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## (54) Safety device without contact specifically for vertical sliding closing systems

(57) The invention concerns a safety device without contact for motorized doors movable in height, The device comprises two opposite safety units (14) attached to the internal face of the door, on its lower side, carrying means for defining at least an optical barrier positioned on the movement trajectory of the door and designed to provoke the stoppage of said door in the presence of an obstacle. The means for defining the optical barrier (23) are on board the parallel cursors (16, 26, 36)) each one belonging to one of said two safety units (14). The cursors are guided in cam slots of respective supporting elements and each one is susceptible to combined horizontal and vertical translation movements to position the optical barrier in parallel below the lower side and in the plane of the door during its opening and closing movements, and in parallel at a distance from the internal face of the door when the latter is in the lowered closed position.

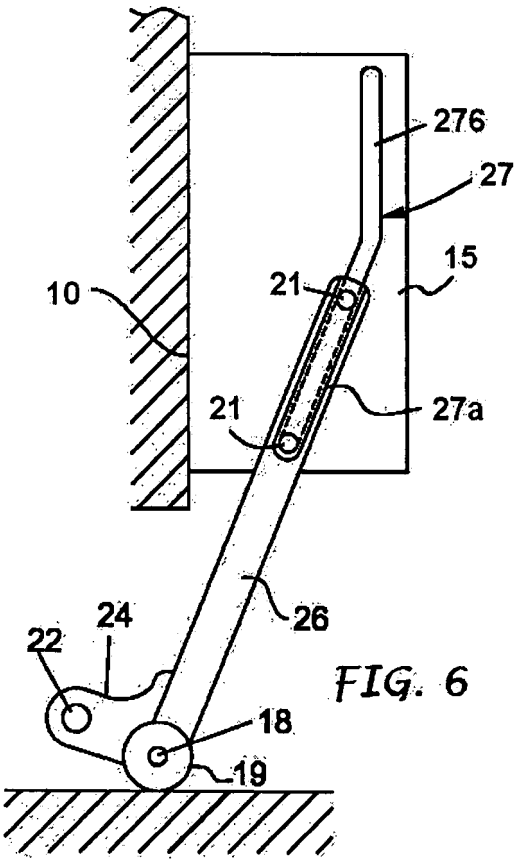


FIG. 6

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## Description

### Field of the Invention

**[0001]** This invention concerns in general vertical sliding closing systems such as sectional doors, rolling shutters, roller blinds and the like, and refers in particular to a safety device with sensors without contact for such closing systems.

### State of the Technique

**[0002]** The type of doors named above usually move on guides tracks and for their vertical movement between opening and closing positions they can be controlled by an electric gear reduction motor which can be activated by a remote control or by other means, such as a proximity sensor, key controlled devices, push buttons and the like.

**[0003]** For safety purposes, and in particular in order to avoid knocks, crushing or injury to persons or damage to things when it is moving downwards to close, each of said doors is usually equipped along its bottom horizontal margin with a safety system able to detect the presence of bodies or obstacles on the movement path and therefore cause the door to automatically stop. Such a system can comprise devices such as a so-called sensitive edge, infrared or similar optical barriers which, however, activate and intervene to stop the door only when the latter physically encounters an obstacle, a situation that can be dangerous and damaging should the obstacle be a child, an animal or something fragile and delicate, because of the pressure they are subjected to by the door before the latter stops. Furthermore, the sensitive edge or the proximity sensors, as preset up to now, can be inefficient when the bottom edge of the door is not in the vertical sliding surface and therefore is not exactly perpendicular to the obstacle as may happen, for example, with a vehicle which being high may interfere with the lower margin of the door in movement when the latter, when beginning to move from the opening to the closed position, is still following the curvilinear tract.

**[0004]** In the attempt to avoid these drawbacks, safety systems have also been proposed in which an infrared optical barrier, in particular at least one pair of emitting and receiving photoelectric cells, is applied to a door by means of supporting arms susceptible on one side to overturning or to linear movement to the ground when the door reaches the closed lowered position. These systems however are relatively complex and encumbering.

**[0005]** The documents US 6 176 039B1 and DE 10 2006 026 698A1 are indicative of the state of the technique. The first of these documents reveals a safety device in which infrared photocells are carried by a system of parallelogram levers that also needs a return spring. The second document reveals a safety device wherein infrared photocells are carried by a system of levers oscillating between two positions, but the application of which to a door disadvantageously implies the removal of a part of the gasket positioned on the bottom side of the door itself.

### Objects and Summery of the Invention

**[0006]** The main object of this invention is to propose safety device without contact for sliding and non sliding doors, which are particularly simple, efficient and reliable, and able to place itself in a working position by means of its own gravity and to retract in a defiladed position compared to the door by means of a basically vertical composite movement, when the door reaches a closed position.

**[0007]** Another object of the invention is to provide a safety device for the abovementioned type of doors and able to place itself perfectly in the sliding surface of the door, at the base of the latter, and to detect obstacles at any level within the range of the closing travel of the door and cause it to stop automatically should any obstacle be detected.

**[0008]** Said objects and the obvious advantages deriving from them are reached by a safety device without contact according to the preamble of claim 1 and wherein the sensor means suitable to define at least an optical barrier are on board parallel cursors each belonging to one of two safety units, and these cursors are each susceptible to horizontal and vertical translation movements combined to position the optical barrier in parallel below the lower side and within the plane of the door during the movements of the latter between the opening and closing positions, and in parallel at a distance from the internal face of the door when the door is in the lowered closed position and the cursors are in contact with the ground.

**[0009]** In particular, the supporting element is formed of two parallel vertical wall each of which provided with a slot cam and the cursor extends outside or inside of the said lateral walls of said supporting element and has a pair of sliding pins passing through said slot cams. Thus, the cursor always remains positively guided during their movements without necessitating of levers or other articulated members.

### Brief Description of the Drawings

**[0010]** The invention will be described in greater detail in the continuation making reference to the indicative and not limited attached drawings and to its application on a sectional door. In said drawings:

Fig. 1 shows a view of the safety device according to an first realization applied to the inside of a door in a partially open position;

Fig. 2 shows, enlarged, a side view of a safety device unit in an operating position in the direction of arrows A-A in Fig. 1;

Figs. 3 and 4 show, respectively, two side views of the device in an intermediate position and in an idle

position;

Fig. 5 shows a false section of a device unit according to arrows B-B in Fig. 2;

Fig. 6 shows a similar view to the one in Fig.2, but of a device unit according to a constructional variation;

Fig. 7 shows a view of a further constructional variation of the safety device in different positions; and

Fig. 8 shows a view of the only supporting element for the device in Fig. 7.

**Detailed Description of the Invention**

**[0011]** In said drawings an example of a door 10 is indicatively represented which has a lower side 10' provided with a seal 110 and which slides, by means of rollers -not shown, in lateral guides 12 each having an almost vertical rectilinear segment followed at the top by a curvilinear section that connects with an upper horizontal segment.

**[0012]** The door 10 is moveable, by means of a motor 11 and however in a known way, along the guides 12 between a lowered closed position, in which its lower side 10' is near the underlying floor 13, and a raised complete opening position, in which it is positioned almost horizontally between the upper segments of the lateral guides and with its lower side 10' on a level with the curvilinear section of the guides 12.

**[0013]** The safety device of the invention is applied on the internal front of the door 10 by its lower side 10'. It comprises two opposite safety device units 14, distanced in parallel, positioned near the vertical lateral margins of the door. Each of said units 14 comprises principally a vertically positioned supporting element 15 fixed and jutting out of the internal face of the door, and a cursor 16 associated with said support 15 and movable in height with regard to the latter and as regards to the lower side of the door.

**[0014]** In particular, the supporting element 15 is provided, in the direction of its height, with guide slots 17 and, for its part, the cursor 16 is joined by sliding with said support 15. The guide element has two parallel lateral walls 15' and the guide slots 17 are provided in said walls, one each, both with the same course.

**[0015]** According to a mode of realization as shown in Figs. 2-5, each guide slot 17 has a curvilinear course that is like a cam with a concavity facing towards the door. As to the cursor 16, it has an obtuse or acute shaped angle similar to that of the guide slots 17 and is provided at its lower end with a pin 18 supporting roller 19.

**[0016]** The cursor 16 can be made up of two cheeks 20 connected transversally to each other by a pair of horizontal sliding pins 21. In particular the cheeks 20 are respectively on the outside of the walls 15' of the supporting element 15 and the sliding pins 21 pass through and are both guided into the slots or guide cams 17.

**[0017]** As an alternative, without however departing from the object of the invention, the cursor 16 can also be arranged and move between the two lateral walls 15' of the supporting element 15 and its transversal pins 21 can extend from opposite sides of the cursor 16 until they engage with the guide slots 17.

**[0018]** Furthermore, each pin 21 can be coupled with the guide slots 17 directly or, if required, by means of an interposed rolling element-not shown.

**[0019]** On board the cursor 16 of one of the two units 14 of the device an infrared emitter 22 is placed in line with an infrared receiver 22 placed on board the cursor of the opposed unit so as to define between the two units, an optical barrier 23 represented by dotted lines in Fig. 1.

**[0020]** In the example represented in Figs. 2-5, the infrared emitter 22 is positioned on an axis with the pin 18 of the supporting roller 19 of the cursor 16 of a safety unit 14; analogically the infrared receiver 22' is positioned on an axis with the pin 18 of the supporting roller 19 of the cursor 16 of the opposed safety unit. As an alternative, both the emitter 22 and the infrared receiver 22' can be supported by a bracket 24 fitted on the respective side of the cursor 16 facing towards the door. Infrared emitter and receiver 22, 22' will then be at a distance from the supporting rollers 19 as shown in Figs. 6 and 7, therefore forming an optical barrier parallel to the pins 18 of said rollers.

**[0021]** In any case, the infrared emitter and receiver 22, 22' will be conveniently fed and connected to an electronic circuit so as to send a stop signal to the drive motor 11 of the door each time the optical barrier 23 is interrupted.

**[0022]** The constructional variation of the device shown in Fig. 6 is different only as regards to the shapes of the cursor and the guide slots in the supporting element 15, the remaining being the same as described above. In fact, the cursor, here designated by number 26, is basically rectilinear and the guide slots, designated by number 27 and provided for receiving both the sliding pins 21 of said cursor 26, each has a lower slanting portion 27a followed by an upper vertical portion 27b, the lower portion 27a being slanted so as to move away from the internal surface of the door 10 in the direction from the bottom towards the top.

**[0023]** In another variation of the device shown in Figs. 7 and 8, the cursor 36 is still rectilinear, but the relative sliding pins 21 are conducted individually, each in a guide slot 37 also having in this case a sloping lower part 37a and a vertical top part 37b. In other words, the supporting element 15 of each unit 14 of the safety device has then a pair of slots 37 in each of its lateral walls 15' as shown in Fig. 8.

**[0024]** In each of the opposite units 14 of the safety device, the cursor 16, 26, 36 is compelled to follow the shape of the guide slots 17, 27, 37 and to follow a combined horizontal and vertical translation movement at the same time depending on the position of the door.

**[0025]** In fact, as soon as the door is in a raised position from the floor 13 below, the cursors 16, 26, 36 of the two units 14 move, and remain, in a lowered position due to

its own gravity or possibly, but not necessarily, with the help of a spring-not shown. In this position -Figs. 2, 6 and 7- their lower end supporting the infrared emitter and receiver 22, 22' that define the optical barrier 23, position themselves below the bottom side 10' provided with gasket 110 of the door in the plane of movement of the latter and for all its opening and closing stroke. So, if the optical barrier 23 is intercepted and for whatever reason interrupted, for example by a body or obstacle in the path of the door, the latter is automatically and rapidly stopped.

**[0026]** When on the other hand the door 10 is near its lowered closed position-Fig. 3- the rollers 18 of the two units 14 of the device rest on the floor causing the cursors 16, 26, 36 to move, which, following the respective guide slots 17, 27, 37 move at the same time towards the interior of the door and upwards, avoiding in this way any interference with the lower side 10' and the gasket 110 of the door until the latter is fully closed-Fig. 4.

**[0027]** Practically, the safety device is always active at every level the lower side 10' of the door finds itself, at starting from the maximum open position in which its lower side is at the height of the curved section of the guides 12 up to the closed position on the floor 13. Then, from the moment the optical barrier 23 is found to be between the two units of the device and is below the lower side of the door, each time a body or an obstacle interferes with said barrier, the door automatically stops beforehand and furthermore, without its lower side having to rest against the body or obstacle.

**[0028]** The safety device described above can also be provided with some detailed changes without however moving away from the objective of the invention. For example, each cursor 16, 26, 36 can be provided with means to define not a single but double optical barriers on parallel planes either at the same level or on different levels.

## Claims

1. Safety device without contact, especially for motorized doors movable in height between a lowered closed position on a level with the floor below and a open raised position, comprising two opposite safety units (14) attached to the internal face of the door and carrying means for defining at least an optical barrier positioned on the movement trajectory of the door and designed to provoke the stoppage of said door in the presence of an obstacle, where the means defining the at least an optical barrier (23) are on board parallel cursors (16, 26, 36) each one belonging to one of said two safety units (14), and where said cursors (16) are each susceptible to horizontal and vertical translation movements arranged for positioning the optical barrier in parallel below the lower side and in the plane of the door during its movements between the open and closed positions, and parallel at a distance from the internal face of the door when the door is in the closed lower position, **characterized in that** every safety unit (14) comprises a supporting element (15) fixed and protruding from the internal face of the door and provided with at least a cam guide slot (17, 27, 37), and **in that** every cursor (16) has horizontal sliding pins (21) conducted in said at least a cam guide slot (17, 27, 37).

2. Safety device according to claim 1, wherein the supporting element (15) has two parallel vertical wall (15') each with a slot cam (17, 27) and wherein the cursor (16, 26) extends to the outside or inside of the lateral walls of said supporting element (15) and has a pair of sliding pins (21) passing through said came guide slots.

3. Safety device according to claims 1 or 2, wherein each cam guide slot (17) is curved with a concavity facing towards the internal face of the door, and wherein each cursor (16) undertakes the position the optical barrier is in on the movement plane of the door, following the respective cam guide slots for its own gravity or with the help of a spring.

4. Safety device without contact according to claims 1 or 2, wherein each cam slot cam (27) has a inclined lower inclined portion (27a) followed by a vertical upper portion (27b), with the lower portion (27a) inclined to move away from the internal surface of the door in the direction from low to high.

5. Safety device according to claim 1, wherein the supporting element (15) has two vertical parallel walls (15') each with two slot cams (37) on two different levels, wherein each cam guide slot has a lower inclined portion (37a) followed by an upper vertical portion (37b), with a lower portion (37a) inclined to move away from the internal surface of the door in the direction from low to high, and wherein the cursor (36) extends to the outside or inside of the lateral walls of the supporting element and has a pair of sliding pins (21) each one conducted individually in one of said cam guide slots.

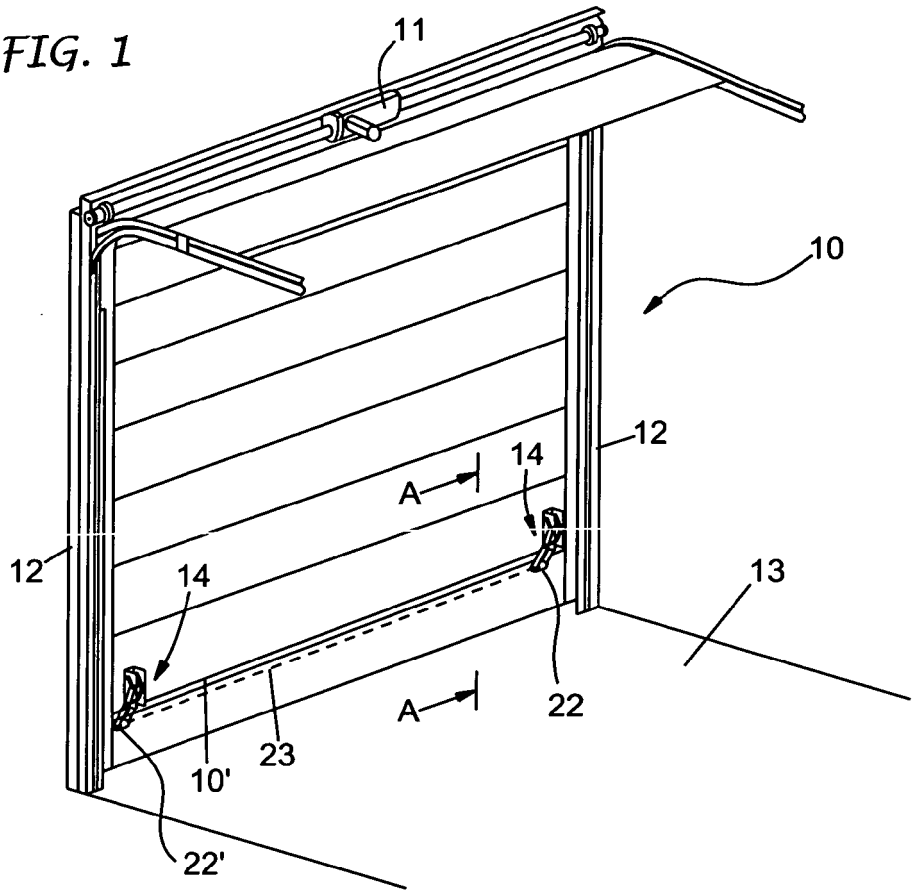
6. Safety device according to claims 4 or 5, wherein the cursor (26, 36) is rectilinear.

7. Safety device according to any of the previous claims, wherein the cursor (16, 26, 36) is provided at the bottom with at least a roller (19) resting on the floor when the door is in the closed position.

8. Safety device according to any of the previous claims, wherein the infrared emitter and receiver defining the optical barrier (23) are positioned on an axis to the supporting rollers of the respective cursors (16, 26, 36).

**9.** A safety device according to any of the claims 1-7, wherein the infrared emitter and receiver defining the optical barrier (23) are on board a bracket fixed to one side of the respective cursors facing towards the door, so that the optical barrier is parallel to the axis of the supporting rollers of said cursors.

FIG. 1



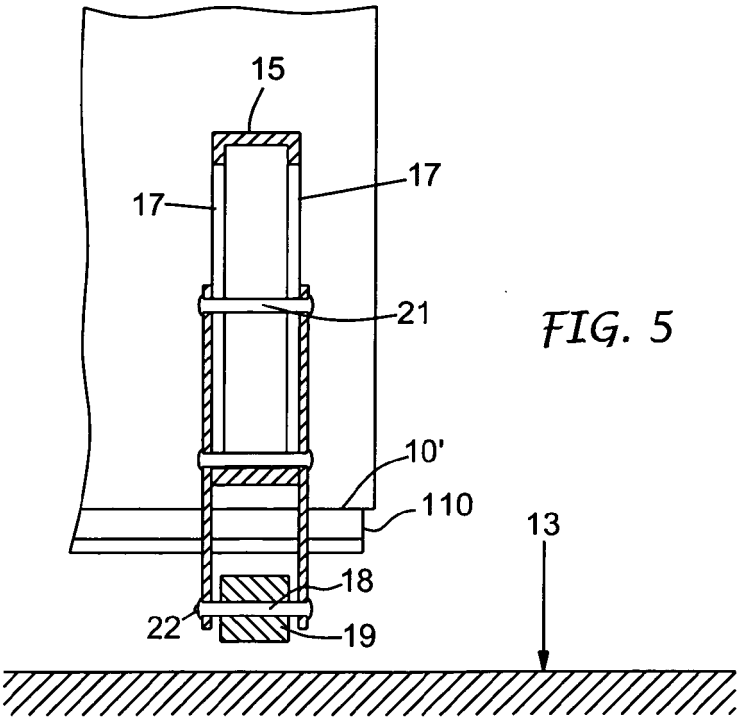




FIG. 5

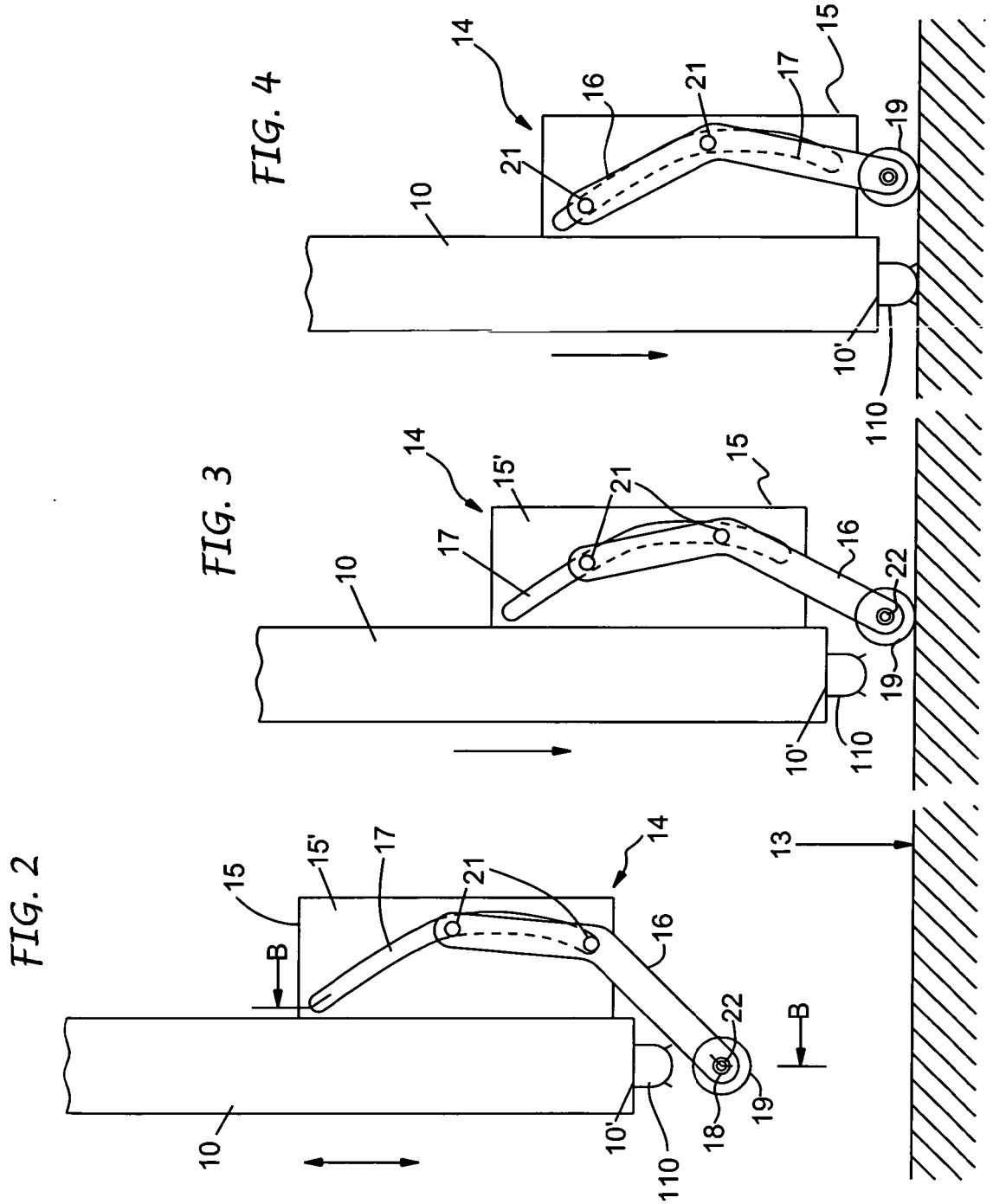


FIG. 2
FIG. 3
FIG. 4
10
10'
110
13
14
15
15'
16
17
18
19
21
22
B

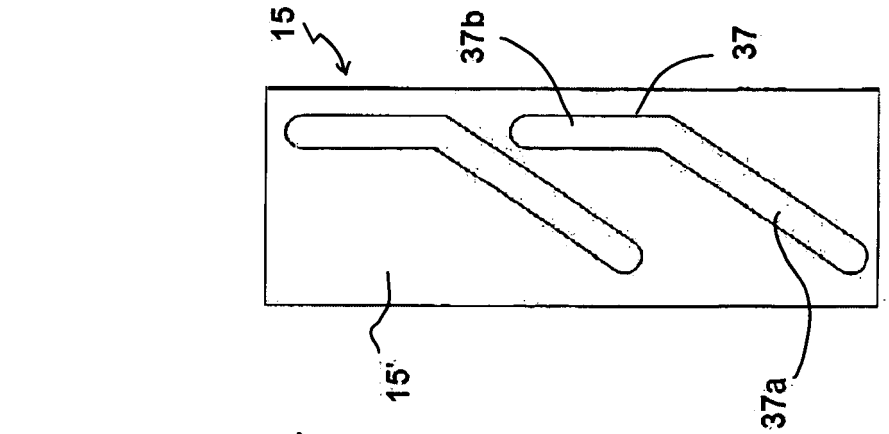



FIG.8

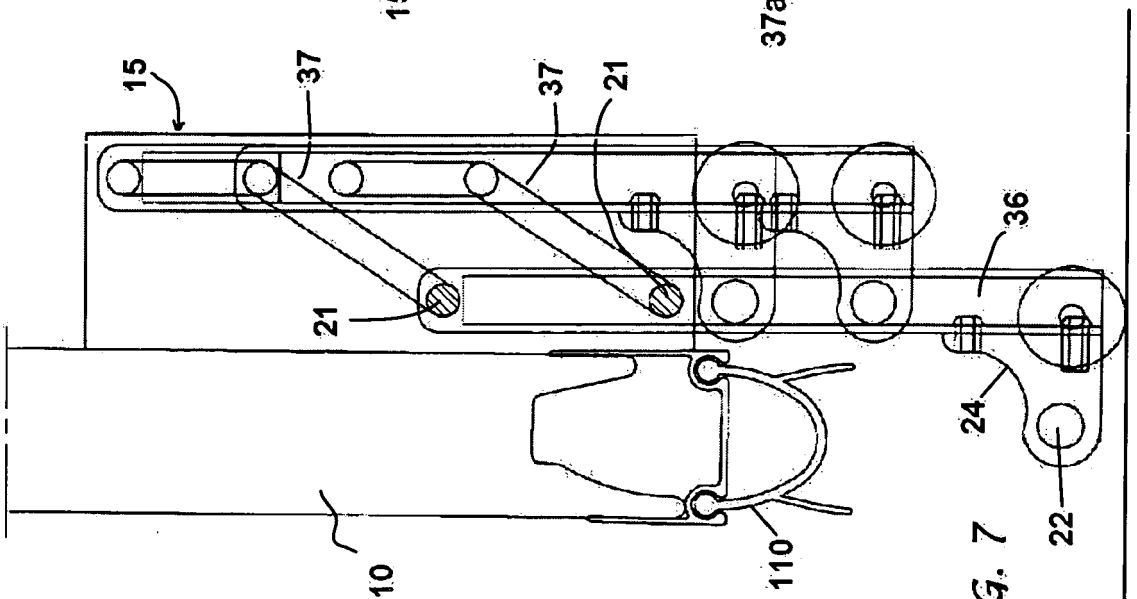



FIG. 7

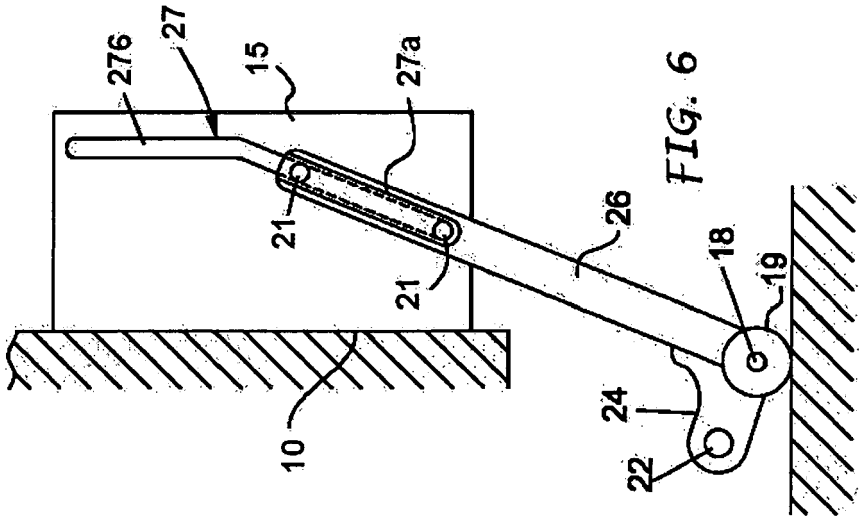



FIG. 6

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# EUROPEAN SEARCH REPORT

Application Number
EP 10 42 5155

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | EP 0 284 066 A2 (SCHIEFFER GMBH CO KG [DE]) 28 September 1988 (1988-09-28) * column 2, line 33 - column 4, line 15; claim 1; figure 1 * | 1-9 | INV. E05F15/00 |
| A | US 6 176 039 B1 (CRAIG TERRY A [US]) 23 January 2001 (2001-01-23) * column 2, line 44 - column 5, line 10; claim 1; figures 1-5 * | 1-9 | |
| A | DE 10 2006 026698 A1 (DROBEK WERNER [DE]) 14 December 2006 (2006-12-14) * paragraph [0043] - paragraph [0056]; claim 1; figures 1-6 * | 1-9 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| | | | E05F |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 3 August 2010 | Balice, Marco |

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03-08-2010

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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| US 6176039 B1 | 23-01-2001 | NONE | |
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- US 6176039 B1 **[0005]**
- DE 102006026698 A1 **[0005]**