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(54) **A device for standing seatings on each row of a telescoping seating system.**

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Description

This invention relates to a device for standing seatings on each floor row of a telescoping seating system adapted to be installed in a multiple-purpose hall and the like.

It has been conventionally known to employ a telescoping seating system in order to diversely utilize the floor space of a gymnasium or hall in conformity to the scale and purpose of a gathering.

Referring to a telescoping seating system shown in Figs. 9 and 10, a plurality of floor rows "b" provided on its upper surface with collapsible seatings "a", and on its bottom surface with wheels "h" are so arranged as to be formed into a step-like structure. To the lowest floor row "b′" is connected a distal end of a lower wire "c" the proximal end portion of which is in turn wound around a drum "d". Around the drum "d" is also wound the proximal end portion of an upper wire "e" whose free end is extended so as to be successively hooked around each pair of fixed pulleys "f" and "g" mounted respectively to the underside surface and the back surface of each of the floor rows "b", the distal end of the wire "e" being fixed to the lowest floor row "b′".

The seat portion, back portion and armrest portion of the seating "a" are collapsibly and pivotally mounted on a supporting rod, the lower end portion of which is rotatably mounted on the floor row "b".

When not in use, all of these portions of the seating "a" are collapsed, and at the same time the supporting rod "j" is forwardly fallen down thereby to make the seating "a" flat. Then, the lower wire "c" is wound around the drum "d" by rotating the drum "d" by means of an actuating means (not shown), thereby successively housing each floor row "b" below the next higher floor row "b" as shown in Fig. 10.

On the other hand, when the upper wire "e" is wound up, each one of the floor rows "b" is extended to form a stepped structure, and at the same time each of the seatings "a" is automatically set to stand up by means of a standing device.

In the prior art (e.g. US-A-4 557 080), it has been proposed a various kinds of such a standing device for standing seatings in a telescoping seating system wherein the seatings in a collapsed state are as explained above automatically turned into a standing posture in association with the forward movement of the floor row being extended. One of the examples of the prior standing device has a structure in which seatings and each floor row are connected by means of a link and a cam.

Another example of the prior standing device is constructed as such that an axis "i" of the supporting rod "j" pivotally supporting the seatings "a" is connected to the output axis of a motor so that the seatings can be stood up by rotating the motor in one direction, and the rotation of the motor in the other direction causes the seatings to lay down.

The former standing device however has defects in that it is rather complicated in structure, troublesome in assembling and adjustment, and expensive in manufacturing.

The latter standing device is also accompanied with problems in that since the motor is required to be mounted on each of the floor rows, it is necessary to wind up or pull out the wire cords each extending from the motors whenever the floor rows are to be extended or retracted, thus requiring a sophisticated mechanism for dealing with the wire cords. Moreover, the number of the motor has to be increased as the number of the seatings increases, thereby inevitably raising the cost.

According to this invention, there is provided a device for standing seatings mounted on each floor row of a telescoping seating system comprising a plurality of floor rows adapted to be disposed in a stepped relation, wherein when each one of the floor rows in extended forward in front of the next higher floor row, the seatings in said each one of the floor rows are set to take a standing position, and when said each one of the floor rows is retracted below the next higher floor row, the seating in said each one of the floor rows are collapsed and received within the next higher floor row, which is characterized in that said device comprises;

a frame having on its backward and forward portions a pair of horizontal shafts and secured to said each one of the floor rows;

a rotatable supporting rod provided on its free end with a projection adapted to be collided with a mounted portion of the seating as well as with a forward surface portion of the floor row, and on its lower end an engaging piece projecting therefrom, and pivotally mounted at the intermediate portion thereof on the shaft disposed in the forward portion of the frame;

a locking lever rotatably mounted at an intermediate portion thereof on the shaft disposed in the backward portion of the frame, having its upper end portion adapted to be slidingly contacted to at least the forward underside surface portion of the next higher floor row and having its lower portion adapted to be detachably engaged with said engaging piece of the rotatable supporting rod thereby to prevent the rotatable supporting rod from rotating to fall forward;

an elastic member mounted to the frame in such a manner as to energize said locking lever to engage with said rotatable supporting rod; and

a means for connecting said rotatable supporting rod to said floor row.

The invention will be explained in more detail with reference to the following preferred embodiments shown in the accompanying drawings.

Fig. 1 is a fragmentary and partially sectioned side view of one embodiment of a telescoping seating system according to this invention, showing a standing posture of seatings;

Fig. 2 is a fragmentary and partially sectioned side view of the telescoping seating system shown in Fig. 1, showing a collapsed state of the seatings;

Fig. 3 is a perspective view of a seat-standing device, part of which being sectioned;

Fig. 4 is a fragmentary and partially sectioned side view of a telescoping seating system according to a second embodiment of this invention;

Fig. 5 is a fragmentary and partially sectioned side view of a telescoping seating system according to a third embodiment of this invention showing a standing posture of seatings;

Fig. 6 is an enlarged fragmentary and partially sectioned side view of a telescoping seating system of Fig. 5, showing a collapsed state of the seatings;

Fig. 7 is an enlarged plan view of a seat-standing device as it is seen from line X-X of Fig. 6;

Fig. 8 is an enlarged fragmentary and partially sectioned side view of the third embodiment shown in Fig. 5, showing a tilted state of the seating while it is being moved;

Fig. 9 is a schematical side view of the conventional telescoping seating system illustrating the telescoping mechanism; and

Fig. 10 is a schematical side view of the conventional telescoping seating system showing a retracted state thereof.

Referring to Figs. 1 to 3, reference numerals 1, 2 and 3 respectively indicate a floor row which is kept flat and provided on the underside surface thereof with wheels to run on a floor (not shown). These floor rows 1, 2 and 3 are so arranged with each other that the more forward a floor row is to be disposed, the lower the floor row becomes thereby forming a step-like structure. Although it is not indicated in the drawings, any desired number of floor rows are generally disposed in the same manner as mentioned above over the floor row 1 as well as below the floor row 3 to complete a telescoping seating system.

Each of these floor rows 1, 2 and 3 can be received below the next higher floor row, or extended to be disposed in a stepped relation by means of a wire having the proximal end thereof wound around a rotatable drum and the distal end thereof fixed to the foremost floor row, i.e. by winding the wire around the drum which is rotatable in both direction, or by unwinding the wire from the drum.

Since the telescoping mechanism of these floor row of the telescoping seating system is already explain above with reference to Figs. 9 and 10, a further explanation thereabout is omitted hereinafter.

On the both sides of each back portion of the floor rows 2 and 3 are respectively attached with a seat-standing device 4 of this invention.

A frame 5 having a bottom plate 5a and side walls 5b fixed to both sides of the bottom plate 5a, thereby forming a U-shaped cross section is mounted on the rear portion of the surface of each floor row 1, 2 and 3. Between there side walls 5b is mounted an axis 6 piercing therethrough. A frame 5c having a U-shaped cross section is mounted on the bottom plate 5a of the frame 5 and provided with an axis 7 crossing the both side walls of the frame 5c.

A rotatable supporting rod 8 having a U-shaped cross section and an L-shaped side wall in rotatably mounted at its corner portion (or proximal end portion) 8a on the axis 6. One free end portion of the supporting rod 8 is tapered to constitute an engaging piece 8b.

On the upper end portion of the rotatable supporting rod 8 is attached with a mounting metal member 9 having an L-shaped side surface, constituting a seat-securing means. A horizontal rod 11 extending in a direction in traverse to the device is attached to the mounting metal member 9.

To this horizontal rod 11 are fixed each lower end of a plurality (three or more) of supporting rods 12 kept apart equidistantly from each other. The seating 10 comprising a seat portion 13, a back portion 14 and an armrest portion 15 which are constantly energized by means of a spring and the like to take a collapsed state is disposed between a pair of adjacent supporting rods 12. A pair of twisted coil springs 16 and 17 are respectively inserted over the each portion of the axis 6 extending from both sides of the rotatable supporting rod 8 in order to energize the rotatable supporting rod 8. In this case, tip portions 16a and 17a of each of the coil springs 16 and 17 are fixed to the proximal end portion of the engaging piece 8b of the rotatable supporting rod 8, and the other tip portions 16b and 17b thereof are fixed respectively to the side walls 5b of the frame 5.

In this manner, the rotatable supporting rod 8, namely the seating 10, is constantly energized to take a standing posture so that when the seating 10 is being forwardly fallen down, there is little possibility that the seating 10 suddenly falls down due to its own weight. On the contrary, the seating 10 will gradually fall down while resisting against the aforementioned energized force, thereby alleviating the shock of the falling-down.

Behind the mounting metal member 9 is disposed a bracket 18 which is adapted to more backward and face toward the front surface of the next higher floor row when the seating 10 stands up. On this distal end portion of the bracket 18 is rotatably mounted a projection such as a roller 20 through a shaft 19 attached to and pierced in a transverse direction through the distal end portion of the bracket 18.

When the seating 10 is kept in a standing state, a locking mechanism is actuated to prevent the rotatable supporting rod from falling forward. This locking mechanism will be explained below.

Reference numeral 21 indicates a locking lever having an open forward surface having a U-shaped section. A middle portion of the locking lever 21 is rotatably mounted on the axis 7. On the upper portion of the locking lever 21 is provided with a sliding member, namely a roller 23 rotatably mounted on a shaft 22 fixed to and piercing through the forward portion of the locking lever 21.

To a middle portion between the roller 23 and the shaft 22 is attached one end 24a of a pulling coil spring 24, the other end 24a of which is secured to a rod 25 provided between a pair of side walls 5b. Accordingly, when the seating 10 is in a standing state, the engaging piece 8b of the rotatable supporting rod 8 is engaged with the engaging portion 21a located at the lower end of the locking lever 21 as shown in Fig. 1 so as to prevent the seating 10 from falling forward.

When the floor row 2 is to be retracted below the floor row 1, the forward surface 1a of the floor row 1 is collided with the roller 23, and the locking lever 21 is rotated in the counter clockwise in resistance to the energized force of the coil spring 24, so that the engagement between the locking lever 21 and the engaging piece 8b is released.

Next, the mechanism for standing the seating 10 will be explained.

A bracket 26 having a triangular side surface is attached onto the back surface of the free end portion of the rotatable supporting rod 8. To this bracket 26 is mounted a shaft 28 on which a forward end portion of an engaging arm 27 having a forwardly facing hook 27a on the rear end thereof is rotatably mounted.

A stopper 29 having a reversed L-shaped side surface is secured at its lower end to the rotatable supporting rod 8, while the upper end surface of the stopper 29 supports the engaging arm 27 to keep it at a prescribed height.

Below the forward end surfaces 1a, 2a and 3a of the floor rows 1, 2 and 3 are disposed projections 1b, 2b and 3b which are adapted to engage respectively with the hook 27a. The combination of these projections 1b, 2b and 3b, and the hooks 27a constitutes an engaging means to cause the engagement of the floor rows with the rotatable supporting rod.

A horizontal pin 30 is projected from the side surface of the middle portion of the rotatable supporting rod 8, and is adapted to prevent the rotatable supporting rod 8 from falling backward by colliding with stoppers 32 provided on the brackets 31 projecting inwardly from the side walls 5b of the frame 5.

Retracting operation of the seatings 10 standing in use as shown in Fig. 1 to cause the seating 10 to collapse and house them below the next higher row will be explained.

When the floor row 2 is getting retracted, the engagement between the hook 27a and the projection 1b is released, and then the forward end surface 1a of the floor row 1 is collided with the roller 23, and causes the locking lever 21 to fall forward while resisting to the energized force of the pulling spring 24. Due to these movement, the engagement between the engaging piece 8b and the locking lever 21 is released.

Since the forward end surface 1a of the floor row 1 is collided with the roller 20, the rotatable supporting rod 8 is caused to gradually fall forward while resisting the energized force of the twisted coil spring 17.

The roller 20 is forced to slide into the underside surface 1c from the forward end surface 1a of the floor row 1 to be pressed under the underside surface 1c, thereby causing the seating 10 to keep the collapsed horizontal state and to be vertically aligned below the highest floor row as shown in Fig. 2.

The seatings 10 on the floor row 3 are also collapsed and housed in the same manner as discussed above.

When the seatings 10 are to be extended from the collapsed state as shown in Fig. 2 to a step-like structure, each of the floor rows 1, 2 and 3 is pulled out to cause the roller 20 to be released from being pressed under the next floor row, thereby causing the seatings 10 to become free and stand up to some extent.

Then, after the roller 23 is set free, the locking lever 21 is caused to rotate clockwise as shown in Fig. 2 due to the restoring force of the pulling coil spring 24 thereby to become ready to locking.

At the end of the extending operation of the floor rows, hooks 27a are caused to engage with the projections 1b and 2b of the floor rows, thereby causing the rotatable supporting rods 8, namely the seatings 10 to stand up, and at the same time the horizontal pins 30 are disposed to be contacted to the stoppers 32 thereby to prevent the seatings 10 from tilting backward, and finishing the stand-up operation of the seatings 10.

In this case, the engaging piece 8b of the rotatable supporting rod 8 is caused to engage with the lower end portion of the locking lever 21 after the lower end portion of the locking lever 21 is slightly rotated backward. Therefore, the seatings are kept locked in the standing posture as shown in Fig. 1.

When the seatings 10 are in use, seat portion 13 and back portion 14 are set in position, the armrest 15 is also set to become horizontal, making the seatings 10 ready for use.

Fig. 4 shows a second embodiment of this invention wherein the hook 27a of the engaging arm 27 employer in the first embodiment as an engaging means to stand up the seating 10 is replaced by a wire 33. The same member or part as indicated in the first embodiment will be indicated by the same reference numerals thereby omitting the explanations thereof.

A roller 35 is rotatably mounted on a vertical shaft 34 suspended from the lower surface of a top plate 1d disposed near the front end portion of the floor row. Around this roller 35 is wound a proximal end portion 33a of the wire 33 employed as an engaging means. The free end portion of the wire 33 is fixed to the bracket 18 provided at the upper end portion of the rotatable supporting rod 8.

Accordingly, when the floor row 2 is extended in relative to the floor row 1, the seatings are caused to stand up by means of the wire 33.

This second embodiment is more simple in structure as compared with the first embodiment, and therefore advantageous in lowering the manufacturing cost thereof.

In the first embodiment, as an engaging means the engaging arm having a hook is mounted on a portion of the rotatable supporting rod located within the frame. However, the engaging arm may be mounted outside the frame.

Next, a third embodiment of this invention will be explained with reference to Figs. 5 to 8.

In the seat-standing devices set forth in the first and the second embodiments, the upper end portion of the locking lever locking the rotatable supporting rod in the standing state to support the seating is adapted to slide from the forward end surface of the next higher floor row down to the underside surface of the next higher floor row. Specifically, the roller provided at the upper end portion of the locking lever is adapted to run along the underside surface of the next higher floor row. Therefore, the underside surface of the next higher floor row which is contacted with the roller is required to be smooth and flat in the running direction of the roller.

Meanwhile, according to the third embodiment of this invention, a seat-standing device is provided, wherein the locking lever can be mounted at any place without adjusting it to the position of the frame of the next higher floor row, or to the position of a reinforcing rod.

With this embodiment, when a floor row is to be retracted, the roller provided at the upper end portion of the locking lever is adapted to run into a groove formed inside the next higher floor row after being collided with the forward end portion of the underside surface of the next higher floor row. Moreover, a stopper lever is provided below the locking lever so that when the lower end portion of the locking lever is contacted with the upper end portion of the stopper lever, any further rotation of the locking lever can be prevented.

Reference letters "A", "B" and "C" shown in these Figs. 5--8 respectively indicate a floor row which is kept flat and provided on the underside surface thereof with wheels to run on a floor (not shown). These floor row A, B and C are so arranged with each other that the more forward a floor row is to be disposed, the lower the floor row becomes thereby forming a step-like structure. Although it is not indicated in the drawings, any desired number of floor rows are generally disposed in the same manner as mentioned above over the floor row A as well as below the floor row C to complete a telescoping seating system.

Each of the floor rows A, B and C comprises a frame 51 formed into a rectangular shape, a plurality of reinforcing rods 52 arranged within the frame 51, extending back and forth and suitably spaced apart from each other, and a floor board 53 placed all over the reinforcing rods 52.

Each of these floor rows A, B and C can be received below the next higher floor row, or extended to be disposed in a stepped relation by means of a wire having the proximal end thereof wound around a rotatable drum and the distal end thereof fixed to the foremost floor row, i.e. by winding the wire around the drum which is rotatable in both direction, or by unwinding the wire from the drum.

Since the telescoping mechanism of these floor row of the telescoping seating system is already explained above with reference to Figs. 9 and 10, a further explanation thereabout is omitted hereinafter.

On the both sides of each back portion of the floor row B and C are respectively attached with a seat-standing device 54 of this invention.

A frame 55 having a bottom plate 55a and side walls 55b fixed to both sides of the bottom plate 55a, thereby forming a U-shaped cross section is mounted on the rear portion of the surface of each floor row A, B and C. Between these side walls 55b is mounted an axis 56 piercing therethrough. A bracket 55c having a U-shaped cross section is mounted on the bottom plate 55a of the frame 55

and provided with an axis 57 crossing the both side walls of the frame 55c.

A rotatable supporting rod 58 formed of a grooved member is rotatably mounted at its lower end portion on the axis 56. On the lower end portion of the rotatable supporting rod 58 is attached with an engaging piece 58a having a tapered free end projecting from the supporting rod 58.

On the upper end portion of the rotatable supporting rod 58 is attached with a mounting metal member 59 having an L-shaped side surface, constituting a seat-securing means. A horizontal rod 61 extending in a direction in traverse to the device is attached to the mounting metal member 59.

To this horizontal rod 61 are fixed each lower end of a plurality (three or more) of supporting rods 62 kept apart equidistantly from each other. The seating 60 comprising a seat portion 63, a back portion 64 and an armrest 65 which are constantly energized by means of a spring and the like to take a collapsed state is disposed between a pair of adjacent supporting rods 62.

A pair of twisted coil springs 66 are respectively inserted over the each portion of the axis 56 extending from both sides of the rotatable supporting rod 58 to energize the rotatable supporting rod 58. In this case, inner tip portions 66a of each of the coil springs 66 are respectively fixed to a horizontal pin 67 passing through the middle portion of the rotatable supporting rod 68, and outer tip portions 66b thereof are respectively fixed to the lower end portions of brackets 68 inwardly projecting from the both side walls 55b of the frame 55.

In this manner, the rotatable supporting rod 58 as well as the seating 60 is constantly energized to take a standing posture so that when the seating 60 is being forwardly fallen down, there is little possibility that the seating 60 suddenly falls down due to its own weight. On the contrary, the seating 60 will gradually fall down resisting against the aforementioned energized force of the coil spring 66, thereby alleviating the shock of the falling-down.

A stopper 69 extending in an upper forward direction is mounted on each of the brackets 68, so that when the rotatable supporting rod 58 is completely set to stand, each end of the pins 67 is contacted with the tip end portion of this stopper 69, thereby stopping the movement of the rotatable supporting rod 58.

Reference numeral 70 indicates a bracket which is fixed through the mounting metal member 59 as indicated above to the back surface near the both ends of the horizontal rod 61, and if required to the back surface of the middle portion of the rod 61. On this bracket 70 is fixed a shaft 71 on which a roller 72 is rotatably mounted.

When the lower floor row C or B is retracted from the extended state as shown in Fig. 5 to be received within the next higher floor row B or A, the roller 72 collides first with the forward end surface "a" of the next higher floor row B or A, and then runs along the underside surface "b" of the forward frame 51 and the underside surface "c" of the reinforced rod 52 (or underside surface of the side frame 51), thereby causing the rotatable supporting rod 58 to fall forward (See Figs. 6 and 8).

Accordingly, the roller 72 as well as the bracket 70 is required to be attached to the horizontal rod 61 in such a manner that they are aligned to be disposed at the right and left sides of the reinforced rod 72 of the next higher floor row B or A. In order to make the positionings of the roller 72 and bracket 70 easier, the mounting metal member 59 for them is separated from the mounting metal member 59 of the rotatable supporting rod 58.

When the seating 60 is kept in a standing state, a locking mechanism is actuated to prevent the rotatable supporting rod 58 from falling forward. This locking mechanism will be explained below.

Reference numeral 73 indicates a locking lever having an open front surface having a U-shaped section. A middle portion of the locking lever 73 is rotatably mounted on the axis 57. On the upper portion of the locking lever 73 is provided a roller 74 rotatably mounted on a shaft 75 fixed to and piercing through the tip portion of the locking lever 73.

The locking lever 73 is rotatably mounted so that it is possible for the locking lever 73 to take a locked position in which the locking lever 73 is engaged with the tip end portion of the engaging member 58a provided in integral with the rotatable supporting rod 58 so as to prevent the rotatable supporting rod 58 from falling down as shown in Fig. 5, or to take an unlocked position in which the lower end portion of the locking lever 73 is removed backward from the rotating locus of the tip portion of the engaging member 58a as shown in Figs. 6 and 8. The locking lever 73 is also mounted in such a manner that it is constantly energized by a spring 76 to move toward the locked position or clockwise in Fig. 5.

When each of the floor rows B or C is being retracted, the locking lever 73 is caused to fall forward to move into the unlocked position while the roller 74 mounted on the upper portion of the lever 73 is collided with the forward end surface "a" of the next higher floor row A or B, and moves therefrom into the underside "b" of the forward frame 51.

The lower end surface of the locking lever 73 is formed of a curved cam surface such that the radius of the curvature as measured from the rotat-

ing center thereof, i.e. the axis 57 increases as a distance from the cam surface to the engaging member 58a is getting larger, so that the more the locking lever 73 rotates in clockwise from the locked state, the more deeply the cam surface 73a is caused to engage with the engaging member 8a thereby preventing the rotatable supporting rod 58 and the seating 60 from shaking once they are set in the standing position.

Below the locking lever 73 is provided a stopper lever 77, the forward end of which is rotatably mounted on a shaft 78 attached to the bracket 55c. The stopper lever 77 is so constructed that it can take either an engaging position in which the rear end portion thereof is contacted with the lower end portion of the locking lever 73 thereby to keep the locking lever 73 in the unlocked position and to prevent the locking lever 73 from rotating toward the locked position thereof, or an engagement-releasing position in which the rear end portion thereof is removed downward from the rotating locus of the lower end portion of the locking lever 73 as shown in Figs. 6 to 8. The stopper lever 77 is also mounted in such a manner that it is constantly energized by a twisted coil spring 79 to move toward the engaging position or counter-clockwise as shown in Fig. 5.

The stopper lever 77 is so arranged that immediately before the rotatable supporting rod 58 is completely set to its standing position it is pressed downward by the tip portion of the engaging member 58a, thereby caused to move into the engagement-releasing position.

Reference numeral 80 indicates a standing means for standing the rotatable supporting rod 58. This standing means is actuated in association with the forward movement of the lower floor rows B and C in relative to the next higher floor row A and B. A couple of joint arms 82 and 83 are mounted via a shaft 81 on the middle portion of the standing means.

The forward end portion of the forward joint arm 82 is rotatably mounted on the pin 67 attached to the rotatable supporting rod 58. The middle portion of the joint arm 82 collides with a pin 84 projecting from a side surface of the rotatable supporting rod 58 while the latter is being fallen down, and thereafter the joint arm 82 itself is rotated together with the rotatable supporting rod 58 while keeping s suitable angle in relative to the rotatable supporting rod 58.

A plate-shaped hook 85 projecting in an upward and forward direction is attached to the rear end portion of the rearward joint arm 83, and adapted to be engaged with an L-shaped engaging piece 86 attached to the lower surface of the next upper floor rows A and B and projecting in a downward and rearward direction as the floor rows B and C are advanced in relative to the next upper floor rows A and B, thereby to pull the both joint arms 82 and 83 rearward and to stand the rotatable supporting rod 58.

Reference numeral 87 indicates a receiving roller which is rotatably mounted on a shaft 89 attached to a U-shaped bracket 88. The bracket 88 is mounted on the upper portion of the rear end of the frame 55. The roller 87 is adapted to receive the rear portion of joint arm 83, allowing a back and forth movement of the joint arm 83.

The operation of the device of this embodiment will be illustrated below.

When each of the floor rows A, B and C is extended as shown in Fig. 5, the rotatable supporting rod 58 and the seating 60 are kept upright, the pin 67 is contacted with the stopper 69, the forward end portion of engaging member 58a is contacted with the cam surface 73a formed at the lower end of the locking lever 73, thereby preventing the rotatable supporting rod 50 from falling downward, and the stopper lever 77 is pressed down to its engagement-releasing position by the forward end portion of the engaging member 58a.

When the floor row B is gradually retracted below the floor row A from the extended state shown in Fig. 5, the engagement between the hook 85 and engaging piece 86 is first released, the hook 85 is retracted together with the floor row B, and then the roller 74 is collided with the forward end surface "a" of the floor row A and continues to move therefrom to the underside surface "b", of the forward frame 51, during which the locking, lever 73 is caused to tilt down to the lock-releasing position while resisting the energized force of the spring 76.

Then, the roller 72 is collided with the forward end surface "a" of the floor row A, and continues to move below the underside surface "b" of the forward frame 51 as well as below the underside surface of the reinforced rod 52, during which the rotatable supporting rod 59 and the seating 60 are caused to fall forward while resisting the energized force of the twisted coil spring 66. At this moment, the locking lever 73 is kept in the lock-releasing position, and therefore the falling movement of the rotatable supporting rod 58 would never be inhibited by the locking lever 73.

When the rotatable supporting rod 58 is slightly tilted forward from its upright position as shown in Fig. 8, the stopper lever 77 which is up to this moment kept in the engagement-releasing position by the engaging member 58a is caused to rotate to return to the engagement position due to the energized force of the twisted coil spring 79.

Subsequently, the roller 74 is passed through the underside surface "a" of the forward frame 51 of the floor row A. When the roller 74 approaches a

lower space formed between the frame 51 and the reinforcing rod 52, the locking lever 73 is caused to slightly rotate clockwise in Fig. 8, but since the lower portion of the locking lever 73 is collided with the rear end portion of the stopper lever 77 disposed in the engagement position, any further rotation toward the locking position is surely inhibited and the locking lever 73 is thereafter kept in this lock-releasing position.

When the floor row B is retracted from this state up to a position directly below the floor row A as shown in Fig. 6, the seating 60 on the floor row B is kept in a collapsed state and received within the space between the floor row B and floor row A.

The retracting movement of the floor row C toward a position below the floor row B is the same as explained above, and the seating 60 on the floor row C is kept in a collapsed state and received within the space between the floor row C and floor row B.

When the floor row C is advanced from the state shown in Fig. 6, the hook 85 is first engaged with the engaging piece 86 provided on the underside surface of the next higher floor row B, thereby correspondingly pulling backward the joint arms 83 and 82, and to cause the rotatable supporting rod 58 and the seating 60 to gradually stand up.

During this movement, the roller 74 runs along the underside surface "b" of the forward frame 51 of the next floor row B, and then passes through the forward end of the floor row B. At this moment however, the stopper lever 77 is kept in the engagement position thereof so that even if the roller 74 is passed through the forward end of the floor row B, the locking lever 73 would be kept in its lock-releasing position.

Immediately before the rotatable supporting rod 58 is completely set to stand, the forward end portion of the engaging member 58a is collided with the stopper lever 77, and the stopper lever 77 is forced to be lowered down to the engagement-releasing position by the engaging member 58a.

Then, the locking lever 73 is caused to rotate by the energized force of the spring 76 to turn back toward the locking position, and at the same time the rotatable supporting rod 58 is caused to completely set up. On the other hand, when the pin 67 is collided with the stopper 69, and stopped moving, the cam surface 73a formed on the lower end of the locking lever 73 is engaged with the forward end portion of the engaging member 58a, thereby preventing the rotatable supporting rod 58 from falling down.

Additionally, if the rotatable supporting rod 58 is forced to tilt backward in an increasing degree, the increase in the tilting angle invites in turn an increased degree of engagement between the cam surface 73a of the locking lever 73 and the engaging member 58a. Therefore, due to this engagement as well as an engagement between the pin 67 and stopper 69, the back and forth movement of the rotatable supporting rod 59 can be effectively inhibited.

When the floor row B is to be advanced in relative to the floor row A, the seating 60 on the floor row B can be set up as shown in Fig. 5 and in the same manner as explained above.

According to this embodiment, it is no more required to determine the setting position of the locking lever in relative to the setting positions of the frame of the floor row and of the reinforced rod member, and the locking lever can be secured at any desired place. Therefore, it has become easy to layout and manufacture the whole structure of the telescoping seating system.

Claims

1. A device for standing seatings (10) mounted on each floor row of a telescoping seating system comprising a plurality of floor rows (1,2,3) adapted to be disposed in a stepped relation, wherein when each one of the floor rows is extended forward in front of the next higher floor row, the seatings (10) in said each one of the floor rows are set to take a standing position, and when said each one of the floor rows is retracted below the next higher floor row, the seating (10) in said each one of the floor rows is collapsed and received within the next higher floor row, which is characterized in that said device comprises;

a frame (5) having on its backward and forward portions a pair of horizontal shafts (6,7) and secured to said each one of the floor rows;

a rotatable supporting rod (8) provided on its free end (8a) with a projection adapted to be collided with a mounted portion of the seating (10) as well as with a forward surface portion of the floor row, and on its lower end an engaging piece (8b) projecting therefrom, and pivotally mounted at the intermediate portion thereof on the shaft (6) disposed in the forward portion of the frame (5);

a locking lever (21) rotatably mounted at an intermediate portion thereof on the shaft (7) disposed in the backward portion of the frame, having its upper end portion (23) adapted to be slidingly contacted with at least the forward underside surface portion of the next higher floor row and having its lower portion (21a) adapted to be detachably engaged with said engaging piece (8b) of the rotatable supporting rod (8) thereby to prevent the rotatable supporting rod (8) from rotating to fall forward;

an elastic member (24) mounted to the

frame (5) in such a manner as to energize said locking lever (21) to engage with said rotatable supporting rod (8); and

a means for connecting said rotatable supporting rod (8) to said floor row (1,2,3).

2. The device according to claim 1, characterized in that said locking lever (21) further comprises on its upper portion a roller (23) which is adapted to be slidingly run on the underside surface of the next higher floor row.

3. The device according to claim 2, characterized in that said means for connecting said rotatable supporting rod (8) to said floor row (1,2,3) is a hook (27a) having its proximal end portion pivotally mounted to said rotatable supporting rod (8), and the free end portion thereof being engaged with said floor row (1,2,3).

4. The device according to claim 4, characterized in that said means for connecting said rotatable supporting rod (8) to said floor row (1,2,3) in a wire (33) having one end portion thereof being fixed to said floor row, and the other end portion thereof being fixed to said rotatable supporting rod (8).

5. The device according to claim 1, characterized in that said locking lever (21) further comprises on its upper portion a roller (23) which is adapted to run through a space below said next higher floor row after being contacted with the forward underside surface portion of said next higher floor row, and that a holding lever is disposed below said locking lever (21) such that when said locking lever (21) is set free from its locking position, the holding lever is collided with a lower portion of said locking lever (21) thereby to prevent said locking lever from moving toward said locking position.

6. The device according to claim 5, characterized in that the lower end surface of said locking lever (21) is formed into a curved cam surface (73a) such that the radius of curvature thereof as measured from the rotating center of the locking lever (21) gradually increases as a distance from said cam surface (73a) to said holding lever is getting larger.

7. The device according to claim 5, characterized in that said means for connecting said rotatable supporting rod (8) to said floor row (1,2,3) is a hook (27a) having its proximal end portion pivotally connected to said rotatable supporting rod (8), and the free end portion thereof being engaged with said floor row.

Patentansprüche

1. Vorrichtung zum Aufrichten von Sitzen (10) in jeder Reihe eines ausziehbaren Sitzsystems mit Reihen (1, 2, 3) in mehreren Etagen, die in einer Stufenanordnung angeordnet werden können, wobei dann, wenn eine Reihe in einer Etage vor die jeweils nächst höhere Reihe nach vorne gezogen wird, die Sitze (10) in der Reihe eine aufgerichtete Position einnehmen und dann, wenn eine Reihe unter die Reihe der nächst höheren Etage gezogen wird, die Sitze (10) in der Reihe zusammengefaltet und in der Etage der nächst höheren Reihe aufgenommen werden, gekennzeichnet durch
einen Rahmen (5), der ein Paar horizontaler Wellen (6, 7) in seinem hinteren und vorderen Bereich aufweist und jeweils mit einer der Reihen in einer Etage befestigt ist;
einen schwenkbaren Stützarm (8), der an seinem freien Ende (8a) mit einem Fortsatz, der sowohl mit einem Befestigungsabschnitt des Sitzes (10) als auch mit einem vorderen Bereich der Oberseite der Reihe in Kontakt ist, und an seinem unteren Ende mit einem wegragenden Eingriffsstück (8b) versehen ist, und der zwischen seinen Enden auf der Welle (6) im vorderen Bereich des Rahmens (5) schwenkbar befestigt ist;
einen Riegelarm (21), der in seinem mittleren Bereich schwenkbar mit der Welle (7) in dem hinteren Bereich des Rahmens verbunden ist, dessen oberer Endabschnitt (23) auf der Unterseite zumindest des vorderen Bereichs der nächst höheren Reihe gleiten kann und dessen unterer Abschnitt (21a) mit dem Eingriffsstück (8b) des schwenkbaren Stützarmes (8) lösbar in Eingriff gebracht werden kann, um den schwenkbaren Stützarm (8) daran zu hindern, nach vorne zu fallen;
ein elastisches Glied (24), das mit dem Rahmen (5) derart befestigt ist, daß der Riegelarm (21) in Eingriff mit dem schwenkbaren Stützarm (8) gebracht werden kann; und
eine Einrichtung zum Verbinden des schwenkbaren Stützarmes (8) mit der Reihe (1, 2, 3) der Etage.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Riegelarm (21) ferner in seinem oberen Bereich eine Rolle (23) trägt, die gleitend auf der Unterseite der Reihe der nächst höheren Reihe laufen kann.

3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Einrichtung zum Verbinden des schwenkbaren Stützarmes mit der Reihe (1, 2, 3) ein Haken (27a) ist, dessen proximaler

Endabschnitt schwenkbar mit dem schwenkbaren Stützarm (8) befestigt ist und dessen freier Endabschnitt in die Reihe (1, 2, 3) eingreift.

4. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß die Einrichtung zum Verbinden des schwenkbaren Stützarmes (8) mit der Reihe (1, 2, 3) ein Draht (33) ist, dessen eines Ende mit der Reihe und dessen anderes Ende mit dem schwenkbaren Stützarm (8) befestigt ist.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Riegelarm (21) an seinem oberen Abschnitt eine Rolle (23) aufweist, die durch einen Raum unterhalb der nächst höheren Reihe laufen kann, nachdem sie in Kontakt mit der Unterseite des vorderen Bereiches dieser nächst höheren Reihe gekommen ist, und daß ein Haltearm unterhalb dieses Riegelarmes vorgesehen ist, derart, daß dann, wenn der Riegelarm (21) aus seiner Riegelposition freigegeben ist, der Haltearm an einem unteren Abschnitt des Riegelarmes (21) anliegt, um dadurch dieses Riegelarm daran zu hindern, sich in Richtung auf die Riegelposition zu bewegen.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Oberfläche des unteren Endes des Riegelarmes (21) als gekrümmte Nokkenoberfläche (73a) ausgebildet ist, derart, daß der Kurvenradius gemessen von dem Drehmittelpunkt des Riegelarmes (21) graduell ansteigt, wenn die Entfernung von dieser Nokkenoberfläche (73a) zu dem Riegelarm größer wird.

7. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Einrichtung zum Verbinden des schwenkbaren Stützarmes (8) mit der Reihe (1, 2, 3) ein Haken (27a) ist, dessen proximaler Endabschnitt schwenkbar mit dem schwenkbaren Stützarm (8) verbunden ist und dessen freier Endabschnitt mit der Reihe in Eingriff steht.

Revendications

1. Dispositif pour dresser des sièges (10) montés sur chaque niveau de plancher d'un système de sièges télescopiques comprenant une pluralité de niveaux de plancher (1, 2, 3) adaptés à être disposés selon une relation étagée, dans lequel, quand chacun des niveaux de plancher est poussé devant le niveau de plancher immédiatement supérieur, les sièges (10) de chaque niveau de plancher sont placés pour prendre une position dressée, et quand chacun des niveaux de plancher est rétracté sous le niveau de plancher immédiatement supérieur, le siège (10) de chacun des niveaux de plancher est replié et reçu dans le niveau de plancher immédiatement supérieur, ce dispositif étant caractérisé en ce qu'il comprend :

un châssis (5) muni sur ses parties arrière et avant d'une paire d'axes horizontaux (6, 7) fixés à chacun des niveaux de plancher ;

une tige support pivotante (8) munie à son extrémité libre (8a) d'une partie en saillie propre à être mise en contact avec une partie montée du siège (10) ainsi qu'avec une partie de surface avant du niveau de plancher, et sur son extrémité inférieure d'une pièce de contact (8b) qui en fait saillie, et montée à pivotement au niveau de sa partie intermédiaire sur l'axe (6) disposé dans la partie avant du châssis (5) ;

un levier de verrouillage (21) monté à pivotement au niveau de l'une de ses parties intermédiaires sur l'axe (7) disposé à la partie arrière du châssis, ayant sa partie extrême supérieure (23) adaptée à être en contact glissant avec au moins la partie superficielle inférieure avant du niveau de plancher immédiatement supérieur, et ayant sa partie inférieure (21a) adaptée à être engagée de façon séparable avec la pièce de contact (8b) de la tige support pivotante (8) pour empêcher ainsi la tige support pivotante (8) de tourner jusqu'à tomber vers l'avant ;

un élément élastique (24) monté sur le châssis (5) de façon à solliciter le levier de verrouillage (21) en engagement avec la tige support pivotante (8) ; et

un moyen pour relier la tige support pivotante (8) audit niveau de plancher (1, 2, 3).

2. Dispositif selon la revendication 1, caractérisé en ce que le levier de verrouillage (21) comprend en outre sur sa partie supérieure un rouleau (23) adapté à se déplacer par glissement sur la surface inférieure du niveau de plancher immédiatement supérieur.

3. Dispositif selon la revendication 2, caractérisé en ce que le moyen pour relier la tige support pivotante (8) audit niveau de plancher (1, 2, 3) est un crochet (27a) ayant sa partie d'extrémité proximale montée à pivotement sur la tige support pivotante (8) et sa partie d'extrémité libre en engagement avec ledit niveau de plancher (1, 2, 3).

4. Dispositif selon la revendication 4, caractérisé en ce que le moyen pour relier la tige support

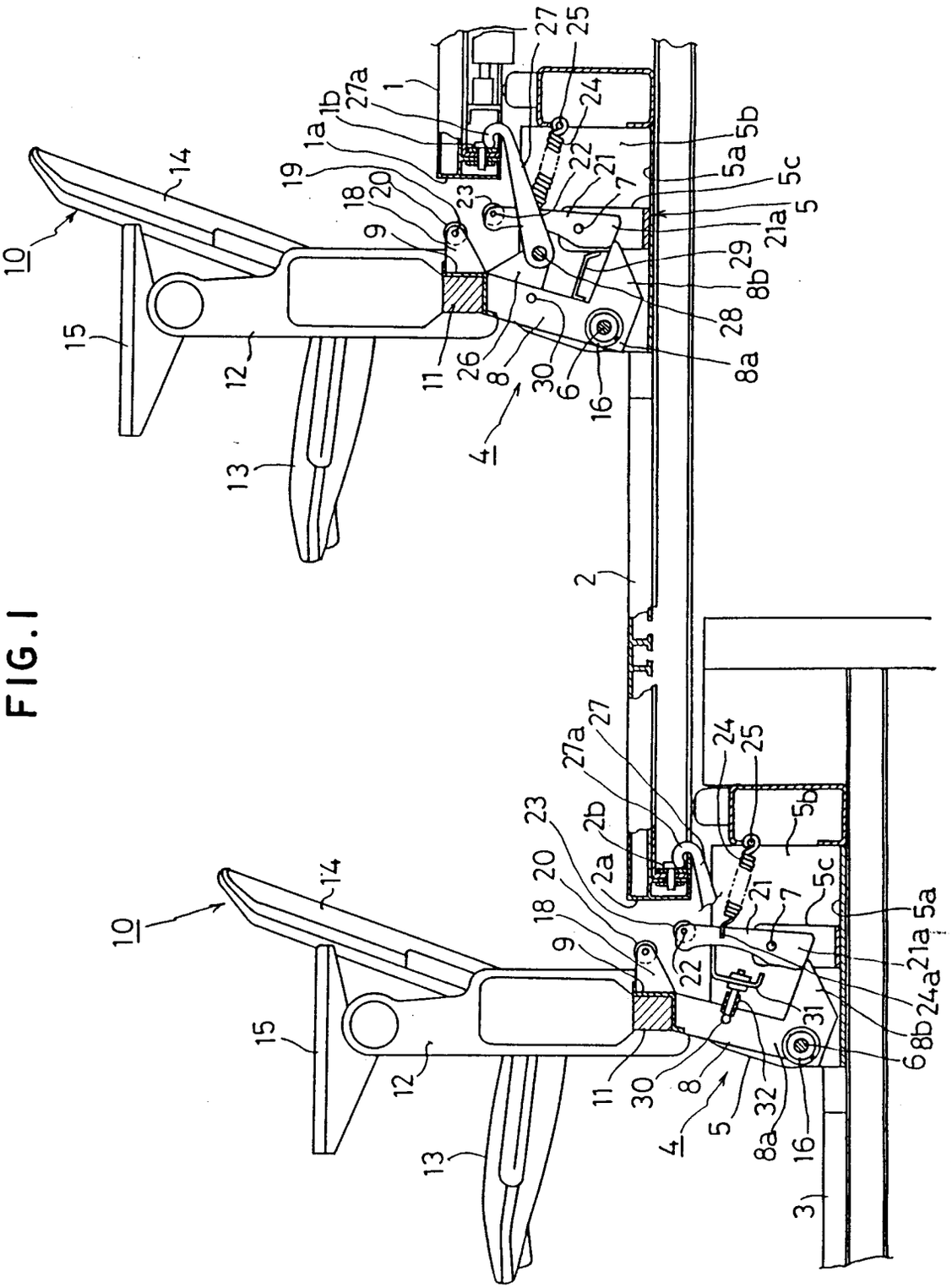
pivotante (8) au niveau de plancher (1, 2, 3) est un fil (33) ayant l'une de ses parties d'extrémité fixée audit niveau de plancher et son autre partie d'extrémité fixée à ladite tige support pivotante (8).

5. Dispositif selon la revendication 1, caractérisé en ce que le levier de verrouillage (21) comprend en outre sur sa partie supérieure un rouleau (23) adapté à se déplacer sur un espace situé sous le niveau de plancher immédiatement supérieur après avoir été mis en contact avec la partie de surface inférieure avant du niveau de plancher immédiatement supérieur, et en ce qu'un levier de maintien est disposé sous le levier de verrouillage (21) de sorte que, quand le levier de verrouillage (21) est libre par rapport à sa position de verrouillage, le levier de maintien est en contact avec une partie inférieure du levier de verrouillage (21) pour empêcher ainsi le levier de verrouillage de se déplacer vers la position de verrouillage.

6. Dispositif selon la revendication 5, caractérisé en ce que la surface extrême inférieure du levier de verrouillage (21) est constituée d'une surface de came courbe (73a) telle que son rayon de courbure, mesuré à partir du centre de rotation du levier de verrouillage (21), augmente progressivement quand la distance de ladite surface de came (73a) au levier de maintien augmente.

7. Dispositif selon la revendication 5, caractérisé en ce que le moyen pour relier la tige support pivotante (8) audit niveau de plancher (1, 2, 3) est un crochet (27a) ayant sa partie d'extrémité proximale montée à pivotement sur la tige support pivotante (8) et sa partie d'extrémité libre en engagement avec ledit niveau de plancher.

FIG. 1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27
25
24
22
21
7
23
5a
5b
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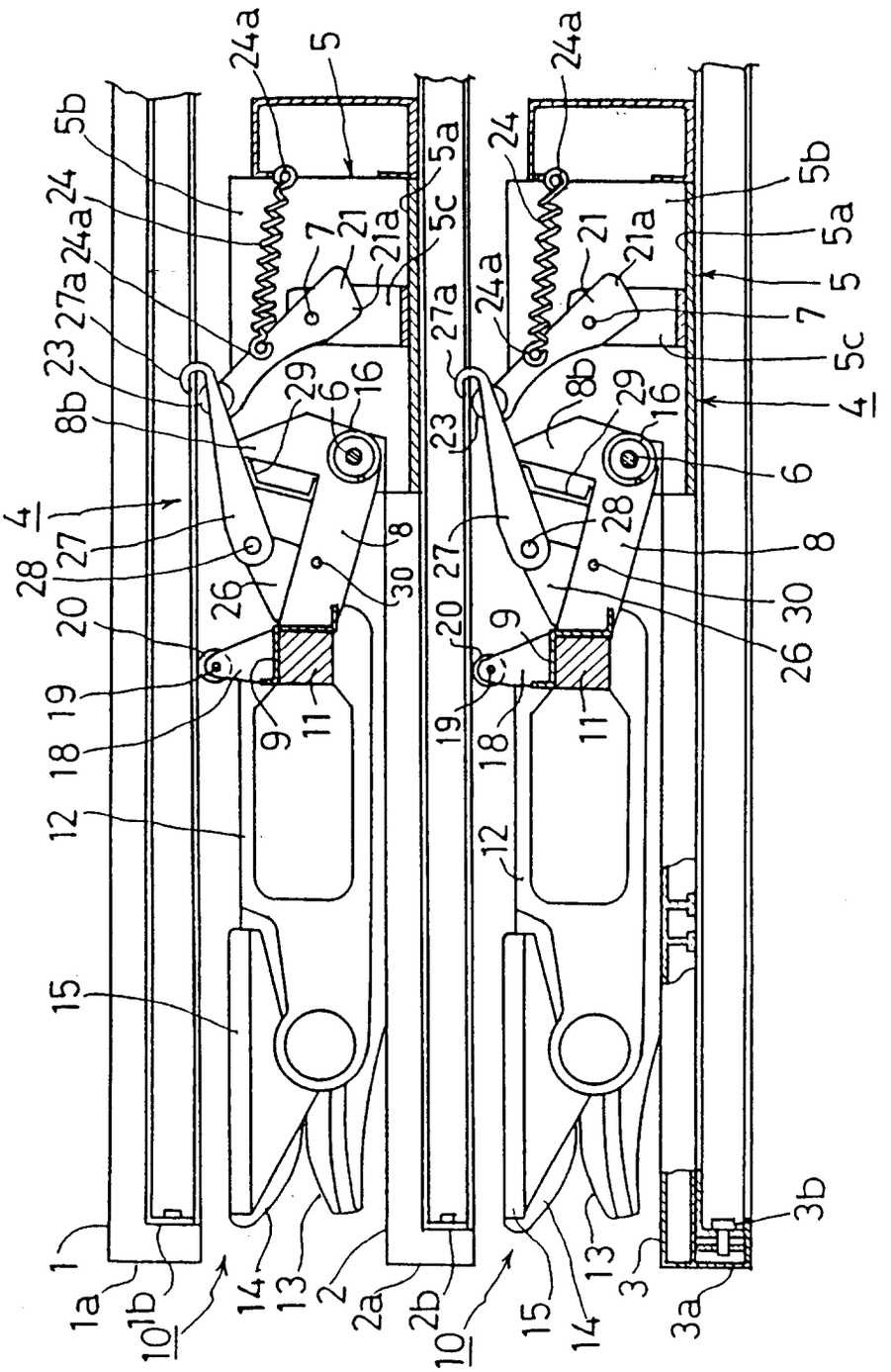
24a
3

FIG.2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28
27
26
8
30
20
9
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2b
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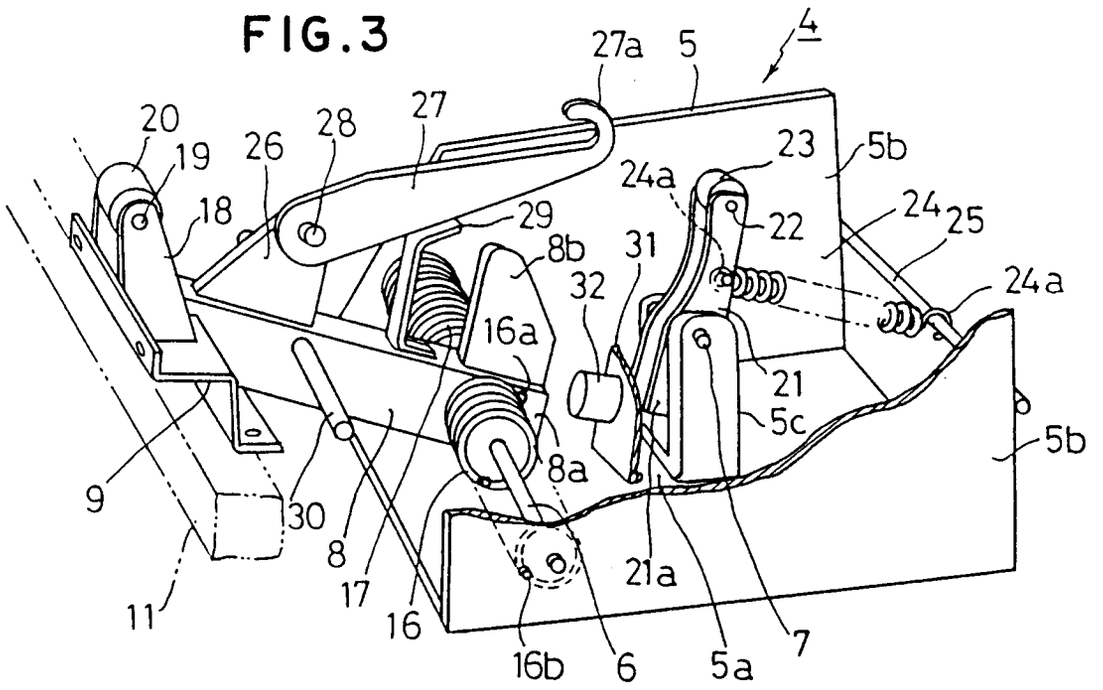
3a
3b

FIG.3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5
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18
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22
24
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24a
16a
21
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5b
9
30
8a
8
17
21a
11
16
16b
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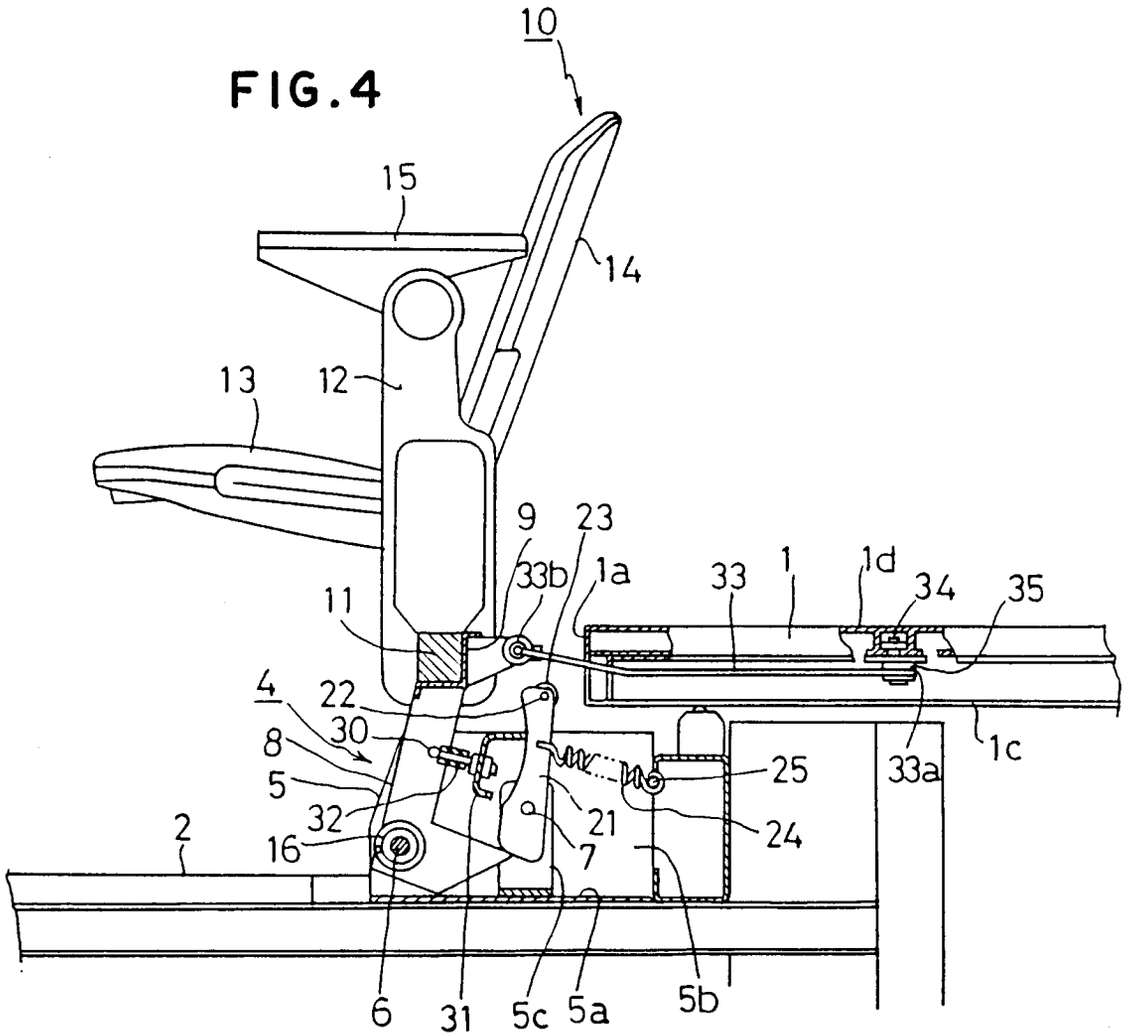
5a
7

FIG.4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24
21
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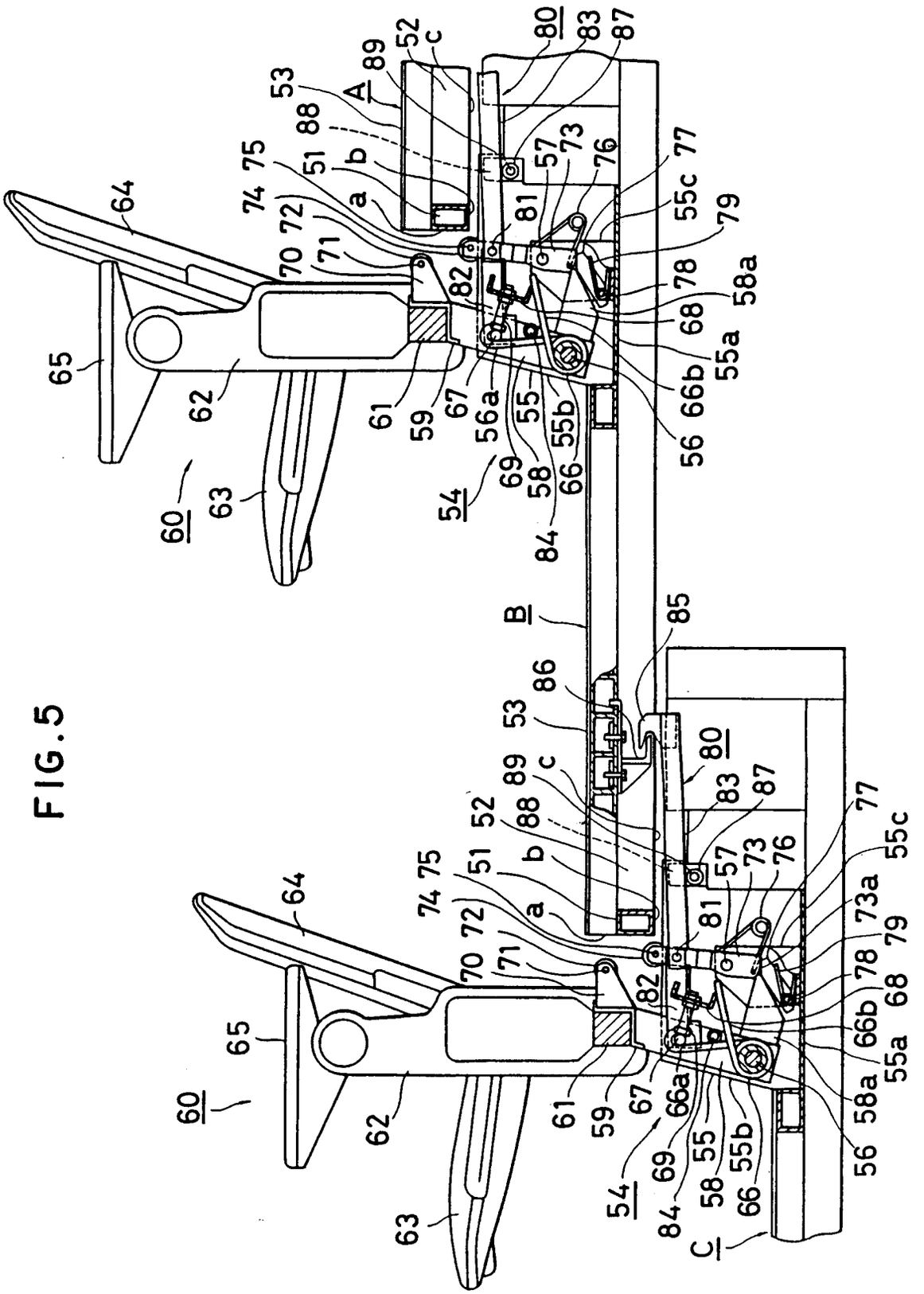
1c
6
31
5c
5a
5b

FIG.5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C
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64
65
66
66a
66b
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73a
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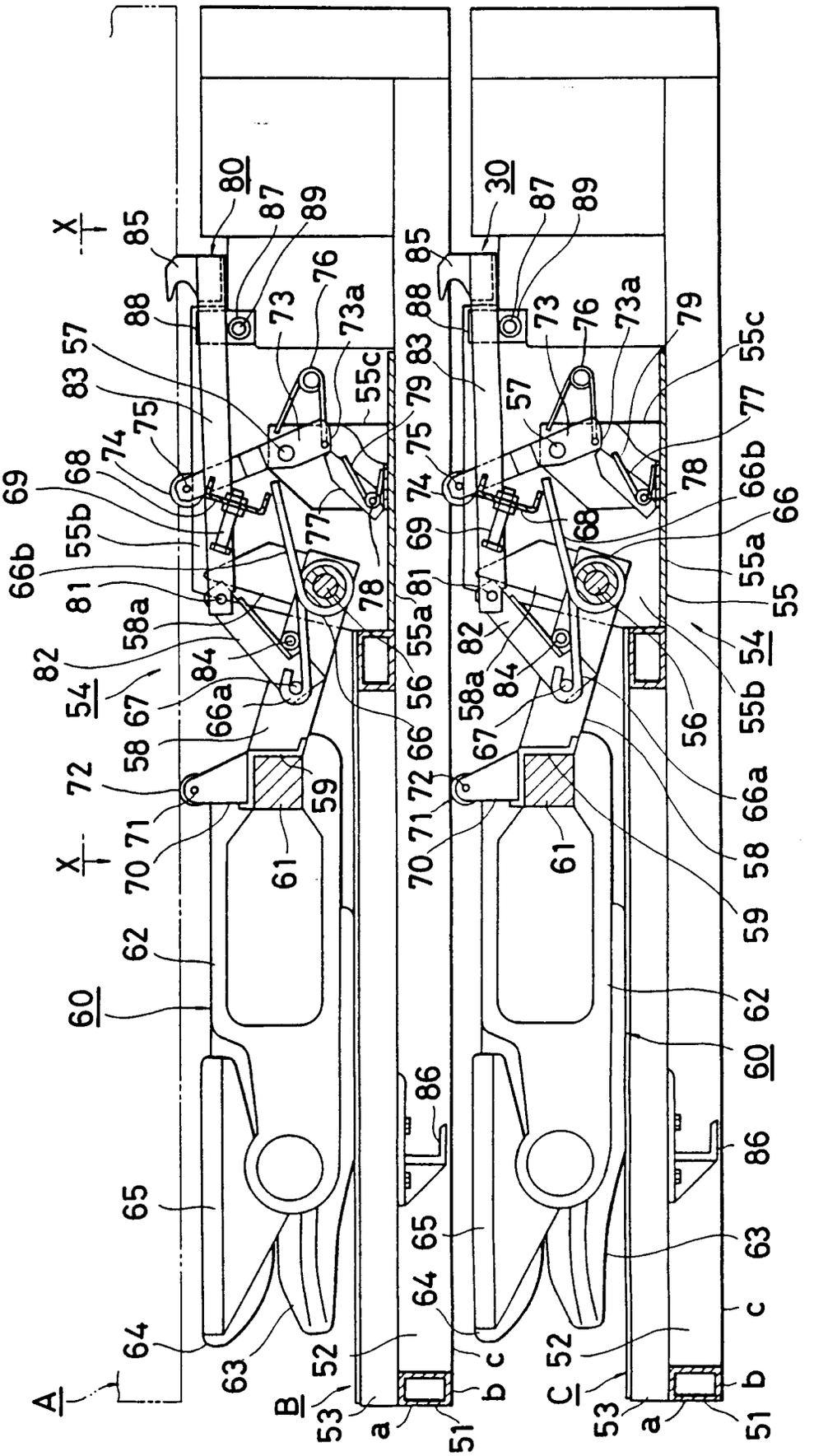
FIG.6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66a
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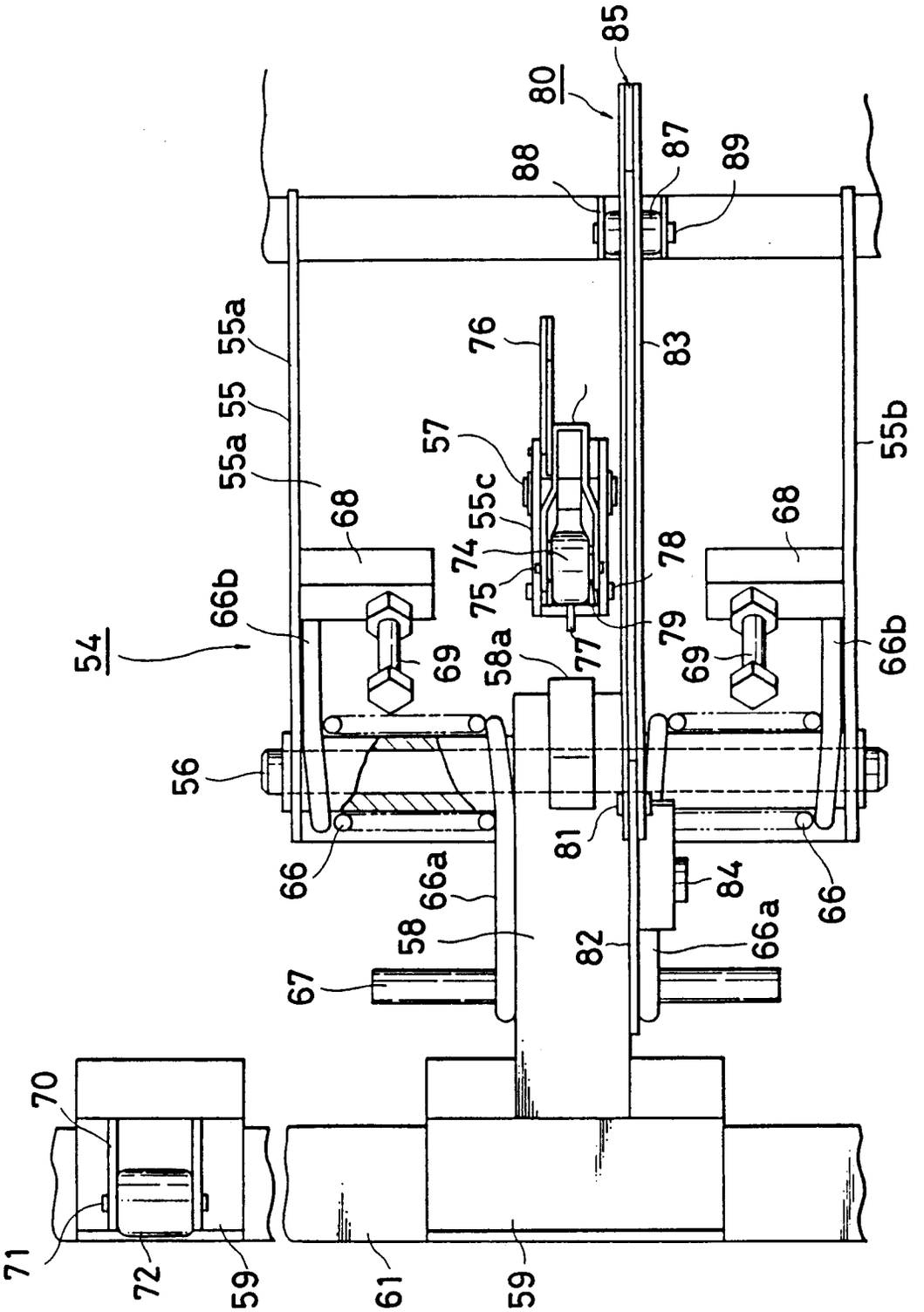
56

FIG.7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69
58a
77
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58
82
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70
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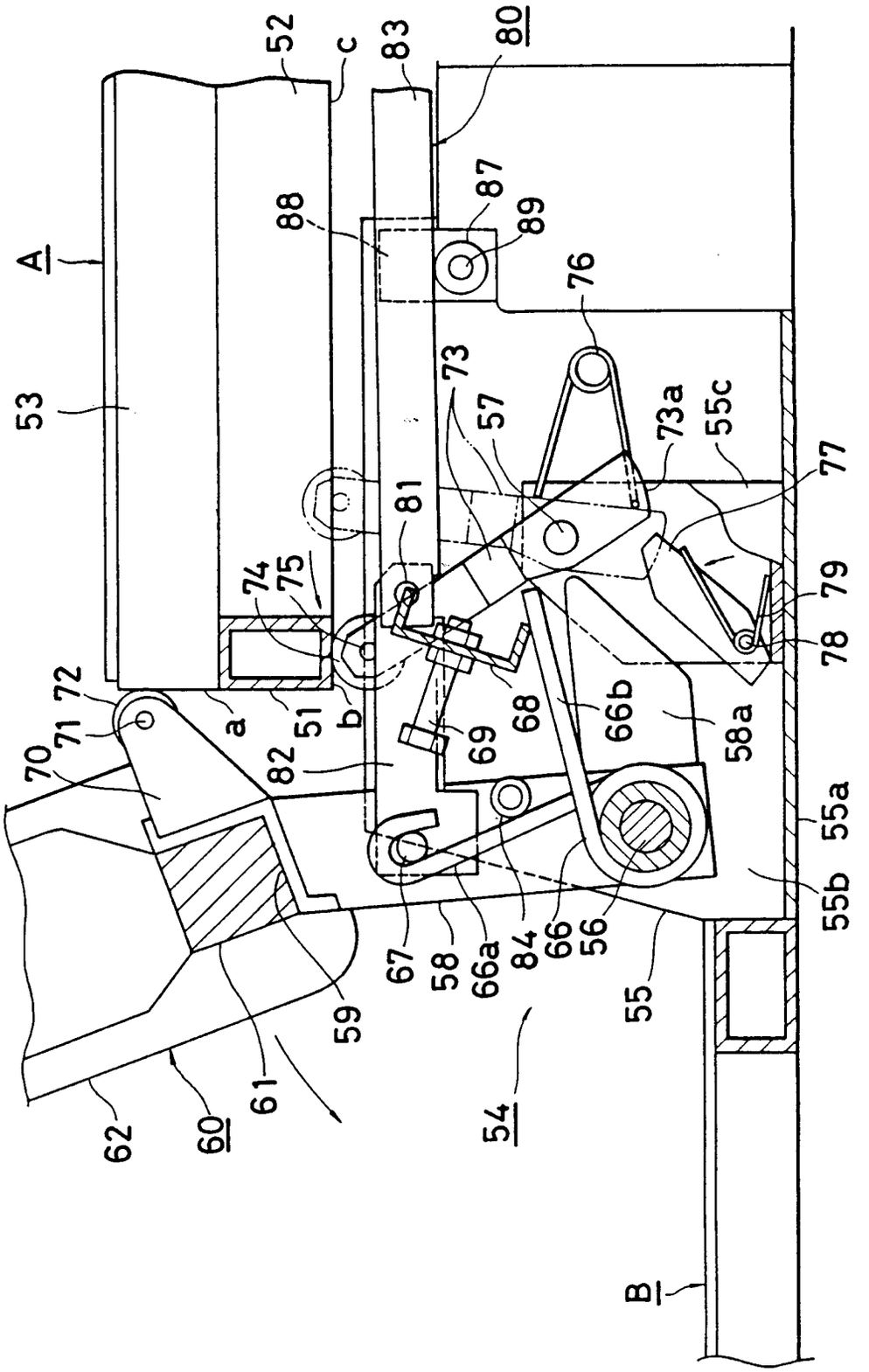
72
59
61
59

FIG.8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69
68
66b
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54
B

FIG.9

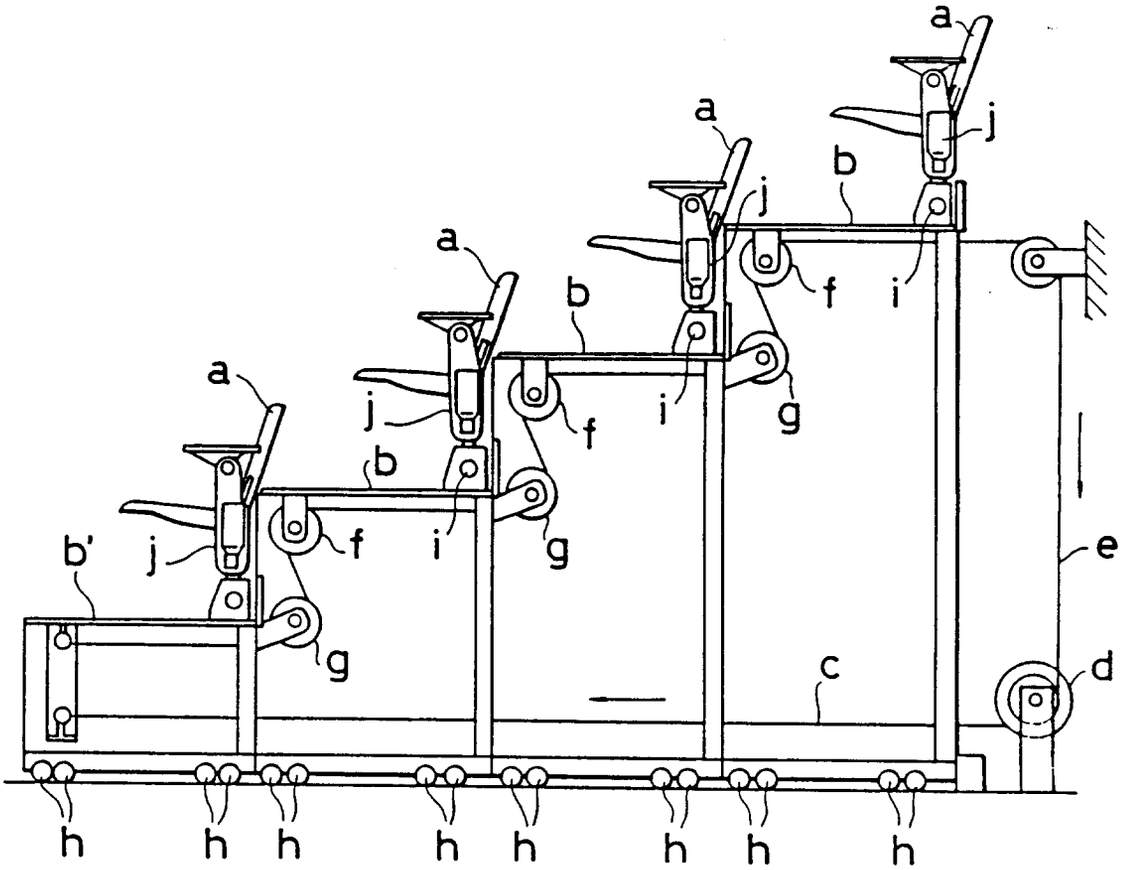

FIG.10