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(54) **APPLIANCE WITH HINGED DOOR**

HAUSHALTSGERÄT MIT SCHWENKBAREM FLÜGEL

APPAREIL AVEC PORTE À CHARNIÈRE

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Description

[0001] The present invention relates to an appliance, for domestic or professional use, provided with a hinged door which is automatically opened and closed by means of a motorised device, with a safety control which, during the movement of the door, commands the stopping or reversal of the rotation of the motor if the door encounters an obstacle in its path. In the following, specific reference will be made to a dishwasher, but it is clear that the device can be applied to other types of appliances comprising the same type of door (e.g. thermo-disinfectors, washing machines, refrigerators, ovens, etc.).

[0002] It is known that the opening and closing movement of an automatic door requires a safety control to prevent the door from damaging an obstacle (an object or an operator) that could be found in its path. To this end, the presence of the obstacle is typically detected through the increase in the motor torque required to move the door, which has a two-way connection with the motorised device that controls its movement. In practice, the safety control is entrusted only to a sensor that detects the increased absorption due to an obstacle, so as to interrupt/reverse the operation of the motor beyond a certain overload threshold.

[0003] However, this type of traditional control is not very safe or convenient, as it depends on adjusting the threshold according to the weight of the door. However, said weight can change significantly if the door is equipped with a support frame for placing lids or pans on the door, or in the case of a refrigerator depending on the amount of bottles or other heavy items placed on the door. This variability in weight implies a risk of malfunctioning of the safety control, because if the threshold is set too low a "false positive" can occur, i.e. a non-existent obstacle is detected, whereas if the threshold is set for the maximum possible door weight there is a risk of not detecting in time an obstacle in the path of the door in a low weight condition.

[0004] Other problems can occur in the case of appliances in which the compartment that is closed by the door has a perimeter seal that the door must compress when closing, for example to prevent the escape of water and steam in a dishwasher, or hot air and/or steam in an oven.

[0005] A first drawback can arise when the seal becomes stiffer as it ages, requiring a greater push to compress it. In such a case, if the safety control intervention threshold is not raised to take account of this increased push, a "false positive" as mentioned above may occur, with the result that the device is unable to close the door.

[0006] A second similar drawback that can occur at the beginning of the opening phase is that the aged seal tends to stick to the door, thus causing an initial overload of the motor. This leads to a risk of "false positive" if the threshold is too low, as an obstacle is detected in the opening process that is not there, with the result that the device is unable to open the door.

[0007] On the other hand, adjusting the threshold to suit the aged seal is not easy either, as it is necessary to proceed by trial and error and the threshold may be adjusted so high that it risks damaging an obstacle.

[0008] Finally, there are other types of safety control using different means, such as an infrared barrier or a contact-sensitive moving edge, which are however much more expensive and complex to operate. EP 3 685 707 A1 discloses an example of an appliance.

[0009] The object of the present invention is therefore to provide an appliance having an automatic door which overcomes these drawbacks. This object is achieved by means of an appliance whose door movement device provides an active connection between the motor and the door only in the opening direction, by means of the interposition of an elastic safety element, while the closing is performed by an elastic return element whose actuation speed is limited by a passive connection with the motor or by a damping element. In a preferred embodiment, the device also comprises a door latch which actively assists in compressing the seal in the closing phase and detaching it from the door in the opening phase.

[0010] The main advantage of the appliance according to the present invention is therefore that of having a door movement device in which the safety control is obtained through means which do not rely on the current consumption of the motor, so that the safety control is independent of variations in the weight of the door without risk of "false positives" or damage to an obstacle due to an excessively high intervention threshold.

[0011] A further significant advantage of this appliance, in its preferred embodiment, is that interventions on the seal are entrusted to the latch, so that ageing of the seal does not affect the correct functioning of the safety control.

[0012] Yet another advantage is that the door movement device is extremely simple and therefore reliable and inexpensive, and its operation is very easy to control by the control unit.

[0013] These and other advantages and features of the appliance according to the present invention will be evident to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the accompanying drawings in which:

Fig.1 is an enlarged schematic view, partially in section, of the main elements of the door movement device;

Figs.2 and 3 are views similar to the previous one showing the intervention of the safety control during opening;

Figs.4a-4e are schematic views of the door and the movement device in different positions during the opening stroke, from the closed door to the fully open door;

Fig.4f is a similar view to the previous ones, showing the return to the closed position;

Fig.5 is an enlarged schematic view, partially in sec-

tion, of the main elements of the door latch, during the door engagement phase;

Fig.6 is a similar view to the previous one, in the phase of locking the door and compressing the seal; and

Fig.7 is a similar view to the previous one, in the phase of unlocking the door and detaching it from the seal.

[0014] Referring to Fig.1, it can be seen that a dishwasher according to the present invention traditionally comprises a door 1 hinged at the bottom, so as to rotate about a horizontal axis 2. The door 1 is provided with a lever 3 extending inwards and downwards to act as a connection with the movement device.

[0015] More specifically, lever 3 carries at its distal end a roller 4 having a horizontal axis, and in an intermediate position a horizontal pin 5 to which the upper end of a return spring 6 is engaged, the lower end of which is engaged to a similar pin fixed on the frame of the dishwasher. In addition, a damper 7 is pivoted between the frame and lever 3, preferably in correspondence with roller 4 but pin 5 could also be used or a further pin could be provided specifically for damper 7.

[0016] A linear actuator 8 is arranged vertically and has an extendible stem 9 with a portion 9a of reduced cross-section, on which a spring 10 is threaded. A vertical plate 11, with a substantially inverted L shape, is carried by stem 9 through two vertically aligned collars 11a, 11b which are fitted with minimum play on said reduced portion 9a above spring 10, which thus acts as an element for the transmission of the push of actuator 8 to plate 11.

[0017] It should be noted that stem 9 ends with a portion of a cross-section larger than the reduced portion 9a, so that plate 11 is constrained to move with stem 9 both upwards and downwards. The only relative movement between stem 9 and plate 11 is due to the compressibility of spring 10, as will be illustrated below.

[0018] The plate 11 carries a microswitch 12 arranged above actuator 8 in such a way that its movable element 12a is vertically aligned with stem 9. In addition, plate 11 also carries a pushing element 13 arranged in a substantially horizontal position at its lower end and shaped as a track for the rolling of roller 4. More specifically, the pushing element 13 has in sequence from the inside to the outside a flat horizontal part, a flat downwardly sloping part and a curved part rising upwards until it exceeds the inner horizontal part (inside/outside being defined from the wash tank towards the door).

[0019] For reasons of balance and smooth operation of the device, it is preferable to have a lever 3 on each side of door 1, with equal and parallel springs 6 acting on both sides of the door. On the contrary, for cost reasons, damper 7 and actuator 8 are provided only on one side of the door, preferably the same side.

[0020] Referring now to Figures 2 and 3, the simple and effective operation of the safety control during automatic door opening of the dishwasher according to the

invention is immediately apparent from the above description.

[0021] Starting from the position of Fig.2, corresponding to Fig.1, when door 1 encounters an obstacle which stops its opening movement, actuator 8 continues to extend stem 9 by pushing up plate 11 through spring 10, but roller 4 does not allow the pushing element 13 to rise since lever 3 cannot rotate further. Consequently, the push of stem 9 results in a compression of spring 10 against the lower collar 11b, and this compression stroke allows the top of stem 9 to come into contact with the movable element 12a of microswitch 12 (Fig.3), which is then activated and can command the stopping or reversal of actuator 8.

[0022] Figs.4a-4e show different positions of the door and of the elements of the movement device (lever 3, roller 4, spring 6, damper 7, stem 9, plate 11) during the opening stroke, from the closed door of Fig.4a to the fully open door of Fig.4e. More specifically, it can be seen that spring 6 and damper 7 rotate counterclockwise around their lower mounting pins to the position in Fig.4d, where lever 3 is arranged horizontally, and then rotate slightly clockwise in the final stretch of the stroke to Fig.4e where lever 3 is tilted upwards.

[0023] Similarly, roller 4 starts from the outer end of the track forming the pushing element 13, descending along the curved part (Fig.4b) and then ascending along the sloping part (Fig.4c) to reach the inner end at the beginning of the horizontal part (Fig.4d), and finally moves back slightly (Fig.4e). Note that the shape, size and position of the pushing element 13 are related to the position of roller 4 with respect to the axis of rotation of door 1, so it is clear that the one depicted is only an exemplary shape that any person skilled in the art can easily modify in case of a different position of roller 4 on lever 3.

[0024] During the closing of door 1, as shown in Fig.4f, stem 9 is retracted and brings with it plate 11 so that spring 6 can recall lever 3 with a counterclockwise rotation, the rotation speed being limited by the fact that roller 4 continues to rest on the pushing element 13, so it is the retraction speed of stem 9 that determines the time necessary for the closing (usually in the order of 10-15 seconds). The safety control during closing is intrinsic in the structure of the movement device, since actuator 8 does not act on lever 3 which is rotated only by the action of spring 6, which is selected to have a recall force sufficient to close door 1 but not such as to cause damage to any obstacle.

[0025] Furthermore, in the event that door 1 remains open, due to manual intervention by the user or due to an excessive weight on the door, even when stem 9 is retracted (as indicated by the continuous line in Fig.4f), damper 7 nevertheless ensures that the subsequent closing performed when spring 6 succeeds in recalling door 1 takes place at a limited speed, even if roller 4 is not in contact with the pushing element 13.

[0026] As mentioned above, in a preferred embodi-

ment illustrated in Figs.5-7, the appliance is also provided with an "active" latch which provides for the compression phase of a seal, if any, at the end of the closing movement of the door, as well as for the detachment of the door from the seal at the beginning of the opening movement, so that the ageing of the seal does not affect the correct functioning of the safety control.

[0027] The latch acts on a horizontal eyelet 14, fixed to the door 1, which is engaged by the free end of an inverted hook 15 swinging around a horizontal pin 16, under the action of a connecting rod 17 pivoted at the other end of hook 15. The connecting rod 17 is pivoted at its opposite end to a crank of a crankshaft 18, which rotates counterclockwise about a horizontal axis 19 being driven by a unidirectional motor 20.

[0028] The engagement position of Fig.5 is preferably confirmed by means of a sensor that detects the presence of door 1 when it arrives in the vicinity of the latch in such a position that eyelet 14 can be engaged by hook 15, preferably a Reed sensor (not shown) that detects a magnet 23 mounted on door 1. A control unit (not shown), once it receives confirmation from the aforementioned position sensor, activates motor 20 so that the rotation of crankshaft 18 causes the backward movement of the connecting rod 17 which rotates hook 15 clockwise around the pin 16.

[0029] Consequently, hook 15 pulls inwards eyelet 14 and therefore door 1, which compresses seal 24 without the need for a push by actuator 8. A microswitch (not shown) is actuated by hook 15 when the fully closed position of door 1 is reached in which seal 24 is compressed (Fig.6), so as to authorize the start of the washing cycle.

[0030] The crankshaft 18 is also provided with a cam profile 21 that is able to operate a second microswitch 22 that is used to detect the position in which hook 15 has disengaged from eyelet 14 (Fig.7), so as to authorize the activation of actuator 8 for the start of the opening phase. Note that in the passage from the locked position of Fig.6 to this disengagement position, the central portion of hook 15 comes into contact with eyelet 14, pushing it outwards. In this way, door 1 is detached from seal 24 even before the start of the opening phase, without the need for intervention by actuator 8.

[0031] It is clear that the embodiment of the appliance according to the invention described and illustrated above is only an example susceptible to numerous variations. In particular, the exact nature, form and arrangement of the elements could be varied according to specific constructional requirements, for example by using mechanical equivalents of the elements described above such as a different type of sensor/detector than the Reed sensor and microswitches 12, 22 (e.g. optical sensors, resistive sensors, etc.), a different type of linear actuator than the one with the extendible stem 9 (e.g. rack and pinion, worm screw, etc.), a different type of spring elements than coil springs 6, 10 and so on, as long as the general structure of the automatic door actuating device is maintained with the actuator acting in the opening

phase through an elastic safety element and the elastic return element acting in the closing phase in cooperation with the actuator and/or the damper.

[0032] Similarly, the rotation mechanism of hook 15 could also be different from the connecting rod 17+crankshaft 18 combination, and the rotation pin 16 of hook 15 could be vertical if the mechanism is intended to act on an eyelet 14 arranged in the vertical plane. Alternatively, hook 15 could be reversed and pivot 16 located below eyelet 14 to engage it from below, in which case motor 20 would rotate clockwise.

[0033] Furthermore, the engagement element on door 1 could also be different from eyelet 14, whereby the latch could be consequently modified in the structure and movement of its element that goes to engage the engagement element on the door.

Claims

1. An appliance having an automatic hinged door (1), a motorised device for the movement of said door (1) and at least one sensor capable of detecting the interference of an obstacle during the movement of the door (1) and sending a stop/reverse command to said motorised device via a control unit of the appliance, **characterized in that** said door movement device comprises at least one linear actuator (8) acting on the door (1) only during the opening phase and through an elastic safety element allowing a relative movement between said linear actuator (8) and the door (1) in case of an obstacle during opening, said interference sensor being capable of detecting said relative movement, whereas the closing phase is performed by at least one elastic return element (6) arranged between the door (1) and a fixed part of the appliance, the actuation speed of said elastic return element (6) being limited by the linear actuator (8) during its return stroke and/or by at least one damping element (7) arranged between the door (1) and a fixed part of the appliance.
2. Appliance according to claim 1, **characterized in that** the door (1) is hinged at the bottom so as to rotate about a horizontal axis (2) and is provided with at least one lever (3) extending inwards and downwards and carrying a roller (4) with a horizontal axis, the elastic return element (6) and the damping element (7) being connected to said lever (3), the linear actuator (8) being arranged vertically and carrying a pushing element (13) which pushes upwards said roller (4) and is shaped as a track for the rolling of the roller (4).
3. Appliance according to the preceding claim, **characterized in that** the linear actuator (8) has an extendible stem (9) with a portion (9a) of reduced cross-section on which the elastic safety element in the

form of a coil spring (10) is threaded, a vertical plate (11) having a substantially inverted L shape being carried by said stem (9) through two vertically aligned collars (11a, 11b) which are fitted with minimum play on said portion (9a) of reduced cross-section above said coil spring (10), the stem (9) ending with a portion having a cross-section greater than the portion (9a) of reduced cross-section.

4. Appliance according to the preceding claim, **characterized in that** the vertical plate (11) carries a microswitch (12) arranged above the linear actuator (8) in such a way that a movable element (12a) of said microswitch (12) is vertically aligned with the stem (9) at a distance such that a relative movement between the stem (9) and the plate (11) can be detected in case of compression of the coil spring (10) threaded on the stem (9).
5. Appliance according to claim 3 or 4, **characterized in that** the pushing element (13) has in sequence from the inside to the outside a flat horizontal part, a flat downwardly sloping part and a curved part rising upwards until it exceeds the internal horizontal part, said pushing element (13) being preferably arranged in a substantially horizontal position on the vertical plate (11).
6. Appliance according to any of the preceding claims, **characterized in that** it comprises at least one elastic return element (6) on both sides of the door (1), and only one linear actuator (8) and only one damping element (7), which are preferably arranged on one and the same side of the door (1).
7. Appliance according to any one of the preceding claims, **characterized in that** it further comprises a motorised latch which engages the door (1) in order to make it perform the last stretch of the closing stroke and the first stretch of the opening stroke, the length of said stretch performed under the action of said motorised latch being sufficient to obtain the compression of a seal (24) arranged in correspondence with the abutment area of the door (1) and the subsequent detachment of the door (1) from said seal (24) during the opening phase.
8. Appliance according to the preceding claim, **characterized in that** the door (1) is provided with an eyelet (14) and the latch comprises a hook (15) swinging around a pin (16), parallel to the plane of said eyelet (14), between a locking position in which it engages said eyelet (14) pulling the door (1) inwards until it compresses the seal (24), and a position in which it does not engage said eyelet (14), the oscillation between said locking position and said disengagement position implying a push of the hook (15) on the eyelet (14) such as to cause the door (1)

to be detached from the seal (24).

9. Appliance according to the preceding claim, **characterized in that** the hook (15) oscillates under the action of a connecting rod (17) pivoted between the hook (15) and a crank of a crankshaft (18) driven by a unidirectional motor (20).
10. Appliance according to the preceding claim, **characterized in that** the crankshaft (18) is provided with a cam profile (21) arranged to actuate a microswitch (22) in correspondence with the disengagement position of the hook (15), said microswitch (22) being operatively connected to the control unit so as to authorize activation of the actuator (8) for starting the opening phase.
11. Appliance according to any of claims 8 to 10, **characterized in that** it further comprises a microswitch which is activated by the hook (15) in correspondence with its locking position, said microswitch being operatively connected to the control unit so as to authorize the start of the operating cycle of the appliance.
12. Appliance according to any of claims 7 to 11, **characterized in that** it further comprises a sensor that detects the presence of the door (1) when it arrives in proximity to the latch in a position where it can be engaged by the latch, preferably a Reed sensor that detects a magnet (23) mounted on the door (1).

Patentansprüche

1. Gerät mit einer automatischen Gelenktür (1), einer motorisierten Vorrichtung für die Bewegung der Tür (1) und mindestens einem Sensor, der in der Lage ist, die Störung durch ein Hindernis während der Bewegung der Tür (1) zu erkennen und über eine Steuerungseinheit des Geräts einen Stopp-/Rückwärtsbefehl an die motorisierte Vorrichtung zu senden, **dadurch gekennzeichnet, dass** die Türbewegungsvorrichtung mindestens einen linearen Aktuator (8) umfasst, der nur während der Öffnungsphase auf die Tür (1) einwirkt und durch ein elastisches Sicherheitselement eine Relativbewegung zwischen dem linearen Aktuator (8) und der Tür (1) im Falle eines Hindernisses während der Öffnung ermöglicht, wobei der Störungssensor in der Lage ist, die Relativbewegung festzustellen, wobei die Schließphase durch mindestens ein elastisches Rückstellelement (6) ausgeführt wird, das zwischen der Tür (1) und einem festen Teil des Geräts angeordnet ist, wobei die Betätigungsgeschwindigkeit des elastischen Rückstellelements (6) durch den linearen Aktuator (8) während seines Rückhubs und/oder durch mindestens ein Dämpfungselement

- (7) begrenzt wird, das zwischen der Tür (1) und einem festen Teil des Geräts angeordnet ist.
2. Gerät nach Anspruch 1, **dadurch gekennzeichnet, dass** die Tür (1) unten gelenkig ist, sodass sie sich um eine horizontale Achse (2) herum dreht, und mit mindestens einem Hebel (3) bereitgestellt wird, der sich nach innen und unten erstreckt und eine Rolle (4) mit horizontaler Achse trägt, das elastische Rückstellelement (6) und das Dämpfungselement (7) mit dem Hebel (3) verbunden sind, wobei der lineare Aktuator (8) vertikal angeordnet ist und ein Schiebeelement (13) trägt, das die Rolle (4) nach oben schiebt und als Bahn für das Rollen der Rolle (4) ausgebildet ist.
 3. Gerät nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** der lineare Aktuator (8) einen ausziehbaren Schaft (9) mit einem Abschnitt (9a) mit verringertem Querschnitt aufweist, auf den das elastische Sicherheitselement in Form einer Schraubenfeder (10) aufgefädelt ist, wobei eine vertikale Platte (11) mit einer im Wesentlichen umgekehrten L-Form von dem Schaft (9) durch zwei vertikale ausgerichtete Kragen (11a, 11b) getragen wird, die mit minimalem Spiel an den Abschnitt (9a) mit reduziertem Querschnitt oberhalb der Spule (10) angeschlossen sind, wobei der Schaft (9) in einem Abschnitt endet, der einen größeren Querschnitt als der Abschnitt (9a) mit reduziertem Querschnitt aufweist.
 4. Gerät nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** die vertikale Platte (11) einen Mikroschalter (12) trägt, der oberhalb des linearen Aktuators (8) derart angeordnet ist, dass ein bewegliches Element (12a) des Mikroschalters (12) vertikal mit dem Schaft (9) in einem solchen Abstand ausgerichtet ist, dass eine Relativbewegung zwischen dem Schaft (9) und der Platte (11) im Falle des Zusammendrückens der auf den Schaft (9) geschraubten Schraubenfeder (10) festgestellt werden kann.
 5. Gerät nach Anspruch 3 oder 4, **dadurch gekennzeichnet, dass** das Schiebeelement (13) in Sequenz von innen nach außen einen flachen horizontalen Teil, einen flachen nach unten geneigten Teil und einen gekrümmten Teil aufweist, der nach oben ragt, bis er den inneren horizontalen Teil überragt, wobei das Schiebeelement (13) vorzugsweise in einer im Wesentlichen horizontalen Position auf der vertikalen Platte (11) angeordnet ist.
 6. Gerät nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** es mindestens ein elastisches Rückstellelement (6) auf beiden Seiten der Tür (1) und nur einen linearen Aktuator (8) und nur ein Dämpfungselement (7) umfasst, die vorzugsweise auf ein und derselben Seite der Tür (1) angeordnet sind.
 7. Gerät nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** es ferner einen motorisierten Riegel umfasst, der in die Tür (1) eingreift, um sie die letzte Streckung des Schließhubs und die erste Streckung des Öffnungshubs ausführen zu lassen, wobei die Länge der unter der Wirkung des motorisierten Riegels ausgeführten Streckung ausreicht, um das Zusammendrücken einer Dichtung (24), die in Übereinstimmung mit dem Anlagebereich der Tür (1) angeordnet ist, und das anschließende Lösen der Tür (1) von der Dichtung (24) während der Öffnungsphase zu erhalten.
 8. Gerät nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** die Tür (1) mit einer Öse (14) versehen ist und der Riegel einen Haken (15) umfasst, der um einen Stift (16) parallel zur Ebene der Öse (14) zwischen einer Verriegelungsposition, in der er in die Öse (14) eingreift und die Tür (1) nach innen zieht, bis er die Dichtung (24) zusammendrückt, und einer Position, in der er nicht in die Öse (14) eingreift, pendelt, wobei die Schwingung zwischen der Verriegelungsposition und der Entriegelungsposition einen Druck des Hakens (15) auf die Öse (14) impliziert, sodass die Tür (1) von der Dichtung (24) getrennt werden kann.
 9. Gerät nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** der Haken (15) unter der Wirkung einer Verbindungsstange (17) oszilliert, die zwischen dem Haken (15) und einer Kurbel einer Kurbelwelle (18), die von einem unidirektionalen Motor (20) angetrieben wird, angelenkt ist.
 10. Gerät nach dem vorstehenden Anspruch, **dadurch gekennzeichnet, dass** die Kurbelwelle (18) mit einem Nockenprofil (21) versehen ist, das so angeordnet ist, dass es einen Mikroschalter (22) in Übereinstimmung mit der Entriegelungsposition des Hakens (15) betätigt, wobei der Mikroschalter (22) funktionell mit der Steuereinheit verbunden ist, um die Aktivierung des Aktuators (8) zum Starten der Öffnungsphase zuzulassen.
 11. Gerät nach einem der Ansprüche 8 bis 10, **dadurch gekennzeichnet, dass** es ferner einen Mikroschalter umfasst, der durch den Haken (15) in Übereinstimmung mit seiner Verriegelungsposition aktiviert wird, wobei der Mikroschalter funktionell mit der Steuereinheit verbunden ist, um den Beginn des Betriebszyklus des Geräts zu autorisieren.
 12. Gerät nach einem der Ansprüche 7 bis 11, **dadurch gekennzeichnet, dass** es ferner einen Sensor umfasst, der das Vorhandensein der Tür (1)

erkennt, wenn sie in der Nähe des Riegels in einer Position ankommt, in der sie in den Riegel eingreifen kann, vorzugsweise einen Reed-Sensor, der einen an der Tür (1) montierten Magneten (23) erkennt.

Revendications

1. Appareil ayant une porte automatique à charnière (1), un dispositif motorisé pour le mouvement de ladite porte (1) et au moins un capteur capable de détecter l'interférence d'un obstacle pendant le mouvement de la porte (1) et d'envoyer une instruction d'arrêt/de recul audit dispositif motorisé par l'intermédiaire d'une unité de commande de l'appareil, **caractérisé en ce que** ledit dispositif de mouvement de porte comprend au moins un actionneur linéaire (8) agissant sur la porte (1) uniquement pendant la phase d'ouverture et par l'intermédiaire d'un élément de sécurité élastique permettant un mouvement relatif entre ledit actionneur linéaire (8) et la porte (1) en cas d'obstacle pendant l'ouverture, ledit capteur d'interférence étant capable de détecter ledit mouvement relatif, tandis que la phase de fermeture est effectuée par au moins un élément de rappel élastique (6) agencé entre la porte (1) et une partie fixe de l'appareil, la vitesse d'actionnement dudit élément de rappel élastique (6) étant limitée par l'actionneur linéaire (8) lors de sa course de retour et/ou par au moins un élément d'amortissement (7) agencé entre la porte (1) et une partie fixe de l'appareil.
2. Appareil selon la revendication 1, **caractérisé en ce que** la porte (1) est articulée en bas de manière à tourner autour d'un axe horizontal (2) et est pourvue d'au moins un levier (3) s'étendant vers l'intérieur et vers le bas et portant un rouleau (4) à axe horizontal, l'élément de rappel élastique (6) et l'élément d'amortissement (7) étant reliés audit levier (3), l'actionneur linéaire (8) étant agencé verticalement et portant un élément de poussée (13) qui pousse vers le haut ledit rouleau (4) et a la forme d'une piste pour le roulement du rouleau (4).
3. Appareil selon la revendication précédente, **caractérisé en ce que** l'actionneur linéaire (8) a une tige extensible (9) avec une portion (9a) de section transversale réduite sur laquelle l'élément de sécurité élastique sous forme de ressort hélicoïdal (10) est fileté, une plaque verticale (11) ayant une forme de L sensiblement inversé étant portée par ladite tige (9) à travers deux colliers (11a, 11b) alignés verticalement qui sont ajustés avec un jeu minimum sur ladite portion (9a) de section transversale réduite au-dessus dudit ressort hélicoïdal (10), la tige (9) se terminant par une portion ayant une section transversale supérieure à la portion (9a) de section transversale réduite.
4. Appareil selon la revendication précédente, **caractérisé en ce que** la plaque verticale (11) porte un microrupteur (12) agencé au-dessus de l'actionneur linéaire (8) de telle manière qu'un élément mobile (12a) dudit microrupteur (12) est aligné verticalement avec la tige (9) à une distance telle qu'un mouvement relatif entre la tige (9) et la plaque (11) peut être détecté en cas de compression du ressort hélicoïdal (10) fileté sur la tige (9).
5. Appareil selon la revendication 3 ou 4, **caractérisé en ce que** l'élément de poussée (13) présente successivement, de l'intérieur vers l'extérieur, une partie horizontale plate, une partie plate inclinée vers le bas et une partie incurvée s'élevant vers le haut jusqu'à ce qu'elle dépasse la partie horizontale interne, ledit élément de poussée (13) étant de préférence agencé en position sensiblement horizontale sur la plaque verticale (11).
6. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend au moins un élément de rappel élastique (6) de part et d'autre de la porte (1), et seulement un actionneur linéaire (8) et seulement un élément d'amortissement (7), qui sont de préférence agencés d'un seul et même côté de la porte (1).
7. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend en outre un loquet motorisé qui vient en prise avec la porte (1) pour lui faire effectuer le dernier tronçon de la course de fermeture et le premier tronçon de la course d'ouverture, la longueur dudit tronçon effectué sous l'action dudit loquet motorisé étant suffisante pour obtenir la compression d'un joint (24) agencé en correspondance de la zone de butée de la porte (1) et le détachement ultérieur de la porte (1) dudit joint (24) pendant la phase d'ouverture.
8. Appareil selon la revendication précédente, **caractérisé en ce que** la porte (1) est pourvue d'un oeillet (14) et le loquet comprend un crochet (15) oscillant autour d'une broche (16), parallèle au plan dudit oeillet (14), entre une position de verrouillage dans laquelle il vient en prise avec ledit oeillet (14) en tirant la porte (1) vers l'intérieur jusqu'à comprimer le joint (24), et une position dans laquelle il ne vient pas en prise avec ledit oeillet (14), l'oscillation entre ladite position de verrouillage et ladite position de désengagement impliquant une poussée du crochet (15) sur l'oeillet (14) de manière à provoquer le détachement de la porte (1) du joint (24).
9. Appareil selon la revendication précédente, **caractérisé en ce que** le crochet (15) oscille sous l'action d'une bielle (17) pivotée entre le crochet (15) et une manivelle d'un vilebrequin (18) entraîné par un mo-

teur unidirectionnel (20).

10. Appareil selon la revendication précédente, **caractérisé en ce que** le vilebrequin (18) est pourvu d'un profil de came (21) agencé pour actionner un micro-rupteur (22) en correspondance avec la position de désengagement du crochet (15), ledit micro-rupteur (22) étant relié fonctionnellement à l'unité de commande de façon à autoriser l'activation de l'actionneur (8) pour le démarrage de la phase d'ouverture. 5
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11. Appareil selon l'une quelconque des revendications 8 à 10, **caractérisé en ce qu'il** comprend en outre un micro-rupteur qui est activé par le crochet (15) en correspondance avec sa position de verrouillage, ledit micro-rupteur étant relié fonctionnellement à l'unité de commande afin d'autoriser le démarrage du cycle de fonctionnement de l'appareil. 15
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12. Appareil selon l'une quelconque des revendications 7 à 11, **caractérisé en ce qu'il** comprend en outre un capteur qui détecte la présence de la porte (1) lorsqu'elle arrive à proximité du loquet dans une position où elle peut être mise en prise par le loquet, de préférence un capteur Reed qui détecte un aimant (23) monté sur la porte (1). 25
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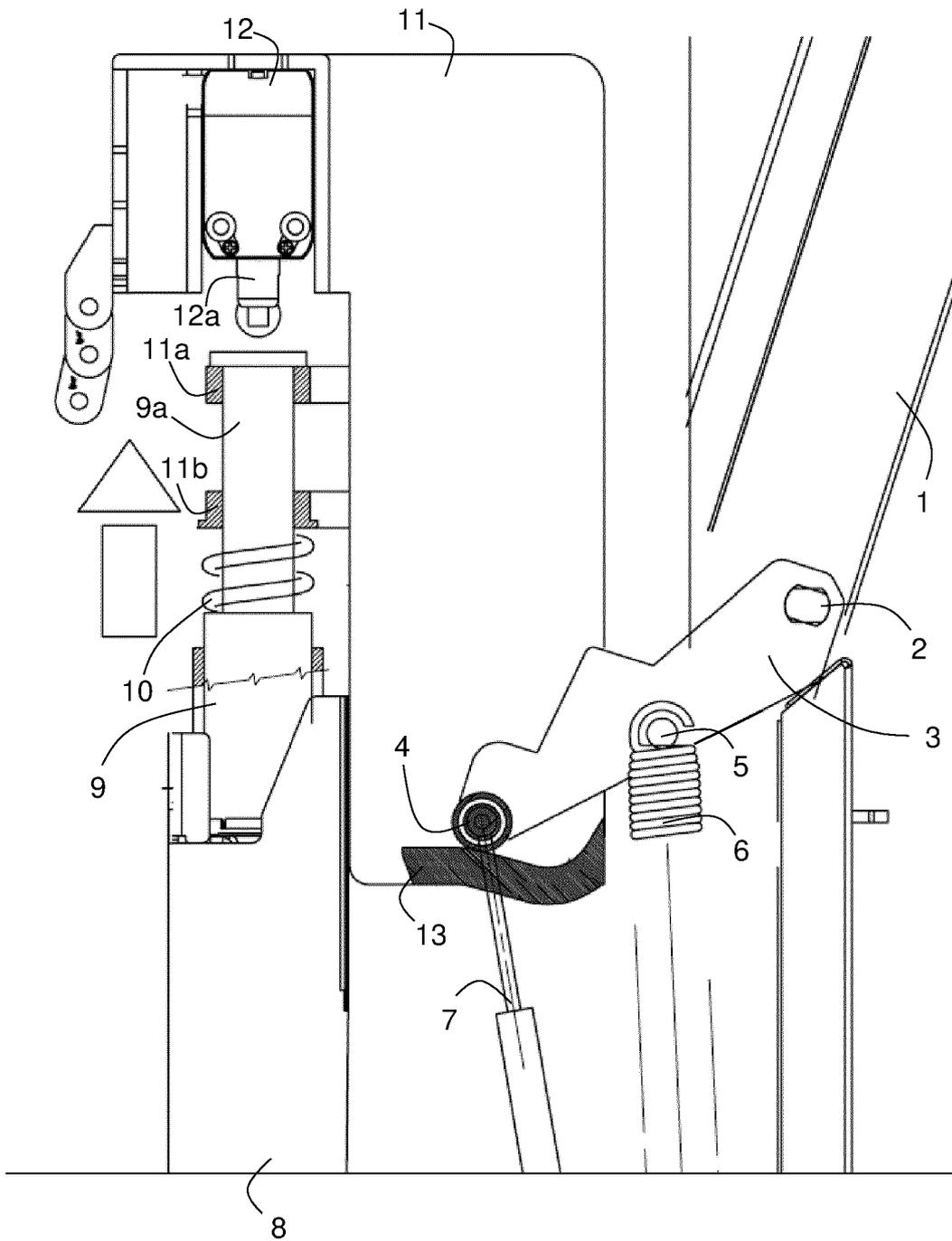


FIG.1

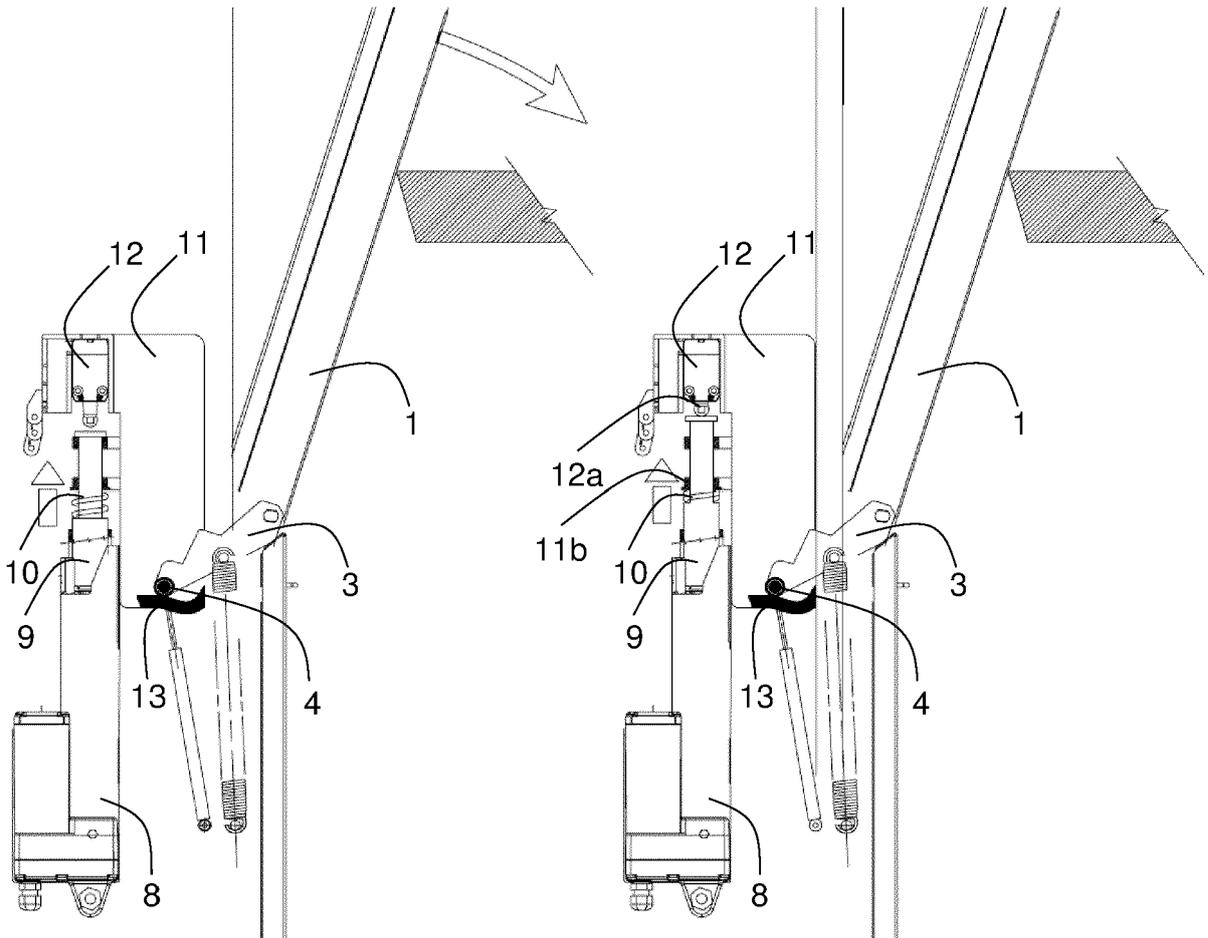


FIG.2

FIG.3

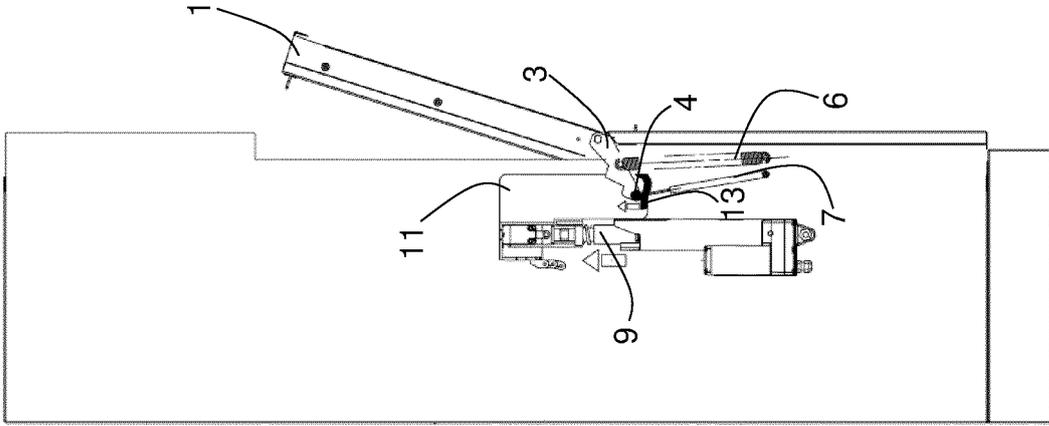


FIG. 4c

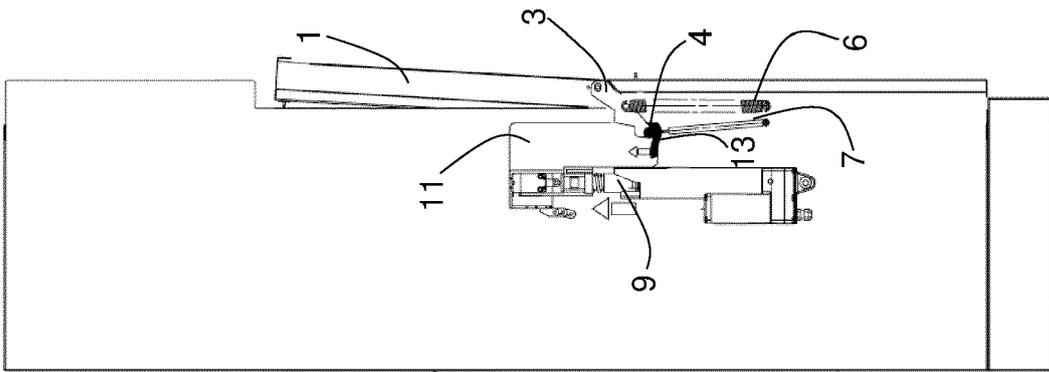


FIG. 4b

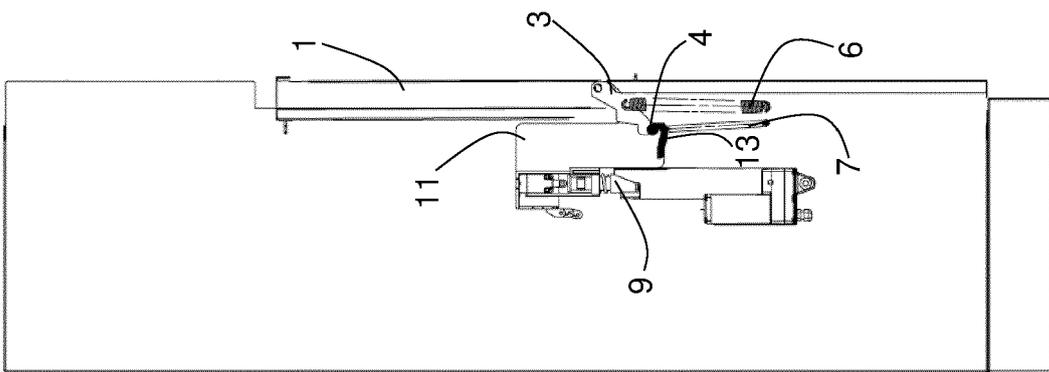


FIG. 4a

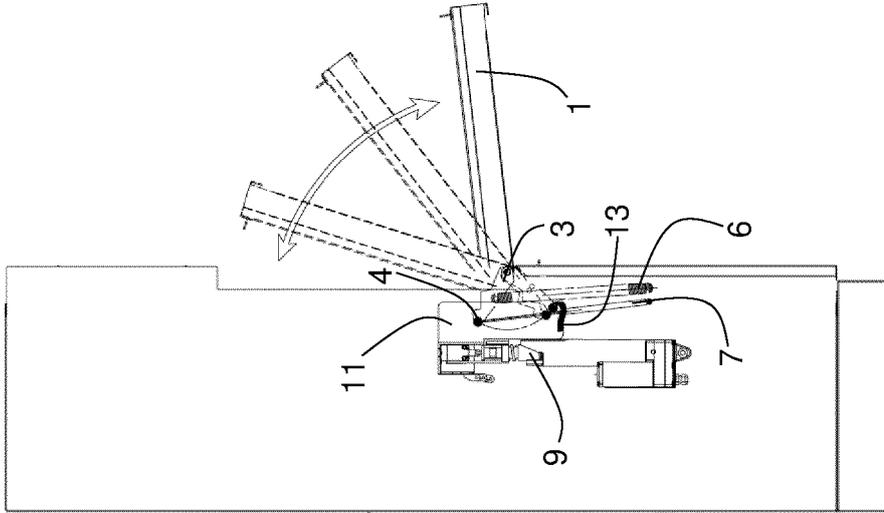


FIG. 4f

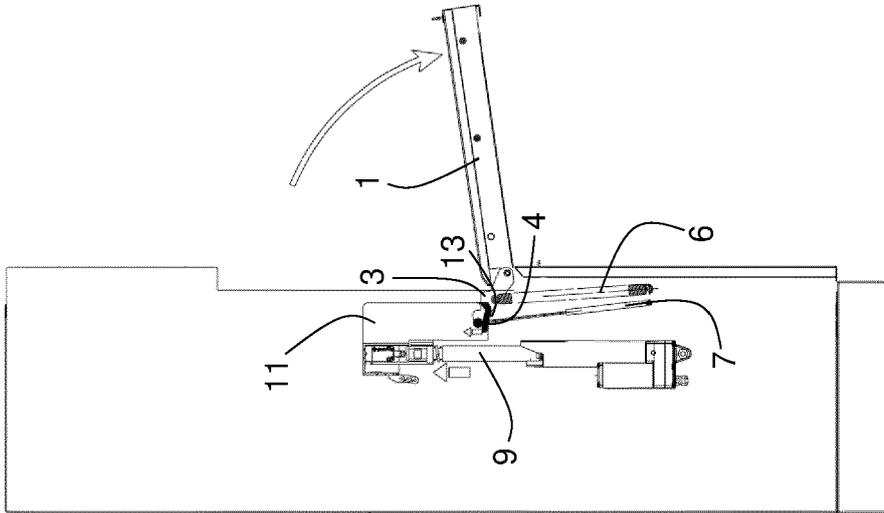


FIG. 4e

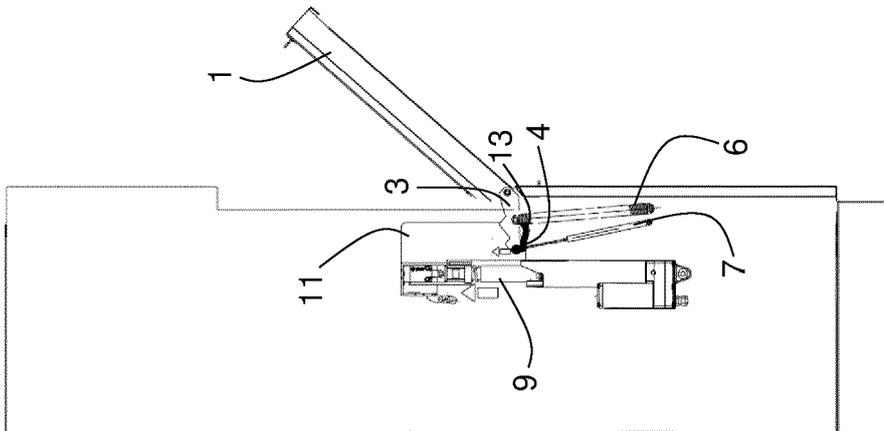


FIG. 4d

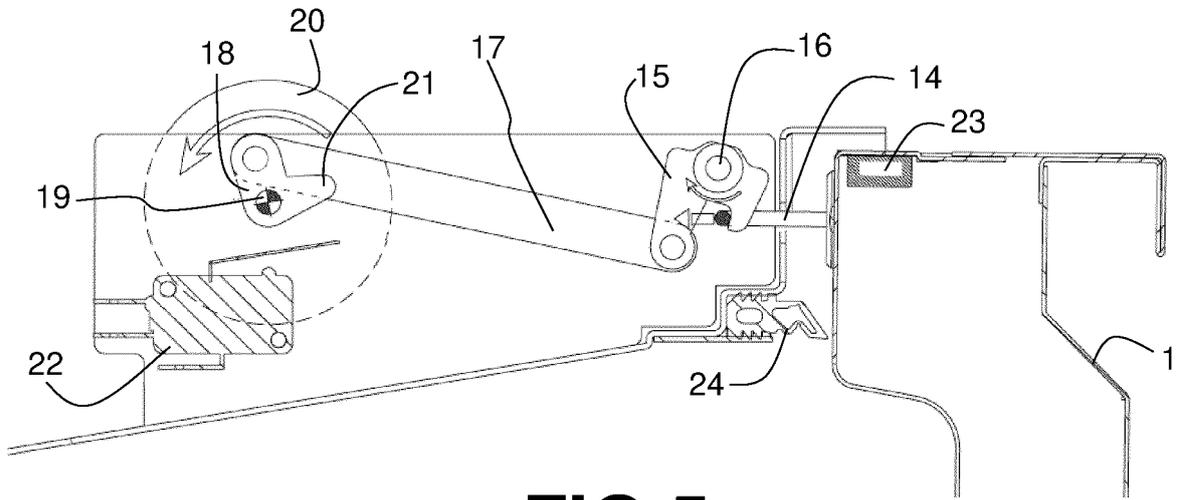


FIG. 5

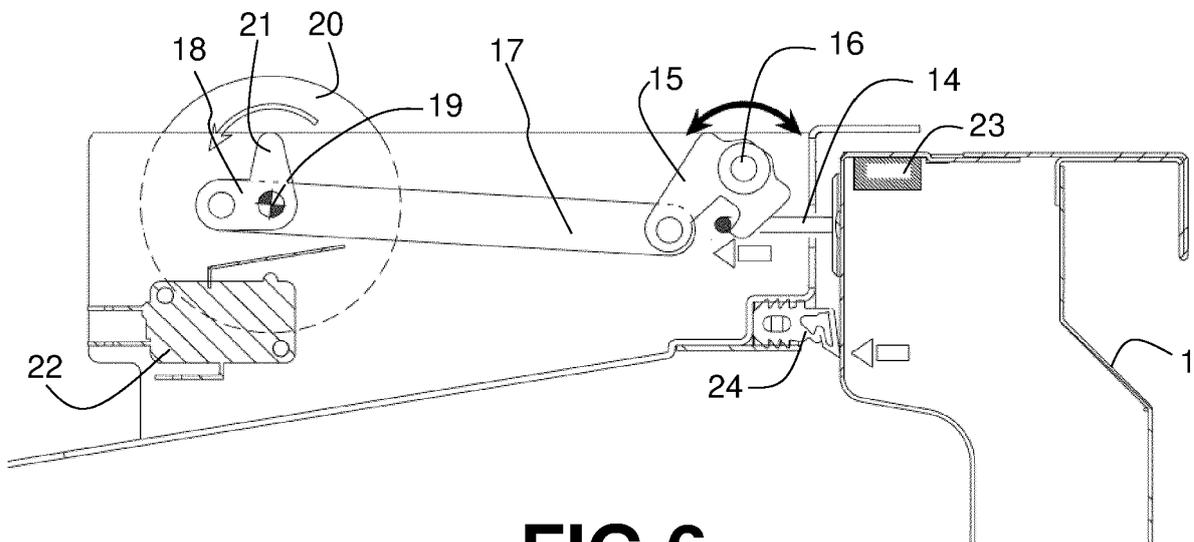
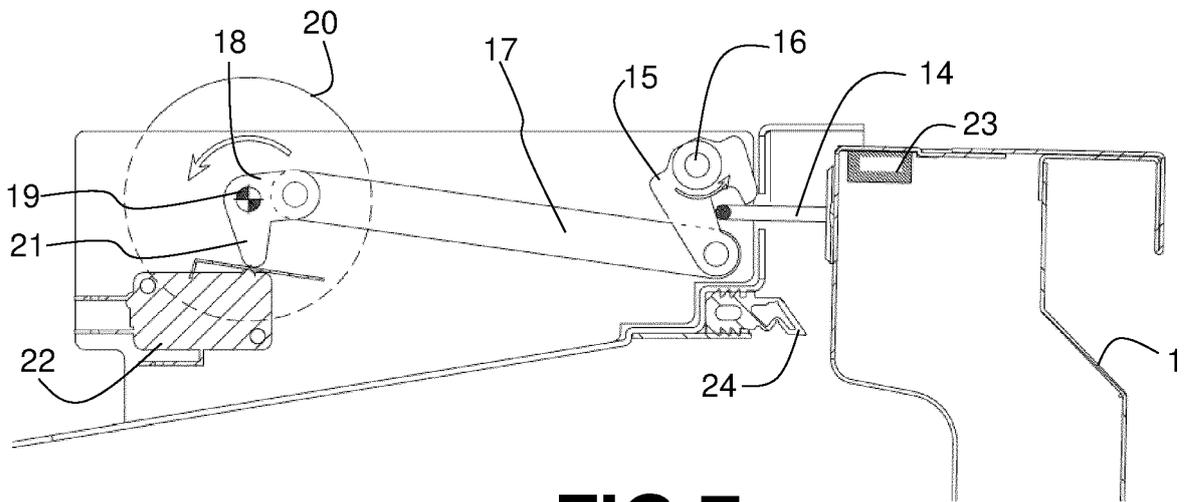


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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