

[54] FOLDING SOFA-BED CONSTRUCTION WITH ADJUSTABLE HEAD SECTION

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[51] Int. Cl. .... A47c 17/14, A47c 17/40

[58] Field of Search ..... 5/13, 28, 29, 74, 52

[56] References Cited

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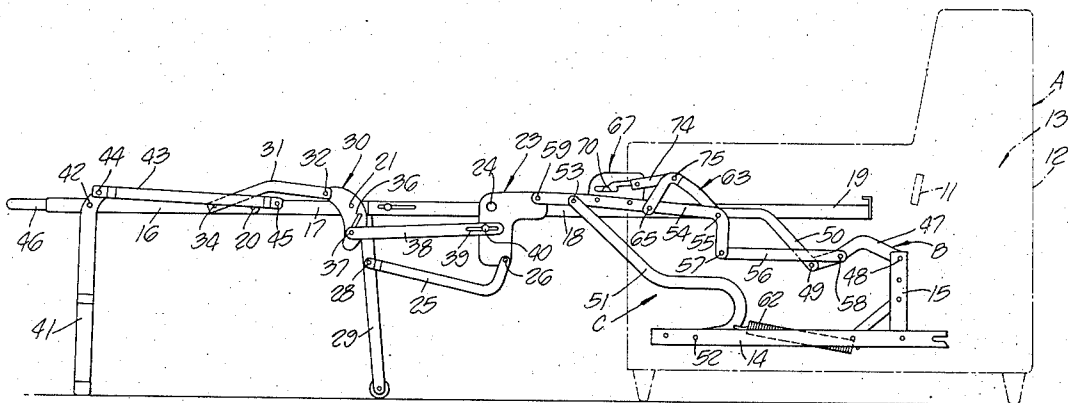
3,395,409	8/1968	Eakins	5/13
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3,585,658	6/1971	Spitz	5/13

Primary Examiner—Casmir A. Nunberg  
Attorney, Agent, or Firm—Whann & McManigal

[57] ABSTRACT

A folding bed frame for sofa-beds in which a plurality of frame sections, including a foot section, knee section, trunk section and head section are pivoted in end-to-end relation so as to be foldable between an extended bed-forming position and a retracted sofa seat-forming position; wherein front and rear support and guiding link assemblies for the trunk section coact with head section actuating link means to control movements of the trunk section and head section during movements to the extended bed-forming position and to the retracted sofa seat-forming position; and including a mechanism operatively connected with the head section actuating link means for automatically latching and releasing the head section in a raised position of use extending at an angle to the trunk section, in response to a manual raising movement of the head section, when the trunk section and head section are in the bed-forming position.

17 Claims, 7 Drawing Figures



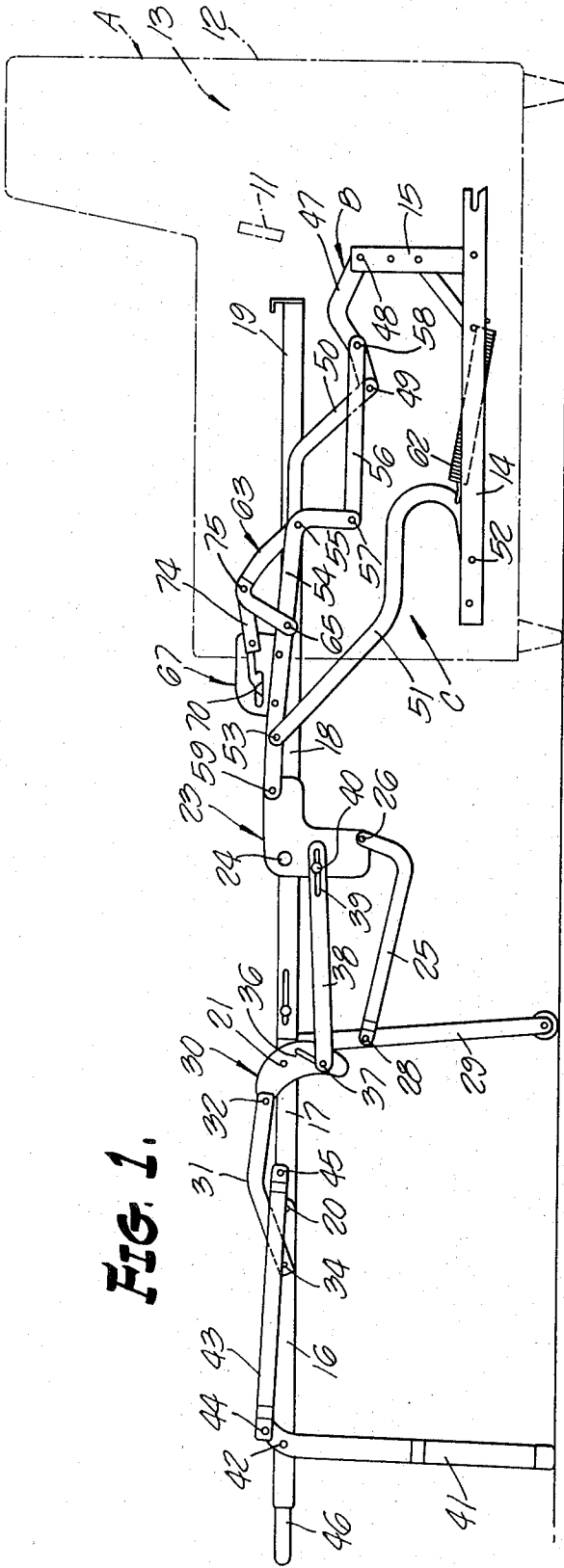


FIG. 1.

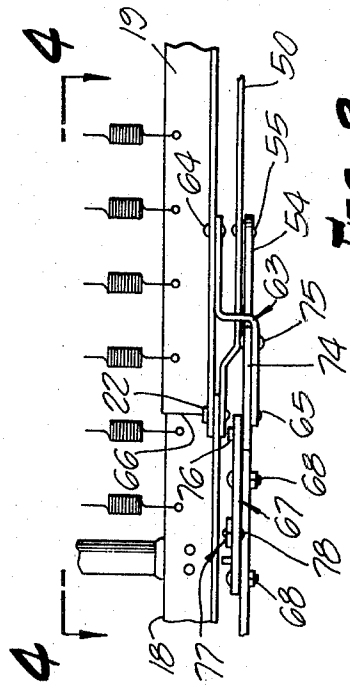


FIG. 3.

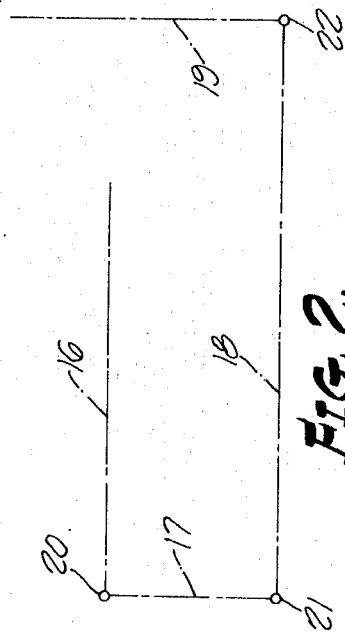


FIG. 2.

FIG. 4.

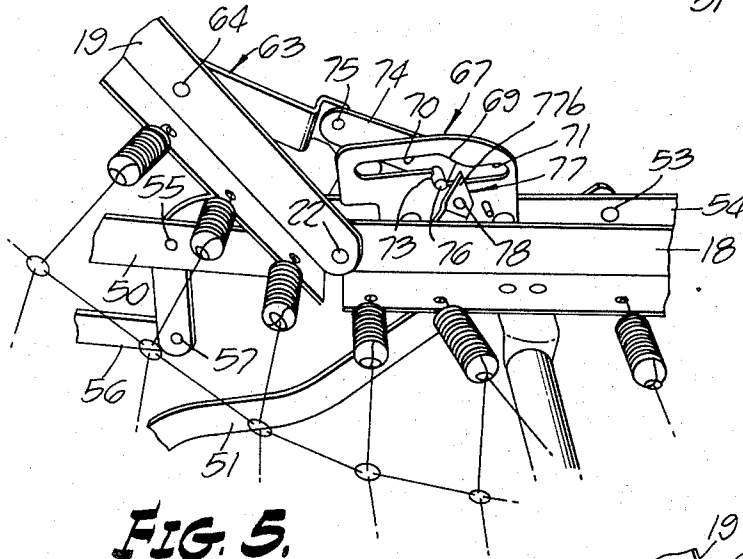
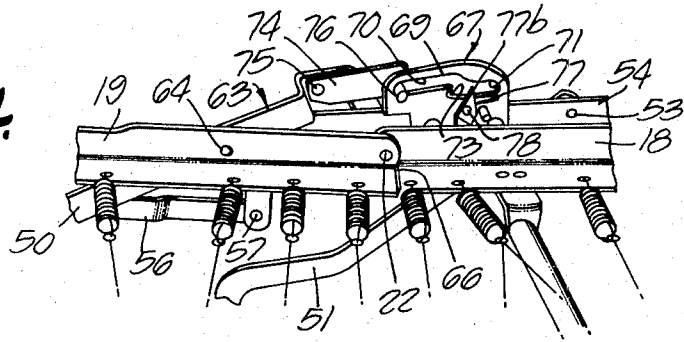


FIG. 5.

FIG. 6.

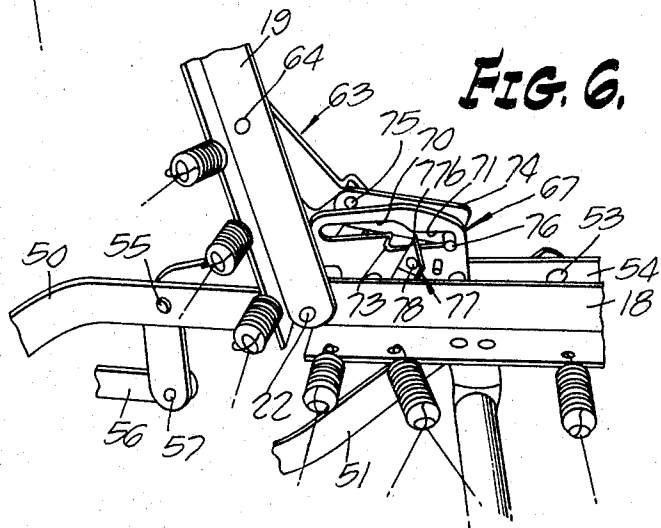
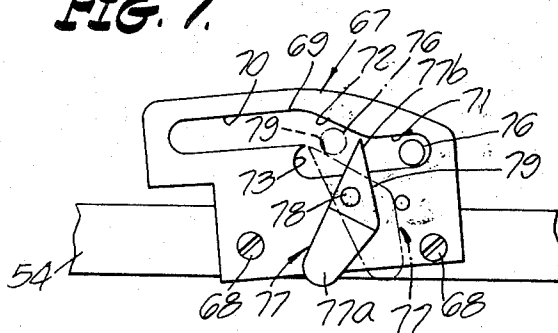


FIG. 7.



# FOLDING SOFA-BED CONSTRUCTION WITH ADJUSTABLE HEAD SECTION

## BACKGROUND OF THE INVENTION

The present invention relates generally to the field of articulated bed frames.

It has been generally known heretofore from a number of known arrangements to provide sofa-bed structures in which pivotally connected bed sections could be selectively actuated into an extended bed-forming position or into a sofa seat-forming position. Exemplary of these constructions is the arrangement disclosed in U.S. Pat. No. 3,585,658 which discloses a plurality of frame sections, including a foot section, knee section, trunk section and head section pivoted in end-to-end relation, the trunk section being supported upon forward and rearward support assemblies, and the head section operatively connected through a linkage mechanism such that during folding and unfolding operations of the bed frame, the head section will be moved so as to occupy a substantially horizontal position when the bed frame sections are in a bed-forming position, and a substantially vertical position when the bed frame sections are moved into a sofa seat-forming position. In the arrangement disclosed in this patent, the head section is locked against independent pivotal swinging movement away from its horizontal position. It is thus impossible to independently tilt or otherwise adjust the head section into an inclined position such as might be desirable for reading, television viewing, and the like.

It has also been known heretofore to provide bed frames of the non-folding type with an adjustable head section which could be moved into a raised inclined position in which it was supported by a manually releasable bracket. It has been appreciated by many that it would be very desirable to provide a folding bed structure such as disclosed in the above mentioned patent with an adjustable head section such as that used in beds of the non-folding type, but a problem was presented as to how this could be done without interfering with the operation of the linkage mechanism and the movement of the bed frame sections during folding and unfolding operations. The present invention has solved the problem in a novel manner by modifying the head section actuating link portion of the linkage mechanism so that it performs its regular function in moving the head section between its horizontal position and vertical position during folding and unfolding operations of the bed frame, but which will permit independent swinging movement of the head section when the foldable bed frame is in a bed-forming position.

The invention further embodies the novel feature of means connected with the head section actuating link for automatically releasably latching the head section in a raised tilted position.

## SUMMARY OF THE INVENTION

The present invention relates generally to beds of the type having an articulated sectional bed frame, and more particularly to improved linkage for actuating and controlling swinging movements of the bed frame head section.

Among the various objects of the herein described invention, it is a general object to provide an articulated bed frame with an adjustable head section which can be manually pivotally swung from a horizontal position to a raised inclined position of use in which it will

be automatically latched, and which will be automatically released by manually raising the head section above its raised position of use, whereupon it may then be lowered to the horizontal position.

A further object is to provide a head section arrangement according to the foregoing object in connection with a folding sofa-bed in which the head section will be permitted to automatically swing in its normal manner during movements of the frame sections between an extended bed-forming position and a retracted sofa seat-forming position, and yet may be manually raised and lowered when the frame sections are in the bed-forming position.

Another object is to provide an improved folding sofa-bed construction of the type having a plurality of pivotally interconnected frame sections, wherein a pivoted head section will be actuated by a linkage mechanism so as to occupy a substantially horizontal orientation when the frame sections are in a bed-forming position, and a substantially vertical orientation when the frame sections are in a sofa seat-forming position, and in which the linkage mechanism is such as to permit the head section to be independently movably adjusted when the frame sections are in the bed-forming position.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

## BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is a side elevational view of a sofa-bed construction having a bed frame operatively controlled in accordance with the features of the present invention;

FIG. 2 is a view schematically illustrating the relative orientation of the bed frame sections when actuated to a sofa seat-forming position;

FIG. 3 is a fragmentary top plan view showing the head section actuating link and associated mechanism for latching the head section in a raised position at an angle to the trunk section, the head section and trunk section being in a bed-forming position;

FIG. 4 is a fragmentary perspective side view of the same as seen generally when viewed along line 4-4 of FIG. 3;

FIG. 5 is a view similar to FIG. 4, the head section being shown in a raised latched position of use;

FIG. 6 is a similar view in which the head section is shown as being raised beyond its position of use to release the latching mechanism; and

FIG. 7 is an enlarged fragmentary elevational view showing details of the latching means.

## DESCRIPTION OF THE DISCLOSED EMBODIMENT

Referring more specifically to the drawings, the sofa-bed structure embodying the features of the present invention as shown in FIG. 1, embodies a linkage actuating and control arrangement generally similar to that disclosed in U.S. Pat. No. 3,585,658, and has been modified as will hereinafter be explained more fully so as to incorporate the feature of an adjustable head section. The bed frame structure is arranged to be mounted in a conventional upholstered sofa structure as generally indicated in phantom lines at A. Such sofa

structure usually comprises opposite end portions that are associated with a fixed wooden frame having a rearwardly spaced back center rail member 11 below and back of which certain parts of the articulated bed frame structure must be moved, when the bed frame is folded to a seat-forming position. The back center rail member is forwardly spaced with respect to a back wall 12 of the sofa structure and cooperates therewith to form a behind-the-back-rail space as generally indicated at 13 and into which certain parts of the bed frame structure will be received, when in fully folded seat-forming position, as will hereinafter be more fully explained.

The folding sofa-bed structure of the present invention includes on each side, a fixed end frame structure in which a main horizontal frame member 14 of conventional construction is fixedly secured. This frame member, together with an upstanding bracket 15 thereon, constitute a supporting base for appropriate linkage assemblies for interconnecting the bed frame structure with the sofa and guiding the movements of certain portions thereof during folding and unfolding operations of the bed frame structure.

As best seen in FIG. 1, the bed frame comprises a plurality of generally rectangular folding sections identified by their side rails, namely, as a foot section 16, knee section 17, body or trunk section 18 and head section 19. These sections are connected in end-to-end articulated relation by joint pivots as indicated at 20, 21 and 22 (FIG. 2), respectively. The side rails of the sections and the operative linkage mechanisms are the same and duplicated on opposite sides of the bed frame structure. In the following description reference will be made to one side only.

The actuating mechanism for the foot and knee sections, as well as the supporting legs, is conventional and includes a bell crank 23 which is rotatably supported at its elbow on the trunk section 18 by a fulcrum pin 24. One end of an actuating link 25 is pivotally connected at 26 to one end of the bell crank, the other end of the link 25 being pivoted at 28 to a folding leg 29 having its inner end hingedly supported on the trunk section 18.

A second bell crank 30 is fulcrumed on the joint pivot 21 at the connected ends of the knee section and the trunk section. One end of an anchor link 31 is pivoted at 32 to one arm of the bell crank 30, while the other end is pivoted at 34 to the side rail of the foot section 16 in spaced relation to the joint pivot 20. The other arm of the bell crank 30 is formed with an elongate slot 36 to slidably receive a connection pin 37 at one end of a link 38, the other end of this link being provided with a longitudinal slot 39 for slidably receiving a pin 40 on the bell crank 23.

The foot section of the bed frame is supported in its extended position upon an end leg 41 which is pivoted inwardly of its upper end at 42 to the foot section 16, and an actuating link 43 has one end pivoted at 44 to the upper end of leg 41, and its other end pivoted at 45 on the knee section 17 in spaced relation to the joint pivot connection 20.

The bell cranks 23 and 30, together with their associated connecting linkages and other linkages as thus far described, are conventionally known arrangements for controlling the movements of the foot and knee sections, and to fold the legs 29 and 41 during folding and unfolding movements of these sections by an operator first grasping a crossbar 46 at the outermost end of the

foot section to fold the foot and knee sections into their retracted positions, simultaneously folding the legs 41; then grasping a crossbar (not shown) transversely connected to the knee section side rails at either side and lifting and closing the bed structure into the sofa frame, simultaneously causing legs 29 to fold into retracted position as the bell crank 23 rotates about fulcrum pin 24.

As diagrammatically shown in FIG. 2, when the bed frame structure is completely folded into a seat-forming position, the foot section 16 becomes the seat base upon which the seat cushions of the sofa are placed. The knee section 17 is substantially vertically oriented closely behind a front rail of the sofa frame structure, and the trunk section 18 is oriented in a generally horizontal position along the bottom of the sofa below the foot section with which it cooperates to hold the folded mattress therebetween. The head section 19 in the completely folded position of the bed frame is oriented in a substantially vertical position adjacent the back wall 12 within the space 13 behind the back center rail member 11.

During the folding and unfolding operations of the bed frame structure, the movements of the trunk section 18 and head section 19 are controlled by means of conventional cooperatively associated linkage systems which comprise a rear support linkage assembly B and a front support linkage assembly C.

The rear support assembly B comprises a rear hanger link 47 which has one end connected at a fixed pivot point 48 at the upper end of the bracket 15. The other end of the hanger link is pivoted at 49 to one end of a rear support link 50, this link having its other end pivotally connected with the joint pivot 22, as best shown in FIG. 3, connecting the trunk section and head section.

The front support linkage assembly comprises a main front anchor link 51 which is connected at its lowermost end to a front fixed pivot point 52 toward the forward end of the horizontal frame member 14, the other end of the anchor link being pivoted at 53 adjacent and inwardly positioned with respect to one end of a coordinating link 54 which is pivoted between its ends at a pivot point 55 to the rear support 50 for relative swinging movement. In the alternative, the pivot 53 of the anchor link may be directly connected to the upper arm of the bell crank 23. The other end of the coordinating link 54 is in right angled relation and is connected with a second link 56 by a pivot connection 57. At its other end, the link 56 is connected by a pivot 58 which is inwardly spaced from the pivot 49 at the outermost end of the rear hanger link 47. The end of the link 54 which extends beyond the pivoted connection 53 is connected by a pivot 59 to the outer end of the upper arm of the bell crank 23. The connected end portion of the link 54 and the bell crank 23 thus become operative elements of the front support linkage assembly C, and the interconnected links 54 and 56 cooperate to form coordinating connecting means between the rear support linkage assembly B and the front support linkage assembly C, and determine the path of movement of the trunk frame section in the conventionally known manner during folding and unfolding operations thereof. A tension spring 62 connects at one end with the front anchor link 51 and is anchored at its other end to the horizontal frame member 14. This spring operates in a manner well known in this type of bed construction and is provided to assist the operator in mov-

ing the bed frame from the folded seat-forming position to the extended bed-forming position.

The movement of the head section 19 is coordinated with the movements of the trunk section as determined by the front support linkage assembly and the rear support linkage assembly, by providing a head section actuating link 63 having one end connected to the head section rail at a pivot point 64 which is spaced from the pivot connection 22 of the head section to the front section, as best shown in FIG. 3. The other end of the actuating link 63 is connected by a pivot 65 to the coordinating link 54 at a point spaced from its pivot point 55. In the conventional arrangement, the pivot 65 is offset with respect to the joint pivot 22 in such a manner that in the horizontal bed-forming position of the head section 19, the head section will be locked against downward or upward swinging movement. Independent raising movement of the head section is therefore prevented. It therefore becomes necessary, in order to incorporate the head section tilting adjustment as contemplated in the present invention to modify the known linkage arrangement so as to permit free movement of the head section to a tilted location when desired. This is accomplished by modifying the location of the pivot 65 on the coordinating link 54 so that the pivot 65, as shown in FIG. 3, will be axially aligned with the joint pivot 22, in the bed-forming position. As thus arranged, the head section is freely movable about its joint pivot 22. In order to prevent downward swinging movement of the head section and provide for its support in the horizontal oriented position, the adjacent ends of the side rails 18 and 19 are arranged for abutting engagement in the extended bed-forming position as indicated by the numeral 66.

With the arrangement as just described, the linkage mechanism continues to function in its normal manner during folding and unfolding operations of the bed structure, and during these operations, the relative position of the coordinating link 54 and actuating link 63 will remain constant during their transitory movement as the bed is folded or unfolded. On the other hand, with the head section in its horizontal orientation, as shown in FIG. 1, the head section and actuating link 63 may be rotated as a unit about their aligned pivots 22 and 65 during raising and lowering movements of the head section.

The mechanism for releasably latching the head section in a raised position of use extending at an angle to the trunk section will now be described. For this purpose, as best shown in FIGS. 4 - 7, a bracket plate 67 is secured to the coordinating link 54 adjacent pivot 65, so as to extend in an upright position projecting above the coordinating link. This plate is formed with an elongate slot 69 as best shown in FIG. 7, this slot having axially offset end portions 70 and 71 which extend in opposite directions from an angular interconnecting portion 72 containing a latching notch 73.

Operatively associated with the plate 67 is a link member 74 which is pivotally connected at one end by a pivot pin 75 to an offset portion of the actuating link 63. The other end of the link member 74 carries a projecting pin 76 which is positioned in the slot 69 for movement between its ends.

As shown in FIG. 4, when the head section 19 is in a horizontally oriented position, the pin 76 will be located at the end of the slot portion 70.

When it is desired to swing the head section 19 into an elevated angular position for reading, television viewing, and the like, raising movement of the head section to its raised position of use will move the pin 76 in a right hand direction within the slot until the pin drops into the latching notch 73 as shown in FIG. 5.

As thus far described, it will be seen that further raising movement of the head section would only tend to move the pin 76 into the slot end portion 71, and that an attempt to then lower the head section would merely move the pin back into the latching notch 73. It is therefore necessary to provide means which will render the latching notch ineffectual when the head section is moved beyond its normal raised position and then lowered. For such purpose, an elongate member 77 is swingably supported at one side of the notch 73 on a pivot 78. The member 77 has a lowermost end 77a which is heavier than the uppermost end 77b so that gravity will act to dispose the member with its uppermost end extending into the path of movement of the pin 76 as it leaves the notch 73 and moves into the end portion 71 of the slot. During this movement, the end 77b will be swung in a direction to let the pin 76 pass into the end portion 71 as shown in FIGS. 6 and 7.

The end 77b of the member 77 is tapered towards its upper end to provide a side camming edge 79. When the head section is again lowered from the position in which the pin 76 is in the slot end portion 71, the pin will strike this camming edge and swing the member 77 in an opposite direction so that the camming edge 79 will form a ramp across the mouth of the notch and guide the pin 76 back into the end portion 70 during further lowering movement of the head section back to its horizontal oriented position.

While only one mechanism has been explained above for latching the head section in a raised position of use, it is to be understood that a similar mechanism will be provided at the opposite side of the bed in order to latch the head section at each side thereof.

From the foregoing description and drawings, it will be clearly evident that the delineated objects and features of the invention will be accomplished.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit and scope of our invention and, hence, we do not wish to be restricted to the specific forms shown or uses mentioned, except to the extent indicated in the appended claims.

We claim:

1. In a bed frame structure:

- a. a foldable frame with a supporting flexible fabric, said frame including a body section and a head section;
- b. pivot means connecting the head section to the body section for swinging movements between a lowered position of use coplanar with the body section and a raised position of use extending at an angle to the body section;
- c. an upstanding bracket plate fixedly mounted in association with the body section adjacent the pivot means, said plate having an elongate slot with a side portion providing a latching notch;
- d. a linkage connection with the head section adjacent said pivot means including a link pivoted at one end for swinging movement and at its other end having a pin movable in said slot, and upon being positioned in said notch operating to latch

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- the head section in said raised position of use; and  
 e. means operative in response to a raising movement of the head section for releasing said pin with respect to the notch and permitting subsequent lowering movement of the head section to said coplanar position of use.
2. A bed frame structure according to claim 1, wherein said notch is positioned between end portions of the slot, and the raising movement of the head section to release the pin is beyond the raised position of use.
3. A bed frame structure according to claim 2, wherein said slot end portions extend in opposite directions from said notch and are in axially offset relation.
4. A bed frame structure according to claim 3, wherein said notch is so formed as to enable unobstructed movement of the pin in one direction from one slot end portion to the other slot end portion, but opposes pin movement in an opposite direction between the end portions.
5. A bed frame structure according to claim 2, wherein said means for releasing said pin comprises a movably supported member having a part normally in a position permitting movement of said pin from said notch in one direction into one of said slot end portions, and thereafter upon reverse movement of said pin permitting movement from said one of said slot end portions past the notch into the other of the slot end portions.
6. A bed frame structure according to claim 5, wherein said member is pivoted for swinging movement in opposite directions from a normal position, and said part comprises one end portion which extends at the normal position into the path of movement of said pin.
7. A bed frame structure according to claim 6, wherein said end portion of said member has a camming side edge operative in one direction of the swinging movement of the member to provide a pin guiding ramp across the notch.
8. A bed frame structure according to claim 7, in which a stop limits the swinging movement in said one direction.
9. A bed frame structure according to claim 6, wherein force generating means urges said member towards said normal position.
10. A bed frame structure according to claim 9, in which said force generating means is gravity.
11. A bed frame structure according to claim 6, wherein said member is pivoted between its ends, and the end portion opposite said one end portion provides a weight operative under the force of gravity to urge the member towards said normal position.
12. In a folding sofa-bed construction including a bed frame having a plurality of frame sections, one of which is an inner head section and another an adjacent trunk section, said sections being pivotally interconnected in end-to-end relation for selective unfolding movement to an extended coplanar bed-forming position and folding movement to a folded retracted sofa seat-forming position in which the trunk section is disposed generally horizontally along the base of the sofa frame and the head section extends generally upright in a space at the rear of the sofa seat, the combination comprising:

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- a. mechanism for supporting and controlling the movements of the frame sections during movement of the bed frame to extended and retracted positions including:  
 front and rear support linkage assemblies connected with the trunk section for determining the path of movement of the trunk section during folding and unfolding movements of the bed frame;  
 connecting means between said assemblies including a link member for coordinating the movements of said assemblies; and  
 a head section actuating link for swinging the head section relative to the trunk section, one end of said actuating link being pivotally connected with the head section in spaced relation to its pivot connection with the trunk section, and its other end being pivotally connected with the coordinating link member of the connecting means;
- b. mechanism for releasably latching the head section in a raised position of use extending at an angle to the trunk section, when the frame sections are in a bed-forming position, including:  
 an upstanding bracket plate fixedly secured to said coordinating link member adjacent the pivotal connection of the trunk section with the head section, said plate having an elongate slot with a side portion providing a latching notch; and  
 a link member pivotally connected at one end with said head section actuating link and at its other end having a pin movable in said slot, and upon being positioned in said notch operating to releasably latch the head section in said raised position of use.
13. A folding sofa-bed construction according to claim 12, wherein the front linkage assembly includes an anchor link having a fixed pivot at its inner end, and the coordinating link member has a pivotal connection with the anchor link.
14. A folding sofa-bed construction according to claim 12, including means operative in response to a raising movement of the head section for releasing said pin with respect to said notch and permitting subsequent lowering movement of the head section to a lowered position of use coplanar with the trunk section.
15. A folding sofa-bed construction according to claim 14 wherein said notch is positioned between the slot ends, and the raising movement of the head section to release the pin is beyond the raised position of use.
16. A folding sofa-bed construction according to claim 12, wherein the pivotal connection of the head section actuating link with the coordinating link member is coaxial with the pivot connection of the head section with the trunk section, when the frame sections are in the bed-forming position.
17. A folding sofa-bed construction according to claim 12, wherein the actuating link and coordinating link are connected in a manner such that their angular relation remains relatively constant while being moved in a translatory path during folding and unfolding movements of the bed frame sections.

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