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(54) **FOLDING AND POSITIONING DEVICE FOR TIER-SEATS**

(76) Inventor: **Guoxun Feng**, Yuyao City (CN)

Correspondence Address:
ALSTON & BIRD LLP
BANK OF AMERICA PLAZA
101 SOUTH TRYON STREET, SUITE 4000
CHARLOTTE, NC 28280-4000 (US)

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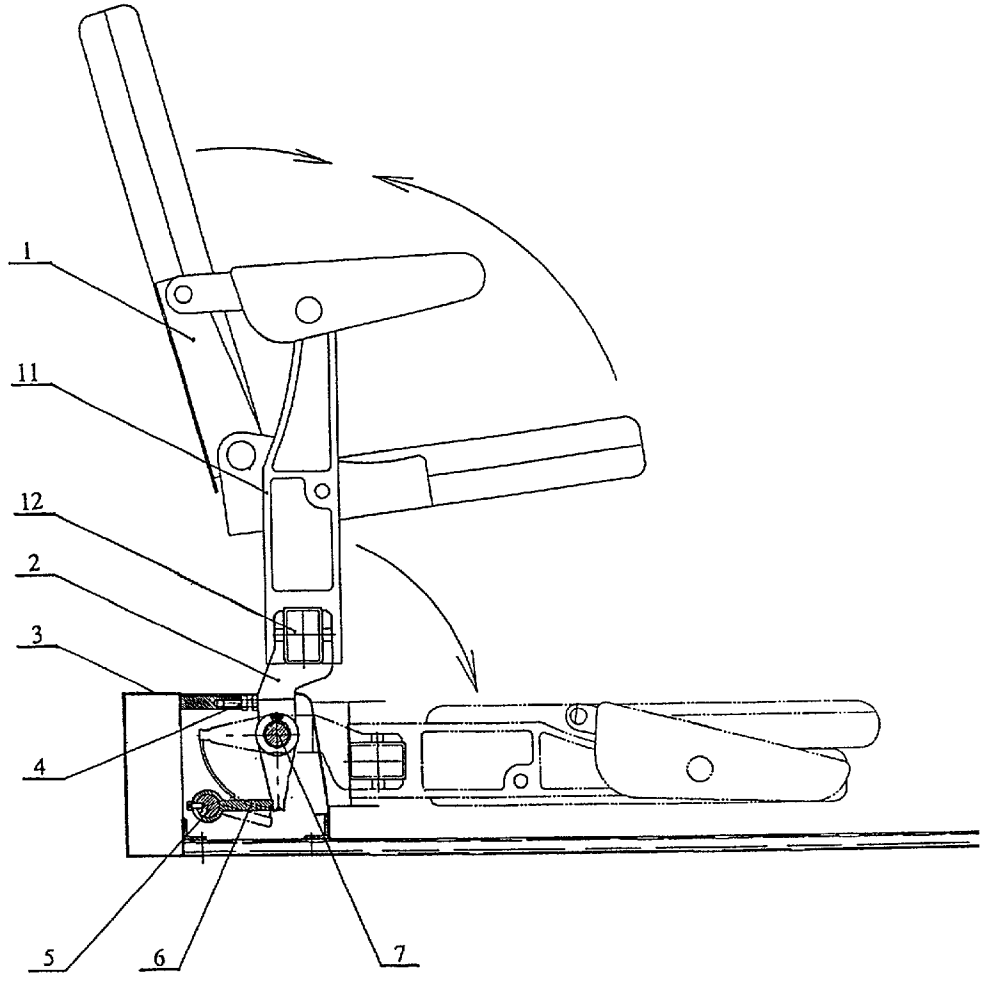
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(57) **ABSTRACT**

A folding and positioning device for tier-seats comprising several linked seats **1** in the same row with their pedestals **3**. At least one rotational leg **2** is fixed in the middle on the rotational shaft **7** on the upper front side inside the pedestal, its upper end fixed on the seat **1** and the lower end having a step. In the lower rear inside the pedestal is another rotational shaft **5**, on which is fixed a bracketing arm **6** in the position corresponding to the rotational leg **2**. When the seats are being erected to their upright position, the free end of the bracketing arm **6** abuts against the step at the lower part of the rotational leg **2**. Compared with conventional technologies, the present invention calls for very little force in order to erect or lay down the seats. Furthermore, the seats in the entire row are linked joint motion, thus greatly enhancing the efficiency.



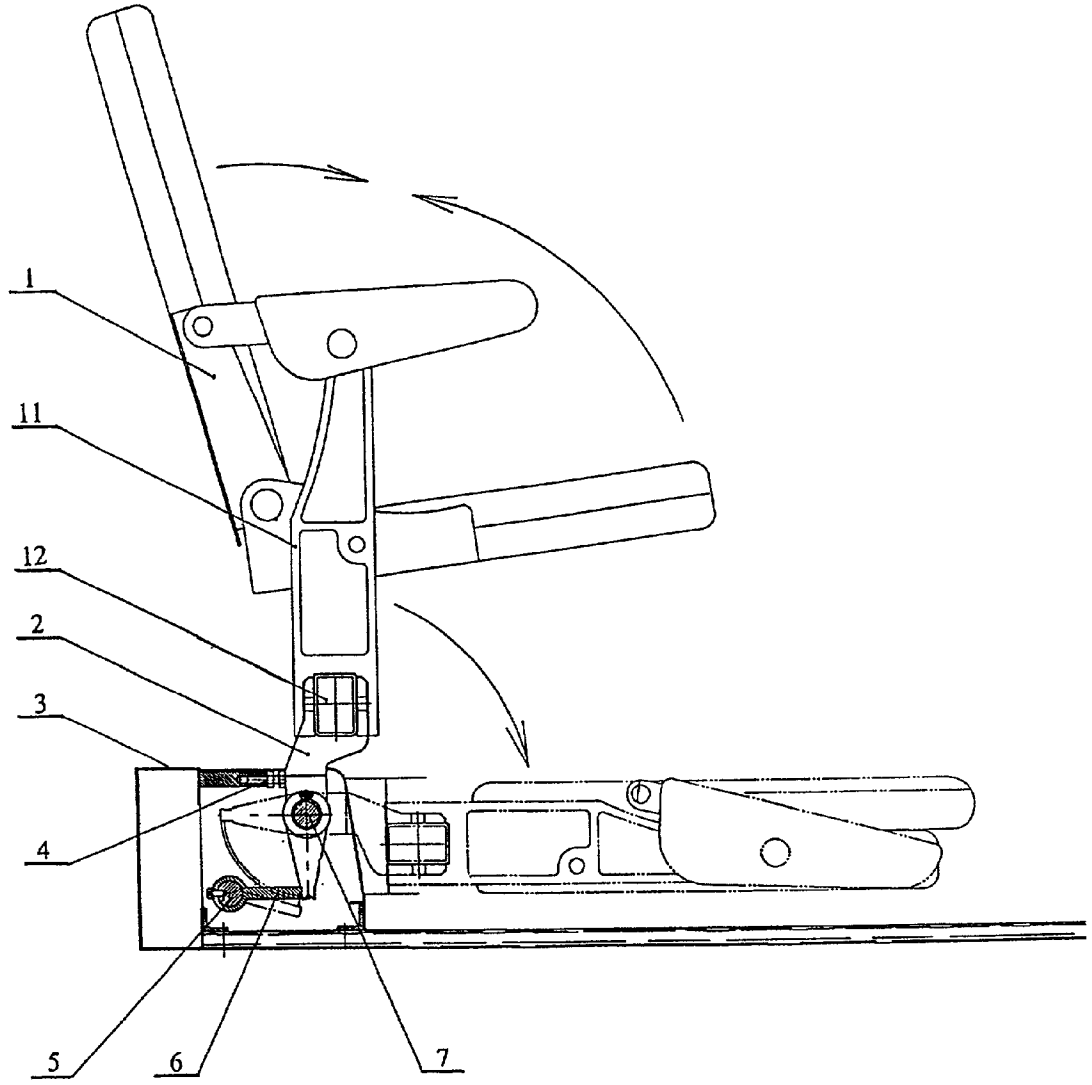


FIG. 1

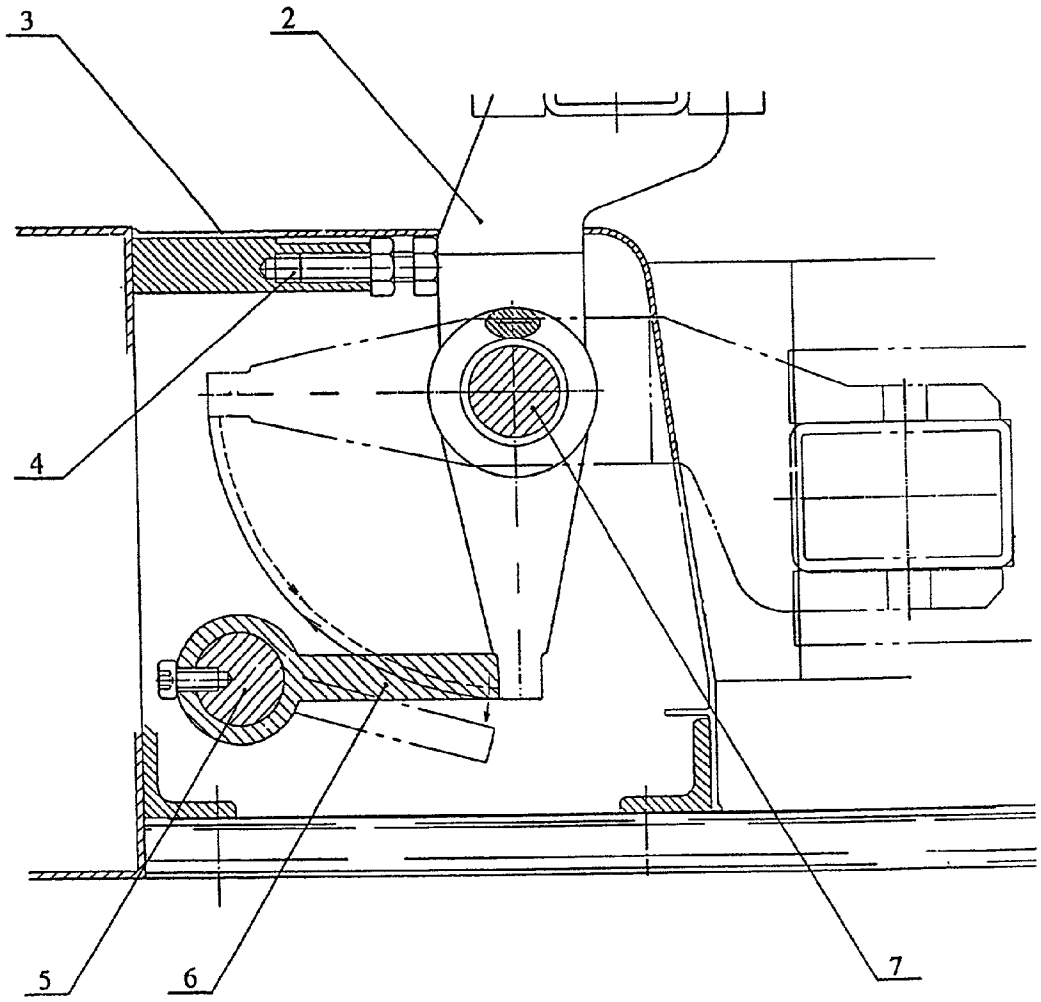


FIG. 2

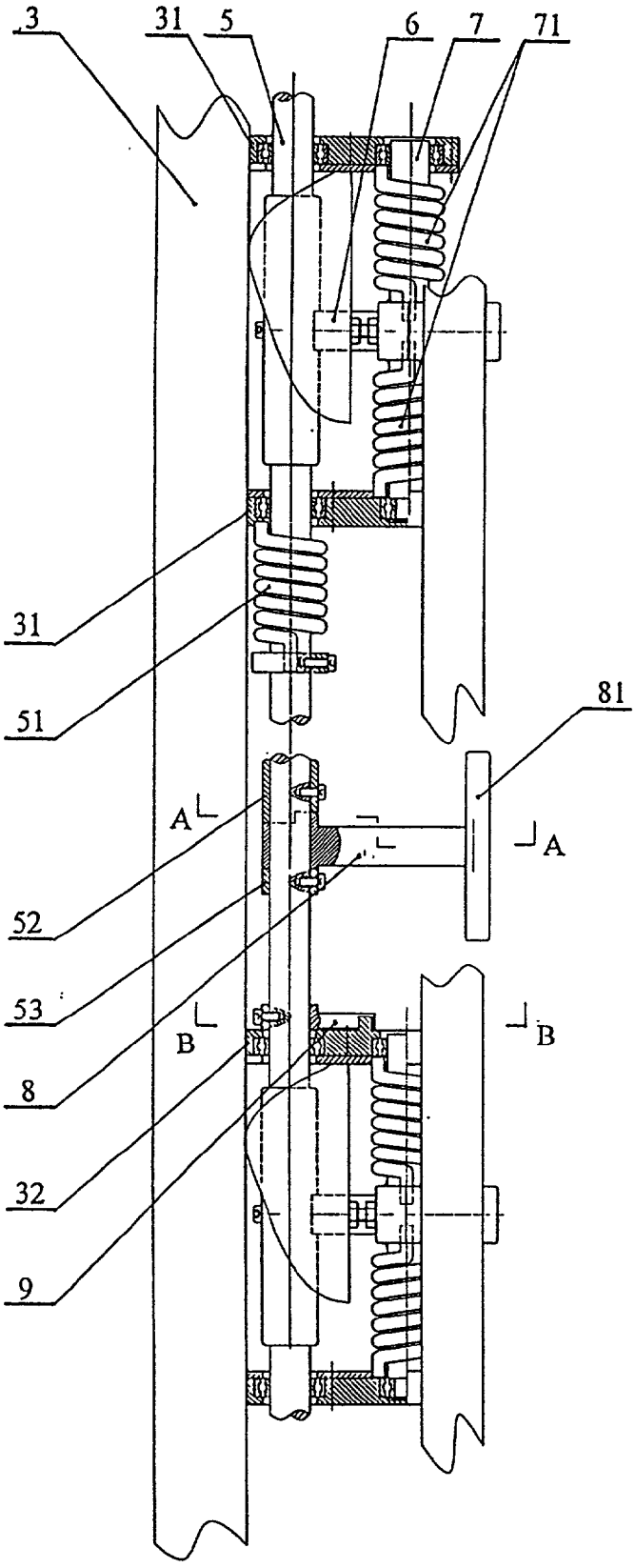
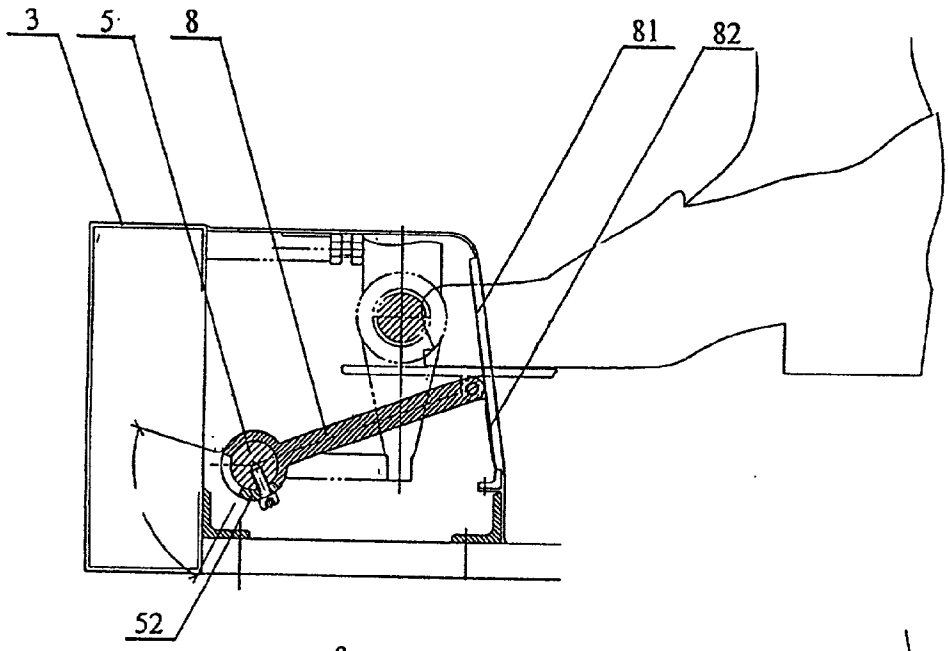
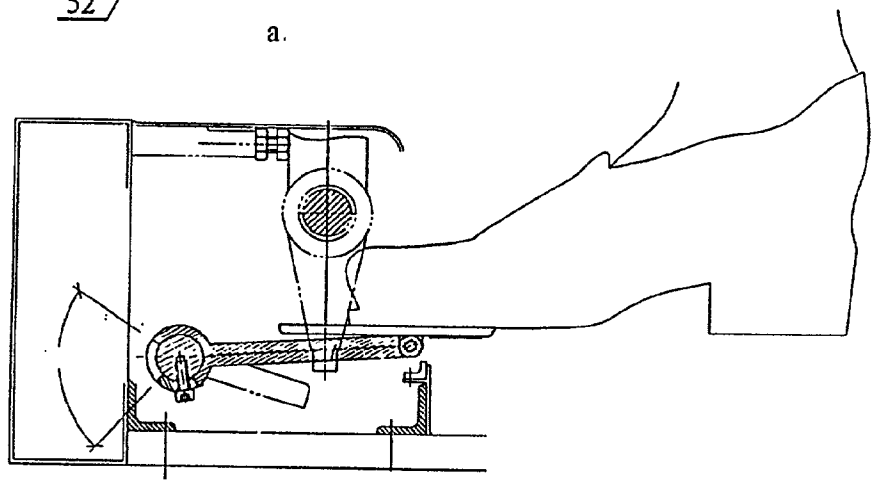


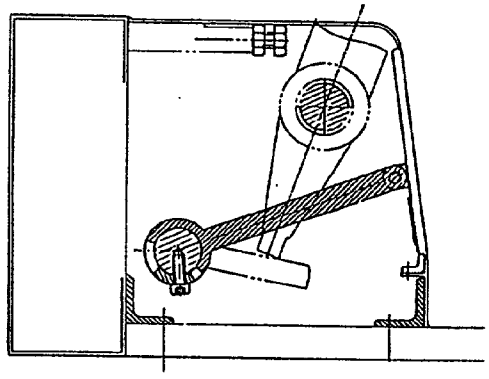
FIG. 3



a.



b



c

FIG. 4

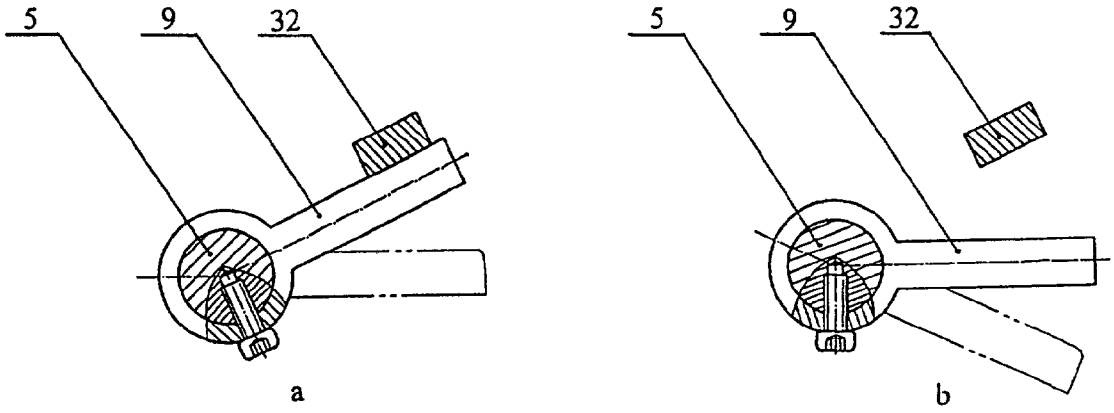


FIG. 5

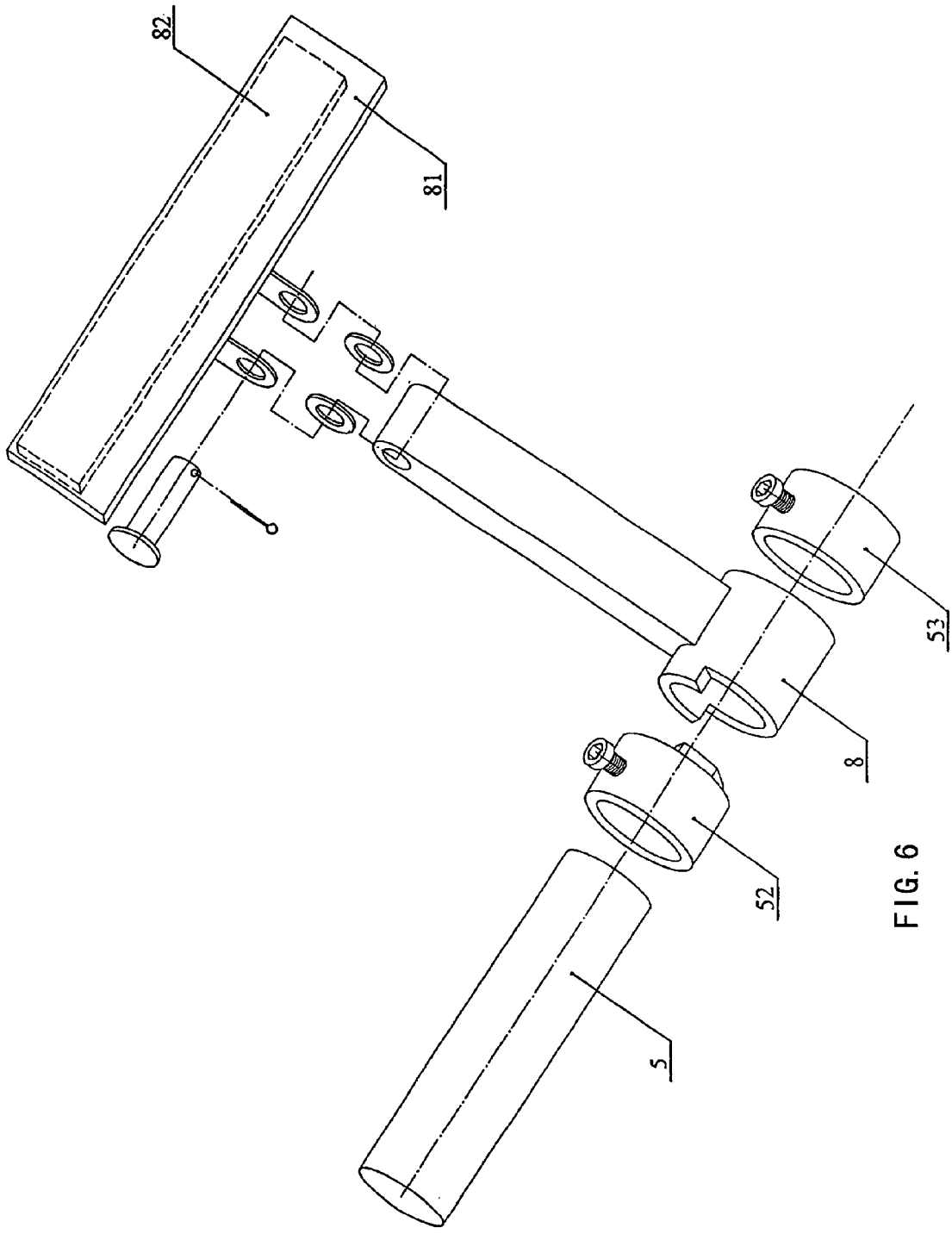


FIG. 6

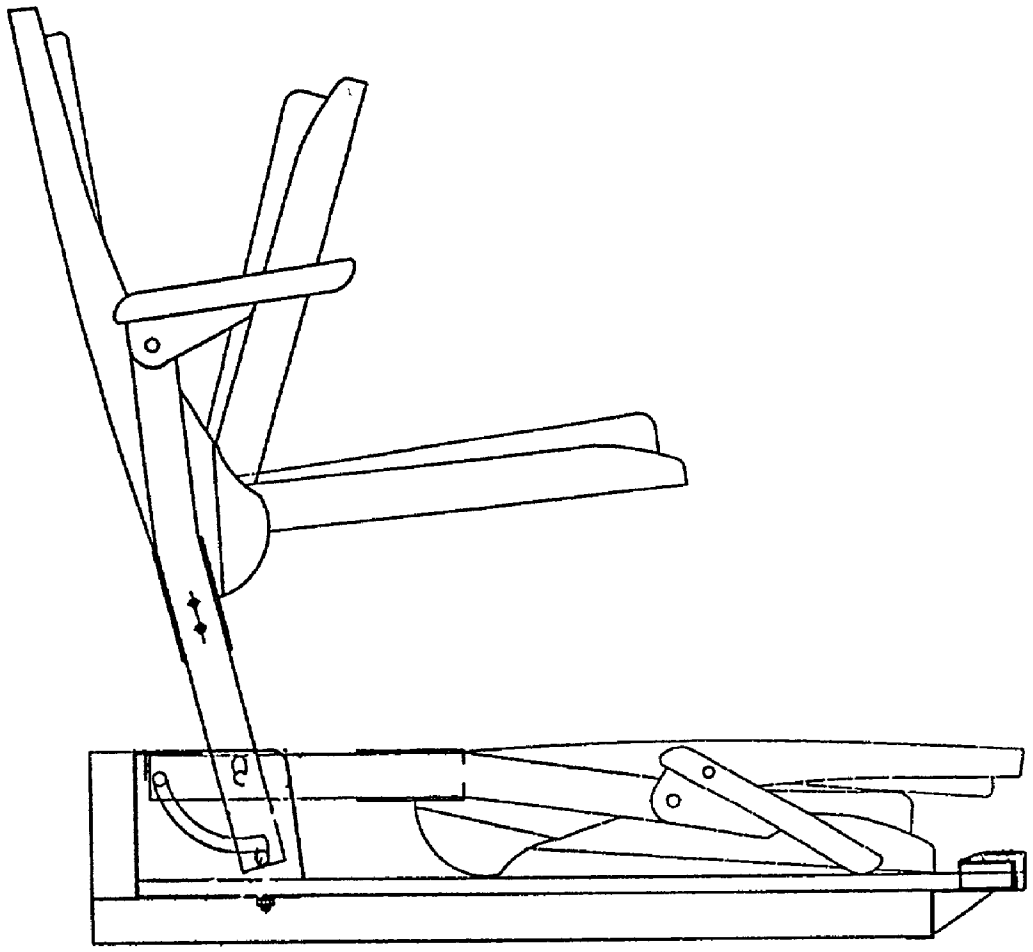


FIG. 7

FOLDING AND POSITIONING DEVICE FOR TIER-SEATS

FIELD OF THE INVENTION

[0001] The present invention relates to a folding and positioning device for tier-seats.

[0002] Folding tier-seats are commonly found on moveable spectator stands in gymnasiums, conference halls and other places. For the sake of saving space, these moveable spectator stands are usually folded and put away when in idle time, during which time all the tier-seats mounted in the row should be lay down. And when these seats are put to use, the rows of seats should be erected and fixated when the moveable spectator stand is prepared. The conventional seats on moveable spectator stands are usually manually lifted and folded one by one or two by two. Their structure is characterized in that there is a pintle on the leg of the seat and the pintle is located within the arc-like sliding chute on the bracket of the seat (see **FIG. 7**). Therefore, when folding the seats, the entire weight of the seats should be overcome manually so as to make the pintle on the chair leg slide from the upper end of the arc-like sliding chute downwards to the concave at the lower end of the chair and be locked there. And when laying down the seats, the entire weight of the seats should also be overcome to pull the pintle of the chair leg out of the concave at the lower end of the arc-like sliding chute, and then the seats are supported to make the pintle of the chair leg slide from the lower end of the arc-like sliding chute to the upper end and put down the chair. However, an ordinary spectator stand consists of at least several hundred or even thousands of tier-seats; therefore, this mode of chair-folding is labor-consuming and costs a lot of time and produces very low efficiency. In addition, the use of sliding chute locking structure can hardly remove the moving clearance, thus resulting in instability and sway of the seats.

[0003] The aim of the present invention is to provide a folding and positioning device for tier-seats capable of folding in a row of seats in linkage based on current technologies.

[0004] Another objective of the present invention is to provide a folding and positioning device for tier-seats capable of achieving firm fixation.

[0005] A further objective of the present invention is to provide a folding and positioning device for tier-seats which dispenses with the need to overcome the entire weight of the seats when laying them down.

[0006] A further objective of the present invention is to provide a folding and positioning device for tier-seats dispensing with the need to overcome the entire weight of the seats when unfolding them.

SUMMARY OF THE INVENTION

[0007] The aims of the present invention are realized thus: the folding and positioning device for tier-seats comprising several seats with their pedestals mounted in the same row, characterizing in that the seats are linked up as a whole and there is at least one rotational leg, which is fixed in the middle on the rotating shaft located at the front upper part of the interior of the pedestal, the upper end of the rotational leg is fixed on the seats and a step is provided on its lower end, another rotating shaft is provided at the lower rear part in the pedestal, on which a bracketing arm is fixed in the position corresponding to the rotational leg . When the seats are in an unfolded and positioned state, the free end of the bracketing arm abuts against the step at the lower end of the rotational leg.

[0008] An adjusting bolt is provided at the upper end of the pedestal and when the seats are unfolded and positioned, the outer extending end of the bolt abuts against the back of the rotational leg.

[0009] A gravity balance torsion spring can preferably be mounted on the rotational shaft in the middle of the rotational leg, one end of the torsion spring is secured to the rotational leg, and the other end is secured to the fixed bracket in the corresponding position on the pedestal.

[0010] The seats can be linked up together by the transverse tube that runs through the middle part of the legs of the seats and the transverse tube can also run through the upper end of the rotational leg.

[0011] Compared with conventional technology, the present invention has several advantages in use. When laying down the tier-seats, we need only to make the axis of the bracketing arm rotate manually or electrically so as to make the bracketing arm rotate downwards and move away from the steps at the end of the rotational leg. Then we need only to push or pull gently the seats so that the linked seats fall down under their own gravitational force. When erecting the seats, we need only to overcome part of the gravitation of the seats manually because of the returned force of the gravity balance torsion spring. When the seats are restored to their positions, the bracketing arm then extends beneath the steps under the lower end of the rotational leg and thus achieve fixation, making possible the synchronic folding and erecting of the entire row of seats, which is a tremendous enhancement of efficiency. Furthermore, the zero clearance of the adjusting bolt completely eliminates the shaking of the seats.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] **FIG. 1** shows the structure of the present invention (partial sectional view).

[0013] **FIG. 2** is a partial enlarged view of **FIG. 1**.

[0014] **FIG. 3** is a top view of **FIG. 1** (partial sectional view).

[0015] **FIG. 4** is an enlarged sectional view taken along line A-A of **FIG. 3** (**FIG. 4***a*, **4***b* and **4***c* showing the three different states of the seats before and after the stepping arm is pressed down when the seats are being laid down and when the seats are being erected.)

[0016] **FIG. 5** is an enlarged sectional view taken along line B-B of **FIG. 4** (**FIG. 5***a* and **5***b* showing the two different states of the seats when they are being laid down and when they are erected in position.)

[0017] **FIG. 6** is an exploded perspective view of the stepping arm **8**, the transmission bushing **52**, the rotational axis **5** and the footplate **81**.

[0018] **FIG. 7** is a structural representation of the conventional folding and positioning device for seats.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Below is a detailed description of an embodiment of the present invention with reference to the drawings.

[0020] FIGS. **1** to **6** show an embodiment of the manually-folding seats, the folding and positioning device for tier-seats comprises several seats **1** and their pedestals **3** arranged in the same row. Each tier-seat **1** can be linked up as a whole through a transverse tube **12** that runs through the seat leg **11** in the middle; the cross section of the transverse tube **12** can be in any shape but circular and it can not be rotated relative to the seats. The cross section of the transverse tube **12** in the present invention takes the form of a rectangle. Therefore, whenever one of the tier-seats in the row is being restored to position or laid down, the transverse tube **12** then revolves simultaneously, causing the synchronic folding or erecting of the other seats in the row.

[0021] At least one rotational leg **2** should be installed in a proper position on the transverse tube **12**. The upper end of the rotational leg **2** runs through the transverse tube **12**. The rotational leg **2** is fixed on the rotational shaft **7** on the upper front side of the interior of the pedestal **3** (the two ends of the rotational shaft **7** are fixed on the fixed bracket **31** inside the pedestal **3** through bearings respectively). On the lower side there is a step, where the upper end of the rotational leg **2** penetrates the transverse tube **12** so as to join the upper end of the rotational leg **2** with seat **1**. This can also be achieved through alternative means. For example, it can also be fixed by a bolt on the chair leg **12** directly or by welding.

[0022] There is a gravity balance torsion spring **71** encasing the rotational shaft **7** in the middle of the rational leg. In the embodiment of the present invention, there are two symmetrical springs on each seat. As shown in **FIG. 3**, one end of the torsion spring **71** is fixed on the rotational leg **2**, and the other end is fixed on the fixed bracket **31**.

[0023] There is an adjusting bolt **4** set on the upper part of the pedestal **3**. When the seat **1** is being erected to its position, the bolt **4** stretches out to prop the back of the rotational leg **2**, as shown in **FIG. 1**.

[0024] There is a long rotational shaft **5** set on the lower in the rear of the pedestal **3** and a bracketing arm **6** is installed in the position that corresponds to the rotational leg **2** on the rotational shaft **5**. One end of the bracketing arm **5** encases the rotational shaft **5** circularly and is integrated with the rotational shaft by the bolt. There is at least one torsion spring **51** on the rotational shaft **5**, which is fixed to the shaft **5** at one end and to one of the fixed brackets **31** inside the pedestal **3** at the other end. If the torsion spring **51** is installed properly, the torsion moment produced by the torsion spring **51**, when the seat is in a laid down position, can restore the free end of the bracketing arm **6** to its position which points a little upwards. For the sake of easy installation, a better design is to set torsion moment of the torsion spring **51** sufficiently high and fix an extending restricting arm **9** in another proper position on the rotational shaft **5**, with the adjoining fixed bracket **32** having a protrusion over the restricting arm. As shown in **FIG. 5***b*, when the seat **1** is laid down, the free end of the bracketing arm **6** moves upwards with the shaft **5** under the force of the torsion spring **51** until the restricting arm **9** is stopped by the cam of the fixed bracket **32** that is adjacent to the restricting arm, as shown in **FIG. 5***a*.

[0025] At least one stepping arm **8** is joined on the rotational shaft **5**, the circular bushing on the end of the stepping arm **8** encases the rotational shaft **5** and can rotate relative to the rotational shaft **5**. The circular bushing has an arc-shaped nick and the side cam of the transmission bushing **52** which sheathes the rotational shaft **5** and is fixed by the bolt is just located in the arc-shaped nick and keeps a clearance in it. As shown in **FIG. 4** and **FIG. 6, 53** represents a restricting bushing, the free end of the stepping arm **8** is hinged on a footplate **81**, which covers a gap in the pedestal **3**. A weight block **82** can be set at the lower part on the inner side of the footplate **81**.

[0026] The seat **1** can be laid down by stepping on the footplate **81** and the stepping arm **8**, making the stepping arm **8** revolve downwards, thus setting the transmission bushing **52** in motion and causing the rotational shaft **5** to revolve, as is shown in **FIG. 4***b*. The bracketing arm **6** fixed on the rotational shaft **5** then revolves downwards and moves away from the steps at the end of the rotational leg **2**, and the entire row of seats will fall down automatically under their own gravitational force if we give any one of the seats a gentle push or pull. The rotational shaft **5** revolves reversely under the force of the torsion spring **51** until the restricting arm **9** on the rotational shaft **5** is stopped by the cam of the adjacent fixed bracket **32**. At this time, the bracketing arm **9** reverts to its horizontal position with a slight upward orientation and the transmission bushing **52** drives the stepping arm **8** to revolve in the opposite direction and restore to its original state.

[0027] When restoring the seats **1** to their original erectile position, the only thing needed to do is to overcome manually part of the gravitational force of the seats because of the return action of the gravity balance torsion spring **71**. When the seats nearly completes its full restoration, the lower part of the rotational leg **2** first pushes the bracketing arm **6** downwards. At this moment, the transmission bushing **52** revolves simultaneously. However, because of the clearance retained on the arc-shaped nick of the circular bushing of the stepping arm **8**, the cam of the transmission bushing **52** revolves separately in the arc-shaped nick of the circular bushing of the stepping arm **8** without causing the synchronic revolution of the stepping arm **8**, as shown in **FIG. 4***c*. When the seats reverts to its position completely, the bracketing arm **6** returns and extends beneath the steps at the lower part of the rotational leg **2**, thus fixing the seats in position.

[0028] The transverse tube **12** in the above embodiment is only one means of linking up the seats. The seats can be joined together by other current means so as to make them move simultaneously when being folded or erected.

[0029] The laying down of the seats in the above embodiment is realized by stepping on the plate. According to the present invention, the rotational shaft **5** can also be motor-driven, and the structure of the driving motor is omitted here.

What is claimed is:

1. A folding and positioning device for tier-seats comprising several seats **(1)** with their pedestals **(3)** mounted in the same row, characterizing in that the respective seat **(1)** are linked up as a whole and there is at least one rotational leg **(2)**, which is fixed in the middle on a rotating shaft **(7)** located at the front upper part of the interior of the pedestal, the upper end of the rotational leg is fixed on the seat **(1)** and

a step is provided on its lower end, another rotating shaft **(5)** is provided at the lower rear part in the pedestal, on which a bracketing arm **(6)** is fixed in the position corresponding to the rotational leg **(2)**, when the seats are in an unfolded and positioned state, the free end of the bracketing arm **(6)** abuts against the step at the lower end of the rotational leg **(2)**.

2. A folding and positioning device for tier-seats according to claim 1, characterizing in that an adjusting bolt **(4)** is provided at the upper end of said pedestal **(3)** and when the seats are unfolded and positioned, the outer extending end of the bolt **(4)** just abuts against the back of the rotational leg **(2)**.

3. A folding and positioning device for tier-seats according to claim 1, characterizing in that a gravity balance torsion spring **(71)** is mounted on the rotational shaft **(7)** in the middle of said rotational leg **(2)**, one end of the torsion spring **(71)** is secured to the rotational leg **(2)**, and the other end is secured to the fixed bracket **(31)** in the corresponding position on the pedestal **(3)**.

4. A folding and positioning device for tier-seats according to claim 1 or 2 or **3**, characterizing in that the respective seat **(1)** is linked up together by a transverse tube **(12)** that runs through the middle part of a legs **(11)** of the seat.

5. A folding and positioning device for tier-seats according to claim 4, characterizing in that the upper end of said rotational leg **(2)** penetrates said transverse tube **(12)**.

6. A folding and positioning device for tier-seats according to claim 1 or 2 or **3**, characterizing in that on the rotational shaft **(5)** there is at least one torsion spring **(51)** which maintains the free end of the bracketing arm **(6)** in its horizontal or vertical positions, said torsion spring **(51)** is fixed to the rotational shaft **(5)** at one end and to one of the fixed brackets **(31)** inside the pedestal **3** at the other end.

7. A folding and positioning device for tier-seats according to claim 5, characterizing in that on the rotational shaft **(5)** there is at least one torsion spring **(51)** which maintains the free end of the bracketing arm **(6)** in its horizontal or vertical positions, said torsion spring **(51)** is fixed to the rotational shaft **(5)** at one end and to one of the fixed brackets **(31)** inside the pedestal **3** at the other end.

8. A folding and positioning device for tier-seats according to claim 1 or 2 or **3**, characterizing in that at least one stepping arm **(8)** is connected to said rotational shaft **(5)**.

9. A folding and positioning device for tier-seats according to claim 8, characterizing in that said stepping arm **(8)** has a circular bushing sheathing the rotational shaft **(5)**, said circular bushing having an arc-shaped nick, a side cam of a transmission bushing **(52)** which sheathes the rotational shaft **(5)** and is fixed thereupon is located just in the arc-shaped nick and keeps a clearance in it.

10. A folding and positioning device for tier-seats according to claim 9, characterizing in that the free end of the stepping arm **(8)** is hinged on a footplate **(81)**, which covers a gap in the pedestal **(3)**.

* * * * *