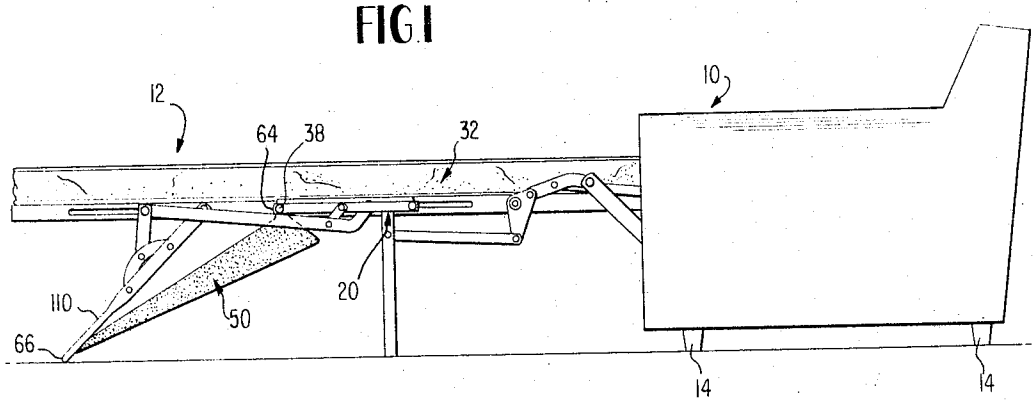
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SOFA BED IMPROVEMENTS

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FIG. 1



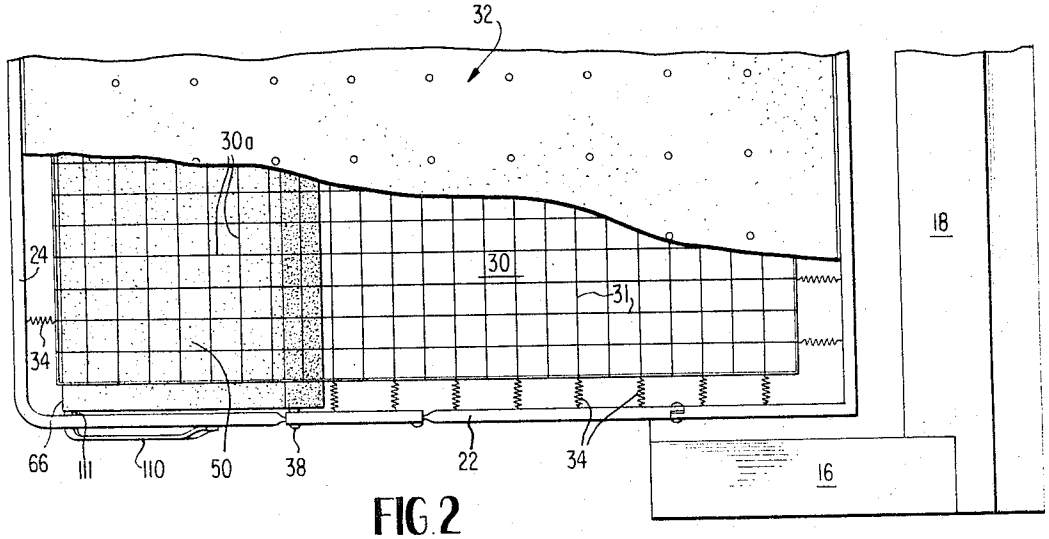
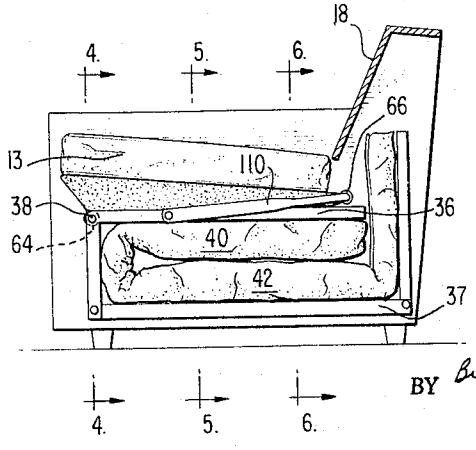


FIG. 2

FIG. 3



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FIG. 7

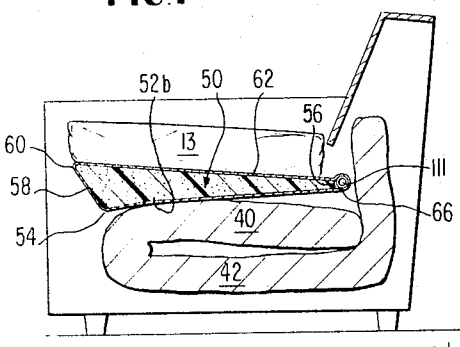
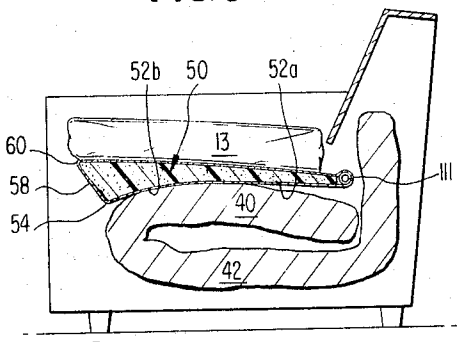


FIG. 8



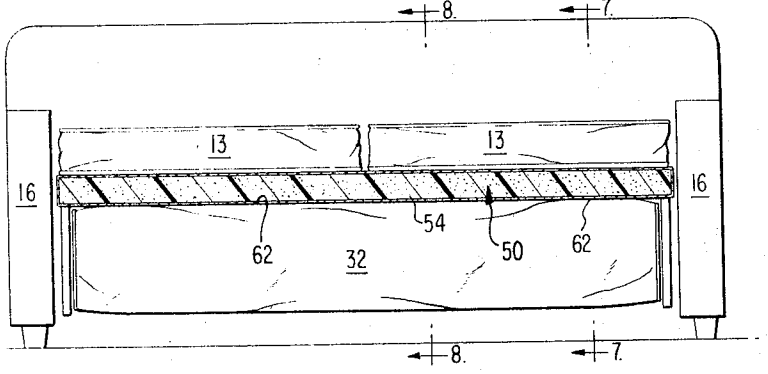


FIG. 4

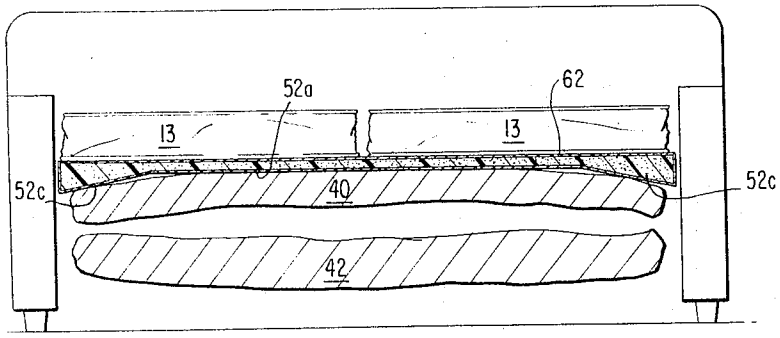


FIG. 5

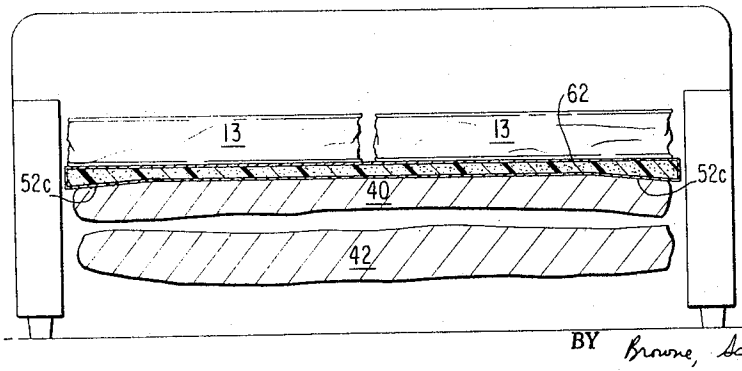


FIG. 6

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United States Patent Office 3,296,632 Patented Jan. 10, 1967

3,296,632

SOFA BED IMPROVEMENTS

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Filed Dec. 3, 1965, Ser. No. 511,512
20 Claims. (Cl. 5—13)

This invention relates to furniture commonly known as sofa beds since they may be used either as a sofa or bed. Although illustrated and described below in connection with a sofa bed, the present invention is equally applicable to related furniture having similar foldability and conversion characteristics such as may be employed in a combination chair and bed.

Typical sofa beds include a mattress spring secured on a frame of articulated members which are foldable between an extended position for use in forming the bed and a retracted position for use in forming the sofa. On the spring is a mattress and when the sofa bed is used as a sofa, one or more cushions are placed on the mattress.

In folding from the bed position to the sofa position, the frame and spring with the mattress in position, are doubled over as a unit into upper and lower layers with the upper layer of the spring firmly pressing and forcing the upper mattress layer into contact with the lower mattress layer. Because of this confinement by the spring, the mattress layers form a firm body having, effectively, no cushioning quality. Instead of cushioning the weight of a person sitting on the sofa, the firm mattress layers, in effect, act as a rigid stop below the upper cushions of the sofa. Discomfort caused by this condition has been a long-standing problem of sofa beds.

To overcome this problem and provide a sofa bed which is comfortable to sit upon, is therefore, an object of the present invention.

A further object of the present invention is to provide a load distributing member, hereinafter referred to as a "deck," insertible between the outer cushion and inner mattress of a sofa bed to enhance comfort.

A still further object of the present invention is to provide a sofa bed which will achieve the above objects in a relatively economical manner and without sacrificing construction or operability.

In achieving the above objects, a foldable sofa bed frame is provided with a bed spring which is yieldable to allow the upper layer of the mattress in folded position to bow upwardly away from the lower layer of the mattress in generally convex fashion. In use as a sofa, the upper mattress layer is thus uncompressed and free to move downwardly to absorb the weight of a person in cushioned manner. In one application of the present invention to a conventional sofa bed such as illustrated in the drawings, the bed spring is connected to the far end portion of the foldable frame in such a way to decrease tension on the bed spring and thus increase its yieldability to allow the upper layer of the mattress to bow away from the lower layer and provide the desired cushioning described above.

Additionally, a shaped deck of resilient deformable material is interposed between the outer sofa cushions and the upper convex layer of the mattress in the folded sofa position. In the lower face of the deck is a recess shaped to receive and accommodate the bowed mattress layer. In this manner enhanced comfort and improved distribution of the load from the outer cushion seats to the underlying mattress, are achieved. In the preferred embodiment the deck is attached to the foldable bed frame for movement between an idle position when the sofa bed is used as a bed and an operative position on the folded mattress when the sofa bed is used as a sofa. Also in the preferred embodiment the deck is covered by skin which stretches to compress the deck in thickness when the deck is moved with the frame into the sofa position with the deck engaged on the bowed upper mattress layer. When the deck is in its idle position, the deck skin and the enclosed body are substantialy relaxed.

Other objects and advantages of the present invention will become apparent from the following description and accompanying drawings in which:

FIG. 1 is a side view of a sofa bed constructed in accordance with the present invention and illustrated in the unfolded bed position;

FIG. 2 is a fragmental plan view of the sofa bed as shown in FIG. 1;

FIG. 3 is a side view of the sofa bed in the folded sofa position with portions removed to show internal parts;

FIG. 4 is a cross-sectional view taken generally along lines 4—4 of FIG. 3 but excluding the bed spring and part of its frame for clarity;

FIG. 5 is a cross-sectional view similar to FIG. 4 but taken generally along lines 5—5 of FIG. 3;

FIG. 6 is a cross-sectional view similar to FIG. 4 but taken generally along lines 6—6 of FIG. 3;

FIG. 7 is a cross-sectional view taken generally along lines 7—7 of FIG. 4; and

FIG. 8 is a cross-sectional view taken generally along lines 8—8 of FIG. 4.

Referring to the drawings in detail, a sofa bed embodying the present invention is shown for illustrative purposes only, as basically including a sofa portion generally designated **10**, a foldable bed portion generally designated **12**, and removable cushion seats **13**. Sofa portion **10** may be of conventional construction such as includes four bottom legs **14**, two arms **16** over the legs at the opposite sides of the sofa bed and a back rest **18** extending between arms **16**.

Bed portion **12** includes an articulated bed frame generally designated **20** foldable between an unfolded extended position (FIG. 1) projected from sofa portion **10** for use in forming the bed and a folded or retracted position (FIG. 3) in sofa portion **10** for use in forming the sofa. Frame **20** is anchored to sofa portion **10** and may be of any suitable construction which will provide the desired foldability and support. For purposes of illustration only, frame **20** is disclosed herein as corresponding to that disclosed in United States Patent No. 3,165,757 issued January 19, 1965. References to this patent may be had for a detailed description of the structure and operation of bed frame **20**.

Referring to FIG. 2, surrounded and supported by bed frame **20** is a bed spring **30** of any suitable or conventional construction such as that schematically indicated in FIG. 2 including spring wire or fabric elements **31** interconnected in reticulated fashion. Bed spring **30**, at its periphery, is resiliently connected to frame **20** to lie horizontally and support a mattress **32** when the sofa bed is unfolded as indicated in FIG. 1. In the particular embodiment shown, connection of bed spring **30** to frame **20** is by a plurality of spaced tension coil springs **34** whose opposite ends are suitably anchored between the peripheral elements **31** of spring **30** and the adjacent rails **22** of the bed frame.

In folding and transforming the bed into a sofa, frame **20**, with mattress **32** in place, is ultimately folded into upper and lower layers illustrated as **36** and **37** with the mattress sandwiched therebetween also in upper and lower layers **40** and **42** as indicated in FIG. 3. In conventional sofa beds, the upper bed spring layer **30***a* resists bowing and flexing of upper mattress layer **40** and instead presses upper mattress layer **40** into firm engagement with lower mattress layer **42**. This presents the discomfiture problem described above.

In accordance with the present invention, the resistance or conversely, the yieldability of the far end of the bed spring which forms the upper layer of the bed spring is calculated to permit the desired bowing of the upper mattress layer upon folding intto the sofa position.

While this may be accomplished in several ways, in the illustrated embodiment it is achieved by omitting tension coil springs **34** along the opposite sides of spring portion **30***a* and employing, preferably, two coil springs **34** to connect the far end of spring portion **30***a* to adjacent bed frame rail **24** as shown in FIG. 2.

Also according to the invention, between cushions **13** and folded mattress layer **40**, there is provided a deck **50** for effectively distributing to the mattress, the load from cushions **13**. Deck **50** is formed from resilient deformable material such as for example foam rubber or the like and in the disclosed embodiment has a generally rectangular outline corresponding in length and width generally to that of the overall sofa seat as formed by the combined area of cushions **13**.

To accommodate bowed upper matress layer **40**, lower face **52** of deck **50** is recessed in generally concave fashion as illustrated in FIGS. 4 through 7. In the particular deck illustrated, the deck recess is defined by a central portion **52***a* of reduced and generally uniform thickness; an elongated front portion **52***b* extending longitudinally of the deck and inclined transversely of the deck from a ridge line **54** to central portion **52***a*; and opposite end portions **52***c* inclined transversely of the deck from front portion **52***b* to longitudinal rear edge **56** of the deck which edge also forms the longitudinal rear edge of central portion **52***a*. Additionally, end portions **52***c* are inclined longitudinally of the deck from opposite ends **58** of the deck to central portion **52***a* as illustrated in FIGS. 5 and 6. Thus the bowing of the mattress is less at the opposite sides of the mattress than at the center of the mattress as illustrated in FIGS. 7 and 8 and moreover, the mattress is also bowed in varying degrees across its sides as illustrated in FIGS. 5 and 6. This condition has been found to provide optimum load distribution and comfort.

Additionally, to increase yieldability and comfort at the front edge of the sofa in the preferred embodiment, the lower face of the deck is bevelled at **58** from ridge line **54** to front longitudinal edge **60** of the deck.

Although a soft non-rigid deck is desirable, it is preferred that the deck have at least some degree of firmness when in use. In the preferred embodiment therefore, deck **50** is enclosed in a skin cover or case **62** which is made from suitable stretchable material and is dimensioned and applied to the deck body such that the deck body will be compressed in thickness when skin **62** is stretched. To stretch skin **62** and thereby compress the deck body, skin **62** is attached at its opposite longitudinal edge portions **64** and **66** to the bed frame. Any suitable method of attachment may be employed and in the shown embodiment, skin portions **64** are attached on opposite pivot pins **38** in the frame side rails while opposite skin portion **66** is attached around the cross piece **111** of foldable frame leg **110**.

By reference to the above-identified Patent No. 3,165,757, it will be understood that the distance between frame pins **38** and leg cross piece **111** increases when in the sofa position. Thus, movement of frame leg **110**, **111** to the sofa position shown in FIG. 3 will move skin end portion **66** away from skin portions **64** to stretch skin **62** and thereby obtain the desired compression and firmness of the enclosed deck body. When the bed frame is unfolded into the bed position, deck skin **62** will return to a substantially unstressed or natural condition as will the enclosed deck body **50**.

Attachment of deck **50** to the frame in the aforedescribed manner is also advantageous in that it provides automatic placement and removal of the deck relative to the mattress by virtue of the folding movement of the frame. This highly facilitates conversion between bed and sofa.

From the above description, it will also be seen that the present invention may be easily applied to existing sofa beds as well as incorporated into new constructions.

Modifications and adaptations of the present invention readily apparent from the foregoing description and associated drawings, although not specifically mentioned herein, will nevertheless be included within the scope of the present invention as indicated in the appended claims.

What is claimed is:

1. A deck adapted to be inserted between the seat and a mattress of a folded sofa bed or the like comprising a body formed of self-supporting material and having a recessed area in one face thereof dimensioned to receive and accommodate an underlying mattress.

2. A deck according to claim **1** wherein said body is made from resilient deformable material.

3. A deck according to claim **2** further including a stretchable skin covering said body, said skin and said body being constructed and dimensioned such that stretching of said skin compresses said body in thickness.

4. A deck according to claim **1** wherein said recess is generally concave in both the longitudinal and transverse directions of the deck body.

5. In combination with a foldable sofa bed or the like including a mattress and resilient means supporting the mattress; a deck engageable on said mattress when the sofa bed and the included mattress and spring means are in folded position for use as a sofa, said deck being formed of self-supporting material and having a recessed bottom face shaped to accommodate the mattress in folded position.

6. The combination defined in claim **5** wherein said mattress and resilient means are foldable as a unit into upper and lower layers with the upper layer of said resilient means overlying and engaging the upper layer of said mattress, said resilient means being constructed to permit the upper layer of the mattress to assume a generally convex shape in folded position.

7. The combination defined in claim **6** wherein the shape of said deck face is generally concave.

8. The combination defined in claim **7** wherein the portion of said resilient means which engages the lower layer of the mattress has a greater resistance to movement of the mattress than the portion of the resilient means which engages the upper layer of the mattress.

9. The combination defined in claim **8** wherein said resilient means is a spring including a plurality of wire-like spring elements interconnected in reticular fashion.

10. The combination defined in claim **9** further including a foldable bed frame surrounding and supporting said spring, and a plurality of resilient members interconnecting said spring to said frame, said resilient members being arranged such that the portion of said spring engageable with the upper mattress layer has less resistance to movement of the mattress than the portion of said spring engageable with the lower mattress layer.

11. The combination defined in claim **10** wherein said deck is formed of resilient deformable material.

12. In combination with a sofa bed or the like including a frame foldable between a retracted position for use as a sofa and an extended position for use as a bed, a bed spring on the frame, and a mattress on the bed spring; a deck including a resilient deformable body and a stretchable skin covering and enclosing said body such that upon stretching of said skin said deck body will be compressed in thickness, means attaching said deck to said frame for movement therewith between a first position located on said mattress when said mattress and frame are in folded retracted position and a second position below said frame when the frame is in extended position, said means being such that upon movement of said deck into said first position thereof said skin will stretch and compress said deck body in thickness.

13. The combination defined in claim 12 wherein said skin and said body are in generally relaxed unstressed condition when the deck is in said second position thereof.

14. The combination defined in claim 13 wherein said deck has a concave surface receiving and accommodating the mattress when the deck is in its first position.

15. A method of increasing the cushioning quality and comfort of a combination sofa bed when in use as a sofa, the sofa bed having a foldable bed frame movable between a folded position for use as a sofa and an extended position for use as a bed, a mattress spring connected to the frame and foldable therewith, and a mattress on the spring; the step comprising decreasing tension in said spring at one end of the frame to permit the underlying portion of the mattress to bow upwardly in a generally convex shape when the mattress and spring are folded with the frame for use as a sofa.

16. The method defined in claim 15 further including the step of placing a shaped deck member of self-supporting material on the bowed portion of the mattress to accommodate the convex shape thereof.

17. A method of increasing the cushioning quality and comfort of a combination sofa bed when in use as a sofa, the sofa bed being of the type including an articulated bed frame movable between a folded position for use as a sofa and an extended position for use as a bed, a mattress spring connected to the frame by tension members, and a mattress on the spring; the steps comprising decreasing the number of the tension members at one end of the frame to decrease the resistance of the spring at that end of the frame to permit the underliving portion of the mattress to bow upwardly in a generally convex shape when the frame, spring and mattress are folded into the sofa position, and placing a shaped deck of self-supporting material on the bowed portion of the mattress to accommodate the convex shape.

18. A sofa bed comprising in combination a foldable bed frame movable between a folded retracted position for use in forming a sofa and an extended position for use in forming a bed, spring means connected to the frame for supporting a mattress, a mattress on said spring means, and said spring means with said mattress thereon being foldable with the bed frame into upper and lower layers with the upper layer of said spring means overlying the upper layer of said mattress but permitting the upper layer of the mattress to bow upwardly away from the lower layer of the mattress in a generally convex shape.

19. A deck adapted to be inserted between the seat and a mattress of a folded sofa bed or the like comprising a body having a recess in one face thereof dimensioned to receive and accommodate an underlying mattress, said recess being generally concave in both the longitudinal and transverse directions of the deck body, said recess being formed by deck portions including a central portion of reduced thickness, generally inclined end portions on opposite ends of said central portion and a generally inclined front portion extending between said end portions along said central portion and adjacent the front edge of the deck body, said central portion extending to the rear edge of the deck body.

20. A deck adapted to be inserted between the seat and mattress of a folded sofa bed or the like comprising, a body having a recess in one face thereof dimensioned to receive and accommodate an underlying mattress, said recess being generally concave in both the longitudinal and transverse directions of the deck body, said recess being formed by portions of the deck body including a central portion of reduced thickness, generally inclined end portions on opposite ends of said central portion, and a generally inclined front portion extending between said end portions along said central portion and adjacent the front edge of the deck body.

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