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Equipment for connecting a cage door with a shaft door

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(71) Applicant(s)
Inventio AG

(72) Inventor(s)
Pierrick Vandenbussche

(74) Agent/Attorney
WATERMARK PATENT and TRADEMARK ATTORNEYS, Locked Bag 5, HAWTHORN
VIC 3122

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Abstract:

This equipment for connecting a cage door with a shaft door and for locking and unlocking the doors consists of an entrainer (1) arranged at the cage door, which entrainer (1) together with a second roller (2) arranged at the shaft door and a third roller (3) arranged at the shaft door detachably connects the cage door with the shaft door, and of a first locking mechanism (4) for locking and unlocking the cage door and a second locking mechanism (5) for locking and unlocking the shaft door. When the doors are closed and locked, the entrainer (1) is closed and can move freely between the second roller (2) and the third roller (3), wherein the lift cage during the journey is between two storeys or travels past a storey which is not to be served.

(Fig. 1)

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**COMPLETE SPECIFICATION
STANDARD PATENT**

Application Number:

Lodged:

Invention Title: **EQUIPMENT FOR CONNECTING A CAGE DOOR WITH A SHAFT DOOR**

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

EQUIPMENT FOR CONNECTING A CAGE DOOR WITH A SHAFT DOOR

FIELD OF THE INVENTION

The invention relates to equipment for selectively coupling a lift cabin (or cage) door with a lift shaft door and for locking and unlocking the doors, including an entrainer with a pair of rails arranged at the cage door, a pair of rollers arranged at the lift shaft door so as to cooperate with the entrainer to couple the lift cage and lift shaft doors in detachable manner, a first locking mechanism arranged to lock and unlock the lift cage door, and a second locking mechanism to lock and unlock the shaft door.

10 BACKGROUND OF THE INVENTION

Patent specification EP 0 332 841 B1 discloses a device by means of which a door of a lift cage disposed in the region of a storey is opened concurrently with a shaft door. If the lift cage is disposed outside a storey landing area, the cage door remains locked by the same device. The cage door is driven by a belt drive means using an entrainer parallelogram consisting of a fixed and a movable cam, (ie in form of guide rails). For the free travel, the entrainer parallelogram is closed, and it opens for coupling with the shaft door, between two coupling rollers arranged at the shaft door, before movement of the door takes place. The movable cam of the entrainer parallelogram has a displaceable run-up cam which, during the travel and when at a stop outside a storey, lifts-off a fixed cam carrier by means of leaf springs. For coupling with the coupling rollers of a shaft door, the run-up cam is pressed against the fixed cam carrier. This displacing travel is utilised for unlocking a cage door lock.

A disadvantage of the known equipment is that the movement of the run-up cam is transmitted by means of a control cam to a control roller of the cage door lock. The relatively small movement of the run-up cam has to be transmitted by way of several elements as far as the cage door lock, which notwithstanding a complicated mechanism, has to lock and unlock the cage door.

SUMMARY OF THE INVENTION

It would be desirable to provide a device or arrangement for selectively coupling lift cage doors with lift shaft doors that ameliorates or avoids the shortcomings mentioned above.

In accordance with the present invention there is provided equipment for selectively coupling a lift cage door with a lift shaft door and for locking and unlocking the doors, including

an entrainer which is arranged at the cage door, the entrainer having a first
5 and second cam rails;

a pair of rollers arranged at the shaft door such as to cooperate with the entrainer to selectively couple and uncouple the lift cage and shaft doors;

a first locking mechanism arranged to lock and unlock the cage door; and

a second locking mechanism arranged to lock and unlock the shaft door;

10 wherein a pair of spaced apart levers are pivotably secured at one end to the second rail of the entrainer, are connected with a further rail of the entrainer and are pivotably secured at an opposite other end with a locking rod of the first locking mechanism in such a manner that movement of the second rail and movement of the further rail are transmissible to the first locking mechanism to
15 effect locking and unlocking.

One advantage achieved by a preferred embodiment of the invention can essentially be seen in that the movement of the third (ie further) rail pivotably connected to the entrainer parallelogram is directly transmitted to the first locking mechanism. The movement of the third rail, translated without control cams and control rollers, is transmitted to the first locking mechanism. A quick and reliable
20 locking and unlocking of the cage door is thereby achieved. Moreover, the movement of the entrainer parallelogram and the third rail is transmitted directly to the second locking mechanism for locking and unlocking the shaft door. A quick and reliable locking and unlocking of the shaft door is thereby achieved.

25 Other aspects and preferred features of the present invention will become apparent from the following description of a preferred embodiment of the invention, provided with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows equipment for connecting a cage door with a
30 shaft door and for locking and unlocking the doors, in accordance with a first embodiment of the invention;

Fig. 2 shows a detail A of Figure 1;

Fig. 3 shows the equipment of Figure 1 during the opening process of the cage door and the shaft door;

Fig. 4 shows the equipment of Figure 1 with opened cage door and with opened shaft door;

5 Fig. 5, 6 and 7 show details of a locking mechanism for the shaft door as present in the equipment of Figure 1;

Fig. 8 shows an entrainer and a locking mechanism with closed and locked doors;

10 Fig. 9 shows an entrainer and a locking mechanism with closed doors;

Fig. 10 seeks to illustrate the movements of parts of the entrainer and the locking mechanism for the cage door;

Fig. 11 shows details of the entrainer and the locking mechanism for the cage door as present in the equipment of Figure 1;

15 Fig. 12 shows a detail B of Figure 11; and

Fig. 13 shows details of the lock for the cage door.

DESCRIPTION OF PREFERRED EMBODIMENT

Figure 1 shows equipment of connecting a cage door with a shaft door and for locking and unlocking the doors. The equipment consists of an entrainer 1 arranged at the cage door, which entrainer 1 together with a second roller 2 arranged at the shaft door and a third roller 3 arranged at the shaft door detachably connects the cage door with the shaft door, and of a first locking mechanism 4 for locking and unlocking the cage door and a second locking mechanism 5 for locking and unlocking the shaft door. When the doors are closed and locked the entrainer 1 is closed and can move freely between the second roller 2 and the third roller 3, wherein the lift cage on the journey is between two storeys or moves past a story which is not to be served.

The entrainer 1 comprises a first rail 6 and a second rail 7, which are pivotably connected together by means of a first lever 8 and a second lever 9. 30 The first lever 8 is rotatably mounted at a second axle 10 and the second lever 9 is rotatably mounted at a third axle 11. The axles 10, 11 are arranged at the cage door. Provided at the upper end of the first rail 6 is a first roller 12, which rolls on an inclined roller track 13 of a first base plate 14 arranged at the lift cage. A first

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tension spring 15 connects the first rail 6 with the second rail 7, wherein the first tension spring 15 acts on the entrainer 1 in opening manner. A third rail 16 extending parallelly to the second rail 7 is pivotably connected to a third lever 17 and to a fourth lever 18 of the second rail 7.

- 5 The first locking mechanism 4 consists of a first lock 21, which is provided with a recess 19 and a locking nose 20 and which is rotatably mounted at a first axle 22. The first axle 22 is arranged at the cage door. As shown in Figure 1, the locking nose 20 of the first lock 21 was disposed against a first catch 23 of the first base plate 14 in the case of an unauthorised opening movement of the cage
- 10 door. The position of the first lock 2 is monitored by means of a first contact 24. A locking rod 25 actuates the first lock 21, wherein a rod pin 26 projects into the recess 19 of the first lock 21. The locking rod 25 is pivotably connected to the third lever 17 and the fourth lever 18.



The second locking mechanism 5 consists of a second lock 28 rotatably mounted at a fourth axle 27 and a second catch (not illustrated) arranged at the shaft door-frame. The fourth axle 27 is arranged at a second base plate 29 and this, in turn, at the shaft door.

5 The second roller 2 is arranged at the second lock 28 and the third roller 3 is arranged at the second base plate 29. A second contact 32 monitors the setting of the second lock 28.

Fig. 2 shows details of the first lock 21, wherein the recess 19 has approximately the shape of a triangle. The shape of the recess 19 is determined by the movement of the second rail 7, by the movement of the third rail 16 and by the rotational movement, which is to be executed, of the first lock 21. A first buffer 30, which prevents metallic impact noises, is provided at the locking nose 20. A first contact bridge 31, which in the illustrated locked state closes the first contact 24, is arranged in electrically insulated manner at the first lock 21.

15 Fig. 3 shows the entrainer 1, the first locking mechanism 4 and the second locking mechanism 5 during the opening process of the cage door and the shaft door. The first roller 12 rolls along the roller track 13, whereby the first rail 6 moves horizontally in the opening direction and vertically downwardly. The second rail 7 and the third rail 16 are horizontally and vertically moved by means of the levers 8, 9, wherein the second rail 7 and the third rail 16 move away from the first rail 6; the entrainer 1 opens. With the vertical movement of the second rail 7, the locking rod 25 is raised, wherein the rod pin 26 displaces the first lock 21 in a rotational movement in clockwise sense. In Fig. 3 the first contact bridge 31 has already detached from the first contact 24. As soon as the first rail 6 runs up on the third roller 3 and the third rail 16 runs up on the second roller 2, the second lock 28 is displaced in a rotational movement in anticlockwise sense and the second contact 32 is opened. When the third rail 16 impinges on the second roller 2, the third rail 16 moves towards the second rail 7. This relative movement is transmitted to the third lever 17 and the fourth lever 18 and by these to the locking rod 25, wherein the locking rod 25 executes an additional movement upwardly in vertical direction.

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Fig. 4 shows the entrainer 1, the first locking mechanism 4 and the second locking mechanism 5 when the cage door is opened and the shaft door is opened. The first roller 12 is at the lower end of the roller track 13. After leaving the roller track 13, the rails are

kept in their position by means of the first tension spring 15. The entrainer 1, the first lock 21 and the second lock 28 are fully opened.

Fig. 5 shows the second locking mechanism 5 when the shaft door is closed and locked. When the entrainer 1 is closed the second lock 28 is behind the second catch (not illustrated) as seen in opening direction. The second lock 28 was disposed against the second catch in the case of an unauthorised opening movement of the shaft door. A second tension spring (not illustrated) engages at a first pin 33 and keeps the second lock in the illustrated setting.

Fig. 6 shows the second locking mechanism 5 when the shaft door is opened. During the opening process of the doors the second lock 28 has, through running-up of the rails 6, 16 on the rollers 2, 3, executed a rotational movement in anticlockwise sense, wherein the second contact 32 was opened.

The equipment according to Figs. 1 to 6 is illustrated as seen from the shaft door side.

Fig. 7 shows the locking mechanism 5 as seen from the cage side. As explained above, the second roller 2 is arranged at the second lock 28 and the third roller 3 is arranged at the second base plate 29. The third rail 16 running up on the second roller 2 effects a rotational movement of the second lock 28 in clockwise sense about the fourth axle 27.

Fig. 8 shows the entrainer 1 and the first locking mechanism 4 when the cage door is closed and locked. The second locking mechanism 5 is not illustrated. The entrainer 1 is closed and the third rail 16 is spaced from the second rail 7. The entrainer 1 can move between the second roller 2 and the third roller 3. In the case of an unauthorised opening movement of the cage door the locking nose 20 of the first lock 21 was disposed against the first catch 23 of the first base plate 14.

Fig. 9 shows the entrainer 1 and the first locking mechanism 4 when the cage door is closed and unlocked. The second locking mechanism 5, the second roller 2 and the third roller 3 are not illustrated. The entrainer 1 is partly opened and the third rail 16 bears against the second rail 7. The movement, which is executed up to then, of the second rail 7 in vertical direction has been transmitted to the locking rod 25. The movement, which has been executed up to then, of the third rail 16 in horizontal direction has been

translated by means of the third lever 17 and the fourth lever 18 into a vertical movement and transmitted to the locking rod 25. With the vertical movement of the locking rod the rod pin 26 has lifted the first lock 21 out of the region of the first catch 23 and unlocked the cage door. The first contact bridge 31 has been separated from the first contact 24.

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Fig. 10 shows the movements of parts of the entrainer 1 and the first locking mechanism 4. The rotational movement of the first lever 8 and the second lever 9 is symbolised by P1. The rotational movement of the third lever 17 and the fourth lever 18 is symbolised by P2. P3 symbolises the horizontal movement of the third rail 16. P4 symbolises the vertical movement of the locking rod 25. The rotational movement of the first lock 21 is symbolised by P5.

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The equipment according to Figs 8 to 10 is illustrated as seen from the shaft door side.

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Fig. 11 shows details of the entrainer 1 and the first locking mechanism 4 as seen from the cage side. The third lever 17 is rotatably mounted at a fifth axle 34 and the fourth lever 18 is rotatably mounted at a sixth axle 35 of the second rail 7. Arms 38, 39 of the third rail 16 are pivotably arranged at the short arms 36, 37 of the levers 17, 18. The locking rod 25 is pivotably arranged at the long arms 40, 41 of the levers 17, 18. The spacing of the third rail 16 from the second rail 7 is denoted by d. If the third rail 16 runs on the second roller 2, the spacing d reduces until the third rail 16 is disposed against a second buffer 42 and the second rail 7 is disposed against a third buffer 43. A fourth buffer 44 limits the downward travel of the locking rod 25.

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Fig. 12 shows the detail B of Fig. 11, from which the arrangement of the third lever 17 or the fourth lever 18 at the second rail 7 as well as the arrangement of the third rail 16 and the locking rod 25 at the third lever 17 and the fourth lever 18, respectively, are apparent. The horizontal movement of the third rail 16 is transmitted as a vertical movement to the locking rod 25 substantially in the length ratio of the arms 36, 40.

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Fig. 13 shows the first lock 21 with a synthetic material lining 45 in the region of the recess 19. The synthetic material lining 45 prevents metallic impact noises during the locking and unlocking.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Equipment for selectively coupling a lift cage door with a lift shaft door and for locking and unlocking the doors, including
 - an entrainer which is arranged at the cage door, the entrainer having a first
 - 5 and second rails;
 - a pair of rollers arranged at the shaft door such as to cooperate with the entrainer to selectively couple and uncouple the lift cage and shaft doors;
 - a first locking mechanism arranged to lock and unlock the cage door; and
 - a second locking mechanism arranged to lock and unlock the shaft door;
 - 10 wherein a pair of spaced apart levers are pivotably secured at one end to the second rail of the entrainer, are connected with a further rail of the entrainer and are pivotably secured at an opposite other end to a locking rod of the first locking mechanism in such a manner that movement of the second rail and movement of the further rail are transmissible to the first locking mechanism to
 - 15 effect locking and unlocking.
2. Equipment according to claim 1, wherein the levers of the pair of spaced apart levers each have a short arm and a long arm, and wherein the further rail is pivotably connected with the short arms and the locking rod is pivotably connected with the long arms.
- 20 3. Equipment according to claim 1 or 2, wherein the locking rod which is pivotably connected with the levers is arranged to transfer a vertical movement of the second and further rails to a first lock member of the first locking mechanism arranged at the cage door.
- 25 4. Equipment according to claim 3, wherein the first lock member has a recess into which projects a rod pin of the locking rod, the shape of the recess being determined by the movement pattern of the rails during operation of the equipment.
5. Equipment according to claim 4, wherein a synthetic material lining is provided in the region of the recess thereby to define said shape.

6. Equipment according to any one of the preceding claims, wherein the second locking mechanism is actuatable by said pair of rollers in that the first, second and further rails of the entrainer act on the rollers.
7. Equipment according to claim 6, wherein the second locking mechanism
- 5 includes a lock plate which is rotatably arranged at the shaft door and at which one of the pair of rollers is arranged, the other one of the pair of rollers being fixedly arranged at the shaft door.

DATED this 17th day of March 2006

INVENTIO

WATERMARK PATENT & TRADE MARK ATTORNEYS
290 BURWOOD ROAD
HAWTHORN VICTORIA 3122
AUSTRALIA

P21441AU00



Fig. 1

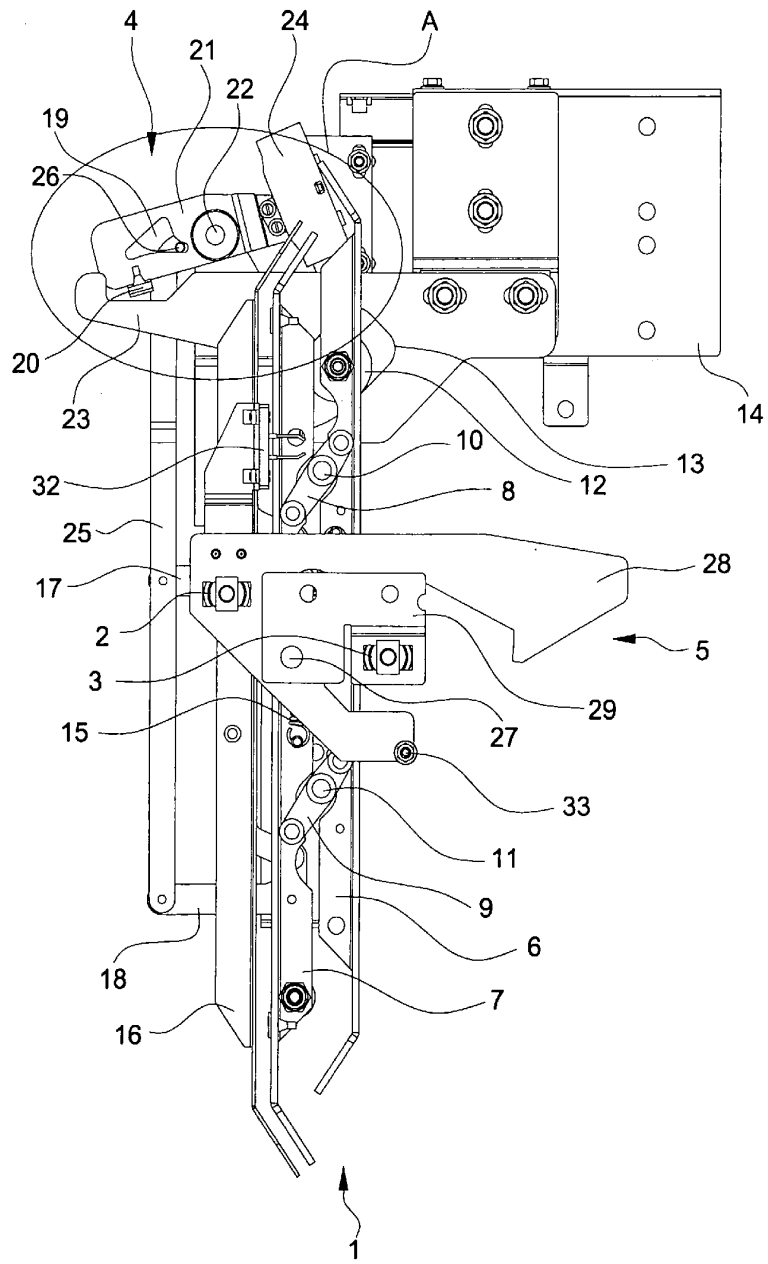
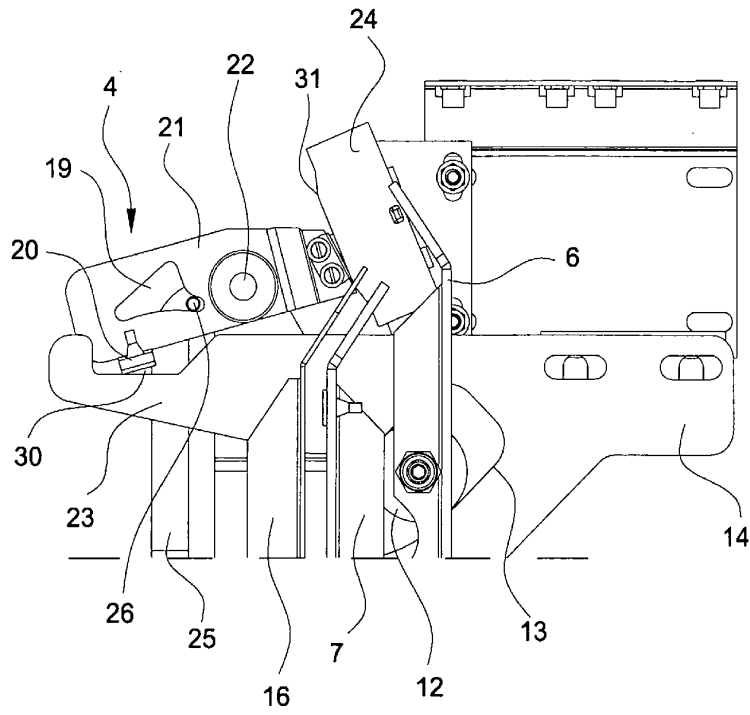


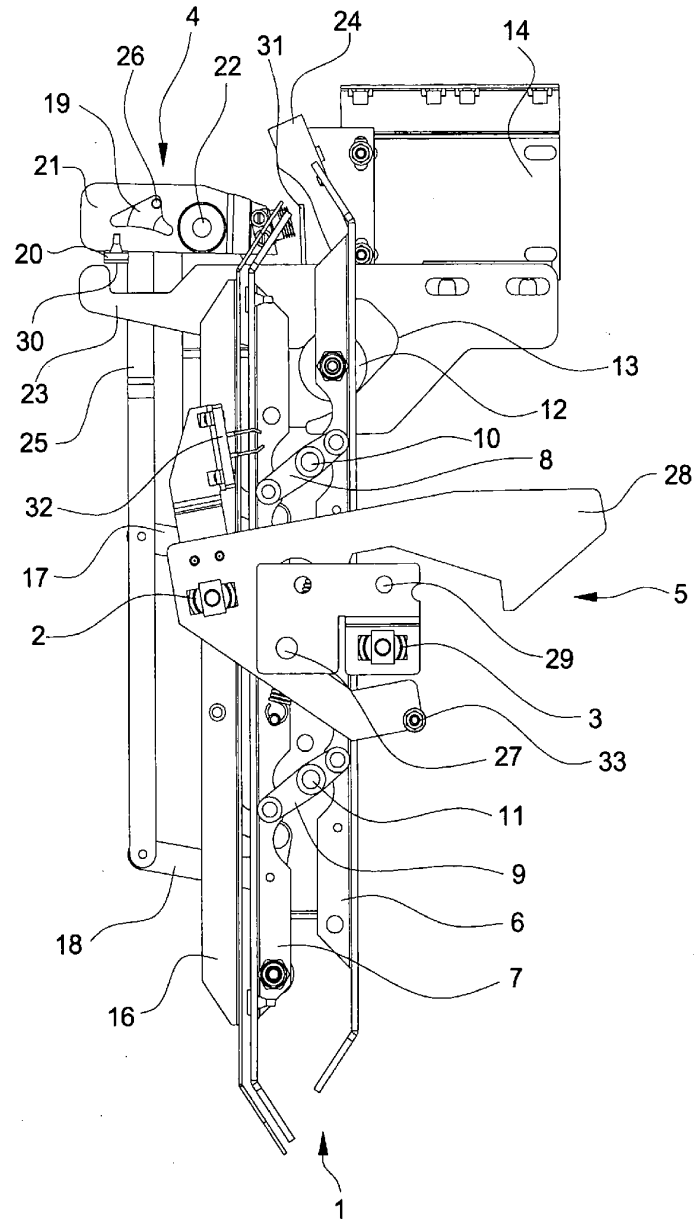
Fig. 2



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Fig. 3



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Fig. 4

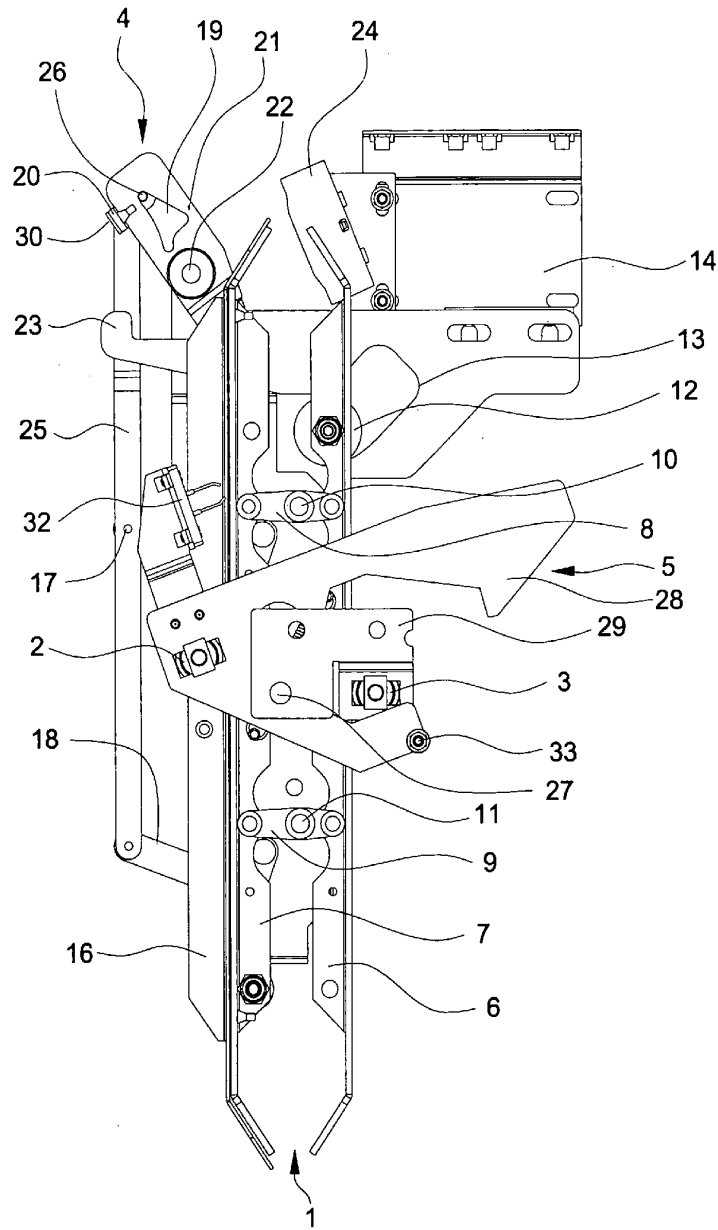


Fig. 5

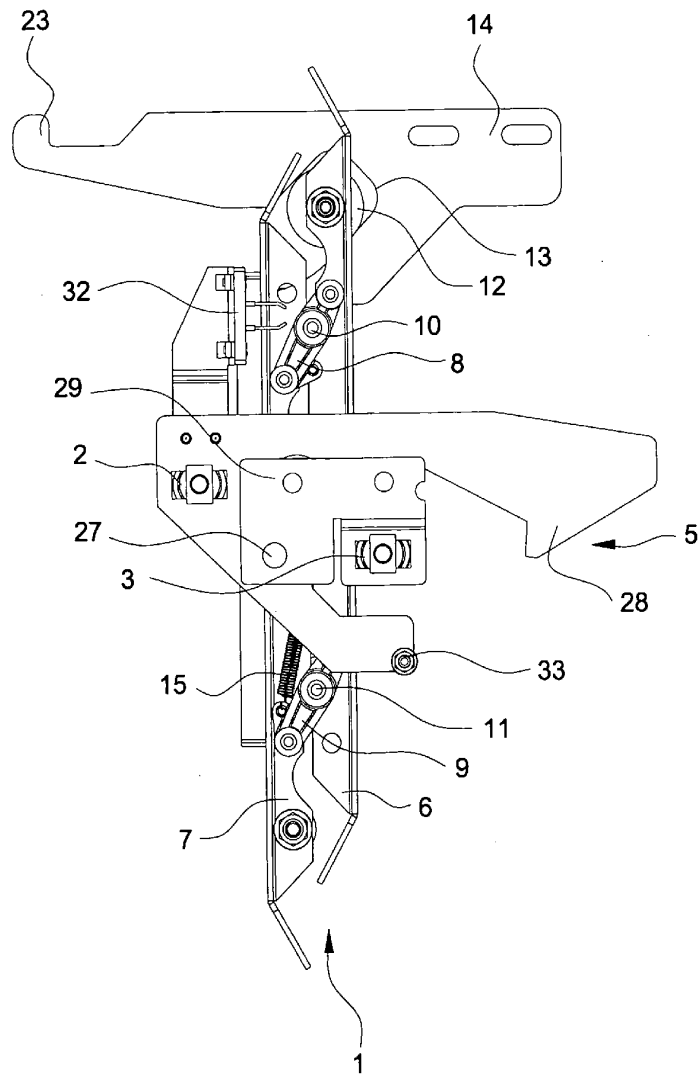


Fig. 6

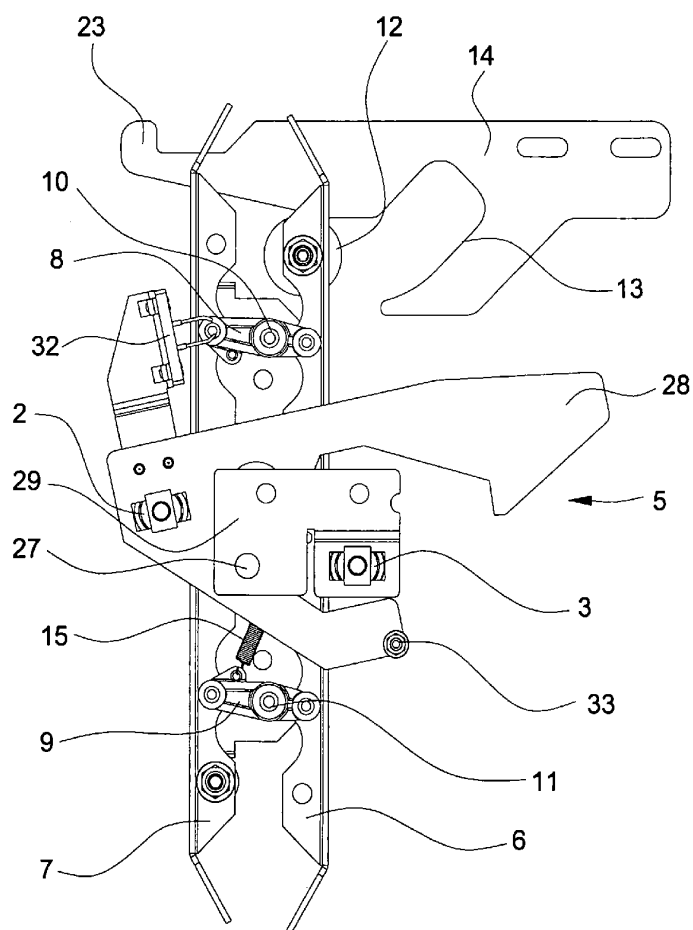


Fig. 7

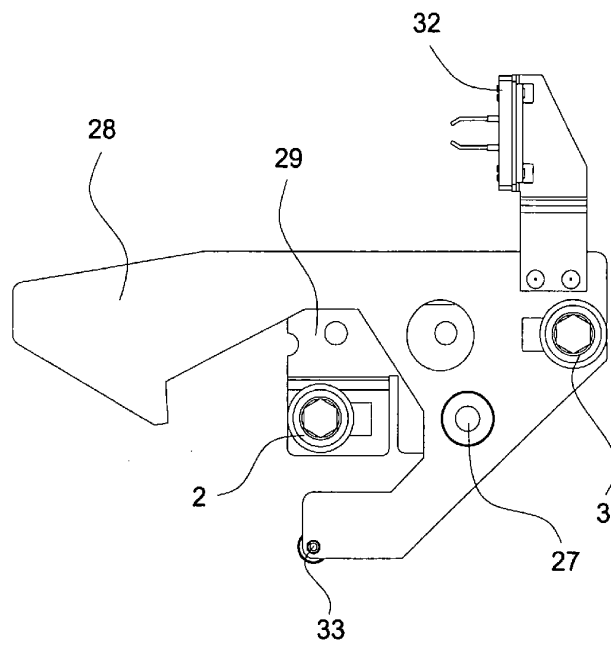


Fig. 8

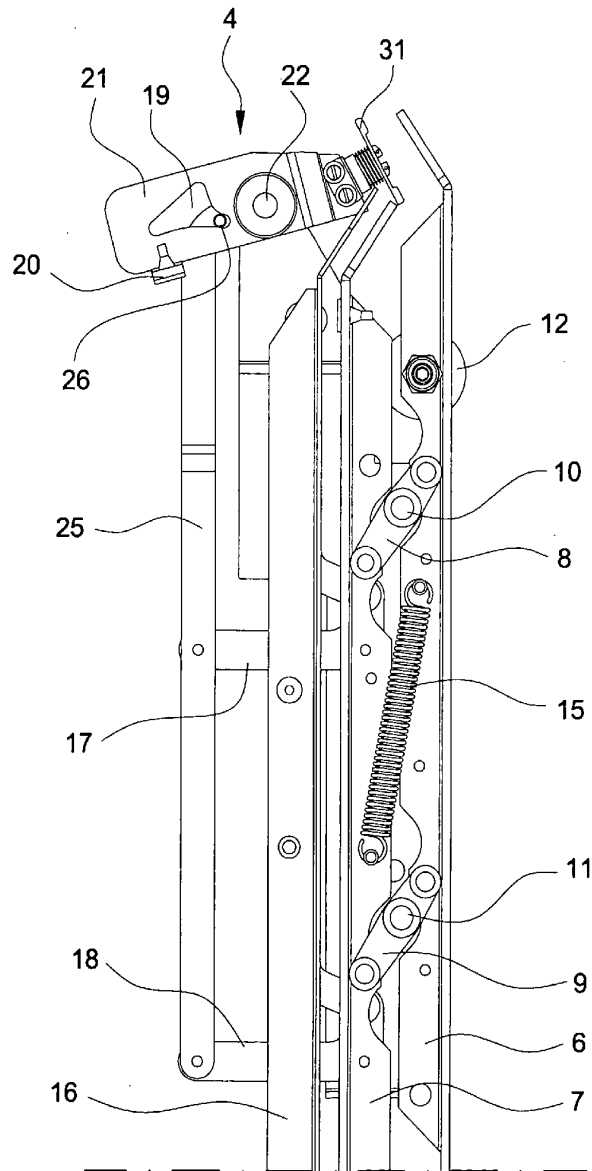


Fig. 9

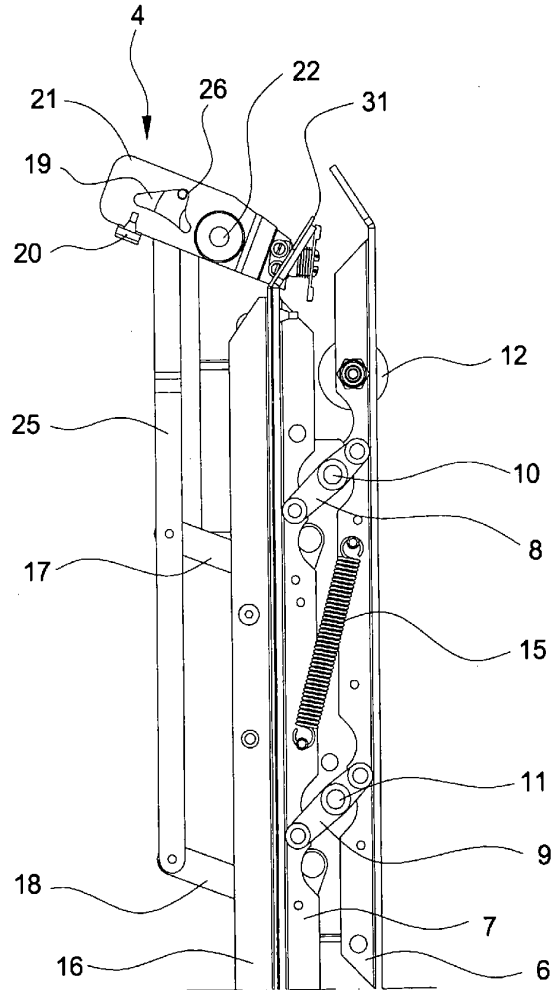


Fig. 10

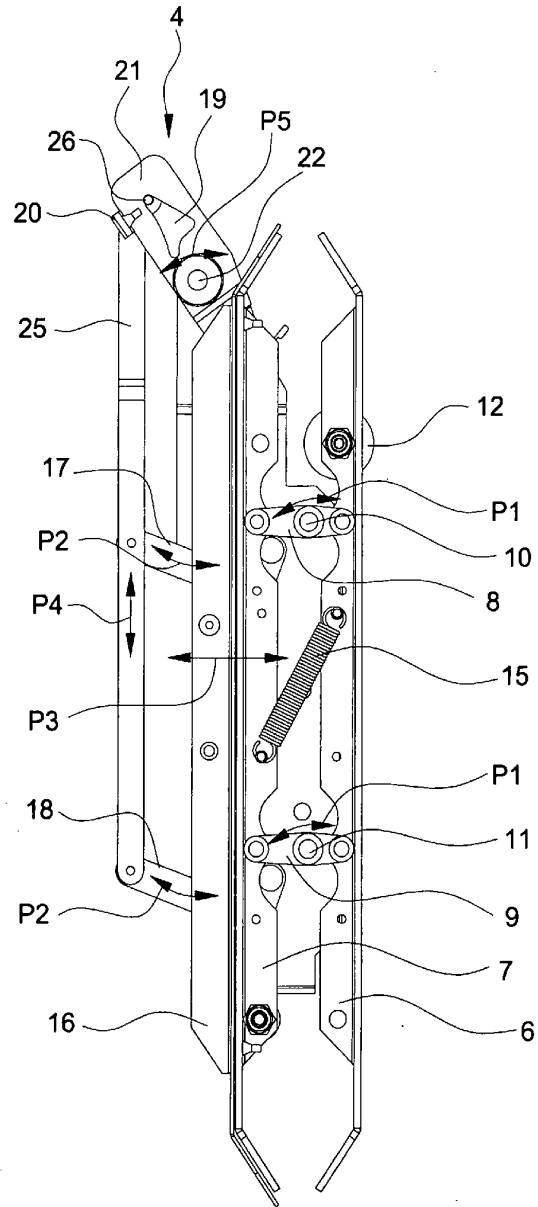
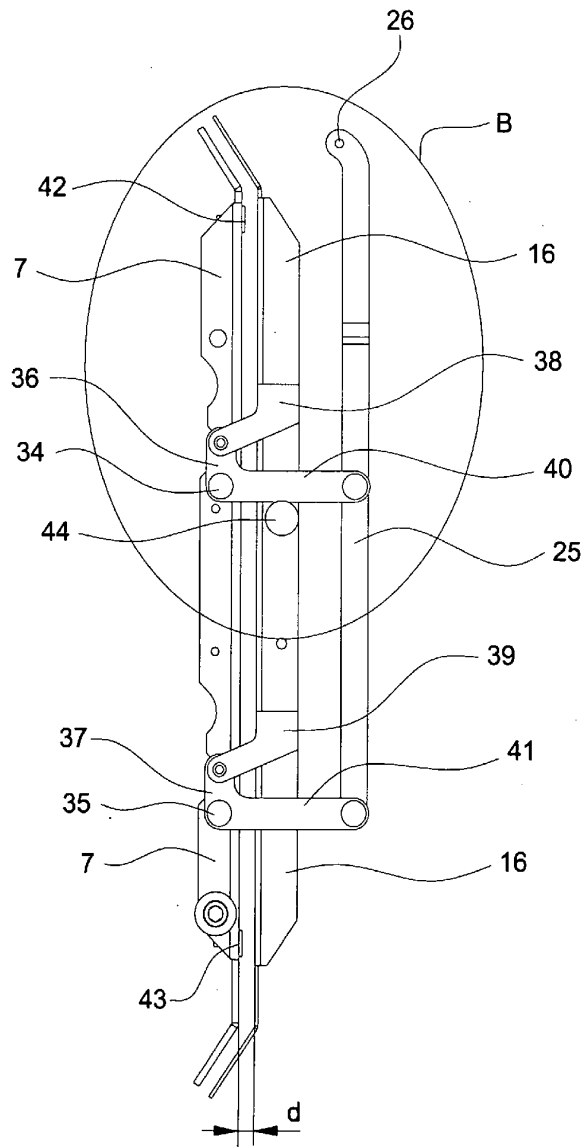


Fig. 11



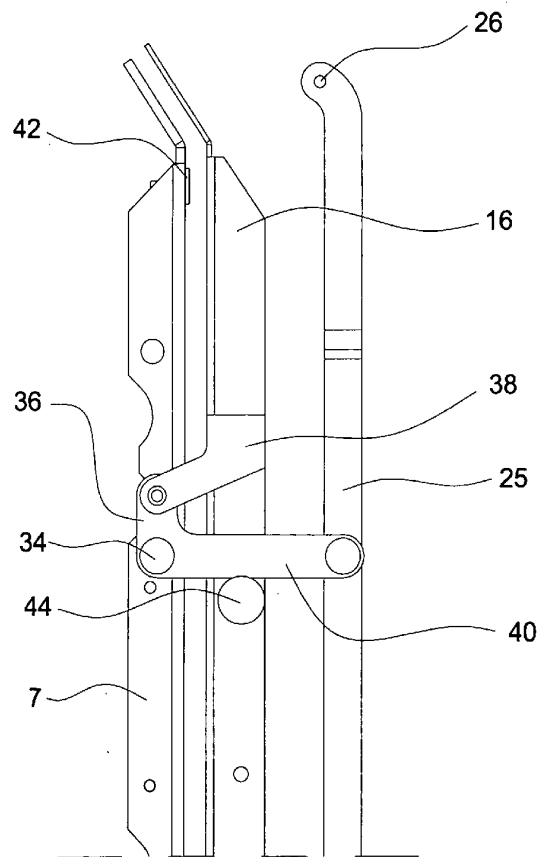
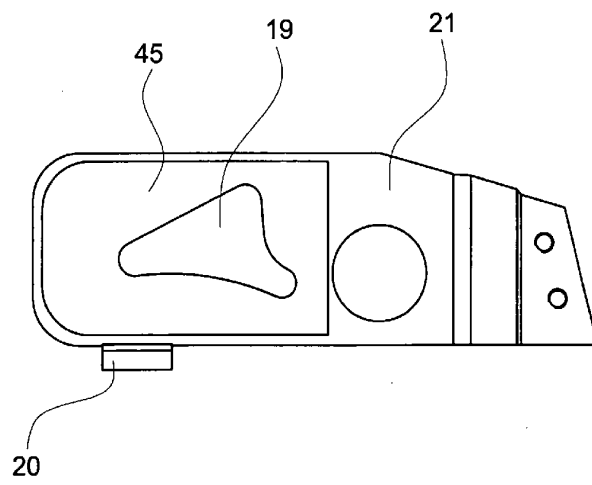


Fig. 13



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