United States Patent [19]

Hopper et al.

[11] **3,818,516**

[45] **June 25, 1974**

[54] **MOBILE HOSPITAL BED TO FACILITATE X-RAY EXAMINATIONS**

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[73] Assignee: **Centinela Hospital Association, d/b/a Centinela Valley Community Hospital,** Inglewood, Calif.

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[52] **U.S. Cl.** **5/67,** 5/63, 250/446

[51] **Int. Cl.** **A61g 7/10,** G03b 41/16

[58] **Field of Search** 5/11, 62, 63, 66–69, 5/317, 280, 92; 248/345.1; 250/445–448

[56] **References Cited**

UNITED STATES PATENTS

3,343,182	9/1967	Waters	5/92
3,503,082	3/1970	Kerwit	5/67
3,722,010	3/1973	Saternus	5/67
3,722,700	3/1973	Cummings	248/345.14

Primary Examiner—Casmir A. Nunberg

Attorney, Agent, or Firm—Smyth, Roston & Pavitt

[57] **ABSTRACT**

The hospital bed is adjustable as usual for height, tilt, elevated back rest and elevated knees, and is also mounted on wheels for use to transport the patient. In addition, the upper bed section that carries the mattress is slidable longitudinally to carry the upper part of a reclining patient forward beyond the rest of the bed structure to an extended position which affords ample clearance for special X-ray equipment, both above and below the extended section of the bed. The extended portion of the bed section is transparent to X-rays to permit X-ray examination of the upper part of the reclining patient's body without the necessity of handling or disturbing the reclining patient. A releasable latch normally retains the extendable bed section at its retracted position.

23 Claims, 13 Drawing Figures

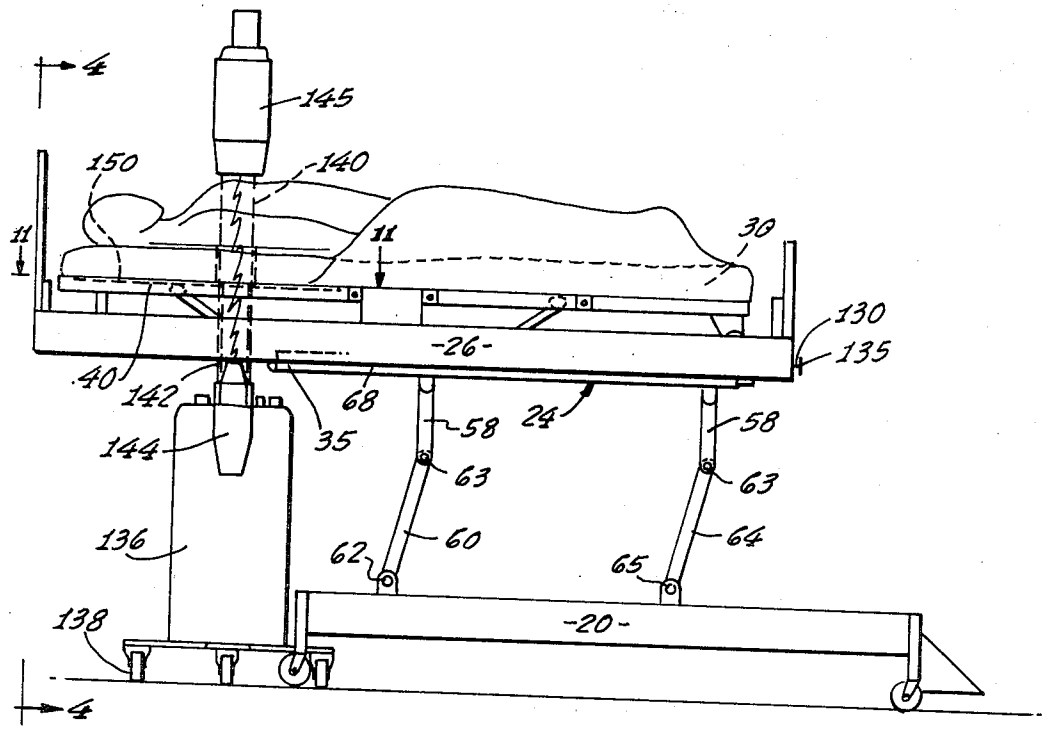


Fig. 1

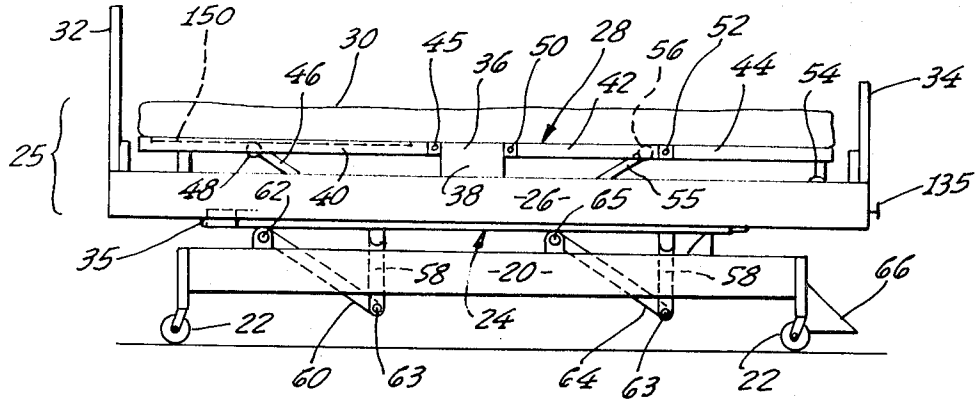

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Fig. 2

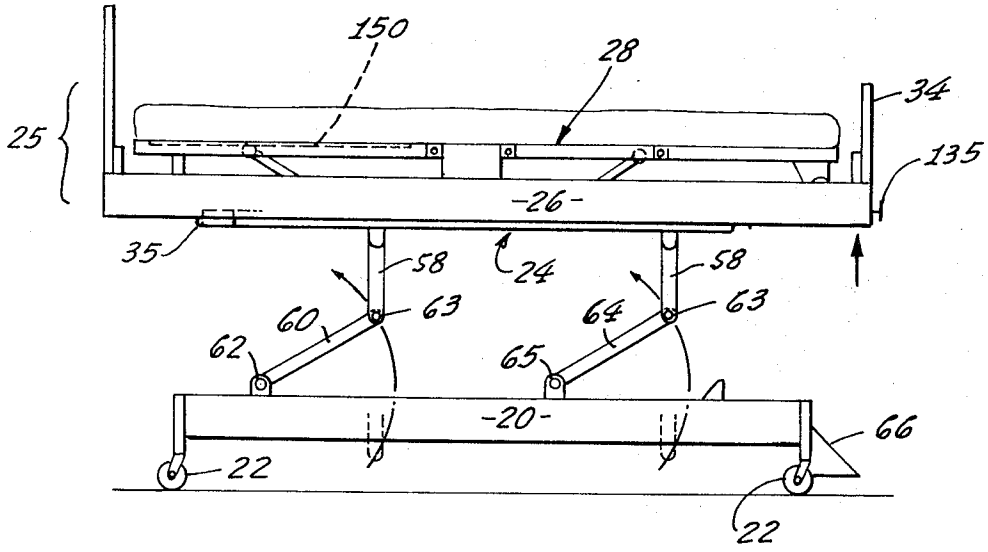

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Fig. 3

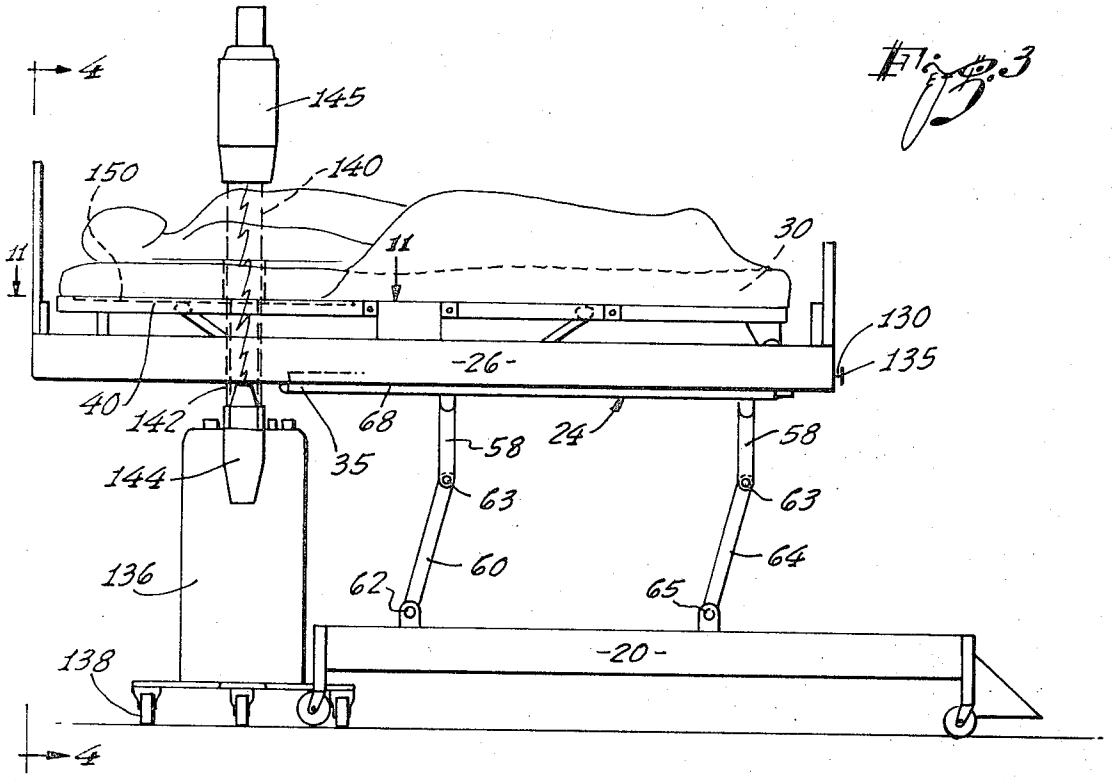
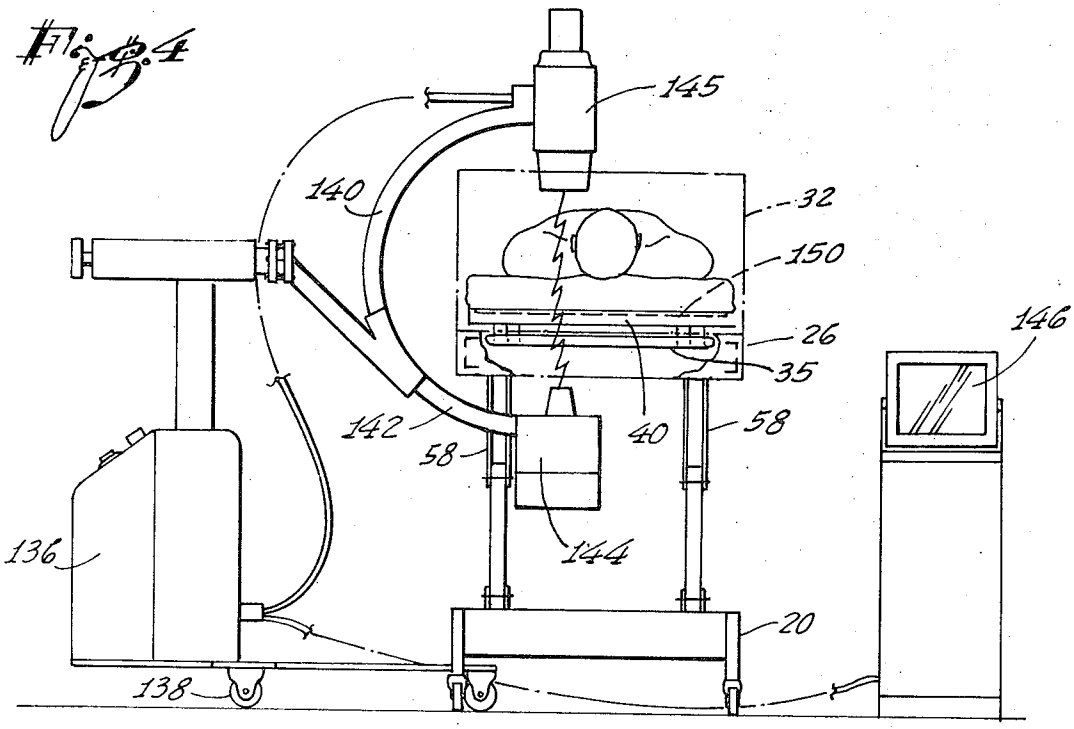

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Fig. 4


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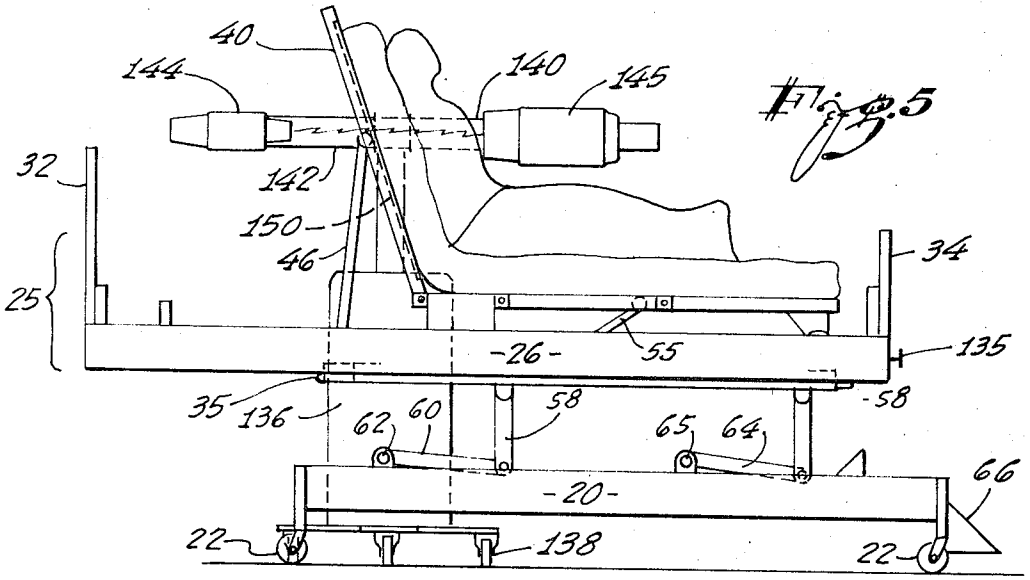

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Fig. 5

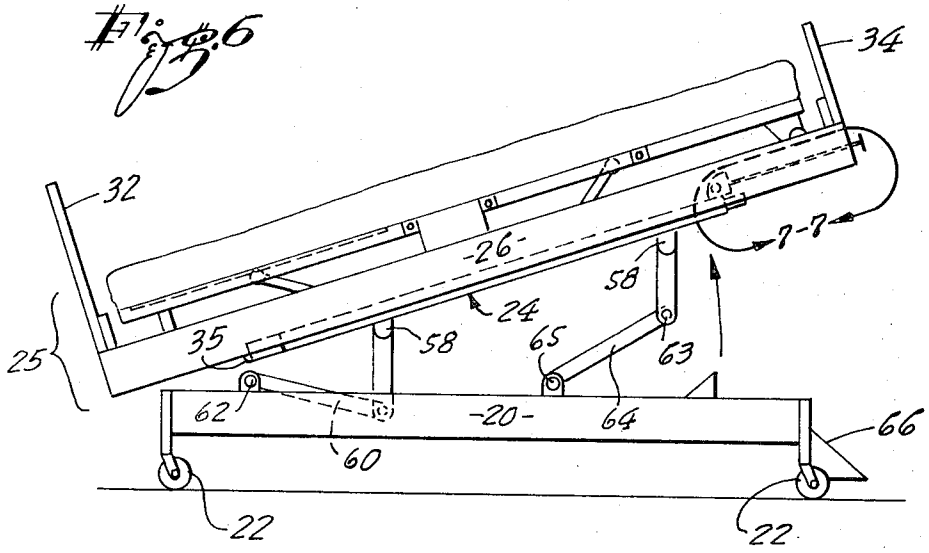
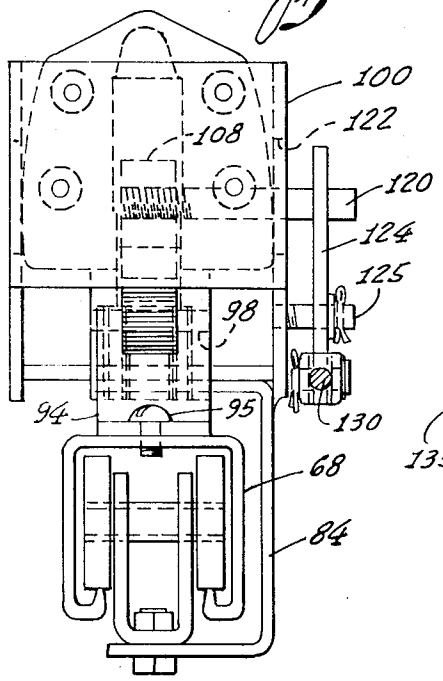

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Fig. 6

Fig. 8



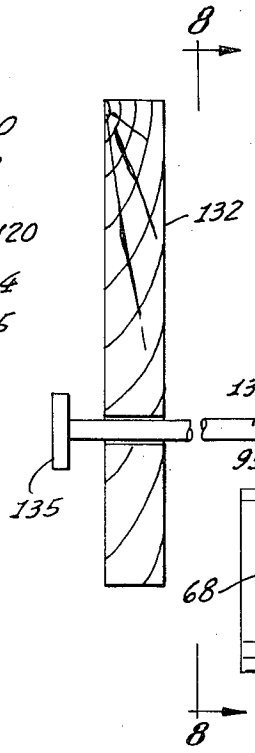


Fig. 7

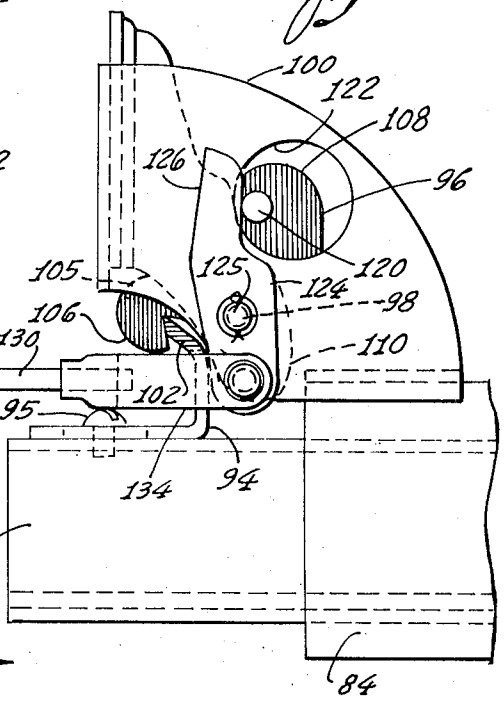


Fig. 9

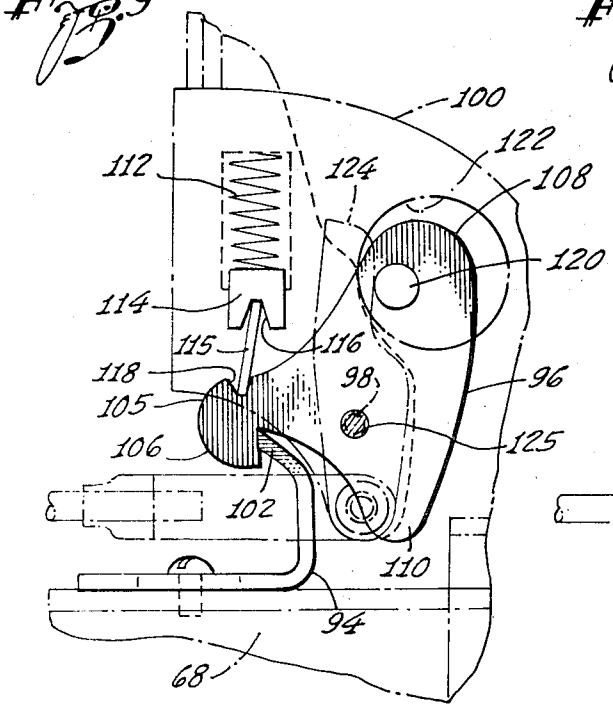


Fig. 10

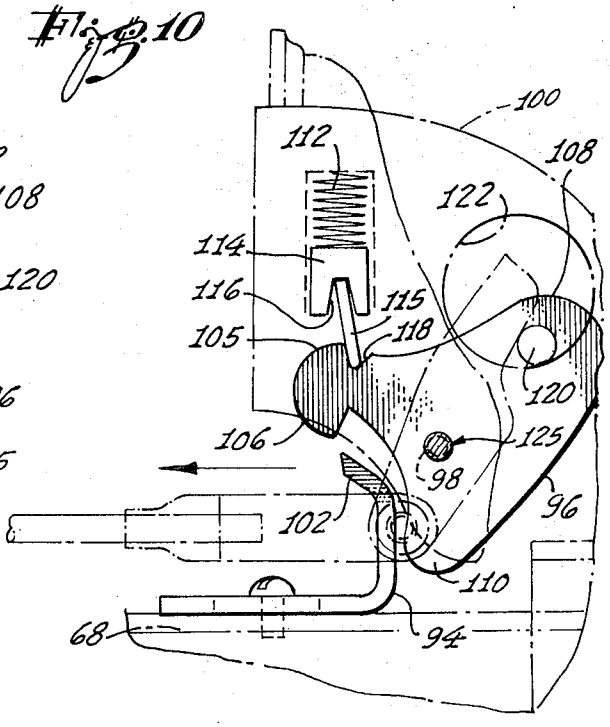


Fig. 11

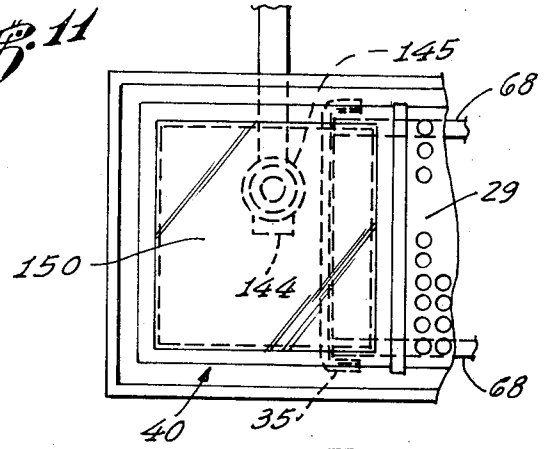


Fig. 12

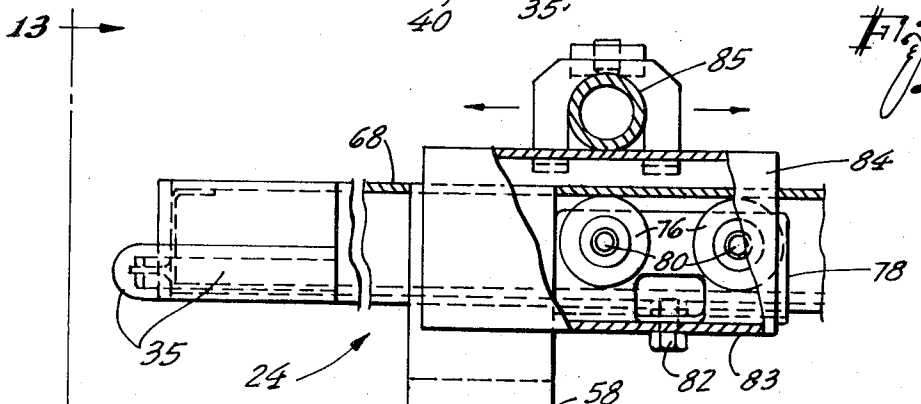
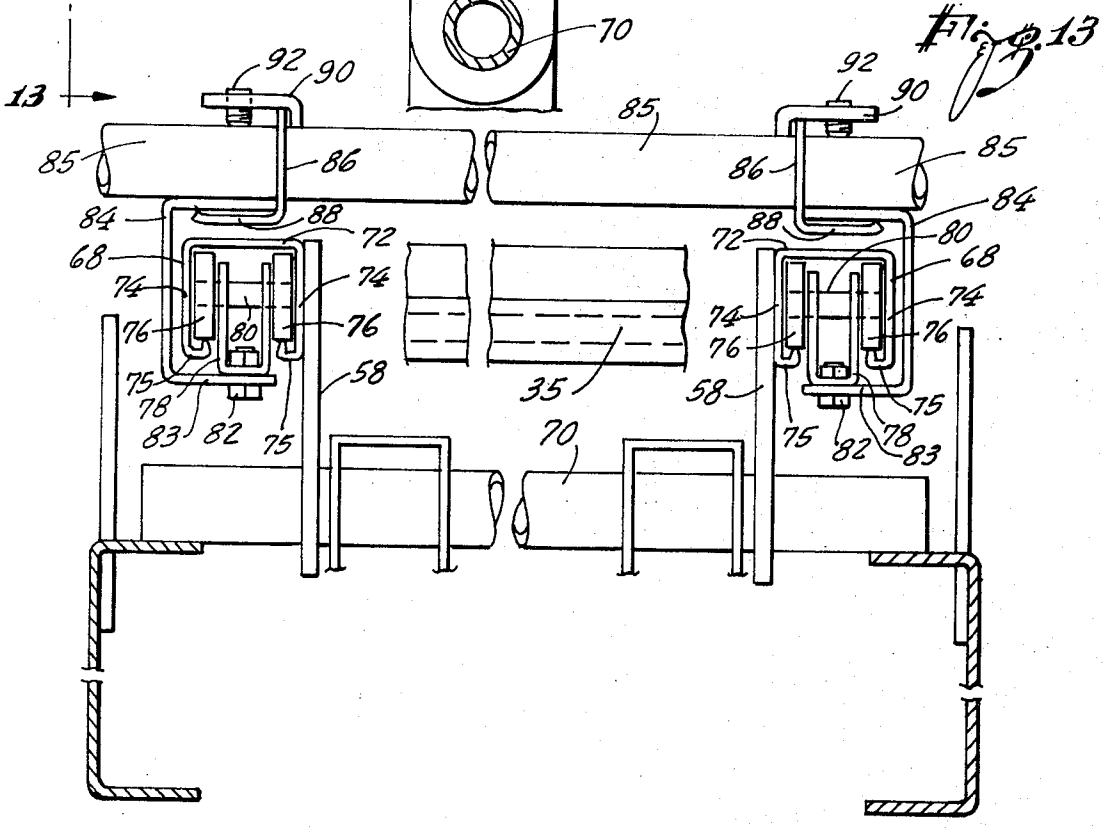


Fig. 13



MOBILE HOSPITAL BED TO FACILITATE X-RAY EXAMINATIONS

BACKGROUND OF THE INVENTION

Beds for hospitalized patients are commonly adjustable to make a reclining patient comfortable as well as to facilitate various medical procedures. Thus, a hospital bed may be raised and lowered and may be tilted either forwardly or rearwardly. The head end may be swung upward through a range of angles to elevate the head and back of the patient and the patient's knees may be raised to various degrees.

If it is necessary to move a reclining patient to an X-ray facility of the hospital for examination or treatment, the patient must be lifted and manuevered from the bed to a mobile structure for transportation and upon arrival at the special facility, the patient must be again lifted and maneuvered onto an X-ray table. For example, when an artificial pacemaker is to be placed in the body of a cardiac patient, the installation procedure must be monitored by X-rays, and upon arrival of the patient at the X-ray room, it is necessary not only to lift the reclining patient from the mobile stretcher but the patient must also be handled bodily for correct positioning relative to the X-ray equipment. Afterward the patient must be lifted back onto the mobile structure and finally must be lifted from the mobile structure onto his customary hospital bed.

Such repeated handling of the patient is not only fatiguing to a seriously ill patient, but is also undesirable in exciting and stimulating a reclining patient at a time when he should rest with as little disturbance as possible.

SUMMARY OF THE INVENTION

The primary object of the invention is to avoid disturbing a reclining patient when it is necessary for X-ray examination or treatment. For example, if a surgeon is to place an artificial pacemaker in a patient with the aid of X-ray equipment monitored by a cathode ray tube or a television unit, this object is carried out in accord with the present invention by using a special adjustable mobile hospital bed on which the patient normally rests instead of using the usual mobile structure to transport the patient to the X-ray room. At the X-ray room or in the patient's room, the height of the bed is adjusted as required and the upper mattress-bearing section of the bed with the reclining patient thereon is shifted longitudinally forward from the rest of the bed to an extended position for X-ray examination. There is ample space both above and below the extended upper section of the bed and with the extended bed section including the mattress transparent to X-rays, there is ample freedom for X-ray examination of the upper part of the reclining patient's body without at all disturbing the patient. Subsequently, the extended upper bed section may be retracted longitudinally to its normal position and then the mobile bed may be moved on its wheels to return the reclining patient for normal use of the mobile bed in his hospital room.

Another object of the invention is to prevent inadvertent extension of the upper bed section and especially to prevent such extension by gravity when the bed is adjusted to a forwardly tilted position. For this purpose a manually releasable latch immobilizes the upper bed section, the latch automatically engaging in response to return of the upper bed section to its normal retracted position.

Preferably the upper bed-section is mounted by rollers on a pair of longitudinal channel-shaped tracks and a further object of the invention is to insure that the tracks are kept clear of debris. In this respect, a feature of the invention is the inversion of the channel-shaped tracks to turn the open sides of the tracks downward, the longitudinal sides of the inverted channel members being flanged inwardly to provide support surfaces for rollers on the underside of the upper bed section. By virute of this arrangement, the inverted track members act as their own shields and any foreign material that finds its way into the channel-shaped tracks eventually drops out instead of accumulating.

The features and advantages of the invention may be understood from the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are merely illustrative:

FIG. 1 is a simplified side elevational view of the hospital bed, with the hospital bed at its lowest elevation;

FIG. 2 is a similar view with the hospital bed elevated;

FIG. 3 is a similar view of the elevated hospital bed with the upper mattress-bearing section of the bed extended longitudinally forward beyond the forward end of the rest of the bed structure for the purpose of carrying out X-ray examination;

FIG. 4 is a front end elevation of the bed as seen along the line 4 – 4 of FIG. 3;

FIG. 5 is a side elevational view showing how the forward panel of the mattress-bearing section may be swung upward for the purpose of X-ray examination of the patient in sitting position;

FIG. 6 is a side elevational view showing how the hospital bed may be tilted forwardly;

FIG. 7 is a fragmentary side elevational view on an enlarged scale showing how a manually releasable latch normally retains the upper extendable bed section at its retracted position;

FIG. 8 is an elevational view as seen along the line 8 — 8 of FIG. 7;

FIG. 9 is a view similar to FIG. 7 with parts shown in phantom and with the latch in engagement with the retracted upper bed section;

FIG. 10 is a view similar to FIG. 9 showing the latch in its released position;

FIG. 11 is a fragmentary plan view of the upper extendable section of the hospital bed with the mattress removed to show a forward panel of the bed that is transparent to X-rays;

FIG. 12 is an enlarged fragmentary side elevational view, partly broken away, showing how the extendible upper section of the bed is mounted on rollers for longitudinal displacement relative to the rest of the bed structure; and

FIG. 13 is a fragmentary end elevational view as seen along the line 13 — 13 of FIG. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Much of the structure of the hospital bed that is shown in the drawings is found in the prior art. There-

fore, to avoid unnecessary description of well-known hospital bed components, the Pruim, et al U.S. Pat. No. 3,222,693 is hereby incorporated into the present disclosure by reference.

Referring to FIGS. 1 – 3, the major parts of the illustrated embodiment of the invention include: a mobile base frame 20, provided with suitable wheels or casters 22; an intermediate support frame, generally designated 24, which is carried by the base frame and is adjustable in height relative to the base frame; and an upper bed section, generally designated 25 which is longitudinally movable on the support frame 24. The upper bed section 25 includes a carriage frame 26 which is longitudinally slidable on the support frame 24 and further includes an articulated mattress frame, generally designated 28, mounted on the upper side of the carriage frame. The mattress frame 28 is partly made of perforated sheet metal 29 (FIG. 11) and carries a mattress 30 of suitable material, such as foamed rubber that is transparent to X-rays. The upper bed section 25 is normally positioned on the support frame 24 as shown in FIGS. 1 and 2, but may be displaced longitudinally forwardly from the support frame to the extended position shown in FIG. 3.

The carriage frame 26 of the upper bed section 25 has the usual detachable headboard 32 and detachable footboard 34 and preferably the front end of the frame 24 is provided with a suitable resilient bumper 35 to cushion any inadvertent impacts to X-ray equipment that may occur during the maneuvering of the X-ray head.

The articulated mattress frame 28 is divided into the following sections: a seat section 36 that is fixedly mounted on the carriage frame 26 by connecting structure 38; a forward panel 40 to support the torso of a reclining patient; an upper knee panel 42; and a lower knee panel 44. The forward panel 40 is pivotally connected to the fixed seat panel 36 by a hinge 45 and may be adjustably elevated through a range of angles by power-actuated means including swingable arms 46 on opposite sides of the panel that incline upward from the carriage frame 26 and have rollers 48 at their upper ends to bear against the under side of the panel. Upper knee panel 42 is hingedly connected to the fixed seat section 36 by a hinge 50 and is hingedly connected to the lower knee panel 44 by a second hinge 52. The free end of the lower knee panel 44 is provided with rollers 54 in rolling contact with the carriage frame 26, and a pair of power-actuated arms 55 having rollers 56 in rolling contact with the upper knee panel 42 may be swung upward in a well known manner to elevate the two knee panels in the region of the hinge 52 with the rollers 54 shifting along the carriage frame 26 to accommodate the movement.

The support frame 24 has rigid downwardly extending brackets 58 on each of its opposite sides and a pair of corresponding lifting arms 60 on a power-actuated transverse shaft 62 are connected by pivots 63 to the brackets 58. The transverse shaft 62 is journaled on the base frame 20 and may be actuated as desired to adjust the height of the front end of the support frame relative to the base frame 20. In like manner a pair of lifting arms 64 on a second power-actuated transverse shaft 65 are pivotally connected to rear brackets 58 of the support frame 24 and may be actuated to adjustably elevate the rear end of the support frame.

The forward pair of lifting arms 60 and the rearward pair of lifting arms 64 may be actuated simultaneously to change the level of the support frame 24, or may be actuated selectively to tilt the support frame and the upper bed section 25 rearwardly or to tilt the support frame forwardly as shown in FIG. 6. A plurality of foot pedals 66 at the rear end of the base frame 20 serve as convenient controls for the pairs of arms 60 and 64.

The support frame 24 comprises essentially a pair of parallel longitudinal tracks 68 which are of the construction shown in FIGS. 7 – 10, 12 and 13. As shown in FIG. 12, the rigid downwardly extending brackets 58 of the support frame 24 are unitary with the tracks 68. Each pair of the brackets 58 is rigidly interconnected by a transverse tube 70 which, as shown in FIG. 13, rests on the base frame 20 of the bed when the pair of brackets are at their lowest positions. FIG. 13 also shows, how the forward pair of lift arms 60 rotatably embrace the forward transverse tube 70.

Each of the two tracks 68 is of the configuration of an inverted channel member having a horizontal top web 72 and two vertical opposite side webs 74 which have inward curved flanges 75. The carriage frame 26 is supported by rollers 76 that ride on the edges of the curved flanges 75, as shown in FIGS. 8 and 13.

On opposite sides of the forward portion of the carriage frame 26 and again on opposite sides of the rearward portion, the carriage frame is equipped with roller assemblies the construction of which is best shown in FIGS. 12 and 13. Each of the four roller assemblies includes a miniature carriage 78 of U-shaped cross section which carries two transverse axles 80 with rollers 76 on the opposite ends of each axle. The miniature carriage 78 extends upward through the open bottom side of the track 68 and is mounted by bolts 82 on the lower flange of a C-shaped housing 84. The upper flange of the C-shaped housing 84 of each of the two forward roller assemblies is secured to a forward transverse tubular frame member 85 on the carriage frame 26, and in like manner the C-shaped housings 84 of the two rearward roller assemblies are secured to a second rearward transverse tubular frame member 85 (not shown).

In the construction shown, each of the C-shaped housings 84 is secured to the corresponding tubular frame member 85 by a yoke 86 that straddles the tubular frame member and is formed with a pair of flanges 88 that engage the upper flange of the C-shaped housing 84. United with the yoke 86 is an upper clip 90 that overhangs the tubular frame member 85 and is provided with a set screw 92 that is tightened against the tubular frame member to make the assembly rigid.

To releasably secure the carriage frame 26 at its retracted position, a latch mechanism is provided at one of the two rear corners of the bed structure and FIGS. 7, 9 and 10 show the latch mechanism as viewed from the left side of the bed structure along the line 7 — 7 of FIG. 4.

The latch mechanism includes an angular clip 94 mounted on the top side of one of the tracks 68 by a pair of screws 95, and further includes a rotary latch member 96 that is mounted on a transverse pivot 98 inside a curved housing 100. As shown in FIG. 8 the curved housing 100 is unitary with a C-shaped housing 84 of one of the four roller assemblies. The latch clip 94 has an upright flange which is bent forwardly adja-

cent its upper edge as indicated at 102 in FIGS. 7, 9 and 10.

The rotary latch member 96 has three arms, namely: a forwardly extending hook arm 105 that has a rounded nose 106 and is shaped for hook engagement with the latch clip 94; an upwardly extending release arm 108; and a downwardly extending stop arm 110 which serves as a stop in the path of movement of the latch clip 94 and which tends to rotate the latch member to its latching position in response to pressure from the latch clip. Suitable means is provided to bias the rotary latch member 96 towards its latching position. In the construction shown, a concealed spring 112 urges a small plastic body 114 downward and a toggle member 115 has its upper end seated in a notch 115 of the plastic body and has its lower end seated in a notch 118 of the rotary latch member 96.

Any suitable means may be provided for manual release of the latch member 96. In the construction shown in FIGS. 7 — 10, the release mechanism includes: a release pin 120 that is mounted on the release arm 108 of the latch member 96 and extends laterally from the release arm through a circular aperture 122 in the side of the curved housing 100; a trip lever 124 pivoted on a stud 125 on the side of the curved housing 100, the trip lever having an upper arm 126 to swing against the release pin 120 and having a lower operating arm 128; a rearwardly extending pull rod 130 that extends through a rear wall 132 of the carriage frame 26; a clevis 134 that pivotally connects the pull rod to the lower operating arm 128 of the trip lever; and a knob 135 that serves as a handle on the outer end of the pull rod. The circular aperture 122 cooperates with the release pin 120 to limit release rotation of the rotary latch member 96.

When the carriage frame 26 is at its forward extended position shown in FIG. 3, the rotary latch member 96 is in its latching position in the absence of the latch clip 94. When the carriage frame 26 is moved rearward from its forward extended position the latch clip 94 approaches the curved nose 106 of the hook arm 105 and the bent flange 102 of the latch clip acts on the curved nose of the hook arm of the latch member with the cam action to force the latch member clockwise in opposition to the biasing spring 112 and as the latch clip 94 reaches the stop arm 110 of the rotary latch member, the hook arm 105 snaps into engagement with the latch clip. The latch mechanism may be caused to release the carriage frame 26 when desired by operation of the pull rod 130 by means of the knob 135.

The manner in which the described hospital bed serves its purpose may be readily understood from the foregoing description. The hospital bed normally serves as a conventional hospital bed that is adjustable in the usual manner to make the reclining patient comfortable and to facilitate various medical procedures. When it is desired to transport the reclining patient to the X-ray room, the hospital bed serves as a mobile transportation means. On arrival at the X-ray room, the headboard 32 is removed, the height of the upper bed section 25 is adjusted as required and then the latch mechanism is released to permit the upper bed section 25 to be extended, as shown in FIG. 3 for X-ray examination of the patient. Subsequently the upper bed section 25 is retracted to its normal latched position and the bed is again used for transportation to return the reclining patient to his hospital room.

As indicated in phantom in FIGS. 3 and 4, a conventional X-ray apparatus consists of a pedestal 136 mounted on casters 138 and the pedestal carries upper and lower arms 140 and 142 to straddle a patient, the two arms carrying corresponding X-ray components 144 and 145. When the upper bed section 24 is extended for the purpose of X-ray examination of the upper part of the patient's body, the X-ray apparatus is maneuvered to the position shown in FIGS. 3 and 4 where the two arms 140 and 142 straddle the extended upper bed section with ample clearance under the extended bed section for the lower arm 142 and the lower X-ray component 145. An oscilloscope 146 may be connected to the X-ray apparatus, for example, to monitor the installation of an artificial pacemaker in a patient's body.

The carriage frame 26 is of open construction to avoid blocking the X-rays and the forward panel 40 of the mattress frame includes a body-support plate 150, best shown in FIG. 11, of suitable material such as high impact "Masonite" that, like the mattress 30, is transparent to X-rays.

FIG. 5 shows how the bed may be used to X-ray the upper portion of the patient's body with the patient in sitting position, for example to show the progress of ingested barium. The forward panel 40 of the mattress frame is elevated as shown and the X-ray apparatus is adjusted for the two arms 140 and 142 to straddle the patient and the elevated panel.

Our description in specific detail of the presently preferred embodiment of the invention will suggest various changes, substitutions and other departures from our disclosure within the spirit and scope of the appended claims.

We claim:

1. In a hospital bed wherein the bed has an upper bed section to support a reclining patient, said bed section being mounted in spaced relation to a base frame member,

the improvement to facilitate X-ray examination of the upper part of the reclining patient's body with minimum disturbance of the reclining patient, comprising:

means forming an intermediate frame positioned between said bed section and said base frame member,

means cooperating with said intermediate frame and said bed section for controlled longitudinal movement of said upper bed section with respect to said intermediate frame member whereby

said upper bed section is extendible forwardly from the rest of the bed structure to permit two components of X-ray apparatus to straddle the forward portion of the upper bed section and the upper part of the patient's body thereon, and

the extended portion of the upper bed section being transparent to X-rays to avoid blocking the X-rays.

2. In a mobile device for normal use as a hospital bed for a reclining patient and for optional use to transport the reclining patient to X-ray apparatus for X-ray inspection of the upper part of the patient's body, the combination of:

a mobile base frame;

a support frame above the base frame carried by the base frame and variable in height relative to the base frame;

an upper bed section to support the reclining patient, an end portion of the bed section corresponding to the upper portion of the patient's body being transparent to X-rays passing both through the patient's body and the upper bed section, and

means cooperating with said upper bed section to effect controlled longitudinal movement of said upper bed section relative to the support frame from a normal position to an alternate forward position extending beyond the forward end of the support frame with ample space both above and below the extended bed section for the X-ray apparatus.

3. A combination as set forth in claim 2 which includes a latch mechanism to releasably hold the carriage frame at its normal retracted position.

4. A combination as set forth in claim 3 in which said latch mechanism includes cooperating parts on the bed section and the support frame respectively;

in which the latch mechanism is biased to latching position;

and in which said cooperating parts of the latch mechanism are shaped with cam surfaces for cooperation to automatically latch the upper bed section in response to return of the upper bed section to its normal retracted position.

5. A combination as set forth in claim 3 which includes a latch component carried by one of said support frame and said bed section and a rotary latch member carried by the other of said support frame and said bed section, said rotary latch member having one portion for engagement with said latch component and having a second portion to serve as stop means for said component.

6. A combination as set forth in claim 3 in which said latch mechanism includes a rotary latch member that is biased to latching position and which includes manual means to rotate the latch member to its release position in opposition to its bias.

7. A combination as set forth in claim 6 which includes a pull rod operable to rotate the latch member to release position, said pull rod being accessible at the foot end of the mobile device.

8. A combination as set forth in claim 3, in which said latch mechanism includes a rotary latch member with a lateral projection for use in rotating the latch member to a release position;

and which includes means cooperative with said lateral projection to limit release rotation of the latch member.

9. A combination as set forth in claim 2 which includes track means on one of said support frame and said bed section and which includes rollers on the other of said support frame and said bed section to traverse said track means.

10. A combination as set forth in claim 9;

in which the track means is on the support frame;

in which the track means comprises a pair of tracks;

in which each track is an inverted channel member with the open side of the channel member downward;

and in which the two longitudinal sides of each inverted channel member has inwardly directed flanges on which said rollers ride.

11. A combination as set forth in claim 10;

which includes roller assemblies on the opposite sides of the bed section to cooperate with the two inverted channel tracks;

in which each of said roller assemblies includes a carriage attached to the bed section and extending upwardly through the lower open side of the corresponding track;

and in which said carriage is provided with rollers on each of its opposite sides to ride on the corresponding inwardly turned flanges of the corresponding rack.

12. A combination as set forth in claim 9 which includes a latch component on one of said tracks and means on said bed section cooperative with the latch component to releasably engage the latch component to retain the bed section at its normal retracted position.

13. A combination as set forth in claim 9 which includes a latch component on one of said tracks;

and which includes a rotary latch member on the bed section to engage said latch component to hold the bed section at its normal retracted position, said rotary latch member having a hook portion for engagement with said latch component and having a portion in the path of said component to tend to rotate the latch member to latching position in response to pressure from the latch component.

14. A combination as set forth in claim 1 which includes a support element for the extended bed section and resilient bumper means on the leading end of the support element.

15. A combination as set forth in claim 1, in which said bed section comprises a carriage frame longitudinally movable on said intermediate frame and an articulated mattress frame fixedly mounted on the upper side of the carriage frame.

16. A combination as set forth in claim 1, in which said bed section has a forward panel on its leading end to support the upper portion of the body of a reclining patient and in which said panel has a body-support plate made of material that is transparent to X-rays.

17. A combination as set forth in claim 16 in which said forward panel is swingable upward to support the patient in sitting position.

18. A combination as set forth in claim 16, which includes a mattress overlying said body-support plate, said mattress being made of material that is transparent to X-rays.

19. A combination as set forth in claim 16 in which the structure of the extendible bed section is open below said body-support plate to avoid blocking X-rays.

20. A combination as set forth in claim 1, in which said extendible bed section has a headboard that is removable to avoid interference with the X-ray apparatus.

21. An improvement as set forth in claim 1 wherein said upper bed section includes a carriage frame means,

said carriage frame means supporting an articulated mattress frame,

first linkage means interconnecting said carriage frame and said mattress frame to effect movement the latter with respect to said carriage frame,

second linkage means cooperating with said intermediate frame to effect movement of said carriage frame independently of said first linkage means whereby said carriage frame may be moved vertically with respect to said base frame and said articulated mattress frame may be adjusted independently of said carriage frame while permitting longitudinal movement of said carriage frame means relative to said intermediate frame means.

22. An improvement as set forth in claim **21** wherein said base frame member is provided with roller means for movement of said hospital bed from one location to another.

23. An improvement as set forth in claim **1** wherein

said upper bed section includs means supporting an articulated mattress frame, and

linkage means operative to effect independent movement of each of said mattress frame and said intermediate frame.

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