

A DEVICE FOR CHEST RADIOGRAPHY ON WHEELCHAIR-BOUND PATIENTS

Field of the Invention

This invention relates to medical equipment. Particularly, this invention relates to an apparatus to facilitate radiography on wheelchair bound patients. More particularly, this invention relates to a portable apparatus for holding an imaging cassette to facilitate radiography on wheelchair bound patients. Still more particularly, this invention relates to a portable apparatus that allows adjustment of the imaging cassette to a required height.

Prior Art

Medical imaging equipment is known to be cumbersome due to its size and weight. Due to its size and weight, it is the practice of radiographers to adjust the patient to the required position in order to capture an image of the area of anatomy desired by the medical practitioner. This poses a challenge to the infirmed and/or elderly as they have difficulties adjusting themselves to the required position.

Some known medical imaging equipment has been devised to allow positioning of the cassette in relation to the patient. One example is as shown in US 6,722,783 granted on 20 April 2004 where the imaging device is incorporated in a portable, padded chair. Particularly, the imaging device is provided in the backrest so that the patient is comfortably supported when taking X-rays. However, one concern is that patients are required to be transferred to the padded chair in order to take an X-ray image. Another concern is that maintenance of the padded chair is high since the padded chair needs to be disinfected for every use to ensure high level of hygiene.

Another example is that as shown in US 4,589,124 granted on 13 May 1986 where a cassette holder is provided. The cassette holder is mountable onto a wheelchair

with a pair of jaws. The pair of jaws is clamped to each sides of the backrest of the wheelchair at a required height in order to accurately capture the image of the anatomy desired by the medical practitioner. However, one major flaw is that most, if not all, wheelchairs are collapsible. The use of the pair of jaws with springs provided to bring the pair of jaws together induces the wheelchair to move to the retracted position. In doing so, the patient is being squeeze between the armrests. Further, the use of the pair of jaws require the radiographers a certain amount of effort and time to accurately clamp the cassette holder onto the wheelchair.

Hence, those skilled in the art are striving to provide an improved apparatus that facilitates efficient capturing X-ray image of patients on wheelchair.

Summary of the Invention

The above and other problems are solved and an advance in the art is made by a portable imaging cassette holder in accordance with this invention. A first advantage of the portable imaging cassette holder in accordance with this invention is that the portable imaging cassette holder is light and easy handle. A second advantage of the portable imaging cassette holder in accordance with this invention is that the portable imaging cassette holder allows adjustment of the imaging cassette to a required position with minimal fuss. A third advantage of the portable imaging cassette holder in accordance with this invention is that the portable imaging cassette holder allows changing of the imaging cassette easily. A fourth advantage of the portable imaging cassette holder in accordance with this invention is that the portable imaging cassette holder is adaptable to a wheelchair. Hence, the patient can sit comfortably on his/her wheelchair while taking an X-ray image.

In accordance with an aspect of the invention, a portable imaging cassette holder for a wheelchair is provided in the following manner. The portable imaging cassette holder for a wheelchair comprises an outer frame, an inner frame and a securing grip. The outer frame has a base plate defining a slot and a guide having an elongated aperture. The inner frame is slidably receivable in the slot of the outer frame and further defines a slot to receive an imaging cassette. The securing grip has a grip and an extension extending from an end of the grip. The extension extends through the elongated aperture and couples to the inner frame. The outer frame is arranged between the inner frame and the securing grip such that rotating the securing grip in one direction locks the inner frame to the outer frame and rotating the securing grip in opposing direction unlocks the inner frame from the outer frame in which the inner frame is movable within the outer frame.

In accordance with an embodiment of this invention, the base plate of the outer frame has a top edge, a bottom edge, a first side and a second side. The outer frame further comprises a sidewall extending from a front surface of the base plate and along the first side, the second side and the bottom edge. A retaining wall extends vertically, with respect to the front surface of the base plate, from a portion of the sidewall proximate the bottom edge of the base plate. The outer frame further comprises a first notch abutting the sidewall at the first side and a second notch abutting the sidewall at the second side. The first and second notches are arranged at opposing sides of the base plate. Further, the first and second notches extend beyond the bottom edge.

In accordance with an embodiment of this invention, the guide of the outer frame extends out from a back surface of the base plate proximate the top edge and between the first and second sides. The guide further defines an elongated void having a length, width and depth.

In accordance with an embodiment of this invention, the outer frame further comprises a canvas hook at a back surface of the base plate. Still further, the outer frame comprises a handle extending from said top edge. Preferably, the handle has a hollow
5 body defining a through opening such that the inner frame is insertable through the through opening.

In accordance with an embodiment of this invention, the inner frame comprises a plate having a top edge, a bottom edge, a first side and a second side. The inner frame
10 further comprises an L-shape wall extending along the first side, the bottom edge and the second side. The L-shape wall and the plate define a slot to receive the imaging cassette. Further, the plate comprises a number of through openings. Each of the through openings is spaced apart from each other.

15 In accordance with an embodiment of this invention, the extension of said securing grip has a threaded surface and the plate of the inner frame has a threaded aperture proximate the top edge and between the first and second sides. The threaded aperture is arranged to receive the extension.

20 In accordance with an embodiment of this invention the portable imaging cassette holder is made of anodized aluminium.

Brief Description of the Drawings

The above and other features and advantages in accordance with this invention
25 are described in the following detailed description and are shown in the following drawings:

Figure 1 illustrating a perspective view of an apparatus in accordance with an embodiment of this invention;

Figure 2 illustrating a perspective view of the apparatus with an imaging cassette in accordance with an embodiment of this invention;

5 Figure 3 illustrating an exploded view of the apparatus in accordance with an embodiment of this invention;

Figure 4 illustrating a front view of an outer frame of the apparatus in accordance with an embodiment of this invention;

10 Figure 5 illustrating a rear view of the outer frame of the apparatus in accordance with an embodiment of this invention;

Figure 6 illustrating a side view of the outer frame of the apparatus in accordance with an embodiment of this invention;

Figure 7 illustrating a perspective view of the outer frame of the apparatus in accordance with an embodiment of this invention;

15 Figure 8 illustrating a front view of an inner frame of the apparatus in accordance with an embodiment of this invention;

Figure 9 illustrating a rear view of the inner frame of the apparatus in accordance with an embodiment of this invention;

20 Figure 10 illustrating a perspective view of the inner frame of the apparatus in accordance with an embodiment of this invention;

Figure 11 illustrating a side view of a securing grip of the apparatus in accordance with an embodiment of this invention;

Figure 12 illustrating a perspective view of a conventional wheelchair; and

Figure 13 illustrating the apparatus being arranged on the conventional wheelchair.

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Detailed Description

This invention relates to medical equipment. Particularly, this invention relates to an apparatus to facilitate radiography on wheelchair bound patients. More particularly, this invention relates to a portable apparatus for holding an imaging cassette to facilitate radiography on wheelchair bound patients. Still more particularly, this invention relates to a portable apparatus that allows adjustment of the imaging cassette to a required height.

Figure 1 illustrates an apparatus 100 in accordance with an embodiment of this invention. Figure 2 illustrates an imaging cassette 190 being secured to the apparatus 100. Figure 3 illustrates an exploded view of the apparatus 100. As shown in figure 3, the apparatus 100 comprises an outer frame 110, an inner frame 120, and a securing grip 130 provided at the back of the outer frame 110.

Figure 4 illustrates a front view of the outer frame 110. Figure 5 illustrates a rear view of the outer frame 110. Figure 6 illustrates a side view of the outer frame 110. Figure 7 illustrates a perspective view of the outer frame 110. As shown in figures 4-7, the outer frame 110 comprises a base plate 210, sidewall 220, semi-circular notches 230, and a handle 250. The base plate 210 has a top edge 211, bottom edge 212, first side edge 213, second side edge 214, a front surface 215 and a back surface 216. A guide 240 is defined proximate top edge 211 and between first and second edges 213 and 214. The guide 240 extends out from the back surface 216 of the base plate 210 defining an elongated void 241 having a length 242, width 243 and depth 244. An elongated aperture 245 is defined along the length 242 of the guide 240 for guiding the securing grip 130. Particularly, the elongated aperture 245 is 150mm in length. One skilled in the art will recognise that the elongated aperture 245 may be configured with other length without departing from the invention.

Sidewall 220 extends out of the front surface 215 and along the first side edge 213, bottom edge 212 and second side edge 214. A retaining wall 221 parallel to the front surface 215 of the base plate extends from a portion of the sidewall 220. Particularly, the retaining wall 221 extends vertically from the sidewall 220 in the region proximate the bottom edge 212. The sidewall 220 together with retaining wall 221 defines a slot to receive and hold the inner frame 120. One skilled in the art will recognise that the retaining wall 211 only needs to be provided at the region proximate the bottom edge and need not extend to the full length of the first and second edge in order to hold the inner frame 120.

A pair of notches 230 and 231 is provided against the sidewall 220. Particularly, the first notch 230 is abutting the sidewall at the first side edge 213 and the second notch 231 is abutting the sidewall at the second side edge 214. The first and second notches 230 and 231 are arranged at opposing sides of the base plate 210. The first and second notches 230 and 231 are shaped accordingly to receive the rods supporting the backrest of a wheelchair. In use, the pair of notches 230 receives the rods supporting the backrest of a wheelchair, securing the apparatus to the wheelchair. The first and second notches 230 and 231 provide added grip and stability onto the frame of the wheelchair. Further, since the chest area of the patient is typically a certain distance away from the seat of the wheelchair, each of the first and second notches 230 and 231 extend beyond the bottom edge 212 to elevate the apparatus 100 from the seat of the wheelchair. Although the first and second notches 230 and 231 as shown in figures 4-7 are rectangular in shape, one skilled in the art will recognise that other shapes such as the semi circular shape as shown in figures 1 and 2 may be implemented without departing from the invention.

A canvas hook 260 is provided at the back surface 216 of the base plate 210. The canvas hook 260 enables the apparatus to be secured to the wheelchair's backrest

preventing forward displacement. The canvas hook 260 is provided below and adjacent to the guide 240.

The handle 250 extends from the top edge 211. As shown in figure 7, the handle 250 is a hollow body defining a through opening 251 allowing the inner frame 120 to be inserted through the through opening 251. Nevertheless, one skilled in the art will recognise that the handle 250 may be a solid body without departing from the invention. The handle 250 comprises a pair of apertures 252 and 253 for a user to hold the apparatus 100.

Figure 8 illustrates a front view of the inner frame 120. Figure 9 illustrates a rear view of the inner frame 120. Figure 10 illustrates a perspective view of the inner frame 120. As shown in figures 8-10, the inner frame 120 comprises a plate 830 having a top edge 831, a bottom edge 832, a first side 833 and a second side 834. An L-shape wall 820 extends along the first side 833, bottom edge 832 and second side 834. The plate 830 together with the L-shape wall 820 defines a slot for receiving an imaging cassette.

The plate 830 has a threaded aperture 850 proximate top edge 831 and between first and second sides 833 and 834. The threaded aperture 850 is provided to receive threaded extension 1120 of securing grip 130.

A number of through openings 860 are provided on the plate 830. Each of the through openings 860 is spaced apart from each such that structural rigidity of the plate 830 is not compromised. This configuration reduces the overall weight of the apparatus without compromising on structural rigidity.

The plate 830 is made of anodized aluminium with a thickness of 25mm. One skilled in the art will recognise that other materials may be used without departing from the invention.

5 Figure 11 illustrates a side view of the securing grip 130. As shown, the securing grip 130 comprises a grip 1110 and a threaded extension 1120 extending from one end of the grip 1110. The threaded extension 1120 is inserted through the elongated aperture 245 of guide 240 and received by the threaded aperture 850. The threaded extension 1120 has a length that is slightly less than the total length of the depth of guide 240 and
10 threaded aperture 850. This ensures that a simple a clockwise twist brings the inner frame 120, outer frame 110 and securing grip 130 together and in doing so, clamping the inner frame 120 to the outer frame 110.

 Figures 12 and 13 illustrate the use of the apparatus 100. Particularly, figure 12
15 shows a conventional wheelchair 1200 and figure 13 shows the apparatus 100 being arranged on the wheelchair 1200. For clarity, an imaging cassette 190 is not loaded onto the slot of the inner frame 120 in figure 13. The apparatus 100 may be used in the following manner. First, a user slots an imaging cassette through the through opening 251 and slides the imaging cassette to the slot of the inner frame 120. Alternatively, the user
20 may slot the imaging cassette via the front opening and into the slot of the inner frame 120. Secondly, the apparatus 100 is arranged against the backrest 1210 of the wheelchair 1200 with the pair of notches 230 receiving the rods 1220 and 1230 of the wheelchairs and the canvas hook 260 hooking onto the backrest 1210. One skilled in the art will recognise that steps 1 and 2 may be interchangeably arranged without departing
25 from the invention. Next, the inner frame 120 is easily moved by the securing grip 130 to a required position. A subsequent clockwise twist locks the inner frame 120 to the outer frame 110. One skilled in the art will recognise that the threaded extension 1120 and

threaded aperture 850 may be modified to lock the inner frame 120 to the outer frame 110 with an anti-clockwise twist without departing from the invention.

Essentially, the apparatus 100 is a portable imaging cassette holder adapted for use on a wheelchair. The portable imaging cassette holder allows adjustment of the imaging cassette to a required position so that an image of the chest of a patient can be captured accurately. The apparatus 100 is made entirely of anodized aluminium and consists of two parts namely an outer frame 110 and an inner frame 120. The inner frame 120 is for holding a radiographic imaging cassette. The imaging plate can be easily slotted into the inner frame via the front opening and into the slot of the inner frame. A securing grip 130 is provided to allow a user to move the inner frame 120, with respect to the outer frame, to a required position.

The apparatus 100 provides a 150mm allowance for the imaging cassette height translation. Vertical translation of the imaging cassette can be achieved by manually adjusting the inner frame 120 to a required height with the securing grip 130 before locking the inner frame 120 to the outer frame 110 by simply activating the locking mechanism with a clockwise twist of the securing grip 130. A subsequent anti-clockwise twist unlocks the inner frame 120 from the outer frame 110.

Imaging cassette can be easily changed and all parts of the apparatus 100 can be detached for cleaning. The apparatus 100 is light weight and hence, easy to handle with one hand.

The outer frame 110 and inner frame 120 are configured with dimension to support all 35cm by 43cm imaging cassette. The weight of the apparatus 100 without

imaging cassette is 2.6kg. With the imaging cassette, the total weight of the apparatus 100 is 3.6kg.

5 The above is a description of exemplary embodiments of an apparatus in accordance with this invention. It is foreseeable that those skilled in the art can and will design alternative devices based on this disclosure that infringe upon this invention as set forth in the following claims.

Claims:

1. A portable imaging cassette holder for a wheelchair comprising:

an outer frame having a base plate defining a slot and a guide having an
5 elongated aperture;

an inner frame slidably receivable in said slot of said outer frame, said inner frame
defining a slot to receive an imaging cassette; and

a securing grip having a grip and an extension extending from an end of said grip,
said extension extends through said elongated aperture and couples to said inner frame,
10 wherein said outer frame is arranged between said inner frame and said securing grip
such that rotating said securing grip in one direction locks said inner frame to said outer
frame and rotating said securing grip in opposing direction unlocks said inner frame from
said outer frame in which said inner frame is movable within said slot of said outer frame.

15 2. The portable imaging cassette holder according to claim 1 wherein said base plate
of said outer frame has a top edge, a bottom edge, a first side and a second side.

3. The portable imaging cassette holder according to claim 1 wherein said outer
frame further comprises:

20 a sidewall extending from a front surface of said base plate and along said first
side, said second side and said bottom edge; and

a retaining wall extending vertically from a portion of said sidewall proximate said
bottom edge of said base plate.

25 4. The portable imaging cassette holder according to claim 3 wherein said outer
frame further comprises:

a first notch abutting said sidewall at said first side and a second notch abutting said sidewall at said second side, said first and second notches opposing each other.

5. The portable imaging cassette holder according to claim 4 wherein said first and
5 second notches extend beyond said bottom edge.

6. The portable imaging cassette holder according to claim 2 wherein said guide
extends out from a back surface of said base plate proximate said top edge and between
said first and second side, said guide defining an elongated void having a length, width
10 and depth.

7. The portable imaging cassette holder according to claim 2 wherein said outer
frame further comprises a canvas hook at a back surface of said base plate.

15 8. The portable imaging cassette holder according to claim 2 wherein said outer
frame further comprises a handle extending from said top edge.

9. The portable imaging cassette holder according to claim 8 wherein said handle
has a hollow body defining a through opening such that said inner frame is insertable
20 through said through opening.

10. The portable imaging cassette holder according to claim 1 wherein said inner
frame further comprises a plate having a top edge, a bottom edge, a first side and a
second side.

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11. The portable imaging cassette holder according to claim 10 wherein said inner
frame further comprises an L-shape wall extending along said first side, said bottom edge

and said second side, said L-shape wall and said plate defining said slot to receive said imaging cassette.

12. The portable imaging cassette holder according to claim 10 wherein said plate
5 comprises a plurality of through openings, each of said plurality of through openings are spaced apart from each other.

13. The portable imaging cassette holder according to claim 10 wherein said extension of said securing grip has a threaded surface.

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14. The portable imaging cassette holder according to claim 13 wherein said plate of said inner frame comprises a threaded aperture proximate said top edge and between said first and second sides, said threaded aperture being arranged to receive said extension.

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15. The portable imaging cassette holder according to claim 1 wherein said portable imaging cassette holder is made of anodized aluminium.

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