air duct 15 to the air pump 13 and raise an alarm if there is a fault in connection between the air duct 15 and the air pump 13. For this process, in one embodiment, the power consumption or torque of air pump 13 is read from microcontroller 14. If air pump works with lower than nominal torque or power value, the locked door 3 is not locked and air pump pumping is in vain. So, user is warned as door is open, and pumping is stopped. If the locked door 3 is closed by user, power consumption or torque value of the air pump 13 is equal the its nominal values and system can understand the locked door 3 is locked.

[0055] The washing machine 1 further includes a motor 17 for providing a driving power and a switch 18 which switches the driving power either to the air pump 13 for pumping in or out the air with respect to the tubular air bagel 6 or to the washing drum 2 for performing the washing function onto the clothes. In one embodiment, a separate motor can be provided for the air pump 13, and the motor 17 for the washing function shall purely be used for driving the washing drum 2.

[0056] The microcontroller 14 triggers the switch 18 to

switch the driving power to the air pump 13 when the microcontroller 14 receives the input 10 from the user input device 9 relating to locking or unlocking of the locking door 3, and to switch the driving power to the washing drum 2 when the locking door 3 is locked. In an alternate embodiment, the switch 18 can be manually handled, where a user can manually turn the switch 18 to switch the driving force of the motor 17 between the air pump 13 and the washing drum 2.

[0057] Thus, the present invention provides an efficient mechanism for locking the door and making it leak free during the washing function. Also, it removes previous elements being used in washing machine for locking the door which is the mechanical door switch and the gasket for ant-leak functionality, which are prone to mechanical defects. The washing machine 1 of the current disclosure includes a washing drum 2 for holding clothes while the clothes are being washed, and a locking door 3 for allowing access through an opening 4 in a cabinet wall 5 of the washing machine 1 to inside of the washing drum 2 for putting or taking out the clothes, wherein the locking door 3 of the washing machine 1 comprising a tubular air bagel 6 having a perimeter and is affixed to the locking door 3 on a side 19 facing the washing drum 2, such that when the locking door 3 is closed and the tubular air bagel 6 is expanded to be in an expanded position 7, the tubular air bagel 6 compresses the locking door 3 and the cabinet wall 5 of the washing machine 1 for locking the washing machine 1, and when the tubular air bagel 6 compresses to be in a normal position 8, the washing machine 1 is unlocked.

List of reference numbers

[0058]

- | | |
|----|--|
| 1 | washing machine |
| 2 | washing drum |
| 3 | locking door |
| 4 | opening of the cabinet wall |
| 5 | cabinet wall |
| 6 | tubular air bagel |
| 7 | expanded position |
| 8 | normal position |
| 9 | user input device |
| 10 | input |
| 11 | higher thickness part of the tubular air bagel |
| 12 | lower thickness part of the tubular air bagel |
| 13 | air pump |
| 14 | microcontroller |
| 15 | air duct |
| 16 | feedback |
| 17 | motor |
| 18 | switch |
| 19 | side of the locking door facing the washing drum |
| 20 | other side of the locking door |

Claims

1. A washing machine (1) comprising a washing drum (2) for holding clothes while the clothes are being washed, and a locking door (3) for allowing access through an opening (4) in a cabinet wall (5) of the washing machine (1) to inside of the washing drum (2) for putting or taking out the clothes, **characterized in that** the locking door (3) of the washing machine (1) comprises:

- a tubular air bagel (6) having a perimeter and being affixed to the locking door (3) on a side (19) facing the washing drum (2); and
- an air pump (13) which is adapted to pump in air into the tubular air bagel (6) for expanding the tubular air bagel (6) into the expanded position (7) or adapted to suck out air from the tubular air bagel (6) to compress from the expanded position (7) to the normal position (8),

wherein when the locking door (3) is closed and the tubular air bagel (6) is expanded to be in the expanded position (7), the tubular air bagel (6) compresses the locking door (3) and the cabinet wall (5), such that a surrounding part of the cabinet wall (5) is sandwiched between the tubular bagel (6) and the locking door (3) of the washing machine (1) for locking the locking door (3), and when the tubular air bagel (6) compresses to be in the normal position (8), the locking door (3) is unlocked.

2. The washing machine (1) according to the claim 1, the washing machine (1) comprises:

- a user input device (9) adapted to provide an input (10) for locking or unlocking the locking door (3) of the washing machine (1), and based on the input (10) the tubular air bagel (6) is adapted to move into the expanded position (7) to normal position (8), and vice-versa.

3. The washing machine (1) according to the claim 2, wherein the user input device (9) is a touch sense device or a gesture recognition device, and is adapted to receive the input (10) based on a specific finger movement onto the touch sense device or recognized by the gesture recognition device.

4. The washing machine (1) according to the claim 3, wherein the specific finger movement for locking the locking door (3) is movement of thumb along with at least one of the fingers of one hand together at same time in same direction representative of pushing the locking door (3).

5. The washing machine according to any of the claims 2 to 4, wherein the user input device (9) is attached

to the locking door (3) at the other side (20) of the locking door (3) which is not facing the washing drum (2) when closed.

6. The washing machine (1) according to any of the claims 1 to 5, wherein the tubular air bagel (6) is made of a composite material comprising elastic plastic.

7. The washing machine (1) according to any of the claims 1 to 6, wherein the tubular air bagel (6) is of variable thickness at various parts of the tubular air bagel (6), in such a way that the thickness of the material shall be lesser at the parts where the tubular air bagel (6) is compressing the locking door (3) against the cabinet wall (5) when being in the expanded position (7).

8. The washing machine (1) according to any of the claims 1 to 7 comprising:

- a microcontroller (14) adapted to receive the input (10) and to process the input (10), and to accordingly actuates the air pump (13) for expanding or compressing the tubular air bagel (6).

9. The washing machine (1) according to the claim 8 comprising:

- an air duct (15) attached to the tubular air bagel (6) and the air moves into and moves out of the tubular air bagel (6) through the air duct (15) when the air duct (15) connects to the air pump (13),

wherein the microcontroller (14) is adapted to receive a feedback (16) from the air pump (13) based on the connection of the air duct (15) to the air pump (13) and raise an alarm if there is a fault in connection between the air duct (15) and the air pump (13).

10. The washing machine (1) according to any of the claims 8 or 9 comprising

- a motor (17) for providing a driving power; and
- a switch (18) adapted to switch the driving power either to the air pump (13) for pumping in or out the air with respect to the tubular air bagel (6) or to the washing drum (2) for performing the washing function onto the clothes.

11. The washing machine (1) according to the claim 10, wherein the microcontroller (14) is adapted to trigger the switch (18) to switch the driving power to the air pump (13) when the microcontroller (14) receives the input (10) from the user input device (9) relating to locking or unlocking of the locking door (3), and to switch the driving power to the washing drum (2)

when the locking door (3) is locked.

Patentansprüche

1. Waschmaschine (1) mit einer Waschtrommel (2) zum Aufnehmen von Kleidung, während die Kleidung gewaschen wird, und einer Verriegelungstür (3), um den Zugang durch eine Öffnung (4) in einer Schrankwand (5) der Waschmaschine (1) zur Innenseite der Waschtrommel (2) zum Ein- oder Ausgeben der Kleidung zu ermöglichen, **dadurch gekennzeichnet, dass** die Verriegelungstür (3) der Waschmaschine (1) umfasst:

- einen rohrförmigen Luftballon (6) mit einem Umfang, der an der Verriegelungstür (3) auf einer der Waschtrommel (2) zugewandten Seite (19) befestigt ist; und
- eine Luftpumpe (13), die zum Einpumpen von Luft in den rohrförmigen Luftballon (6) zum Expandieren des rohrförmigen Luftballons (6) in die expandierte Position (7) oder zum Absaugen von Luft aus dem rohrförmigen Luftballon (6) zum Komprimieren aus der expandierten Position (7) in die Normalposition (8) ausgebildet ist,

wobei, wenn die Verriegelungstür (3) geschlossen ist und der rohrförmige Luftballon (6) in der expandierten Position (7) aufgeweitet wird, der rohrförmige Luftballon (6) die Verriegelungstür (3) und die Schrankwand (5) zusammendrückt, so dass ein umlaufender Teil der Schrankwand (5) zwischen dem rohrförmigen Luftballon (6) und der Verriegelungstür (3) der Waschmaschine (1) zum Verriegeln der Verriegelungstür (3) eingeklemmt ist, und wenn der rohrförmige Luftballon (6) in die Normalposition (8) komprimiert wird, wird die Verriegelungstür (3) entriegelt.

2. Waschmaschine (1) nach dem Anspruch 1, wobei die Waschmaschine (1) umfasst:

- eine Benutzereingabevorrichtung (9), die angepasst ist, um eine Eingabe (10) zum Verriegeln oder Entriegeln der Verriegelungstür (3) der Waschmaschine (1) bereitzustellen, und basierend auf der Eingabe (10) ist der rohrförmige Luftballon (6) angepasst, um sich in die expandierte Position (7) in die Normalposition (8) zu bewegen, und umgekehrt.

3. Waschmaschine (1) nach Anspruch 2, wobei die Benutzereingabevorrichtung (9) eine Berührungssensorvorrichtung oder eine Gestenerkennungsvorrichtung ist und angepasst ist, um die Eingabe (10) basierend auf einer bestimmten Fingerbewegung auf der Berührungssensorvorrichtung zu empfangen oder von der Gestenerkennungsvorrichtung erkannt

zu werden.

4. Waschmaschine (1) nach Anspruch 3, wobei die spezifische Fingerbewegung zum Verriegeln der Verriegelungstür (3) eine Daumenbewegung zusammen mit mindestens einem der Finger einer Hand gleichzeitig in gleicher Richtung ist, die für das Drücken der Verriegelungstür (3) repräsentativ ist.

5. Waschmaschine nach einem der Ansprüche 2 bis 4, wobei die Benutzereingabevorrichtung (9) an der Verriegelungstür (3) auf der anderen Seite (20) der Verriegelungstür (3) befestigt ist, die im geschlossenen Zustand nicht zur Waschtrommel (2) zeigt.

6. Waschmaschine (1) nach einem der Ansprüche 1 bis 5, wobei der rohrförmige Luftballon (6) aus einem Verbundmaterial hergestellt ist, das elastischen Kunststoff umfasst.

7. Waschmaschine (1) nach einem der Ansprüche 1 bis 6, wobei der rohrförmige Luftballon (6) an verschiedenen Teilen des rohrförmigen Luftballons (6) eine variable Dicke aufweist, so dass die Dicke des Materials an den Teilen, an denen der rohrförmige Luftballon (6) die Verriegelungstür (3) in der aufgeweiteten Position (7) gegen die Schrankwand (5) drückt, geringer ist.

8. Waschmaschine (1) nach einem der Ansprüche 1 bis 7, umfassend:

- einen Mikrocontroller (14), der angepasst ist, um den Eingang (10) aufzunehmen und den Eingang (10) zu verarbeiten und die Luftpumpe (13) entsprechend zu betätigen, um den rohrförmigen Luftballon (6) zu expandieren oder zu komprimieren.

9. Die Waschmaschine (1) nach dem Anspruch 8 umfassend:

- einen Luftkanal (15), der an dem rohrförmigen Luftballon (6) befestigt ist, und die Luft bewegt sich in den rohrförmigen Luftballon (6) und bewegt sich aus ihm heraus durch den Luftkanal (15), wenn der Luftkanal (15) mit der Luftpumpe (13) verbunden ist,

wobei der Mikrocontroller (14) angepasst ist, um eine Rückmeldung (16) von der Luftpumpe (13) basierend auf der Verbindung des Luftkanals (15) mit der Luftpumpe (13) zu empfangen und einen Alarm auszulösen, wenn ein Fehler in der Verbindung zwischen dem Luftkanal (15) und der Luftpumpe (13) vorliegt.

10. Die Waschmaschine (1) nach einem der Ansprüche

8 oder 9 umfassend

- einen Motor (17) zum Bereitstellen einer Antriebsleistung; und
- einen Schalter (18), der geeignet ist, die Antriebsleistung entweder auf die Luftpumpe (13) zum Ein- oder Auspumpen der Luft in Bezug auf den rohrförmigen Luftballon (6) oder auf die Waschtrommel (2) zum Ausführen der Waschkfunktion auf die Kleidung zu schalten.

11. Waschmaschine (1) nach Anspruch 10, wobei die Mikrosteuerung (14) angepasst ist, um den Schalter (18) auszulösen, um die Antriebsleistung auf die Luftpumpe (13) umzuschalten, wenn die Mikrosteuerung (14) den Eingang (10) von der Benutzereingabevorrichtung (9) bezüglich des Ver- oder Entriegelns der Verriegelungstür (3) empfängt, und um die Antriebsleistung auf die Waschtrommel (2) umzuschalten, wenn die Verriegelungstür (3) verriegelt ist.

Revendications

1. Machine à laver (1) comprenant un tambour de lavage (2) pour maintenir les vêtements pendant que les vêtements sont lavés, et une porte de verrouillage (3) pour permettre l'accès par une ouverture (4) dans une paroi d'armoire (5) de la machine à laver (1) à l'intérieur du tambour (2) pour mettre ou enlever les vêtements,
caractérisé en ce que la porte de verrouillage (3) de la machine à laver (1) comprend :

- un coussin d'air tubulaire (6) ayant un périmètre et étant fixé à la porte de verrouillage (3) sur un côté (19) faisant face au tambour de lavage (2) ; et
- une pompe à air (13) qui est adaptée pour pomper de l'air dans le coussin d'air tubulaire (6) pour expandre le coussin d'air tubulaire (6) dans la position expandée (7) ou adaptée pour aspirer l'air du coussin d'air tubulaire (6) pour comprimer de la position expandée (7) à la position normale (8),

dans laquelle, lorsque la porte de verrouillage (3) est fermée et que le coussin d'air tubulaire (6) est déployé pour se trouver dans la position déployée (7), le coussin d'air tubulaire (6) comprime la porte de verrouillage (3) et la paroi de caisson (5), de telle sorte qu'une partie environnante de la paroi d'armoire (5) est prise en sandwich entre le coussin d'air tubulaire (6) et la porte de verrouillage (3) de la machine à laver (1) pour verrouiller la porte de verrouillage (3), et lorsque le coussin d'air tubulaire (6) se tasse pour être dans la position normale (8), la porte de verrouillage (3) est déverrouillée.

2. Machine à laver (1) selon la revendication 1, la machine à laver (1) comprend :

- un dispositif d'entrée utilisateur (9) adapté pour fournir une entrée (10) pour verrouiller ou déverrouiller la porte de verrouillage (3) de la machine à laver (1), et sur la base de l'entrée (10), le coussin d'air tubulaire (6) est adapté pour se déplacer dans la position déployée (7) en position normale (8), et vice versa.

3. Machine à laver (1) selon la revendication 2, dans laquelle le dispositif d'entrée d'utilisateur (9) est un dispositif tactile ou un dispositif de reconnaissance de gestes, et est adapté pour recevoir l'entrée (10) sur la base d'un mouvement spécifique du doigt sur le dispositif tactile ou reconnu par le dispositif tactile.

4. Machine à laver (1) selon la revendication 3, dans laquelle le mouvement spécifique du doigt pour verrouiller la porte de verrouillage (3) est un mouvement du pouce avec au moins l'un des doigts d'une main en même temps dans la même direction représentant la poussée de la porte de verrouillage (3).

5. Machine à laver selon l'une quelconque des revendications 2 à 4, dans laquelle le dispositif d'entrée d'utilisateur (9) est fixé à la porte de verrouillage (3) de l'autre côté (20) de la porte de verrouillage (3) qui ne fait pas face au tambour de lavage (2) lorsque celui-ci est fermé.

6. Machine à laver (1) selon l'une quelconque des revendications 1 à 5, dans laquelle le coussin d'air tubulaire (6) est constitué d'un matériau composite en matière plastique élastique.

7. Machine à laver (1) selon l'une quelconque des revendications 1 à 6, dans laquelle le coussin d'air tubulaire (6) a une épaisseur variable en diverses parties du coussin d'air tubulaire (6), de telle sorte que l'épaisseur du matériau est inférieure aux parties où le coussin d'air tubulaire (6) comprime la porte de verrouillage (3) contre la paroi (5) de l'enceinte, en étant en position déployée (7).

8. Machine à laver (1) selon l'une quelconque des revendications 1 à 7 comprenant :

- un microcontrôleur (14) adapté pour recevoir l'entrée (10) et pour traiter l'entrée (10), et pour actionner en conséquence la pompe à air (13) pour dilater ou comprimer le coussin d'air tubulaire (6).

9. Machine à laver (1) selon la revendication 8 comprenant :

- un conduit d'air (15) fixé au coussin d'air tubulaire (6) et l'air entre et sort du coussin d'air tubulaire (6) par le conduit d'air (15) lorsque le conduit d'air (15) est relié à la pompe à air (13),

5

dans lequel le microcontrôleur (14) est adapté pour recevoir une rétroaction (16) de la pompe à air (13) sur la base de la connexion du conduit d'air (15) à la pompe à air (13) et déclencher une alarme s'il y a un défaut dans la connexion entre le conduit d'air (15) et la pompe à air (13).

10

10. Machine à laver (1) selon l'une quelconque des revendications 8 ou 9 comprenant

15

- un moteur (17) pour fournir une puissance motrice ; et

- un interrupteur (18) adapté pour commuter la puissance motrice soit sur la pompe à air (13) pour pomper ou évacuer l'air par rapport à le coussin d'air tubulaire (6) soit sur le tambour de lavage (2) pour effectuer la fonction de lavage sur les vêtements.

20

11. Machine à laver (1) selon la revendication 10, dans laquelle le microcontrôleur (14) est adapté pour déclencher l'interrupteur (18) pour commuter la puissance d'entraînement vers la pompe à air (13) lorsque le microcontrôleur (14) reçoit l'entrée (10) du dispositif (9) d'entrée utilisateur concernant le verrouillage et le déverrouillage du volet (3), et pour commuter la puissance d'entraînement vers le tambour (2) du lavage lorsque le volet (3) du verrou est bloqué.

25

30

35

40

45

50

55

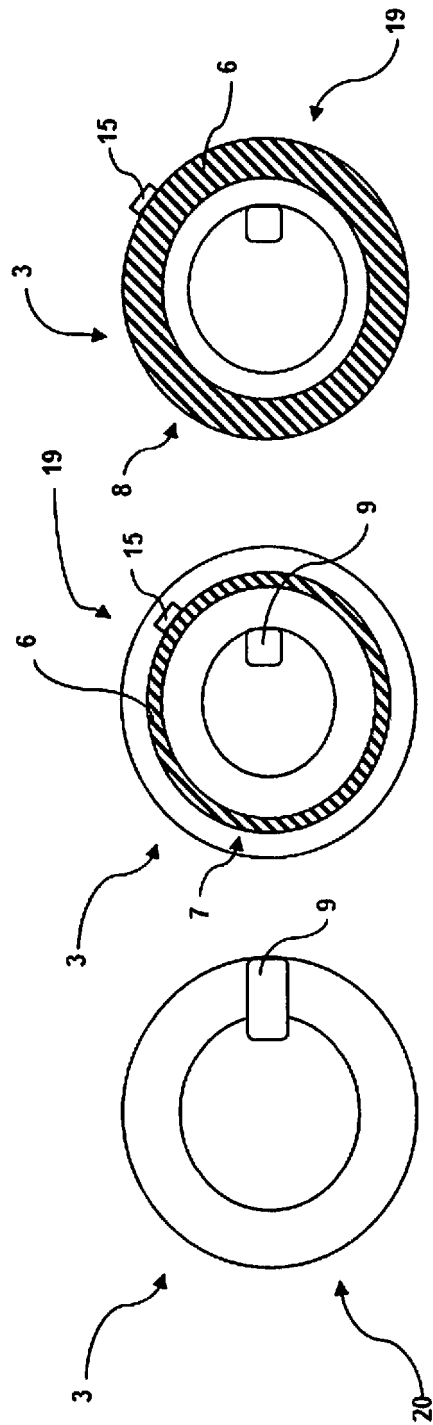


Fig. 1 C

Fig. 1B

Fig. 1A

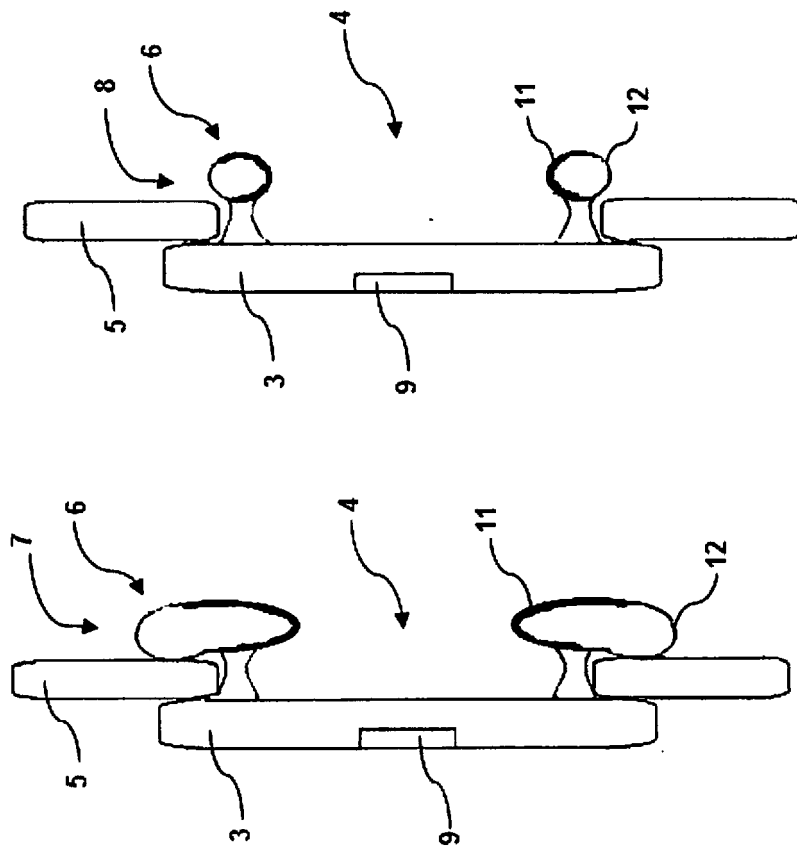


Fig. 2A

Fig. 2B

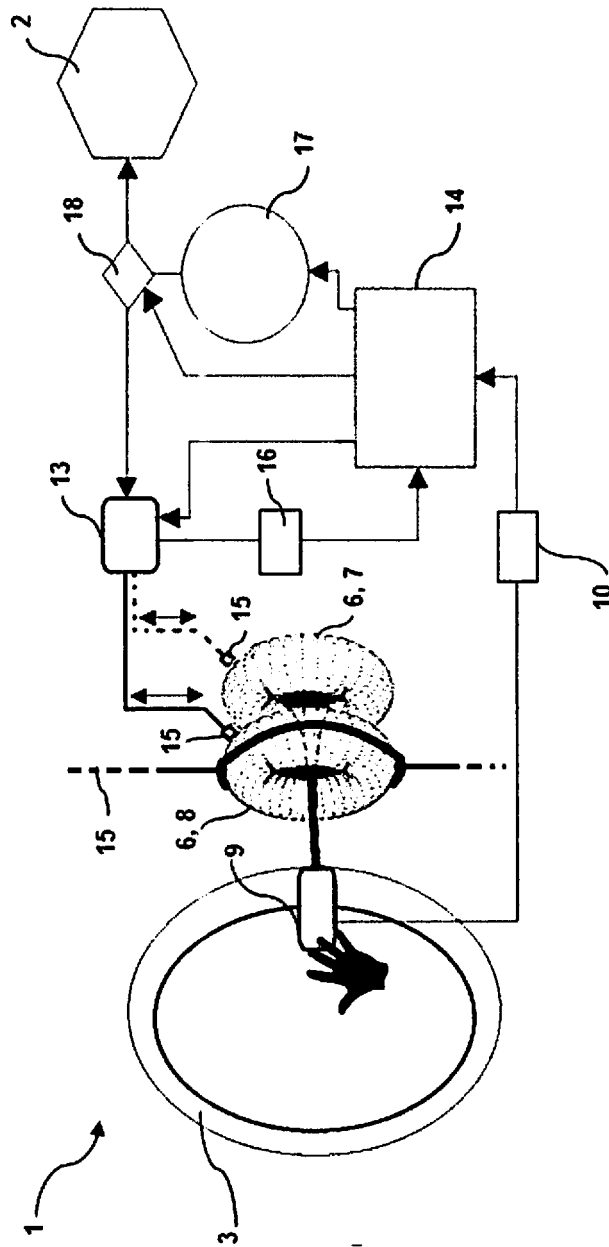


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 2639340 [0003]
- GB 890947 A [0004]
- CN 201586655 [0005]
- US 20150361690 A [0006]
- CN 204403367 [0007]