Nov. 1, 1966

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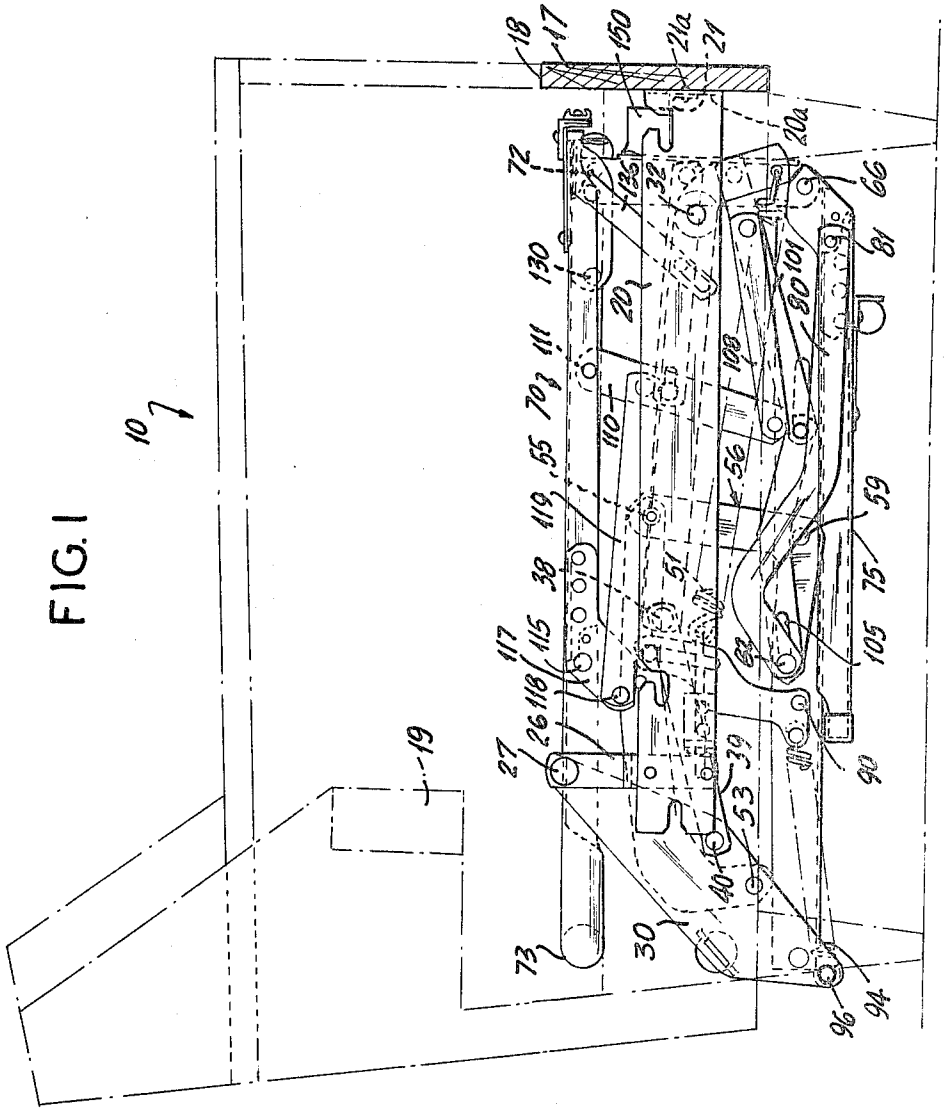
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Filed March 18, 1965

5 Sheets-Sheet 1

FIG. 1



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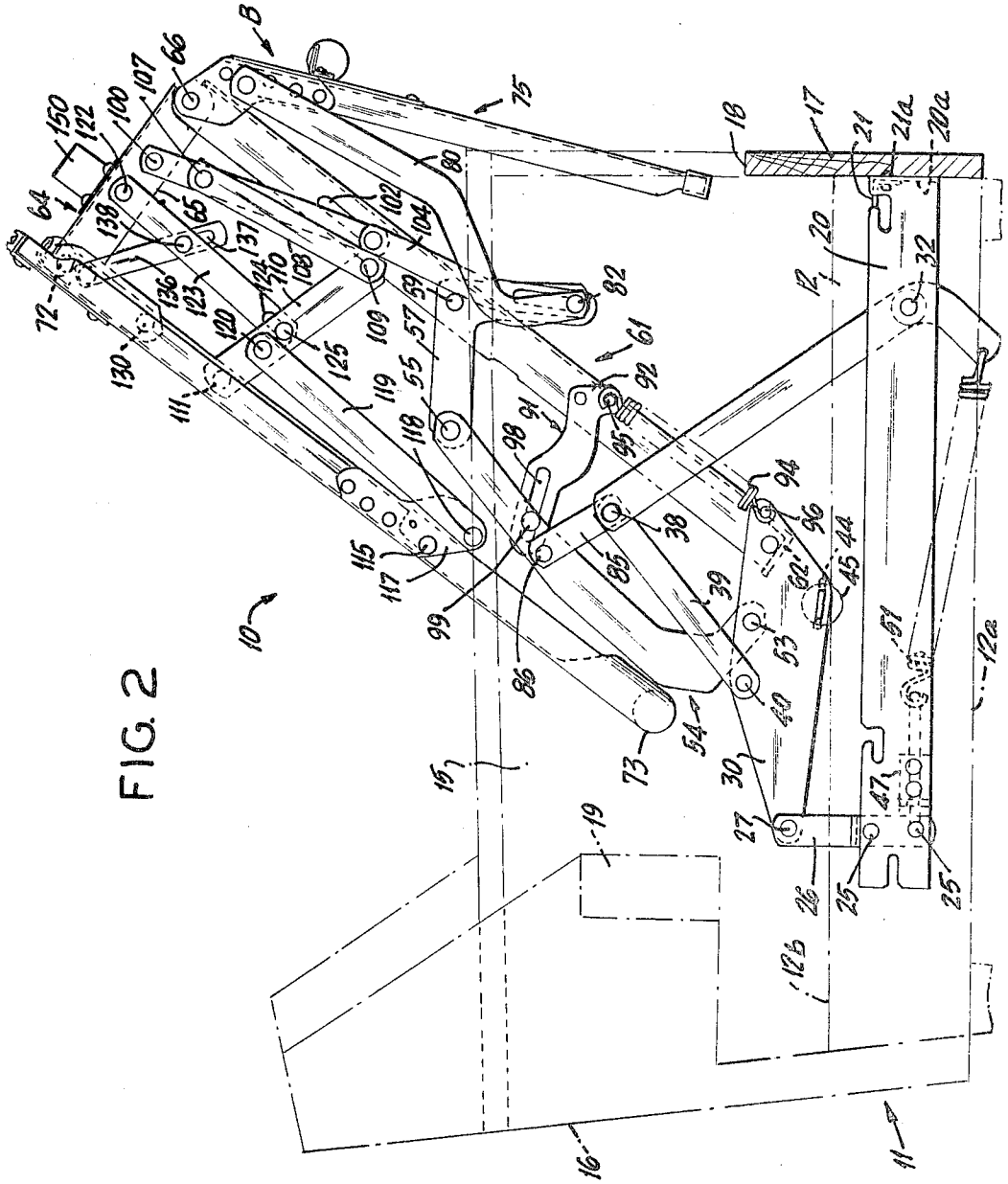


FIG. 2

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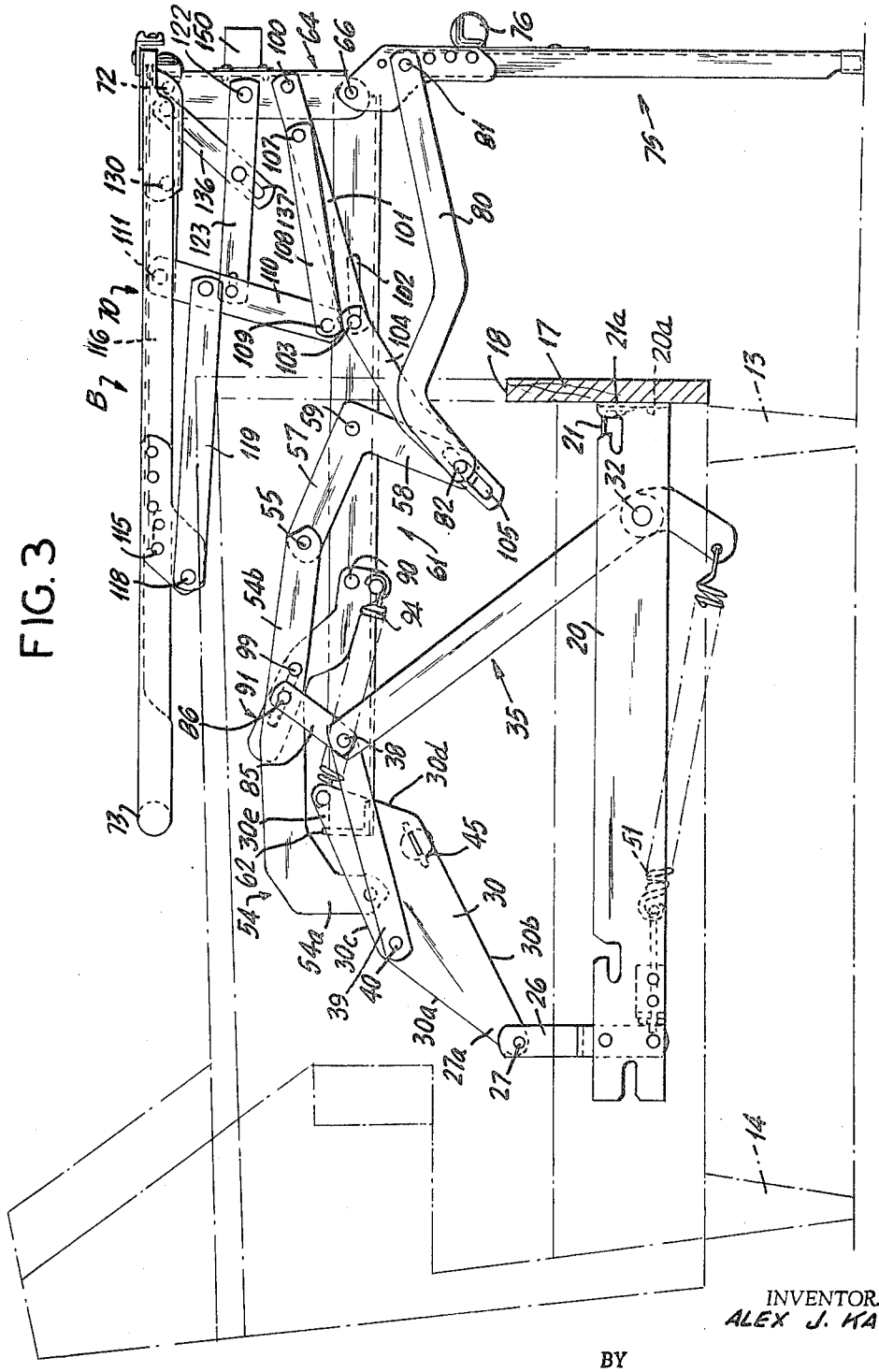
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FIG. 3



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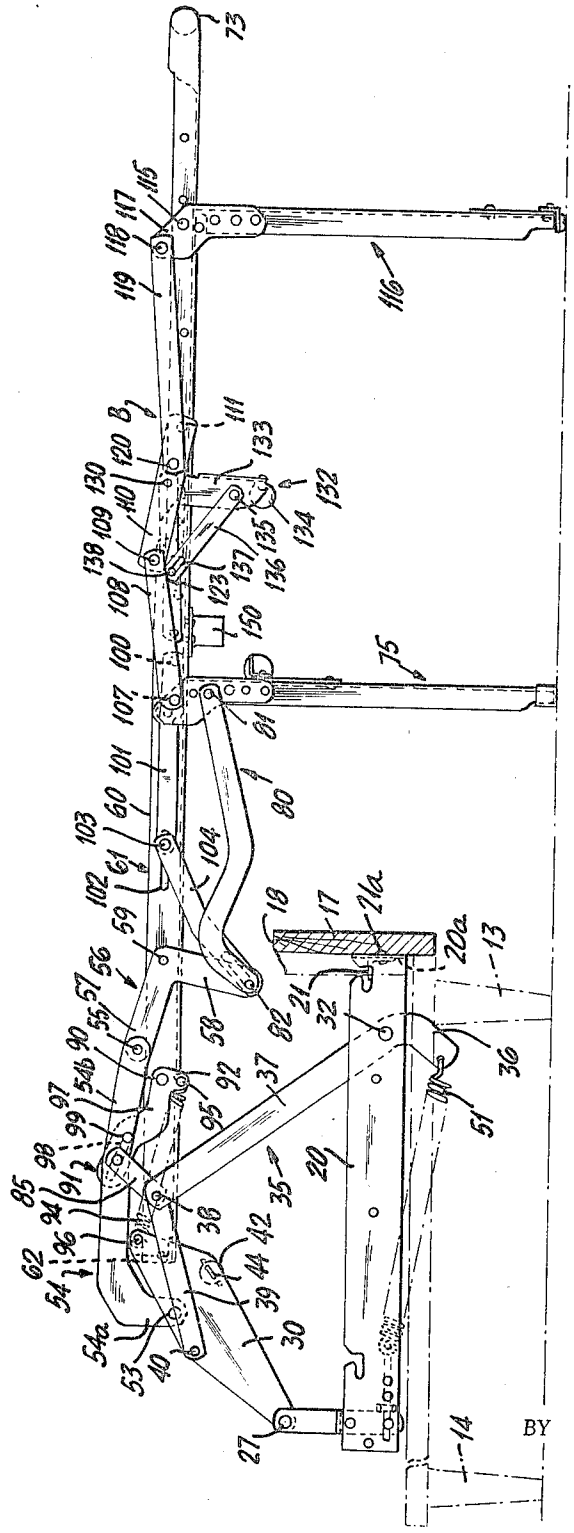


FIG. 4

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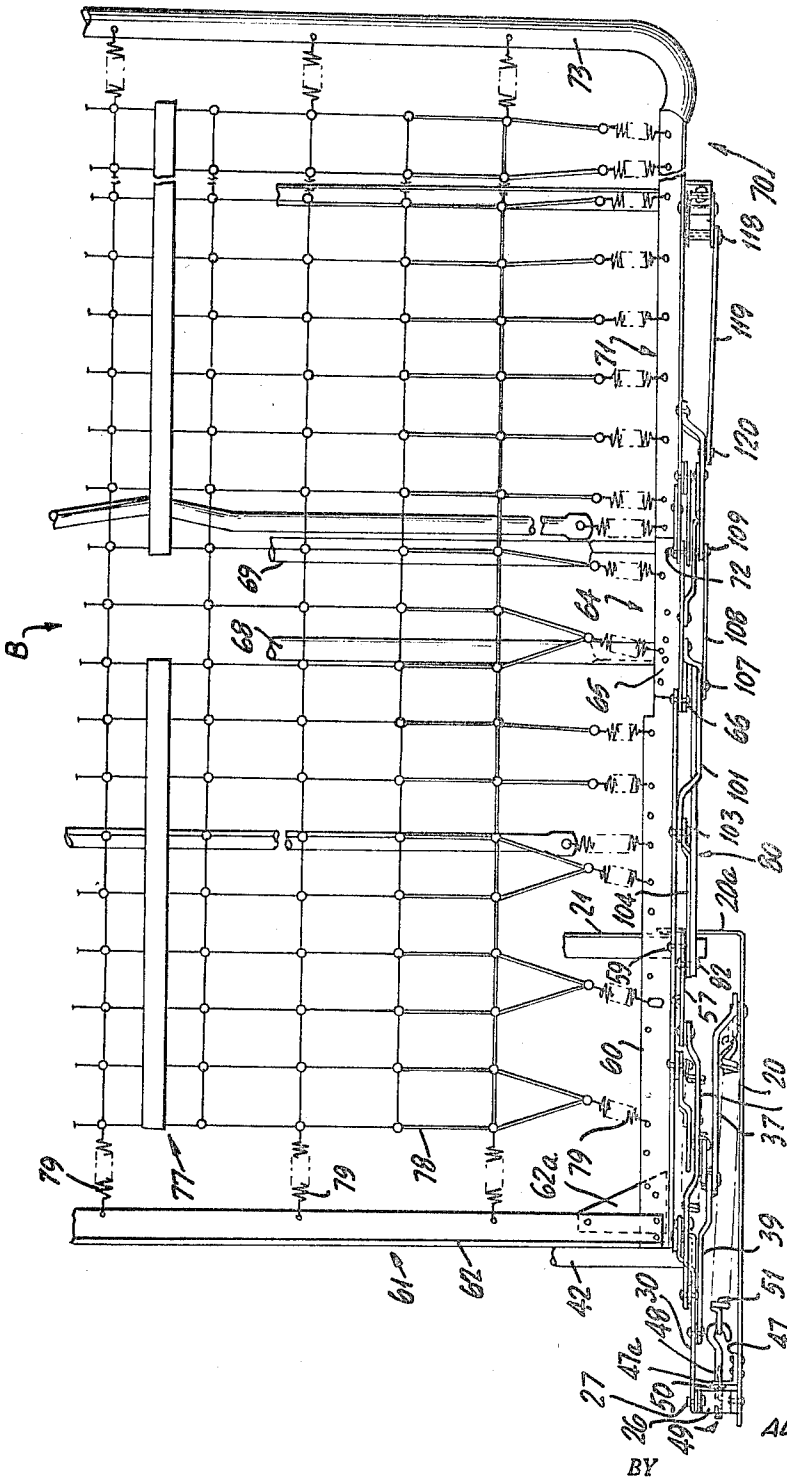


FIG. 5

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SOFA-BED

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14 Claims. (Cl. 5—13)

This invention relates to sofa-beds in which the bed comprises a plurality of collapsible pull-out sections. It is particularly directed to a clam shell type of collapsible bed on which people sleep parallel to the sofa. This type of bed comprises three interpivoted bed sections.

An object of this invention is to provide a sofa-bed of the character described which in closed, collapsed or sitting position has no linkage sticking up above the bed deck (the top of the front bed section in the fully collapsed position of the bed), the construction being such, furthermore, that the sofa can employ a loose pillow back or comprise a completely open back, or a conventional fitted back.

Another object of this invention is to provide a bed of the character described having a motion which enables it to clear a front board of the sofa frame, and at the same time to clear a conventional padded back of the sofa frame; and in which the bed has a conventional sleeping height when opened; the construction being such that the bed moves up considerably from a low collapsed position to obtain proper height, and yet moves out sufficiently to give the bed proper width.

A further object of this invention is to provide in a bed of the character described, mechanism including a rear throw-out link and a rear booster spring, which in the collapsed position of the bed is tensioned and is attempting to rotate the throw-out link away from collapsed position to facilitate the initiation of the pull-out cycle, said booster spring further acting to close the bed, after the bed clears the front foot board, thereby tending to lift the bed and hence preventing it from banging down on the floor; this booster spring, in the open position of the bed, also being helpful to start the closing of the bed, thereby to make the bed easier to close.

Another object of this invention is to provide a strong, durable and compact sofa-bed of the character described, which shall be relatively inexpensive to manufacture, easy to manipulate, comfortable to use, and which shall yet be practical and efficient to a high degree.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown an illustrative embodiment of the invention,

FIG. 1 is a side elevational view of a sofa-bed embodying the invention, in fully collapsed condition;

FIG. 2 is a view similar to FIG. 1, but showing the bed partially open up and showing the front legs just clearing the front board of the sofa frame;

FIG. 3 is a view similar to FIG. 1 but showing the bed with the front section over the rear section.

FIG. 4 is a partial side elevational view showing the bed fully opened up and extended; and

FIG. 5 is a partial top plan view of the bed in opened up condition, showing one side only.

Referring now in detail to the drawing, 10 designates a sofa bed embodying the invention. The same comprises a sofa frame 11 having side walls 12 having lower edges 12*a* and upper edges 12*b*, front legs 13, rear legs 14, side arms 15, a back 16 and a front board 17 having an upper edge 18 disposed at a level well below the top

of the side arms 15. The side arms are interconnected by the back 16, the front board 17 and by a cross-rail 19 disposed forwardly of the back and above the upper edge 18 of the front board, and defining the space for the conventional pillow back for the sofa frame. The sofa frame may be of usual, conventional construction.

Fixed to the inner sides of each side arm 15 is a chassis plate 20 extending horizontally and disposed in a vertical plane above the lower edges 12*a* of the side walls 12. The drawings show the bed mechanism on one side of the sofa, it being understood that the mechanism on the other side is similar and symmetrically disposed. Said plates 20 extend to the inside of the front board 17 and are interconnected by a front angle iron 21 riveted as at 21*a* to front flange extensions 20*a* of said plates. The rear ends of plates 20 are located forwardly of the back 16 of the sofa-frame. Fixed to said plates 20, adjacent the rear ends thereof, as by rivets 25, are off-set upstanding chassis bars 26 projecting up above the upper edges 12*b* of said side walls 12. Connected to said chassis plates 20 and chassis bars 26, is a collapsible bed B, as will be explained hereinafter.

Pivoted as at 27, to the upper ends of chassis bars 26 are rear throw-out links 30 which, in the extended position of the bed B, as will be explained hereinafter, are inclined forwardly and upwardly as shown in FIG. 4 of the drawing.

Throw-out links 30 are almost diamond shaped, having an apex 27*a* at pivot pin 27, from which extend edges 30*a*, 30*b*. Extending from edge 30*a* is an edge 30*c* substantially parallel to edge 30*b* and forming an obtuse angle with edge 30*a*. Extending from edge 30*b* is an edge 30*d* forming an obtuse angle with edge 30*b* and an acute angle with edge 30*c* and forming an apex 30*e* opposite apex 27*a*.

Pivoted to each chassis plate 20, as by pivot 32 located rearwardly of front board 17, is a main lever 35 having one short arm 36 curved downwardly and rearwardly in the position of FIG. 4, and a second long, straight arm 37 inclined rearwardly and upwardly in said position of FIG. 4. In the fully extended position of the bed, as shown in FIG. 4, the upper end of arm 37 is located somewhat in front of and somewhat below the apex 30*e* of throw-out link 30. Pivoted to said upper end of arm 37, as at 38, is a first control link 39 inclined downwardly and rearwardly and connected by pivot 40 to throw-out link 30 near the junction of edges 30*a*, 30*c* thereof. The throw-out links 30 on both sides of the bed B are interconnected by a transverse tubular tie rod 42 having flattened end portions 44 extending through slots 45 in said links and riveted at their outer ends.

Arm 36 of main lever 35 projects down below edge 12*a*, in the fully extended position of FIG. 4. Attached to the inside of each chassis plate 20, near the rear end thereof, is a bracket 47 having an offset flange 47*a* formed with an opening through which extends the threaded shank 48 of a hook screw 49. A nut 50 screwed on said shank 48, abuts flange 47*a*. The hook of said screw 49 is connected by a coil tension spring 51 to the lower end of arm 36 of the main link 35. Thus, springs 51 tend to rotate the main levers 35 in a clockwise direction, looking at FIG. 4, hence tending to rotate the throw-out links 30 in a clockwise direction about pivot 27.

Pivoted to each throw-out link 30, as by pivot 53 located near edge 30*c* and between pivot 40 and apex 30*e*, is a second control link 54. In the fully extended position of FIG. 4, link 54 has an arm 54*a* extending up from pivot 53, from which arm extends forwardly an arm 54*b*. Pivoted to the forward end of each arm 54*b*, as at 55, is a bell crank lever 56. Said lever 56 has an arm 57 projecting rearwardly in the FIG. 4 position, and an arm 58

projecting downwardly. Said lever **56** is pivoted as at **59**, at the junction of said arms **57**, **58**, to a side member **60** of a rear bed section **61** of bed B. The side members **60** are interconnected by an end member **62**. Said members **60**, **62** are angle irons. A gusset plate **62***a* may be provided to strengthen the corner of members **60**, **62**. End member **62** is located forwardly of pivots **53** and just thereabove in the fully extended position of the bed B.

Pivoted to the front ends of rear bed section **61** is an intermediate bed section **64** comprising side angle iron members **65** having vertical flanges pivoted at the rear ends as at **66**, to the forward ends of the vertical flanges of side members **60** of the rear bed section **61**. Side members **65** are interconnected by transverse tie rods **68**, **69**. Pivoted to the front ends of intermediate bed section **64** is a front bed section **70**. Said bed section **70** comprises side member angle irons **71** having vertical flanges pivoted at their rear ends, as by pivot pins **72**, to the front ends of the vertical flanges of side members **65**.

The front ends of side members **71** are interconnected by a transverse front member **73**. The lengths of front and rear bed sections **70**, **61** are about the same and are each considerably longer than the intermediate bed section **64**.

Pivoted on the pivot pins **66** are rear legs **75** interconnected by a cross tie-rod **76**. In the partially opened position of the bed shown in FIG. 3, the legs **75** contact the floor.

The bed sections **61**, **64**, **70** support a mattress platform **77** of usual construction comprising wires **78** connected to each other and also connected to the bed sections by coil tension springs **79**. Said rear legs **75** are connected to the lower ends of arms **58** of bell crank levers **56**, by means of links **80** pivoted to the legs **75** as by pivot pins **81** slightly below the upper ends of said legs, and by pivot pins **82** located at the lower ends of said arms **58**.

For the purpose hereinafter appearing short third control links **85** are pivoted at their lower ends to pivot pins **38**, and at their upper ends, as by pivots **86**, to intermediate portions of arms **54***b* of links **54**. Pivoted to side memebrs **60** of rear bed section **61**, as by pivot pins **90**, are slotted bell-crank control links or levers **91**. The pivots **90** are located rearwardly of pivots **59**.

Bell-crank levers **91** each have a short arm **92** projecting downwardly, in the FIG. 4 position of the bed, and said arm is connected by a coil tension booster spring **94**, engaging a pin **95** on said arm **92**, to a pin **96** at the apex **30***e* of the throw-out link **30**.

Each bell-crank lever **91** also has a longer arm **97** projecting upwardly and rearwardly, in said fully extended position of said bed, which arm is formed with a straight longitudinal slot **98** in which is slidably received a guide pin **99** fixed to said arm **54***b* of link **54** and located to the right of pivot **86**.

In the fully extended or open position of the bed, guide pin **99** is located at the rear lower end of slot **98**.

Pivoted to each side member **65** of intermediate section **64**, as by pivot **100**, is a link **101**. The vertical flange of each of the side members **60** of rear section **61**, is formed with a longitudinal slot **102**. Each link **101** carries a pivot pin **103** passing through slot **102**. In the fully extended position of the bed, pins **103** are at the forward ends of slots **102**. Pivoted on each pivot pin **103** is a link **104** inclined downwardly and rearwardly in the fully extended position of the bed. Each link **104** is formed with a longitudinal slot **105** through which the pivot pin **82** slidably passes. In said FIG. 4 position of the bed, pivot pin **82** is at the rear or lower end of slot **105**.

Pivoted to each link **101** near pivot pin **100**, as by pivot pin **107**, is a link **108** which extends forwardly of pivot **107**, as shown in FIG. 4. The forward end of each link **108** is pivoted as at **109** to a link **110** which also extends forwardly and is pivoted as at **111** to a vertical flange of side member **71** of front bed section **70**.

Pivoted to each side member **71** of front section **70**, as

at **115**, is a front leg **116** which contacts the floor when the bed is fully extended. Said leg **116** has a portion **117** projecting above pivot **115**. Pivoted to said projecting portion **117**, as at **118** is a link **119** which is pivoted as at **120**, to link **110** in spaced relation to pivot **111**.

Pivoted to each side member **65** of intermediate section **64**, as at **122**, is a link **123** formed at its outer end with a slot **124** slidably receiving a pin **125** on link **110** and located between pivot pins **120** and **109** but closer to pin **120**.

Pivoted to front side members **71** as at **130**, is a stabilizing cross-member **132** having side portions **133** extending down from said pivots **130** and an interconnecting portion **134**. Pivoted to said side members **133** as at **135**, are links **136** formed with slots **137** slidably receiving pins **138** on links **123**.

In the fully extended position of the bed, pins **138** are at the upper ends of slots **137** and links **136** are inclined rearwardly and upwardly.

It will be noted that the throw-out link **30**, and control links **54**, **85** and **39** constitute a four bar linkage.

To collapse the bed from the fully extended position of FIG. 4, the front section **70** is swung up 90° about pivot pins **72** and then the front and intermediate sections **70** and **64** are swung together for another 90° about pivot pins **66** to the position of FIG. 3. Then the bed is first raised to the position of FIG. 2 and then swung down into the sofa frame to the fully collapsed position of FIG. 1. It will be understood that this procedure is reversed to open the bed.

The booster spring control links or levers **91** have two functions. In the closed or fully collapsed position of the bed, the booster springs **94** are stretched and tensioned and are urging the rear throw-out links **30** away from collapsed position in a counter clockwise direction. This pull is in addition to the pull of the main levers **35** under the influence of main springs **51**, which also tend to rotate the rear throw-out links **30** away from collapsed condition, to facilitate movement of the bed from the fully collapsed position of FIG. 1 toward the partially opened up position of FIG. 2.

Also, as the bed clears the front board **17**, as shown in FIG. 2, the bed would have a tendency to drop heavily toward the floor, but the booster springs **94** then pull the rear throw-out links **30** in an opposite direction (see FIG. 3), tending then to close the bed and hence tending to lift the bed and prevent it from banging down heavily on the floor. These booster springs **94** also help start the close of the bed from the position of FIG. 3 to the position of FIG. 2.

It will be noted that pin **96** passes from one side of an imaginary line connecting fixed pin **27** and pin **95** to the other side of said line as the bed moves from the position of FIG. 2 toward the position of FIG. 3.

It will be observed that in the fully closed position of the bed (FIG. 1), no part of the linkage projects above the the deck, i.e., the top of the front bed section **70** when collapsed.

Furthermore, the mechanism permits the use of a loose pillow back or a completely open back bed or a conventional fitted back.

The two control levers **39** and **85** serve the function of controlling the motion of the rear throw-out links **30**, giving the bed a forwardly and upwardly motion which enables it to clear a front board, and at the same time clear a conventional padded sofa back. The bed will move from the collapsed position of FIG. 1 to the position of FIG. 2, by moving up forwardly of cross-rail **19** and over the front board **17**. This movement is accomplished because the rear throw-out links **30** swing forwardly from the downwardly and rearwardly inclined position of the fully collapsed bed to clear the padded back and then swing up to move the bed upwardly to clear the front board.

Further, the bed moves up considerably to get a proper

height from a low collapsed position and yet moves out sufficiently to bring the bed out a considerable distance in the fully extended position, to permit sufficient room for comfortable sleeping of two persons in positions parallel to the sofa frame.

Upon raising the front section **70** of the bed, leg **116** is swung toward said front section about pivot **115**, due to the push of link **119** acted upon by links **110**, **108**.

As the front section **70** is swung together with the intermediate section **69**, to the position of FIG. 3, pin **103** is slid to the left end of slot **102**. As the bed is moved from the position of FIG. 3 to the position of FIG. 2, leg **75** is raised and swung by link **80** toward the underside of the rear section **61** of the bed. During this movement pin **82** slides down slot **105**, bell-crank **56** is rotated to pull on link **54** for rotating the rear throw-out links **30** in a clockwise direction. As the bed is moved from the position of FIG. 2 to the fully closed position of FIG. 1, the main springs **51** are tensioned by rotation of the main lever **35** in a counterclockwise direction, as the rear throw-out links **30** swing downwardly and rearwardly, thereby also tensioning the booster springs **94**.

In the fully extended position of the bed, (FIG. 4), the rear section **61** is supported by the main lever **35**, the first control lever **39**, the throw-out link **30**, and the control link **85** pivoted to the control link **54** (which is pivoted to the throw-out link **30**), and the bell-crank lever **56** which is pivoted to the control link **54** and to the rear bed section **61**.

In the fully collapsed position of the bed, lugs **150** fixed to side members **65** of intermeditae bed section **64**, rest on angle iron **21**. Also arms **57** of bell-cranks **56** project up and are pivoted to link **54** which is pivoted to the rear throw-out link **30**, which in this position projects downwardly and rearwardly. The bed is thus supported in fully collapsed position. In the collapsed position links **110**, **108** and **101** hold the rearwardly extending front section at right angles to intermediate section **64**, since pins **103** are at the left ends of slots **102**.

It will thus be seen that there is provided a combination device in which the several objects of the present invention are achieved and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In an extensible collapsible bed, a chassis, a rear throw-out member pivoted to said chassis and inclined upwardly and forwardly in the extended condition of the bed, a main lever pivoted to said chassis and having an arm projecting downwardly and an arm projecting upwardly and rearwardly in the extended condition of the bed, a main tension spring connecting said downwardly projecting arm with said chassis, a first control link connecting said upwardly projecting arm with said throw-out member, a three section collapsible bed comprising a rear bed section, an intermediate bed section pivoted to the front end of said rear bed section, and a front bed section pivoted to the front end of said intermediate bed section, said three sections being in alignment, in the extended condition of the bed, a rear leg pivoted to the rear bed section, a front leg pivoted to said front bed section, a bell crank pivoted to said rear bed section and having a downwardly extending arm and a forwardly extending arm, and a second control link connecting said forwardly extending arm of said bell-crank with said throw-out member, said bed being fully collapsible to a position in which the rear bed section is down, the intermediate bed section extends up from the front end of said rear section, and said front section is located above the rear section and extends rearwardly from the upper end of said intermediate section, said rear throw-out link extending downwardly and rearwardly from its pivotal connection to said chassis, in the collapsed condition of said bed.

2. In an extensible collapsible bed, a chassis, a rear throw-out member pivoted to said chassis and inclined upwardly and forwardly in the extended condition of the bed, a main lever pivoted to said chassis and having an arm projecting downwardly and an arm projecting upwardly and rearwardly, a main tension spring connecting said downwardly projecting arm with said chassis, a first control link connecting said upwardly projecting arm with said throw-out member, a rear bed section, an intermediate bed section pivoted to the front end of said rear bed section, a front bed section pivoted to the front end of said intermediate bed section, said sections being in alignment, in the extended condition of the bed, a rear leg pivoted to the rear bed section, a front leg pivoted to said front bed section, a bell-crank pivoted to said rear bed section and having a downwardly extending arm and a forwardly extending arm, and a second control link connecting said forwardly extending arm of said bell-crank with said throw-out member, a control lever pivoted to said rear bed section, and having a downwardly extending arm, a booster spring connecting said downwardly extending arm of said control lever with said throw-out link, and a third control link connecting the pivotal connection of said upwardly extending arm of said main lever and said first control link, to said second control link.

3. The combination of claim **2**, said control lever having a rearwardly extending arm formed with a longitudinal slot and a pin on said second control link slidably received in said slot.

4. The combination of claim **3**, the pivotal connection of said first control link to said throw-out member being located between the pivotal connection of said second control link with said throw-out member, and the pivotal connection of said throw-out member to said chassis, the pivotal connection of said second control link with said throw-out member being disposed between the pivotal connection of said first control link with said throw-out member and the point of connection of said booster spring with said throw-out member.

5. In combination, a chassis, a bed comprising a rear section, an intermediate section pivoted to the front of said rear section, and a front section pivoted to the front of said intermediate section, a rear throw-out member pivoted to said chassis, a main lever pivoted to said chassis, spring means to rotate said main lever in one direction, a first control link connecting said main lever with said throw-out member, a bell crank member pivoted to said rear section, a second control link pivotally connecting said throw-out member with said bell-crank member, and booster spring means tending to rotate said throw-out member in one direction when said bed sections are extended and in horizontal alignment, and said throw-out member extends forwardly, said sections being fully collapsible to bring said rear section down, said intermediate section at right angles to and extending up from the front end of said rear section, and said front section to a position over the rear section and extending rearwardly from the upper end of said intermediate section, with said throw-out link extending rearwardly and said booster spring means tending to rotate said throw-out member in an opposite direction when said bed sections are in said collapsed condition.

6. The combination of claim **5**, a leg pivoted to the front end of said rear section, and said booster spring means tending to swing said leg up toward the underside of said rear section when said throw-out link is inclined upwardly and forwardly.

7. In combination, a chassis, a rear throw-out link pivoted to the rear of the chassis, a main lever pivoted to the front of the chassis, a control link connecting the main lever and the throw-out link, first spring means acting on

the main lever tending to swing the throw-out link forwardly, a three section bed comprising a rear section, an intermediate section pivoted to the rear section, and a front section pivoted to the intermediate section, means connecting said throw-out link and main lever to said rear section, and second spring means other than said first spring means, tending to rotate said throw-out link toward a position where the pivotal connection of said throw-out link to said chassis, and the pivotal connections of said control link to said main lever and throw-out link, are substantially in alignment.

8. The combination of claim **7**, a rear leg pivoted to said rear section, and means controlled by said second spring means, and acting on the means which connects said rear section to said main lever and throw-out link, tending to swing said leg toward the underside of said rear section.

9. The combination of claim **8**, a front leg pivoted to said front section, means to permit said bed to be moved from a fully extended position with said bed sections in horizontal alignment and with said legs contacting the floor, and with said rear throw-out link inclined forwardly and upwardly, to a fully collapsed position with said throw-out link inclined downwardly and rearwardly, with the rear section in horizontal position substantially coextensive with said chassis, with the intermediate section extending up from the front end of said rear section, and with the front section extending rearwardly from the upper end of said intermediate section.

10. The combination of claim **9**, said throw-out link, main lever, said second spring means, and said connecting means being located below the top of said front section in said fully collapsed position of the bed.

11. A collapsible bed having an open and closed position, and comprising, in combination, a chassis, a rear throw-out member pivotally mounted on said chassis, a main lever pivotally mounted on said chassis, resilient means to urge said main lever toward the open position of said bed, said bed comprising front and rear bed sections pivotally connected to an intermediate bed section, means to connect said rear bed section to said main lever and said rear throw-out member, said connect means including means to support said rear bed section in the opened position of said bed, and booster spring means, including a coil spring connected to said rear throw-out member, urging said rear throw-out member toward a position where the pivotal connection of said rear throw-out member to said chassis is in alignment with the axis of said coil spring.

12. The combination of claim **11**, said connect means comprising a first control link connecting said main lever to said throw-out member, a bell-crank pivoted to said rear bed section, a second control link connecting a first arm of said bell crank to said throw-out member, and a third control link connecting the connecting point of said main lever and first control link, to said second control link.

13. The combination of claim **12**, the pivotal connection of said first control link to said throw-out member being located between the pivotal connection of said second control link with said throw-out member, and the pivotal connection of said throw-out member to said chassis, the pivotal connection of said second control link with said throw-out member being disposed between the pivotal connection of said first control link with said throw-out member and the point of connection of said booster spring with said throw-out member.

14. The combination of claim **12**, said booster spring means also including a two-armed control lever pivoted to said rear bed section, said coil spring being connected to one arm of said control lever, the other arm of said control lever being formed with a longitudinal slot, and a pin fixed to said second control link slidably received in said slot.

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