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(54) **Electric household appliance, in particular a dishwashing machine, with an improved access door**

(57) The electric home appliance comprises an outer casing (1) with an access door (4), as well as a setting and/or control arrangement formed by an electric portion (6; 18; 22; 25) and a user-interface portion (7; 8; 21;

26) accessible in correspondence of said door. The user-interface portion is mounted on the door (4), whereas the electric portion is mounted on the casing (1) so as to be only able to functionally couple with the user-interface portion when the access door is closed

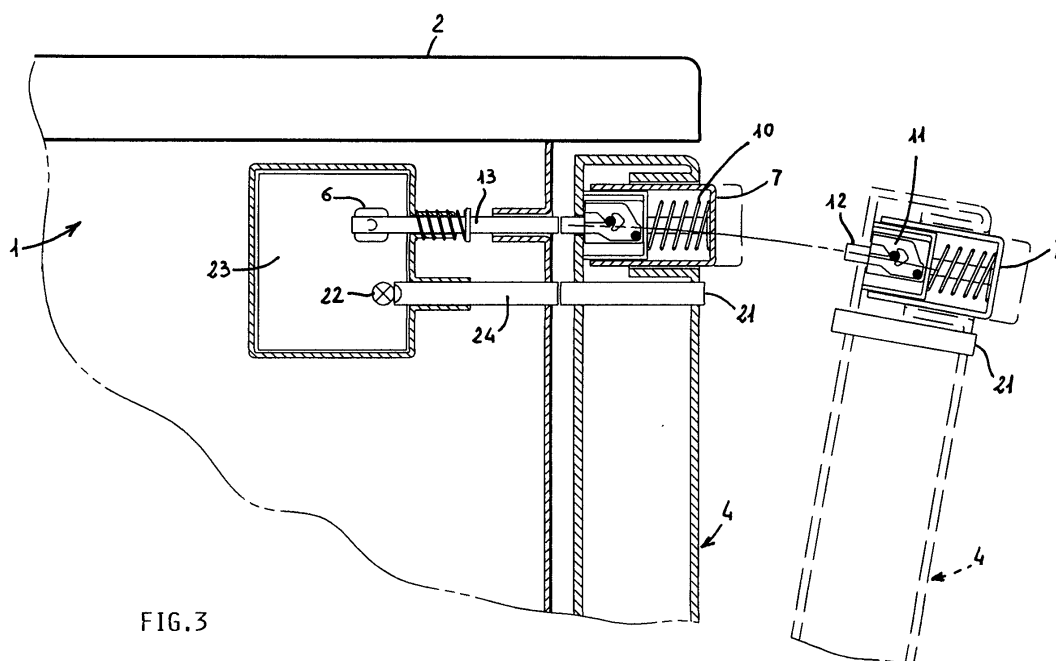


FIG. 3

Description

[0001] The present invention refers to an electric home appliance, in particular a dishwashing machine, provided with an improved door providing access to the interior of the machine.

[0002] Household-type dishwashing machines are largely known to usually include, within an outer casing, a washing vessel that is open on the front and is capable of being closed, under interposition of a sealing gasket, by means of an access door that is hinged along an horizontal axis on the lower side thereof, so as this is described for instance in GB-A-2 166 790.

[0003] Such an access door accommodates, usually in correspondence of a control box or panel appropriately provided on the upper side to this purpose, electronic and/or electromechanical control and setting devices which require respective wiring means for them to be duly connected with the circuitry arranged in the outer casing of the machine.

[0004] The proposal has also been made, so as this is described for instance in EP-A-0 671 143, for said control and setting devices to be installed in the outer casing of the dishwashing machine, rather than in the door assembly, in a front upper position lying between the washing vessel and the worktop of the machine. In this manner, the access door of the machine is advantageously cleared from any presence of wiring harnesses for connecting said control and setting devices to the circuitry in the main casing of the machine.

[0005] However, since the worktop of a dishwashing machine usually protrudes frontally by a few centimetres from the actual casing of the machine, it practically substantially covers said control and setting device, thereby causing them to be scarcely or even hardly visible and accessible by the user.

[0006] In addition, the above mentioned arrangement of said control and setting devices can only be implemented in "special" dishwashing machines, i.e. dishwashing machines having a height of 91 cm, instead of the traditional standard height of 85 cm. In normal household-type dishwashing machines, in fact, it is a largely known fact that it is practically impossible to rely on the availability of an adequate space for a front accommodation to be provided on top of the outer casing of the machine for said control and setting devices to be housed there.

[0007] Furthermore, the solution described in EP-A-0 671 143 is not compatible with the important current requirement of letting the front contour of the dishwashing machine perfectly match, i.e. be adapted to, the general profile of the other kitchen cabinets aligned therewith in a juxtaposed arrangement. In fact, such a requirement implies the need for the access door of the machine, when shut in its closed position, substantially extends to cover the whole height and, preferably, also the whole width dimension of the machine.

[0008] It therefore is a main purpose of the present

invention to provide an electric home appliance, in particular a dishwashing machine, equipped with an access door that is improved in such a manner as to be not only cleared from the burden of any wire needed for connecting it with the remaining outer casing of the machine, but also geometrically and dimensionally adapted to the normal contour of possibly juxtaposed standard kitchen cabinets.

[0009] More particularly, it is a purpose of the present invention to provide an electric home appliance of the above cited kind, which is substantially simple and low-cost, and is further provided with an access door in correspondence of which, albeit in the presence of standard dimensions, there are provided at least the four main control and setting devices, while at the same time clearing the same door from the need for any associated wiring to be provided there to electrically connect said devices with the remaining part of the machine.

[0010] According to the present invention, these and further aims are reached in an electric home appliance, in particular a dishwashing machine, with an improved access door embodying the characteristics as recited and defined in the appended claims.

[0011] Anyway, features and advantages of the present invention may be more readily understood from the description that is given below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a schematic front view of the electric home appliance with the access door thereof in a closed state, according to a preferred embodiment of the present invention;
- Figure 2 is an enlarged schematical top view of the electric home appliance shown in Figure 1, in which the main component parts thereof are shown in a see-through manner;
- Figure 3 is a partially cross-sectional side view of an enlarged detail of the electric home appliance shown in Figure 1, in which the access door is shown also in a partially open state by dashed lines; and
- Figure 4 is a partially cross-sectional side view of another enlarged detail of the electric home appliance shown in Figure 1, in which the access door is shown also in a partially open state by dashed lines.

[0012] The electric home appliance according to the present invention is preferably a dishwashing machine comprising an outer casing 1 with a worktop 2 on the upper side thereof, and sized to standard dimensions, with a height that may be of approx. 85 cm from the floor.

[0013] The outer casing 1 contains a washing vessel 3 having an open front side that can be closed, under

the interposition of a sealing gasket 15, by an access door 4 that is hinged on a horizontal axis 5 and is preferably, although not solely made of plastic material as a single-piece construction, in a substantially per se known manner.

[0014] Preferably, when it is in its closed position, the door 4 extends to substantially cover the whole height and the whole width with respect to the front profile, i.e. contour of the machine.

[0015] In a per se known manner, the dishwashing machine comprises setting and/or control devices that may be different in accordance with the various requirements and the different level of sophistication of the machine itself. In the simplest version of such a machine, said setting and/or control devices comprise at least a main power switch 6 (Figures 2 and 3) to switch on and off, i.e. to energize and de-energize the machine, which is therefore connected to a circuitry (only shown schematically at 9) arranged in correspondence of the outer casing 1.

[0016] The switch 6 (or any other similar electric device) is operable by the user through a push-button 7, or through any other equivalent mechanical interface device, which is mounted on the door 4 and is preferable accessible by the user in a convenient front position comprised within the overall contour of the same door. This enables the access door to be made to such a size and such a shape as to be capable of appropriately matching, i.e. adapting itself to the normal contour of standard kitchen cabinets installed in a juxtaposed arrangement.

[0017] The interface push-button 7 is preferably capable of being accessed by the user in correspondence of the front surface of the door 4 or, possibly, of a control panel mounted on the same door.

[0018] As an alternative thereto, the interface device 7 may be provided for being accessed by the user in correspondence of a side surface of the door 4, such as for instance the top surface.

[0019] Both solution are anyway per se well-known, for instance from the disclosure in EP-A-858 768.

[0020] According to a feature of the present invention, however, it is only the mechanical interface device 7 that is mounted on the door 4, whereas the power switch 6 is mounted on the outer casing 1 in such a manner as to be adapted to functionally couple with the same interface device only and solely when the door itself is substantially closed.

[0021] In other words, in the door 4 there is only mounted the mechanical portion 7 of the control means, whereas the electric portion 6 thereof is arranged on the outer casing 1 of the machine. This brings an important advantage with it. In that the door 4 can be made so as to include no electric wiring at all.

[0022] In particular, the push-button 7 may be of the type loaded, i.e. biased by a spring 10 and associated to a bi-stable switching mechanism 11, so as illustrated in Figure 3. The push-button 7 comprises a pushing

member 12 by means of which, when the door 4 is closed, it is capable of acting upon the switch 6, possibly under the interposition of a springy actuating rod 13 mounted in correspondence of the outer casing 1.

5 **[0023]** In order to enable assembly tolerances to be compensated for automatically when assembling the door 4 on to the outer casing 1, the moving member of the power switch 6 is preferably arranged laterally with respect to the axis of the actuating rod 13, which is adapted to act upon the same switch through an inclined plane 14 that imparts an angular direction to the longitudinal displacement of the rod.

10 **[0024]** The power switch 6 is preferably of the normally open type, so as to be able to make advantageously use of the mechanical disengagement thereof from the interface push-button 7 when the door 4 is opened. In this condition, in fact, regardless of the actual switching condition, i.e. on or off, of the push-button 7, the latter mechanically disengages the switch 6, which therefore changes over to its normally open position, thereby cutting off the general power supply to, i.e. de-energizing the machine. As a result, the switch 6 also acts as a safety provision adapted to automatically cut out the power supply to the appliance if the access door thereof is opened during operation.

20 **[0025]** With particular reference to Figure 4, the electric home appliance may be provided with control means similar to said push-button 7 and comprising, in correspondence of the door 4, an interface push-button 8 of a monostable type that can be used for instance to select the various operational programmes, or duty cycles, of the machine. Said push-button 8 is preferably loaded, i.e. biased by a spring 16 and is provided with a pushing member 17 by means of which, only and solely when the door 4 is closed, it is capable of acting upon an electric contact 18, or the like, which is provided in correspondence of the outer casing 1 of the machine.

30 **[0026]** In particular, said electric contact 18 may be mounted on an associated printed-circuit board 28, or the like, that includes an appropriate electronic driving circuit and is preferably arranged in correspondence of a front upper corner of the home appliance, in a position adjacent to the door 4.

35 **[0027]** The pushing member 17 of the push-button 8 is capable of acting upon the electric contact 18 through a transmission member 19 that is mounted in correspondence of the outer casing 1 and is preferably shaped into a fork-like form, or the like, featuring a hinging point 20. Similarly to the afore described inclined plane 14, this transmission member 19 enables a springy coupling to be provided between the interface push-button 8 and the electric contact 18, so as to enable assembly tolerances to be compensated for automatically when assembling the door 4 on to the outer casing 1, while at the same time preventing any excessive mechanical stress from being imparted to the electric portion 18, 28.

45 **[0028]** The electric home appliance may also com-

prise control devices adapted to display indications concerning given operating conditions of the machine. With reference to Figure 3, for example, these control devices comprise a user interface formed by an optical waveguide 21 that extends through the thickness, i.e. the cross-section of the door 4 and that, only when the same door is closed, establishes an optical coupling with at least a LED 22, or the like, so as to receive the light emitted by it and transmit such a light from the casing 1 through to the door 4 of the machine.

[0029] Said LED 22 forms the electric portion of the control device and is provided in correspondence of the casing 1, as mounted for instance on a printed-circuit board 23 that also supports the power switch 6 and is preferably arranged in correspondence of a front upper corner of the appliance casing, in a position adjacent to the door 4.

[0030] If required, the LED 22 and the interface optical waveguide 21 can be coupled with each other, when the door 4 is closed, through the interposition of a further optical waveguide 24 mounted on the outer casing 1 of the appliance. Said optical waveguides 21 and 24 may be provided in the form of optical fibres; preferably. However, they are formed by simple transparent bars that are brought against each other axially and optically coupled with each other when the door 4 is closed, so as to be able of indicating for instance an power-on or power-off condition brought about by the actuation of the push-button 7.

[0031] Referring again to Figure 2, a similar solution can be provided in association with the push-button 8, with at least a LED 25, or the like, mounted on the printed-circuit board 28 in order to display in a coded manner (for instance, with different colours) an indication concerning the various operating programmes that are selected for the machine to carry out. In particular, when the door 4 is closed, an optical waveguide 26 mounted on the same door is coupled with the LED 25 through a further optical waveguide 27, that is provided adjacent thereto and aligned axially therewith on the outer casing 1 of the appliance, so as to be able to receive the light emitted by such a LED and transmit it from the casing 1 through to the door 4 of the appliance.

[0032] The great construction and operating simplicity of the home appliance, which in this way effectively reaches all of the aims of the present invention, clearly emerges from the description given above.

[0033] In particular, it is important to notice that the door 4 is most advantageously of the so-called "functional" type, i.e. of the type supporting all of the interfaces 7, 8, 21 and 26 of the setting and/or control devices of the appliance, and is at the same time cleared from the need to include wire harnesses to be provided in order to ensure an electric connection with the devices and circuits mounted in correspondence of the outer casing 1 of the appliance.

[0034] As a result, further to all other practical advantages, the door 4 also offers the advantage of being able

to be most quickly and conveniently removed and/or replaced with a similar door at any desired moment, for instance in view of adapting it to varying aesthetical requirements of the overall kitchen furniture.

[0035] It shall be appreciated that the above described home appliance may be the subject of a number of modifications without departing from the scope of the present invention.

[0036] So, for example, in the case that one or more of the interface elements 7, 8, 21, 26 is provided in correspondence of a side surface of the door 4, instead of the front surface thereof (so as described in the afore mentioned publication EP-A-858 768), the mechanical and/or optical coupling thereof with the corresponding electric portions 6, 18, 22, 25 mounted on the casing 1 of the appliance may be implemented by means of respective angular transmissions of a mechanical and/or optical type, according to the particular case.

Claims

1. Electric home appliance, in particular dishwashing machine, comprising an outer casing (1) provided with an access door (4), as well as at least a setting and/or control device formed by an electric portion, connected to the circuitry of the machine that is associated to the outer casing thereof, and a user-interface portion that is accessible in correspondence of said door, **characterized in that** said user-interface portion (7; 8; 21; 26) of the setting and/or control device is mounted on the access door (4), whereas the electric portion (6; 18; 22; 25) thereof is mounted on the casing (1) so as to be only able to functionally couple with said user-interface portion when the access door (4) is closed.
2. Electric home appliance according to claim 1, **characterized in that** said access door (4) is free of electrical connections for connecting said setting and/or control device (6; 7; 8; 18; 21; 22; 25; 26) to said circuitry (9).
3. Electric home appliance according to claim 1, **characterized in that** said user interface portion comprises a mechanical push-button (7; 8), or the like, which is adapted to actuate said electric portion, comprising a switch (6; 18) or the like, through pushing means (12; 17).
4. Electric home appliance according to claim 1, **characterized in that** said user interface portion comprises optical guide and indication means (21; 26) which, when said door (4) is closed, are optically coupled with light-emitting means (22; 25) forming said electric portion, so as to receive said light and transmit it from the casing (1) through to the door (4) of the appliance.

5. Electric home appliance according to claim 3, **characterized in that** said pushing means (12) of the mechanical push-button (7) are adapted to cooperate with said electric portion (6) through the interposition of a springy actuation rod (13) mounted in correspondence of the casing (1). 5
6. Electric home appliance according to claim 3, **characterized in that** said electric switch (6) is arranged laterally with respect to the axis of said pushing means (12), which are adapted to act upon the same switch through an inclined plane (14) that is adapted to impart an angular direction to the longitudinal displacement of the pushing means (12), so as to enable assembly tolerances of the access door (4) with respect to the outer casing (1) to be compensated for automatically. 10 15
7. Electric home appliance according to claim 3, **characterized in that** said pushing means (17) of the mechanical push-button (8) are adapted to cooperate with said electric portion (18) through the interposition of a springy, fork-shaped actuation member (19) hinged on to the casing (1). 20 25
8. Electric home appliance according to claim 3, **characterized in that** said electric switch (6) is of the normally open type and is capable of cutting out the general power supply circuit of the appliance, regardless of the actual switching condition of said mechanical push-button (7), when the access door (4) is opened. 30
9. Electric home appliance according to claim 4, **characterized in that** said optical guide and indication means (21; 26) are optically coupled with said light-emitting means (22; 25) through further optical guide means (24; 27) provided adjacent thereto and aligned axially therewith on the outer casing (1). 35 40
10. Electric home appliance according to any of the preceding claims, **characterized in that** said electric portion (6; 18; 22; 25) is mounted in the casing (1) on a printed-circuit board (23; 28), or the like, that is arranged in correspondence of a front upper corner of the home appliance, in a position adjacent to the access door (4). 45

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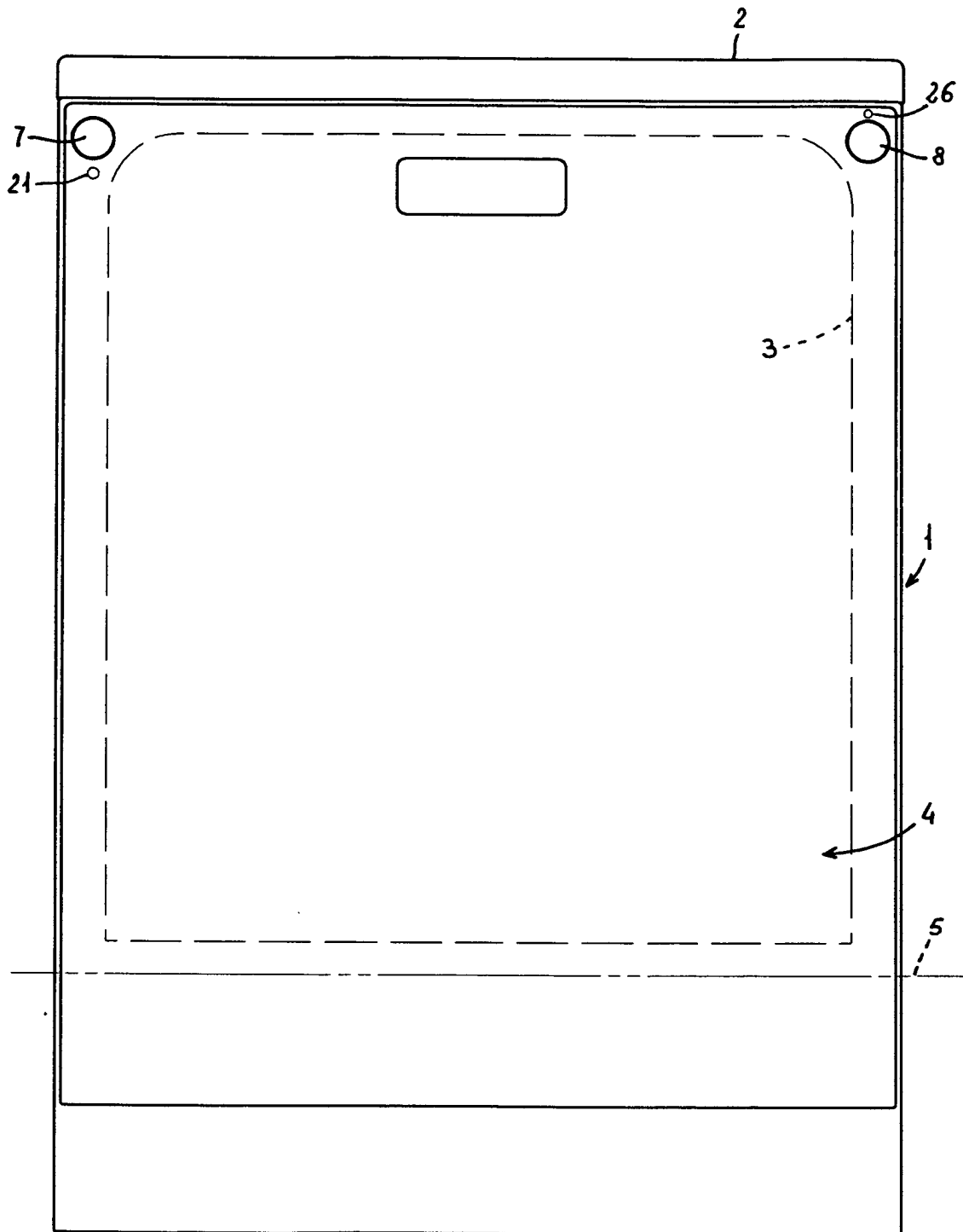


FIG.1

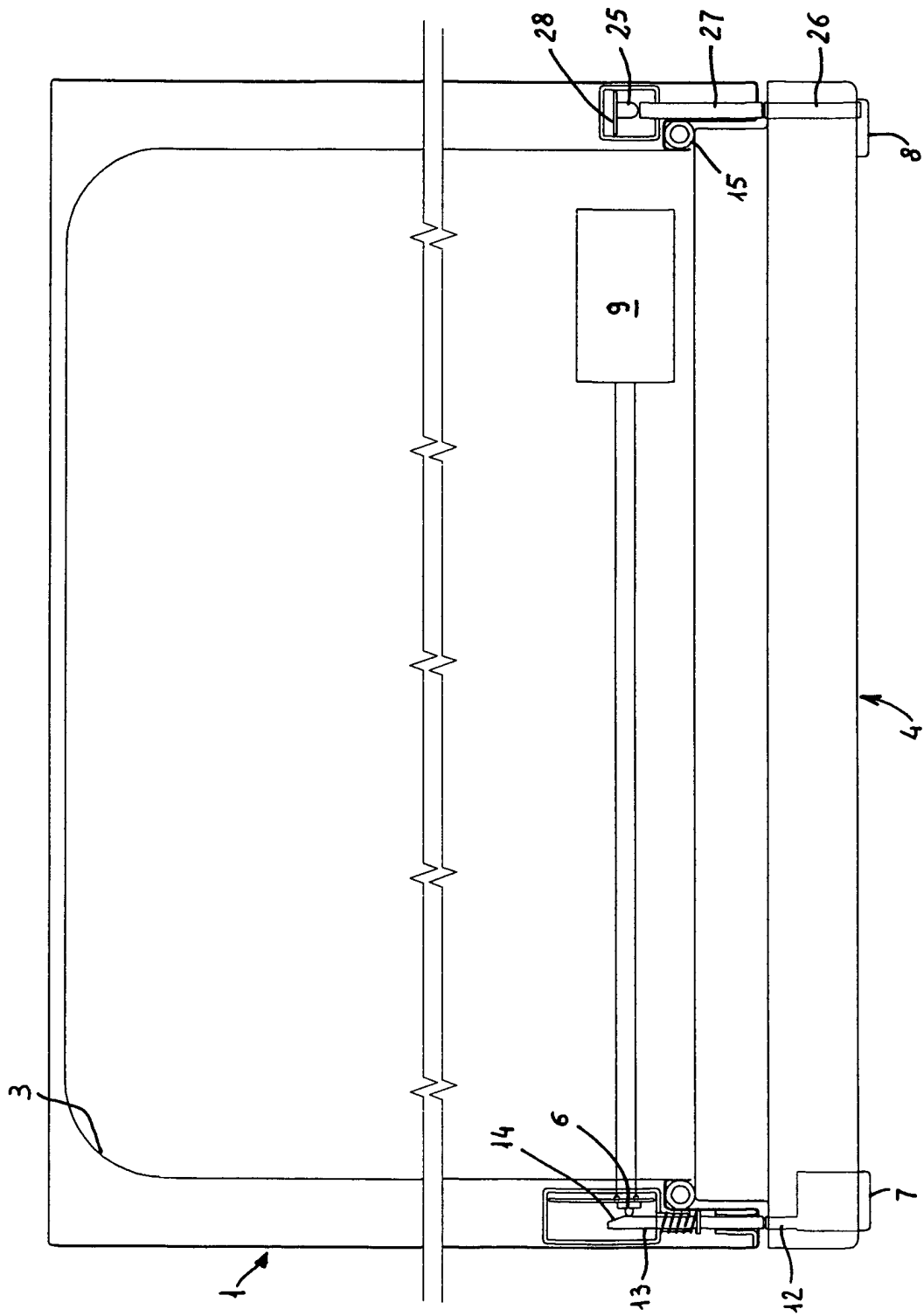


FIG. 2

