March 15, 1966 B. R. F. MacDONALD 3,239,853

CONVERTIBLE HOSPITAL BED-CHAIR

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Fig. 1.

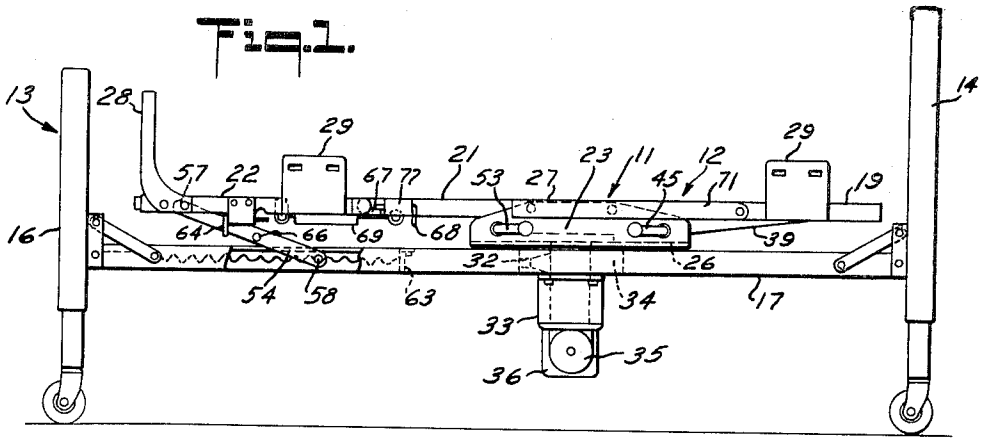
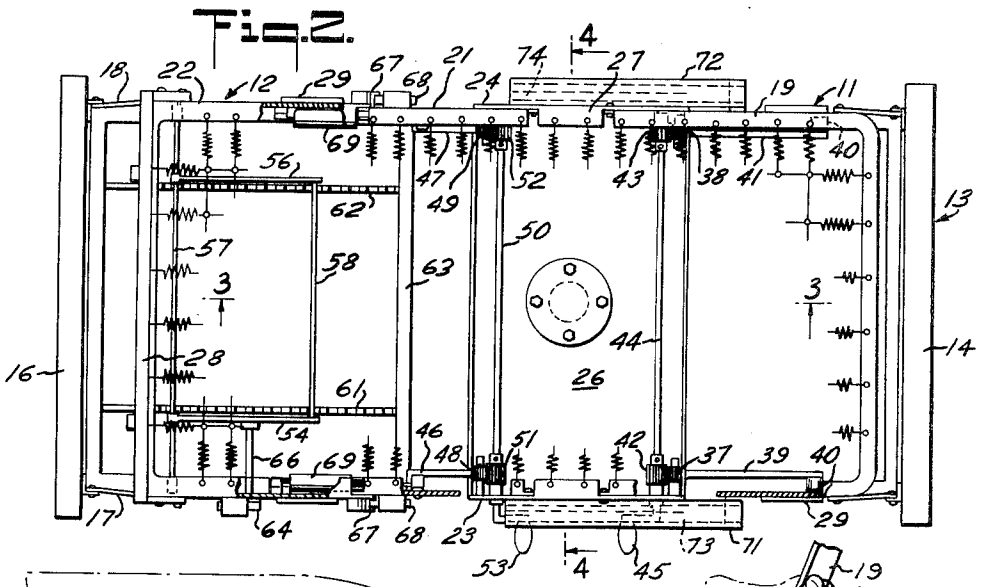


Fig. 2.



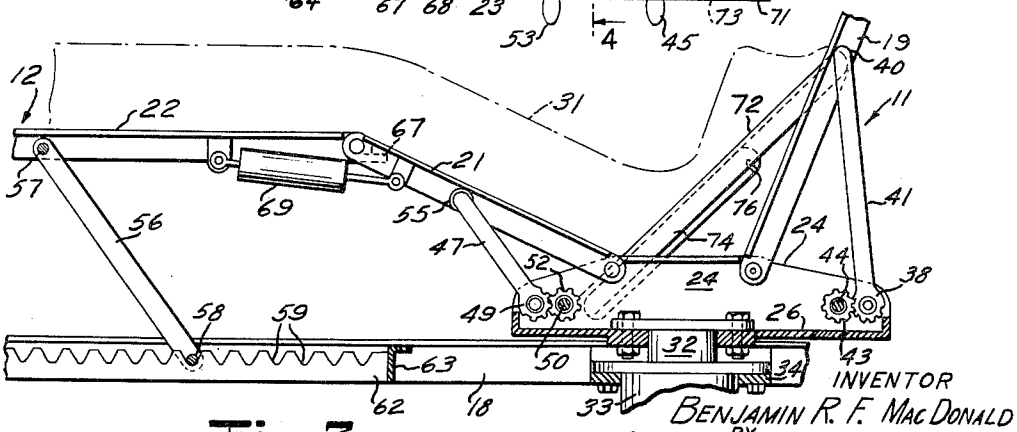


Fig. 3.

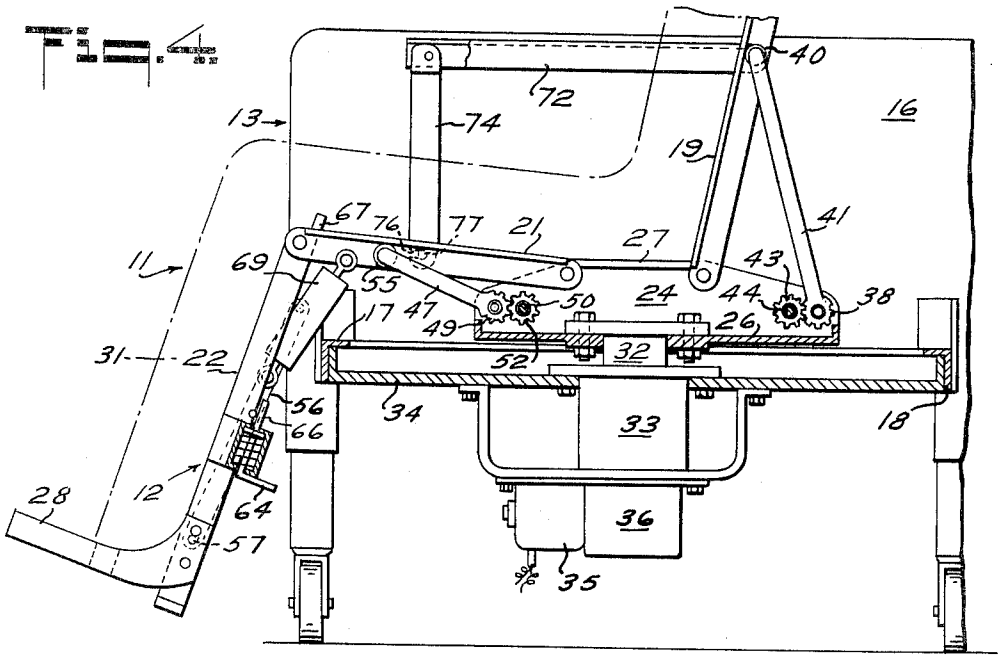
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Fig. 4



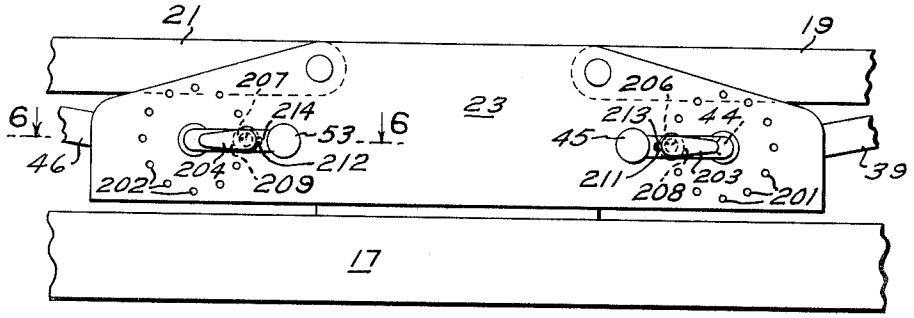


Fig. 5

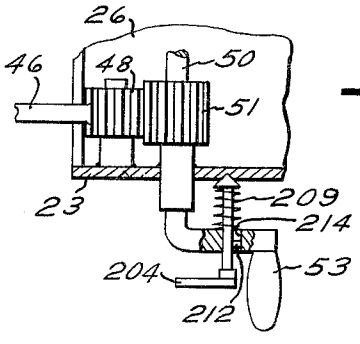


Fig. 6

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CONVERTIBLE HOSPITAL BED-CHAIR

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6 Claims. (Cl. 5—68)

This application is a continuation-in-part of my prior copending application S.N. 820,678, now abandoned.

The present invention relates generally to hospital beds, and more particularly to a hospital bed having an adjustably foldable mattress spring frame which is also pivotal between positions parallel and transverse to the bed and convertible to a chair in the transverse position.

Various hospital beds are known wherein the mattress spring frame is formed in several independently vertically foldable sections. Such beds enable a patient to be moved from a flat reclining position in the bed to a variety of advantageous positions, e.g., a partially sitting position. Suitable mechanical adjusting means are conventionally coupled to the foldable sections to enable the various positions to be assumed with no exertion to the patient and with a minimum of effort to a nurse or other attendant.

Although foldable beds of the foregoing type have done much to further patient comfort and facilitate more efficient nursing operations, patients are still subjected to discomfort and valuable nursing hours are lost in moving patients from their beds to chairs wherein they can assume a more comfortable sitting position, desirable in many cases at various times during the day. Advantages are therefore to be gained by the provision of a foldable mattress spring frame in a hospital bed wherein the conventional adjustment mechanism is retained and in addition the frame is selectively pivoted from the usual position parallel to the bed to a position transversely thereof. With the added capability of the frame being pivotal, the frame may be readily adapted to a chair-like configuration for employment in the transverse position. The patient may then be gently and easily placed in a normal full sitting position without necessitating his removal from the bed. Moreover, such transverse chair position enables a patient to get off of or onto the bed with a minimum of effort, and also, and of extreme importance, the bed may thus be positioned to facilitate ready and proper use of a bed pan by the patient while remaining on the bed.

Formidable problems are encountered, however, in providing in a hospital bed an adjustably foldable mattress spring frame which is also pivotal and which may be readily adjusted to a chair-like position. More particularly, the usual adjusting mechanism necessarily occupies a substantial portion of the underside of the spring frame such that the frame is extremely difficult to pivotally mount upon the bed frame without detracting from the full foldable adjustment capabilities of same. Further difficulties arise in the provision of arm rest forming structure and the like for facilitating ready conversion of the frame into a complete chair, which structure must be necessarily adapted for disposal in an unobstructing position upon the frame when the same is employed as a bed.

The foregoing problems and difficulties are overcome by the present invention which provides a fully adjustable foldable mattress spring frame structure which is also pivotal and readily convertible to a complete chair. The invention provides such pivotal frame structure as an integral unit of a hospital bed.

It is therefore an object of the present invention to provide a foldable mattress spring frame which is pivotal to a position transversely of a hospital bed wherein the frame may be manipulated to form a chair.

Another object of the invention is the provision of apparatus of the class described above whereby the need for separate costly and hospital space consuming special chairs is eliminated.

It is still another object of the present invention to provide a hospital bed-chair whereby a bed patient may be manipulated from a reclined position in bed to a complete sitting position in a chair without exertion to the patient and with a minimum of effort to a nursing attendant.

A further object of this invention is the provision of a fully adjustable foldable gatch spring frame in a hospital bed, the gatch frame being capable of being swung to a transverse position and made to assume a chair configuration to enable an occupant to readily step either off or onto the bed.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

FIGURE 1 is a side elevation view of a convertible hospital bed-chair in accordance with the present invention in extended horizontal position.

FIGURE 2 is a top plan view of the embodiment of FIGURE 1.

FIGURE 3 is a longitudinal sectional view taken at plane 3—3 of FIGURE 2 but showing the foldable spring frame of the bed-chair of FIGURE 1 in alternative position as a bed.

FIGURE 4 is a transverse sectional view taken at plane 4—4 of FIGURE 2 but showing the spring frame in chair position.

FIGURE 5 is an enlarged elevational view of a portion of the bed and illustrating particularly the means by which the head and central portions thereof may be locked in selected positions.

FIGURE 6 is a sectional view taken on the line 6—6 of FIGURE 5.

Considering now the invention in some detail and referring to the illustrated forms thereof in the drawings, a convertible hospital bed-chair 11 is seen to be provided by means of a remotely adjustably foldable mattress spring frame 12 which is adapted for rotation from a bed position parallel to the bed (see FIGURE 1) to a chair position at right angles thereto (see FIGURE 4).

As regards more particularly the spring frame 12 as integrally employed in a convertible bed-chair, and referring to the drawings, it is to be noted that such spring frame is supported upon a bedstead frame 13 of generally conventional construction, consisting of a head frame 14, foot frame 16, and side frames 17, 18 secured together to form a rigid structure. The spring frame 12 is formed of a plurality of foldable sections 19, 21, 22 which are normally arranged in end to end relation when occupying their position upon the bedstead. More specifically, the head section 19 and central section 21 are respectively hingedly connected at longitudinally spaced positions of a pair of transversely spaced vertical support plates 23, 24, rigidly interconnected at their bottom edges by a base plate 26. In addition a fixed horizontal spring section 27 is attached to the plates 23, 24 at the top edges thereof in interposed complementary relation between the foldable head and central sections 19, 21. The foot section 22 of the spring frame is in turn hingedly connected to the end of the central section 21. An upright transverse foot plate 28 is additionally rigidly secured across the end of foot section 22 and several upright side plates 29 are

preferably secured in longitudinally space relation along both sides of the spring frame **12** in order to facilitate lashing or the like of a mattress **31** (see FIGURE 3) to the upperside of the spring frame **12** in substantially non-slipping relation thereto.

The spring frame **12** in the respects just described is substantially similar to spring frames of the gatch spring variety as employed on most conventional hospital beds. The separate foldable sections are usually remotely adjustable with the adjusting mechanism being disposed at the underside of the spring frame. In accordance with the present invention, however, the spring frame **12** is pivotally mounted upon the bedstead frame **13** and in order for the spring frame to be unobstructedly rotatable, a unique arrangement of the adjusting mechanism is required. The spring frame is mounted for rotation transversely of the bedstead frame **13** preferably by means of a vertical shaft **32** rigidly secured as by flanged attachment to the center of base plate **26**. The shaft **32** is journalled within a bearing well **33** depending from a cross member **34** secured between side frames **17, 18** of the bedstead. In the event power driven rather than manual rotation of the spring frame **12** is desired, an electric motor **35** coupled to shaft **32** through a gear box **36** (see FIGURE 4) may be alternatively employed. In addition suitable longitudinal and transverse stop means such as detents (not shown) are preferably employed between plates **26, 34** to lock the spring frame at such positions of rotation.

Considering now means for remotely adjusting the foldable spring frame **12** while permitting rotation of same to a transverse position for conversion to a chair, the adjustment mechanism facilitates independent remote raising and lowering adjustment of the head and central sections **19, 21** respectively, and direct adjustment of the foot section **22** to a plurality of locked positions of rotation relative to the central section. By appropriately adjusting the individual sections, the spring frame may be manipulated into a variety of desirable bed positions, e.g., Trendelenburg, reverse Trendelenburg, hyperextension, semi-chair and other positions. In addition, the spring frame may be appropriately manipulated such that the head section **19** forms the back, the central section **21** the seat, the foot section the leg support, and the plate **23** the foot rest of a chair in the rotated transverse chair position of the spring frame.

The adjusting mechanism for the head section **19** preferably includes a pair of cog wheels **37, 38** journalled to the inner sides of vertical support plates **23, 24** and having links **39** and **41** respectively projecting radially outward therefrom. The ends of the links **39** and **41** are in turn provided with rollers **40** which engage undersurfaces of the frame of the head section to support it in the various positions of such frame. The cog wheels **37, 38** are respectively engaged by gears **42, 43** rigidly attached to a common shaft **44** rotatably secured between support plates **23, 24** and extending transversely through one thereof for rigid end connection of an external hand crank **45**. The crank may accordingly be rotated manually to effect a corresponding rotation of the links **39** and **41**. Since the rollers **40** carried by the links **39** and **41** engage the frame, such rotation causes the head section to be selectively raised and lowered. By virtue of the rollers engaging the frame, substantially frictionless movement between the frame and links is provided and thus ready and easy adjustment of the head section may be attained. The adjusting mechanism for the central section **21** is similarly preferably provided as a pair of links **46** and **47** projecting radially outward from cog wheels **48** and **49** journalled to the support plates **23, 24**. Rollers **55** are carried on the free ends of the links **46** and **47** to engage the central section in a manner similar to engagement of rollers **40** with the head section **19**. A shaft **50** having gears **51, 52** rigidly attached thereto and engaging cog wheels **48, 49** is similarly provided such that upon

manual operation of a hand crank **53** attached thereto, raising or lowering of the central section **21** to substantially any desired stationary position of inclination relative to fixed spring section **27** is effected.

Means are preferably provided to facilitate locking of the head and central sections **19** and **21** in any of the various positions to which they may be adjusted. A variety of locking means may be employed for this purpose, for example, the means depicted in FIGURES 5 and 6. As shown therein one of the support plates **23, 24** is provided with circular arrays of circumferentially spaced depressions **201, 202**, respectively concentrically disposed about the rotational axes of the hand cranks **45, 53**. Spring loaded latch bolts **203, 204** are respectively slidably disposed in bores **206, 207** through the cranks at radial positions registerable with the depressions **201, 202**. The loading springs **208, 209** of the bolts normally urge them inwardly towards the plate **23** and into engagement with whatever ones of the depressions **201, 202** is aligned therewith. In order that the latch bolts may be selectively retracted to positions out of engagement with the depressions, the bolts are respectively provided with radially projecting pins **211, 212** at their outer ends. These pins are selectively engageable with the portion sof the cranks bordering the bores **206, 207** or slidable within longitudinal keyways **213, 214** communicating with the bores. It will thus be appreciated that the bolts **203, 204** may be pulled outwardly against the loading of springs **208, 209** and rotated to engage the pins **211, 212** with the exterior surfaces of the cranks as best shown in FIGURE 6. The bolts are thus retained in retracted positions whereby the cranks may be freely rotated to adjust the head and central sections **19, 21**. When the desired positions of the head and central sections are approached, the latch bolts **203, 204** are rotated to align the pins with the keyways. The bolts are now free to be urged by the springs **208, 209** inwardly towards the plate **23** and into engagement with the nearest ones of the depressions **201, 202**. The cranks are thus locked in position as are therefore the head and central sections of the spring frame.

In order to lock the foot section **22** in various positions of inclination relative to the central section **21** when the spring frame is in the bed position, a pair of foldable parallel spaced support arms **54, 56** are secured at one of their ends to a shaft **57** which is journalled transversely between the sides of the foot section in the end region thereof. The other ends of the arms **54, 56** are rigidly secured by a connecting arm **58** for selectively engaging longitudinally spaced teeth **59** of a pair of parallel rack members **61, 62** mounted longitudinally of the bedstead frame **13**. The rack members **61, 62** may be, for example, rigidly attached between the foot frame **16** and a cross member **63** connecting the side frames **17, 18** at a longitudinal position in the region of the juncture of the foot section **22** with the central section **21**. The foot section **22** may hence be directly manually rotated to various positions of inclination relative to the central section **21** and supported therein by engaging the connecting arm **58** of the support arms **54, 56** in the corresponding teeth **59** of the rack members **61, 62**. The support arms **54, 56**, moreover, may be pivoted to an out-of-the-way position parallel to the foot section **22** of the spring frame to facilitate unobstructed rotation of same to the transverse chair position. Suitable releasable latching means are provided to retain the arms **54, 56** in the out-of-the-way position, preferably a spring loaded latch bolt **64** secured to the underside of foot section **22** for engaging a laterally projecting rod **66** secured to one of the arms **54**.

In order that the foot section **22** may be locked in a position parallel to central section **21** commensurate with unobstructed rotation of spring frame **12**, the foot section is best provided with longitudinally projecting fingers **67** on opposite sides of the end thereof for engag-

ing spring loaded latch bolts **68** secured to opposite sides of the central section when such sections are positioned parallel. The spring frame **12** may thus be prepared for rotation by locking the foot section **22** parallel to the central section **21** with the latch bolts **68** and the support arms **54**, **56** parallel to the foot section with latch bolt **64**. Subsequent to rotation of the spring frame to the transverse chair position, the latch bolts **68** may be retracted to thus release the foot section **22** and permit same to rotate relative to central section **21** into a chair leg rest position slightly inclined to the vertical as depicted in FIGURE 4. It will be appreciated that free rotation of the foot section under the influence of gravity might be detrimental to a bed patient occupying the bed-chair at the same time it is converted to the chair configuration. Accordingly the present invention provides a pair of dash pots **69**, or equivalent motion damping means, pivotally connected between the foot and central sections at the opposite sides thereof.

The bed-chair in accordance with the present invention may additionally be provided with foldable arm members **71**, **72** to facilitate conversion to a complete chair. The arm members are preferably provided as channels respectively pivotally connected at one end to the exterior sides of the head section **19** at a medial longitudinal location thereof. Elongated plate support members **73**, **74** are respectively pivotally connected at the opposite ends of channel arm members **71**, **72** intermediate the depending parallel sides thereof so as to be foldable into the channel space formed therebetween. The support members **73**, **74** are transversely slotted at the unpivoted ends thereof as shown generally at **76** and are of a length to rigidly support the arm members **71**, **72** in horizontal position when the slots **76** engage laterally projecting pins **77** of the central section **21**. The slots may be disengaged from the pins and the support members **73**, **74** pivoted to positions enclosed by the channeled arm members **71**, **72** (see FIGURE 3) while such latter members are pivoted to an out-of-the-way rest position when the bed-chair is employed in the bed position.

The hospital bed-chair of the present invention physically described hereinbefore may hence be employed as a normal hospital bed with the sections **19**, **21**, **22** of the spring frame in parallel end to end relation longitudinally of bedstead frame **13** as depicted in FIGURE 1. The head and central sections **19**, **21** respectively may be independently manipulated by operation of remote adjusting hand cranks **45**, **53** and locked in desired positions by means of the associated latch bolts **203**, **204**. The latch bolts **64**, **68** may in addition be opened to permit independent direct manipulation of foot section **22** and locking of same in various positions by engagement of the support arm connecting arm **58** in the teeth **59** of rack members **61**, **62**. By virtue of such independent manipulation of the foldable sections **19**, **21**, **22**, the spring frame is readily transformable into a variety of bed configurations.

Conversion of the bed-chair from the bed to the chair configuration may be readily accomplished even with an occupant in the bed, the occupant being thereby manipulated into a full sitting position in the chair with no exertion on his part and a minimum of effort on the part of an attendant. More particularly, the central section **21** may be adjusted parallel to the fixed section **27** by operating crank **53** and the head section **19** raised to a partial chair position upwardly inclined relative to the fixed section **27** by operating crank **45**, these sections being locked in position upon manipulation of the latch bolts **203**, **204**. As a result of the gradual raising of the head section, the bed occupant is gently urged into a partial sitting position. The foot section **22** is additionally locked parallel to the central section **21** by means of latch bolts **68** and the support arms **54**, **56** are retained in unobstructing position parallel to the foot section by means of latch

bolt **64**. The arms **71**, **72** are then rotated into horizontal position and locked therein by engaging the slots **76** of support members **73**, **74** with the pins **77**. The spring frame **12** with the occupant in partial sitting position is rotated to the chair position transversely of the bedstead frame **13**. In this transverse position, the foot section **22** is released by opening latch bolts **68** and rotates slowly downward by virtue of dash pots **69**, to a slightly inclined substantially vertical leg supporting position with the foot plate **28** forming a foot rest. A complete chair configuration is thus provided in the foregoing manner by the spring frame **12** and simultaneously the bed occupant is placed in complete sitting position therein. The back and seat of the chair (viz. head and central sections **19**, **21** of the spring frame), moreover, are readily adjustable to various comfort promoting positions by manipulation of hand cranks **45**, **53** and lockable in these positions by means of the latch bolts **203**, **204**.

What is claimed is:

1. Mattress spring frame structure for a hospital bed and convertible to a chair comprising a pivotal support base secured to a bedstead frame with the base being rotatable about an axis normal to the frame, a spring frame head section pivotally connected to one end of said base, a spring frame central section pivotally connected at one end to the other end of said base, a spring frame foot section pivotally connected to the other end of said central section, releasable latch means carried by said central section for selectively locking said foot section in parallel relation thereto, a first pair of cog wheels respectively journalled at the opposite sides of said base and having radially projecting link arms slidably engaging opposite sides of said head section in supporting relation thereto, a first pair of gears respectively engaging said first pair of cog wheels and journalled upon said base for selective rotation to responsively effect rotation of the head section, means for selectively locking said head section at positions throughout its rotation, a second pair of cog wheels respectively journalled at the opposite sides of said base and having radially projecting link arms slidably engaging opposite sides of said central section in supporting relation thereto, a second pair of gears respectively engaging said second pair of cog wheels and journalled upon said base for selective rotation to responsively effect rotation of the central section, means for selectively locking said central section at positions throughout its rotation, a transverse rod member pivotally secured to said foot section, a pair of transversely spaced rack members mounted longitudinally of said bedstead frame and having longitudinally spaced teeth engageable by said rod member whereby the foot section may be rotated to selected positions and locked therein by engagement of the rod member with the corresponding teeth of the rack members, and releasable latch means carried by said foot section for selectively locking said rod member in an unobstructing position of rotation in abutment with the foot section.

2. Mattress spring frame structure according to claim **1**, further defined by first and second hand cranks connected to said first and second pairs of cog wheels and disposed exteriorly adjacent one side of said base, said base having pluralities of depressions in its exterior side surface respectively concentrically disposed about the axes of said cranks, and said means for selectively locking said head section and said means for selectively locking said central section respectively comprising spring loaded latch bolts carried by said first and second hand cranks and selectively movable between retracted positions and extended positions engageable with said depressions.

3. A convertible bed-chair comprising a bedstead frame, a cross member rigidly attached between the sides of said frame at an intermediate location thereof, a pair of upright support plates, a base plate rigidly interconnecting said support plates at the bottom edges thereof,

means carried by said cross member for mounting said base plate for rotation thereon, a fixed spring frame section secured between said support plates at the top edges thereof, a spring frame head section pivotally connected to said support plates at one end thereof in abutting relation to said fixed section, a spring frame central section pivotally connected to said support plates at the other end thereof in abutting relation to said fixed section, a spring frame foot section pivotally connected to the end of said central section and having longitudinal fingers at the sides thereof projecting toward the central section, a pair of spring loaded latch bolts secured to the opposite sides of said central section for releasably engaging said fingers when said foot section is rotated parallel to said central section, a foot plate transversely secured to the end of said foot section in right angle relation thereto, a first pair of cog wheels respectively journalled to said support plates and having radially projecting link arms slidably engaging opposite sides of said head section in supporting relation thereto, a first pair of gears respectively engaging said first pair of cog wheels, a shaft rigidly connected to said first pair of gears and journalled between said support plates with one end of the shaft extending through one of the support plates, a hand crank secured to the extending end of said shaft, a second pair of cog wheels respectively journalled to said support plates and having radially projecting link arms slidably engaging opposite sides of said central section in supporting relation thereto, a second pair of gears respectively engaging said second pair of cog wheels, a second shaft rigidly connected to said second pair of gears and journalled between said support plates with one end of the shaft extending through one of the support plates, a second hand crank secured to the extending end of said second shaft, a pair of transversely spaced support arms pivotally secured at one of their ends to said foot section and rigidly interconnected at their other ends by a rod, a pair of transversely spaced rack members mounted longitudinally of said bedstead frame and having longitudinally spaced teeth engageably by said rod, a laterally projecting rod secured to one of said support arms, a spring loaded latch bolt secured to the side of said foot section for releasably engaging said projecting rod when the support arms are rotated to a position parallel to the foot section, a pair of dash pots respectively secured between said foot and central sections at their opposite sides, and a pair of foldable chair arms respectively pivotally secured to opposite sides of said head section and each including support means for selective supporting attachment to said central section.

4. A convertible bed-chair as claimed by claim 3, further defined by said foldable chair arms each comprising a channel member pivotally connected at one end to said head section, and an elongated support member having one end pivotally connected to the free end of the channel member intermediate the depending sides thereof and the other end transversely slotted, and a pair of laterally projecting pins secured to opposite sides of said central section for respectively engaging the slots of said support members.

5. Mattress spring frame structure for a hospital bed and convertible to a chair comprising a pivotable support base secured to a bedstead frame with the base being rotatable about an axis normal to the frame, a spring frame head section pivotally connected to said base, a spring frame central section pivotally connected to said base and extending generally away from said head section, a spring frame foot section pivotally connected to said central section, means for releasably locking said foot and central sections against rotation in one direction relative to one another, a pair of support arms pivotally secured adjacent opposite sides of said base and slidably engaging spaced side portions of said head section in supporting relation thereto, means for relatively pivoting said support arms to effect rotation of said head section, means for selectively locking said head section at different positions throughout its rotation, a second pair of support arms pivotally secured adjacent opposite sides of said base and slidably engaging spaced side portions of said central section, means for selectively pivoting said second support arms to effect rotation of said central section, means for selectively locking said central section at positions throughout its rotation, means for selectively locking said foot section at various positions throughout its rotation, and means for selectively positioning said last named means in unobstructing relation to rotational movement of said pivotable base on said bed stead.

6. Mattress spring frame structure for a hospital bed and convertible to a chair comprising a pivotable support base secured to a bedstead frame with the base being rotatable about an axis normal to the frame, a spring frame head section pivotally connected to said base, a spring frame central section pivotally connected to said base and extending generally away from said head section, a spring frame foot section pivotally connected to said central section, means for rotating said head section to various positions and releasably maintaining said head section stationary in each such position thereof, means for rotating said central section to various positions and releasably maintaining said central section stationary in each such position thereof, means for locking said foot section at various positions throughout its rotation, a pair of arm rest members pivotally mounted respectively adjacent opposite sides of said head section, said arm rest members being pivotable from an inoperative unobstructing position adjacent said head section to an operative position extending angularly to said head section and spaced above said bedstead, and a pair of support members each pivotally connected to one of said arm rest members and adapted to support the latter members in their said operative position, said support members being pivotable to an inoperative position disposed closely adjacent and substantially parallel to their respective arm rest members.

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