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(54) **Electrical appliance with an improved door mechanism**

Elektrisches Gerät mit verbessertem Türmechanismus

Appareil électrique avec mécanisme de porte amélioré

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Description

TECHNICAL FIELD

[0001] The present invention relates to an electrical appliance with an improved door mechanism.

[0002] The present invention may be used to particular advantage in a washing machine, to which the following description refers purely by way of example.

BACKGROUND ART

[0003] Household and professional appliances have a common structure: a work environment in which the material to be processed (e.g. fabrics to be washed, food to be cooked, dishes to be washed, etc.) is loaded by the user through a loading/unloading opening; work components for the appliance to function (e.g. washing means or a heater to heat the environment); a cabinet housing both the work environment and the work components; and a door, which is fitted to the cabinet and closes the loading/unloading opening of the work environment to allow access to the work environment (door open) and to isolate the work environment from the external environment (door closed).

[0004] At present almost all door mechanisms comprise a hinge, which is located either on the side of the door (as in washing machines) or on the bottom of the door (as in dishwashers or ovens) and allows the door to rotate about a fixed axis of rotation. Although convenient in terms of simplicity and cost, these door mechanisms can be troublesome when the space around the machine is tiny (e.g. small apartments, kitchens or bathrooms), as the whole door is rotated about a fixed axis of rotation, regardless of the location of the machine or door. In other words, a door hinged to rotate about a fixed axis of rotation requires a large amount of space in front of the appliance when the door is open (as in an oven) or being opened (as in a washing machine or tumble drier).

[0005] Patent application EP1333118A1 discloses a front-loading electrical household appliance comprising a supporting and containing structure with a front wall having a loading opening closed by a door. The door is connected to the front wall by two closing links located near two opposite sides of the door and connected rotatably, by a first end, to the door and, by a second end, to the front wall to cause the door to move from the closed position to a sliding position; two tracks formed in the door and in sliding connection with said first ends of the closing links cause the door to slide parallel to the front wall from the sliding position to the open position.

[0006] Patent application EP2007103015.9 discloses an electrical appliance having: a casing; a work environment supported inside the casing and having a loading/unloading opening; a door supported by the casing to close the loading/unloading opening of the work environment; and connecting means for connecting the door to the casing so that the door can be moved between a closed position and an open position, and having at least one first guide formed on the casing, at least one first trolley sliding along the first guide and connected to the door, at least one second guide formed on the door and the same shape as the first guide, and at least one second trolley sliding along the second guide and connected to the casing; each guide has a curved first portion, along which the respective trolley slides when the door nears the closed position, and a second portion, which is longer than the first portion and is tangent to the first portion at a point of connection to the first portion.

[0007] Patent US6029649 discloses an oven including a body portion and a door that engages the body portion. The body portion is cylindrical in shape and has two lateral sides, each of which has a circular groove and two vertical slots extending upwardly from the circular groove. The door has two flanges at two ends, each provided, at an inner side, with two projections that slide inside the circular groove and the vertical slots.

DISCLOSURE OF INVENTION

[0008] It is an object of the present invention to provide an electrical appliance with an improved door mechanism, designed to eliminate the aforementioned drawbacks, and which is cheap and easy to implement.

[0009] According to the present invention, there is provided an electrical appliance with an improved door mechanism, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic perspective view of a washing machine in accordance with the present invention and with a door in a closed position;

Figure 2 shows a schematic perspective view of the Figure 1 washing machine with the door in a partially open position;

Figure 3 shows a schematic perspective view of the Figure 1 washing machine with the door in a fully open position and with a detergent dispenser in an extracted position;

Figure 4 shows a schematic perspective view of a portion of the door of the Figure 1 washing machine;

Figures 5 and 6 show two schematic perspective views of a hinge of the door of the Figure 1 washing machine in two different positions;

Figures 7 and 8 show two different enlarged schematic perspective views of the hinge of the door of the Figure 1 washing machine;

Figure 9 shows a schematic side view of a portion of a casing of the Figure 1 washing machine supporting a guide of door connecting means; and

Figure 10 shows a schematic perspective view of the Figure 1 washing machine highlighting the position of an inner wash tub defining a work environment.

PREFERRED EMBODIMENTS OF THE INVENTION

[0011] Number 1 in Figure 1 indicates as a whole a washing machine comprising a casing 2 resting on a floor on a number of feet (not shown). Casing 2 supports a work environment 3 (in particular, a cylindrical wash tub) in which the material to be processed (i.e. fabrics to be washed) is loaded/unloaded by the user through a loading/unloading opening 4 of casing 2. Access to loading/unloading opening 4 of casing 2 is closed by a door 5 supported by casing 2.

[0012] As shown in Figures 4-9, connecting means 6 are provided to connect door 5 to casing 2, so that door 5 can be moved between a closed position (shown in Figure 1) and an open position (shown in Figure 3).

[0013] Connecting means 6 comprise two guides 7 (only one shown in Figure 9) formed on casing 2, both the same shape, and located on two opposite sides of door 5; and two followers 8 (only one shown in Figure 4), each of which slides along a respective guide 7 and projects from door 5. Connecting means 6 also comprise two guides 9 (only one shown in Figure 5) formed on door 5, both the same shape, and located on two opposite sides of door 5; and two trolleys 10 (only one shown in Figures 4-8), each of which slides along a respective guide 9 and is connected to casing 2 by means of a hinge 11.

[0014] As shown more clearly in Figures 5 and 6, each hinge 11 has a fixed end portion 12 connected rigidly to casing 2; and a movable end portion 13 opposite fixed end portion 12 and connected rigidly to trolley 10. In each hinge 11, movable end portion 13 rotates with respect to fixed end portion 12, about a horizontal axis of rotation 14 substantially parallel to door 5 and perpendicular to relative guide 9, between an inside position (shown in Figure 5) and an outside position (shown in Figure 6). In a preferred embodiment shown in the attached Figures, each hinge 11 comprises three arms 15, each of which is hinged to both fixed end portion 12 and movable end portion 13 to connect the two portions 12 and 13 to each other. By comprising three arms 15, each hinge 11 prevents any undesired movement of door 5; i.e. door 5 can only rotate about axis of rotation 14.

[0015] Each hinge 11 also comprises at least one spiral spring 16, which has a first end connected to fixed end portion 12, and a second end opposite the first end and connected to a central portion of an inner arm 15, so that each spring 16 is of minimum length when hinge 11 is in one of its two limit positions (inside position and outside position shown in Figures 5 and 6) defined by its stops, and is of maximum length when hinge 11 is in an intermediate position between its two limit positions. In other words, each spring 16 has to be extended to move hinge 11 out of each of its two limit positions; thus, spring 16 pulls hinge 11 into each of its two limit positions and so tends to keep hinge 11 in each of its two limit positions. As shown more clearly in Figure 7, fixed end portion 12 and the inner arm 15 of each hinge 11 have respective eyelets 17 for receiving the ends of spring 16.

[0016] When hinges 11 are in the inside position (shown in Figures 1 and 5), i.e. when hinges 11 are in the inside limit position, door 5 is in the closed position and vice versa; on the contrary, when hinges 11 are in the outside position (shown in Figures 2, 3 and 6), i.e. when hinges 11 are in the outside limit position, door 5 can slide towards the fully open position of Figure 3 and thus door 5 can be in any position comprised between the partially open position of Figure 2 and the fully open position of Figure 3.

[0017] As shown in Figure 4, each guide 9 is curved with a fixed radius, but, in a different embodiment, may vary in radius. As shown in Figure 9, each guide 7 has a curved top portion 18 with a fixed radius substantially equal to the radius of rotation of hinges 11; and a curved bottom portion 19, which is longer than curved top portion 18, has a fixed radius, and is the same shape (i.e. has the same radius) as guides 9. In other words, curved bottom portions 19 of the two guides 7 are the same shape as guides 7. Curved bottom portions 19 of the two guides 9 may, of course, differ in shape from the two guides 7, but only to a minor extent, since guides 7 and 9 all guide the movement of the same rigid object: door 5.

[0018] As shown in the opening sequence in Figures 1-3, door 5 is guided by guides 7 and 9 and by hinges 11, which allow two combined movements: door 5 moves (rotates) initially out of its closed position (from the closed position in Figure 1 to the partially open position in Figure 2), and then slides down (from the partially open position in Figure 2 to the open position in Figure 3) to allow access to work environment 3. The first part of the movement of door 5 is a rotation and is guided by top portions 19 of guides 7 and by hinges 11; over the first part of the movement of door 5, each follower 8 slides along top portion 19 of the relative guide 7, while hinge 11 rotates about the respective axis of rotation 14. The second part of the movement of door 5 is guided by bottom portions 19 of guides 7 and by guides 9; over the second part of the movement of door 5, each follower 8 slides along bottom portion 19 of relative guide 7, while each trolley 10 slides along relative guide 9.

[0019] In other words, over the first part of the movement of door 5, door 5 moves substantially away from casing 2, at least up to a point at which the space requirements for door 5 to move parallel to casing 2 no longer interfere with casing 2; whereas, over the second part of the movement of door 5, door 5 moves substantially parallel to casing 2.

[0020] As stated, springs 16 pull hinges 11 into each of their limit positions and so tend to keep hinges 11 in each of their limit positions. Springs 16 therefore have two functions: keeping door 5 pulled against a door gas-

ket fitted about loading/unloading opening 4 to prevent water leakage during the wash cycle; and moving door 5 smoothly into the open and closed position. This second function in particular is very important, in that springs 16 keep hinges 11 in the outside position (shown in Figure 6) as trolleys 10 slide along guides 9, thus preventing hinges 11 from rotating into the inside position (shown in Figure 5) as trolleys 10 slide along guides 9. It is important to note that rotation of hinges 11 into the inside position (shown in Figure 5) as trolleys 10 slide along guides 9 results in undesired stoppage of trolleys 10 along guides 9.

[0021] The bottom parts of guides 9 slope towards casing 2 so that, over the last portion of its opening movement, door 5 moves towards casing 2, and, in its lowest (open) position shown in Figure 3, the bottom edge 20 of door 5 is right next to the bottom portion of casing 2, safely out of range of the user's feet.

[0022] As shown in Figures 7 and 8, one arm 15 of at least one hinge 11 supports a stop 21, which limits downward slide of trolley 10 along guide 9, i.e. defines the lowest (open) position of door 5 shown in Figure 3.

[0023] In a preferred embodiment shown in the attached Figures, casing 2 comprises two vertical appendixes 22, which are located on opposite sides of loading/unloading opening 4, have respective vertical walls 23 facing relative vertical walls 24 of door 5, and completely surround door 5 when door 5 is in the closed position (shown in Figure 1). Guides 7 are defined on vertical walls 23 of appendixes 22, and followers 8 project from vertical walls 24 of door 5.

[0024] In the embodiment shown in the attached Figures, bottom portions 19 of guides 7 are shorter than guides 9, so that followers 8 disengage guides 9 at the end of the opening movement of door 5, and engage guides 9 at the start of the closing movement of door 5. Each guide 9 obviously has an opening, through which the respective follower 8 disengages or engages guide 9. In a different embodiment not shown, bottom portions 19 of guides 7 are the same length as guides 9, so followers 8 never disengage guides 7.

[0025] In a different embodiment not shown, connecting means 6 only comprise one guide 7 formed on casing 2, one follower 8 sliding along guide 7, one guide 9 formed on door 5, and one trolley 10 sliding along guide 9.

[0026] In another different embodiment not shown, connecting means 6 only comprise guides 9 and trolleys 10, and so comprise no guides 7 and no followers 8.

[0027] Washing machine 1 may comprise locking means for locking door 5 in the closed position; and braking and/or damping means for attenuating the sliding movement of door 5 between the closed position and the open position.

[0028] In the embodiment shown in the attached Figures, guides 7 and 9 are located on both casing 2 and door 5 (guides 7 on casing 2, and guides 9 on door 5). In a different embodiment not shown, guides 7 and 9 are located either on door 5 only, or on casing 2 only.

[0029] In each trolley 10, the sliding part 25 which engages relative guide 9 (i.e. slides inside guide 9) may be covered with antifriction material (for example, Teflon or similar) to reduce the force necessary to move trolley 10 along guide 9.

[0030] As shown in Figure 3, washing machine 1 comprises a detergent dispenser 26 mounted in casing 2 to slide between a stowed position (not shown), in which detergent dispenser 26 is fully inserted inside casing 2, and an extracted position (shown in Figure 3), in which detergent dispenser 26 is partially extracted from casing 2. Preferably, detergent dispenser 26 is located through a front panel 27 of casing 2, which is closed by a top panel 28 of door 5 when door 5 is in the closed position (shown in Figure 1).

[0031] Preferably, a front panel 29 of door 5 supports a user interface 30 having a display and a number of buttons. User interface 30 communicates with an electronic control unit (not shown) of washing machine 1, housed inside casing 2, by means of a wireless communication device 31 (e.g. employing infrared or radio signals) having two communication means 32 (shown in Figure 3), one of which is located inside door 5, and the other inside casing 2. For example, one communication means 32 may be located on top panel 28 of door 5, and the other communication means 32 may be located on front panel 27 of casing 2, so that the two communication means 32 face each other when door 5 is in the closed position (shown in Figure 1). The fact that the two communication means 32 face each other is important when the two communication means 32 communicate using infrared signals.

[0032] As shown in Figure 10, work environment 3 is a cylindrical wash tub having a central axis 33 parallel to loading/unloading opening 4 of casing 2, and encloses a revolving perforated drum 34 having two access doors 35 to the inside of perforated drum 34. Access doors 35 are hinged to perforated drum 34 and can be fixed to one another by means of hooks and slots (not shown). One of access doors 35 is equipped with a safety lock to prevent undesired opening of access doors 35. Central axis 33 of wash tub 3 being parallel to loading/unloading opening 4 provides for more efficient use of the space inside casing 2, thus greatly increasing the rated capacity of washing machine 1, i.e. the maximum amount of laundry (normally measured in kg) that perforated drum 34 can hold, even with a relatively small casing 2. In a different embodiment not shown, central axis 33 of the cylindrical wash tub (and thus of perforated drum 34) is perpendicular to loading/unloading opening 4 of casing 2.

[0033] In the embodiment shown in the attached Figures, door 5 has a curved cross section and varies in thickness, which is maximum at top panel 28 and minimum at a bottom edge 36. In other words, door 5 tapers gradually in thickness from top panel 28 to bottom edge 36.

[0034] Washing machine 1 as described above has numerous advantages, by being easy to implement, by

allowing door 5 to open without too much space needed, and so being suitable for use in confined spaces. It is important to note that in its lowest (open) position shown in Figure 3, bottom edge 20 of door 5 is right next to the bottom portion of casing 2, and so safely out of range of the user's feet.

[0035] Though particularly advantageous for a washing machine, the above connecting means 6 of door 5 also apply to any other kind of electrical appliance, such as a drier, washer-drier, refrigerator, conventional oven, microwave oven, or dishwasher.

Claims

1. An electrical appliance (1) comprising:

a casing (2);
a work environment (3) housed inside the casing (2) and having a loading/unloading opening (4);
a door (5) fitted to the casing (2) to close the loading/unloading opening (4) of the work environment (3); and
connecting means (6) for connecting the door (5) to the casing (2) so that the door (5) can be moved between a closed position and an open position, and comprising at least one first guide (9) formed on the door (5), at least one trolley (10) sliding along the first guide (9), and at least one hinge (11) connecting the trolley (10) to the casing (2) to permit rotation about a horizontal axis of rotation (14) between the trolley (10) and the casing (2);
the electrical appliance (1) being **characterized in that** the hinge (11) comprises at least one spring (16), which pulls the hinge (11) into each of its two limit positions and so tends to keep the hinge (11) in each of its two limit positions.

2. An electrical appliance (1) as claimed in Claim 1, wherein the spring (16) is of minimum length when the hinge (11) is in one of its two limit positions, and is of maximum length when the hinge (11) is in an intermediate position between its two limit positions.

3. An electrical appliance (1) as claimed in Claim 1 or 2, wherein the hinge (11) has a fixed end portion (12) connected rigidly to the casing (2), and a movable end portion (13) opposite the fixed end portion (12), connected rigidly to the trolley (10), and rotating with respect to the fixed end portion (12) about the axis of rotation (14); and the hinge (11) comprises at least one arm (15) hinged to both the fixed end portion (12) and the movable end portion (13) to connect the two end portions (12, 13) to each other.

4. An electrical appliance (1) as claimed in Claim 3, wherein the hinge (11) comprises three arms (15).

5. An electrical appliance (1) as claimed in Claim 3 or 4, wherein one arm (15) of at least one hinge (11) supports a stop (21), which limits downward slide of the trolley (10) along the first guide (9) to define the open position of the door (5).

6. An electrical appliance (1) as claimed in Claim 3, 4 or 5, wherein the fixed end portion (12) and the inner arm (15) of the hinge (11) have respective eyelets (17) for receiving the ends of the spring (16).

7. An electrical appliance (1) as claimed in any of Claims 1 to 6, wherein the first guide (9) is curved.

8. An electrical appliance (1) as claimed in any of Claims 1 to 7, wherein the connecting means (6) comprise at least a second guide (7) formed on the casing (2); and at least one follower (8), which slides along the second guide (7) and is connected to the door (5).

9. An electrical appliance (1) as claimed in Claim 8, wherein the follower (8) projects from door (5).

10. An electrical appliance (1) as claimed in Claim 8 or 9, wherein the second guide (7) has a curved top portion (18) with a fixed radius substantially equal to the radius of rotation of the hinge (11); and a curved bottom portion (19), which is longer than the curved top portion (18) and is the same shape as first guide (9).

11. An electrical appliance (1) as claimed in Claim 10, wherein the bottom portion (19) of the second guide (7) is shorter than the first guide (9), and has an opening, through which the follower (8) disengages or engages the second guide (7); the follower (8) disengages the second guide (7) at the end of the opening movement of the door (5), and the follower (8) engages the second guide (7) at the start of the closing movement of the door (5).

12. An electrical appliance (1) as claimed in Claim 10, wherein the bottom portion (19) of the second guide (7) is the same length as the first guide (9); and the follower (8) never disengages the second guide (7).

13. An electrical appliance (1) as claimed in any of Claims 8 to 12, wherein the connecting means (6) comprise two second guides (7) formed on opposite sides of the loading/unloading opening (4); and two followers (8), each of which slides along the second guide (7) and is connected to the door (5).

14. An electrical appliance (1) as claimed in any of Claims 1 to 13, wherein the casing (2) comprises two vertical appendixes (22), which are located on opposite sides of the loading/unloading opening (4),

have respective vertical walls (23) facing relative vertical walls (24) of the door (5), and completely surround the door (5) when the door (5) is in the closed position.

15. An electrical appliance (1) as claimed in Claim 14, wherein the connecting means (6) comprise two second guides (7) formed on the vertical walls (23) of the appendixes (22) of the casing (2); and two followers (8), each of which slides along a respective second guide (7) and is connected to a vertical wall (24) of the door (5).

16. An electrical appliance (1) as claimed in any of Claims 1 to 15, wherein the sliding part (25) of the trolley (10) engaging the first guide (9) is covered with antifriction material.

17. An electrical appliance (1) as claimed in any of Claims 1 to 16 and comprising a detergent dispenser (26), which is mounted in the casing (2) to slide between a stowed position, in which the detergent dispenser (26) is fully inserted inside the casing (2), and an extracted position, in which the detergent dispenser (26) is partially extracted from the casing (2); the detergent dispenser (26) is located through a front panel (27) of the casing (2), which is closed by a top panel (28) of the door (5) when the door (5) is in the closed position.

18. An electrical appliance (1) as claimed in any of Claims 1 to 17 and comprising:

a user interface (30) fitted to a front panel (29) of the door (5);
an electronic control unit housed inside the casing (2); and
a wireless communication device (31) having a first communication means (32) located inside door (5) and connected to the user interface (30); and a second communication means (32) located inside the casing (2) and connected to the electronic control unit.

19. An electrical appliance (1) as claimed in Claim 18, wherein the first communication means (32) is located on a top panel (28) of the door (5), and the second communication means (32) is located on a front panel (27) of the casing (2), so that the two communication means (32) face each other when the door (5) is in the closed position.

20. An electrical appliance (1) as claimed in any of Claims 1 to 19, wherein the electrical appliance (1) is a washing machine, and the work environment (3) is a cylindrical wash tub having a central axis (33) parallel to the loading/unloading opening (4) of the casing (2).

21. An electrical appliance (1) as claimed in Claim 20, wherein the work environment (3) houses a revolving perforated drum (34) having two access doors (35) to the inside of the perforated drum (34).

22. An electrical appliance (1) as claimed in Claim 21, wherein the access doors (35) are hinged to the perforated drum (34), and can be fixed to one another by means of hooks and slots; and one of the access doors (35) is equipped with a safety lock to prevent undesired opening of the access doors (35).

23. An electrical appliance (1) as claimed in any of Claims 1 to 22, wherein the door (5) has a curved cross section and varies in thickness, which is maximum at a top panel (28) and minimum at a bottom edge (36).

24. An electrical appliance (1) as claimed in any of Claims 1 to 23, wherein the connecting means (6) comprise two first guides (9) located on two opposite sides of the door (5); and two trolleys (10) sliding along the second guides (7).

25. An electrical appliance (1) as claimed in any of Claims 1 to 24, wherein respective bottom parts of the first guides (9) slope towards the casing (2), so that, over the last portion of its opening movement, the door (5) moves towards the casing (2).

Patentansprüche

1. Elektrisches Gerät (1), welches umfasst:

ein Gehäuse (2);
eine in dem Gehäuse (2) untergebrachte Arbeitsumgebung (3) mit einer Belade-/Entladeöffnung (4);
eine am Gehäuse (2) angebrachte Tür (5) zum Verschließen der Belade-/Entladeöffnung (4) der Arbeitsumgebung (3); und
Verbindungsmittel (6) zum Verbinden der Tür (5) mit dem Gehäuse (2), sodass die Tür (5) zwischen einer geschlossenen und einer geöffneten Position bewegt werden kann, und umfassend mindestens eine erste Führung (9), die an der Tür (5) gebildet ist, mindestens einen Wagen (10), der die erste Führung (9) entlang gleitet, und mindestens ein Gelenk (11), das den Wagen (10) mit dem Gehäuse (2) verbindet, um die Rotation um eine horizontale Rotationsachse (14) zwischen dem Wagen (10) und dem Gehäuse (2) zu erlauben;
wobei das elektrische Gerät (1) **dadurch gekennzeichnet ist, dass** das Gelenk (11) mindestens eine Feder (16) umfasst, die das Gelenk (11) in jede seiner zwei Endpositionen zieht und

so dazu neigt, das Gelenk (11) in jeder seiner zwei Endpositionen zu halten.

2. Elektrisches Gerät (1) nach Anspruch 1, wobei die Feder (16) die minimale Länge hat, wenn sich das Gelenk (11) in einer seiner zwei Endpositionen befindet, und die maximale Länge hat, wenn sich das Gelenk (11) in einer Zwischenposition zwischen seinen beiden Endpositionen befindet.

3. Elektrisches Gerät (1) nach Anspruch 1 oder 2, wobei das Gelenk (11) einen festen Endabschnitt (12) aufweist, der fest mit dem Gehäuse (2) verbunden ist, und einen beweglichen Endabschnitt (13) gegenüber dem festen Endabschnitt (12) aufweist, der fest mit dem Wagen (10) verbunden ist und bezogen auf den festen Endabschnitt (12) um die Rotationsachse (14) rotiert; und das Gelenk (11) mindestens einen Arm (15) umfasst, der gelenkig sowohl mit dem festen Endabschnitt (12) als auch dem beweglichen Endabschnitt (13) verbunden ist, um die zwei Endabschnitte (12, 13) miteinander zu verbinden.

4. Elektrisches Gerät (1) nach Anspruch 3, wobei das Gelenk (11) drei Arme (15) umfasst.

5. Elektrisches Gerät (1) nach Anspruch 3 oder 4, wobei ein Arm (15) des mindestens einen Gelenks (11) eine Anschlagvorrichtung (21) trägt, die die Abwärtsbewegung des Wagens (10) entlang der ersten Führung (9) begrenzt, um die geöffnete Position der Tür (5) zu definieren.

6. Elektrisches Gerät (1) nach Anspruch 3, 4 oder 5, wobei der feste Endabschnitt (12) und der innere Arm (15) des Gelenks (11) entsprechende Ösen (17) zum Aufnehmen der Enden der Feder (16) aufweisen.

7. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 6, wobei die erste Führung (9) gewölbt ist.

8. Elektrisches Gerät (1) nach Anspruch 1 bis 7, wobei das Verbindungsmittel (6) mindestens eine zweite Führung (7) umfasst, die am Gehäuse (2) gebildet ist; und mindestens einen Mitläufer (8), der die zweite Führung (7) entlang gleitet und mit der Tür (5) verbunden ist.

9. Elektrisches Gerät (1) nach Anspruch 8, wobei der Mitläufer (8) von der Tür (5) absteht.

10. Elektrisches Gerät (1) nach Anspruch 8 oder 9, wobei die zweite Führung (7) einen gewölbten oberen Abschnitt (18) aufweist mit einem festen Radius im Wesentlichen gleich dem Rotationsradius des Gelenks (11); und einen gewölbten unteren Abschnitt (19), der länger ist als der gewölbte obere Abschnitt (18) und dieselbe Form aufweist wie die erste Führung (9).

11. Elektrisches Gerät (1) nach Anspruch 10, wobei der untere Abschnitt (19) der zweiten Führung (7) kürzer ist als die erste Führung (9), und eine Öffnung aufweist, durch die der Mitläufer (8) aus der zweiten Führung (7) ausrückt oder darin einrückt; der Mitläufer (8) am Ende der Öffnungsbewegung der Tür (5) aus der zweiten Führung (7) ausrückt, und der Mitläufer (8) zu Beginn der Schließbewegung der Tür (5) in die zweite Führung (7) einrückt.

12. Elektrisches Gerät (1) nach Anspruch 10, wobei der untere Abschnitt (19) der zweiten Führung (7) dieselbe Länge hat wie die erste Führung (9); und der Mitläufer (8) niemals aus der zweiten Führung (7) ausrückt.

13. Elektrisches Gerät (1) nach einem der Ansprüche 8 bis 12, wobei die Verbindungsmittel (6) mindestens zwei Führungen (7) umfassen, die auf gegenüberliegenden Seiten der Belade-/Entladeöffnung (4) gebildet sind; und zwei Mitläufer (8), von denen jeder die zweite Führung (7) entlang gleitet und mit der Tür (5) verbunden ist.

14. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 13, wobei das Gehäuse (2) zwei vertikale Fortsätze (22) umfasst, die sich auf gegenüberliegenden Seiten der Belade-/Entladeöffnung (4) befinden, entsprechende vertikale Wände (23) aufweisen, die den entsprechenden vertikalen Wänden (24) der Tür (5) zugewandt sind und die Tür (5) vollständig umgeben, wenn sich die Tür (5) in geschlossener Position befindet.

15. Elektrisches Gerät (1) nach Anspruch 14, wobei die Verbindungsmittel (6) mindestens zwei Führungen (7) umfassen, die an vertikalen Wänden (23) der Fortsätze (22) des Gehäuses (2) gebildet sind; und zwei Mitläufer (8), von denen jeder eine entsprechende zweite Führung (7) entlang gleitet und mit einer vertikalen Wand (24) der Tür (5) verbunden ist.

16. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 15, wobei das Gleitstück (25) des Wagens (10), das in die erste Führung (9) einrückt, mit einem Antifriktionsmaterial überzogen ist.

17. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 16, welches einen Waschmittelspender (26) umfasst, der im Gehäuse (2) angebracht ist, um sich zwischen einer beladenen Position, in der der Waschmittelspender (26) vollständig im Inneren des Gehäuses (2) eingeschoben ist, und einer ausgezogenen Position, in der der Waschmittelspender (26) teilweise aus dem Gehäuse (2) herausgezogen ist,

zu bewegen; wobei der Waschmittelspender (26) über eine Frontblende (27) des Gehäuses (2) lokalisiert wird, die von einer Deckblende (28) der Tür (5) verschlossen wird, wenn sich die Tür (5) in der geschlossenen Position befindet.

18. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 17, das umfasst:

eine Bedienoberfläche (30), die an einer Frontblende (29) der Tür (5) angebracht ist;
eine elektronische Steuereinheit im Inneren des Gehäuses (2); und
ein Funkkommunikationsgerät (31) mit einem ersten Kommunikationsmittel (32), das sich in der Tür (5) befindet und mit der Bedienoberfläche (30) verbunden ist; und
ein zweites Kommunikationsmittel (32), das sich im Gehäuse (2) befindet und mit der elektronischen Steuereinheit verbunden ist.

19. Elektrisches Gerät (1) nach Anspruch 18, wobei sich das erste Kommunikationsmittel (32) an einer Deckblende (28) der Tür (5) und das zweite Kommunikationsmittel (32) an einer Frontblende (27) des Gehäuses (2) befindet, sodass die zwei Kommunikationsmittel (32) einander zugewandt sind, wenn sich die Tür (5) in der geschlossenen Position befindet.

20. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 19, wobei das elektrische Gerät eine Waschmaschine und die Arbeitsumgebung (3) ein zylindrischer Waschbottich mit einer Mittelachse (33) ist, die parallel zur Belade-/Entladeöffnung (4) des Gehäuses (2) verläuft.

21. Elektrisches Gerät (1) nach Anspruch 20, wobei die Arbeitsumgebung (3) eine sich drehende perforierte Trommel (34) mit zwei Zugangstüren (35) zum Innenraum der perforierten Trommel (34) beherbergt.

22. Elektrisches Gerät (1) nach Anspruch 21, wobei die Zugangstüren (35) in die perforierte Trommel (34) eingehängt sind, und mithilfe von Haken und Schlitzen aneinander befestigt sein können; und eine der Zugangstüren (35) mit einer Sicherheitsverriegelung ausgestattet ist, um ein unerwünschtes Öffnen der Zugangstüren (35) zu verhindern.

23. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 22, wobei die Tür (5) einen gewölbten Querschnitt aufweist und in der Dicke variiert, die an der Deckblende (28) am größten und an der Unterkante (36) am dünnsten ist.

24. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 23, wobei die Verbindungsmittel (6) mindestens zwei erste Führungen (9) umfassen, die sich auf zwei gegenüberliegenden Seiten der Tür (5) befinden; und zwei Wagen (10), die die zweiten Führungen (7) entlang gleiten.

25. Elektrisches Gerät (1) nach einem der Ansprüche 1 bis 24, wobei die jeweiligen Unterteile der ersten Führungen (9) derart in Richtung Gehäuse (2) abfallen, dass sich die Tür (5) über den letzten Abschnitt ihrer Öffnungsbewegung in Richtung Gehäuse (2) bewegt.

Revendications

1. Appareil électrique (1) comprenant :

une carrosserie (2) ;
un environnement de travail (3) reçu à l'intérieur de la carrosserie (2) et ayant une ouverture de chargement/déchargement (4) ;
une porte (5) montée sur la carrosserie (2) pour fermer l'ouverture de chargement/déchargement (4) de l'environnement de travail (3) ; et
des moyens de liaison (6) pour relier la porte (5) à la carrosserie (2) de telle sorte que la porte (5) peut être déplacée entre une position fermée et une position ouverte,
et comprenant au moins un premier guide (9) formé sur la porte (5), au moins un chariot (10) coulissant le long du premier guide (9), et au moins une charnière (11) reliant le chariot (10) à la carrosserie (2) pour permettre une rotation autour d'un axe de rotation horizontal (14) entre le chariot (10) et la carrosserie (2) ;
l'appareil électrique (1) étant **caractérisé par le fait que** la charnière (11) comprend au moins un ressort (16), qui tire la charnière (11) dans chacune de ses deux positions limites et tend ainsi à maintenir la charnière (11) dans chacune de ses deux positions limites.

2. Appareil électrique (1) selon la revendication 1, dans lequel le ressort (16) a une longueur minimale lorsque la charnière (11) est dans l'une de ses deux positions limites et a une longueur maximale lorsque la charnière (11) est dans une position intermédiaire entre ses deux positions limites.

3. Appareil électrique (1) selon l'une des revendications 1 ou 2, dans lequel la charnière (11) a une partie d'extrémité fixe (12) reliée rigidement à la carrosserie (2) et une partie d'extrémité mobile (13) opposée à la partie d'extrémité fixe (12), reliée rigidement au chariot (10), et tournant par rapport à la partie d'extrémité fixe (12) autour de l'axe de rotation (14) ; et la charnière (11) comprend au moins un bras (15) relié par charnière à la fois à la partie d'extrémité fixe (12) et à la partie d'extrémité mobile (13)

pour relier les deux parties d'extrémité (12, 13) l'une à l'autre.

4. Appareil électrique (1) selon la revendication 3, dans lequel la charnière (11) comprend trois bras (15).

5. Appareil électrique (1) selon l'une des revendications 3 ou 4, dans lequel un bras (15) d'au moins une charnière (11) supporte un arrêt (21), qui limite un coulissement descendant du chariot (10) le long du premier guide (9) pour définir la position ouverte de la porte (5).

6. Appareil électrique (1) selon l'une des revendications 3, 4 ou 5, dans lequel la partie d'extrémité fixe (12) et le bras intérieur (15) de la charnière (11) ont des oeillets respectifs (17) pour recevoir les extrémités du ressort (16).

7. Appareil électrique (1) selon l'une quelconque des revendications 1 à 6, dans lequel le premier guide (9) est incurvé.

8. Appareil électrique (1) selon l'une quelconque des revendications 1 à 7, dans lequel les moyens de liaison (6) comprennent au moins un second guide (7) formé sur la carrosserie (2) ; et au moins un galet (8), qui coulisse le long du second guide (7) et est relié à la porte (5).

9. Appareil électrique (1) selon la revendication 8, dans lequel le galet (8) fait saillie de la porte (5).

10. Appareil électrique (1) selon l'une des revendications 8 ou 9, dans lequel le second guide (7) a une partie supérieure incurvée (18) ayant un rayon fixe sensiblement égal au rayon de rotation de la charnière (11) ; et une partie inférieure incurvée (19), qui est plus longue que la partie supérieure incurvée (18) et a la même forme que le premier guide (9).

11. Appareil électrique (1) selon la revendication 10, dans lequel la partie inférieure (19) du second guide (7) est plus courte que le premier guide (9), et a une ouverture, à travers laquelle le galet (8) se désengage ou s'engage avec le second guide (7) ; le galet (8) se désengage du second guide (7) à la fin du mouvement d'ouverture de la porte (5), et le galet (8) s'engage avec le second guide (7) au début du mouvement de fermeture de la porte (5).

12. Appareil électrique (1) selon la revendication 10, dans lequel la partie inférieure (19) du second guide (7) a la même longueur que le premier guide (9) ; et le galet (8) ne se désengage jamais du second guide (7).

13. Appareil électrique (1) selon l'une quelconque des revendications 8 à 12, dans lequel les moyens de liaison (6) comprennent deux seconds guides (7) formés sur des côtés opposés de l'ouverture de chargement/déchargement (4) ; et deux galets (8), chacun desquels coulissant le long du second guide (7) et étant relié à la porte (5).

14. Appareil électrique (1) selon l'une quelconque des revendications 1 à 13, dans lequel la carrosserie (2) comprend deux appendices verticaux (22), qui sont situés sur des côtés opposés de l'ouverture de chargement/déchargement (4), ont des parois verticales respectives (23) faisant face à des parois verticales relatives (24) de la porte (5) et entourent entièrement la porte (5) lorsque la porte (5) est dans la position fermée.

15. Appareil électrique (1) selon la revendication 14, dans lequel les moyens de liaison (6) comprennent deux seconds guides (7) formés sur les parois verticales (23) des appendices (22) de la carrosserie (2) ; et deux galets (8), chacun desquels coulissant le long d'un second guide respectif (7) et étant relié à une paroi verticale (24) de la porte (5).

16. Appareil électrique (1) selon l'une quelconque des revendications 1 à 15, dans lequel la partie de coulissement (25) du chariot (10) s'engageant avec le premier guide (9) est recouverte d'un matériau antifrottement.

17. Appareil électrique (1) selon l'une quelconque des revendications 1 à 16 et comprenant un distributeur de détergent (26), qui est monté dans la carrosserie (2) pour coulisser entre une position rangée, dans laquelle le distributeur de détergent (26) est entièrement introduit à l'intérieur de la carrosserie (2), et une position extraite, dans laquelle le distributeur de détergent (26) est partiellement extrait de la carrosserie (2) ; le distributeur de détergent (26) est situé à travers un panneau avant (27) de la carrosserie (2), qui est fermée par un panneau supérieur (28) de la porte (5) lorsque la porte (5) est dans la position fermée.

18. Appareil électrique (1) selon l'une quelconque des revendications 1 à 17, comprenant :

une interface utilisateur (30) montée sur un panneau avant (29) de la porte (5) ;
une unité de commande électronique reçue à l'intérieure de la carrosserie (2) ; et
un dispositif de communication sans fil (31) ayant un premier moyen de communication (32) situé à l'intérieur de la porte (5) et relié à l'interface utilisateur (30) ; et
un second moyen de communication (32) situé à l'intérieur de la carrosserie (2) et relié à l'unité

de commande électronique.

19. Appareil électrique (1) selon la revendication 18, dans lequel le premier moyen de communication (32) est situé sur un panneau supérieur (28) de la porte (5), et le second moyen de communication (32) est situé sur un panneau avant (27) de la carrosserie (2), de telle sorte que les deux moyens de communication (32) se font face lorsque la porte (5) est dans la position fermée.

20. Appareil électrique (1) selon l'une quelconque des revendications 1 à 19, dans lequel l'appareil électrique (1) est un lave-linge, et l'environnement de travail (3) est une cuve de lavage cylindrique ayant un axe central (33) parallèle à l'ouverture de chargement/déchargement (4) de la carrosserie (2).

21. Appareil électrique (1) selon la revendication 20, dans lequel l'environnement de travail (3) reçoit un tambour perforé tournant (34) ayant deux portes d'accès (35) à l'intérieur du tambour perforé (34).

22. Appareil électrique (1) selon la revendication 21, dans lequel les portes d'accès (35) sont reliées par charnière au tambour perforé (34) et peuvent être fixées l'une à l'autre au moyen de crochets et de fentes ; et l'une des portes d'accès (35) est équipée d'un verrou de sécurité pour empêcher une ouverture non souhaitée des portes d'accès (35).

23. Appareil électrique (1) selon l'une quelconque des revendications 1 à 22, dans lequel la porte (5) a une section transversale incurvée et varie en épaisseur, laquelle est maximale au niveau d'un panneau supérieur (28) et minimale au niveau d'un bord inférieur (36).

24. Appareil électrique (1) selon l'une quelconque des revendications 1 à 23, dans lequel les moyens de liaison (6) comprennent deux premiers guides (9) situés sur deux côtés opposés de la porte (5) ; et deux chariots (10) coulissant le long des seconds guides (7).

25. Appareil électrique (1) selon l'une quelconque des revendications 1 à 24, dans lequel des parties inférieures respectives des premiers guides (9) sont inclinées vers la carrosserie (2), de telle sorte que, sur la dernière partie de son mouvement d'ouverture, la porte (5) se déplace vers la carrosserie (2).

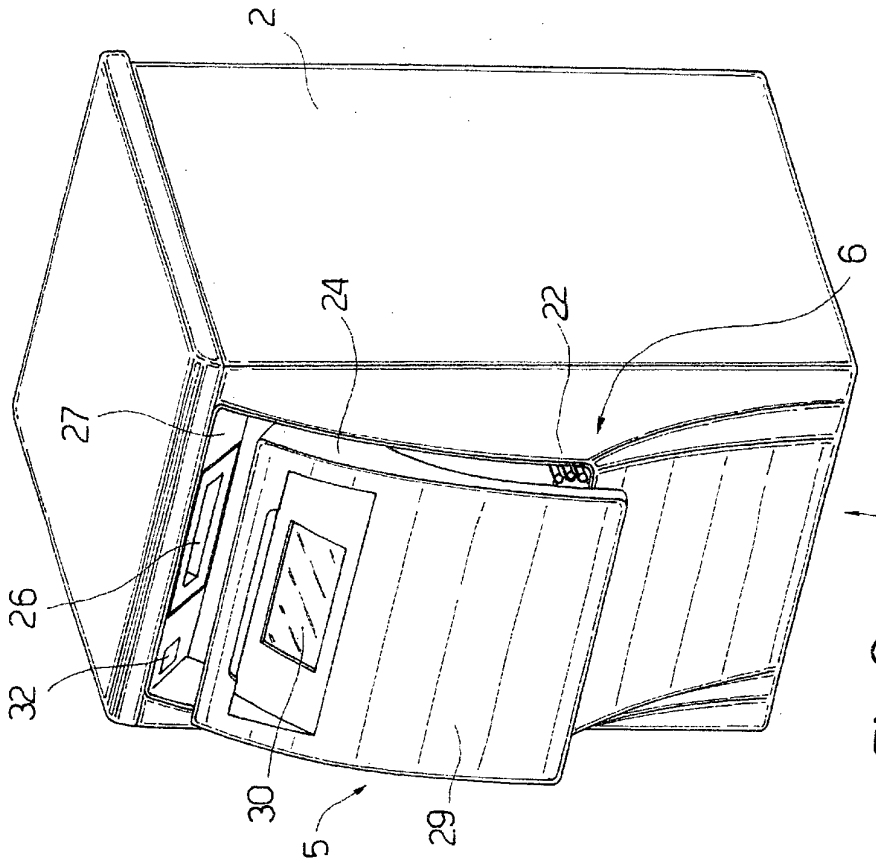


Fig.2

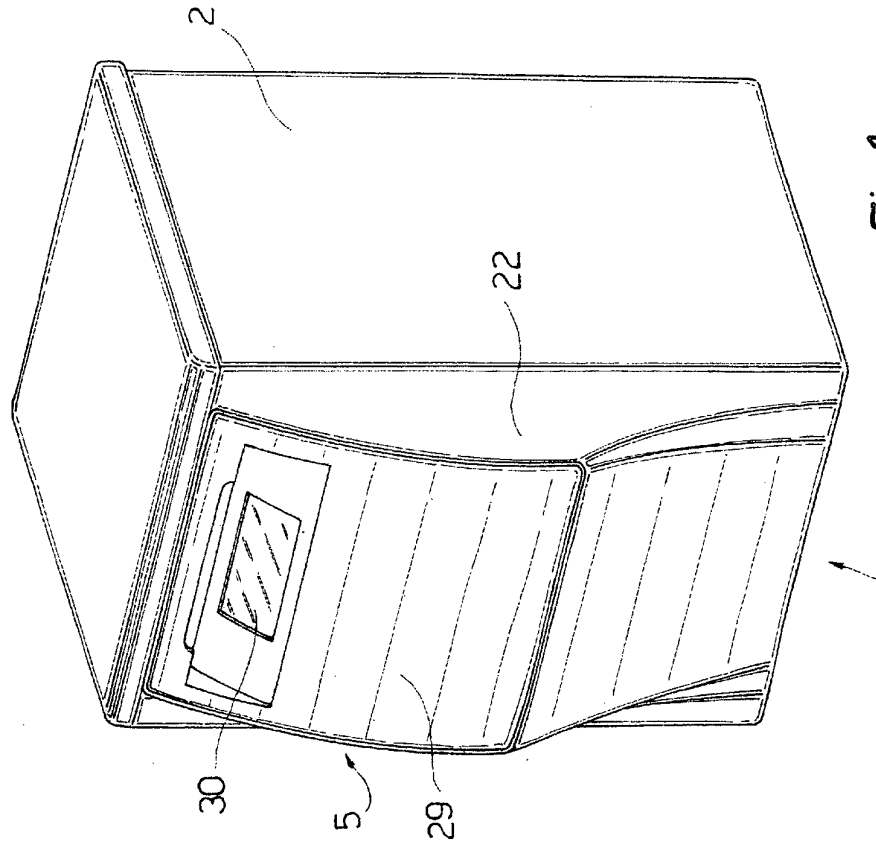


Fig.1

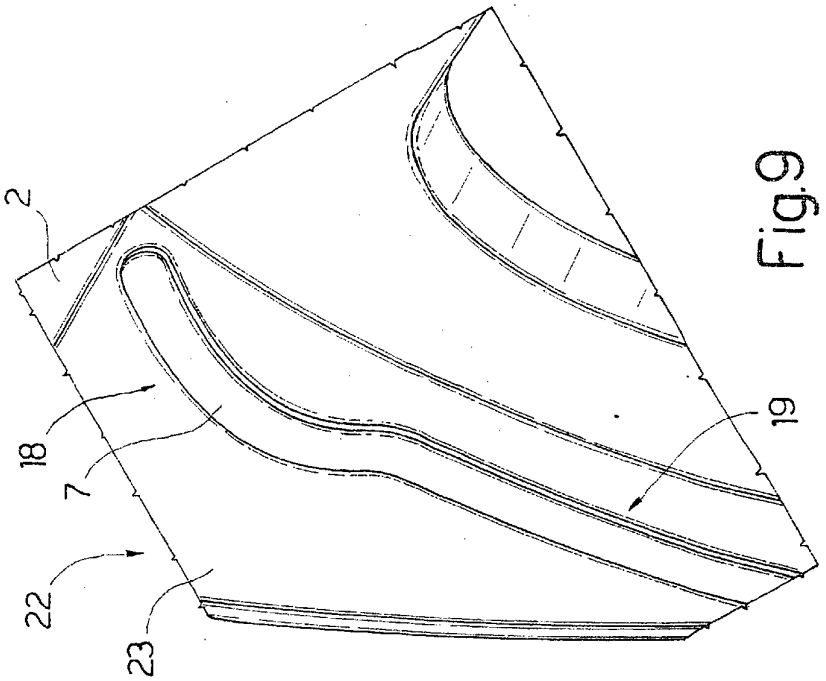


Fig.9

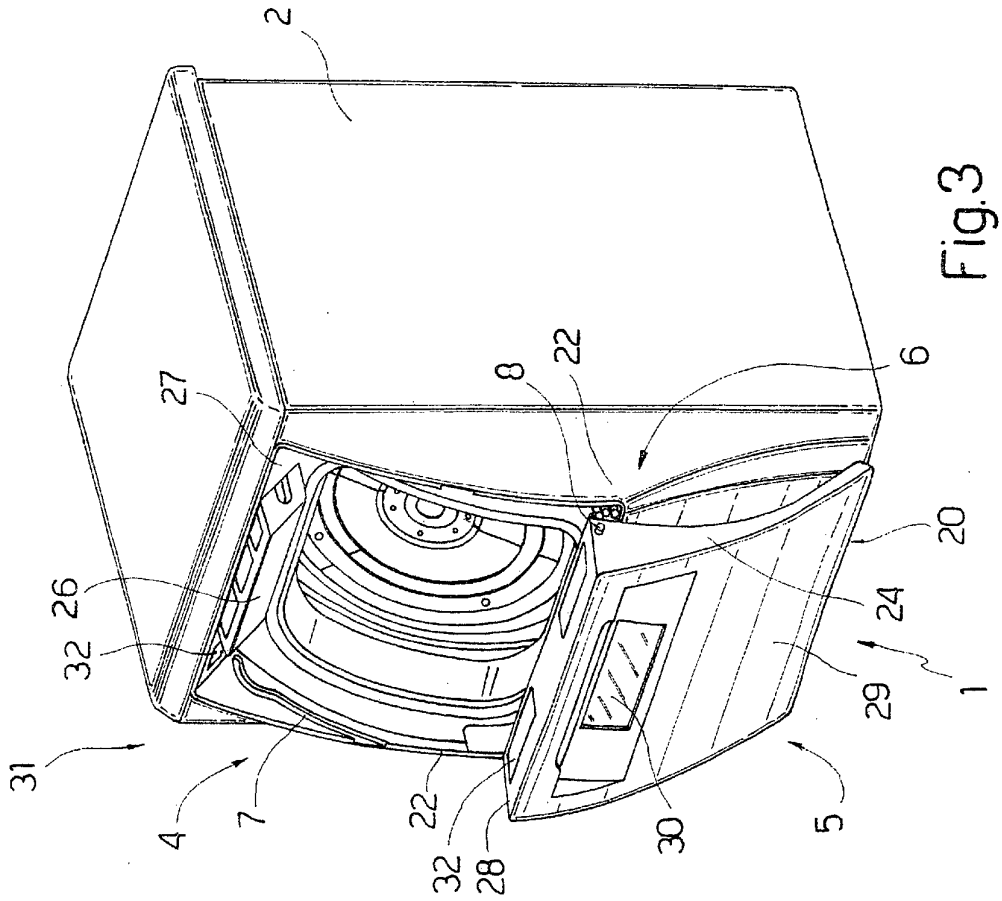


Fig.3

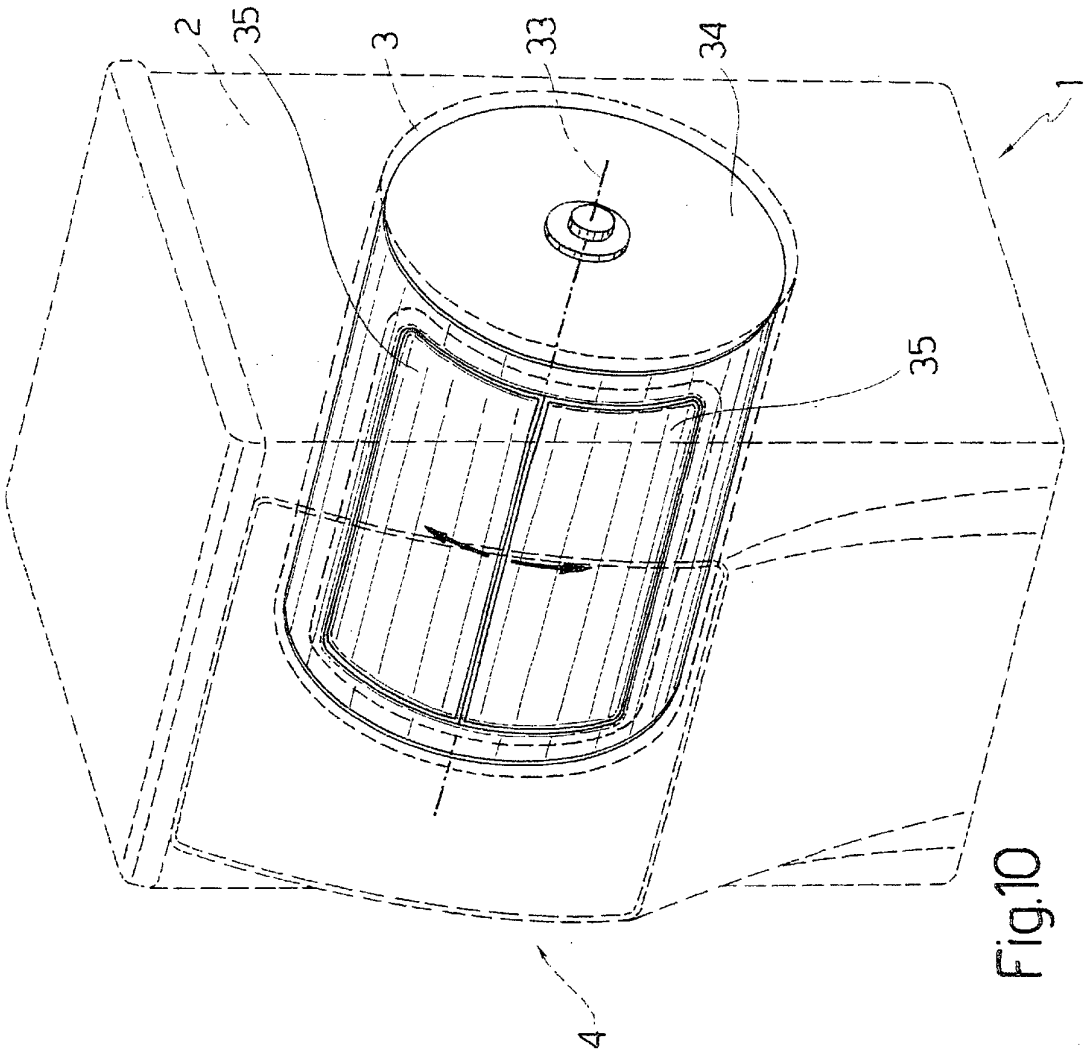


Fig.10

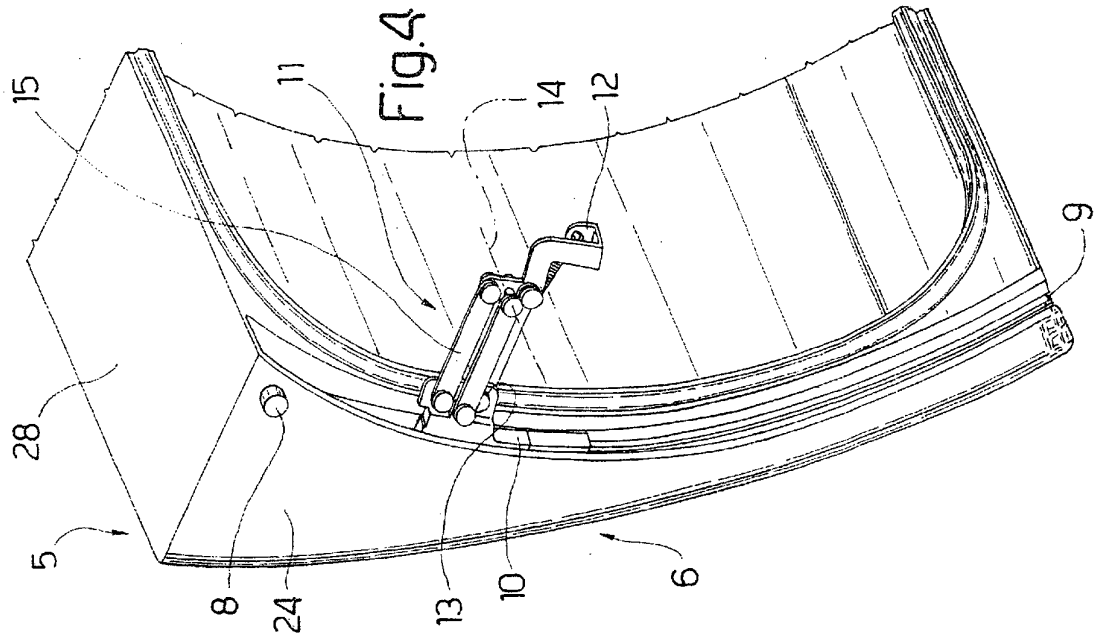


Fig.4

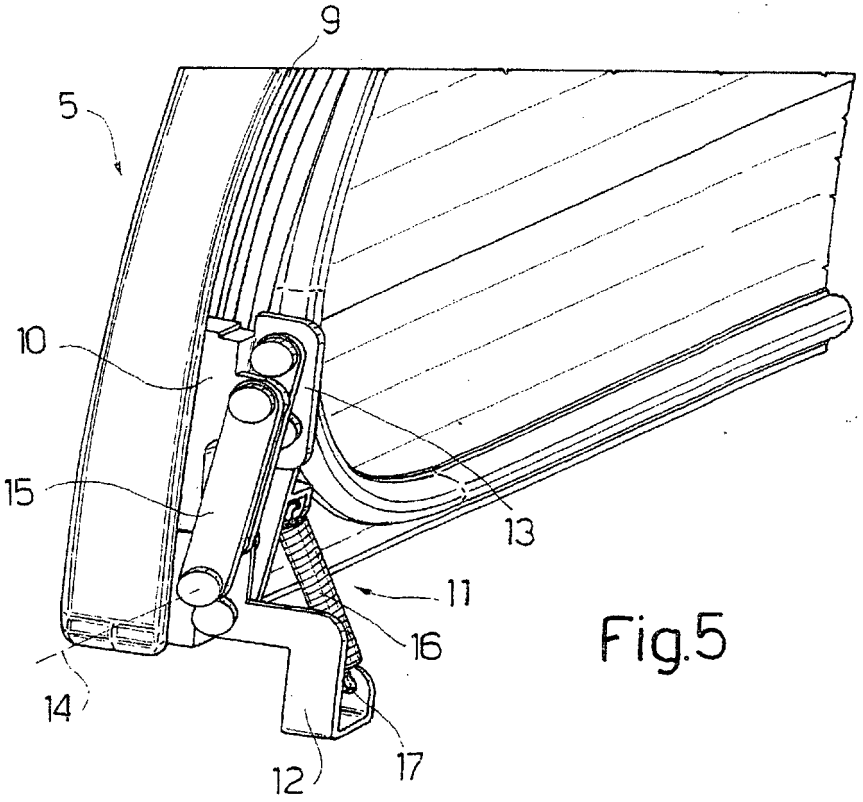


Fig.5

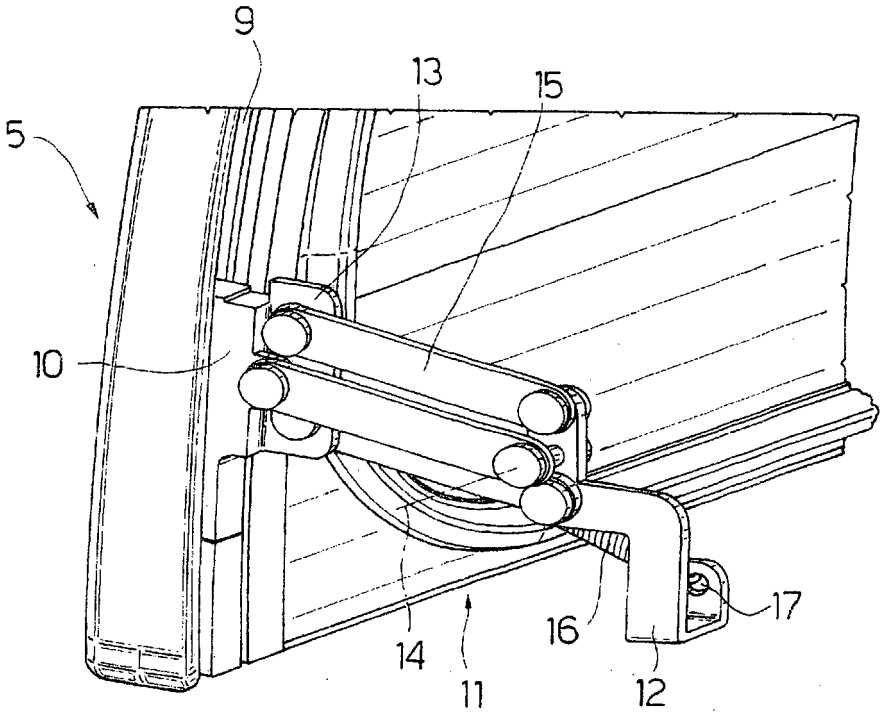


Fig.6

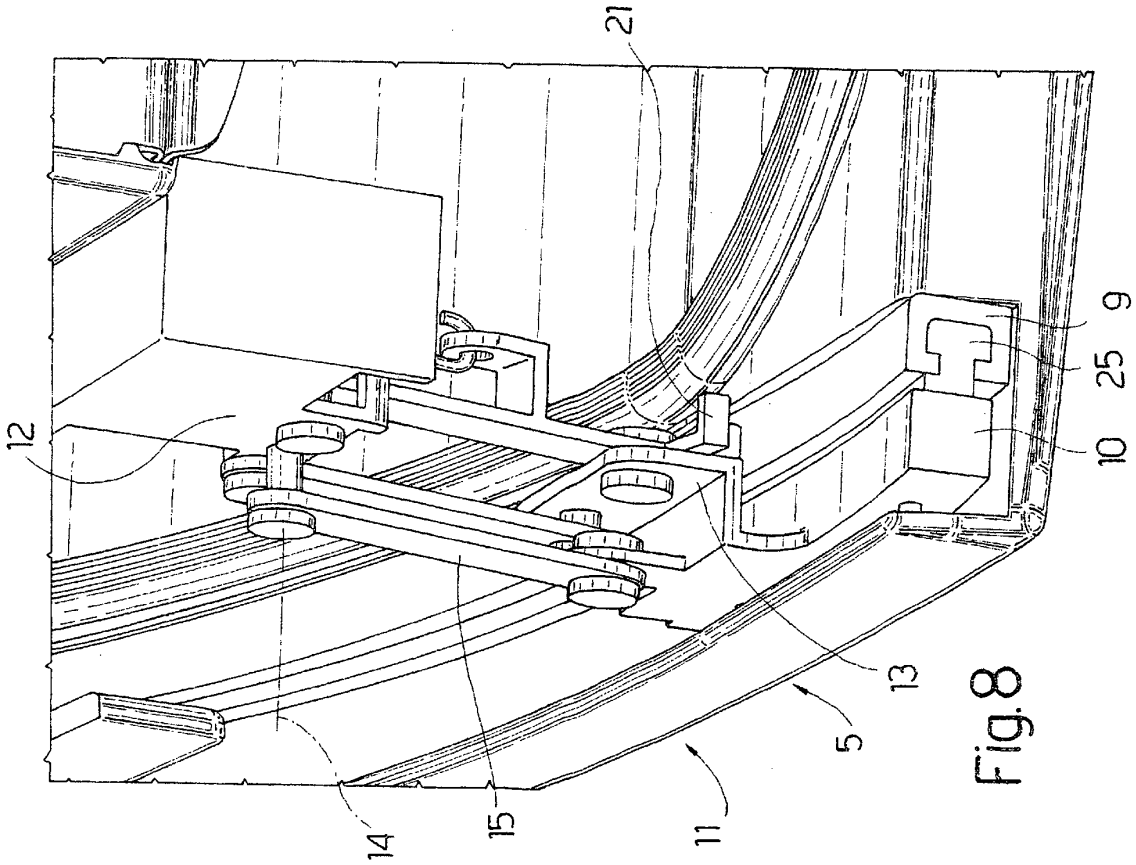


Fig.8

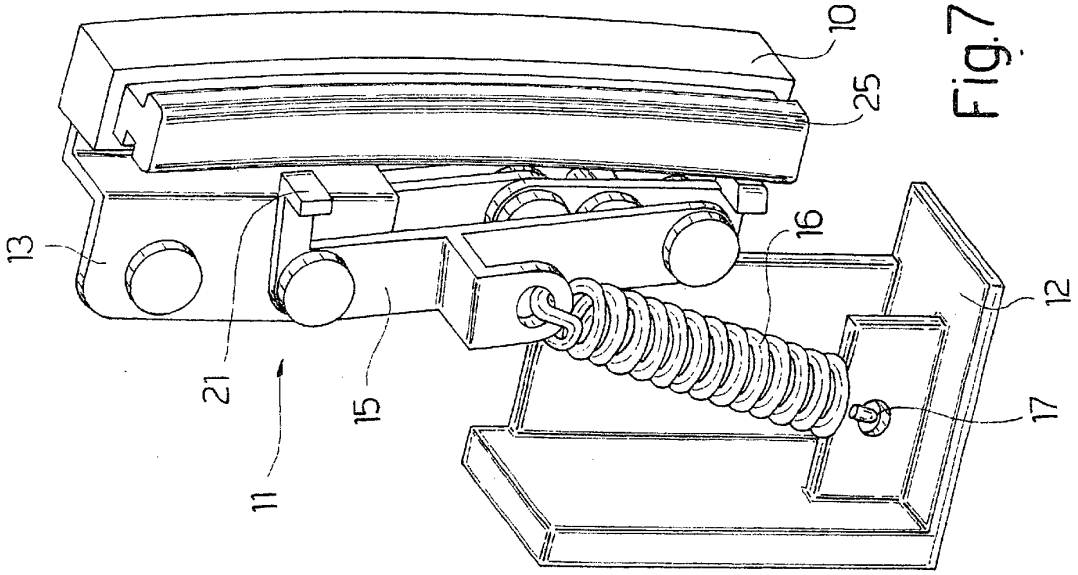


Fig.7

REFERENCES CITED IN THE DESCRIPTION

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