

[54] **REMOVABLE LINKAGE FOR A FOLDABLE BED**

[75] Inventor: **Harold W. Inman**, Birmingham, Mich.

[73] Assignee: **Lear Siegler, Inc.**, Detroit, Mich.

[22] Filed: **June 22, 1972**

[21] Appl. No.: **265,412**

[52] U.S. Cl. 5/13, 5/29

[51] Int. Cl. A47c 17/04, A47c 17/14

[58] Field of Search 5/13, 17, 18, 29, 5/31; 297/85, 111, 112

[56] **References Cited**

UNITED STATES PATENTS

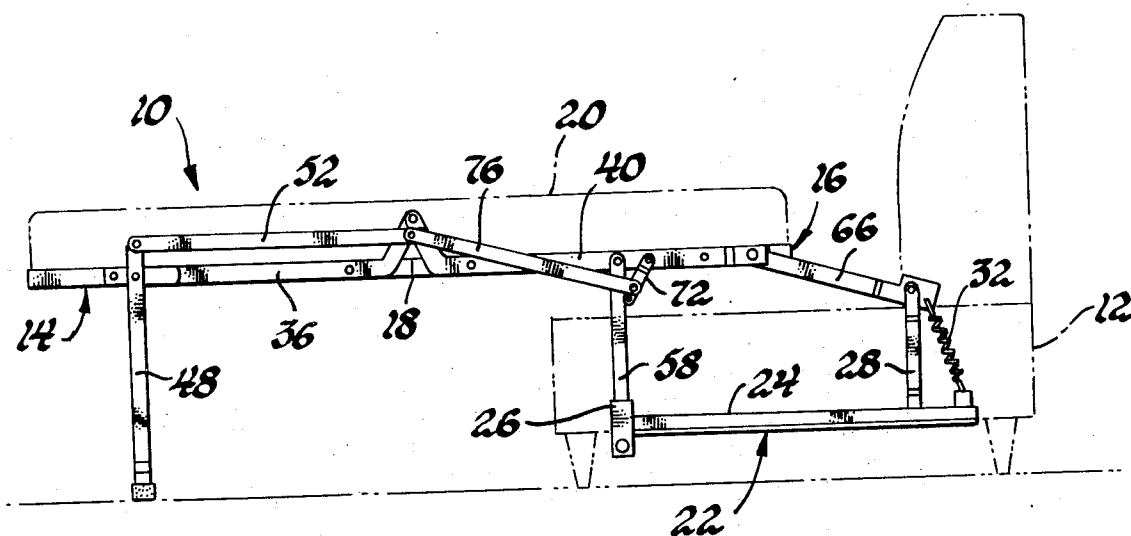
3,456,268	7/1969	Rogers, Jr.	5/17
3,482,270	12/1969	Hill	5/13
3,389,409	6/1968	Rogers, Jr.	5/17
3,162,482	12/1964	Katz	297/85

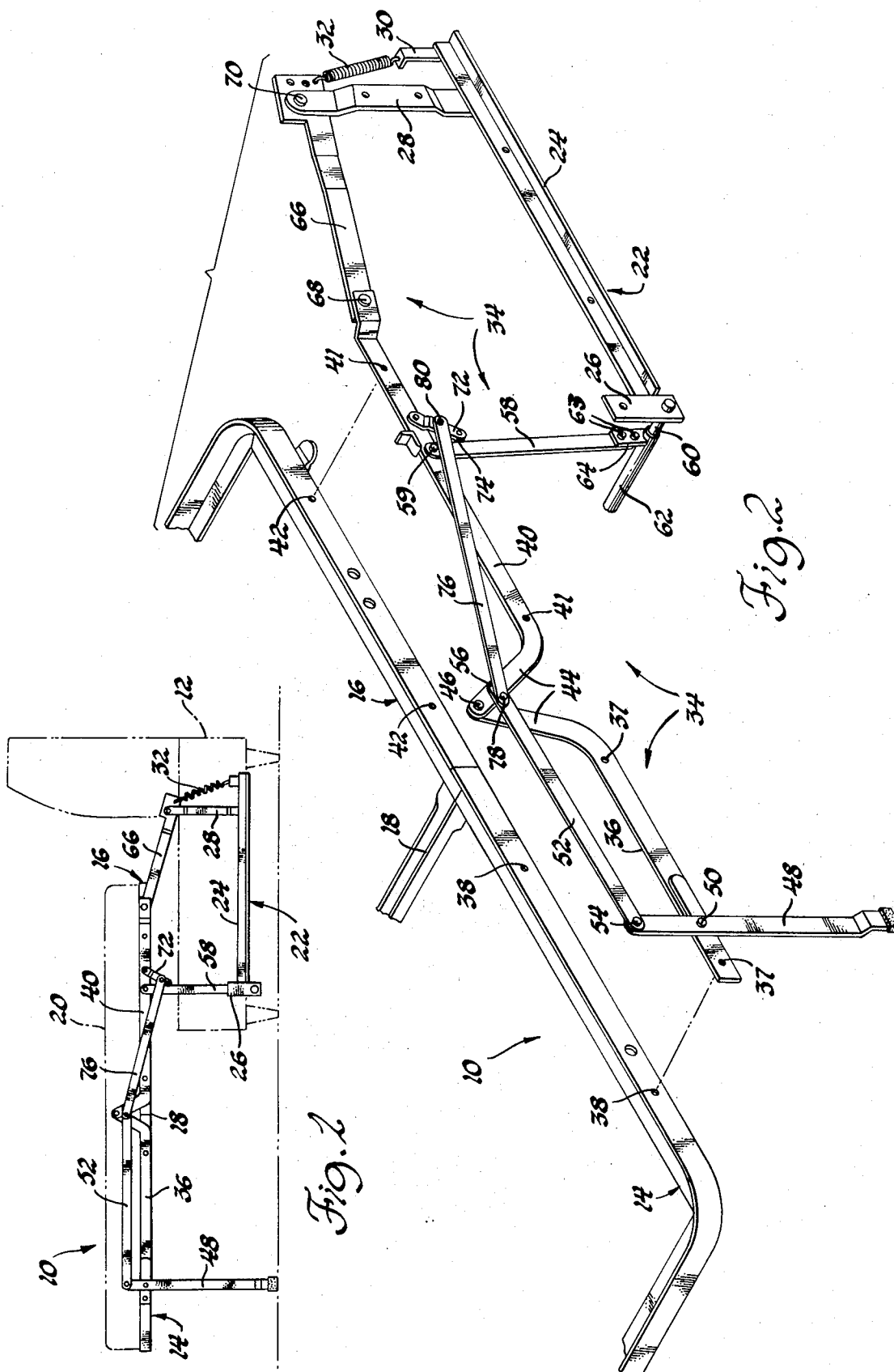
Primary Examiner—Casmir A. Nunberg
Attorney—Gerald E. McGlynn, Jr. et al.

[57] **ABSTRACT**

A foldable sofa-bed assembly including first and second frame means, a base means adapted for connection to a support, such as a wooden frame of a piece of furniture, and linkage means for operatively interconnecting the frame means and the base means for moving the frame means relative to each other and relative to the base means between a folded sofa forming position and an open bed forming position. The linkage means includes a plurality of pivotally interconnected links pivotally connected to the base means and operable for movement between the sofa and bed forming positions independently of being connected to either of the frame means. In other words, the linkage means which is connected to the base means is adapted for connection to the two frame means and is operable for movement between the sofa and bed forming positions without being connected to the first and second frame means. Thus, the entire assembly may be shipped without being connected together yet the linkage means is easily attached to the frame means.

12 Claims, 5 Drawing Figures





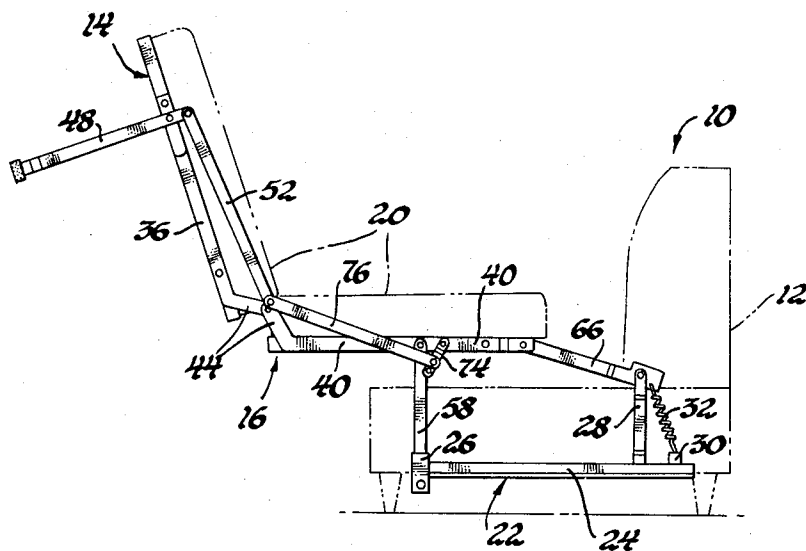


Fig. 3

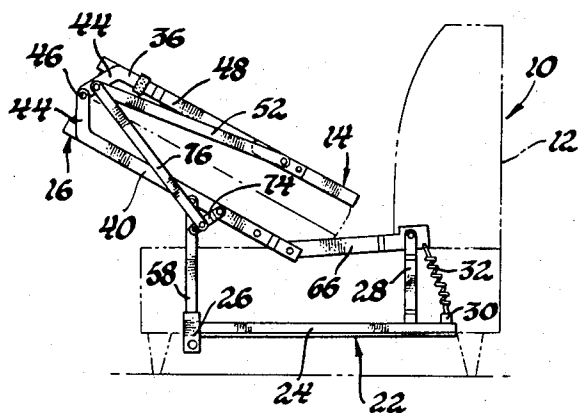


Fig. 4

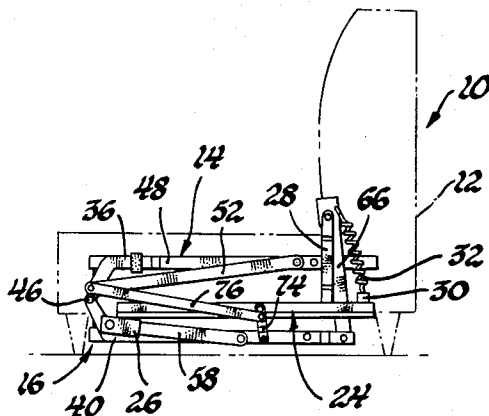


Fig. 5

REMOVABLE LINKAGE FOR A FOLDABLE BED

This invention relates to a foldable sofa-bed assembly of the type which is normally in the sofa forming position whereby it may be utilized for seating but may be unfolded to a bed forming position so that it may be utilized as a bed. Such assemblies typically include at least two frames which are pivotally connected together and which are generally coplanar for supporting a mattress when in the bed forming position. The assemblies also include some sort of base frame which is adapted for attachment of a wooden frame of a piece of furniture. Various linkages are utilized for interconnecting the two bed forming frames with the base frame to accommodate movement of the two bed forming frames between the bed forming position and the sofa forming position. These linkages include a significant number of links which are normally pivotally connected to one another and to the two bed forming frames. The manufacturers of such assemblies must attach the linkages to the base frame and to the two bed forming frames before shipping the entire assembly to the customer who installs it into a sofa frame and applies the upholstery because the linkages can become very entangled to the extent that they are unusable or very difficult to attach to the two bed forming frames. The assemblies have therefore been shipped with the linkages attached to the bed forming frames. The assemblies are shipped in the sofa forming position where the bed forming frames overlie and are spaced vertically from one another. The space between the vertically separated bed forming frames during shipment is wasted and costly shipping space.

Accordingly, it is an object and feature of this invention to provide a foldable sofa-bed assembly which includes first and second frame means and a base means adapted for connection to a support and linkages means for operatively interconnecting the first and second frame and the base means to move the frame means relative to each other and relative to the base means between a folded sofa forming position and an open bed forming position with the linkage means including a plurality of pivotally interconnected links pivotally connected to the base means and operable for movement between the sofa and bed forming positions independently of being connected to either of the frame means whereby the first and second frame means may be shipped disconnected from the linkage means while the linkage means may be easily connected to the first and second frame means after shipment.

In correlation with the foregoing object and feature, it is another object and feature of this invention to provide such a foldable sofa-bed assembly wherein the linkage means includes a first link adapted for rigid non-pivotal connection to the first frame means and a second link adapted for rigid non-pivotal connection to the second frame means.

Other objects and attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a preferred embodiment of the instant invention showing the folded sofa-bed assembly in the bed forming position;

FIG. 2 is a fragmentary exploded perspective view showing one end of a preferred embodiment of the foldable sofa-bed assembly as shown in FIG. 1;

FIG. 3 is an end view of the subject assembly showing the assembly at an initial position in being folded from the bed forming position toward the sofa forming position;

FIG. 4 is an end view similar to FIG. 3 but showing the assembly in a subsequent position as it is being moved toward the sofa forming position; and

FIG. 5 is an end view similar to FIGS. 3 and 4 but showing the assembly in the sofa forming position.

Referring now to the drawings, a preferred embodiment of the foldable sofa-bed assembly constructed in accordance with the instant invention is generally shown at 10. In all FIGURES only one end of the assembly is illustrated; however, the other end is the same but opposite in configuration; thus, only one end will be described and claimed.

An upholstered sofa-bed frame is shown in phantom at 12. Such is well known in the art and includes a wooden frame to which the foldable sofa-bed assembly of the instant invention is attached.

The sofa-bed assembly 10 includes a first frame means generally indicated at 14 and a second frame means generally indicated at 16. The first frame means 14 is sometimes referred to as a foot frame and the second frame means 16 is sometimes referred to as a head frame. The two frame means 14 and 16 are completely separate but abut one another along line 18 in the bed forming position illustrated in FIGS. 1 and 2. Springs, canvas, or the like may be stretched between the structural members defining each frame means for supporting a mattress, such as that shown in phantom at 20.

The assembly 10 also includes a base means generally indicated at 22. The base means includes an angle member 24, a bracket 26 and an upwardly extending arm 28. Both the bracket 26 and the arm 28 are welded or otherwise rigidly secured to the angle member 24. Also included is a tab 30 which is connected to a spring 32, the purpose of which will be described hereinafter.

The assembly 10 also includes linkage means generally indicated at 34 in FIG. 2 for operatively interconnecting the first and second frame means 14 and 16 and the base means 22 to move the frame means 14 and 16 relative to each other and relative to the base means 22 between a folded sofa forming position as shown in FIG. 5 and an open bed forming position as illustrated in FIGS. 1 and 2. As illustrated in FIG. 5, when in the sofa bed forming position, the first frame means 14 is disposed above the second frame means 16 and they are both disposed immediately above the angle member 24 of the base for forming the seat of the sofa. The linkage means 34 includes a plurality of pivotally interconnected links pivotally connected to the base means 22 and operable for movement between the sofa and bed forming positions independently of being connected to either of the frame means 14 and 16. In other words, the links forming the linkage means 34 may be sequenced between the sofa and bed forming positions without being attached to the frame 14 and 16. Said another way, the linkage means 34 forms an operable mechanism and need not be connected to the frames 14 and 16 to complete the mechanism. Thus there is no problem in shipping the linkage means 34 connected to the base means 22 independently of being connected to the frames 14 and 16; thus, conserving a great deal of

space during shipment yet allowing easy assembly of the linkage means 34 to the frames 14 and 16 without first having to understand how the linkage means or mechanism 34 operates or in what positions the various links should be in for attachment to the frames 14 and 16.

The linkage means 34 includes a first link 36 adapted by the holes 37 for rigid non-pivotal connection to the first frame means 14. Two spaced fasteners (not shown) connect the first link 36 to the first frame means 14 by extending through the holes 37 in the first link 36 and through holes 38 in a first frame means 14.

The linkage means 34 also includes a second link 40 adapted by the holes 41 for rigid non-pivotal connection to the second frame means 16. Two spaced fasteners (not shown) connect the second link 40 to the second frame means 16 by extending through the holes 41 in the second link 40 and through the holes 42 in the second frame means 16. The importance of having two fasteners connecting each of the first and second links 36 and 40 to the respective frame means 14 and 16 is that the first and second links 36 and 40 are prevented from pivoting or rotating or otherwise moving relative to the frame means 14 and 16 when connected thereto. Previous linkage means of this type did not include these first and second links 36 and 40 and therefore the linkage was not operable until or unless connected at precise pivot points to the frame means 14 and 16. Also, both the first and second links are each pivotally connected at at least two spaced points to other links of the linkage means 34 which is structurally important in that such connection must exist for the linkage means to have integrity as an operative mechanism independently of being connected to the first and second frame means 14 and 16.

The first and second links 36 and 40 each have an upwardly extending arm 44 as viewed in the bed forming position and the assembly includes a pivot means 46 such as a rivet for pivotally interconnecting the first and second links 36 and 40 whereby when the first and second links 36 and 40 are attached to the frame means 14 and 16, the frame means 14 and 16 becomes pivotally interconnected. The reason for the arms 44 is that when the linkage means is pivoted from the bed forming position to the sofa forming position the link 36 and consequently the plane of the frame means 14 will be spaced above and parallel to the second link 40 as well as to the second frame means 16.

The linkage means 34 includes a leg link 48 which is pivotally connected at 50 to the first link 36. The leg 48 along with other links later to be described supports the frame means 14 and 16 in the bed forming position as illustrated in FIG. 1. The leg link 48 extends downwardly from the first link 36 and upwardly from the first leg 36 when in the bed forming position. The linkage means 34 further includes a drive link 52 pivotally connected at one end 54 to the upper end of the leg link 48, which is above the pivotal connection at 50 thereof to the first link 36 when in the bed forming position. Drive link 52 is pivotally connected at the other end 56 to the second link 40 for controlling the position of the leg link 48 during movement between the sofa and bed forming positions.

The linkage means 34 also includes a support link 58 which when in the bed forming position is pivotally connected at 58 at its upper end to the second link 59 and is pivotally connected at its lower end to the

bracket 26 of the base means 22. A shaft 60 is secured to and extends from the bracket 26. A tube 62 is rotatably supported on the shaft 60 and has a flange 64 extending upwardly therefrom and bolted by the bolts 63 to the support link 58. Thus, it is through the tube 62 and the shaft 60 that the lower end of support link 58 is pivotally connected to the base means 22. As alluded to hereinbefore, a linkage means like the linkage means 34 but of the opposite or mirror image is disposed at the other end of the frame means 14 and 16 and the tube 62 extends between the two linkage assemblies. Although during shipment the bolts 63 disconnect the support link 58 from the tube 62, nevertheless the linkage means 34 along with the parallel linkage means on the other side when connected by the tube 62 are operable for movement between the sofa and bed forming positions independently of being connected to the first and second frame means 14 and 16. Additionally, the support link 58 may be otherwise pivotally connected to the bracket 26 of the base means 22 so that the linkage means 34 is operable as an integral mechanism independently of being connected to the first and second frame means 14 and 16.

The linkage means 34 further includes a guide link 66 pivotally connected at 68 at one end to the second link 40 and pivotally connected at 70 at the other end to the upwardly extending arm 28 of the base means 22. It should be noted that the pivotal connection 70 of the guide link 66 to the arm 28 of the base means 22 is at a position horizontally displaced but vertically above the pivotal connection of the support link 58 to the bracket 26 of the base means 22. This is important because the guide link 66 hangs generally vertically downwardly from the pivot 70 when the assembly is in the sofa forming position.

The linkage means 34 also includes a stop link 72 pivotally connected to the second link 40 and has a stop 74 extending inwardly therefrom to engage the support link 58 in the bed forming position. There is also included a control link 76 pivotally interconnecting the drive link 52 by being pivotally connected thereto at 78 and to the stop link 72 by being pivotally connected thereto at 80 for moving the stop link 72 into engagement with the support link 58 in the bed forming position to prevent pivotal movement of the second link 40 about its pivotal connection 59 to the support link 58 without relative pivotal movement between the first and second links 36 and 40 from the bed forming position. Said another way, if for some reason the pivotal connection 46 were binding so that relative pivotal movement between the first and second links 36 and 40 were prevented, an upward lifting force on the front of the first link 36 would cause a pivotal movement of the second link 40 about its pivotal connection at 59 to the support link 58. Such pivotal movement would move the pivotal connection 68 between the second link 40 and the guide link 66 downwardly. Such might occur if an extreme weight were placed on the assembly at a position rearwardly of the pivotal connection 59 while in the bed forming position as illustrated in FIG. 1. To prevent such pivotal movement the stop 74 on the link 72 engages the rear of support link 58 to prevent the pivot point 68 from moving downwardly unless or before the first link 36 is pivoted upwardly relative to the second link 40 about the pivot point 46. After a predetermined amount of upward pivotal movement of the first link 36 about the pivot 46 relative to the second

link 40, the stop 74 of the link 72 can be moved out of engagement with the support link 58; thus, allowing the first frame means 14 to be folded over and spaced above the second frame means 16 and both frame means moved downwardly adjacent the base means as the pivot 68 moves in an arc downwardly to a position below the pivot 70.

As will be appreciated, the spring 32 reacts between the guide link 66 and the base means 24 for assisting in raising the assembly from the sofa forming position to the bed forming position.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A foldable sofa-bed assembly comprising; first frame means, second frame means, base means adapted for connection to a support, linkage means for operatively interconnecting said first and second frame means and said base means to move said frame means relative to each other and relative to said base means between a folded sofa forming position and an open bed forming position, said linkage means including a plurality of pivotally interconnected links pivotally connected to said base means and capable of movement between said sofa and bed forming positions independently of being connected to either of said first and second frame means.

2. An assembly as set forth in claim 1 wherein said linkage means includes a first link adapted for rigid non-pivotal connection to said first frame means and a second link adapted for rigid non-pivotal connection to said second frame means.

3. An assembly as set forth in claim 2 including at least two spaced fasteners connecting said first link to said first frame means and at least two spaced fasteners connecting said second link to said second frame means.

4. An assembly as set forth in claim 2 wherein said first link is pivotally connected at least at two spaced points to other links of said linkage means and said second link is pivotally connected at least at two spaced points to other links of said linkage means.

5. An assembly as set forth in claim 2 including pivot means pivotally interconnecting said first and second links for pivotally interconnecting said first and second frame means.

6. An assembly as set forth in claim 5 wherein said linkage means includes a leg link pivotally connected to said first link for at least partially supporting said frame means in said bed forming position.

7. An assembly as set forth in claim 6 wherein said leg link extends downwardly from said first link and upwardly therefrom when in said bed forming position, said linkage means further including a drive link pivotally connected at one end to said leg link above said first link when in said bed forming position and pivotally connected at the other end to said second link for controlling the position of said leg link during move-

ment between said sofa and bed forming positions.

8. An assembly as set forth in claim 7 wherein said linkage means further includes a support link which when in said bed forming position is pivotally connected at the upper end thereof to said second link and is adapted to be pivotally connected at the lower end thereof to said base means.

9. An assembly as set forth in claim 8 wherein said linkage means further includes a guide link pivotally connected at one end to said second link and pivotally connected at the other end thereof to said base means, said pivotal connection of said guide link to said base means being at a position above the pivotal connection of said support link to said base means.

10. An assembly as set forth in claim 9 wherein said linkage means further includes a stop link pivotally connected to said second link and engageable with said support link in said bed forming position, and a control link pivotally interconnecting said drive link and said stop link for moving said stop link into engagement with said support link in said bed forming position to prevent pivotal movement of said second link about the pivotal connection thereof to said support link without relative pivotal movement between said first and second links from said bed forming position.

11. An assembly as set forth in claim 10 including at least two spaced fasteners connecting said first link to said first frame means and at least two spaced fasteners connecting said second link to said second frame means.

12. A foldable sofa-bed assembly comprising: base means adapted for connection to a support; linkage means connected to said base means and adapted for connection to at least two bed forming frames to move the frames relative to each other and said base means between a folded sofa forming position and an open bed forming position; said linkage means including a first link adapted for rigid attachment to one of the bed forming frames and a second link adapted for rigid attachment to the other of the bed forming frames, said first and second links being pivotally connected together, a leg link pivotally connected to said first link and extending above and below the pivotal connection thereof to said first link when in said bed forming position, a drive link pivotally interconnecting said second link and said leg link at a position above the pivotal connection of said leg link to said first link when in said bed forming position, a support link adapted for pivotal connection to said base means and pivotally connected to said second link, said support link being substantially vertical when in said bed forming position, a guide link pivotally interconnecting said second link and said base means, the pivotal connection of said guide link to said base means being horizontally displaced and vertically above the pivotal connection of said support link to said base means, a stop link pivotally connected to said second link and engageable with said support link in the bed forming position, and a control link pivotally interconnecting said drive link and said stop link for moving said stop link into and out of engagement with said support link during movement of said assembly between the bed and sofa forming positions.

* * * * *