DEVICE FOR MAGNETIC RESONANCE IMAGING

Field of the Invention

The invention relates to the technical field of medical instruments, and specifically to a device for magnetic resonance imaging.

Background to the Invention

A device for magnetic resonance imaging is medical equipment that uses magnetic fields and radio waves to generate detailed images of internal human structures; it can be used for disease diagnosis and condition monitoring and is one of the important devices in the medical field. During use, after a patient has used the device, sweat may remain, and for patients with infectious diseases such as influenza, tuberculosis, and hepatitis B, or subjects carrying pathogens, the equipment must be disinfected and cleaned after examination, otherwise cross-infection may occur. To overcome this defect, the prior art 1 (Chinese patent application with application number 202211360400.4, filed on 2022-11-02) discloses a multifunctional MRI device for imaging departments, wherein during use, a water pump sprays disinfectant inside a disinfection box onto the upper side of a contact pad via an atomising nozzle, and a heating element heats the contact pad via a moving plate so as to dry the disinfectant on the upper side of the contact pad, thereby achieving automatic disinfection of the contact pad and effectively improving the convenience of use of the device.

However, during disinfection, if disinfection cannot be performed from multiple angles over a wide range, the disinfection effect will be significantly insufficient, and the device in the above application, during use, does not have a structure for multi-angle spraying disinfection, so the overall safety of the device remains insufficient.

Statement of Invention

The object of the invention is to overcome the problems in the background art whereby, during use, there is no structure for multi-angle spraying disinfection and the overall safety

of the device remains insufficient, and to design a device that can self-disinfect after use, with a spraying component capable of working over a wide range.

To achieve the above object, the technical approach adopted by the invention is: during operation, through the provided actuating block and outer frame, the main body is such that the actuating block and outer frame are in a non-working state, so the bedboard is not in a disinfecting state; after the main body finishes operation and the patient leaves the bedboard, the airbag is intermittently compressed by the force-bearing plate, the airbag supplies the sprayer, and the sprayer and the rotating rod, under the action of the rack plate and working gear, are in a swinging state, offering a wide disinfection range and high efficiency, thereby improving the overall safety of the main body and the bedboard.

Based on the above technical approach, the technical solution adopted by the invention is: a device for magnetic resonance imaging, comprising a main body, an equipment box and a movable plate, the main body being provided on the left side of the equipment box, a bedboard being slidably provided on the upper surface of the equipment box, and the end of the bedboard being fixedly connected to a fixing plate; an external plate is fixedly connected to the outer wall of the movable plate, a connecting shaft is rotatably arranged inside the external plate, and the outer end of the connecting shaft is fixedly connected to an auxiliary plate; a placement plate is fixedly connected to the outer wall of the movable plate, an airbag is adhesively connected to the upper surface of the placement plate, and a force-bearing plate is connected to the outer wall of the movable plate via a lifting mechanism; a sprayer is connected to the inner side of the movable plate via a swinging mechanism.

Preferred, the outer wall of the movable plate is fixedly connected with guide rods, the guide rods penetrate the interior of the fixing plate, the guide rods are symmetrically distributed on both sides of the movable plate, and a reset spring is fixedly connected between the movable plate and the fixing plate, the outer wall of the movable plate is fixedly connected with a damping rod, and the output end of the damping rod is fixedly connected to the inner side of the fixing plate.

Preferred, the outer wall of the movable plate is fixedly connected with a transition shaft,

the surface of the fixing plate is fixedly connected with a traction rope, the end of the traction rope is wound and fixedly connected to the surface of the connecting shaft, and the traction rope bypasses the transition shaft, an inner rod is rotatably arranged inside the auxiliary plate, the surface of the inner rod is fixedly connected with an actuating block, the surface of the connecting shaft is fixedly connected with a spiral spring, and the other side of the spiral spring is fixedly connected to the inner wall of the external plate.

Preferred, a rotating shaft is rotatably arranged on the outer wall of the movable plate, the inner end of the rotating shaft is fixedly connected with an outer frame, teeth blocks are formed on the inner wall of the outer frame, the actuating block is located inside the outer frame, the surface of the actuating block is of an arc-shaped structure, and a torsion spring is fixedly connected between the inner rod and the auxiliary plate.

Preferred, the end of the rotating shaft is fixedly connected with a cam, the lifting mechanism comprises a limiting plate fixedly connected to the outer wall of the movable plate, the limiting plate being viewed from the right as an inverted “U”, and the surface of the limiting plate is sleeved and connected with the force-bearing plate.

Preferred, the lower surface of the force-bearing plate is fixedly connected with a connecting spring providing elastic reset, and the other side of the connecting spring is fixedly connected to the inner wall of the limiting plate.

Preferred, the side surface of the airbag is fixedly connected with a feeding pipe, the front end of the airbag is fixedly connected with a replenishing pipe, and both the surface of the feeding pipe and the surface of the replenishing pipe are fixedly connected with one-way valves.

Preferred, the end of the connecting shaft is fixedly connected with a circular plate, the outer wall of the movable plate is fixedly connected with an outer rod, the surface of the outer rod is sleeved and connected with a working plate, and both sides of the working plate and the surface of the circular plate are fixedly connected with guide blocks.
Preferred, adjacent guide blocks are movably connected with an external rod, the swinging mechanism comprises a rotating rod vibrationally arranged on the inner side of the movable plate, and further comprises a rack plate fixedly connected to the upper surface of

the working plate, the rack plate being bent. Preferred, the rotating rod is fixedly connected with the sprayer, the sprayer is connected to the feeding pipe via an external hose, and the surface of the rotating rod is fixedly connected with a working gear meshing with the rack plate.

Compared with the prior art, the beneficial effects of the invention are that, by means of the actuating block and the outer frame, the main body is such that during operation the actuating block and the outer frame are in a non-working state, so the bedboard is not in a disinfecting state, that is, when the patient lies on the bedboard and the main body performs normal examination, the airbag is not in operation, so the patient will not become wet due to spraying of disinfectant, thereby improving comfort, whereas after the main body finishes operation and the patient leaves the bedboard, the airbag is intermittently compressed by the force-bearing plate, the airbag supplies the sprayer, and the sprayer and the rotating rod, under the action of the rack plate and the working gear, are in a swinging state, giving a wide disinfection range, high efficiency, and improving the overall safety of the main body and the bedboard:

(1) During operation, the patient lies on the bedboard and presses the movable plate with the feet, causing the movable plate to move towards the reset spring; after operation the patient leaves the bedboard, the movable plate returns under the action of the reset spring, the airbag is intermittently compressed, the sprayer is in a swinging state, and the airbag supplies the swinging sprayer, thereby achieving self-disinfection with wide coverage and improving overall safety.

(2) After the patient leaves the bedboard, when the movable plate returns, the connecting shaft rotates under the action of the traction rope, at this time the connecting shaft drives the outer frame and the rotating shaft via the auxiliary plate and the actuating block, the cam intermittently pushes the force-bearing plate, the force-bearing plate moves vertically under the action of thrust, the limiting plate and the connecting spring, the airbag is intermittently compressed, while when the patient initially lies on the bedboard and the movable plate is close to the fixing plate, the connecting shaft reverses under the action of the spiral spring, the actuating block does not drive the outer frame, so only after the patient leaves does the device self-disinfect, improving flexibility.

(3) When the connecting shaft rotates, it drives the circular plate, the circular plate rotation, through cooperation of the guide blocks, external rod and outer rod, drives the working plate to move vertically, the working plate then drives the sprayer and the rotating rod to rotate via the rack plate and the working gear, thereby increasing the working range of the sprayer and broadening the disinfection coverage.

(4) During operation of the airbag and sprayer, the feeding pipe supplies the sprayer, and after long use when disinfectant inside the airbag is reduced, the replenishing pipe can add disinfectant to the airbag, increasing endurance.

(5) During operation of the force-bearing plate and the airbag, they only start after the patient leaves the bedboard, so when the patient lies on the bedboard and the main body performs normal examination, the airbag is not in operation, the patient will not become wet due to spraying of disinfectant, thereby improving comfort.

Brief Description of the Drawings

In order to more clearly illustrate the technical solutions of the embodiments of the invention or of the prior art, the drawings required in the description of the embodiments or the prior art are briefly introduced below. It is obvious that the drawings described below are merely some embodiments of the invention, and for those skilled in the art, other drawings can also be obtained on the basis of these drawings without creative effort.

Figure 1 is a schematic diagram of the overall structure of the main body of the invention.

Figure 2 is a schematic diagram of the connection structure between the movable plate and the fixing plate of the invention.

Figure 3 is a schematic diagram of the cut-section state structure of the external plate of the invention.

Figure 4 is a schematic diagram of the cut-section state structure of the auxiliary plate of the invention.

Figure 5 is a schematic diagram of the enlarged structure at position A in Figure 4 of the invention.

Figure 6 is a schematic diagram of the connection structure between the rotating shaft and the cam of the invention.

Figure 7 is a schematic diagram of the connection structure between the movable plate and the outer rod of the invention.

Figure 8 is a schematic diagram of the connection structure between the working plate and the outer rod of the invention.

Figure 9 is a schematic diagram of the connection structure between the rotating rod and the sprayer of the invention.

Figure 10 is a schematic diagram of the swinging state structure of the sprayer of the invention.

In the drawings: 1 - Main body; 2 - Equipment box; 3 - Bedboard; 4 - Fixing plate; 5 - Movable plate; 6 - Traction rope; 7 - Transition shaft; 8 - Guide rod; 9 - Damping rod; 10 - Reset spring; 11 - External plate; 12 - Connecting shaft; 13 - Spiral spring; 14 - Auxiliary plate; 15 - Inner rod; 16 - Actuating block; 17 - Torsion spring; 18 - Rotating shaft; 19 - Outer frame; 20 - Cam; 21 - Limiting plate; 22 - Force-bearing plate; 23 - Placement plate; 24 - Connecting spring; 25 - Circular plate; 26 - Guide block; 27 - Working plate; 28 - External rod; 29 - Outer rod; 30 - Rack plate; 31 - Rotating rod; 32 - Sprayer; 33 - Working gear; 34 - Airbag.

Detailed Description

The invention is further explained below in conjunction with specific embodiments. It should be understood that these embodiments are provided solely for illustrating the invention and are not intended to limit the scope of the invention. It should also be understood that, after reading the content disclosed herein, those skilled in the art may make various changes or modifications to the invention, and such equivalent forms likewise fall within the scope defined by the appended claims of this application.

Embodiment 1

By means of the actuating block 16, the inner rod 15 and the torsion spring 17, the rotating

shaft 18 does not rotate when the patient is being examined, so that the force-bearing plate 22 and the airbag 34 are not in operation, thereby ensuring high fluency when the main body 1 is working and the patient is being examined. As shown in Figures 1–5, the embodiment comprises the main body 1, the equipment box 2 and the movable plate 5, the main body 1 being arranged on the left side of the equipment box 2, the upper surface of the equipment box 2 being slidably provided with a bedboard 3, and the end of the bedboard 3 being fixedly connected with a fixing plate 4; the outer wall of the movable plate 5 is fixedly connected with an external plate 11, a connecting shaft 12 is rotatably arranged inside the external plate 11, and the outer end of the connecting shaft 12 is fixedly connected with an auxiliary plate 14; the outer wall of the movable plate 5 is fixedly connected with a placement plate 23, the upper surface of the placement plate 23 is adhesively connected with an airbag 34, and the outer wall of the movable plate 5 is connected with a force-bearing plate 22 via a lifting mechanism; the outer wall of the movable plate 5 is fixedly connected with guide rods 8, the guide rods 8 penetrate the interior of the fixing plate 4, the guide rods 8 are symmetrically distributed on both sides of the movable plate 5, and a reset spring 10 is fixedly connected between the movable plate 5 and the fixing plate 4, the outer wall of the movable plate 5 is fixedly connected with a damping rod 9, and the output end of the damping rod 9 is fixedly connected to the inner side of the fixing plate 4.

The outer wall of the movable plate 5 is fixedly connected with a transition shaft 7, the surface of the fixing plate 4 is fixedly connected with a traction rope 6, the end of the traction rope 6 is wound and fixedly connected to the surface of the connecting shaft 12, and the traction rope 6 bypasses the transition shaft 7, an inner rod 15 is rotatably arranged inside the auxiliary plate 14, the surface of the inner rod 15 is fixedly connected with an actuating block 16, the surface of the connecting shaft 12 is fixedly connected with a spiral spring 13, and the other side of the spiral spring 13 is fixedly connected to the inner wall of the external plate 11.

A rotating shaft 18 is rotatably arranged on the outer wall of the movable plate 5, the inner end of the rotating shaft 18 is fixedly connected with an outer frame 19, teeth blocks are formed on the inner wall of the outer frame 19, the actuating block 16 is located inside the

outer frame 19, the surface of the actuating block 16 is of an arc-shaped structure, and a torsion spring 17 is fixedly connected between the inner rod 15 and the auxiliary plate 14.

The end of the rotating shaft 18 is fixedly connected with a cam 20, the lifting mechanism comprises a limiting plate 21 fixedly connected to the outer wall of the movable plate 5, the limiting plate 21 being viewed from the right as an inverted “U”, and the surface of the limiting plate 21 is sleeved and connected with the force-bearing plate 22.

The lower surface of the force-bearing plate 22 is fixedly connected with a connecting spring 24 providing elastic reset, and the other side of the connecting spring 24 is fixedly connected to the inner wall of the limiting plate 21.

During operation, the patient lies on the bedboard 3 and pushes the movable plate 5 with the feet, causing the movable plate 5 to drive the guide rods 8 to slide inside the fixing plate 4, while the reset spring 10 is compressed. At this time, the connecting shaft 12 rotates inside the external plate 11 under the action of the spiral spring 13, and the actuating block 16 does not drive the outer frame 19 to work. The actuating block 16 and the inner rod 15, under the thrust of the outer frame 19 and the action of the torsion spring 17, are in a reciprocating motion state, and finally the connecting shaft 12 winds the traction rope 6.

When the main body 1 finishes operation and the patient leaves the bedboard 3, the movable plate 5 moves back under the action of the reset spring 10 and the damping rod 9. At this time, the fixing plate 4 drives the connecting shaft 12 to rotate in reverse inside the external plate 11 via the traction rope 6, the auxiliary plate 14 and the actuating block 16 drive the outer frame 19 to rotate, and the rotating shaft 18 drives the cam 20 to intermittently push the force-bearing plate 22. When the force-bearing plate 22 is pushed by the cam 20, the force-bearing plate 22 descends along the surface of the limiting plate 21, moving in the direction of compressing the connecting spring 24, and when the force-bearing plate 22 is not pushed by the cam 20, the force-bearing plate 22 rises under the action of the connecting spring 24. At this time, the airbag 34 is intermittently compressed, and the airbag 34 supplies the sprayer 32 via the feeding pipe and external hose, so that the sprayer 32 sprays disinfectant. Thus, only after the patient finishes examination and leaves the bedboard 3 does the sprayer 32 begin to work, disinfecting the

bedboard 3 and improving safety.

Embodiment 2

Different from Embodiment 1, by means of the traction rope 6, after the patient leaves the bedboard 3, the connecting shaft 12 rotates inside the external plate 11, thereby enabling the rotating shaft 18, the cam 20, the force-bearing plate 22 and the airbag 34 to operate, so that the sprayer 32 can normally spray disinfectant. As shown in Figures 6–10, the inner side of the movable plate 5 is connected with the sprayer 32 via a swinging mechanism, the end of the connecting shaft 12 is fixedly connected with a circular plate 25, the outer wall of the movable plate 5 is fixedly connected with an outer rod 29, the surface of the outer rod 29 is sleeved and connected with a working plate 27, and both sides of the working plate 27 and the surface of the circular plate 25 are fixedly connected with guide blocks 26. Adjacent guide blocks 26 are movably connected with an external rod 28. The swinging mechanism comprises a rotating rod 31 vibrationally arranged on the inner side of the movable plate 5, and further comprises a rack plate 30 fixedly connected to the upper surface of the working plate 27, the rack plate 30 being bent.

The rotating rod 31 is fixedly connected with the sprayer 32, the sprayer 32 is connected to the feeding pipe via an external hose, and the surface of the rotating rod 31 is fixedly connected with a working gear 33 meshing with the rack plate 30. During rotation of the connecting shaft 12, the circular plate 25 is driven to rotate, and when the circular plate 25 rotates, it drives the working plate 27 to move via the guide blocks 26 and the external rod 28. When the working plate 27 moves, it is limited by the outer rod 29, so the working plate 27 can only move vertically. Thus, under the action of the guide blocks 26, the outer rod 29 and the external rod 28, the working plate 27 performs reciprocating linear motion in the vertical direction, synchronously driving the rack plate 30 to move. At this time, the rack plate 30 cooperates with the working gear 33 to drive the rotating rod 31 to rotate, and the rotating rod 31 drives the sprayer 32 to swing reciprocally, thereby expanding the working range of the sprayer 32 and improving the disinfection effect.

Embodiment 3

Different from Embodiment 2, by means of the one-way valves, the flow direction of the

disinfectant is more stable and backflow does not occur, thereby increasing the overall operational stability of the device. As shown in Figure 6, the side surface of the airbag 34 is fixedly connected with a feeding pipe, the front end of the airbag 34 is fixedly connected with a replenishing pipe, and both the surface of the feeding pipe and the surface of the replenishing pipe are fixedly connected with one-way valves. During operation of the airbag 34, the material inside the airbag 34 is consumed, and after long use, the replenishing pipe can be used to add raw material to the airbag 34 so that the airbag 34 can operate normally. When the airbag 34 is in operation, the one-way valves on the surfaces of the feeding pipe and the replenishing pipe ensure that the working direction of the disinfectant is from the airbag 34 to the sprayer 32, preventing backflow and ensuring stable operation.

The above content provides further detailed description of the invention in conjunction with specific preferred embodiments, to facilitate understanding and application of the invention by those skilled in the art, and should not be construed as limiting the specific embodiments of the invention to these descriptions. For ordinary technicians in the technical field of the invention, several simple deductions or substitutions may be made without departing from the concept of the invention and without creative effort. Therefore, simple improvements made to the invention by those skilled in the art based on the disclosure of the invention should fall within the protection scope of the invention.