June 5, 1956 J. R. THOMAS 2,748,398

CONVERTIBLE SEAT BED WITH FORWARDLY OVER-TURNING SEAT

Filed March 9, 1953 2 Sheets-Sheet 1

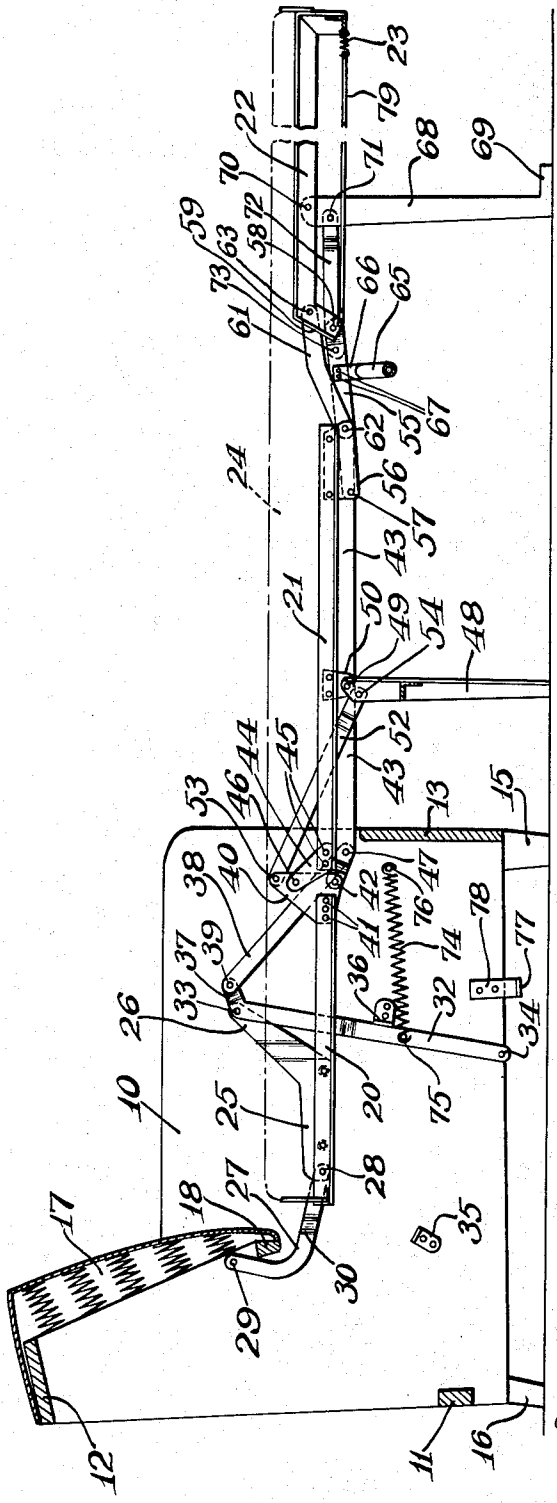


FIG. 1.

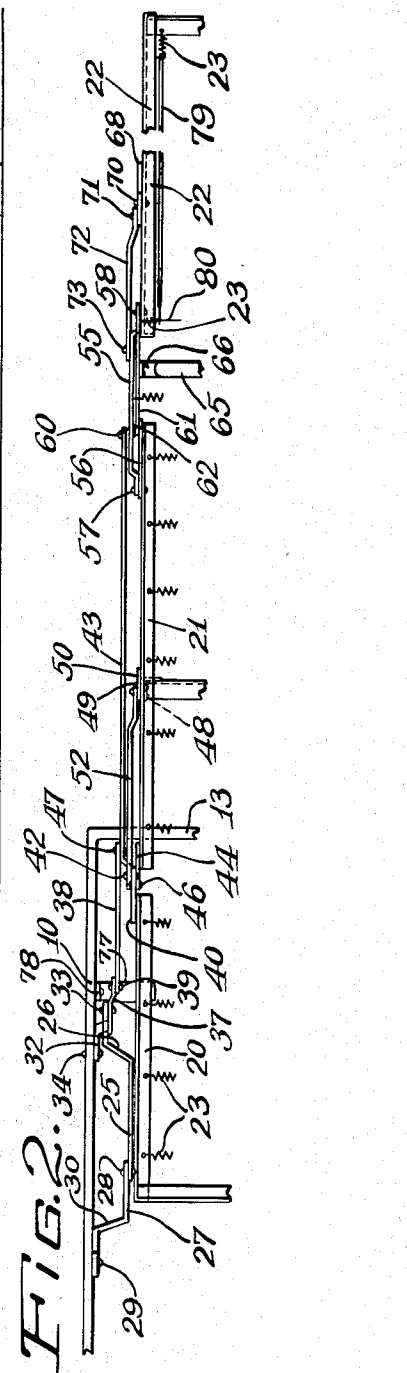


FIG. 2.

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FIG. 3.

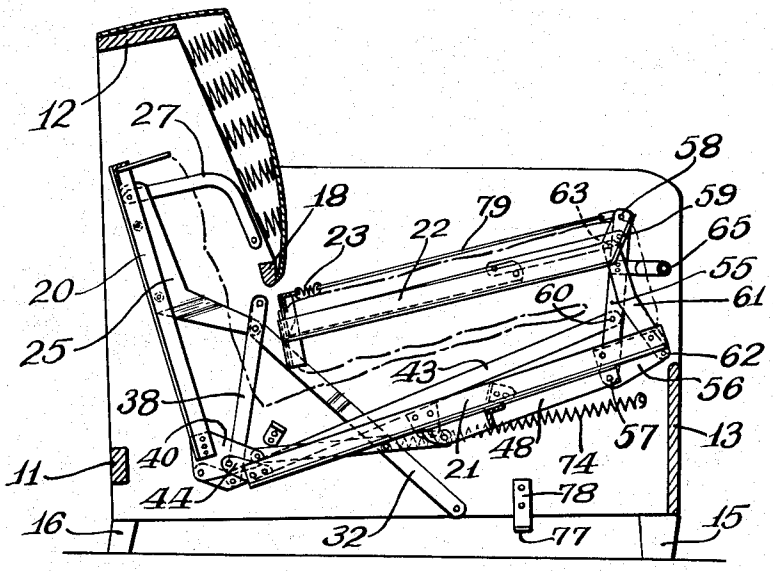
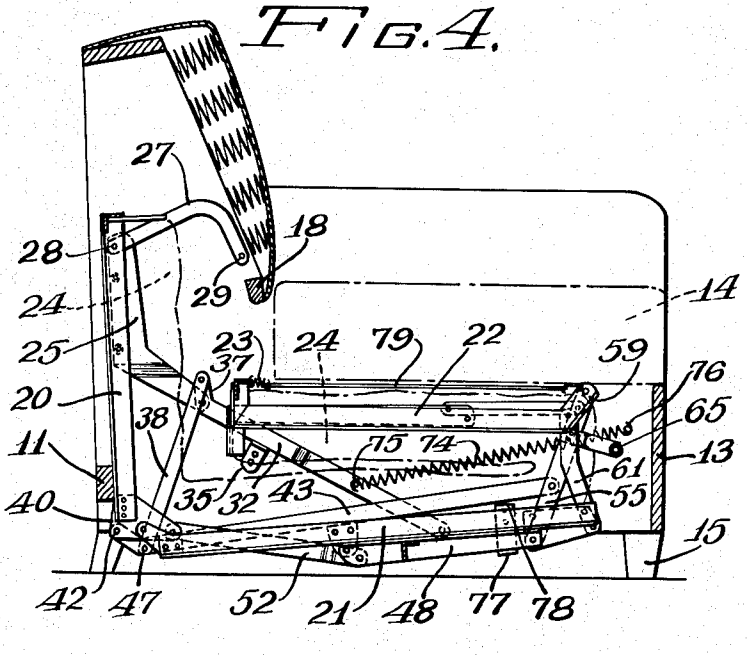


FIG. 4.



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CONVERTIBLE SEAT BED WITH FORWARDLY OVER-TURNING SEAT

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Application March 9, 1953, Serial No. 341,179

12 Claims. (Cl. 5—13)

This invention relates in general to a folding bed construction which may be converted from a chair or a davenport into a full length bed extending forwardly from the frame and in which the seat portion of the construction is inverted forwardly and extended to an outer position in front of the davenport frame.

In convertible furniture of this kind, the structure must be comfortable as a seat and also as a bed; it must be easily and smoothly changed from one form to another, and if a desirable article of furniture is to be produced, the supporting frame must be firmly constructed so that the sides or arms are not loosely connected at the front. To accomplish this last desirable result and to produce an article of furniture, which will have a front board connecting the forward edges of the side arms, a front board of considerable width is provided which firmly connects the forward portions of the arms of the chair or davenport, and substantially conceals the folding mechanism within the frame up to the height of a loose cushion or cushions which are commonly placed on top of the folded bed and seat construction and between the arms at the sides thereof.

These desirable features require that the folding portions of the construction be so mounted in the frame, connected to each other and coordinated in their movements that they may be easily and continuously moved from a position below and behind the seat upwardly in an inclined direction to clear the top of the front board and to unfold and position the folding sections of the bed and seat so that they will extend from within the davenport frame free from engagement with the top of the front board and with some of the sections extending in advance of the davenport frame and all in horizontal alignment in the extended position so that a mattress which may be attached to the sections will fold and unfold with them and will be extended on top of the sections when they are extended to form a bed.

An important object of the invention is therefore to provide a folding convertible seat bed structure in which the seat section is overturned outwardly and forwardly in front of the other folding sections and to so mount the folding sections in a davenport frame and to coordinate their folding and unfolding movement, that they will move upwardly over the top of a fixed front board and outwardly in front of the davenport frame with the rearmost section connected in the frame and the outer sections supported by folding legs in front of the frame.

A further object of the invention is to provide coordinating engagement of the various folding sections so that they will unfold easily and smoothly from the forward overturning of the seat section to an extending position to form a bed, and reversely from the bed position to return all of the sections within the supporting frame without requiring any manual attention to the folding and unfolding movement other than to lightly lift the seat section and to continue the folding or unfolding action by applying a slight pressure thereto.

A still further object of the invention is to provide a

convertible seat structure with a fixed front rail of full height over which coordinated and connected folding sections will move automatically over the rail without contact therewith in either direction and will be seated behind and below the top of the rail and at the back of the davenport frame when folded therein.

Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings in which,

Fig. 1 is a side elevation of a convertible seat structure in accordance with this invention in extended position to form a bed over the top of a fixed front rail, some of the frame parts being shown in section;

Fig. 2 is a plan view of a portion of the sectional folding structure shown in Fig. 1 together with the mounting connection in the davenport or seat frame;

Fig. 3 is a side elevation of the parts shown in Fig. 1 in a partially folded position clearing the top of the front board; and,

Fig. 4 is a side elevation of the parts as shown in Fig. 3 in their completely folded position within the seat frame.

In convertible furniture of the forwardly overturning seat type, it has heretofore been difficult to provide a sufficiently rigid connection for the front ends of the supporting frame arms and at the same time to provide a fixed front board of sufficient height at the front of the frame so that a strong and rigid frame is produced which may be suitably upholstered and also to cover the space at the front of the frame between the lower edge of the frame or the tops of the front legs and the lower edge of the seat cushion support.

In the present invention, a relatively high front board is fixed in position at the front of the frame thereby providing means for producing a firm and rigid davenport frame and at the same time providing a folding sectional bed structure which may be housed within the seat frame but may be extended and unfolded in front of the frame by first overturning the upper or seat section in a forward direction and continuing the outward movement of the seat section in a controlled manner to entirely clear all of the folding sections from contact with the top of the front board without requiring a heavy lifting operation at any stage of the folding or unfolding movement.

Referring now more particularly to the drawings, a davenport (or chair) frame in which the folding seat and bed structure is mounted, comprises a pair of arms or end frames **10** connected at the back by a fixed cross piece **11** near the bottom and a top cross piece **12** adjacent the top. At the forward end of the arms, they are connected by a front board **13** which extends from the bottoms of the side frames to a height substantially at the top of the upholstered seat but at the bottom of a removable seat cushion **14** which may be placed thereon, resting upon the top of the front board as shown in Fig. 4.

At the four corners of the seat frame are front and rear legs **15** and **16** which are adapted to raise the frame a substantial distance above the floor so that period and upholstered designs may be applied to the frame to make it more attractive. Extending downwardly from the top cross piece **12** is an upholstered back **17** which is usually supported by a fixed rail **18** at the bottom, also extending between and forming a support between the end frames **10**. Other transverse supports may be provided in the folding structure itself, but the frame as thus set up with the ends of the front board securely attached to the forward projections of the end pieces may be strong and firm not likely to spring apart at the joints or at the ends of the front board, and adapted to maintain a firm support for the folding mechanism.

The folding mechanism comprises three main sections,

a back section 20, an intermediate section 21, and a seat section 22. These three sections are connected together, only one of the sections has a fixed mounting in the frame, and all of the sections are connected together by a coordinating mechanism which causes them to fold and unfold in a certain predetermined manner such that when the unfolding action is started, the sections will continue to unfold upwardly and outwardly over the top of the front board 13 without engaging it, and into an extended position partly within and partly in front of the davenport frame. In folding the mechanism, the coordinating means controls the entire action and folding movement of all of the sections by first manually raising the outer section and thereupon causing the sections to fold upwardly and over the upper edge of the foot board 13 without touching it and downwardly into and within the davenport frame.

Each of the main sections 20, 21 and 22 is preferably formed of angle metal frames with a flexible mattress supporting fabric therein, supported by marginal helical springs 23 which are well known in this art and constitute no particular portion of the present invention. The mattress support is sufficient to carry a mattress 24 thereon and to fold a mattress with the sectional frames as they are folded and stored within the davenport frame.

In this construction, the rear section 20 has side plates 25 secured thereto by rivets or any other suitable manner, the side plate extending forwardly from the rear end of this section and having an upward and forward extension 26 offset laterally outward at each side toward the side frame 10. To the rear of each side plate is pivotally connected one end of a mounting link 27 by means of a pivot 28, the other end of this link being connected by a pivot 29 and attached to the adjacent side frame. The intermediate portion of this link has an offset 30 which properly spaces the rear section inwardly from the adjacent end frame 10.

To the forward extension 26 of each side plate 25 is connected the upper end of a mounting lever 32 by means of a pivot 33 near the top thereof and the lower end of this lever is connected by a pivot 34 at the lower side of the frame. These levers 32 and the links 27 support the rear frame section 20 for a pivoting movement from an upright position at the rear of the davenport frame as shown in Fig. 4 to a horizontal position within the frame at about the height of the seat therein as shown in Fig. 1.

When the folding structure is returned to seat position within the supporting frames, each lever 32 engages a stop 35 secured to the corresponding end frame 10 and in the extended or bed forming position of the sections, the movement of the lever 32 is limited by another stop 36 secured to the inside of the corresponding end frame. These stops are preferably in the form of angle brackets with one portion attached to the end frame and another portion extending at right angles therefrom in the path of movement of the lever 32.

At the upper end of the lever 32 is an angular offset and projection 37 which extends laterally in the nature of a bell crank and to which one end of a master coordinating link 38 is connected by a pivot 39. At each forward edge of the seat section 20 is a plate 40 extending outwardly and upwardly therefrom when in the bed position. This plate is secured to the back section by rivets 41 or other suitable connections and is substantially triangular in form with a lower corner having a pivot 42 for engaging the end of a coordinating lever 43 which extends under the intermediate section 21 at the side thereof and toward the outer or front portion of this section.

The intermediate section is directly pivoted to the plate 40 by means of a bracket 44 connected to each adjacent edge of the intermediate section 21 by rivets 45 or other suitable securing means, the end of the bracket

projecting outwardly and rearwardly therefrom to slightly overlap the plate 40 to which it is connected by a pivot 46. Thus the sections 20 and 21 are directly pivoted to each other and these two sections are connected by the coordinating linkage which extends from each supporting lever 32 and comprising the coordinating link 38 which is connected to the coordinating lever 43 by a pivotal connection 47 at a short distance from the adjacent end of the lever 43 and at a short distance from its end pivot 42 by means of which it is connected to the plate 40. This end of the lever 43 is preferably formed with a slight offset so that the pivots 42 and 47 are not in alignment with the link 38 in the extended or bed position of the folding sections.

To support the intermediate section 21, a leg 48 has its upper end connected by a pivot 49 with a plate 50 extending downwardly from the side frame of the section 21. To positively operate each leg, a link 52 is connected by a pivot 53 with the upper angular end of the plate 40 and the other end of the link is connected by a pivot 54 with the leg 48 adjacent its mounting pivot 49. The result of this connection is that when the sections 20 and 21 are folded angularly together, the leg is collapsed against the bottom of the intermediate frame 21 as shown in Figs. 3 and 4 but when the sections are extended to form a bed, the leg is automatically advanced as soon as the intermediate section passes over the front board following its outward movement from the position shown in Fig. 3.

Between the intermediate section 21 and the seat section 22, there is a double linking connection comprising one lever 55 which is connected at one end to a plate 56 secured at the adjacent end of the intermediate section by means of a pivot 57 located at a distance from the adjacent end of the section. The other end of the lever 55 is connected by a pivot 58 with an angular extremity 59 of the side frame of the seat section 22. The coordinating lever 43 is connected to the lever 55 by a pivot 60 located intermediate the ends of the lever and substantially closer to the pivot 57 so that when the sections unfold into the bed position, the coordinating lever 43 overlaps the pivot 57 of the lever 55.

Another part of the double linking connection includes a link 61 connected to the outer projecting portion of the plate 56 by a pivot 62 at one end and by a pivot 63 connected to the angular portion of the extremity 59 of the side frame of the seat section 22 at its other end. These links are so connected that in the folded position of the sections as shown in Figs. 3 and 4, the links 55 and 61 extend crosswise of each other, but when they are in extended position as shown in Fig. 1, the links are substantially parallel. One of the links as 55 is provided with a tubular spacing bar 65 with extremities 66 flattened and bent upwardly and secured by rivets 67 or other fastening means to the links 55 at opposite sides of the sections.

A leg 68 is connected to each side frame of the seat section 22 and at its lower end has a right angle projection 69 which supports it more firmly upon the floor or other surface upon which the seat bed is mounted. Each leg is connected to the side frame by a pivot 70 and at a distance from this pivot is another pivot 71 connecting one end of a link 72 thereto, the other end of the link being connected by a pivot 73 with the adjacent link 55 at a short distance from its pivot 58 with the angular extremity 59 of the side frame of the seat section 22. In the unfolded position, the pivots 73, 58 and 71 are substantially in alignment so that each leg is substantially locked in position and cannot be disengaged without bodily lifting the seat section upwardly when the sections are to be collapsed.

In folding and unfolding the sections, the action of raising the mounting lever 32 and with it the folding sections is assisted by a coil spring 74 connected at one end 75 with the lever intermediate its ends and somewhat

nearer the lower end thereof, and the other end of the spring is connected to a fixed projection 76 extending inwardly from the adjacent end frame 10 near the front thereof. In the folding direction of movement, the lowering movement of the sections 20 and 21 by means of the mounting levers 32 on each side is cushioned by these springs 74 until the limiting position is reached in which the levers 32 engage the back stops 35. At this time, the intermediate section 21, and more particularly the leg 48 carried thereby is engaged by an inwardly projecting extremity 77 of a stop bracket 78 secured to the lower edge of the adjacent end frame between the lower pivot 34 of the lever and the front broad 13.

In the seat section 22, the mattress supporting fabric comprises marginal helical springs 23 connected to flexible metal straps 79 which extend from front to rear in the seat section 22 and at the rear are connected to a cross wire 80 extending between the sides of the frame and providing a suitable mattress and cushion support at opposite sides thereof.

When the sections are folded within the frame, the removable seat cushion is loosely supported upon these straps 79 with the bottom of the cushion at the level of the top of the front board 13 which is at such a height that even with the loose cushion supported thereon, the height of the cushion is not so great as to make it uncomfortable as a seat.

With the sections as thus described folded within the frame and a loose cushion mounted thereon, it is necessary only to remove the loose cushion and to manually engage the forward edge of the front of the seat section or more conveniently, the cross bar 65 which extends from side to side of the end frame just back of the front board so that it is easily engaged near the side or center of the frame. In lifting the front ends of the sections upwardly in this manner, the lifting movement is increasingly assisted by the coil spring 74 as the seat and intermediate sections are raised upwardly and the front of the intermediate section clears the top of the front board since all of the sections are mounted upon the levers 32 connected to the lower portions of the side frames and upon the mounting links 27 secured to the rear ends of the rear section 20.

As the pivotally mounted sections are swung upwardly and outwardly, the swinging movement of the sections with respect to the levers 32 causes the automatic action of the coordinating linkage through the master coordinating link 38 which is connected to the end of the coordinating link 43. The lever 43 is connected to the link 55 which joins the intermediate and seat sections so that the seat section which is restrained by the other link 61 will be quickly inverted as the rear and intermediate sections move outwardly over the front board.

As the links 55 and 61 of the seat section are straightened from their crossed connection, the legs 68 are swung outwardly and downwardly, the seat section gradually overturns and as the rear section 20 and the intermediate section 21 are moved apart from their right angled position, the legs 48 are unfolded and swung downwardly clear of the front board until they engage the floor. Since the master coordinating link 38 is connected to the angular portion of the coordinating lever 43 and the two sections 20 and 21 have a fixed hinging connection through the pivots 46, the unfolding movement of the rear and intermediate section carries them outwardly and upwardly so that the legs 48 are folded outwardly and downwardly through their connection with the upper projection of the plates 40. The final alignment of the rear and intermediate sections takes place at about the same time that the seat section is swung outwardly into alignment with the other sections, the legs 68 of the seat section reaching the floor at about the same time or slightly after the legs 48 come in contact with the floor. During this movement, an operator who has manually initiated the unfolding movement, moves outwardly in front of the bed as it unfolds, usually transferring his contact from the front of the seat or the cross bar 65 to the outer end of the seat so that the unfolding action is smooth, continuous and does not require any attention of the operator in the order or amount of the unfolding since the unfolding action is entirely controlled by the coordinating linkage.

When the sections are unfolded and placed in alignment to form a bed, the mattress 24 carried thereby will be likewise extended and the weight of the sections and the movement of the coordinating parts over and in alignment with each other is sufficient to constitute a lock for maintaining the sections in their unfolded relation. To unlock the sections for folding action, it is necessary only to manually raise the outermost section, that is, the seat section, and then to exert a slight continuous lifting and pushing action in order to cause the coordinating linkage to take up the folding and collapsing action of the sections in a reverse order and automatically folding the legs against the sections, overturning the seat section with respect to the intermediate section and swinging all of the raised sections over the top of the fixed front board 13 without engaging the front board and continuing this swinging and folding movement until the rear and intermediate sections are disposed at right angles to each other, and the seat section overlies the outer portion of the intermediate section in the frame, and supporting all of the sections against the back and by means of the side brackets 78 so that the sections will not drag upon the floor but will support the seat firmly in its overturned seat position.

Thus the mattress supporting fabric of the seat section is used in the seat position to directly support a loose cushion or cushions for the purpose of providing a low and comfortable seat, and the seat section is inverted bodily and carried forward at the outer end of the folding sections with a mattress attached thereto and forming a sleeping surface on the other side of the seat fabric. By this means, the seat may be made much lower and more comfortable for receiving a loose cushion, and the bed sections are folded compactly with a mattress of relatively large size therein, and the sections are so mounted in the frame that even through a relatively high fixed front board is provided, all of the folding parts are movable over the fixed front board without engaging it and without interrupting the smooth and continuous folding and unfolding movement of the seat sections as governed and controlled by the coordinating mechanism which assumes complete charge of the folding or unfolding as soon as it is manually started and by the aid of minimum manual assistance in continuing the movement in either direction.

While a preferred construction has been described in some detail, it should be regarded by way of illustration and example rather than as a restriction or limitation thereof, as many changes in the construction, combination and arrangement of the parts may be made without departing from the spirit and scope of the invention.

I claim:

1. In a convertible seat bed structure, a frame having a front board fixed therein and extending upwardly, a sectional seat and bed frame having connected seat, back and intermediate sections, the back section and the intermediate section being foldable at right angles to each other within the frame, means connecting the seat section with the intermediate section to overturn forwardly from its seat position, means for mounting the back and intermediate sections to swing within the frame, and coordinating means consisting of connected links and levers pivoted to the seat section and the other sections for folding and unfolding them together in a continuous predetermined manner and for sequentially inverting the seat section forwardly at the front of the bed frame as the sections are swing upwardly and forwardly out of the frame over and clear from contact with the top of the front board and into alignment at the front of the frame.

2. In a convertible seat bed structure in accordance with claim 1, a mounting link at each side connected to the rear end of the rear section for swinging it downwardly and the lower end forwardly, a mounting lever connected to each side frame to extend above the seat position, a plate connected to the rear section and extending upwardly and forwardly therefrom, a pivotal connection between the upper end of the lever and the upper end of the plate, and an extension of the lever at its upper end to engage and by its movement to control the operation of the coordinating linkage.

3. In a convertible seat bed in accordance with claim 1, a mounting lever for each side having an angular offset pivotally connected at the angle to the rear section for swinging it in the frame, a link connected to the extremity of the angular offset for pivotal movement as the lever is moved, a coordinating lever pivoted to the rear section and having a pivotal connection with the first link adjacent thereto, and means forming a pivotal connection with the intermediate section adjacent its outer side, and a link and a lever connecting the intermediate and seat section to one of which the coordinating lever is connected.

4. In a convertible seat bed in accordance with claim 1, a coordinating linkage comprising a mounting lever pivoted in the frame having an angular offset, the angle of which is pivotally connected with the rear section, and a coordinating linkage connected to the angular extremity of the mounting lever and comprising a first coordinating link directly pivoted to the end of the lever, a coordinating lever pivoted to the rear section and having a pivotal connection with the first link adjacent the said pivotal connection, a double linkage connecting the intermediate section with the seat section for inverting the seat section with respect to the intermediate section and the coordinating lever connected to one member of the double linkage for controlling the overturning movement of the seat section in accordance with the movement of the mounting lever.

5. In a converible seat bed in accordance with claim 1, a mounting lever for each side of the rear section pivotally connected at its lower end to the frame and pivotally connected at its upper end to the rear section, an angular offset at the end of the mounting lever, a first coordinating link connected at one end to the angular offset, a coordinating lever connected at its extremity to the forward side of the rear section, a link and a lever connecting the outer side of the intermediate section with the outer side of the seat section when in seat position, the link and lever being movable from a parallel position to a position crossing each other to invert the seat section relative to the intermediate section, and the lever member of the pair being pivoted at one end to the intermediate section at a distance from the edge thereof, the coordinating lever being connected to the said lever member at a distance from its pivotal connection with the intermediate section.

6. In a convertible seat bed in accordance with claim 1, a mounting lever pivotally connected in the frame and pivotally connected to the rear section, the mounting lever having an angularly offset portion adjacent its connection with the rear section, a coordinating link connected to the angular extension, a coordinating lever pivotally connected at one end to the rear section and having a pivotal connection adjacent this end with the end of the link, a plate at the outer side of the intermediate section, an angular offset on the seat frame and a pair of members connecting the said plate and the angular offset in crossed relation when the sections are folded and in parallel relation when the sections are extended to form a bed, and a pivotal connection between the end of the coordinating lever and one of the members at a distance from its connection with said plate whereby a slight movement of the coordinating lever will effect a relatively quick overturning movement of the seat section with respect to the intermediate section.

7. In a convertible seat bed in accordance with claim 6, in which the bed sections are foldable with the rear section and the intermediate section at right angles in the bed frame, and the seat section is inverted over the top of the outer end of the intermediate section in the frame, means forming a loose cushion support at one side of the seat section and providing a space at the other side of the support for a mattress to be folded therein, and a cross bar extending from one of the pair of members connecting the intermediate and the seat section when the sections are folded and extending toward the top of the fixed front board to provide a manually engageable handle for raising the sections in the frame and starting the operation of the coordinating movement in the unfolding of the sections.

8. In a convertible seat bed structure, a supporting frame having forwardly extending end frames, a front board fixed to the forward ends of the end frames and extending vertically upward at the front, a sectional seat and bed frame comprising seat, back and intermediate sections connected together for hinging movements at their joints, the back section and the intermediate section being foldable at right angles to each other within the frame, means connecting the seat section with the intermediate section to overturn forwardly, means mounting the rear and intermediate sections to swing within the frame and the coordinating linkage for folding and unfolding all of the sections, comprising a master coordinating link pivoted at one end to one of the mounting means, a coordinating lever pivoted at one end to the outer edge of the rear section when in its bed position, the first link being pivoted at its other end adjacent the pivotal connection of the lever with the rear section, a pair of members pivotally connected between the intermediate section and the adjacent side of the seat section, one of the members forming a simple link connection between the sections and the other member and comprising a lever to which the other or free end of the coordinating lever is connected, the connections of the members with the seat section being spaced apart so that when the seat section is extended, these members are substantially in alignment and when the seat section is folded in the frame, the members are in cross relation with respect to each other, and the connection of the coordinating lever with the said one of the members operating to quickly invert the seat section when the rear and intermediate sections are swung from a right angled relation to a position in which they are in alignment with each other, and the coordinating linkage being operative to swing the intermediate and seat section upwardly and outwardly over the top of the front board in the unfolding and folding movement of the sections.

9. In a convertible seat bed in accordance with claim 8, a pair of legs for supporting the seat section in its bed position and a pair of links each pivotally connected at one end to one of the legs and pivotally connected to the other end to one of the said connecting members and operated by the coordinating levers to extend the legs from the seat section when the seat section is unfolded forwardly for supporting the seat section in the bed position.

10. In a convertible seat bed in accordance with claim 8, a pair of legs pivotally connected to the upper side of the seat section when it is in seat position, and means connecting the legs with the operating lever for extending the legs to supporting position when the seat section is inverted at the front of the intermediate section.

11. In a convertible seat bed in accordance with claim 8, a pivoting plate connected to the outer edge of the rear section when it is in bed position and extending upwardly above the rear section, a leg pivoted to and foldable against the bottom of the intermediate section, a link extending from the leg across the side of the intermediate section and upwardly to the top of said plate when the sections are in bed position, the intermediate section

having a bracket pivotally connected to the said plate which mounts the rear and intermediate sections for hinging movement with respect to each other, and the link connecting the leg being operative to extend the leg downwardly from the front of the intermediate section after the rear and intermediate sections are rocked upwardly and outwardly in their substantially right angle position in which the lower portion of the intermediate section and the leg folded thereagainst are moved over and free from engagement with the upper edge of the front board.

12. In a convertible seat bed in accordance with claim 1, the front board extending approximately to the top of the seat section in its seat position and a fixed back rest extending forwardly from the upper rear portion of the frame to provide a space at the rear of the back rest into which the upper portion of the back section extends,

and the means for mounting the back section including a link pivotally connected at the rear of the lower portion of the back rest and to the upper end of the back section in its folded position.

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