March 21, 1961 R. COOPERSMITH ET AL 2,975,433

FOLDABLE LOCK FOR SOFA BEDS

Filed July 21, 1958 4 Sheets-Sheet 1

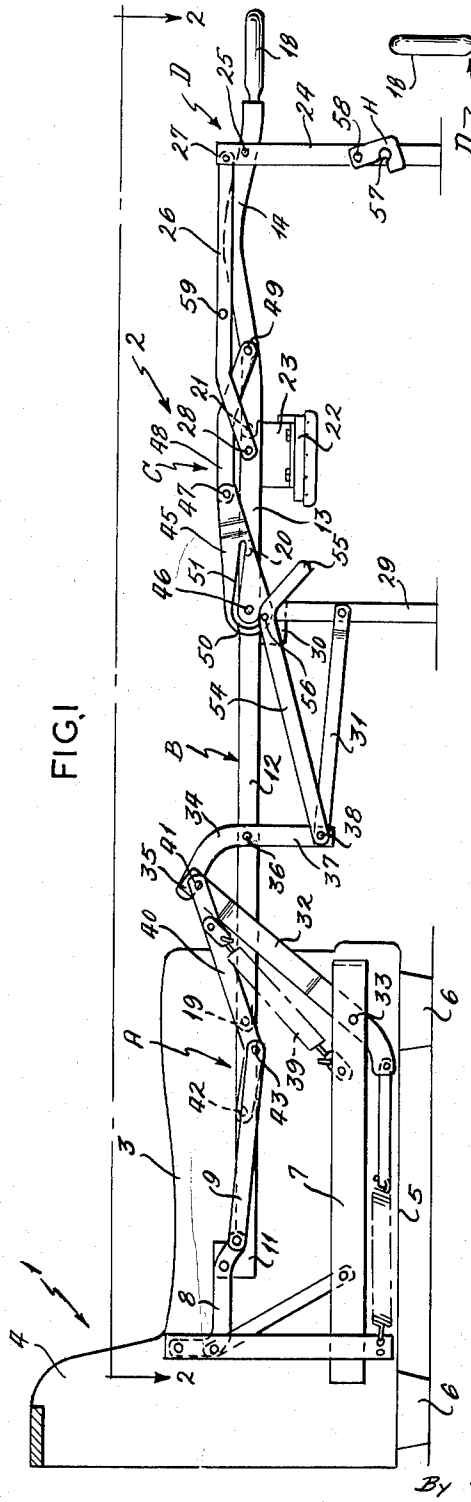


FIG. 1

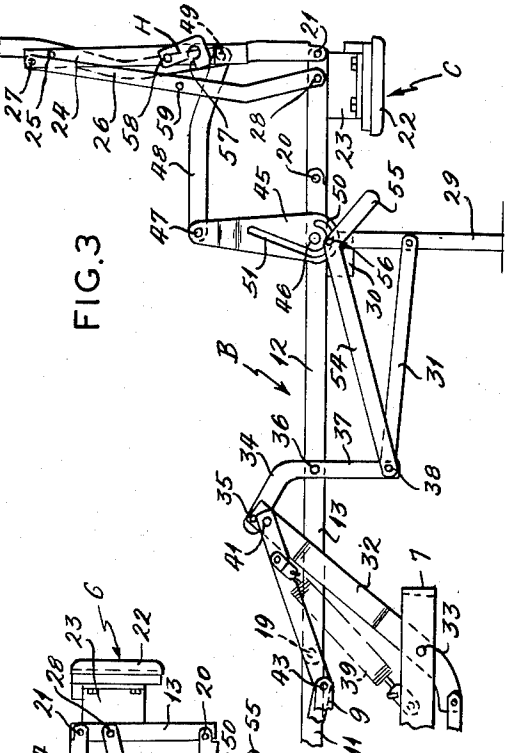


FIG. 3

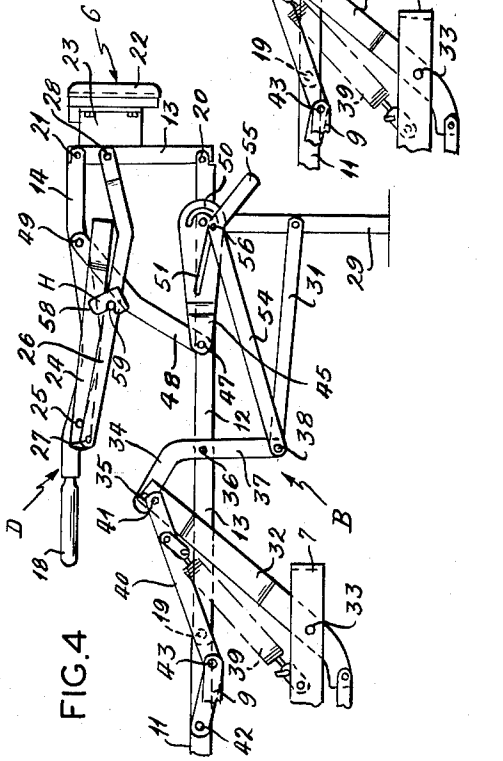


FIG. 4

INVENTORS,
RUDOLPH COOPERSMITH
MICHAEL LOZANO
JULIUS GREENBLATT

By Gravely, Lieder & Woodruff
ATTORNEYS.

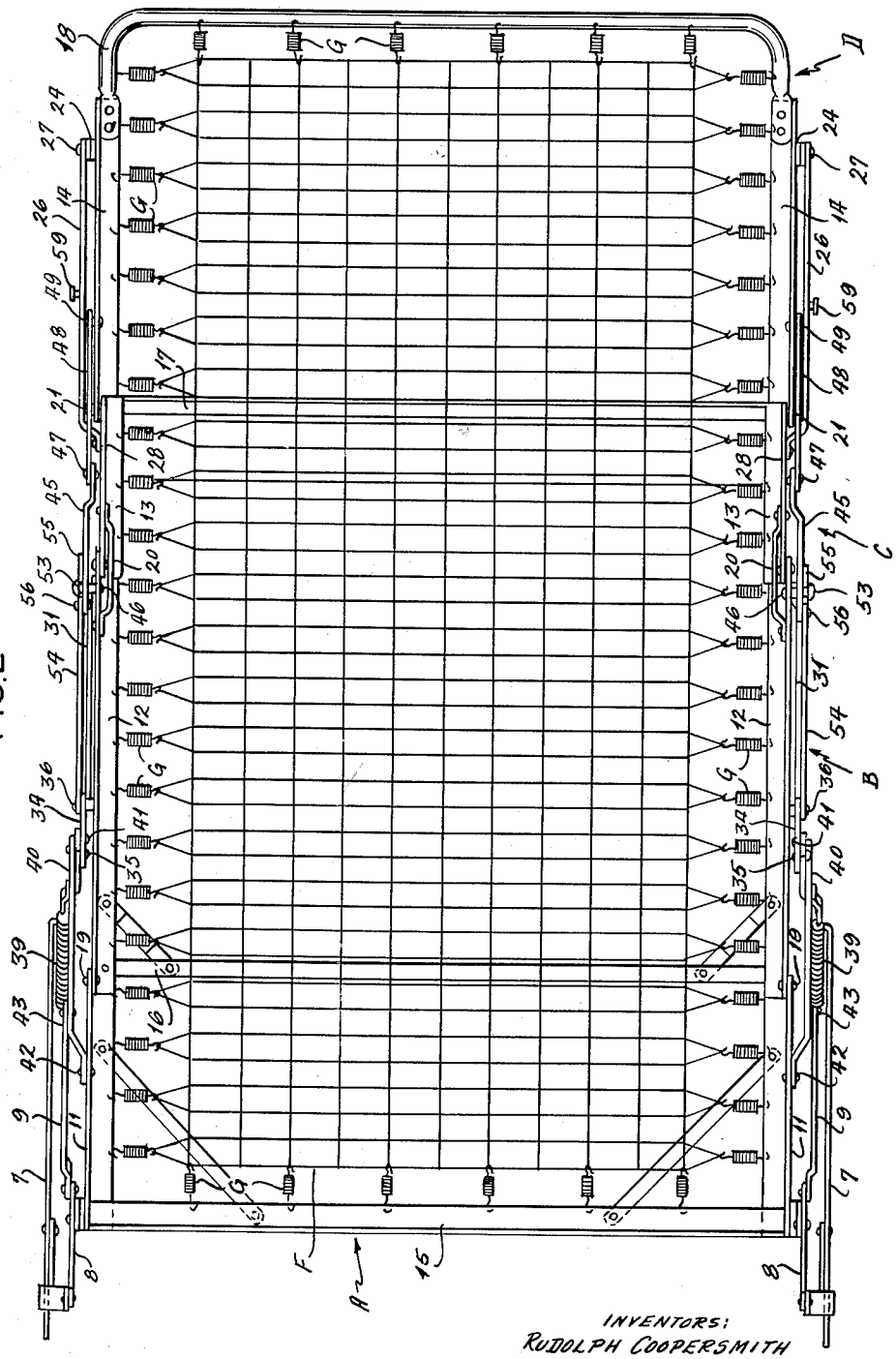
March 21, 1961 R. COOPERSMITH ET AL 2,975,433

FOLDABLE LOCK FOR SOFA BEDS

Filed July 21, 1958

4 Sheets-Sheet 2

FIG. 2



INVENTORS:
RUDOLPH COOPERSMITH
MICHAEL LOZANO
JULIUS GREENBLATT

By Stanely, Lieder & Woodruff
ATTORNEYS.

March 21, 1961 R. COOPERSMITH ET AL 2,975,433

FOLDABLE LOCK FOR SOFA BEDS

Filed July 21, 1958

4 Sheets-Sheet 3

FIG. 5

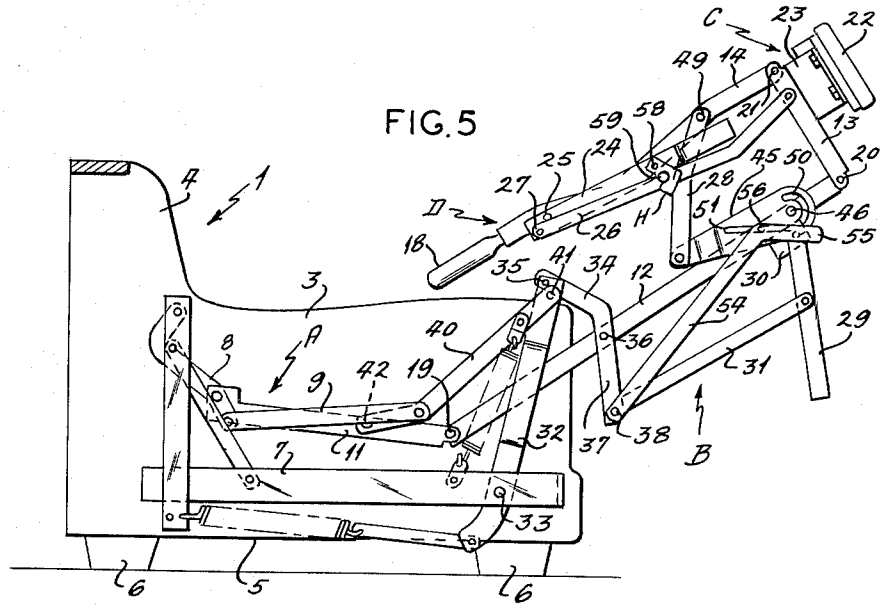


FIG. 6

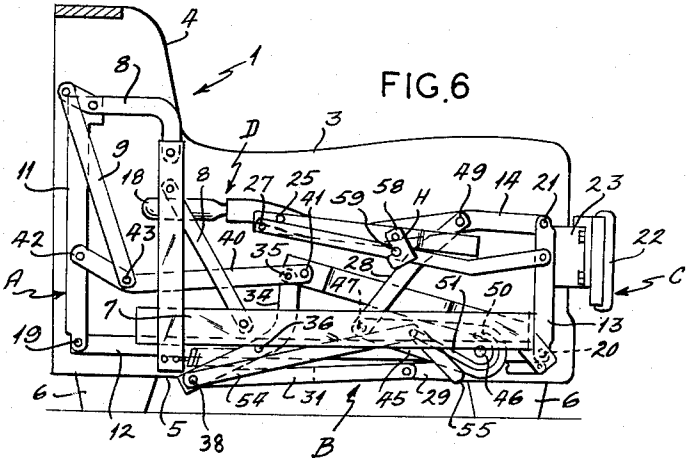


FIG. 7

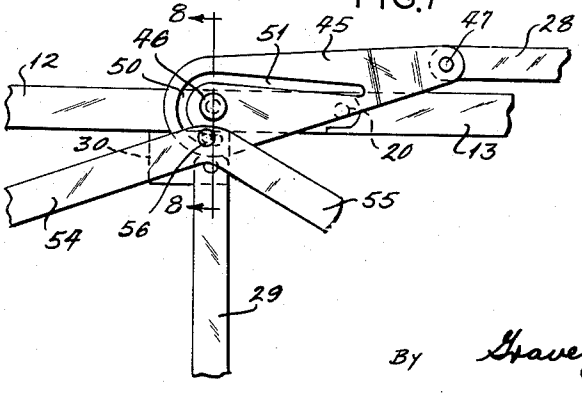
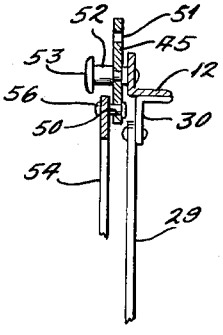


FIG. 8



INVENTORS:
RUDOLPH COOPERSMITH
MICHAEL LOZANO
VULIUS GREENBLATT

BY Gravely, Lieder & Woodruff

ATTORNEYS.

March 21, 1961 R. COOPERSMITH ET AL 2,975,433

FOLDABLE LOCK FOR SOFA BEDS

Filed July 21, 1958

4 Sheets-Sheet 4

FIG.10

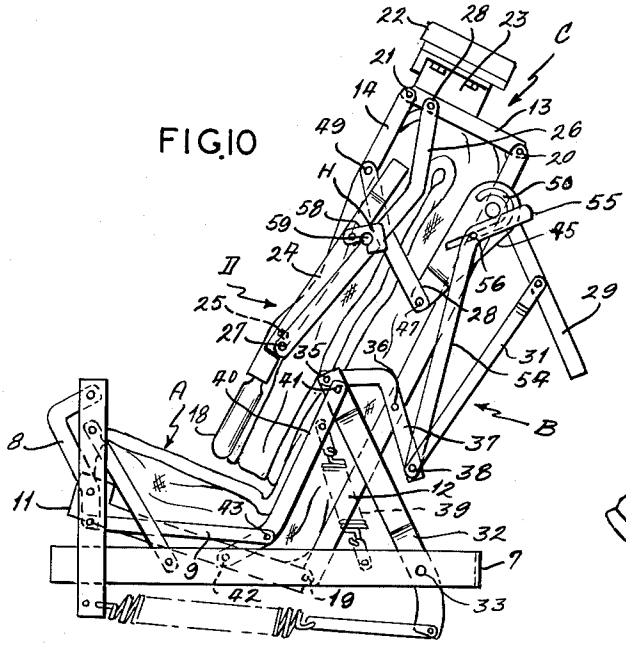


FIG.9

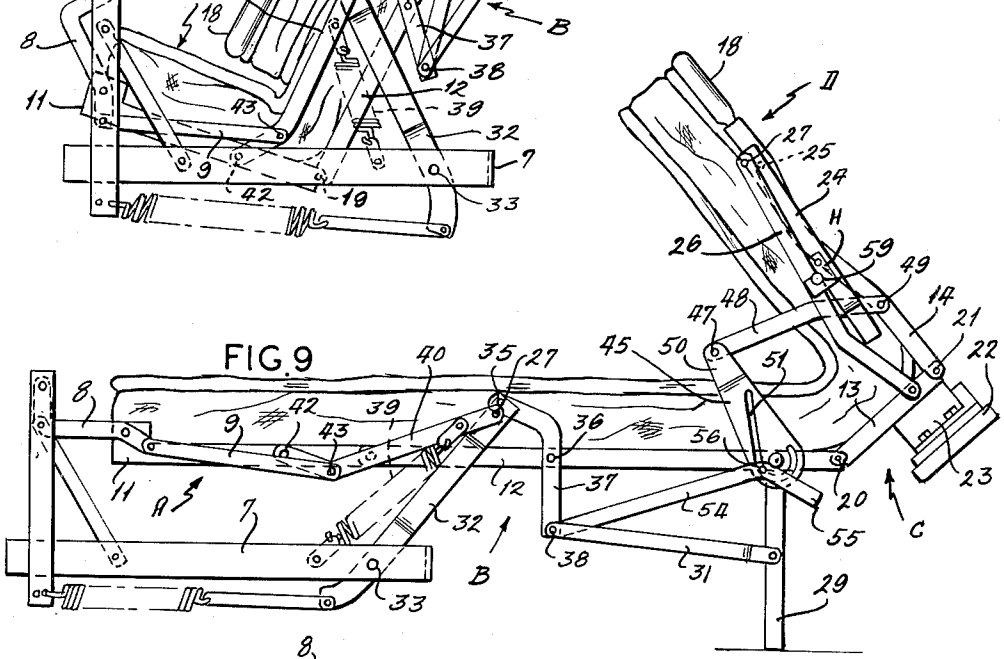
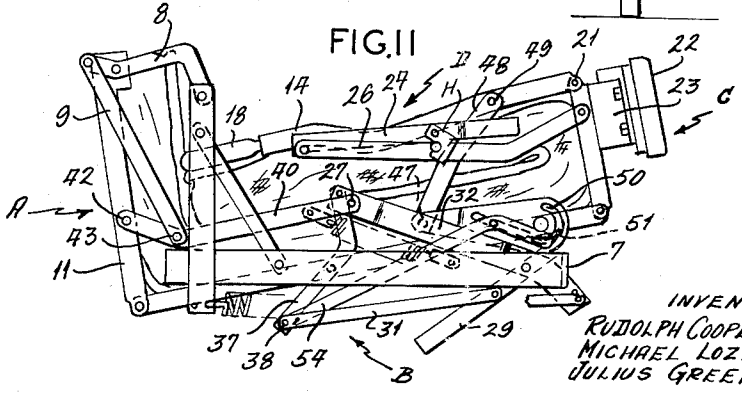


FIG.11



INVENTORS,
RUDOLPH COOPERSMITH
MICHAEL LOZANO
JULIUS GREENBLATT

By Howard, Lieder & Laboschin
ATTORNEYS.

United States Patent Office 2,975,433
Patented Mar. 21, 1961

2,975,433

FOLDABLE LOCK FOR SOFA BEDS

Rudolph Coopersmith, Clayton, Michael Lozano, St. Louis, and Julius Greenblatt, Clayton, Mo., assignors to American Bed & Spring Company, St. Louis, Mo., a corporation of Missouri

Filed July 21, 1958, Ser. No. 750,002

6 Claims. (Cl. 5—55)

This invention relates to improvements in furniture of the sofa bed type in which a foldable bed frame mechanism is operatively mounted in a sofa frame to fold outwardly when used as a bed and to fold inwardly in a compact manner to form the seat when used as a sofa.

Sofa bed constructions of the type exemplified herein usually employ an inner spring mattress to provide sleeping comfort. The bed frame mechanism, therefore, is constructed to enfold the mattress in a compact manner to obviate its removal when the furniture is to be used as a sofa. It has been a problem to hold the bed frame mechanism in its folded condition against the spring-back action of the mattress spring coils during this inward folding of the bed frame mechanism to form the sofa seat. If the bed frame mechanism is not held in its folded position the moving parts of the assembly will interfere with the stationary parts. The bed frame then cannot be smoothly passed back of the sofa to form the sofa seat. A number of arrangements of bed frame mechanism have been advocated to surmount this problem, but none has been found completely satisfactory.

An object of this invention, therefore, is to provide a foldable bed frame mechanism which will overcome this difficulty in a novel manner by employing a simple arrangement of parts to exert a mattress compacting force sufficient to overcome the spring-back action of the mattress spring coils.

More specifically it is an object of this invention to incorporate in a foldable bed frame mechanism a pull-down lever system operably connected to parts of the bed frame so as to exert a powerful force on the mattress to retain the same in compact folded condition.

It is a further object of the invention to provide a foldable bed frame locking system in which a simple swing-over lever is at times free to move about a pivot and at other times is held against swinging motion by a pull-down lever connected to the swing-over lever at a point spaced from the pivot, thereby locking the swing-over lever against free movement.

Other objects of this invention reside in the means and mechanism hereinafter to be described in connection with a presently preferred embodiment of the invention.

In the embodiment chosen for detailed description the improvements consist in a pull-down lever system for the opposite sides of the foldable bed frame mechanism. Each system includes a cam-type swing-over lever formed with an elongated slot to provide a shsiftable contact between the swing-over lever and a pull-down member so that at times the contact of swing-over lever and pull-down member may be brought together adjacent a pivot and at other times may be moved apart to form spaced points of engagement. The invention also consists in the parts and mechanisms of the embodiment disclosed herein and set forth in the claims which form a part of the specification.

In the drawings:

Fig. 1 is a side elevational view of the sofa bed assembly showing the foldable bed frame mechanism extended in bed forming position;

Fig. 2 is a plan view of the sofa bed seen at line 2—2 in Fig. 1;

Fig. 3 is a sectional elevational view of the assembly of Fig. 1 with the bed frame mechanism in partly folded position;

Fig. 4 is a view similar to Fig. 3, but showing the folding action in a more advanced condition;

Fig. 5 is a view similar to Fig. 1, but showing the folding action thereof in a still more advanced condition;

Fig. 6 is a view similar to Fig. 1 but with the bed frame mechanism fully folded;

Fig. 7 is an enlarged fragmentary view of the pull-down lever system for locking the foldable bed frame mechanism;

Fig. 8 is a transverse sectional view seen at line 8—8 in Fig. 7;

Fig. 9 is a view similar to Fig. 1, but showing the mattress in position of being folded by the bed frame linkage;

Fig. 10 is a view like Fig. 9, but showing the folding operation more advanced; and

Fig. 11 is a further view of the folding action of the linkage.

In Figs. 1 and 2, the furniture assembly is seen to include a sofa frame 1 and a foldable bed frame mechanism 2 connected to the frame in a suitable manner. The frame includes side arms 3, a back 4, a base 5 and legs 6. The bed frame mechanism 2 includes mounting means 7 connected to the base 5, fold control links 8 pivotally connected to the back 4 and links 9 pivotally connected to the fold control links 8 to guide the frame mechanism during folding and unfolding.

The bed frame mechanism 2 comprises four foldable frame sections which are conveniently designated as the head section A, an intermediate section B, a front section C, and a foot section D. Each of these sections is understood to include spaced side members 11, 12, 13 and 14 respectively (Fig. 1) formed of suitable structural angles or bars connected by transverse members 15, 16, 17 and 18. Head section A is pivotally connected at its corners to the frame 1 by the control links 8, as shown in Fig. 1, and is also pivotally connected to intermediate section B at pivots 19. In turn, section B is pivoted to section C at pivots 20, and section C is pivoted to section D at pivots 21. The folding action of the mechanism 2 is carried out by raising section D relative to section C to a right angular position, as in Fig. 3. Sections D and C may then be folded relative to section B until the position of Fig. 4 is reached, then sections D, C, and B fold together relative to section A and the frame 2, as in Fig. 5. The whole mechanism may then be swung into frame 1 to complete the folding action, as shown in Fig. 6. Thus the foot section D folds to final position over section B and is substantially parallel and spaced thereabove by the length of section C so that a space is provided to enfold the mattress M. Section C carries an upholstery board 22 which is attached to the side members 13 by brackets 23 and which assumes a position at the front of frame 1 when the assembly is in a sofa forming position. A suitable link fabric F is connected to the several sections by springs G in the usual manner.

When in the extended bed forming position of Fig. 1, the mechanism 2 is supported at its foot section by legs 24 pivoted at 25 to the side members 14. The legs 24 are caused to fold inwardly adjacent members 14 by links 26. These links 26 are connected at 27 to the legs 24 and connected to the side members 13 of section C by pivots 28. Intermediate legs 29 which are pivotally

carried on brackets 30 of the side members 12 of section B support the adjacent sections B and C. Links 31 cause these legs 29 to fold inwardly adjacent side members 12 during conversion of the bed to the sofa seat position of Fig. 6. Section B is also supported in the frame 2 by fold control links 32 which are pivoted at 33 to the mounting means 7. The links 32 are pivoted to dog-leg type suspension levers 34 at point 35. The suspension levers 34, are connected to the side members 12 of section B at point 36 and have depending arms 37. The lower ends of the arms 37 are engaged by links 31 at pivots 38. Counter-balancing springs 39 are connected to the mounting means 7 and to idler links 40. The idler links 40, in turn, are connected at pivots 41 to the fold control links 32, to the side members 11 of section A at pivots 42 and to links 9 at pivots 43.

The pull-down lever system (Figs. 1, 7 and 8) incorporated in the present foldable bed frame mechanism includes similar means at each side of the bed frame. Therefore, only one such system will be described in detail. The system is seen to include a cam type swing-over lever 45 having a pivot at one end connecting the swing-over lever 45 to the side member 12 of section B. The opposite end of the swing-over lever 45 has a pivot 47 connecting it to a link 48. The link 48 is pivotally connected at pin 49 to the side member 14 of section D outwardly of the pivot 21. The swing-over lever 45 is also formed with a cam slot, one portion 50 of which is spaced from and concentric with pivot 46 as a center, and another portion 51 is directed lengthwise and at a predetermined angle relative to a straight line connecting the pivots 46 and 47. The pivot 46 is formed with an elongated stud 52 having a head 53. This is best seen in Fig. 8. A pull-down member 54 having an angular projecting tang portion 55 on one end is fastened at the other end to pivot 38. The end having the tang portion 55 is provided with a pin 56 located adjacent said tang portion 55. The pin 56 may run in the slot portions 50 and 51, and thus connects the pull-down member 54 to the swing-over lever 45. The tang portion 55 is adapted to be received against the elongated stud 52, as will be explained later.

The swing-over lever 45 is shown in Fig. 7 in the position assumed when the bed frame mechanism 2 is extended to the bed forming position of Fig. 1. As the mechanism 2 is folded into sofa frame 1 to make up a sofa, the swing-over lever 45 swings about pivot 46 in a counterclockwise direction through the several positions shown successively in Figs. 3 and 4. During this counterclockwise motion of the swing-over lever 45 shown in Figs. 1, 3 and 4, the pull-down member 54 remains relatively stationary so that the concentric or arcuate slot portion 50 moves entirely past pin 56, and a part of the slot portion 51 may also run past the pin 56. This puts the tang 55 of the pull-down lever 54 in position to be received against the elongated stud 52. Thus, there is no mechanical interference between the swing-over lever 45 and the pin 56 of the pull-down member 54, and the folding action of frame sections D, C and B is accomplished without hinderance.

A gravity latch H having a latch pin engaging recess 57 is pivotally attached at 58 to the leg 24. The latch H is adapted to engage a stud 59 when the bed is in the position of fold shown in Fig. 4. When the stud 59 is engaged by the latch H, sections D and C are locked together. As the mattress M is compressed during the folding operation its spring-back force besides exerting a force tending to unfold sections B, C and D also tends to make section D move in a direction of shear with respect to section B. This shearing tendency increases as the parts become worn. By thus locking the leg 24 to the link 26 by the gravity latch H and the stud 59, this shearing tendency is defeated and the further folding operation shown in Figs. 5 and 6 can be accomplished.

The folding action of the mechanism 2 from the position of Fig. 4 to the positions of Figs. 5 and 6 successively is carried out by lifting and pushing inwardly on front section C. This action causes relative movement between section B and the fold control links 32 about pivots 33 so that suspension levers 34 experience motion in a clockwise sense about the pivots 36 of the side members 12 of section B. The lower arms 37 of the suspension levers 34 thereby exert a pulling force simultaneously upon links 31 to fold legs 29 and upon pull-down members 54 to cause the pins 56 to run out into the slot portions 51 of swing-over levers 45. Figs. 4, 5 and 6 show the operation without the mattress in the frame. However, as the front section C is lifted with the mattress in position, as in Figs. 9, 10 and 11 there is a critical period when the mattress spring-back force tends to force the sections D and C upwardly of the folded position shown in Fig. 9. The action of the tang 55 against the elongated stud 52 and of the pin 56 against the slot portion 51 is adapted to resist the mattress spring-back force. This spring-back force is exerted through link 48 and pivot 47 to the swingover lever 45 tending to rotate it in a clockwise direction. This causes the arcuate slot portion 50 to run past the pin 56. However, the tang 55 reacting against the elongated stud 52 resists the tendency of the slot portions 50 and 51 to move past the pin 56. Therefore, the swing-over bar 45 cannot rotate in a clockwise direction and the sections D, C and B are held in a folded position until the further lifting of section C has forced the slot portion 51 past the pin in a counterclockwise direction locking the sections securely together. If sections D, C and B are allowed to spring apart from the folded position shown in Fig. 4 they will not fit into the frame 1.

During the folding action the pins 56 run out farther into the slot portions 51 and a pull-down force is exerted on the swing-over levers 45. The size of this pull-down force is governed by the angle of inclination of the slot portion 51, as previously defined. This run-out of pins 56 in slot portion 51 transmits the resulting pull-down force or load through the swing-over levers 45 to link 48 which is connected to foot section D, thereby causing the section D to draw down upon the mattress M and oppose the mattress spring-back tendency. The simple mechanical motion of the parts described produces a powerful locking load on section D and allows the mechanism to pass unobstructedly beneath the back cushion of the sofa. Thus, the desired result is smoothly and forcefully obtained by creating at the proper position of the folding action (Fig. 5) three points of connection at the swing-over lever 45. The intermediate point of connection at pin 56 is then guided along the slot portion 51 to a zone between end connections 46 and 47. A locking load is here exerted through swing-over lever 45 and link 48 upon the frame section D which now (Fig. 6) forms the seat section of the sofa.

The advantages of the foregoing improvements and the economies of its manufacture and operation will be appreciated from the detailed description. However, certain modifications and substitutions of equivalent parts for those herein described may appear after understanding the principles of the invention, and all such modifications and substitutions of equivalent parts are intended to be included within the spirit and scope of the annexed claims.

What is claimed is:

1. In combination with an articulated bed frame having first, second and third relatively rotatable sections adapted to move between an extended bed defining position and a seat supporting position in a sofa frame of which the first section and the third section are foldable into a substantially parallel relationship; an elongated swing-over member having one end pivotally attached to the third section and provided with a slot having a substantially arcuate portion opening into a substantially straight portion which extends substantially lengthwise of

said swing-over member at a predetermined angle relative to the longitudinal axis of said swing-over member; means linking the other end of said swing-over member to the first section, said swing-over member being pivotally responsive to movement of the first section; an elongated stud projecting from said pivot; a pull-down member having a pin fastened thereto, said pin being movable in said slot of said swing-over member; link means connecting said pull-down member at one end thereof to the third section; a tang carried by said pull-down member and extending from the other end thereof at a predetermined angle, said tang engaging said elongated stud when the first section is moved toward a position substantially parallel to the third section.

2. In combination with an articulated bed frame having first, second and third relatively foldable sections adapted to be moved between an extended bed defining position and a seat supporting position in a sofa frame of which the first section and the third section are foldable into a substantially superposed relationship; a swing-over member pivotally connected to the third section and provided with a slot having an arcuate portion substantially concentric with said pivot and a substantially straight portion joining said arcuate portion at a predetermined angle; link means connecting said swing-over member to the first section, said swing-over member being rotated about the pivot when the first section is moved in a counterclockwise direction about the second section; an elongated stud projecting from said pivot; a pull-down member; link means connecting said pull-down member to the third section; a tang carried by said pull-down member and extending at a predetermined angle from one end thereof; and means connecting said swing-over member and said pull-down member, said connecting means being movable in said slot portions of said swing-over member and connected to said pull-down member at a point adjacent said tang, said tang abutting said elongated stud when the first section is moved toward a position substantially superposed relative to the third section.

3. A locking mechanism for a sofa bed construction having a plurality of articulated bed sections of which a first section and a third section are interconnected by a second section and are foldable into a substantially superposed relationship and in which the third section is movably connected to a fourth section; said locking mechanism comprising a swing-over member pivoted at one end to the third section and formed with a slot having an arcuate portion adjacent said pivot and an elongated portion joined to the arcuate portion and extending substantially lengthwise of said swing-over member; link means connecting the other end of said swing-over member to the first bed section, said swing-over member being pivotally responsive to movement of the first bed section; a pull-down member; link means connecting one end of said pull-down member to the third bed section; and connecting means connecting the other end of said pull-down member with said swing-over member, said connecting means being received in and movable in the slot portions of said swing-over member, said pull-down member being substantially stationary when the first bed section is moved to a superposed folded position relative to the third bed section; said pull-down member moving the connecting means into the elongated portion of the slot when the folded first, second and third bed sections are moved relative to the fourth section thereby locking the first and third bed sections in a folded relationship.

4. A locking mechanism for a sofa bed construction having a plurality of articulated bed sections movable from a bed defining position to a sofa seat supporting position of which a first section and a third section are interconnected by a second section and are foldable into a substantially superposed relationship; said locking mechanism comprising a swing-over member pivoted at

one end to the third section and formed with a slot having an arcuate portion and an elongated portion joined to said arcuate portion and extending toward the other end of said swing-over member; an elongated stud extending from said pivot; link means connecting the other end of said swing-over member to the first section, said swing-over member being pivotally responsive to rotative movement of the first section about the second section and arranged to lie substantially adjacent the third section with said elongated slot portion disposed above said pivot when the bed sections are in a bed defining position and arranged to lie substantially adjacent the third bed section with said elongated slot portion disposed below said pivot when the first bed section is moved to a position substantially superposed relative to the third bed section; a pull-down member; a tang carried by said pull-down member and extending at a predetermined angle from one end thereof; link means fastened to the other end of said pull-down member linking said pull-down member to the third bed section, said pull-down member being substantially stationary when the first bed section is moved to a position substantially superposed relative to the third bed section; a pin carried by said pull-down member adjacent said tang operatively connecting said pull-down member to the slot of said swing-over member, said pin being slidable in said slot portions of said swing-over member, said arcuate slot portion moving past said pin in a counterclockwise direction when the first bed section is moved to a position substantially superposed relative to the third bed section, said tang engaging said elongated stud when the first bed section is moved toward a position substantially superposed relative to the third bed section.

5. A locking mechanism for a sofa bed construction including a sofa frame having a plurality of articulated bed sections movable from a bed defining position to a sofa supporting position of which a first section and a third section are interconnected by a second section and are foldable into a substantially superposed relationship and in which the third section is movably connected to a fourth section; said locking mechanism comprising a swing-over member pivoted at one end to said third section and formed with a slot having an arcuate portion substantially concentric with said pivot and an elongated portion joined to said arcuate portion and extending toward the other end of said swing-over member; an elongated stud extending from said pivot; means linking the other end of said swing-over member to the first section, said swing-over member being rotated about the pivot when the first section is rotated about the second section and arranged to lie substantially adjacent the third section with said elongated slot portion disposed above said pivot when the sofa bed construction is in a bed defining position and arranged to lie substantially adjacent the third section with said elongated slot portion disposed below said pivot when the first section is folded to a position substantially superposed relative to the third section; a pull-down member; a tang carried by said pull-down member extending from one end thereof at a predetermined angle; link means located near the other end of said pull-down member linking said pull-down member to the third section, said linking means being pivoted to the third section; means pivotally connecting said second mentioned linking means to the sofa frame; and a pin connecting said swing-over member and said pull-down member, said pin being movable in said slot portions of said swing-over member and fastened to said pull-down member at a point adjacent said tang, said tang abutting said elongated stud when the first bed section is moved toward a folded position substantially superposed relative to the third bed section, said pull-down member being substantially stationary while the first section is moved to said folded position, said pin moving in said arcuate portion of said slot during said folding operation, said pull-down member moving said

pin in said elongated portion of said slot when the folded first, second and third bed sections are moved relative to the fourth bed section.

6. A locking mechanism for a sofa bed construction having a plurality of articulated bed sections of which a first section and a third section are interconnected by a second section and are foldable into a substantially superposed relationship and in which the third section is movably connected to a fourth section; said locking mechanism comprising a swing-over member pivoted at one end to the third section and formed with a slot having an arcuate portion substantially concentric with said pivot and a substantially straight portion joined to the arcuate portion at a predetermined angle; link means connecting the other end of said swing-over member to the first bed section, said swing-over member being pivotally responsive to movement of the first bed section; a pull-down member; link means connecting one end of said pull-down member to the third bed section; and connecting means connecting the other end of said pull-down member with said swing-over member, said connecting means being received in and movable in the slot portions of said swing-over member, said pull-down member being substantially stationary when the first bed section is moved to a superposed folded position relative to the third bed section; said pull-down member moving said connecting means into the straight portion of the slot when the folded first, second and third bed sections are moved relative to the fourth section thereby locking the first and third bed sections in a folded relationship.

References Cited in the file of this patent

UNITED STATES PATENTS

2,721,337	Bank et al.	Oct. 25, 1955
2,770,814	Schindler	Nov. 20, 1956
2,785,415	Peterson	Mar. 19, 1957
2,829,382	Bank et al.	Apr. 8, 1958
2,844,827	Bank et al.	July 29, 1958