

Feb. 24, 1953

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2,629,425

BERTHABLE CHAIR

Filed June 18, 1946

3 Sheets-Sheet 1

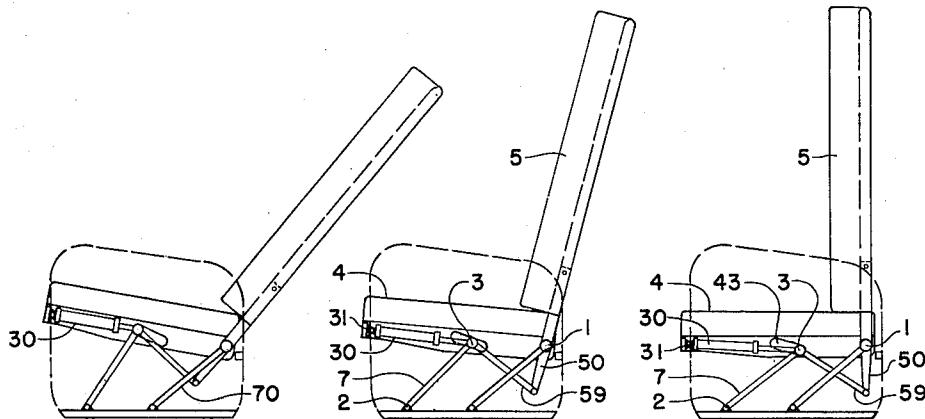


FIG. 3

FIG. 2

FIG. 1

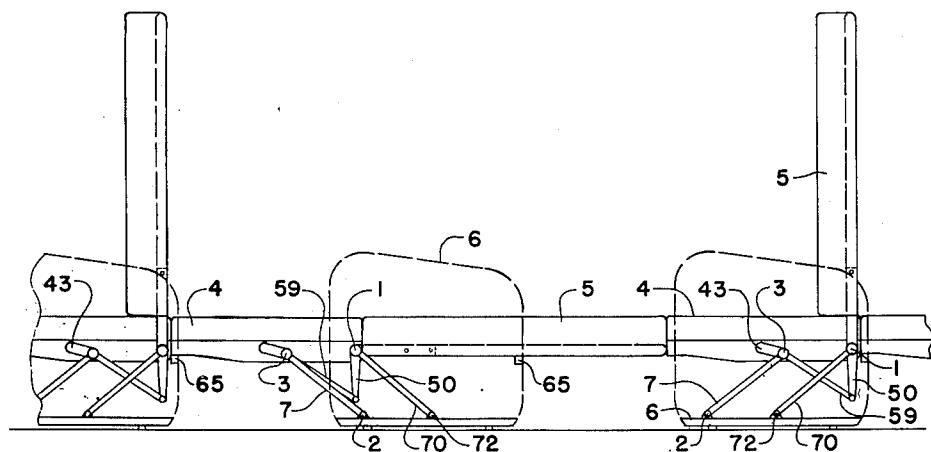


FIG. 4

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3 Sheets-Sheet 2

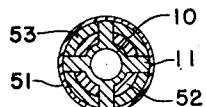


FIG. 6

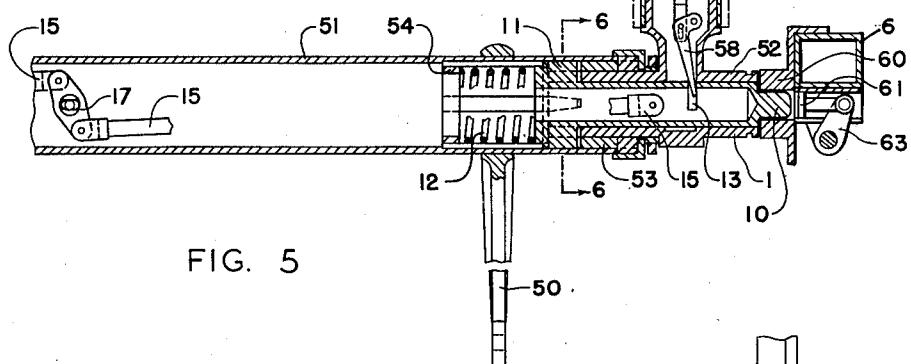


FIG. 5

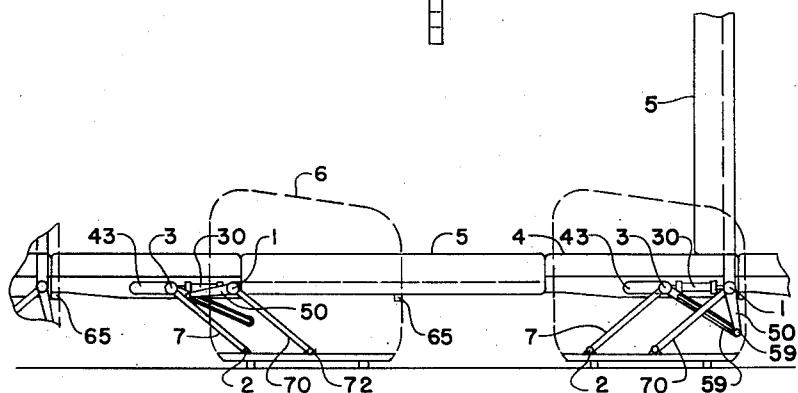


FIG. 7

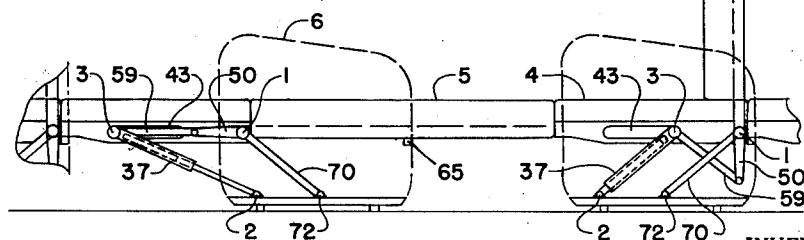


FIG. 8

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3 Sheets-Sheet 3

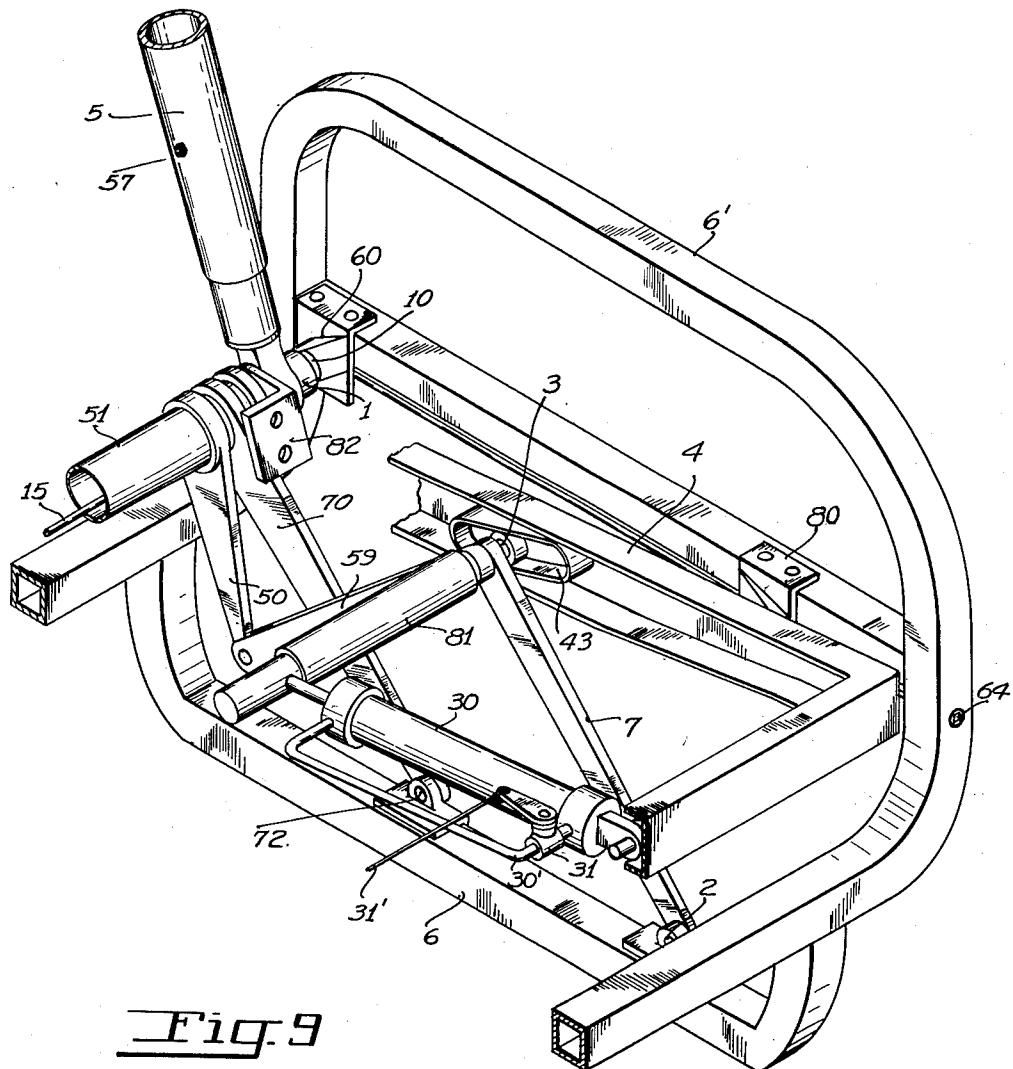


Fig. 9

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UNITED STATES PATENT OFFICE

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BERTHABLE CHAIR

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17 Claims. (Cl. 155—6)

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The present invention concerns chairs, designed primarily for use upon vehicles such as airplanes, such as constitute by day a comfortable and adjustable reclining chair, but capable of forming by night at least a major part of a comfortable berth.

It is an essential object of such invention that the chair be comfortable, both inherently and because it can be adjusted into various reclining or upright positions, easily and simply under control of the occupant, and that the berth for night occupancy be comfortable, so that there be no compromise in the chair in favor of the berth, nor in the berth in favor of the chair. Preferably the adjustment of the chair involves coincidental adjustment of the inclination of the seat and back into corresponding positions, but not through the same angle, so that the back may be tilted to a greater degree than the seat, but so that the seat will be tilted to some degree as the back is tilted, in order that the positions of the seat and back may be at all times consonant and comfortable relative to one another.

The chair being intended for installation in an airplane, though, of course, suited for other installations, nevertheless it is important that it be simple in construction and light in weight, and readily manipulated.

To avoid accidental or mischievous conversion from chair form to berth form, the chair should incorporate a lock or locks to prevent such conversion, but these locking means should be such as are easily and quickly releasable by an authorized person, so that the conversion will require a minimum of time and effort.

Particularly in an airplane, which may encounter bumpy air, it is extremely desirable that the hingedly connected seat and back be locked together, when in the berth form, so that there is no possibility of jackknifing, nor of tilting of the berth or any part thereof, about the hinge axis.

It is also an object to provide an arrangement susceptible of variations in design, in order to accomplish the coordinated tilting of the seat and back in the manner best suited to a given design, or to the designer's choice, and yet capable of release, shifting, and conversion to the berth form in substantially the same manner, regardless of the design chosen.

While the general objects of the invention have been indicated above, many other objects, and particularly those which relate to the more purely mechanical details of the invention, will be ascertainable as this specification progresses, and

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from a study of the accompanying drawings, and of the claims.

The invention comprises the novel berthable chair, and the novel subcombinations and arrangements of the parts thereof, as illustrated herein in several forms, and as will be more fully explained in this specification, and the scope whereof will be more particularly pointed out by the appended claims. In particular it is desired to point out that the invention, while concerning a chair, concerns more especially a chair which not only is comfortable as such, but which is nevertheless convertible to serve as a berth.

In the accompanying drawings the invention has been shown embodied in several typical forms, all incorporating the principles of my invention.

Figure 1 is a side elevation, largely diagrammatic in character, illustrating the chair in its most upright seating position, and Figures 2 and 3 are similar views showing progressively greater inclined or reclining positions thereof.

Figure 4 is a view similar to the preceding figures, showing adjacent chairs arranged cooperatively to constitute a berth.

Figure 5 is a section axially of the common hinge axis of the seat and back at one end, and including also a portion of the supporting frame, and Figure 6 is a transverse sectional view substantially along the line 6—6 of Figure 5.

Figure 7 is a view similar to Figure 4, of a modified arrangement, and Figure 8 is a similar view showing a second modification.

Figure 9 is an isometric view of the chair, showing portions of the seat, back and supporting frames.

The chair is composed of a seat 4 and a back 5, each of which incorporates suitable framework and upholstering, and a fixed supporting structure or frame 6, the sides of which form conventional arm rests 6' (Fig. 9). A description of one end or side of the frame will suffice to make clear the construction and arrangement. A first pivot means, generally designated by the numeral 1, normally held fixed in relation to supporting frame 6 by a socket 60, hingedly connects the rear edge of the seat and the lower edge of the back frame 5 for coordinated swinging about a common hinge axis. This hinge axis can be released from its normally fixed position, for bodily forward shifting of the pivot means 1 and of the seat 4 and back 5 into berth-forming position (Fig. 4). However, the installation will be described first as a chair, and therefore the pivot means 1 may be considered for the present as fixed in position (Figs. 1—3, 5).

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A second pivot means 2, substantially at floor level, and usually carried by and fixedly positioned upon the frame 6, connects the lower end of a seat-supporting link 7 to the frame, to extend upwardly and rearwardly from the pivot means 2. The upper, rear end of this seat-supporting link 7 is connected by a third pivot means 3 to the seat 4, intermediate the front and rear edges of the seat. Preferably this connection is formed by pivot means 3 slidably engaging the cam slot 43 on the seat 4. The connection permits some sliding movement of pivot means 3 relative to the seat frame in a generally fore and aft direction, which movement results in varying the spacing between the pivot means 1 and 3.

Means are provided to control such sliding movement of the pivot means 3, taking the form, in the preferred arrangement illustrated in Figures 1 to 6, inclusive, of a hydraulic locking device 30, reacting between the seat 4 and the pivot means 3, and controllable by a valve 31 actuated through a connection such as link or cable 31' or other suitable conventional means at the will of the occupant of the seat. Such devices are commercially available, and consist essentially of a piston reciprocable within a cylinder, with valve means to control the flow of liquid in either direction as between the two ends of the cylinder. As shown simply in Fig. 9, flow of liquid between the cylinder ends may occur through a by-pass 30' interconnecting such ends.

Back bracing and supporting means are provided, whereby to connect the back in such a way to the seat, or to the seat-supporting means, or to the means governing the tilted position of the seat, that the back will also tilt coincidentally with tilting of the seat, and while not to the same degree, in coordinate amounts. Thus, an arm 50 projects downwardly below the first pivot means 1, and normally is held rigid with the frame of the back. It is releasable for conversion to a berth, but for purposes of the immediate description may be considered as rigid with or a part of the back. A back supporting link 59 connects this arm 50 with the pivot means 3.

To complete the description, and for a purpose which will appear later, a link 70, more or less parallel to the link 7, and disposed rearwardly thereof, connects the first pivot means 1 and a pivot support 72 substantially at floor level. Depending upon the designer's choice, the link 70 may, in either the berth-forming or chair-forming attitude of the parts, assume an appreciable part of the chair's load, or if the pivot means 1 is otherwise supported in fixed position (as it is by the alternatively engaged socket 60 or 80, as will later appear) the link 70 need form no part of the support for the chair, except during shifting from one position of use to the other. Its sole function, in the structure illustrated, is to guide movement of the pivot means 1 between sockets 60 and 80, that is, from chair-forming to berth-forming position, or the reverse. When the pivot means 1 is seated in one or the other of those sockets, as it is in its two positions of use, the pivot means 1 and the link 70 are both immobilized. The link 70 has no part in the adjustment of chair elements into different reclining positions. One or the other of the sockets assumes the support of the pivot means 1 and every element which is supported from the latter. In the absence of one or both sockets the link 70 would assume part of the support of the chair, but in the form illustrated it does not, in any position of use.

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The upright position of the chair is illustrated in Figure 1. Here the hydraulic locking cylinder 30 is farthest extended, to press the third pivot means 3 farthest to the rear, or nearest the immobilized pivot means 1. The sliding connection between this pivot means and the seat 4 is preferably by means of a cam slot 43 which is inclined, and so designed and arranged that with the hydraulic lock device 30 projected to its fullest extent, the pivot means 3 will lie in the rear lower end of the cam slot 43. This causes rearward and downward swinging of the seat supporting link 7 about the pivot means 2 to the maximum extent, and consequent lowering of the front edge of the seat 4 until the seat is horizontal. Likewise, through the back supporting link 59 the arm 50 has been urged rearwardly, until the back with which the arm 50 is rigid is substantially vertical.

Now, if it is desired to tilt the back somewhat rearwardly and the seat somewhat upwardly, the control valve 31 of the hydraulic lock cylinder 30 is opened, and the occupant presses rearwardly upon the back 5. Fluid being now free to flow from one end to the other of the cylinder 30, is caused to do so by the force applied to the back, reacting through the arm 50, the link 59, and the pivot means 3. The seat-supporting link 7 tilts forwardly and upwardly about the pivot means 2, displacing the slideable pivot means 3 forwardly relative to the immobilized pivot means 1, and upwardly within the slot 43. The back, as has already been described, tilts rearwardly about the pivot means 1, fixedly positioned within its supporting socket 60, and the seat 4 tilts upwardly about the same pivot means 1, being thus supported in its tilted position by the pivot means 3 and the seat supporting link 7, in conjunction with the socket 60. When the desired position is reached the valve 31 is closed, holding parts in the attained position. Figure 2 shows an intermediate reclining position, and Figure 3 the limit inclined position, wherein the pivot means 3 has reached the forward upper end of the cam slot 43.

It is not essential, of course, that the valve 31 be closed following each adjustment. It can be left open, and the adjustment can then be accomplished by shifting the weight or differently applying force by the occupant. The device 30 in such circumstances will serve no purpose other than as a dashpot to control and smooth out the movement of the parts, yet it is always ready as a lock when required.

It is desired to point out that the three pivot means 1, 2 and 3 are arranged in all positions of the chair in a generally triangular pattern. The positions of the seat and back can be governed by relative adjustment of the various elements supporting the three pivots, changing the triangular arrangement thereof, and not only by shifting of the pivot means 3. Adjustment of any two pivot means relatively to one another varies the adjustment of the chair. Moreover the back-supporting link 59 need not connect only to the pivot means 3, but to any other of the three mentioned pivots or their supporting elements.

Likewise, while the hydraulic locking element 30 is shown in Figures 1 to 3 as reacting between the front edge of the seat and the pivot means 3, it may react in other fashions, as, for example, as shown in Figure 7, between the pivot means 1 and 3, or, as in Figure 8, it may be incorporated

in or constitute a substitute, 37, for the seat-supporting link 7.

Such an arrangement forms a comfortable, readily adjustable, reclining chair for daytime use, and the control thereof is wholly at the will of the occupant. He may sit straight, or may recline to the very considerable degree indicated in Figure 3, or he may assume any number of intermediate positions, and always as he tilts the back rearwardly, the front edge of the seat tilts upwardly to a sufficient degree that his seat is comfortable with relation to the tilting of the back. At the same time this comfortable, adjustable, reclining chair converts readily and quickly into a berth, as will shortly be described.

The pivot means at 1 is somewhat complex, functionally, hence is a little difficult to understand at a glance, but it is believed it will be clear by reference to Figures 5, 6, and 9, in conjunction with this description. A transverse tubular member 51 connects and journals two tubular elements 52, coaxial with each other and with 51, one projecting at each end of 51. The elements 52 are structurally a part of the back, for they carry integral radial stubs 55 to which the tubular frame pieces 5 of the back are normally secured. Arm 50 is fixed upon the tubular member 51, hence the angular position of the arm 50 about the axis of member 51 determines the angular position of the back 5, provided the back frame, including the elements 52, is locked to the element 51. Normally parts are so locked, by mechanism which will be explained in detail shortly, and this makes tubular member 51 in effect a part of the back, hence the inclination of the back, when parts are set up as a chair, is controlled by the angular position of the arm 50; however, this locking mechanism is releasable, and when released the back may swing down about the pivot means at 1 into horizontal berth-forming position, beyond the limit positions previously maintained through the back bracing means 50, 59, as will appear later.

In addition, the tubular member 51 rotatively mounts the rear portion of the seat 4, and the upper end of the link 70. There is no rigidity of connection, in the rotative direction, between either of the seat 4 or the link 70 and the tubular member 51, nor the back.

The locking mechanism which interconnects the tubular member 51 and the coaxial tubular elements 52 is in the nature of complementary jaw clutch elements, one non-rotatively carried by 51 and the other non-rotatively carried by 52, plus a common axially interengageable element 11. The interengaging clutch element 11 is cruciform in cross-section or in end elevation; see Figure 6. The notched inner end of bushing 53, fixed within and in effect constituting part of the tubular element 51, constitutes one jaw clutch element, and the notched end of tubular element 52, which in effect is part of the back, constitutes the complementary jaw clutch element. Both are notched to receive snugly the cruciform interengaging clutch element 11 by axial movement of the latter. When the parts are so engaged it is clear that bushing 53 (hence tubular element 51) can not rotate relative to tubular element 52 (hence the back of which 52 is a part); the locking mechanism is engaged. A spring 12, reacting axially from a pressed-in ring 54, urges parts into and retains them in this locking engagement. The cruciform element 11 is formed as a head upon a partly hollow pin 10, which is axially slidable within the element 52; 75

disengagement of the jaw clutch elements held fixedly by 11 is effected by inward axial movement of 10, 11 in opposition to spring 12, until 11 leaves the end notches in 52 and 53, whereupon relative rotation between the latter is possible.

The pin 10 is normally held in projected position by the spring 12. When thus projected it can be received in the socket 60 (see Figures 5 and 9) to constitute the fixed pivot of the chair back, or in the socket 80 to constitute a fixed support for the seat portion of the berth.

The cruciform element 11 will reengage within the notches of the bushing 53 and tubular element 52 upon completion of 90° of relative rotation between the two latter members. This will occur when the back has swung downwardly and rearwardly into the plane of the seat, in berth-forming position, as later described. The effect of this reengagement is to lock the back against rotation in its berth-forming position, and so to hold the back in the same horizontal plane as the seat, as will appear hereinafter. Disengagement to reform the chair is accomplished in the manner already described, and by like mechanism.

In order to convert the chair to a berth it is necessary to release the pivot means at 1 from its normally fixed position, so that the seat may shift bodily from its normal position and the back may be swung down to the rear and shifted bodily forwardly. For such release of the pivot means at 1 a pusher 61 is received within a socket 62 in the frame member, in alignment with or as an extension of the socket 60. This pusher, and a similar one for the forward socket 80, is acted upon by a lever 63 pivotally mounted on a suitable shaft extending fore and aft within the frame and having a coaxial key-receiving element 64 by which it can be engaged by a key in the possession of the proper person, a member of the crew of the vehicle. In this manner, by pressing the pin 10 to the left, as viewed in Figure 5, it can be moved out of its socket 60, and the pivot means 1 and the back 5 and seat 4 are thereby freed for swinging and shifting bodily. In berth-forming position, pivot pin 10 enters an auxiliary supporting socket 80 located forwardly of the frame 6 in the arcuate path of swing of pivot means 1 on link 70.

As has theretofore been pointed out, the construction at a single end only of the frame 6 has been described, but it will be realized that the constructions referred to above are more or less duplicated at the opposite side of the seat. In order to release the pivot means at the opposite side of the seat the motion of the pin 10 is transmitted thereto through any suitable arrangement, such as the links 15 joining the rocker arm 17, within tubular pivot shaft 51, and the pins 10 at the opposite sides of the seat.

Referring now to Figure 4, it will be observed that of the three seats illustrated, the two outside seats have their backs straight upright as partitions between berths, being in the position corresponding to Figure 1. The intervening seat, however, has had its pivot means 1 released, and the seat 4 has been displaced bodily forward until its forward edge rests upon berth-supporting brackets 65 on the frame of the seat ahead. To afford greater stability to the seat during conversion, and to guide its rear edge between the seat-forming and berth-forming positions, the link 70 is provided, which is more or less parallel to the link 7, extending, like the link 7, from a

pivot support at 72 near floor level, to the pivot support 1. When the chair is set up as a chair the link 70 has no function, but it does function to guide the rear edge of the seat into the berth-forming position, such as is shown in Figure 4, and it may support the seat in such berth-forming position. Usually the pivot pin 10 will seat in the socket 80, at the berth-forming position, analogous to the socket 60 (Fig. 9).

As has already been explained, release of the pivot means 1 from its normally fixed position within the socket 60 breaks the rigid connection between the back 5 and the downwardly depending arm 50, or, referring to Figure 5, it breaks the anti-rotation locking connection between the tube 51 and the tube 52. The latter tube 52 has a radial stub 55 whereon is slidably mounted the tubular frame 56 of the back 5. The frame 56 is retained in its full line position of Figure 5 by self-projecting locking pins 57, spring-urged outwardly, but retractable inwardly to permit disengagement of the tube 56 from the stub 55 through the agency of means such as a lever 58 and linkage connections illustrated. The long arm of lever 58 is engaged by a transverse slot 13 in the pin 10. As the pin 10 is pressed to the left in the process of its release from the socket 60, the pins 57 are retracted, and the tubular frame 56 of back 5 is free to move inwardly to the dotted line position of Figure 5. The purpose of this is evident when it is noted that the upholstered portion of the back 5 must be spaced far enough from the axis of the pivot means 1 to accommodate the thickness of the upholstered portion of the seat 4. Yet in the arrangement as a bed the two upholstered portions should abut closely, so no gap is left.

So, with the seat 4 shifted forwardly into the position of Figure 4, and with the pivot means 1 seated and fixed within its supporting socket 80, the back can be swung downwardly and rearwardly, and slid toward the rear edge of the seat 4, until it assumes the position shown in Figure 4. Here the back rests upon the berth-supporting bracket 65 of its own frame 6. In this position it is coplanar with its own seat 4 and with the seat 4 of the chair to the rear thereof. As has already been explained, the back will be locked in this coplanar position, since it has rotated through 90°, and the locking head 11 will be urged by the spring 12 into the cruciform notches in the end of the bushing 53 and of the tube 52. Thus the seat and back are locked together in the common plane, and any tendency of the back to rise is resisted by the seat bearing against its support brackets 65, and conversely, any tendency of the seat to rise is resisted by the bearing of the back upon its brackets 65. The berth cannot jackknife, nor can any part thereof move relative to any other part.

To restore the berth for use as a chair it is only necessary to press inwardly upon the pin 10, by mechanism like that described in connection with the socket 60. Such inward movement of the pin 10 disengages it from its forward socket 80, and disengages the head 11 from the notches in the tube 52 and fixed bushing 53, and at the same time releases the pins 57 from holes in which they have been received in the tube 56. The tube 56, hence back 5, can now be slid outwardly, and the tube 56 and the stub 55 can be tilted upwardly, until the back is once more in vertical position. Now the seat, with the back, can be shifted on the links 7 and 70 from the forward position to the rear position, in which

position the pin 10 reengages in the socket 60, and the chair is reconstituted as such.

In the form shown in Figure 7, in addition to the location of the hydraulic locking cylinder 30 between the pivot means 1 and 3, there are certain slight additional modifications. For instance, the cam slot 43 is more nearly in the plane of the seat than inclined with respect thereto, which gives a slightly different movement to the tilting of the seat. Also the back-supporting link 59 is slotted in the direction of its length, and the lockable pivot means at 59', between this link 59 and the arm 50, may, upon release, slide lengthwise of the link 59. In such case the arm 50 may remain rigid with the back 5 at all times, but the back bracing means is broken by the release and sliding of the lock at 59'.

In Figure 8 the arrangement is somewhat similar to that of Figure 7 save that the link corresponding to the link 7 is now formed as a hydraulic plunger and piston arrangement, indicated at 37. By supplying pressure fluid from any suitable source the seat 4 can be tilted more or less through a normal range, and upon release of the pivot means 1 full extension of the hydraulic device at 37, beyond its normal range, will cause or permit the seat to be moved to the forwardly displaced berth-forming position. In this arrangement also the arm 50 remains rigid with the seat 5, due to the particular linkage design.

I claim as my invention:

1. A chair comprising a seat and a separate back, a supporting frame, a first pivot means carried fixedly by said frame and pivotally supporting the rear edge of the seat and the lower edge of the back for relative vertical swinging about a common axis, an arm directed downwardly from and rigid with the back, a second pivot means stationary with relation to said frame and substantially at floor level, a seat-supporting link connected at one end to said second pivot means, a third pivot means mounted on said seat for sliding movement from front to rear of said seat and forming a connection with the other end of said seat-supporting link, a back-supporting link pivotally connected at its ends respectively to said downwardly directed arm and to said third pivot means, and means operable to fix the third pivot means in various positions of movement thereof relative to the seat, thereby to fix the tilted positions of the back and the seat.

2. A chair comprising a frame structure, a seat and a separate back, three pivot means arranged in generally triangular relationship, the first supported by said frame structure and supporting the rear edge of the seat and the lower edge of the back for vertical swinging, the second supported on said frame structure substantially at floor level beneath the forward portion of the seat, and the third carried by the seat rearwardly of its forward edge and of the second pivot means, an element operatively interconnecting said second and third pivot means and supporting the seat intermediate its front and rear edges, means slidably supporting one of said pivot means for fore and aft movement relative to the seat, means operable to control adjustment of the spacing between two of said pivot means to effect tilting of said seat, and means operatively connecting the back with the slidably supported pivot means, to effect tilting of the back conjointly with the seat.

3. A chair comprising a frame, a seat and a separate back hingedly supported on said frame for relative swinging, a seat-supporting link having a lower end carried pivotally by the lower portion of said frame and inclined upwardly and rearwardly therefrom, means connecting the upper end of said link to the seat intermediate to the seat's front and rear edges for fore and aft sliding movement of said upper end relative to the seat, thereby to tilt the seat about its hinge support, back-supporting brace means connecting the back and the slidably mounted upper end of said link, determining tilting of the back, and means to govern swinging of said seat-supporting link, and sliding of its upper end along the seat, thereby to govern coincidental relative tilting of the back and seat.

4. A chair comprising a seat and a separate back, hinge means interconnecting said seat and back for relative swinging, a seat-supporting link, means at floor level pivotally supporting said link inclined upwardly and rearwardly therefrom, means connecting the upper end of said link to the seat intermediate the seat's front and rear edges for fore and aft sliding thereof relative to the seat, hydraulic means operable to restrain such sliding movement in controlled manner, means supporting said hinge means, back-supporting brace means including a bracing link connecting the back and the slidably connecting means for the upper end of said seat-supporting link, for tilting of the back conjointly with the seat, and means to disconnect the back from the slidable connecting means to enable tilting of the back independently of the seat.

5. A berthable chair comprising a seat and a back hingedly connected thereto, frame means supporting and guiding said seat and back to tilt about the hinge axis, means, including linkage means interconnecting said seat and back, operable to coordinate tilting of one as the other tilts, means operable to release one of the back and seat from said linkage coordinating connection, for tilting of the back independently of the seat into the plane of the seat, and means to support the coplanar seat and back in horizontal position to form a berth.

6. A chair comprising supporting means extending upwardly from the floor, a seat, and a separate back, a first pivot means pivotally connecting the rear edge of the seat and the lower edge of the back to the supporting means for tilting of the seat and back each conjointly with and also relative to the other, about a common fixedly located axis, an arm directed downwardly from and secured rigidly to the back, a seat-supporting link, a second pivot means pivotally connecting said link to said supporting means substantially at floor level, said link being inclined upwardly from said second pivot means toward the seat, a third pivot means interconnecting the upper end of said link to said seat at a location intermediate the seat's front and rear edges, said third pivot means incorporating lost-motion means for limited shifting of the link's upper end in a general back and forth direction relative to the seat as the link swings about said second pivot means, a back-supporting link pivotally connected at its respective ends to said downwardly directed arm and to the shiftable upper end of said seat-supporting link at the third pivot means, whereby shifting of the seat-supporting link's upper end effects tilting of the back, and, conjointly therewith, tilting of the seat by the consequent swinging of the seat-supporting link,

thereby to govern the relative tilting of the back and the seat.

5 7. A chair as in claim 6, including additionally an actuator operatively connected between the third pivot means and an element of the chair relative to which said third pivot means moves as the seat is tilted, to shift the third pivot means relative to the seat, thereby to tilt the seat and the back.

10 8. A chair as in claim 6, including extensible and retractable means operatively connected between the third pivot means and a transverse edge of the seat, and operable by extension or retraction to vary the spacing, lengthwise of the seat, between the first and third pivot means, and thereby the tilting of the seat and back.

9. A chair as in claim 6, wherein the seat-supporting link is formed as an extensible and retractable member, operatively connected between the second and the third pivot means, and variable in length to adjust the spacing between said two pivot means, to govern the tilting of the seat and back.

25 10. A chair as in claim 6, wherein the lost-motion means includes a cam slot carried upon and located intermediate the forward and rear edges of the seat, and inclined upwardly and forwardly relative to the seat's general plane, and includes further a pivot pin carried by the upper end of the seat-supporting link and pivotally received in said cam slot for shifting lengthwise of the latter, to effect upward tilting of the seat's front edge at a lesser rate than the rearward tilting of the back's upper edge.

35 11. A chair as in claim 6, including releasable locking mechanism incorporated in the elements which connect the back and the upper end of the seat-supporting link, and normally engaged to tilt the back conjointly with tilting of the seat, but upon release permitting tilting of the back independently of the seat.

40 12. A chair as in claim 6, including releasable locking mechanism normally operatively interconnecting the back and the downwardly directed arm for conjoint tilting about the first pivot means, but upon release permitting tilting of the back wholly independently of tilting of the seat.

45 13. A berthable chair comprising a fixed supporting frame which extends upwardly from the floor, a seat and a separate back, a first pivot means pivotally connecting the rear edge of the seat and the lower edge of the back, a first rest on said supporting frame, in position such that it engages with said first pivot means to retain the latter fixed in chair-forming position, a seat-supporting link, a second pivot means pivotally connecting the lower end of said link to said supporting frame substantially at floor level, said link being inclined, when in chair-forming position, upwardly and rearwardly from said second pivot means towards the seat, a third pivot means interconnecting the upper end of said link to said seat at a location intermediate the seat's front and rear edges, said third pivot means incorporating lost-motion means for limited shifting of the link's upper end in a general back and forth direction relative to the seat as the link swings about said second pivot means, articulated brace means connected to the back and said link, to effect tilting of the back coincident with tilting of the seat between various chair-forming positions, an actuator operable to tilt the link and thereby to govern tilting of the seat, a second rest on said supporting frame in position such

that it will engage with said first pivot means, when the parts are shifted into berth-forming position, to retain the first pivot means fixedly in such latter position, means guiding said first pivot means between chair-forming and berth-forming positions, the seat-supporting link and the lost-motion means of the third pivot means being organized and arranged to support the forward portion of the seat fixedly in berth-forming position when parts are shifted to that position, releasable means incorporated in said articulated brace means, which when released with the first pivot means engaged with said second rest will leave the back free to swing rearwardly and downwardly about the first pivot means into berth-forming position wherein it is substantially coplanar with the seat, and a third rest on said frame to engage and support the back in such downwardly swung berth-forming position.

14. A berthable chair as in claim 13, wherein the means to guide the first pivot means between the first and second rests is formed as a link pivotally anchored on the supporting frame substantially at floor level, and inclined thence upwardly and connected to the first pivot means in general parallelism to the seat-supporting link, in either operative position of the latter.

15. A berthable chair as in claim 13, including means incorporated in said first pivot means to retain the latter in engagement with either of the two rests, means engageable with the first pivot means to disengage the latter at will from its rest, and means operatively connecting the first pivot means and the releasable means for the back's brace means, to release both jointly and simultaneously.

16. A berthable chair as in claim 13, including further releasable means to hold the lower edge of the back spaced from the first pivot means sufficiently to override the seat's thickness, said further releasable means including resilient means active upon release of said further releasable means to shift the back toward the first pivot means, to close any gap between the seat and back when they are coplanar.

17. A berthable chair comprising a supporting frame extending upwardly from the floor level, a seat, a separate back, a first pivot means pivotally connecting the seat and the back near their rear and their lower edges, respectively, for relative swinging, means to secure said first pivot means fixedly to the frame to retain and support parts in a rearwardly chair-forming posi-

tion, an arm directed downwardly from and supported by said first pivot means for pivotal movement relative to the frame, means normally locking said arm rigidly to the back to swing the two 5 conjointly, a seat-supporting link, a second pivot means carried by said supporting frame near floor level, and pivotally mounting the lower end of said link, the link being inclined thence upwardly and, in the chair-forming position, rearwardly to the seat, a third pivot means interconnecting the seat, forwardly of the first pivot means, and the upper end of said link, one of the second and third pivot means including lost-motion means for limited shifting in a general 10 back and forth direction, means operatively connected between two relatively movable elements of the chair to shift such elements relatively, and thereby to shift the third and second pivot means one relative to the other, and thus to govern tilting of the seat, a back-supporting link pivotally connected to the downwardly directed arm and to the third pivot means, to tilt the back coincident with tilting of the seat, means cooperating 15 with the seat-supporting link to guide the seat from its rearwardly displaced chair-forming position forwardly to a berth-forming position, means to release the locking means for said downwardly directed arm, to enable swinging of the back relative to the seat into the plane of the seat in berth-forming position of the parts, said locking means being arranged to be thereupon reengageable to retain the seat and back in their coplanar relationship.

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