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[54] **PATIENT RETENTION DEVICE**

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[58] **Field of Search** ... 250/50, 53, 58, 55, 444, 439, 250/451

[56] **References Cited**

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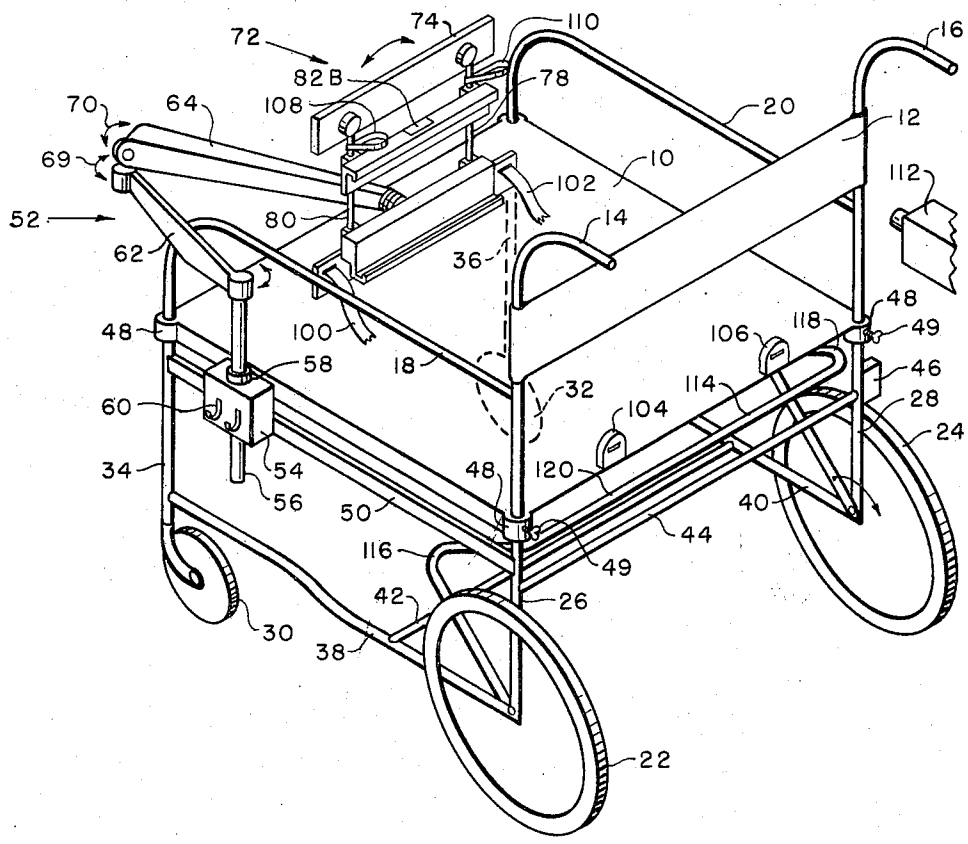
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[57] **ABSTRACT**

A wheelable chair for retaining a patient in an immobile position for radiographic purposes is provided with an articulated arm and an X-ray cassette holder. The holder is positioned by means of the articulated arm in a manner such that it engages with the chest of the patient in a manner sufficient to support and retain the patient in the proper position. Further retention is provided by means of straps or belts interconnecting the cassette holder with the patient, a set of straps for retaining the hands of the patient in a proper position on the holder, and a chin rest which will properly position the head of the patient during the radiographic exposure. The chair, itself, is manipulatable by means of wheels so as to properly position the patient relative to the X-ray device.

14 Claims, 2 Drawing Figures



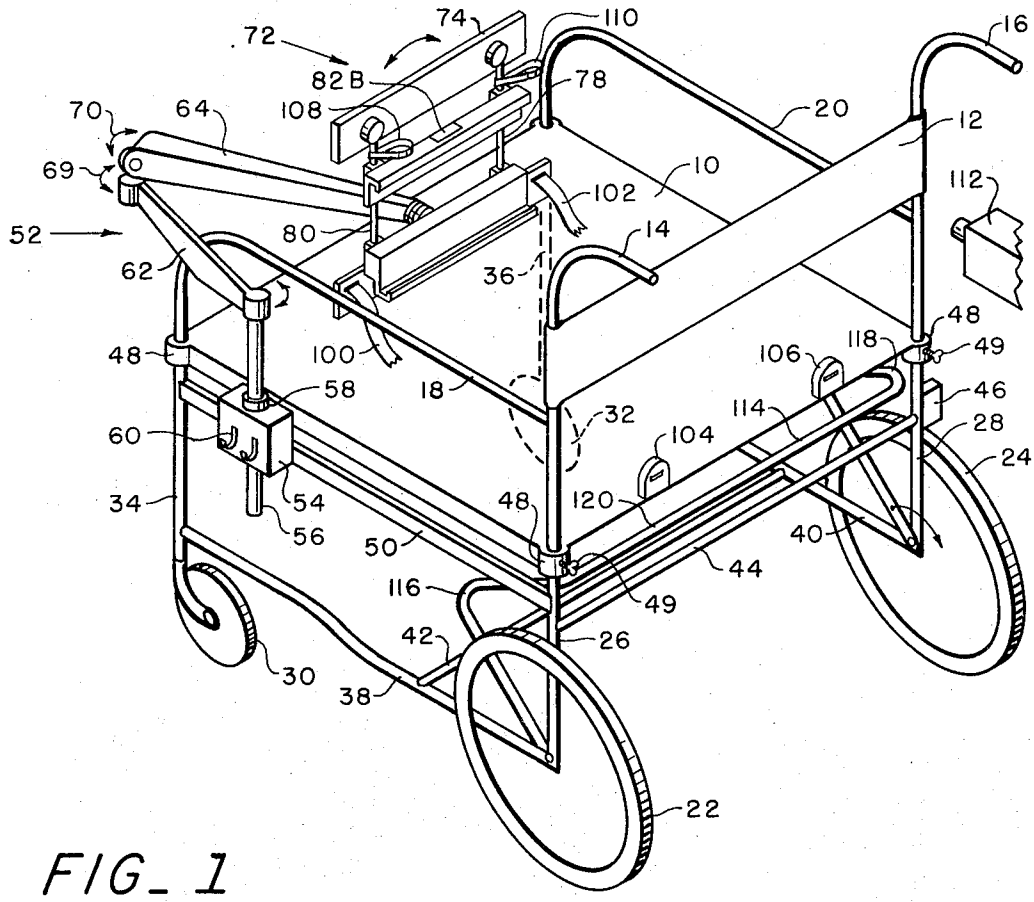

74
110
16
72
82B
78
70
64
108
20
12
69
10
102
112
52
80
14
62
36
48
48
100
106
118
49
58
18
46
60
32
114
28
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26
30
38
22

FIG_ 1

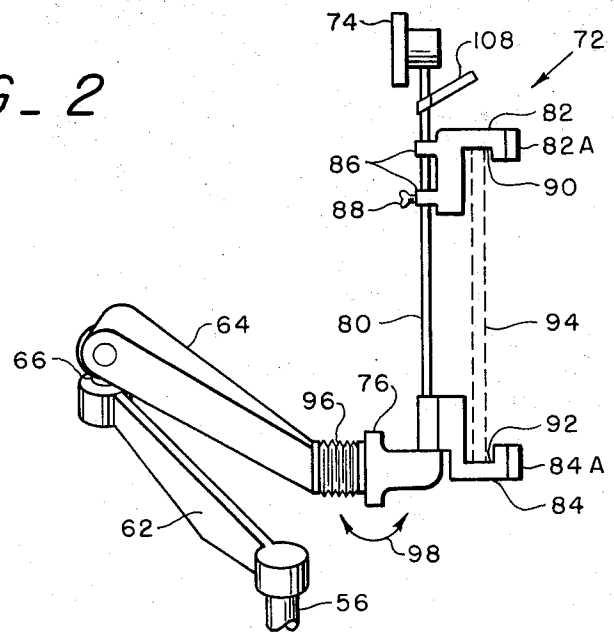

74
108
72
82
82A
86
90
88
64
80
94
66
76
96
92
84A
84
62
98
56

FIG_ 2

PATIENT RETENTION DEVICE

This invention relates to patient retention mechanisms and, more particularly, to a wheelable chair which may be employed for chest X-rays and the like while restraining the subject in an immobile position sufficient for the radiographic exposure.

In dealing with infirm, unconscious, or youthful patients, problems of taking a proper radiographic exposure for examination of chest cavities and the like presents a difficult problem in so far as retention of patients in an immobile position is concerned. It is desirable when performing radiographic analysis of various body portions to be able to conveniently position to X-ray equipment at the desired position of greatest exposure. It is also desirable, during the exposure, to maintain the patient in as immobile a position as possible. In many types of chest X-ray applications, it is required that the patient be in a standing position in order that the chest cavity be exposed to the extent required for proper exposure. The standing position is a requisite due to the necessity of maintaining the position of arms and shoulders as required for the exposure position. Due to the difficulty of accomplishing this effectively in an infirm, unconscious, or extremely youthful patient, it would be extremely desirable to have a chair or like support which could duplicate the function of a standing position. As noted above, it would be further desirable that the chair be easily movable so that it can be properly positioned with respect to a source of X-ray radiation for radiographic exposure. It would be further desirable that the chair would be adjustable to the extent desired in order to further facilitate ease of position.

It is, therefore, the primary object of the present invention to provide a novel and unique mobile chair support for cooperation of a radiographic exposure device which will facilitate radiographic exposure in the desired portion of the patient's body while maintaining the patient in a relatively immobile position.

It is a further object of the present invention, to provide a novel and unique mobile chair supporting device for cooperation with a radiographic exposure mechanism, which can be moved directly to the patient, as by the side of a bed or chair, and will position the patient without regard to the patient's movement or state of consciousness in a manner substantially duplicating the requisite body position for the most desired exposure of the chest cavity.

The foregoing objects are accomplished in a device for maintaining a subject such as a patient in position for radiographic purposes. The device includes an adjustable arm mounted to a chair support with a radiographic cassette holder mounted to the adjustable arm. The cassette holder is adjustable with respect to the chair support to a position engaging a body portion of the patient sitting in said chair support. The engagement of the cassette holder and patient results in the holding of the patient in a relatively immobile position. The X-ray cassette holder further includes a securing means for maintaining the patient in the retained position. The retention means includes a belt mechanism coupled to the X-ray cassette holder and attached to the patient for further securing the patient against the X-ray cassette holder. In addition, the X-ray cassette holder includes a hand hold or strap retention portion for maintaining the arms in an upraised position for proper body cavity X-ray. Finally, the X-ray holder

can include a chin rest support for maintaining the head in the correct position. The chair support is mobile in that it includes wheels and may be positioned with respect to a radiographic mechanism for exposing the X-ray cassette film. The foregoing objects and description as well as further objects, features and advantages of the present invention will become more apparent from the following more detailed description and appended drawings wherein FIG. **1** is a perspective view of the chair support of the present invention, and FIG. **2** is a detailed side elevation of the X-ray holding device employed in cooperation with the chair mechanism of FIG. **1**.

Referring now to FIG. **1**, a chair support is illustrated and as shown includes a seat portion **10**, a back portion **12**, handles **14** and **16**, and side-arms **18** and **20**. The seat and back maintain the patient in a sitting position. Mobility of the chair is provided by a set of wheels **22** and **24** which are as illustrated, relatively large. The wheels are coupled to the chair by means of frame members **26** and **28** which connect the handle portion **14** and **16** to the wheels **22** and **24**. The chair includes a set of front wheels **30** and **32** which are each in turn held in position by means of front frame members **34** and **36**. The front frame members are coupled by means of side return frame members **38** and **40** to the rear frame members **26** and **28** at the rear wheels **22** and **24**. A cross-beam **42** is provided for structural integrity. An additional cross-beam **44** is shown interconnecting the rear frame members **26** and **28** for reasons which will be discussed hereinbelow. Wheels **22** and **24** are rotatable about central pivots corresponding to a junction point between the rear frame members **26** and **28** and the side frame members **38** and **40**, while the front wheels **30** and **32** are preferably castorably mounted upon the front frame members **34** and **36** thereby giving the chair universal movement. Coupled to a rear wheel **24** is wheel braking mechanism **46** which can be employed to lock the position of the rear wheels and thereby securing the chair in fixed position. The seat portion **10** is coupled to the front and rear members **34, 36** and **26, 28** respectively by means of adjusting coupling units **48** which can include a screw tensioning mechanism **49** for the purpose of vertically raising and lowering the chair seat with respect to the frame members. In addition, the back portion **12** can be vertically adjustably positioned along the handle portions **14** and **16** in either a raised or lowered configuration in order to supply varying support positions as desired for retention purposes.

Attached to a side frame member **50** is an articulated arm indicated generally as **52**. The arm is attached to the chair by means of an attachment unit **54** through which the shaft **56** forming the lower portion of the arm passes. The shaft may be vertically adjustable through the unit **54** and held in position by means of a screw tightening mechanism or clamp **58**. The attachment unit **54** can serve additional functions other than holding the shaft **56** to the frame member **50**, for example, the hooks **60** can be mounted to the unit **54** for the holding of medical devices or any other apparatus employable in the environment wherein the chair will be used. In the addition to the hooks **60** provided on the attachment unit **54**, the attachment unit **54** can be employed as a retention device for holding small articles as by the inclusion of drawers, shelves, and the like. The shaft **56** is attached at an upper end thereof in a

pivotal manner to a further arm **62** which is adaptable to rotate over a 180° horizontal range with respect to the shaft **56.** The arm **62** is in turn coupled to an arm **64** by means of a universal joint connection **66** whereby the arm **64** may rotate with a 180° horizontal relationship as indicated by the arrow **69** and with respect to the arm **62** and over a vertical plane as indicated by the arrow **70** with a range which may be 90°.

Coupled to the arm **64** is the retention device, a radiographic cassette holder **72.** The cassette holder includes an upper frame member **74,** a lower frame member **76,** and first and second interconnecting frame members **78** and **80.** As illustrated in greater detail in FIG **2,** the holder **72** is formed by means of an upper carrier **82** and a lower carrier **84.** The upper carrier **82** is slidably mounted by means of appropriate coupling members **86** which are mounted to the back of the upper carrier and include apertures corresponding to the external dimension of the frame members **78** and **80** and which enable the upper carrier **82** to be slidably positioned in a vertical manner with respect to the lower carrier **84.** The coupling mechanism **86** coupled to the back of the upper carrier **82** may be fix positioned on the frame members **78** and **80** by means of adjustably tightened thumb screws **88.** The cassette which the cassette holder **72** carries is positionable between the inner surfaces **90** and **92** and is generally illustrated by means of the dashed section line **94.** The upper and lower carriers can be adjusted in vertical dimension to accommodate varying height cassettes.

The cassette holder **72** is attached to the arm **64** by means of a flexible coupling **96.** The flexible coupling **96** permits the cassette holder **72** to have a degree of rotation about a point located approximately in the center of the flexible coupling **96** and which permits freedom of rotation as indicated by the arrow set **98.** Thus, a large degree of adjustable movement is provided by means of the articulated arm defined by the arms **56, 62, 64** and the flexible coupling **96,** all of which serve to adjustably couple the cassette holder **72** to the chair. The width of the upper and lower frame members **74** and **76** is preferably designed to fit just within the chair arms **18** and **20,** however, it will be evident that the frame member **74** and **76** can be made shorter for the purposes of retaining selected body portions or providing pressure at an area of smaller dimension.

Referring again to FIG. **1,** the lower frame member **76** includes a securing means, including a first and second retention straps or belts **100** and **102.** The belts **100** and **102** each cooperate with linkages **104** and **106** which may be provided on the seat back and which can be engagable by the straps **100** and **102** so as to provide additional immobilization by virtue of retention of the holder **72** against the patient sitting in the chair. The retention pressure is applied between the chair back **12** and the front portion **82A** and **84A** of the upper and lower carrier members **82** and **84.** The linkages **104** and **106** are not essential, and it will be apparent that a single belt or multiple belts can be employed, and that belts **100** and **102** may simply be wrapped around the patient and buckled in the back in the manner equivalent to an automotive seat belt or the like. The front portions **82A** and **84A** of the upper and lower carrier member **82** and **84** may be padded and contoured to the general shape of the body to aid the retention. Such contour can be generally provided by means of a slight radius of curvature. In addition to the retention feature, the use of the straps to secure the holder to the patient prevents relative motion between the holder and the patient, and thus further aids in the effectiveness of the radiographic exposure.

With the holder **72** in position, the frame members **78** and **80** may be employed at their upper segments as additional retention and positioning devices. Thus, referring to FIGS. **1** and **2** the frame member **78** and **80** each include a strap loop indicated generally as **108** and **110** which may be affixed to the wrists or arms of a patient positioned in the chair. While positioning the straps to the wrists or arms of the patient, the patient's arms are thereby maintained in an elevated position, thus positioning the chest in proper relationship relative to the source of radiographic intensity for proper exposure. The portion of the frame **78** and **80** where the straps **108** and **110** are attached can also be used as hand holds, should the patient be capable, for accomplishing this same purpose of arm elevation.

In addition, the upper carrier **82** may include thereon an area **82B** which will serve as a means whereby the patient's chin may be supported, thereby maintaining the patient's head out of interference between the cassette held in the holder **72** and the patient's body. This area **82B** may also be provided with a contour and padding to adapt to this purpose of chin support.

Once in position, the chair is manipulated by means of suitable force applied to the handles **14** and **16** until the cassette held in the cassette holder **72** is located opposite a source of radiographic energy such as the X-ray device generally indicated as the unit **112.** To further aid in positioning of the chair for proper radiographic imaging, the chair also includes a tilt back mechanism including a cross-frame member **114** which includes two side portions **116** and **118,** each of which are respectively swivalable about the wheels **22** and **24,** and a cross frame piece **120.** In operation, the cross member **114** is swung about its pivot point until the v-shaped portion of the side pieces **116** and **118** strike the cross bar **44.** At this point the cross member **120** is outside of the back portion of the chair and relatively low and may be engaged by a foot or the like and upon application of downward pressure will cause the chair to tilt backward. This will enable relatively easy movement to be made of the chair and enable more precise positioning.

Wheels **22** and **24** are purposely made of relatively large dimension with respect to the front wheels **30** and **32.** The relatively large diameter of the wheels **22** and **24** serve to prevent the chair from accidentially being tipped backwards as by a patient applying a backward force while sitting on the chair.

The chair frame may be constructed of tubular aluminum, whereas the chair back and seat may be of leather, caning, plastic, wood or other suitable materials. The articulated arm may be metallic or of heavy plastic, with metallic joints, as may be the cassette holder. The choice of materials is not essential, however, such choice being a convenience of strength and economy.

Thus, a chair support for providing proper radiographic exposure of a patient is provided with means for immobilizing the patient in the proper position, which means includes the cassette holder. The adjustment features and retention features of this device enable a practical utilization to be made of radiographic

equipment when a patient is unable to either maintain himself with rigidity of immobility and must be restrained in a sitting position.

Other variations and changes will be obviously apparent to those skilled in the art. For example, the upper frame member **74** may be adjustably positioned on the frame shaft members **78** and **80** such that it may be raised and lowered thereon. Further, it may be advantageous to employ telescoping frame members for the shafts **78** and **80**, such that the upper frame member **74** may be vertically positioned. It will be understood that the devices shown in the various embodiments are done so for purposes of illustration, and, that the invention may be modified and embodied in various other forms without departing from the scope and spirit of the invention.

What is claimed is:

1. A device for maintaining a subject in position for radiographic purposes comprising a chair support frame including a seat portion and a back portion for supporting a subject in a sitting position, an adjustable articulated arm having a lower first shaft portion mounted to said frame, a second shaft portion rotatably mounted to said lower first shaft portion and a flexible coupling interconnecting said second shaft portion to a cassette holder, said cassette holder being adjustable in accordance with the adjustability of said first and second shaft portions and said flexible coupling, said cassette holder including an upper carrier member, a lower carrier member, an upper frame member, a lower frame member and first and second spaced interconnecting frame members, said upper carrier member positionable with respect to said lower carrier member along said spaced interconnecting frame members in accordance with the size of a radiographic cassette, said upper carrier member and lower carrier member each including front portions forming a retention surface facing said subject, said holder being adjustably positionable to apply retention pressure through each said retention surface to said subject against and in cooperation with said back portion, said holder further including securing means for securing said subject to said holder.

2. The combination of claim **1** further including a plurality of wheels pivotally mounted to said chair support frame, said chair support frame for interposing said subject between a source of radiographic radiation and said cassette holder.

3. The combination of claim **1** wherein said securing means includes a retention strap securing said subject to said holder.

4. The combination of claim **1** wherein said securing means includes a retention strap engagable with said chair for immobilizing said subject.

5. The combination of claim **1** wherein said first and second front portions have a contour generally conformable with the shape of the subject to be retained.

6. The combination of claim **5** wherein said first and second front positions are padded.

7. The combination of claim **1** wherein said chair seat portion is vertically adjustable.

8. The combination of claim **1** wherein said holder includes means for securing the arms of a subject thereto in an elevated position.

9. The combination of claim **8** wherein said means for securing the arms of a subject includes first and second wrist straps affixed to said holder and engagable with the wrists of said subject for maintaining said arms in said elevated position.

10. The combination of claim **1** wherein said back portion is vertically adjustable.

11. A device for maintaining a subject in position for radiographic purposes comprising an armed chair support frame including a seat portion and a back portion for supporting a subject in a sitting position, said chair frame including a plurality of wheels pivotally mounted to said chair support frame, said chair support frame including handles for manual manipulation of said chair support frame to interpose said subject between a source of radiographic radiation and a radiographic cassette, said radiographic cassette contained within a radiographic cassette holder adjustably positioned against said subject for supporting and maintaining said subject in proper position for said radiographic purposes, said radiographic cassette holder including an upper frame member, a lower frame member and first and second spaced interconnecting frame members, said upper carrier member positionable with respect to said lower carrier member along said spaced interconnecting frame members in accordance with the size of a radiographic cassette, said radiographic cassette holder adjustably positioned by an adjustable articulated arm having a lower first shaft portion mounted to said frame, a second shaft portion rotatably mounted with two degrees of movement for both vertical and horizontal movement to said lower first shaft portion and a flexible coupling interconnecting said second shaft portion to said lower frame member of said radiographic cassette holder for movement of said holder through said flexible coupling through angles relative to vertical, said upper carrier member and said lower carrier member each including respective first and second front portions having a contour generally conformable with the shape of the subject to be retained and positionable through said shaft portions and said flexible coupling within said arms of said chair frame and against said subject, the upper portion of said uppper carrier member including a chin support area for supporting the head of said subject, and further including securing means for securing said radiographic cassette holder to said device for securing said subject for radiographic purposes.

12. The combination of claim **11** wherein said holder includes means for securing the arms of a subject thereto in an elevated position.

13. The combination of claim **12** wherein said means for securing the arms of a subject includes first and second wrist straps affixed to said holder and engagable with the wrists of said subject for maintaining said arms in said elevated position.

14. The device of claim **11** wherein said seat portion and said back portion are vertically adjustable.

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