(12) PATENT ABRIDGMENT **(11)** Document No. **AU-B-31436/89**
(19) AUSTRALIAN PATENT OFFICE **(10)** Acceptance No. **613162**

(54) Title
DOOR DRIVE DEVICE WITH LOCKING MECHANISM FOR LIFTS

International Patent Classification(s)
(51)[4] **B66B 013/20**

(21) Application No. : **31436/89** (22) Application Date : **17.03.89**

(30) Priority Data

(31) Number	(32) Date	(33) Country
01051/88	**18.03.88**	**CH SWITZERLAND**

(43) Publication Date : **21.09.89**

(44) Publication Date of Accepted Application : **25.07.91**

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(56) Prior Art Documents
GB 2071203
US 3605952
EP 164581

(57) Claim

1. Door drive device with locking mechanism for lifts, in which device a cage door is movable by a drive and in the region of the storeys connectable through a coupling mechanism with a shaft door, wherein the coupling mechanism includes an entraining parallelogram on a cage door wing and two coupling rollers respectively arranged at each shaft door and the drive includes a drive motor arranged above the cage, a connecting gear and a drive means, whichis connected with the cage door through an actuating lever, said drive means fixing the cage door in a closed and in an open setting, the locking mechanism includes a pivotably connected cage door bolt monitored by a safety contact arrestable at an abutment and is locked by its own weight in a retaining position and urgable into a releasing position by a control roller running up onto a control cam, characterised in that the actuating lever, which is pivotable between two fixedly placed elastic abutments and articulatedly connected at one end with the drive means and at the other end with the cage door, transmits the movement of the cage door and the shaft door coupled thereto and which carries out the opening or closing of the entraining parallelogram when the cage door is stationary, is arranged at the cage door.

COMMONWEALTH OF AUSTRALIA 613162 Form 10

PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

Class Int. Class

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority :

Related Art :

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Complete Specification for the invention entitled:

DOOR DRIVE DEVICE WITH LOCKING MECHANISM FOR LIFTS

The following statement is a full description of this invention, including the best method of performing it known to : us

DOOR DRIVE DEVICE WITH LOCKING MECHANISM FOR LIFTS

The present invention concerns a door drive device with locking mechanism for lifts, in which device a cage door is movable by a drive and in the region of the storeys shap-lockingly connectable through a coupling mechanism with a shaft door, wherein the coupling mechanism consists of an entraining parallelogram borne at a cage door wing and two coupling rollers respectively arranged at each shaft door and the drive displays a drive motor arranged above the cage, a connecting gear and a drive means, which is connec ,ed with the cage door through an actuating lever and fixes the cage door in the closed and in the open setting and the locking mechanism displays a pivotably, borne cage door bolt which is monitored by a safety contact, is arrestable at an abutment, is locked by its own weight in a retaining position and which is urgeable into a releasing position by a control roller running up onto a control cam.

A door drive device of that kind has become known by the CH-PS 663 406, in which the shaft door is moved in common by the cage door of a lift cage situated in the region of a storey. Both the doors are shape-lockingly connected each with the other with the aid of an entraining parallelogram which is borne at the cage door and movable through by two entraining members arranged at the shaft door. A pivotably borne bolt is arranged at the cage door and locked by its own weight at an abutment arranged at the cage. In the region of a target storey, the bolt is unlocked by the running-up of a first control roller, which is arranged at an angle lever articulatedly connected with the bolt, onto a control cam arranged in each storey, wherein the coupled doors in normal operation are automatically opened and again closed by the door drive device.

In the case of current failure, the cage door remains locked outside the storeys. In the region of the storeys, the entraining parallelogram is drawn apart by the force of a tension spring, wherein the door drive is on the

one hand guided out of a dead centre position with the aid of a double lever and a second control roller and the locking of the cage door is on the other hand unlocked by the impinging of the first control roller on the control cam arranged at each shaft door and the movement connected therewith of the angle lever and the articulated bolt. The cage door and the coupled shaft door can be opened by hand.

A disadvantage of this device lies in that a control cam for the unlocking of the cage door locking is required in each storey, which control cam must co-operate exactly in each storey with the drive device arranged at the cage and therefore requires exact and expensive regulating operations on the building site. A further disadvantage also lies in that the entraining parallelogram in the open setting can be compressed by external forces or inertia forces, whereby disturbing noises arise.

The invention is based on the task of proposing a door drive device, in which no control cams for the unlocking of the cage door locking are to be arranged at the individual shaft doors and in which the open entraining parallelogram can not be compressed by external forces or by inertia forces.

This problem is solved by the invention characterised in claim 1.

The advantages achieved by the invention are to be seen essentially in that a single actuating cam arranged at the movable cam of the entraining parallelogram and a control roller arranged directly at the cage door bolt suffice to unlock the cage door bolt in the region of a storey, whilst they do not influence the cage door locking outside the storeys. A further advantage also lies in that the exact degree of splaying of the entraining parallelogram, which is required for an unobjectionable function of the entraining parallelogram, is adjustable thereby, that the pivot angle of the actuating lever pivotable between two fixedly placed elastic abutments is adjustable through two parts of the actuating lever, which

are each displacable relative to the other. With these arrangements, it is possible already during the factory assembly to set the exact manner of function of the entraining parallelogram. A further advantage still lies in that the entraining parallelogram, when the cage door locking is unlocked and after minimum opening path of the cage and the shaft door, tilts away due to the force of a torsion spring through a locking pawl carried in a rest position by a support roller arranged at the cage and, in the open state, is locked with the set degree of splaying. The actuating elements of the locks are moreover so arranged that no wedging is possible even in the case of inaccurate lateral cage position.

An example of embodiment of the invention is illustrated on the accompanying drawings, and more closely explained in the following. These show:

Figure 1 - a view of a door drive device with a centrally opening centre-telescopic sliding cage door, the door suspensions and the entraining parallelograms;

Figure 2 - a plan view of the door drive device according to Figure 1 together with a shaft door closure;

Figure 3 - a view of a closed entraining parallelogram for the free travel of the lift cage through a storey not aimed at;

Figure 4 - a view of an open entraining parallelogram outside the door opening zones with locked cage and shaft doors;

Figure 5 - a view of an open entraining parallelogram on a target storey with compressed movable cam, shaft and cage doors unlocked and doors closed; and

Figure 6 - a view of an open entraining parallelogram on a target storey with compressed movable cam, shaft and cage doors unlocked, doors open about 23 millimetres and locking pawl locked to the entraining parallelogram.

An entraining parallelogram for a coupling mechanism between a cage door 30 and a shaft door 40 of a

door drive device of a lift installation is denoted by 1 in the Figures 1 and 2. The entraining parallelogram 1 is arranged at the upper part of the cage door 30 and connected by a clamping element 19 with a belt-shaped drive means 42. The belt-shaped drive means 42 is a part of a drive 36 of the door drive device, which consists of a drive motor 37, a connecting gear 38, a drive belt 39 and two rollers. The drive 36 is built up at a sheet metal carrier 34, which is arranged at the roof of a cage 33 above the door opening and at the ends of which a fixed drive roller 40 and a tensionable deflecting roller 41 are rotatably borne, which receive the belt-shaped drive means 42 with the required tension. According to the direction of movement of the cage door 30, the same clamping element 19 of the entraining parallelogram 1 can be clamped fast either at the upper run 41.1 or at the lower run 41.2 of the belt-shaped drive means 41. The clamping element is articulatedly connected with an actuating lever 9 and a strap 18 of the entraining parallelogram 1. Fastened below the sheet metal carrier 34 is a guide carrier 35, in which carrier rollers 31 and guide rollers 32, which are rotatably borne at the upper part of the cage door 30, are guided. The cage door 30 and the shaft door 43 are in the present example illustrated as centrally opening centre-telescopic door with the cage door wings 30.1, 30.2, 30.3 and 30.4 and the shaft door wings 43.1, 43.2, 43.3 and 43.4, respectively. A fixed coupling roller 44 and a movable coupling roller 45 are arranged at the shaft door 43 for transmission of the door movement from the cage door to the shaft door. The movable coupling roller 45 at the same time serves for unlocking or for locking of the shaft door, wherein a not illustrated safety contact also monitors the locking electrically.

The entraining parallelogram is again denoted by 1 in the Figures 3, 4, 5 and 6. The entraining parallelogram 1 consists of a rigid cam 2 and a movable cam 3, which are connected with a fixed base plate 10 articulatedly and parallelly pivotable through a lower lever 7 and an upper

lever 8. The base plate 10 is fixedly arranged at the upper part of the cage door 30. The movable cam 3 displays a rigid cam carrier 4 articulated at the lower lever 7 and the upper lever 8 and a ramp curve 5, fastened thereat to be parallelly compressible and slightly spaced from the rigid cam carrier 4 by leaf springs 6. The entraining parallelogram 1 is either drawn apart into an open setting by a tension spring 11 articulated at the upper lever 8 and at the lower part of the base plate 10, or drawn together into a closed setting by a belt-shaped drive means 42. A clamping element 9, which articulatedly connected with an actuating lever 9 adjustably fastened at the upper lever 8 of the entraining parallelogram 1 and guided to be parallelly movable by an additional strap 18 and which is clampable to the upper run 42.1 or tp the lower run 42.2 of the belt-shaped drive means 42, serves as binding link between the entraining parallelogram 1 and the belt-shaped drive means 42. The open setting of the entraining parallelogram 1 is limited by an abutment 16 arranged at the base plate 10 and the closed setting is limited by an abutment 17 likewise arranged at the base plate 10. The exact pivot angle for the attainment of the aforedescribed opening width of the entraining parallelogram can be adjusted through slight displacement of the actuating lever 9 on the upper lever 8. A cage door bolt 12, which through its own weight and through an additional compression spring 15 rests in a rest position on an abutment 13 arranged at the base plate 10, is tiltably borne on the base plate 10. In the rest position, the cage door bolt 12 is locked with an abutment 25 arranged at the cage 33. Fastened at the cage door bolt 12 is a control roller 14, which co-operates with a control cam 24, arranged at the ramp curve 5 of the movable cam 3, of the entraining parallelogram 1 and unlocks the cage door bolt 12 when the entraining parallelogram 1 is coupled with a fixed coupling roller 44 and a movable coupling roller 45 of a shaft door 43. The locked rest position of the cage door bolt 12 is monitored electrically

by a safety contact 20. A locking pawl 23, which is biased by the force of a torsion spring 22, is tiltably borne at the base plate 10. A support roller 21 arranged at the cage presses the locking pawl into an unlocked setting against the force of the torsion spring 22 when the cage door 30 is locked. Immediately after the opening of the cage door 30, the oblique edge 23.1 of the locking pawl 23 rolls over the supporting roller 21, during which the locking pawl 23 tilts until an abutment pin 26 for the torsion spring 22 stands against a lug 27 of the base plate 10 and the rear part 23.2 of the locking pawl 23 stands against a bevel 9.1 of the actuating lever 9 and locks the entraining parallelogram 1 in the opened setting.

The aforedescribed equipment operates as following:

The centrally opening telescopic door, illustrated by way of example in the Figures 1 and 2, consists of two two-wing telescopic doors. On the opening of the cage door 30, two door wings 30.1 and 30.2 or 30.3 and 30.4 one beside the other each time move from the centre either to the left or right respectively, and namely by means of a known, not illustrated equipment, in which the outer, indirectly driven door wing 30.1 and 30.4 each time at half the speed carries out half the travel of the inner, directly driven door wings 30.2 and 30.3 so that both the door wings 30.1 and 30.2 or 30.3 and 30.4, which belong together, lie exactly congruently one behind the other outside the cage door opening when the cage door 30 is open. The individual cage door wings are displacably guided in guides of the guide carrier 35. A common drive 36 built up on the sheet metal carrier 34 above the guide carrier 35 at the cage roof, drives both the middle cage door wings 30.2 and 30.3. The belt-shaped drive means 42, which is laid over the tensionable deflecting roller 41 and at the upper run 42.1 of which the entraining parallelogram 1 of the left hand middle cage door wing 32.2 is clamped fast and at the lower run 42.2 of which the entraining parallelogram 1 of the right hand middle cage door wing 30.3 is clamped fast, is

driven by the drive motor 37 by way of the drive belt 39, the connecting gear 38 and the fixed drive roller 40. The fastening of the entraining parallelogram 1 at the belt-shaped drive means 42 and the manner of function of this entraining parallelogram 1 is more clearly evident from the Figures 3, 4, 5 and 6.

The entraining parallelogram 1, which is firmly arranged at the upper part of the associated cage door wing 30.2 and 30.3 by means of a base plate 10, has the task of keeping the cage door 30 locked during the travel and, in a target storey, of unlocking the cage door 30 and the shaft door 43 and coupling them together in order that the shaft door 43 is opened and closed together with the cage door 30 actuated by the door drive 36 and both doors are subsequently again locked. Additionally, the regulations are still to be fulfilled that the cage door must, in the case of current failure, remain locked outside a storey and that the cage door and the corresponding shaft door must be unlocked automatically in the region of the storeys in order that the cage door together with the shaft door can be opened manually by an enclosed passenger. The Figure 3 shows the closed setting of the entraining parallelogram 1 for the free travel and the travel through storeys not aimed at, the Figure 4 shows the open setting in the case of current failure with cage door 30 locked outside a storey and Figures 5 and 6 show the open setting in normal operation or in the case of current failure with unlocked cage door 30 within the door opening zone of a storey. The clamping element 19, which according to Figure 3 is clamped fast at the belt-shaped drive means 42, holds on the one hand the entraining parallelogram 1 in the closed setting against the force of the tension spring 11 and on the other hand the cage door 30 within the door opening zone of a storey. The clamping element 19, which according to Figure 3 is clamped fast at the belt-shaped drive means 42, holds on the one hand the entraining parallelogram 1 in the closed setting against the force of the tension spring 11 and on

the other hand the cage door 30 itself likewise closed due to a holding force 50, acting at it, of the lower run 40.2 of the belt-shaped drive means 42 when the drive motor 37 is switched off and blocked by a not illustrated retaining brake. The clamping element 19 standing under tension stress draws the articulated actuating lever 9 of the upper lever 8 flush against the abutment 17 of the base plate 10 so that also the rigid cam 2 and the movable cam 3 assume their narrowest setting when the ramp curve 5 is away from the rigid cam carrier 4 due to the leaf springs 6. The control roller 14 and the control cam 24 of the cage door bolt 12 do not touch each other and the cage door bolt 12 due to its own weight and the force of the compression spring 15 lies on the abutment 13. The cage door 30 is locked at the abutment 25 by the cage door bolt 12 and the safety contact 20 is closed. The unlocked locking pawl 23 of the entraining parallelogram 1 rests in its rest position on the supporting roller 21 against the force of the torsion spring 22. In this setting, closed for the travel of the cage 23, of the entraining parallelogram 1, the entraining parallelogram 1 moves through the region of an untargeted storey without contact between the fixed coupling roller 44 and the movable coupling roller 45 of the shaft door 43. In the case of a stop of the cage 33 outside the door opening zone of a storey, for example in case of current failure, according to Figure 4, the tension force through a run 42.1 or 42.2 of the belt-shaped drive means 42 at the clamping element 19 disappears due to the current-free drive motor 37. The tension force of the tension spring 11 tilts the actuating lever 9 from the abutment 17 to the abutment 16 of the base plate 10. The clamping element 19 in that case execuces an idle stroke in a parallel displacement together with the clamped-on belt-shaped drive means 42 with the cage door 30 stationary. The rigid cam 2 and the movable cam 3 of the entraining parallelogram 1 assume the open setting, the compressible ramp cam 5 remains spaced from the rigid cam carrier 4 by the leaf springs 6 and the control cam 24

and the control roller 14 of the cage door bolt 12 do not touch each other. The cage door 30 remains locked due to the cage door bolt 12 standing against the abutment 25 and the locking pawl 23 remains in its rest position relative to the entraining parallelogram 1.

In the case of a targeted or an unintended stop within the door opening zone of a storey, according to Figures 5 and 6, the entraining parallelogram 1 moves between the fixed coupling roller 44 and the movable coupling roller 45 of the shaft door 43. The entraining parallelogram 1 is splayed apart into the opening direction by the tension force of the tension spring 11 either when the drive motor 37 is free of current or on the switching-over of the drive motor 37 regulated by a microprocessor. The clamping element 19 clamped on at the belt-shaped drive means 42 together with the drive means 42 carries out a pivotal movement through the actuating lever 9 when the cage door 30 is stationary, for which movement the fixed cam 2 and the movable cam 3 open parallelly and run up at the coupling rollers 44 and 45 of the shaft door. In that case, the movable coupling roller 45 is pressed away through a certain distance and the shaft door 43 is unlocked and the movable ramp cam 5 pressed against the rigid cam carrier 4, while the control roller 14 runs up on the control cam 24, the cage door bolt 12 is pressed out of its rest position and the cage door 30 is unlocked. The cage door 30 is now, according to the state, either opened by the door drive 36 or can be pressed open by hand. At the beginning of this movement, the locking pawl 23 rolls along on the supporting roller 21 and after a few millimetres tilts due to a force of the torsion spring 22 downwardly over the inclined edge 23.1 until the abutment pin 26 for a spring end of the torsion spring 22 stands against the lug 27 of the base plate 10 (Figure 6). The rear part 23.2 of the locking pawl 23 stands against the bevel 9.1 of the actuating lever 9 and the entraining parallelogram 1 is locked in the opened setting. The further opening movement

and the subsequent closing movement of the cage door 30 and the coupled shaft door 43 take place with locked entraining parallelogram, whereby vibrations and rattling noises during the door movements are avoided. At the end of the closing movement, the cage door 30, which is moved according to Figure 6 by way of the locked entraining parallelogram 1 by the lower run 42.1 from the door drive 36, is pulled together with the shaft door 43 until it stands against a not illustrated abutment. In that case, the locking pawl 23 runs by way of the inclined edge 23.1 onto the supporting roller 21, the locking of the entraining parallelogram 1 becomes unlocked and, when the cage door is stationary, the entraining parallelogram closes itself due to the tension force of the belt-shaped drive means 42. The actuating lever 9 articulated at the clamping element 9 pivots from the abutment 16 for the open setting of the entraining parallelogram 1 to the abutment 17 for the closed setting of the entraining parallelogram 1 and the rigid cam 2 and the movable cam 3 move away from the movable coupling roller 45 and the fixed coupling roller 44 of the shaft door 43. Due to the return movement of the movable coupling roller 45, the shaft door is locked and the not illustrated safety contact is closed. The compressible ramp curve 5 moves away from the rigid cam carrier 4 due to the leaf springs 6, whilst the control cam 24 moves away from the control roller 14 and the cage door bolt 12 moves into its horizontal rest position, in which the cage door 30 is locked and the safety contact 20 is closed (Figure 3). The lift cage is ready for the further travel.

A centrally opening centre-telescopic door with four door wings is illustrated in Figures 1 and 2. It is readily possible to equip any other kind of sliding door with the door drive device according to the invention.

It would readily be feasible in place of a belt-shaped drive means (42) to provide another drive means, for example a crank drive.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Door drive device with locking mechanism for lifts, in which device a cage door is movable by a drive and in the region of the storeys connectable through a coupling mechanism with a shaft door, wherein the coupling mechanism includes an entraining parallelogram on a cage door wing and two coupling rollers respectively arranged at each shaft door and the drive includes a drive motor arranged above the cage, a connecting gear and a drive means, whichis connected with the cage door through an actuating lever, said drive means fixing the cage door in a closed and in an open setting, the locking mechanism includes a pivotably connected cage door bolt monitored by a safety contact arrestable at an abutment and is locked by its own weight in a retaining position and urgable into a releasing position by a control roller running up onto a control cam, characterised in that the actuating lever, which is pivotable between two fixedly placed elastic abutments and articulatedly connected at one end with the drive means and at the other end with the cage door, transmits the movement of the cage door and the shaft door coupled thereto and which carries out the opening or closing of the entraining parallelogram when the cage door is stationary, is arranged at the cage door.

2. Door drive device according to claim 1, characterised in that the entraining parallelogram displays a rigid cam and a movable cam, which consists of a ramp cam, which is compressible parallelly at a rigid cam carrier by two leaf springs, that the control cam for the locking mechanism of the cage door is arranged at the compressible ramp cam and the control roller is arranged at the cage door bolt, which is pivotably borne at a base plate of the entraining parallelogram.

3. Door drive device according to claim 1, characterised in that a tiltably borne locking pawl, which is held in a rest position against the force of a torsion spring by a control roller arranged at the cage and bringable into a locking position of the entraining parallelogram arising at the actuating lever through the torsion spring after the opening of the cage door is arranged at the base plate of the entraining parallelogram.

4. Door drive device according to claim 1, characterised in that a clamping element, which is articulatedly connected with the actuating lever, is arranged at a belt-shaped drive means.

5. Door drive device according to claim 4, characterised in that a strap, parallelly guiding the clamping element, is arranged at the clamping element.

6. Door drive device according to claim 5, characterised in that the clamping element is clampable selectably to the upper run or the lower run of the belt-shaped drive means.

7. Door drive device according to claim 1, characterised in that the actuating lever is adjustably connected with an upper level of the entraining parallelogram.

DATED this 13th day of February, 1989.

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Melb Disk 1/MG

Fig.1

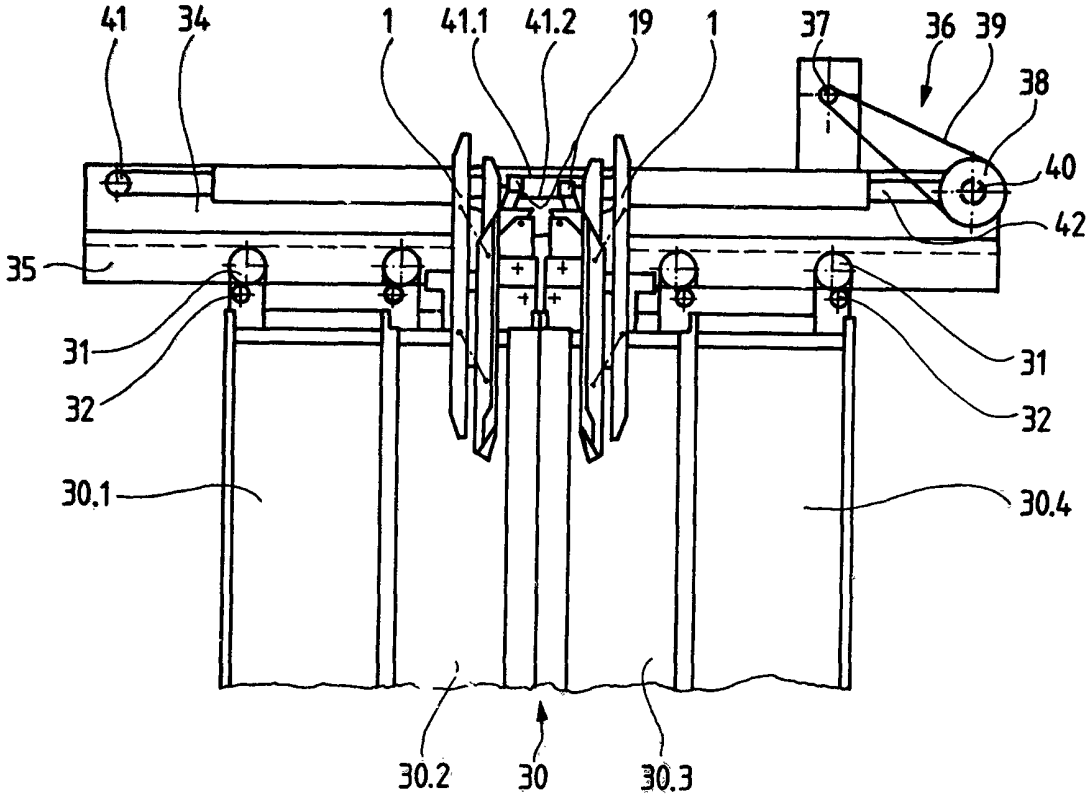
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Fig.2

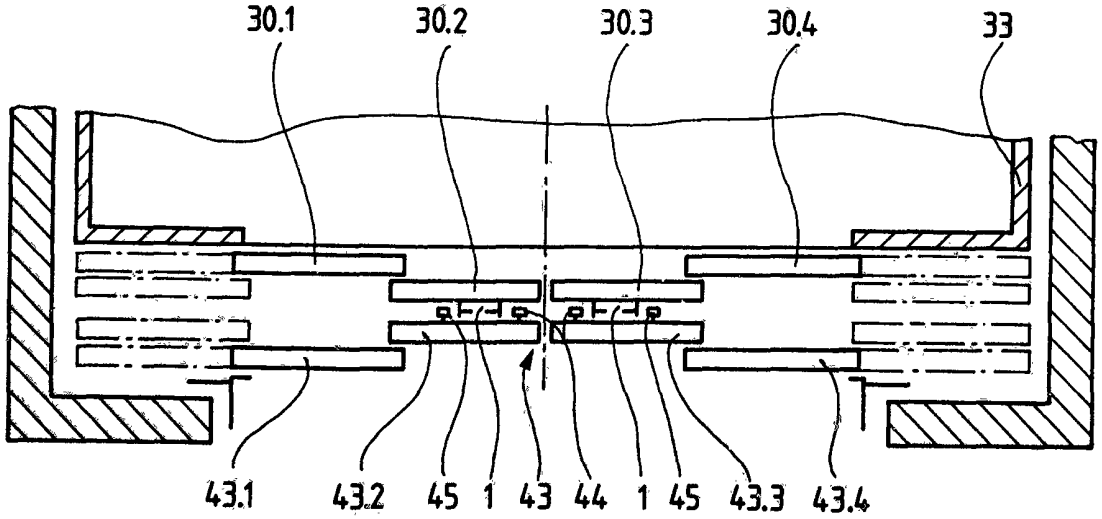
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Fig.3

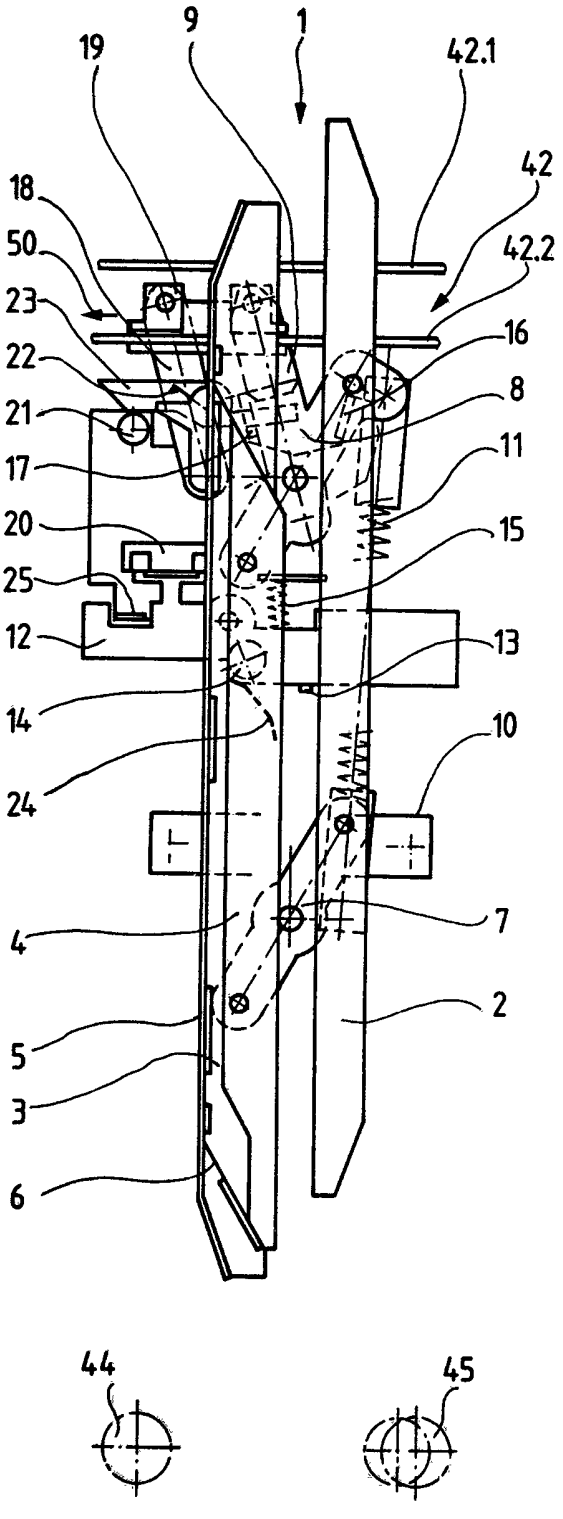
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Fig.4

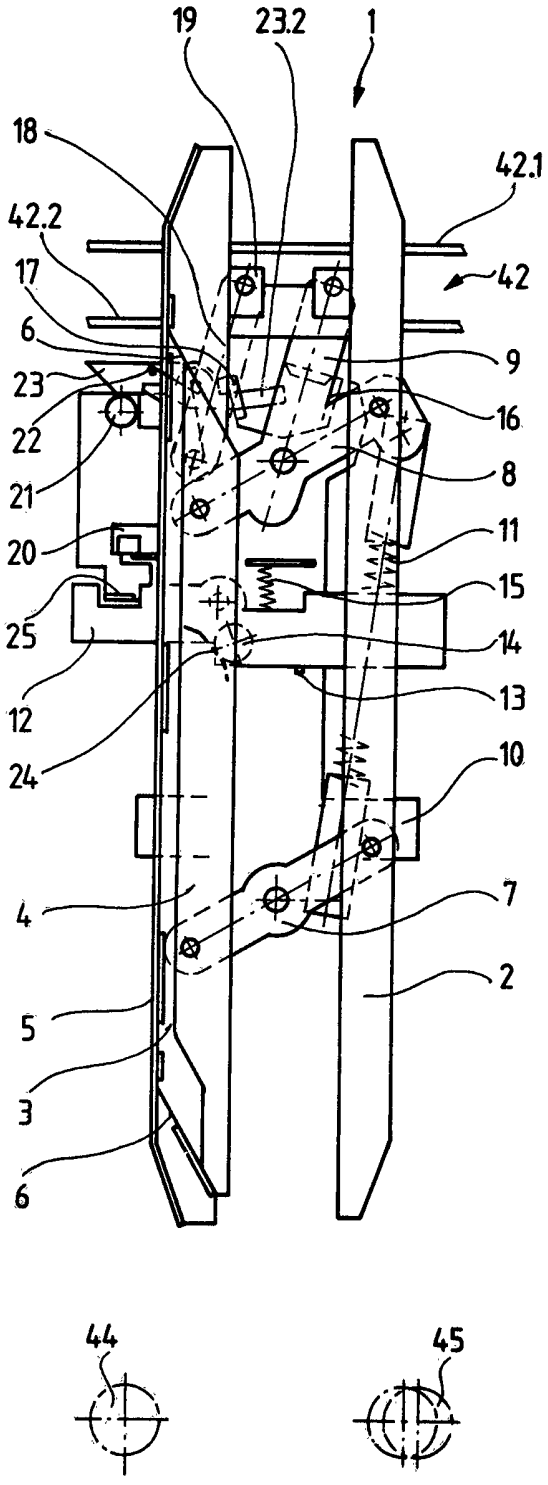
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Fig.5

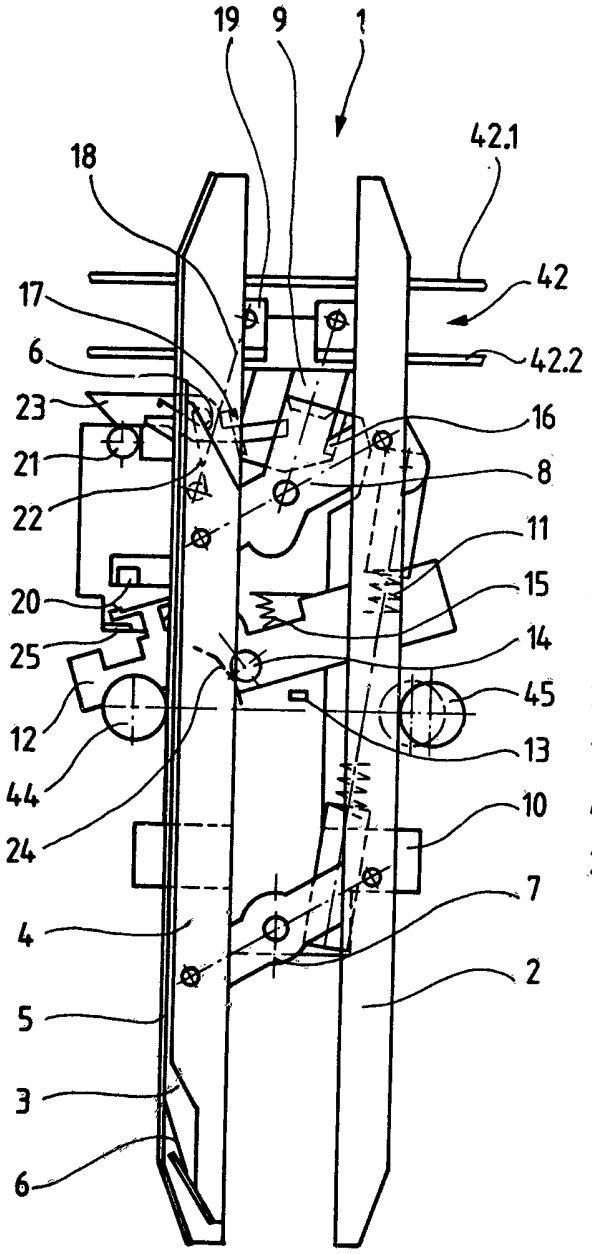
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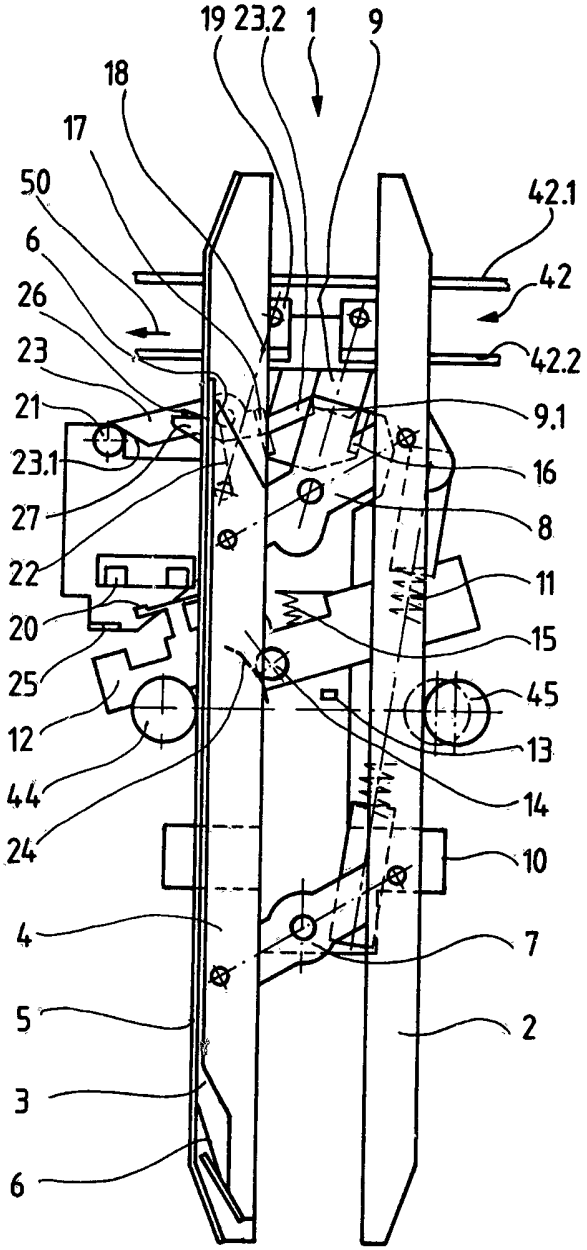
Fig.6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