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(71) Applicant: **Alimak Hek AB**
931 27 Skellefteå (SE)

(72) Inventors:
- **Lindh, Mikael**
  931 46, SKELLEFTEÅ (SE)
- **Nygren, Gunnar**
  930 15, BUREÅ (SE)

(74) Representative: **Nikolopoulou, Sofia**
Albihns.Zacco AB
Patent Department
P.O. Box 5581
114 85 Stockholm (SE)

(54) Interlock mechanism for a landing door

(57) The invention concerns an interlock mechanism for a landing door (2) at a lift, whereby the interlocking is active, in the locked condition, when a lift car that is a component of the lift is in motion or is located at a position beyond a landing, and it can be released when the lift car is located in a stationary condition at a landing through the execution of the operation of a control rod (8) that is a component of the interlock mechanism. In order to block the landing door from change of position [when the lift car" is not positioned at the relevant landing, a number of lock units in series with each other are connected to the control rod (8), of which a first lock unit (10) is arranged to, on displacement of the control rod, axially displace a locking shaft stopper (46) that is a component of the interlock from interaction with a door lock (6) that is a component of the interlock mechanism and thus out of locking interaction with a closure element (7) that is a component of the landing door (2), and in that a second lock unit (11) is arranged to allow that the lock units (10, 11) of the interlock mechanism be released through repositioning of the control rod (8) only after interaction has been established between an interaction section (64, 74) that is a part of the interlock mechanism arranged at the landing and an element (51, 52) arranged at the lift car, when the lift car is stationary at a landing.

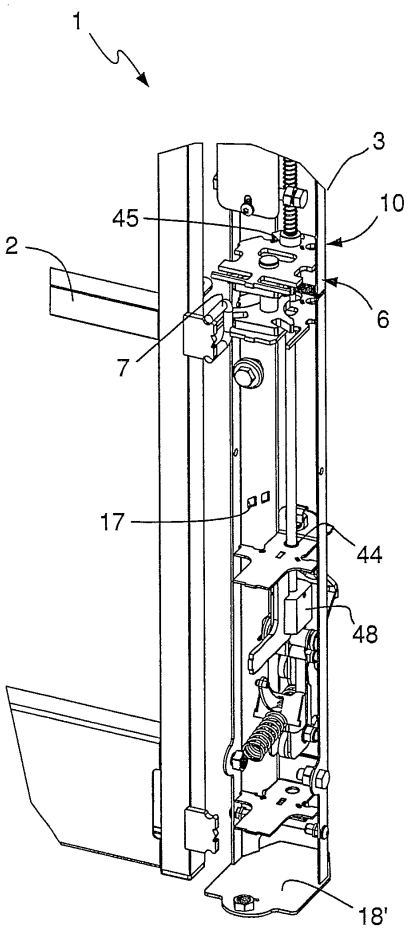

FIG.1

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Description

[0001] The present invention concerns an interlock mechanism for a landing door according to the introduction to claim 1.

[0002] The provision of various types of interlocks at landing doors to prevent the opening of a landing door when the lift car is in motion or is not located at a landing, i.e. beyond a level that has been previously determined, is known. Thus the landing door can be opened only when the lift car is located at the level of the landing, which eliminates the risk that a person falls out through the door when the lift car is not at the level of the landing. One consequence of this is that it is a requirement that each door at a landing, known as a "landing door", be provided with an interlock. Release of the interlock normally takes place automatically in permanent lifts when the lift car has stopped at the landing, while the door lock of a landing door in a construction lift is normally opened manually through the action of a control rod, which releases the interlocking when its position is changed. The interlock mechanism ensures that change of position of the control rod is prevented when the lift car is in motion or at any other location than the relevant landing. The term "interlock" is generally used to denote a technical interdependence between one mechanical component and another mechanical component. One example is the interdependence that a lift car must be located at a landing before the lock of the landing door can be opened.

[0003] Also at least one sensor is arranged at the said interlock, which sensor detects whether the lock units that are components of the interlock are in the locked condition or not. The sensor is thus arranged to interrupt the supply of power to the driving motor of the lift in order to prevent it being set in motion if the landing door is not correctly closed.

[0004] Known solutions of the problem described above concerning interlocking of landing doors have always comprised more or less complicated mechanisms intended for the interlocking of specific door designs. In order to reduce the number of components, it would be desirable and advantageous to be able to combine and use one uniform interlock arrangement for a number of different door designs, such as, for example, for both left-supported and right-supported doors and for doors of both swing type and sliding type. In particular, there is a great need to be able to rapidly and easily select a suitable door design for construction lifts that depends on the situation and particular requirements of the site and for each particular purpose, while using a single uniform interlock mechanism.

[0005] The purpose of the present invention is to achieve an interlock mechanism for a landing door of the type described in the introduction, which mechanism is blocked against change of condition and opening of the landing door when the lift car is in motion or at any other location than the relevant landing. A further purpose of the invention is to achieve a uniform interlock mechanism for a landing door that can be used at several different lift applications with a plurality of different door applications and designs of the door at a landing, and that can be adapted easily for use with several different lift applications. One example of this are lifts of the type in which the interlock mechanism of the landing door is intended to be released by the action of a ramp that can be lowered from the lift car when the lift car is at the relevant landing, or through the action of a follower mechanism equipped with a cam roller.

[0006] It must be pointed out that the term "door" denotes in this context all types of door, gate and similar opening elements at a landing, i.e. not only simple hinged doors, but also double-hinged doors, vertical sliding doors and horizontal sliding doors. It must further be pointed out that all types of existing means of transport for persons or goods between storeys in a building, i.e. including work platforms, transport platforms and similar, are referred to by the term "lift car" as it is used here.

[0007] These purposes of the invention are achieved through an interlock mechanism for a landing door that demonstrates the features and characteristics that are specified in claim 1. Further characteristics and advantages of the invention are made clear by the non-independent claims.

[0008] A detailed description of one preferred embodiment of the invention will be given below. It should be pointed out that only those features that are necessary for an understanding of the principles of the invention will be described and shown in the drawings, for the sake of clarity. It should also be understood that certain components have been omitted from some of the drawings, for the sake of clarity.

[0009] An interlock mechanism according to the invention applied at landing doors of a lift is shown in the attached drawings and with reference to the attached drawings, where:

Figures 1 and 2 show parts that are components of an interlock mechanism according to the invention, in perspective and with partially removed fittings,
Figures 3 and 4 show a lock that is a component of the interlock mechanism in alternative designs, in perspective and with partially removed fittings,
Figures 5 and 6 show one section of a door lock that is a component of the interlock mechanism according to the invention, in perspective and with partially removed fittings, when used in combination with a hinged door, and
Figure 7 shows the door lock shown in Figures 5 and 6, in perspective and with removed fittings, when used in combination with a sliding door.

[0010] An interlock mechanism of the present type is intended to be used at landing doors that have a door lock that can be placed into an interlocked locked condition in which it interacts with a closure element arranged at the door. The design of the door itself and the type of

door that is involved at the landing have no significance for the invention as such, and the door itself will for this reason not be described in more detail. Among the many advantages of the interlock mechanism according to the invention, should, however, be emphasised the fact that it has great flexibility and can be used directly, without any modifications being required, for a number of known door designs, something that will be made clear by the following description. The units that are described below have been manufactured as lightweight designs, preferably of laser-cut and principally plane sheets of metal.

[0011] The interlock mechanism will be described arranged at lifts in two alternative designs, whereby the interlock mechanism in the example that is shown in Figure 3 is arranged at a landing where a lift car is provided with a ramp that can be lowered towards the landing, which ramp is only suggested in the drawing, using dash-dot lines. In the example shown in Figure 4, the interlock mechanism is applied at a landing where a lift car provided with a cam profile interacts with a follower, whereby also in this case the cam profile is only suggested, using dash-dot lines. Since both the said ramp arranged at the lift car and the cam profile/follower mechanism for lifts in which the cam profile is intended to pass the mechanism are, as such, known, these will neither be described in more detail nor shown in detail in the drawings, other than sketched in as dash-dot lines.

[0012] An interlock mechanism 1 for a landing door 2 is shown in Figures 1 and 2 arranged on a fixed part of the landing door whereby the landing door is shown only as a part of a forward vertical free side of the said door intended to interact with a door pillar 3. It should be understood that the opposite vertical side of the door 2 at which the door can be pivoted around a vertical axis is not shown in the drawings, since the design of this part is of subordinate significance for the invention. The door pillar 3 is manufactured from metal elements that have been folded to form a box 4 with a U-shaped profile, which box can be closed by means of a lid with a similar U-shaped profile, not shown in the drawings, such that the elements with a U-shaped profile form together a tubular unit that resembles a pillar. The interlock mechanism 1 consists essentially of a combination of a door lock 6 that is incorporated into the pillar 3, the condition of which door lock can be changed into an interlocked locked condition in which it interacts with a closure element 7 arranged at the door 2. The mechanism can be placed into and removed from the interlocked condition with the aid of a control rod 8 that is part of the mechanism.

[0013] With reference to Figures 1 and 4, a number of lock units are components of the interlock mechanism 1, which units are connected in series with each other and can be placed into the interlocked condition by means of the control rod 8, the first one of which lock units comprises a pivoting staple lock 10 that in its interlocked condition locks the door lock 6 when the closure element 7 is located engaged in the lock and the door 2 is closed, while, conversely, the pivoting staple lock also locks the control rod 8 to prevent it being placed in the interlocked condition if the door is not correctly closed; the second of which lock units comprises a lock 11 for the control rod that prevents the control rod 8 from being taken out of the interlocked condition while a lift car is in motion or not positioned at a landing; and the third of which lock units comprises a sensor unit 12 that interrupts the power supply to the driving motors of the lift if the interlock is not correctly placed in its normal interlocked condition. The control rod lock 11 can be designed for its function in a number of different ways, but it comprises in the embodiment described here a countersurface 13 for a locking peg 15 that is a component of the interlock mechanism 14, which mechanism is arranged to interact with a lift car and is so designed that the locking peg 15 strives to enter into locking interaction with the countersurface 13 when a lift car is in motion or not positioned at a landing. As is made more clear by more detailed study of, in particular, Figures 3 and 4 and the following description, it should be realised that the task of the interlock mechanism 14 is to prevent the control rod 8 from being positioned into a direction away from the interlocked position as long as the lift car is located at any other location than the relevant landing. The term "connected" will be used in the following description to denote units that are connected to each other for alternating interaction, such as a common repositioning into the interlocked condition.

[0014] As has been described above, the door lock 6 is located inside the box 4 with a U-shaped profile and it is fixed in position through interaction between the peg 16 and the hole 17 between the opposing extended side walls of the box and the rear or bottom. It is also possible that the door lock 6 be fixed in position by means of welding, if this is appropriate. The box 4 with a U-shaped profile is terminated at its upper and lower ends by plates 18, 18', respectively, that are fixed to the ends of the box and serve as lid and base, respectively, for the pillar 3, where the said foot plate is intended to be anchored at the landing with the pillar stretching vertically upwards.

[0015] A positioning rod 19 is connected to the control rod 8, which positioning rod extends vertically through the pillar 3 and has an upper end that extends out through an opening 20 in the upper end plate 18 of the pillar whereby the said end is provided with a knob 21, and which positioning rod has a lower end at which a spring 22 is so arranged that it acts to restore the positioning rod in a downwards direction opposite to the normal interlocked position. The sensor unit 12 comprises a switch unit 23 that interrupts the power to the driving motors of the lift when the control rod 8 is taken out from its normal interlocked condition. The switch unit 23 comprises a ring-shaped cam 24 that surrounds the positioning rod 19 and that can be displaced along this rod. The cam 24 can also be fixed into predefined positions along the positioning rod by means of an adjustment screw 25. The cam 24 is arranged to interact with an electrical switch 26 that is located inside the pillar 3 and thus is arranged to be stationary. The switch 26 monitors the position of

the positioning rod and interrupts the power supply to the driving motors of the lift when the control rod 8 is taken out from its normal interlocked condition. The switch unit 23 is located inside of the box 4 with a U-shaped profile and it is fixed by means of transverse screws 27 that extend through mounting holes 28 arranged in the opposing extended side walls of the box with a U-shaped profile. Thus two of the lock units 10, 11, 12 that are components of the interlock mechanism can be positioned relative to each other in the direction of the vertical positioning of the control rod 8 and the positioning rod 19 that is connected to it down towards the interlocked condition, namely the pivoting staple lock 10 and the third sensor lock unit 12.

[0016] The door lock 6 that is a component of the present interlock mechanism is shown in more detail in Figures 5 and 6, and it consists in its basic design principally of first and second striking plates 35, 35' arranged transversely in the pillar 3 and separated from each other by a distance, where the first striking plate 35 is located above the second striking plate 35', and a pivoting staple 36, 36' that belongs to each striking plate 35, 35', respectively, which pivoting staple is mounted to pivot around a shaft 37 that is common to these. Each said striking plate 35, 35' has an opening 38, 38' to receive the closure elements 7 described above, which are located on the forward vertical free side of the door 2. Furthermore, each pivoting staple 36, 36' has a recess 39, 39' for a closure element, in which the closure element 7 can be received. The openings 38, 38' of the striking plates 35, 35' can be accessed from the outer surface of the pillar through rectangular holes 40 located in the U-shaped profile elements of the pillar, which holes can appropriately be designed with a breaker plate that is arranged as a cover, which normally covers the hole but which can be removed by a simple operation by means of a hand tool such as a screwdriver or similar. The pillar 3 and the associated lock 6 can in this way be simply adapted on site for various types of door design, for example, doors of hinged type or sliding type.

[0017] As a closer study of Figures 5 and 6 will make clear, the openings 38, 38' for the upper and lower striking plates 35, 35', respectively, are oriented perpendicularly to each other, which makes it possible to use the uniform door lock for interaction not only with sliding doors but also with hinged doors. Furthermore, the striking plates 35, 35' and the associated pivoting staples 36, 36' are designed with mirror symmetry with the corresponding openings 38, 38' located on opposite sides of a vertical plane 41 that intersects the centre of the door lock 6 perpendicular to the principal plane of the closed door 2. This mirror symmetry contributes further to the flexibility of the door lock 6 by making it possible to use the door lock not only with right-supported doors but also with left-supported doors, of the said hinged door type and sliding door type.

[0018] The opening 38' of the lower striking plate 35' is, in the embodiment shown here, directed perpendicularly out from the principal plane of the closed door and thus it is intended to interact with the closure element 7 of a hinged door, while the opening 38 of the upper striking plate 35 is directed parallel to the principal plane of the closed door and is thus intended to interact with a closure element 7 of a sliding door. Figure 7 shows in more detail an example of how the door lock 6 is used in combination with a door that can be displaced in a horizontal direction, known as a "sliding door". The door lock and the closure element are arranged at such a mutual height, depending on the selected type of door, that they are at the same level as each other, and the closure element 7 can be introduced into the opening of the relevant striking plate and the pivoting staple associated with it. It is appropriate that this is achieved by it being possible to mount the door lock 6 and the two striking plates 35, 35', through interaction between peg and hole, at different heights of the pillar 3, whereby the position of the door lock is fixed at a suitable height on the pillar relative to the closure element 7 of the door 2.

[0019] Since the function of the door lock 6 is essentially identical independently of whether it is used at a hinged door or a sliding door, or at a right-supported or left-supported door, only the locking action of one striking plate 35' and its associated pivoting staple 36' will be described in detail below, for reasons of simplicity. The case that will be described concerns the example of the closure element 7 of the door 2 of hinged type that is shown in more detail in the example in Figures 5 and 6.

[0020] With reference to Figures 5 and 6, the closure element 7 of the door is taken up into the closure element recess 39' that is part of the pivoting staple 36' when the door is closed. The pivoting staple 36' has a locking formation 42' intended to interact with the pivoting staple lock 10. The pivoting staple 36' is mounted to pivot on the shaft 37 such that it can pivot in a horizontal plane, and it is biased to strive towards the open condition, in which it can receive the closure element 7, by the influence of the force from two compression springs 43 mounted in a pair. The inverse is also possible: that the compression springs 43 contribute to spring-loaded operation of the pivoting staple 36' during its reception of the closure element 7 during closure of the door 2. The positioning of the pivoting staple 36' into a locked and interlocked condition thus takes place in the direction towards the said spring force.

[0021] The pivoting staple locks 10 form part of the positioning rod 19 of the control rod 8, extending vertically through the pillar 3. As is made most clear in Figures 1 and 2, the positioning rod 19 is controlled in an upper and lower bushing 44 in the pillar 3, and it is arranged to pass through a circular hole 45 in the striking plate 35', which hole also serves to act, to a certain extent, as control for the positioning rod in the direction of its axis. The pivoting staple locks 10 comprise a locking shaft stopper 46 formed as a ring-shaped sheath that surrounds the positioning rod 19 and is arranged to run axially or in the axial direction through the hole 45 of the striking plate 35

when the control rod 8 is raised or lowered. The locking shaft stopper 46 can be fixed at a freely chosen location along the positioning rod 19 using an adjustment screw 25. It should be understood that the locking shaft stopper 46 can, by being fixed at a suitable height along the positioning rod 19, serve either one of the upper and lower pivoting staples 36, 36', and thus also either one of the upper and lower striking plates 35, 35'. The locking formation 42' of the pivoting staple 36' comprises a recess 47 in the cam-shaped rear edge section 48 of the pivoting staple, which recess has the form of an arc of a circle, and where the said recess corresponds to a part of the outer periphery of the locking shaft stopper 46. As is made most clear by Figure 6, the positioning rod 19 and thus the locking shaft stopper 46 can be displaced or lowered down into the hole 45 of the striking plate 35' into an interlocked condition in which the closure element 7 of the door 2 is inserted into the associated opening 38', and the door is closed. The locking shaft stopper 46 and the recess 47 that has been designed as a locking formation 42' and is located in the rear edge section 48 of the pivoting staple 36' can thus act against each other during interlocking by entering into a locking interaction in which the pivoting staple is prevented from turning. The locking interaction, as has been mentioned above, takes place through interaction between the sheath 46 of the positioning rod 19 and the recess 47 with the form of an arc of a circle in the pivoting staple 36. An interlocked condition is shown in Figures 5 and 6 in which the door 2 is locked and the closure element 7 has been inserted into the closure element recess 39' of the pivoting staple 36', whereby the pivoting staple 36 is in turn prevented from turning by the locking shaft stopper 46 on the positioning rod 19 that is part of the pivoting staple lock 10 by thus being displaced downwards into the hole 45 of the striking plate 35.

[0022] The inverse is also possible, the door lock 6 can be placed into its open condition by the positioning rod 19 being lifted from the interlocked condition in which the locking shaft stopper 46 that is part of the pivoting staple locks 10 is removed from its locked condition against the locking formation 42' of the pivoting staple 36', i.e. against the recess 47 with the form of an arc of a circle in the cam-shaped rear edge section 48 of the pivoting staple. This takes place in practice through the positioning rod 19 being drawn upwards through the hole 45 of the striking plate 35'. When the control rod 8 has been lifted from its interlocked condition, the pivoting staple 36', which is biased towards the open position through the action of the pair of springs 43, is released, whereby the door 2 can be opened. With reference once again to Figure 6, it should be realised that the door lock 6 cannot be set into its interlocked condition unless the closure element 7 of the door 2 is correctly inserted into the door lock and the door is properly closed. This is a result of the locking action that arises between the sheath 46 of the positioning rod 19 and the cam-shaped rear edge section 48 with the form of an arc of a circle of the pivoting staple 36, which locking action prevents the control rod 8 from being lowered into its interlocked condition. In more detail, the rear edge section 48 of the pivoting staple 36' has been given such a form that it prevents the sheath 46 of the positioning rod 19 from being displaced down into the hole 45 of the striking plate 35' as long as the door is not correctly closed and the pivoting staple 36' been caused, through the action of the closure element 7 of the door, to take up its withdrawn interlocked or locked condition.

[0023] With reference to Figures 3 and 4, and as has been mentioned above, the interlock mechanism according to the invention comprises a control rod lock 11 that locks the control rod 8 by means of a interlock mechanism 14 such that it cannot be removed from its interlocked condition as long as the lift car is located at another location than the relevant landing. The function of the control rod lock 11 is controlled by the position of the lift, with the task of allowing the control rod 8 to be taken from its interlocked condition when the lift is located at the relevant landing. As has been mentioned in the introduction, the interlock mechanism 14 comprises a locking peg 15 that, in the interlocked condition, protrudes in an essentially horizontal direction in over a countersurface 13 that is arranged at the lower part of the positioning rod 19 and that is formed in the transition area between the periphery of the rod and the thickened part, is positioned transversely to the direction of travel of the positioning rod 19. The countersurface 13 forms an upper surface of a part of a thickened section 49 arranged at the lower end of the positioning rod 19. The interlock mechanism 14 is so designed that the locking peg 15, under the influence of a force such as a force from a spring or similar, strives to take a position in an interlocked condition with the locking peg 15 in locking interaction with the countersurface 13.

[0024] The interlock mechanism 14 will be described below, not only arranged at a lift of the type that has a lift car provided with a ramp 51 that can be lowered towards the landing whereby the mechanism is so designed that the ramp in its lowered position allows the interlock mechanism arranged at the landing to be released, but also arranged at a lift of the type that has a lift car provided with a cam profile 52 whereby the mechanism is constituted by a cam profile mechanism with such a trajectory that the interlocking can be released when a follower that is a component of the mechanism comes into contact with a cam arranged on the lift car. The said alternative designs are shown in Figures 3 and 4, respectively, and it should thus be understood that the locking mechanism 14 can be designed in a number of different ways, depending in the design of the lift.

[0025] The locking mechanism 14 is shown in Figure 3 designed as a pedal-shaped member 60 with a two-armed lever 61 that can be pivoted around a pivot pin 62 and that is provided at one of its ends with a forked locking peg 15 demonstrating an insertion groove 63 with a width that corresponds to the diameter of the positioning rod 19, and provided at its second end with an interaction

section 64 designed for interaction with the free edge of a ramp 51 that can be lowered from a lift car. Through the influence of a spring 65 arranged at the two-armed lever 61 the locking peg 15 of the two-armed lever 61 normally strives to achieve an interlocked condition pressed in against the pillar, in which condition the positioning rod 19 is prevented from motion in the axial direction through interaction with the forked locking peg 15. In the case given as an example in Figure 3, however, the inverse condition is shown, whereby the forked locking peg 15 is removed from locking interaction with the lower second thickened section 49 of the positioning rod 19, through the ramp 51 having been lowered and having its weight resting against the interaction section 64 of the two-armed lever 61. The interlock mechanism according to the invention is, in this condition, in a locked condition in which the control rod 8 while no longer being locked by the locking mechanism 13, even so - as long as the control rod remains free of influence - is in an interlocked condition in which the door is locked.

[0026] The locking mechanism 13 is shown in Figure 4 designed as a link system comprising a mechanism that has knee-formed joints angled in a vertical plane, consisting of first and second two-armed levers 70, 71 that are located at a certain distance from each other and each of which can be pivoted around a pivot pin 72, 73, respectively, whereby one arm of the first two-armed lever 70 is provided at its free end with a locking peg 15, and where one arm of the second two-armed level 71 is provided at its free end with a follower 74 for a cam profile 52. The two levers are at their second arms so connected to a link arm 79 in a manner that allows pivoting through shaft pegs 77, 78 that the parts together form a parallelogram that can pivot in the said vertical plane perpendicular to the principal plane of the closed door. Furthermore, the complete link system is so balanced that the locking peg 15 strives to be positioned in an interlocked normal condition pressed in against the pillar, in which condition the positioning rod 19 is prevented from motion in the direction of its axis through interaction between the locking peg 15 protruding into a position above the countersurface 13 of the second, lower, thickened section 49 of the positioning rod 19.

[0027] In the case given as an example in Figure 4, the link system 70, 71, 79 that is part of the lock mechanism is shown in a condition in which the follower 74 is positioned in interaction with or in contact with a cam profile 52 fixed arranged on the lift car. The contact between the follower 74 and the cam profile 52 thus forms a pivot point 80 for the link system that prevents the follower from falling outwards when the pivot point 80 is lost if the control rod 8 and thus also the positioning rod 19 are influenced upwards from an interlocked condition. The link system is so designed that the control rod 8 and the associated positioning rod 19 can be taken from their normal interlocked condition into a free non-interlocked condition only in the case in which the follower 74 is located in contact with the said cam profile 52 and prevented from falling outwards, i.e. only in those cases in which the lift car is located at the relevant landing. In all other cases, where the lift car is located at any other place that the relevant landing, i.e. in those positions at which the follower is not influenced by the cam profile, the link system enters a blocking condition in the event of any attempt to move the control rod 8, and thus also the positioning rod 19 that is connected to it, in a vertical direction upwards out of the interlocked condition.

[0028] The interlocking described above functions in the following manner:

a) In the absence of a lift car at the relevant landing: there is in this case no cam profile 52 in front of the follower 74, which is thus not prevented from falling out, whereby the pivot point 80 is thus not present, or the ramp 51 is not lowered down towards the interaction section 64. If the control rod 8 and thus also the positioning rod 19 are then influenced upwards, the door 2 will remain locked and secure in the interlocked condition through the lock units that are connected in series. The first factor that ensures this is through the control rod lock 11 that prevents, in the interlocked condition, the control rod 8 from being taken out of the interlocked condition through interaction between the locking peg 15 and the lower, second thickened part 49 of the positioning rod 19. The second factor that ensures this is the pivoting staple lock 10 that prevents, in the interlocked condition, the door lock 6 from being taken from the interlocked condition when the closure element 7 is located inserted into the lock through interaction between the locking shaft stopper 46 and the locking formation 42' of the pivoting staple. Thus the door 2 will remain locked in this condition, with double security.

b) In the presence of a lift car at the landing: the cam profile 52 is now present in front of the follower 74 and thus the pivot point 80 is also present, or the ramp 51 is lowered down towards the interaction section 64. If the control rod 8 and thus also the positioning rod 19 are now influenced upwards, each one of the lock units that are connected in series will leave its locking condition and the door 2 will be released. The first factor that ensures this is that the follower 74 is prevented from falling out such that the pivot point 80 arises, whereby the locking peg 15 is allowed to pivot under, and thus the lower second thickened section 49 of the positioning rod 19 is allowed to pass the locking peg 15 without hinder when the positioning rod moves vertically upwards. In the case of the ramp 51, the ramp is, naturally, lowered onto the interaction section 64 and the lock unit is taken from its locked condition through the locking peg 15 being pivoted out from locking interaction with the lower, second thickened section 49 of the positioning rod 19. The second factor that ensures this is the pivoting staple lock 10 is taken from its inter-

locked condition when the positioning rod 19 is displaced upwards through the hole 45 of the striking plate 35' and thus the locking shaft stopper 46 is taken out from its locked condition against the locking formation 42' of the pivoting staple 36'. The door 2 is driven towards its open condition through the influence of the pivoting staple 36' pair of springs 43.

[0029] Naturally, the sensing third lock unit 12 ensures by means of the switch unit 23 that the lift cannot be started if the door 2 is not correctly closed, by interrupting the power supply to the driving motors of the lift if the interlock is not placed into a correct interlocked condition.

[0030] The invention is not limited to that which has been described above and shown in the drawings: it can be changed and modified in several different ways within the scope of the innovative concept defined by the attached patent claims.

Claims

1. An interlock mechanism for a landing door (2) at a lift, whereby the interlocking is active, in the locked condition, when a lift car that is a component of the lift is in motion or is located at a position beyond a landing, and it can be released when the lift car is located in a stationary condition at a landing through the execution of the operation of a control rod (8) that is a component of the interlock mechanism, **characterised in that** a number of lock units in series with each other are connected to the control rod (8), of which a first lock unit (10) is arranged to, on displacement of the control rod, axially displace a locking shaft stopper (46) that is a component of the interlock from interaction with a door lock (6) that is a component of the interlock mechanism and thus out of locking interaction with a closure element (7) that is a component of the landing door (2), and **in that** a second lock unit (11) is arranged to allow that the lock units (10, 11) of the interlock mechanism be released through repositioning of the control rod (8) only after interaction has been established between an interaction section (64, 74) that is a part of the interlock mechanism arranged at the landing and an element (51, 52) arranged at the lift car, when the lift car is stationary at a landing.

2. The interlock mechanism according to claim 1, whereby the interaction section (64, 74) forms part of a locking mechanism (14) that is arranged to release a lock formation (15, 13) that operates between the control rod (8) and the locking mechanism (14); where the said release occurs either through interaction between a follower (74) that is a component of the mechanism and a cam profile (52) arranged at the lift car, or through interaction between the second end (61) of a two-armed lever (71) that is a component of the mechanism and a ramp (51) that can be lowered and that is arranged at the lift car.

3. The interlock mechanism according to claim 2, whereby not only the locking shaft stopper (46) but also the lock formation (15, 13) that acts between the control rod (8) and the locking mechanism (14) are arranged to be biased into the interlocked condition by a force, such as the force of a spring (22).

4. The interlock mechanism according to claim 1, whereby a third lock unit (12) connected in series with the control rod (8) is arranged to axially displace an interaction part (24) when the position of the control rod is changed out of interaction with a switch unit (23) that is a component of the interlock mechanism and in this way to a position at which a driving circuit for the supply of power to the driving motors of the lift is interrupted.

5. The interlock mechanism according to any one of claims 1-4, whereby the door lock (6) comprises a striking plate (35') that demonstrates an opening (38') for the reception of a closure element (7) arranged at the door (2), a pivoting staple (36') with a recess (39') for the closure element in which the closure element is located when it has been engaged in the locked condition, and that when the position of the control rod (8) is changed, the locking shaft stopper (46) that is a component of the interlock mechanism is caused to release locked interaction with the pivoting staple (36') and the striking plate (35').

6. The interlock mechanism according to claim 5, whereby the pivoting staple (36') is biased by a spring (43) to hold an open position at which it can receive the closure element (7).

7. The interlock mechanism according to any one of claims 5-6, comprising a positioning rod (19), connected to the control rod (8) and extending in a vertical direction, of which positioning rod the locking shaft stopper (46) forms a part that can be displaced and guided into a hole (45) in the striking plate (35').

8. The interlock mechanism according to claim 7, comprising a locking formation (42') designed as a recess (47) in a cam-shaped rear section (48) of the pivoting staple (36') and against which recess the radially directed outer surface of the locking shaft stopper (46) demonstrates a corresponding form, whereby the locking shaft stopper (46) is displaced from interaction with the recess when the position of the control rod (8) is changed.

9. The interlock mechanism according to any one of claims 7-8, whereby the locking shaft stopper (46)

comprises a ring-shaped sheath that surrounds the positioning rod (19) and can be displaced along this rod, and can be fixed at a freely chosen location along the rod through an adjustment screw (25) that acts between the locking shaft stopper and the rod.

10. The interlock mechanism according to any one of claims 5-9, whereby the control rod (8) is locked against change of position into the interlocked condition through interaction between the end part of the locking shaft stopper (46) and the cam-shaped edge section (48) of the pivoting staple (36') when the closure element (7) of the landing door (2) is located at a position outside of the door lock (6) and is thus not in locked interaction.

11. The interlock mechanism according to any one of claims 5-9, comprising a first and a second striking plate (35, 35') of which each one serves the relevant pivoting staple (36, 36'), whereby the striking plates are located at a separation, one above the other, and demonstrate openings (38, 38') oriented in different directions.

12. The interlock mechanism according to claim 11, whereby the relevant pivoting staple (36, 36') is mounted to pivot around a common shaft (37).

13. The interlock mechanism according to any one of claims 11-12, whereby the opening (38) for one of the striking plates (35) is oriented parallel to the principal plane of the landing door (2) in the interlocked condition, while the opening (38') of the second striking plate (35') is oriented perpendicular to the said principal plane.

14. The interlock mechanism according to claim 7, whereby the switch unit (23) of the third lock unit (12) is connected to the positioning rod (19) and comprises a ring-shaped cam (24) that surrounds the positioning rod (19) and can be displaced along it, an adjustment screw (25) with which the ring-shaped cam can be fixed at predetermined positions along the positioning rod in order to interact with an electrical switch (26) that is attached at a fixed position relative to the positioning rod.

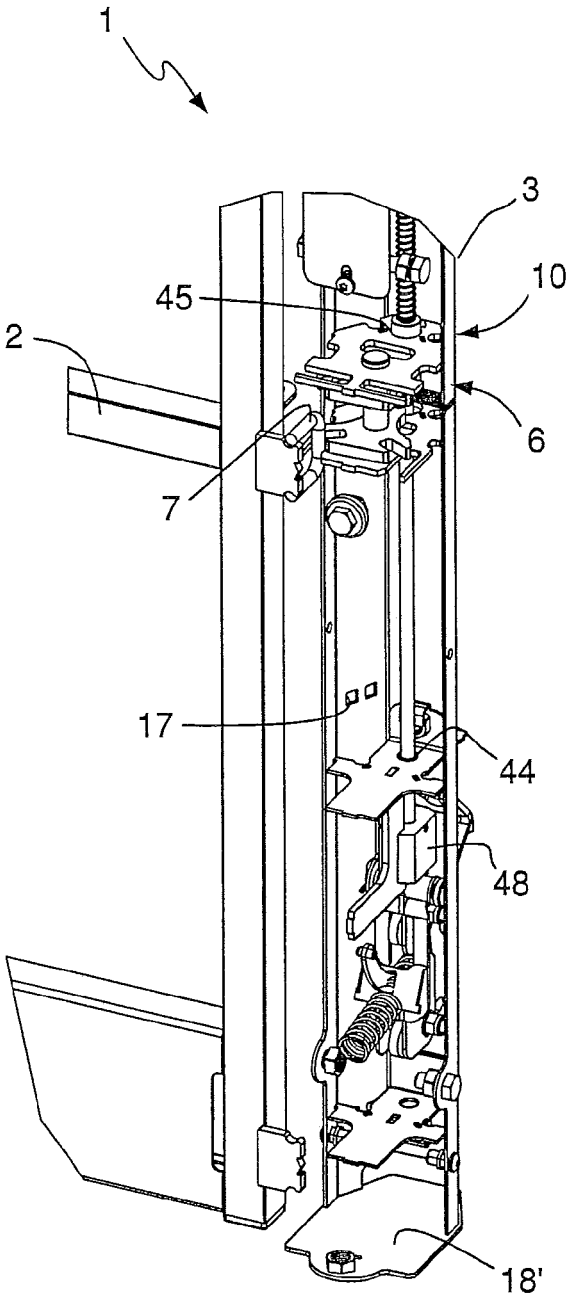


FIG.1

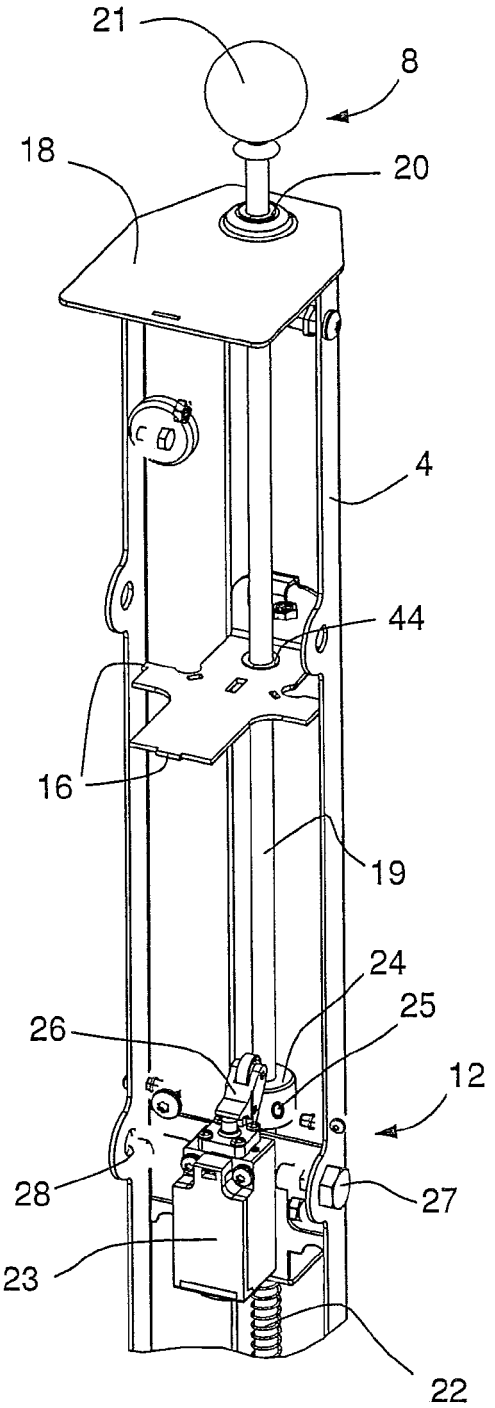
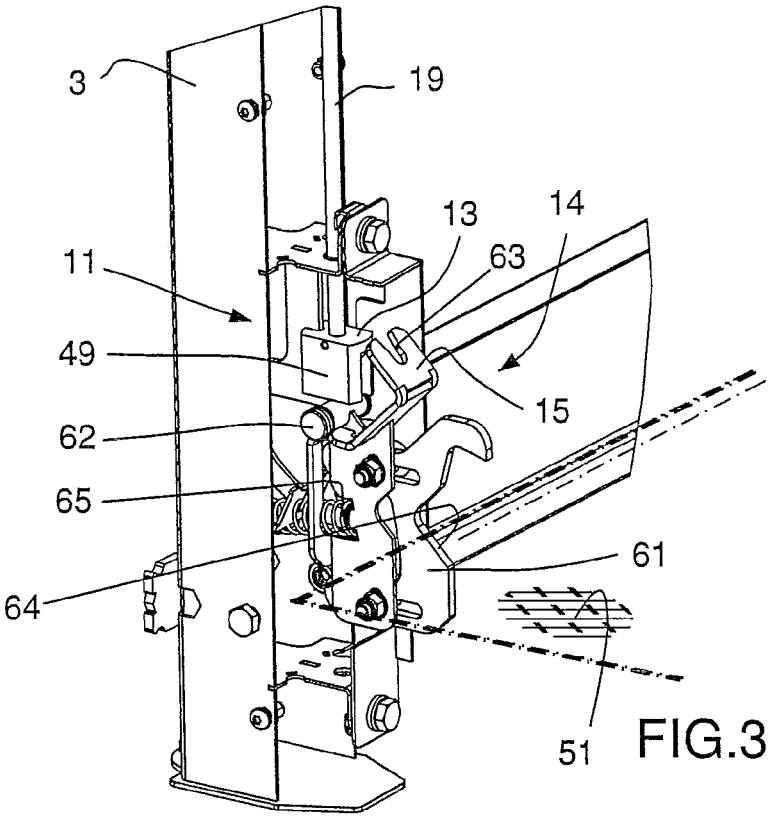


FIG.2


3
19
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63
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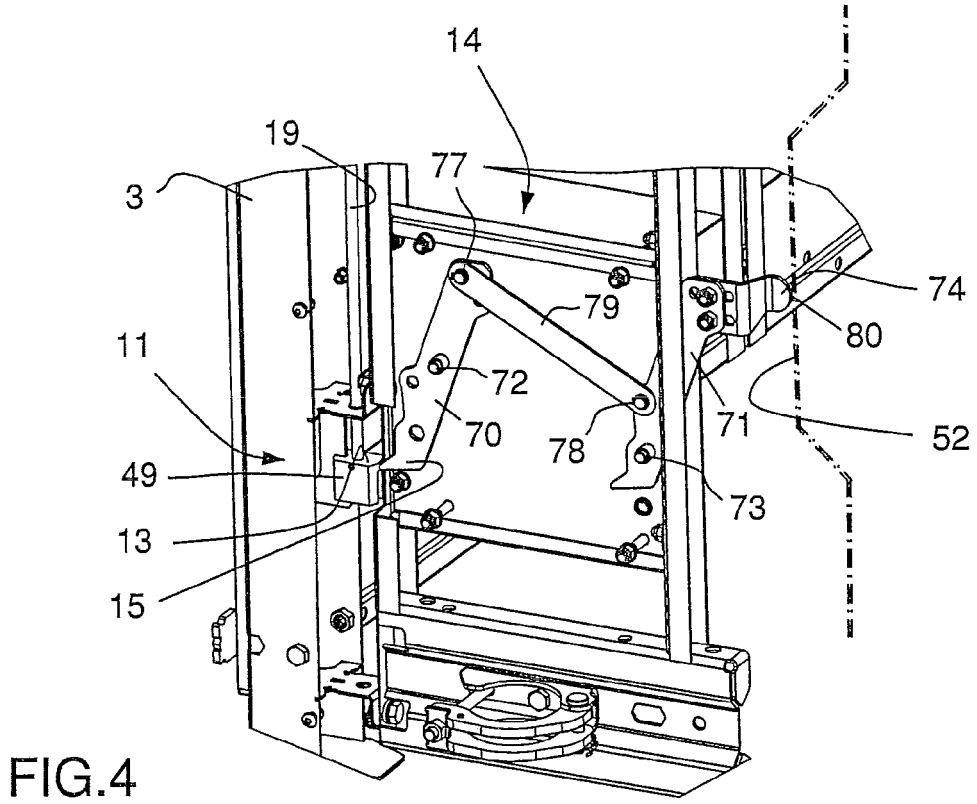
64
51

FIG.3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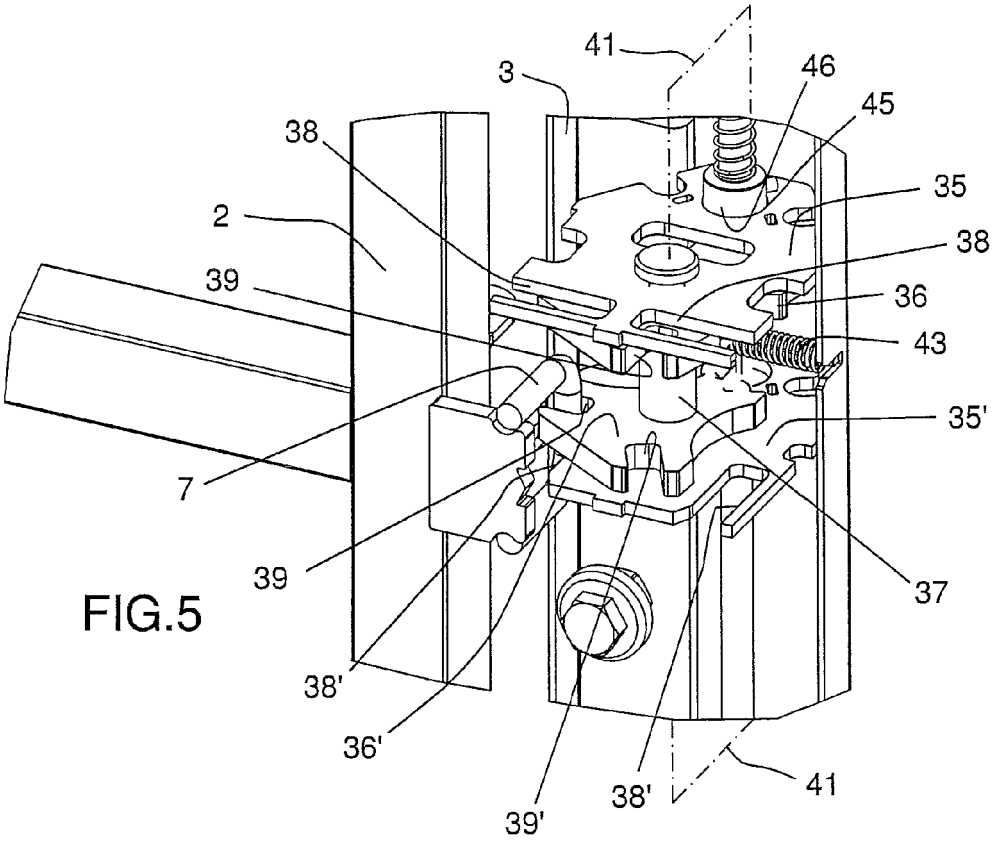
15

FIG.4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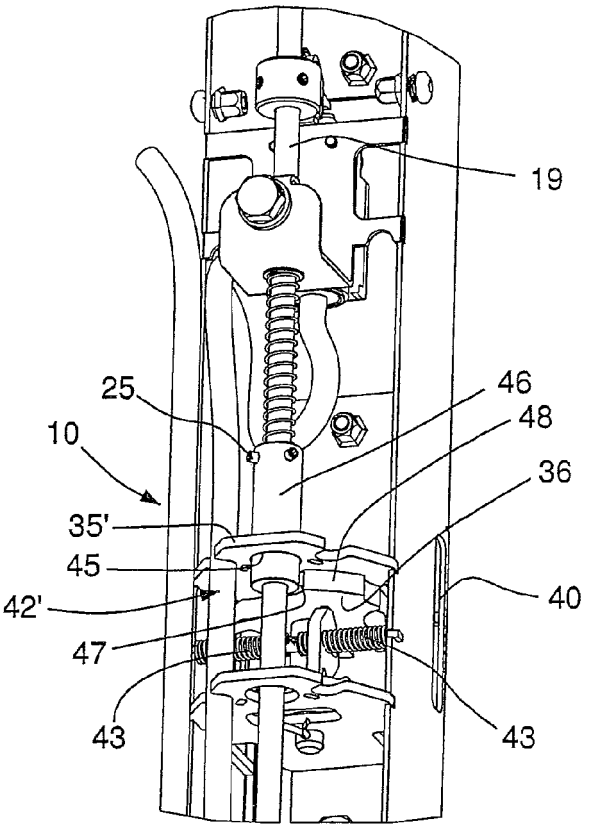
3
46
45
38
35
2
38
39
36
43
35'
7
39
37
38'
36'
39'
38'
41

FIG.5


19
25
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48
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36
35'
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42'
47
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FIG.6

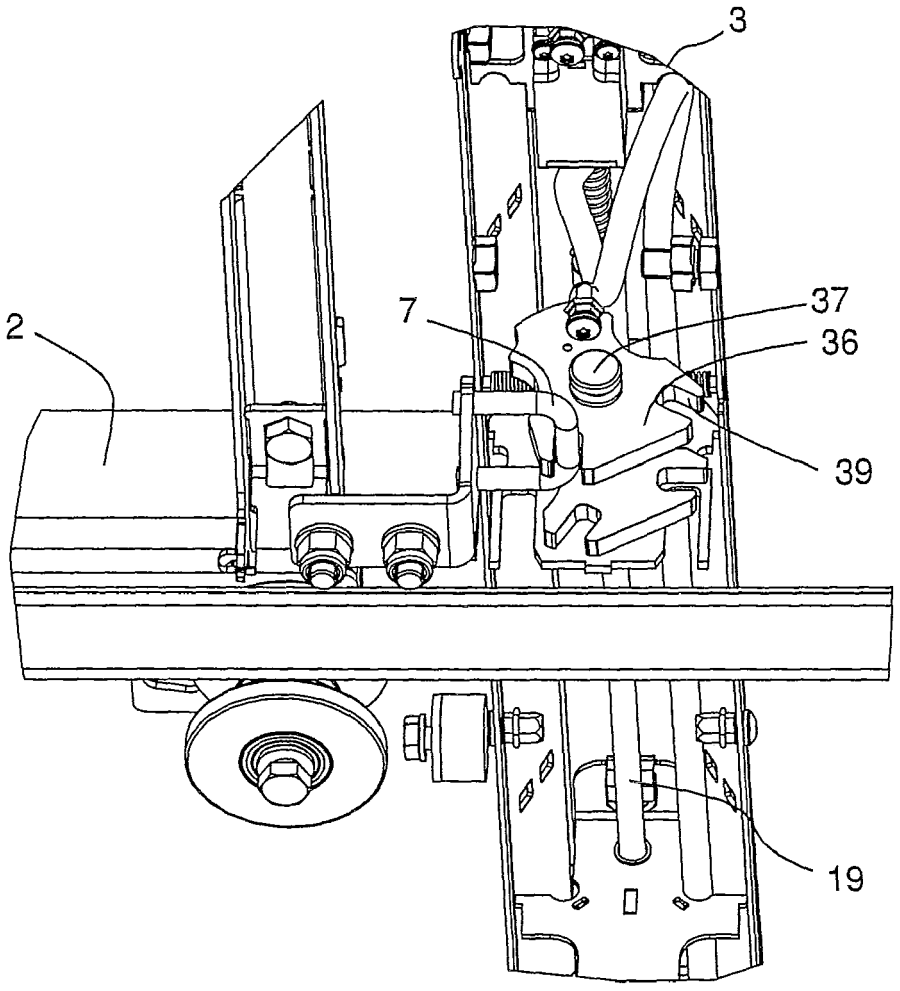

FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 4384

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 97/20766 A1 (ALIMAK AB [SE]; OLOFSSON MATS [SE]) 12 June 1997 (1997-06-12) * abstract; figures 1-3 *	1-13	INV. B66B13/20
X	US 2 240 820 A (WILMOT JOHN C) 6 May 1941 (1941-05-06) * page 2, column 1, line 9 - page 2, column 2, line 61; figures 1,3,5 *	1-13	
X	WO 03/006354 A1 (TEGUR [FR]; ROBERT YVES [FR]; MAILLER FABRICE [FR]) 23 January 2003 (2003-01-23) * abstract; figures 2,3 *	1-5	
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B66B
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 December 2010	Nelis, Yves

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16-12-2010

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