PROTECTIVE CHAIR FOR ELDERLY PSYCHIATRIC PATIENTS

Field of the Invention

The present invention relates to the technical field of psychiatric chairs, and specifically to a protective chair for elderly psychiatric patients.

Background to the Invention

Mental illness refers to diseases in which, under the influence of various biological, psychological and social environmental factors, dysfunction of the brain leads to clinical manifestations of varying degrees of impairment in cognitive, emotional, volitional and behavioural activities. During psychological rehabilitation treatment, elderly psychiatric patients are required to sit on a chair to receive psychological therapy from a doctor.

Chinese Patent Publication No. CN222150339U discloses a protective psychiatric chair for elderly patients, comprising a U-shaped frame, L-shaped plates fixedly connected to both the left and right sides of the U-shaped frame, a rotating shaft rotatably connected to the front side of the top ends of the L-shaped plates, a second rotating plate rotatably connected to the outer wall of the rotating shaft on the left side, a clamping block fixedly connected to the right side of the second rotating plate, a first clamping hole formed at the central top of the clamping block, a first rotating plate rotatably connected to the outer wall of the rotating shaft on the right side, and a second clamping hole formed on the right side of the first rotating plate, the inner side of the second clamping hole engaging with the outer wall of the clamping block. Through the cooperation of the anti-slip pad, support plate, sponge strips, handle, second rotating plate, rotating shaft, clamping block, first rotating plate, second clamping hole, T-shaped buckle and first clamping hole, the structure prevents an operator from falling when sitting on the chair, provides good protective performance and improves safety to a certain extent.

However, in actual use, protective chairs for elderly psychiatric patients of the above type often encounter situations in which patients experience emotional fluctuations, such as epileptic symptoms, causing them to stand up suddenly or make violent movements. This

may not only cause injury to the patient but also create difficulties for surrounding medical staff. Although such chairs provide a certain restraining function, problems such as restraining straps being easily broken free from and the chair being prone to tipping remain, making them unable to meet clinical needs. Moreover, relying solely on a single restraining method is insufficient to restrain elderly psychiatric patients under different circumstances, making it difficult to enhance stability during treatment and failing to ensure patient safety.

Statement of Invention

The purpose of the present invention is to provide a protective chair for elderly psychiatric patients, overcoming the problems in the prior art whereby such chairs cannot effectively restrain psychiatric patients, making it easy for patients to stand up suddenly or make violent movements, which may not only cause injury to the patients themselves but also interfere with normal medical treatment by healthcare staff. Furthermore, the restraining effect is generally poor, the restraining method is relatively single, the restraining straps are easily broken free from, and the chair is prone to tipping, thereby causing injury to elderly psychiatric patients, failing to provide adequate protection and being unable to ensure stability during treatment.

To achieve the above purpose, the technical solution adopted by the present invention is as follows:

A protective chair for elderly psychiatric patients is designed, integrating an anti-tipping assembly, a restraining mechanism, a tightening mechanism and an adaptive adjusting mechanism. When the patient experiences significant emotional fluctuations, the adaptive adjusting mechanism at the back can firmly tighten the upper-body restraining straps, and when the patient relaxes, the restraining straps automatically loosen synchronously, preventing the straps from being broken free due to excessive movement while ensuring patient comfort. Meanwhile, an anti-tipping device is arranged at the bottom of the seat base. When the patient sits on the seat cushion, the patient's own weight presses the pressure-receiving plate downward, causing the anti-tipping assembly below to deploy, thereby extending telescopic support rods in the left, right and rear directions to contact the ground and form a multi-angle anti-tipping structure. This prevents the chair from tipping

and injuring the patient, enhances the protective function of the device, assists physicians in completing treatment efficiently and quickly, and provides significant clinical application value and social benefits. The specific solution is as follows: A protective chair for elderly psychiatric patients comprises a seat base, a seat backrest arranged above the rear side of the seat base, armrest frames on the left and right sides, and a leg-restraining plate below the front side, and further comprises: a restraining mechanism arranged on the front side of the seat backrest for restraining the body of an elderly psychiatric patient, the rear side of the restraining mechanism being connected to a tightening mechanism, the tightening mechanism being arranged on the rear side of the seat backrest.

Preferably, the restraining mechanism comprises: a restraining block arranged at the central front side of the seat backrest, the restraining block being provided with a heart-rate monitor for monitoring the patient's emotional state; and four restraining straps, one end of each being hooked around the outer wall of the restraining block, the other end passing through the seat backrest and being connected to the tightening mechanism.

Preferably, a receiving cavity is provided inside the seat backrest, four symmetrically arranged sliding slots being provided transversely at the front side of the receiving cavity, sliding blocks being slidably connected within the sliding slots; the sliding blocks being slidably connected within the receiving cavity via guide sliding rods, first springs being connected between the outer sides of the sliding blocks and the inner walls on the left and right sides of the receiving cavity, and the four restraining straps respectively passing through the four sliding blocks and being connected to the tightening mechanism.

Preferably, the tightening mechanism comprises: a knob switch arranged on the rear side of the seat backrest, the front end of the knob switch being provided with a pushing plug, the pushing plug penetrating the rear inner wall of the receiving cavity; a driving gear mounted on the front inner wall of the receiving cavity, a telescopic tongue slidably connected to the rear side of the driving gear cooperating with the pushing plug; and four driven gears respectively meshed around the driving gear, each driven gear being connected to a winding rod, the restraining straps being wound around the winding rods.

Preferably, a locking assembly is further connected to the driving gear, the locking

assembly comprising: a U-shaped base mounted on the front inner wall of the receiving cavity, the U-shaped base enclosing the outer side of the driving gear; and two sets of L-shaped locking pieces respectively enclosing the outer side of the U-shaped base, the inner ends of the L-shaped locking pieces cooperating with the pushing plug, the outer ends of the L-shaped locking pieces being provided with limiting blocks, the limiting blocks abutting the driving gear, and second springs being arranged between the limiting blocks and both ends of the U-shaped base.

Preferably, a sponge pad is further arranged on the front side of the seat backrest, an adaptive adjusting mechanism being arranged on the rear side of the sponge pad, the adaptive adjusting mechanism being connected to a rotating column at the front side of the driving gear for automatically tightening the restraining straps when the patient moves violently.

Preferably, the adaptive adjusting mechanism comprises: a support plate arranged on the rear side of the sponge pad, a cross push-rod being slidably connected within the support plate, the rear side of the cross push-rod being connected to a piston plate via a connecting rod, the piston plate being slidably connected within a hydraulic chamber inside the rotating column; and a connecting portion arranged at the central rear side of the support plate, the central portion of the cross push-rod being slidably connected within the connecting portion.

Preferably, two oppositely arranged guide rods are provided within the connecting portion, a spiral groove being provided on the outer side of the rotating column, the guide rods being slidably connected within the spiral groove for forcing the driving gear to rotate.

Preferably, a pressure-receiving groove is provided at the top of the seat base, a pressure-receiving plate being mounted at the top of the pressure-receiving groove, and an anti-tipping assembly being further arranged at the bottom of the pressure-receiving plate for preventing the chair from tipping.

Preferably, the anti-tipping assembly comprises: a hydraulic barrel arranged at the central top of the seat base, telescopic support rods being obliquely arranged at the rear side and at the left and right sides of the bottom of the hydraulic barrel, the lower ends of the

telescopic support rods being provided with ground feet; and a pressure piston mounted at the bottom of the pressure-receiving plate and slidably connected within the hydraulic barrel, for pressing liquid inside the hydraulic barrel into the telescopic support rods so as to extend them to support against the ground.

The beneficial effects of the present invention are as follows:

1. In the present invention, the restraining mechanism can be manually tightened via the tightening mechanism during patient treatment, enabling the restraining mechanism to be firmly secured across the patient's chest to achieve passive restraint, thereby preventing elderly psychiatric patients from breaking free due to excessive emotional agitation. A heart-rate monitor is provided on the restraining block for monitoring the emotional state of psychiatric patients and tracking heart-rate changes in real time.

2. In the present invention, a movable cross push-rod and support plate are arranged on the seat backrest. When an elderly psychiatric patient experiences significant emotional fluctuations and violent movements, pressure is applied to the cross push-rod and support plate, activating the adaptive adjusting mechanism. The adaptive adjusting mechanism drives the tightening mechanism to achieve autonomous restraint of the patient's body, and when the patient relaxes, the restraining straps automatically loosen to avoid discomfort, thereby improving the safety of the chair while ensuring protective performance under special conditions.

3. In the present invention, the anti-tipping assembly operates on the principle that the patient's own weight reduces the volume of the hydraulic chamber and increases its pressure, causing the telescopic support rods on the outer bottom side to extend. This not only saves space when not in use but also provides an anti-tipping function to prevent the chair from tipping during patient movement, improving protection and ensuring safety. Meanwhile, the self-weight of the anti-tipping assembly arranged at the bottom of the seat base further lowers the centre of gravity of the chair, effectively enhancing its stability.

4. In the present invention, straps on the armrests and the leg-restraining plate can effectively restrain the patient's limbs, and straps on the pressure-receiving plate can restrain the patient's thighs, thereby enhancing the restraining effect and assisting medical

staff in treating elderly psychiatric patients, improving the clinical application value of the chair.

Brief Description of the Drawings

Figure 1 is a schematic view of the overall structure of the protective chair for elderly psychiatric patients according to the present invention;

Figure 2 is a schematic view of the rear structure of the protective chair for elderly psychiatric patients according to the present invention;

Figure 3 is a schematic view showing the connection relationship between the restraining mechanism and the tightening mechanism in the protective chair for elderly psychiatric patients according to the present invention;

Figure 4 is a schematic view of the internal structure of the seat backrest in the protective chair for elderly psychiatric patients according to the present invention;

Figure 5 is an enlarged partial view of portion A in Figure 4;

Figure 6 is a schematic view showing the connection relationship between the tightening mechanism and the adaptive adjusting mechanism in the protective chair for elderly psychiatric patients according to the present invention;

Figure 7 is a schematic view of the structure of the tightening mechanism in the protective chair for elderly psychiatric patients according to the present invention;

Figure 8 is a schematic view of the installation of the locking assembly in the protective chair for elderly psychiatric patients according to the present invention;

Figure 9 is a schematic view of the structure of the locking assembly in the protective chair for elderly psychiatric patients according to the present invention;

Figure 10 is a schematic view of the structure of the driving gear in the protective chair for elderly psychiatric patients according to the present invention;

Figure 11 is a schematic view of the installation of the adaptive adjusting mechanism in the protective chair for elderly psychiatric patients according to the present invention;

Figure 12 is a front schematic view of the adaptive adjusting mechanism in the protective chair for elderly psychiatric patients according to the present invention;

Figure 13 is a sectional view taken along line B-B in Figure 12;

Figure 14 is an enlarged partial view of portion C in Figure 13;

Figure 15 is a schematic view of the rear structure of the support plate in the protective chair for elderly psychiatric patients according to the present invention;

Figure 16 is an enlarged partial view of portion D in Figure 15;

Figure 17 is a schematic view of the installation of the anti-tipping assembly in the protective chair for elderly psychiatric patients according to the present invention;

Figure 18 is a front schematic view of the anti-tipping assembly in the protective chair for elderly psychiatric patients according to the present invention;

Figure 19 is a sectional view taken along line E-E in Figure 18;

Figure 20 is a schematic view of the structure of the pressure-receiving plate in the protective chair for elderly psychiatric patients according to the present invention;

Figure 21 is a front perspective structural view of the protective chair for elderly psychiatric patients according to the present invention;

Figure 22 is a rear perspective structural view of the protective chair for elderly psychiatric patients according to the present invention.

In the drawings: 1 - Seat base; 11 - Seat legs; 12 - Leg-restraining plate; 121 - Second strap; 13 - Armrest; 131 - First strap; 14 - Pressure-receiving plate; 141 - Third strap; 142 - Third spring; 143 - Connecting post; 15 - Pressure-receiving groove; 2 - Seat backrest; 21 - Receiving cavity; 22 - Support plate; 23 - Pillow; 24 - Rotating shaft; 3 - Anti-tipping assembly; 31 - Hydraulic barrel; 32 - Pressure piston; 33 - Telescopic support rod; 34 - Ground foot; 4 - Restraining mechanism; 41 - Restraining block; 42 - Restraining strap; 5 - Tightening mechanism; 51 - Rotary switch; 511 - Pushing plug; 52 - Driving gear; 521 - Rotating column; 522 - Spiral groove; 523 - Hydraulic chamber; 524 - Insertion slot; 525 - Connecting post; 53 - Driven gear; 531 - Winding rod; 54 - Fourth spring; 55 - Mounting ring; 56 - Telescopic tongue; 6 - Adaptive adjusting mechanism; 61 - Support plate; 611 - Cross-shaped movable slot; 62 - Fifth spring; 63 - Connecting rod; 631 - Piston plate; 632 - Cross push-rod; 64 - Connecting portion; 641 - Guide rod; 7 - Sliding block; 71 - First spring; 72 - Guide sliding rod; 8 - Locking assembly; 81 - U-shaped base; 811 - Connecting sleeve; 812 - Sleeving ring; 82 - L-shaped locking piece; 83 - Second spring; 84 - Limiting block; 841 - Connecting sliding rod.

Detailed Description

To make the objectives, technical solutions and advantages of the present invention clearer, the following provides a further detailed description of the invention with reference to the embodiments and the accompanying drawings. The illustrative embodiments and their descriptions are provided solely for explaining the invention and shall not be construed as limiting the invention.

In the following description, numerous specific details are set out in order to provide a thorough understanding of the present invention. However, it will be apparent to those of ordinary skill in the art that the invention may be practised without these specific details. In other embodiments, well-known structures, circuits, materials or methods are not described in detail so as to avoid obscuring the present invention.

Throughout the specification, references to "one embodiment", "an embodiment", "one example" or "an example" mean that a particular feature, structure or characteristic described in connection with the embodiment or example is included in at least one embodiment of the invention. Therefore, the appearances of the phrases "one embodiment", "an embodiment", "one example" or "an example" in various places throughout the specification do not necessarily refer to the same embodiment or example. Furthermore, particular features, structures or characteristics may be combined in any suitable combination and/or sub-combination in one or more embodiments or examples. In addition, those of ordinary skill in the art will understand that the drawings provided herein are for illustrative purposes and are not necessarily drawn to scale. The term "and/or" as used herein includes any and all combinations of one or more of the associated listed items.

In the description of the present invention, the terms "front", "rear", "left", "right", "upper", "lower", "vertical", "horizontal", "high", "low", "inner", "outer" and the like indicate orientations or positional relationships based on those shown in the drawings. They are merely for facilitating the description of the invention and simplifying the explanation, and are not intended to indicate or imply that the referenced device or element must have a particular orientation or be constructed and operated in a particular orientation. Therefore,

such terms shall not be construed as limiting the scope of protection of the present invention.

Embodiment 1

As shown in Figures. 1–10, 13, 14, 21 and 22, the present invention provides a protective chair for elderly psychiatric patients, comprising a seat base 1, a seat backrest 2 arranged above the rear side of the seat base 1, armrest frames 13 on the left and right sides, and a leg-restraining plate 12 below the front side, together forming a chair for use by elderly psychiatric patients. Seat legs 11 are respectively arranged on the left and right sides at the bottom of the seat base 1 to support the overall structure of the chair. A first strap 131 for securing the patient's hands is sleeved on each armrest 13. Two sets of leg-restraining plates 12 are provided and are rotatably arranged below the front side of the seat base 1, each being provided with a second strap 121 for securing the patient's lower legs, thereby enabling effective restraint of the patient's limbs and preventing violent limb movements. The seat backrest 2 is rotatably connected to the rear side of the seat base 1 via a rotating shaft 24, allowing the angle of the seat backrest 2 to be adjusted to improve patient comfort, with the patient's head resting on a pillow 23 arranged above the front side of the seat backrest 2. A restraining mechanism 4 is further provided on the front side of the seat backrest 2 for restraining the body of an elderly psychiatric patient to prevent excessive body movement from causing the chair to shake. The rear side of the restraining mechanism 4 is connected to a tightening mechanism 5, which is arranged on the rear side of the seat backrest 2, enabling medical staff to tighten the restraining mechanism secured across the patient's chest to firmly restrain the patient's body.

The restraining mechanism 4 comprises a restraining block 41 arranged at the central front side of the seat backrest 2, the restraining block 41 being provided with a heart-rate monitor for monitoring the patient's emotional state, and four restraining straps 42, one end of each being hooked onto fixing rings arranged around the outer wall of the restraining block 41, the other end passing through the seat backrest 2 and being connected to the tightening mechanism 5, enabling the tightening mechanism 5 to tension the restraining straps 42 to achieve effective restraint of the patient's body.

A receiving cavity 21 is provided inside the seat backrest 2, with four symmetrically arranged sliding slots 26 transversely provided at the front side of the receiving cavity 21. Sliding blocks 7 are slidably connected within the sliding slots 26, and the sliding blocks 7 are slidably connected within the receiving cavity 21 via guide sliding rods 72. First springs 71 are connected between the outer sides of the sliding blocks 7 and the inner walls on the left and right sides of the receiving cavity 21. The four restraining straps 42 respectively pass through the four sliding blocks 7 and are connected to the tightening mechanism 5. The sliding blocks 7 are fixed within the receiving cavity 21 via the guide sliding rods 72 and are slidably connected within the sliding slots 26, enabling the sliding blocks 7 to slide within the defined region of the sliding slots 26 and to return to their initial positions after sliding through the restoring force of the first springs 71. This assists the restraining straps 42 in sliding smoothly within the sliding slots 26 and maintains the restraining straps 42 in a taut state whether tightened or loosened.

The tightening mechanism 5 comprises a knob switch 51 arranged on the rear side of the seat backrest 2, the front end of the knob switch 51 being provided with a pushing plug 511, the pushing plug 511 having a U-shaped structure and penetrating the rear inner wall of the receiving cavity 21. A driving gear 52 is mounted on the front inner wall of the receiving cavity 21 via a mounting ring 55, and a telescopic tongue 56 slidably connected to the rear side of the driving gear 52 cooperates with the pushing plug 511. A connecting post 525 is provided at the central rear side of the driving gear 52, and an insertion slot 524 is formed therethrough. The telescopic tongue 56 is slidably connected within the insertion slot 524, enabling the pushing plug 511 to be inserted onto the telescopic tongue 56 within the insertion slot 524, thereby allowing the knob switch 51 to drive the driving gear 52 to rotate. Four driven gears 53 are provided and are respectively meshed around the driving gear 52, each driven gear 53 being connected to a winding rod 531, with the restraining straps 42 wound around the winding rods 531. Rotation of the driving gear 52 drives the driven gears 53 to rotate, thereby rotating the winding rods 531 to wind the restraining straps 42 and tighten the restraining mechanism 4 to restrain the patient's body.

A locking assembly 8 is further connected to the driving gear 52 to prevent the patient from breaking free from the restraint. The locking assembly 8 comprises a U-shaped base 81

mounted on the front inner wall of the receiving cavity 21, the U-shaped base 81 enclosing the outer side of the driving gear 52, with a sleeving ring 812 provided on the inner side of its central portion to sleeve onto the rear side of the driving gear 52. Two sets of L-shaped locking pieces 82 are provided and respectively enclose the outer side of the U-shaped base 81, being slidably connected to the outer side of the U-shaped base 81 via connecting sleeves 811. The inner ends of the L-shaped locking pieces 82 cooperate with the pushing plug 511. The inner ends of the L-shaped locking pieces 82 are pointed and inclined inward from both the front and rear sides, while the head of the pushing plug 511 is pointed and inclined inward from the left and right sides. When the pushing plug 511 moves forward, it forces the L-shaped locking pieces 82 to move outward. The outer ends of the L-shaped locking pieces 82 are provided with limiting blocks 84, the inner sides of the limiting blocks 84 being provided with internal teeth that abut the external teeth of the driving gear 52 to prevent rotation of the driving gear 52. Second springs 83 are arranged between the limiting blocks 84 and both ends of the U-shaped base 81. The limiting blocks 84 and the inner ends of the L-shaped locking pieces 82 are connected via connecting sliding rods 841, and the second springs 83 are sleeved on the connecting sliding rods 841 to ensure the resetting of the limiting blocks 84.

In the above embodiment, when it is necessary to restrain the patient's body using the restraining mechanism 4, medical staff may push the knob switch 51 forward, causing the pushing plug 511 to abut the inner ends of the L-shaped locking pieces 82 and force them outward, thereby driving the limiting blocks 84 connected to their inner ends to move outward, separating the limiting blocks 84 from the driving gear 52 and removing the locking effect on the driving gear 52. Simultaneously, the pushing plug 511 is inserted into the insertion slot 524, with its end inserted onto the telescopic tongue 56, enabling further rotation of the knob switch 51 to drive the driving gear 52 to rotate. The driving gear 52 drives the driven gears 53 to rotate, thereby winding the restraining straps 42 onto the winding rods 531 to tighten them.

During the tightening process, the restraining straps 42 drive the sliding blocks 7 to move towards each other along the guide sliding rods 72 within the sliding slots 26 until the restraining straps 42 secured around the patient's body are firmly tightened, thereby

achieving effective restraint of the patient's body. When the pushing plug 511 moves rearwards and returns to its initial position, the restoring force of the second springs 83 causes the L-shaped locking pieces 82 to drive the limiting blocks 84 to move inwards to lock the driving gear 52, preventing failure of the restraining effect.

Embodiment 2

As shown in Figures 1, 3, 6 and 11–16, a sponge pad 22 is further arranged on the front side of the seat backrest 2 to reduce discomfort to the patient's back after being restrained. An adaptive adjusting mechanism 6 is arranged on the rear side of the sponge pad 22, and the adaptive adjusting mechanism 6 is connected to the rotating column 521 at the front side of the driving gear 52 so as to drive the tightening mechanism 5 to tighten the restraining mechanism 4 and restrain the patient's body. The adaptive adjusting mechanism 6 is used to automatically tighten the restraining straps 42 when the patient moves violently.

The adaptive adjusting mechanism 6 comprises a support plate 61 arranged on the rear side of the sponge pad 22. A cross-shaped movable slot 611 is provided at the central portion of the support plate 61, and a cross push-rod 632 is slidably connected therein, the cross push-rod 632 protruding from the support plate 61 so that it can be compressed immediately. The rear side of the cross push-rod 632 is connected to a piston plate 631 via a connecting rod 63, and the piston plate 631 is slidably connected within the hydraulic chamber 523 inside the rotating column 521. A telescopic slot is provided at the front side of the insertion slot 524, and the telescopic tongue 56 is slidably connected between the telescopic slot and the insertion slot 524, with a fourth spring 54 sleeved on the telescopic tongue 56 within the telescopic slot. The hydraulic chamber 523 communicates with the telescopic slot, enabling movement of the piston plate 631 within the hydraulic chamber 523 to change the internal hydraulic pressure, thereby pushing the telescopic tongue 56 rearwards within the telescopic slot. Under the pressing force of the telescopic tongue 56, the L-shaped locking pieces 82 are forced to move outwards, unlocking the limiting blocks 84 from the driving gear 52. A connecting portion 64 is arranged at the central rear side of the support plate 61, and the central portion of the cross push-rod 632 is slidably connected within the connecting portion 64 so that the connecting rod 63 can drive the

piston plate 631 to move within the hydraulic chamber 523.

Two oppositely arranged guide rods 641 are provided within the connecting portion 64, and a spiral groove 522 is provided on the outer side of the rotating column 521. The guide rods 641 are slidably connected within the spiral groove 522. When the cross push-rod 632 is compressed, it simultaneously drives the support plate 61 to move rearwards on the front side of the seat backrest 2, enabling the guide rods 641 within the connecting portion 64 to move along the spiral groove 522 and thereby forcing the driving gear 52 to rotate, which in turn tightens the restraining mechanism 4.

A fifth spring 62 is also arranged between the driving gear 52 and the support plate 61, the fifth spring 62 being sleeved on the connecting portion 64. When the patient no longer presses against the support plate 61, the restoring force of the fifth spring 62 enables the support plate 61 to return to its initial position, providing sufficient movement space when the patient presses against the support plate 61 again.

In the above embodiment, when the body of an elderly psychiatric patient undergoes violent shaking, the support plate 61 and the cross push-rod 632 are compressed. The cross push-rod 632 is compressed first, causing the connecting rod 63 to drive the piston plate 631 to move rearwards within the hydraulic chamber 523, thereby compressing the liquid inside the hydraulic chamber 523 and pushing the telescopic tongue 56 rearwards within the telescopic slot. The telescopic tongue 56 then forces the L-shaped locking pieces 82 open, causing the limiting blocks 84 at their ends to disengage from the driving gear 52. Furthermore, compression of the support plate 61 causes the connecting portion 64 to move rearwards. Since the connecting portion 64 is sleeved on the rotating column 521 and the guide rods 641 are positioned within the spiral groove 522, the rearward movement of the connecting portion 64 enables the cooperation between the guide rods 641 and the spiral groove 522 to drive the driving gear 52 to rotate, thereby driving the driven gears 53 meshed around it to rotate. Through the winding rods 531, the restraining straps 42 are wound and tightened to achieve effective restraint of the patient's body, preventing excessive body movement that may cause injury. Conversely, when the support plate 61 is no longer compressed by the patient, it moves forwards under the restoring force of the fifth spring 62, and the cooperation between the guide rods 641 and the spiral

groove 522 causes reverse rotation, thereby loosening the restraining straps 42.

Embodiment 3

As shown in Figures 1, 2 and 17–20, a pressure-receiving groove 15 is provided at the top of the seat base 1, and a pressure-receiving plate 14 is mounted at the top of the pressure-receiving groove 15. The rear side of the pressure-receiving plate 14 can deform into the pressure-receiving groove 15 under the patient's own weight, and a third spring 142 (or an elastic pad) is arranged between the pressure-receiving plate 14 and the seat base 1 to restore the pressure-receiving plate 14 after deformation. An anti-tipping assembly 3 is further arranged at the bottom of the pressure-receiving plate 14 to prevent the chair from tipping. A third strap 141 is arranged at the front top side of the pressure-receiving plate 14 to restrain the patient's thighs, thereby further preventing excessive movement.

The anti-tipping assembly 3 comprises a hydraulic barrel 31 arranged at the central top of the seat base 1, with telescopic support rods 33 obliquely arranged at the rear side and at the left and right sides of the bottom of the hydraulic barrel 31. Ground feet 34 are provided at the lower ends of the telescopic support rods 33. A pressure piston 32 is mounted at the bottom of the pressure-receiving plate 14 via a connecting post 143 and is slidably connected within the hydraulic barrel 31 while maintaining its sealing. The pressure piston 32 is used to press liquid inside the hydraulic barrel 31 into the telescopic support rods 33 so that they extend and support against the ground.

In the above embodiment, when the patient's body shakes violently, the pressure-receiving plate 14 is affected by the patient's own weight during movement and deforms downwards, compressing the third spring 142. Simultaneously, the connecting post 143 drives the pressure piston 32 to move downwards within the hydraulic barrel 31, thereby compressing the liquid inside the hydraulic barrel 31. This causes the telescopic support rods 33 communicating with the hydraulic barrel 31 to extend, pressing their ground feet 34 against the ground to provide support from the left, right and rear sides of the chair, preventing the chair from tipping during violent patient movement and improving the stability of the chair.

Specific implementation case

When using the protective chair for elderly psychiatric patients, the following steps are included:

1. Restraining the limbs

The patient is seated on the pressure-receiving plate 14 at the top of the seat base 1, and the patient's hands and feet are restrained using the first straps 131 and the second straps 121 respectively. The patient's thighs are further restrained using the third straps 141 to enhance the restraining effect.

2. Restraining the body

The patient's body is simply restrained by hooking the four restraining straps 42 around the fixing rings arranged around the restraining block 41 from the patient's shoulders and underarms.

3. Passive tightening

During treatment, medical staff may push the rotary switch 51 forwards, causing the pushing plug 511 at its head to push open the L-shaped locking pieces 82, thereby disengaging the limiting blocks 84 from the driving gear 52. The pushing plug 511 is then inserted onto the telescopic tongue 56 within the insertion slot 524. By rotating the rotary switch 51, the driving gear 52 is driven to rotate, which in turn drives the driven gears 53 to rotate. Through the winding rods 531, the restraining straps 42 are wound and tightened, firmly restraining the patient's body. Afterwards, the rotary switch 51 returns to its initial position, and the limiting blocks 84 lock the driving gear 52 again to prevent failure of the restraining effect.

4. Active tightening

When the patient becomes emotionally agitated and moves violently, the cross push-rod 632 and the support plate 61 on the seat backrest 2 are compressed. As the cross push-rod 632 protrudes from the support plate 61, it first drives the piston plate 631 rearwards within the hydraulic chamber 523 via the connecting rod 63, compressing the liquid inside and pushing the telescopic tongue 56 rearwards within the telescopic slot. The telescopic tongue 56 then pushes open the L-shaped locking pieces 82, causing the

limiting blocks 84 to disengage from the driving gear 52. Simultaneously, the support plate 61 drives the connecting portion 64 to move rearwards. Through the cooperation between the guide rods 641 and the spiral groove 522, the rotating column 521 rotates, thereby driving the driving gear 52 to rotate, which in turn drives the driven gears 53 to rotate. Through the winding rods 531, the restraining straps 42 are wound and tightened to restrain the patient's body, preventing excessive movement that may interfere with medical treatment. When the patient's emotional state stabilises, the compression on the support plate 61 and the cross push-rod 632 decreases. Under the restoring force of the fifth spring 62, the driving gear 52 rotates in the reverse direction, driving the driven gears 53 to rotate in reverse and releasing the restraining straps 42 via the winding rods 531, preventing excessive restraint when the patient is relaxed.

5. Preventing chair tipping

When the patient's body shakes violently, the pressure-receiving plate 14 is compressed by the patient's weight and movement, causing it to deform downwards. The connecting post 143 then drives the pressure piston 32 to move downwards within the hydraulic barrel 31, compressing the liquid inside and forcing it into the telescopic support rods 33. The telescopic support rods 33 extend until their ground feet 34 press against the ground, providing support from the left, right and rear sides to prevent the chair from tipping during violent movement. This improves the stability of the chair, provides effective protection for elderly psychiatric patients and ensures their safety.

The above detailed embodiments further illustrate the objectives, technical solutions and beneficial effects of the present invention. It should be understood that the above are merely specific embodiments of the present invention and are not intended to limit the scope of protection of the invention. Any modifications, equivalent substitutions or improvements made within the spirit and principles of the present invention shall fall within the scope of protection of the invention.