July 1, 1958 J. M. POKORNY ET AL 2,840,830

ADJUSTABLE SOFA-BED PROVIDED WITH FRAME LOCKING MEANS

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Fig. 1.

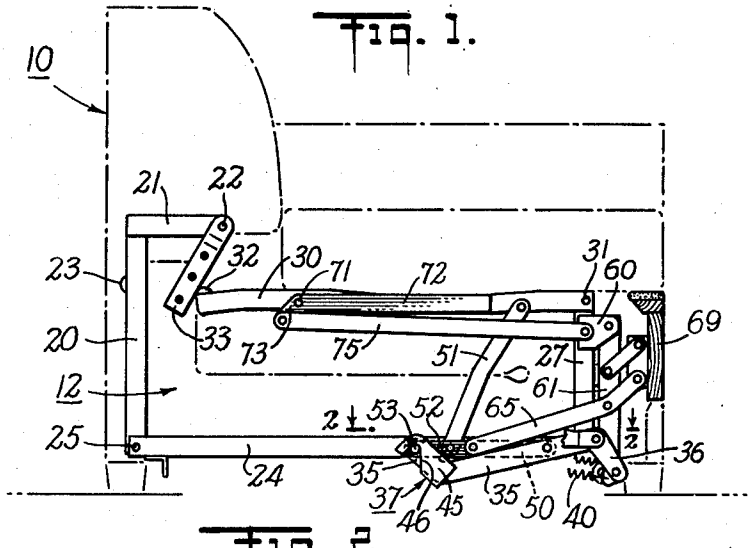


Fig. 2.

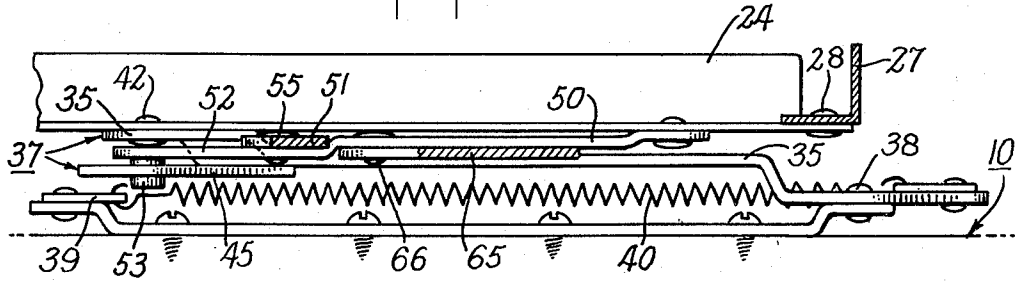
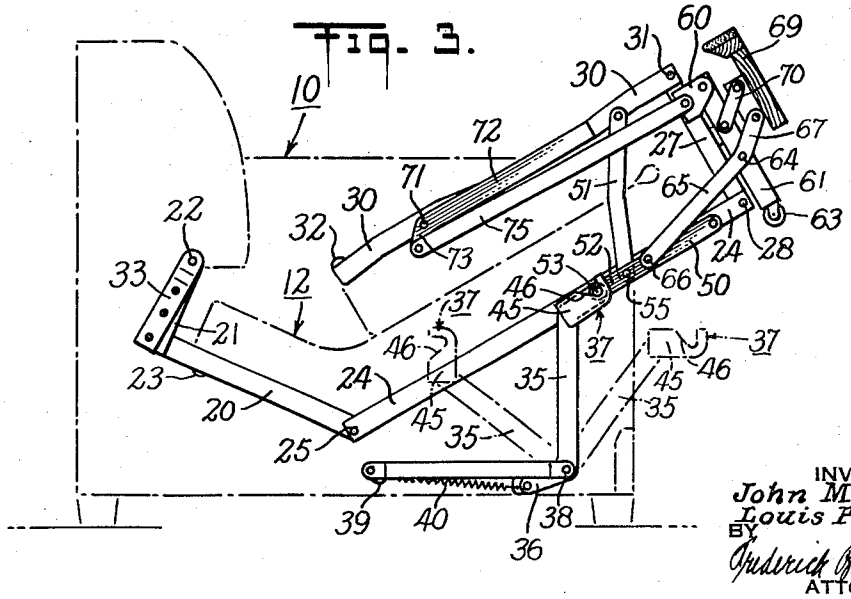


Fig. 3.



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Fig. 4.

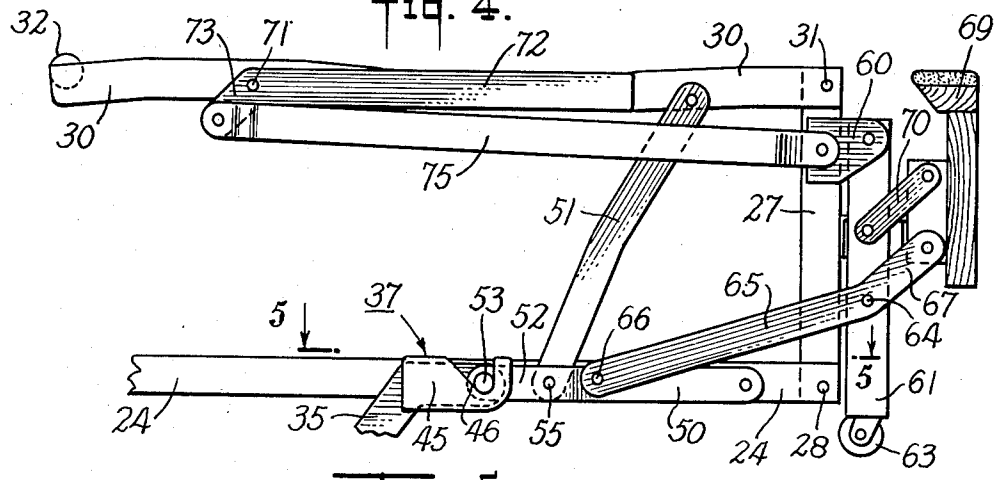


Fig. 5.

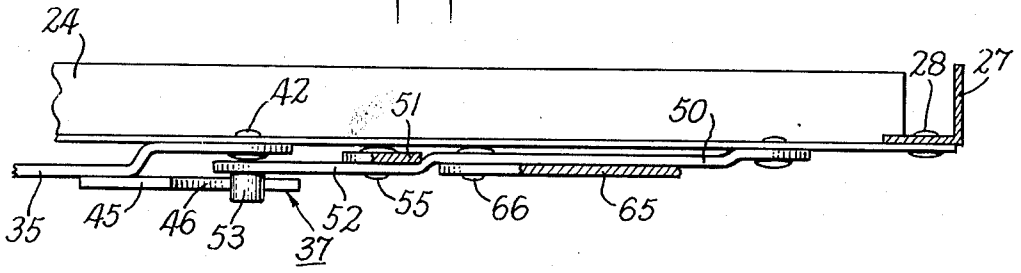
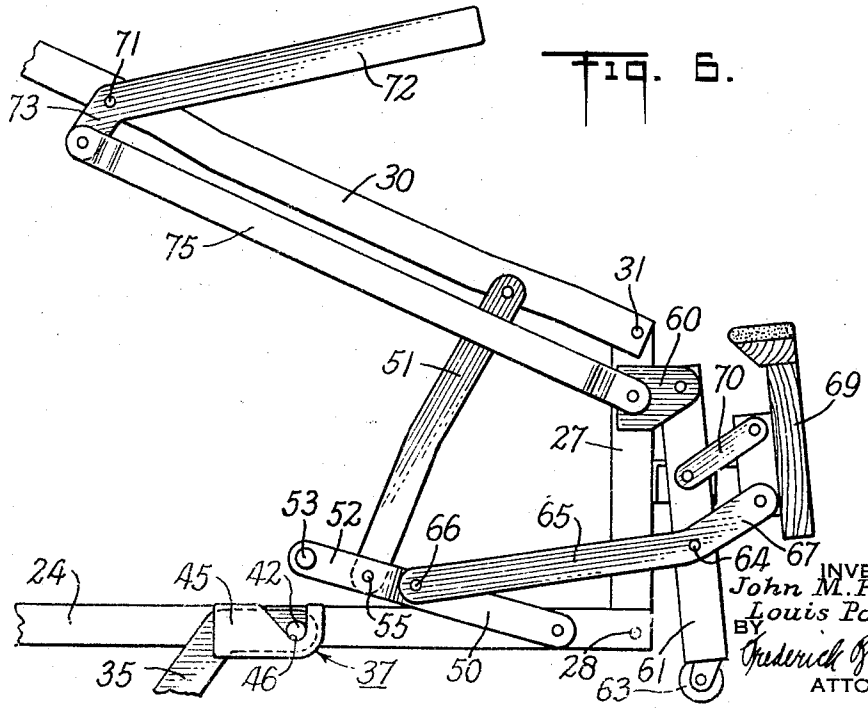


Fig. 6.



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Fig. 7.

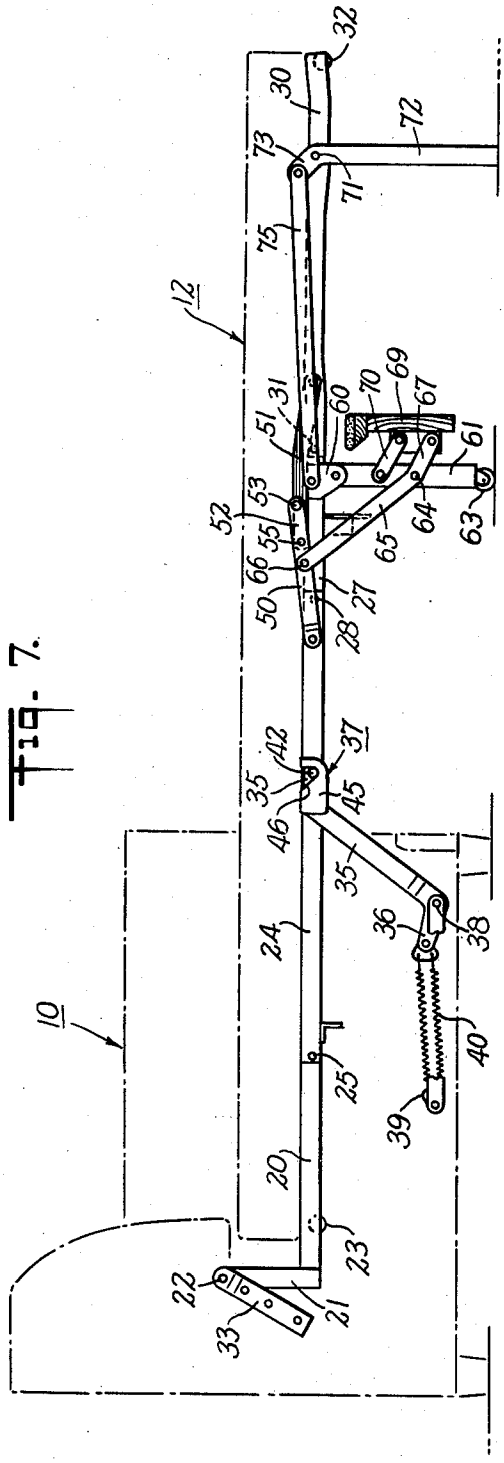
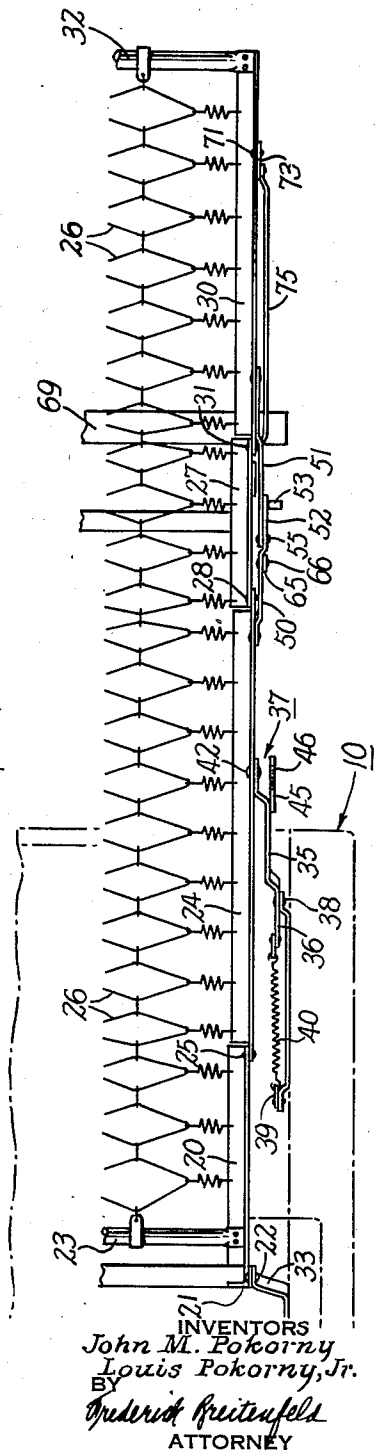


Fig. 8.



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ADJUSTABLE SOFA-BED PROVIDED WITH FRAME LOCKING MEANS

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Application September 25, 1953, Serial No. 382,237

4 Claims. (Cl. 5—13)

Our present invention relates generally to articles of furniture, and has particular reference to an adjustable structure commonly known as a sofa-bed, which in its closed position forms a sofa and may be adjusted into an open position to define a bed.

The invention is specifically concerned with improvements in foldable sofa-bed frames of the type described in Patents Nos. 2,445,241; 2,505,989; and 2,626,406. The constructions therein disclosed include a frame foldable into and out of a sofa body to define, respectively, a sofa and a bed, the frame comprising a plurality of articulated sections, at least two of which must be held in a particular relative disposition, preferably in parallelism, in order that the frame may be properly folded into and out of the sofa body. When the frame is completely unfolded, in its bed defining position, the articulated sections are in substantially horizontal alignment with one another. A mattress is associated with the frame in such a way that it lies flat on the extended frame when the structure is opened to define a bed, and doubles upon itself when the frame is folded to define a sofa.

In folding the parts into sofa-defining relationship, a problem is sometimes encountered during the final stage of adjustment, because any tendency of the lower and upper horizontal sections to separate from each other makes it difficult to maneuver the folded-up frame into the final lowered position. In that position the rear part lies beneath the upholstered back of the sofa, and if the frame elements are not properly compacted the upholstery may be damaged. The difficulty is aggravated by the concurrent desirable objective to use a relatively thick mattress and to keep the sofa seat relatively low. The mattress tends to spread the upper and lower frame sections and the bulge not only makes it more difficult to manipulate the frame properly but makes the sofa seat uncomfortable. Cumbersome strapping operations, to hold the frame sections in proper compacted relation, are not desirable.

It is a principal object of the present invention to obviate this difficulty by providing a sofa-bed of the type described in which at least a pair of the articulated frame sections are automatically interengaged and held in a particular relative disposition when the frame is moved between its folded position in the sofa body and a forwardly raised intermediate position out of the sofa body. The automatic mechanism is so designed that the frame sections are freely movable with respect to each other when the frame is moved between the intermediate position and its fully unfolded position. That is, the pair of frame sections are automatically locked in the required relative disposition only during the phase of frame movement adjacent to the folded position, and are automatically unlocked during the phase of frame movement adjacent to the fully unfolded position. In this way an operator is enabled to effect folding and unfolding of the frame with much greater ease and assurance, and without danger of mishap.

A more specific object of the invention is to provide a sofa-bed which is durable in construction and reliable in operation and in which the required elements are relatively simple in design, low in cost, and few in number.

In the preferred embodiment of the invention two toggle links are connected between a pair of the frame sections, and a means is provided in association with one of the frame sections for movements into and out of engagement with one of the toggle links for locking the latter against opening when the frame, during the folding thereof, reaches an intermediate position of movement.

A preferred way of achieving these general ojects and advantages, and such other objects and advantages as may hereinafter appear or be pointed out, is illustrated in the accompanying drawings, in which:

Figure 1 is an end view showing a sofa-bed frame comstructed in accordance with the present invention, the sofa-bed body being shown in dot-and-dash outline;

Figure 2 is a horizontal, enlarged cross-sectional view taken on the line 2—2 of Figure 1;

Figure 3 is an end view similar to Figure 1, the sofa-bed frame being shown in an initial stage of its unfolding movement;

Figure 4 is an end view similar to Figure 1, but on a larger scale, showing the sofa-bed frame in its forwardly raised intermediate position of unfolding movement;

Figure 5 is a horizontal cross-sectional view taken on the line 5—5 of Figure 4;

Figure 6 is an end view similar to Figure 4, showing the sofa-bed frame entering the final phase of its unfolding movement;

Figure 7 is an end view similar to Figure 1, showing the sofa-bed frame in its completely unfolded position; and

Figure 8 is a partial top plan view of Figure 7.

Before entering upon a detailed description of the present invention, the device as a whole will be briefly described. The device is shown in Figure 1 in its closed or folded position to define a sofa, the sofa body **10** being represented in dot-and-dash lines. When fully opened (Figures 7 and 8) the device defines a bed, the frame of which is made up of four substantially horizontal aligned sections.

In closed or folded position these four sections assume a compacted relationship; and for facility in terminology, the sections will be given descriptive appellations based upon their respective dispositions in the closed position. Thus, section **20**, which is nearest the back of the sofa body **10** and is vertical, will be referred to as the "rear vertical section"; section **24** which is horizontal and lower (compared with section **30**, which is also horizontal) will be referred to as the "lower horizontal section"; section **30** will be termed the "upper horizontal section"; and section **27**, which is vertical (like section **20**) but which is at the front of the sofa body, will be referred to as the "front vertical section."

The sections **24**, **27** and **30** are substantially straight line members, while the rear vertical section **20**, is angular, having an arm **21** pivotally articulated at **22** to a fixed angularly disposed supporting bar **33** secured to the sofa body **10**. The lower end of the rear vertical section **20** is pivoted, as at **25**, to the rear end of the lower horizontal section **24**. The forward end of section **24** is pivoted, at **28**, to the lower end of the front vertical section **27**, the upper end of which is pivoted, at **31**, to the front end of the upper horizontal section **30**. The parts **20**, **24**, **27** and **30** have been spoken of as "sections" rather than mere members because each section has companion parts or members at the respective right and left ends of the sofa body. The particular sections **20**, **24**, **27** and **30** shown in the present figures represent

only the companion parts at the near end of the sofa body. The corresponding parts of the sections at the opposite end of the sofa have been omitted from the drawings, since they are mere counterparts of those shown.

The elements forming sections **20**, **24**, **27** and **30** are preferably angle irons, and are provided with well-known flanges or other suitable stop means to limit unfolding movement to the aligned relationship. Extending transversely across the device at suitable intervals are cross-bars, such as those shown at **23** and **32** (Figure 8) to hold the parts of each section together as a structural unit. Also extending transversely across the device is a bed spring **26** (Figure 8) adapted to support a mattress **12** (shown in dot-and-dash lines in Figures 1, 3 and 7). The spring may be supported in any well-known manner between the opposite members of the frame sections. The mattress **12** is retained in folded condition within the frame when the latter is in its folded position.

During the initial stage of unfolding frame movement the rear vertical section **20** swings forwardly about the pin **22**, the lower horizontal section **24** moves upwardly and forwardly out of the sofa body, and the upper horizontal section **30** remains in parallel spaced relation to the lower horizontal section **24** (Figure 3). At the completion of this stage of unfolding movement the parts assume the forward raised intermediate position indicated in Figure 4. A reverse movement of the frame takes place during the final stage of adjustment of the parts from the bed defining condition to the sofa defining condition.

In order to support the frame during these folding and unfolding movements an elevator arm or lever **35** is interposed between the sofa body and the lower horizontal section **24**. (Actually there are two such elevator arms, one at each end of the sofa, but for the sake of simplicity of description and illustration reference will be made to only one arm, and the same applies to the mechanism with which it cooperates.)

The lever **35** is somewhat S-shaped, having transversely extending arms **36** and **37** at its opposite ends respectively. The lever **35** is pivoted (at the angle part of arm **36**) to a fixed part of the sofa body by means of a pivot pin **38**. In this way the lever **35** is mounted for rotative movement about the pin **38** as an axis. It moves between the lowermost position shown in Figure 1 and the uppermost position shown in Figures 4, 6 and 7, and in the right hand dot-and-dash position shown in Figure 3. The dot-and-dash position at the left of Figure 3 is an intermediate position.

Extending rearwardly from the free end of lever arm **36** into an anchorage with the sofa bed at **39** is a coiled tension spring **40**. This spring is in a stressed condition when the parts are in the relationships of Figures 1 and 4, and it is in its least stressed condition when the parts are in the relationship of Figure 3. Thus the spring facilitates both the unfolding and the folding manipulations. This spring is well-known per se and forms no special part of the present invention. It is best illustrated in Figures 3 and 7.

The upper arm **37** of the lever **35** is bifurcated, as may be best observed in Figure 5. The inner part is angled inwardly toward the section **24** and is pivotally connected to the latter by a pivot pin **42**. The outer part is shown as a separately fabricated piece **45** welded to the lever **35**. It has a side opening or notch **46** in alignment with the pivot pin **42**. The part **45** may thus be seen to be substantially hook-shaped, the opening of the hook facing upwards when the frame is in its intermediate position as shown in Figures 4 and 6.

Before describing the special function and mode of operation of the hook-shaped part **45**, brief reference will be made to some of the other parts of the mechanism illustrated, to facilitate an understanding of its operation.

Connected between the lower and upper horizontal sections **24** and **30** is a pair of toggle links **50** and **51** pivoted together at their adjacent ends. The links **50**, **51** are adapted to open the toggle as shown in Figure 7 when the frame is unfolded, and to collapse together into the relationship shown in Figures 1, 3, 4 and 6 when the frame is folded to bring the upper and lower horizontal sections **30** and **24** into parallel relation.

Fixedly secured to and extending forwardly beyond the front vertical section **27** is a plate **60**. A leg **61** has its upper end pivoted to the plate **60**, and is provided at its lower end with a ground-engaging caster **63**. Pivotally connected to the leg **61** at **64** is a control link **65**. The rear end of the control link **65** is pivoted to the toggle link **50** at **66**, whereby movement of the toggle link will effect turning of the leg **61**. That is, when the upper and lower horizontal sections **30** and **24** are in parallelism, the toggle links **50** and **51** are in their relatively closed position and the leg **61** is disposed alongside of the front vertical section **27**, as shown in Figures 1, 3 and 4. However, when the upper and lower horizontal sections move out of their parallel relationship, the toggle links **50** and **51** move toward their open position, so that when the frame is in unfolded position, as seen in Figure 7, the leg **61** depends vertically from the front vertical section **27** and provides support therefor.

Extending across the front of the sofa is a front board **69**. It is automatically moved downwardly and forwardly, to get it out of the way, when the frame is unfolded (compare Figures 1 and 7). This is achieved by providing a forward extension **67** on the control link **65** and pivoted to the front board, and an adjacent constraining link **70** between the leg **61** and the front board **69**.

Pivoted to the upper horizontal section **30** at **71** is a leg **72**. The leg **72** is formed with an extension **73** and a link **75** is pivotally connected to the front vertical section **27** and to the angular extension **73**, whereby the leg **72** is rotated about the pivot **71** upon unfolding movement of the upper horizontal section with respect to the front vertical section. As seen in Figures 1, 3 and 4, the leg **72** is disposed substantially parallel to the upper horizontal section **30** when the frame is in folded condition and when the upper horizontal section **30** is unfolded with respect to the front vertical section **27** the link **75** will effect rotative movement of the leg **72** about the pin **71** so that the leg will assume a vertically depending position when the frame is unfolded, as seen in Figure 7.

The automatic locking of the parts is achieved in the present construction by providing on one of the toggle links **50**, **51** a special lock or part which is so positioned that it seats itself within the hook-shaped notch **46** when the frame (during the folding thereof) reaches the intermediate position shown in Figure 4. More particularly, it will be observed that the toggle link **50** is provided with a part **52** extending beyond the pivot or pin **55** connecting the links **50**, **51** at their adjacent ends. At the end of the extenson **52** there is provided a transverse lug **53** adapted freely to seat and unseat itself in the notch **46** when the frame is in the intermediate position of Figure 4.

The point of pivotal connection between the lever **35** and the sofa body, i. e., the pivot **38**, is so located that when the frame moves from the intermediate position of Figure 4 through the position of Figure 3 to the fully folded sofa position of Figure 1 the hook **46** moves to engage firmly with the lug **53** and thus lock the lug against disengagement. This prevents any movement of the toggle link **50** into opening position, and thus effectively locks the upper and lower horizontal sections **30** and **24** in the parallel relationship they have assumed.

On the other hand, during the unfolding manipulations of the frame, the upper horizontal section **30** is freely movable out of the intermediate position of Figure 4 (see Figure 6) since the parts in the intermediate position of Figure 4 have automatically assumed a relationship in which the hook **46** opens upward and the lug **53** is freely movable upwardly out of engagement with it, as shown in Figure 6.

It will be understood that changes in any of the details herein described and illustrated may be made by those skilled in the art without necessarily departing from the spirit and scope of the invention as expressed in the appended claims.

Having thus described our invention and illustrated its use, what we claim as new and desire to secure by Letters Patent is:

1. In a sofa-bed, a sofa body, a frame foldable into said body to define a sofa and unfoldable out of said body to define a bed, said frame comprising sections including an upper horizontal section, a front vertical section, and a lower horizontal section, said sections being in substantial alignment when the frame is in unfolded position, the upper and lower horizontal sections being in parallelism during movement of the frame between its folded position and a forwardly raised intermediate position, a lever pivoted to said lower horizontal section and to said sofa body for supporting said frame during unfolding movement thereof, a pair of toggle links pivotally connected to each other and having their outer ends pivotally connected to said upper and lower horizontal sections respectively, a lug on one of said toggle links, said lug being so positioned that it lies in axial alignment with the pivot connecting said lever to said lower horizontal section when said frame is in said intermediate position, and means on said lever for receiving said lug when said frame is in said intermediate position, said means being movable with said lever upon continued folding movement of said frame beyond said intermediate position to lock said lug and hence said toggle links against movement, thereby locking said upper and lower horizontal sections in parallelism during movements of the frame between said intermediate and folded positions.

2. The combination of claim 1, wherein said means comprises a hook fixedly secured to said lever, said hook opening upwards to receive said lug when said frame is in said intermediate position and rotatable about said lug upon continued folding movement of said frame.

3. In a sofa-bed, a sofa body, a frame foldable into said body to define a sofa and unfoldable out of said body to define a bed, said frame comprising pivotally connected sections including upper and lower horizontal sections that are in substantially horizontal alignment when the frame is fully unfolded and lie in superposed proximity when the frame is folded and during movement of the frame between its fully folded position and an intermediate forwardly raised position, a pair of toggle links pivotally connected to each other and having their outer ends pivotally connected to said upper and lower horizontal sections respectively, said toggle links being adapted to open when the frame is unfolded and to collapse together when the frame is folded, a lever pivotally interposed between said sofa body and said lower horizontal section, a lug on one of said toggle links, and a hook-shaped member rigidly secured to and carried by said lever in a position to receive said lug when the frame reaches said intermediate position during the folding of the frame, the pivot connection of said lever to the sofa body being so located that as the frame during the folding thereof moves between the intermediate and the fully folded positions said hook-shaped member moves to retain its engagement with said lug and prevent disengagement thereof thereby retaining said upper and lower horizontal sections in said superposed proximity.

4. In a sofa-bed, a sofa body, a frame foldable into said body to define a sofa and unfoldable out of said body to define a bed, said frame comprising pivotally connected sections including upper and lower horizontal sections that are in substantially horizontal alignment when the frame is fully unfolded and lie in superposed proximity when the frame is folded and during movements of the frame between its fully folded position and an intermediate forwardly raised position, a pair of toggle links pivotally connected to each other and having their outer ends pivotally connected to said upper and lower horizontal sections respectively, said toggle links being adapted to open when the frame is unfolded and to collapse together when the frame is folded, a lever pivotally interposed between said sofa body and said lower horizontal section, a hook-shaped member rigidly secured to and carried by said lever adjacent to the end which is pivoted to the lower horizontal section, the eye of the hook being aligned with said last-mentioned pivot, the hook opening upward when the frame is in the intermediate position, and a lug carried by one of said toggle links in a location to enter said hook when the frame reaches said intermediate position during the folding of the frame, whereby said hook rotates coaxially about said lug to prevent disengagement thereof as the frame during the folding thereof moves between the intermediate and the fully folded positions.

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