April 26, 1966 N. W. MIZELLE 3,247,527

SOFA BED HINGES

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FIG. 1A

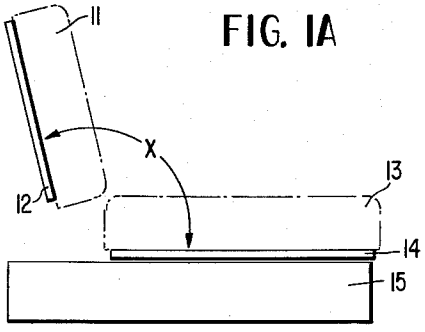


FIG. 1B

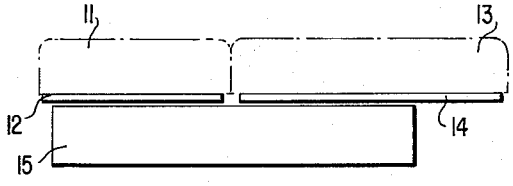
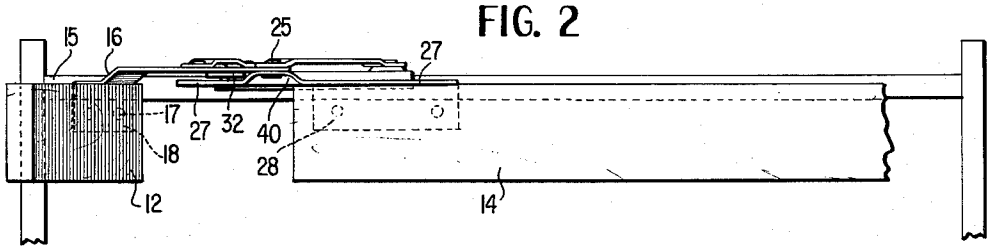


FIG. 2



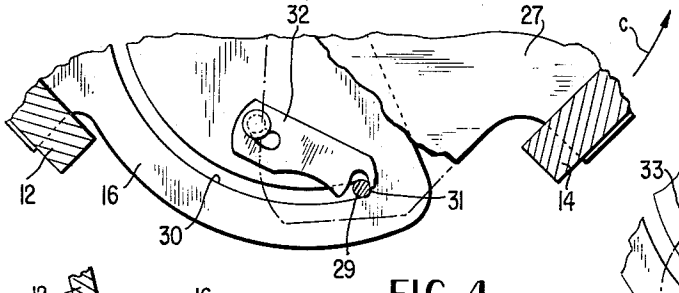


FIG. 4

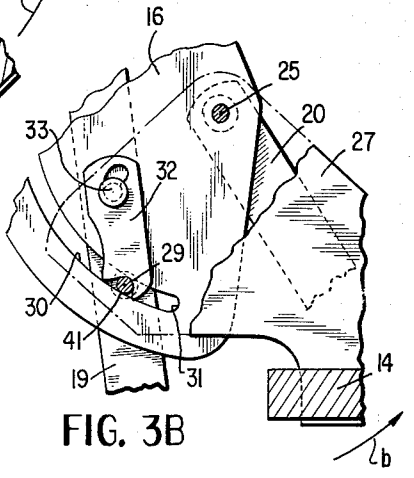


FIG. 3B

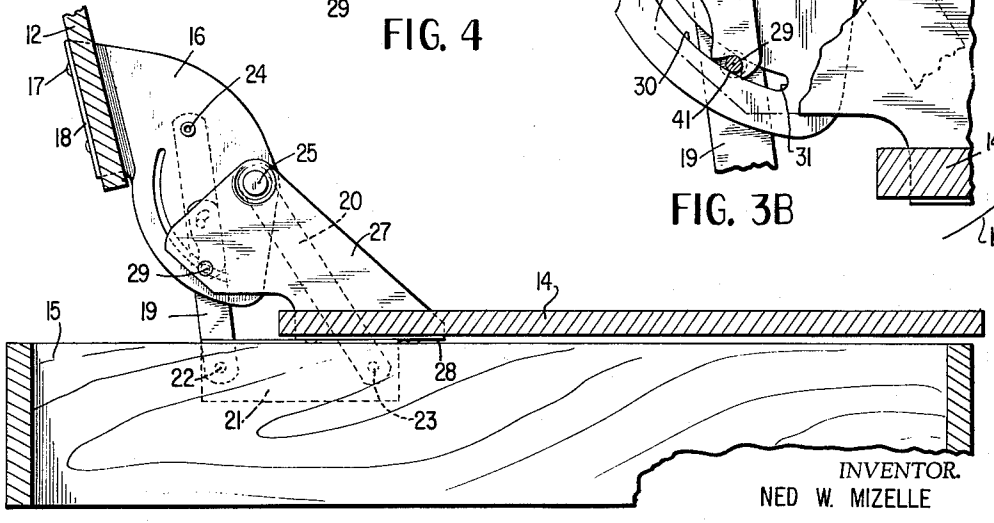


FIG. 3A

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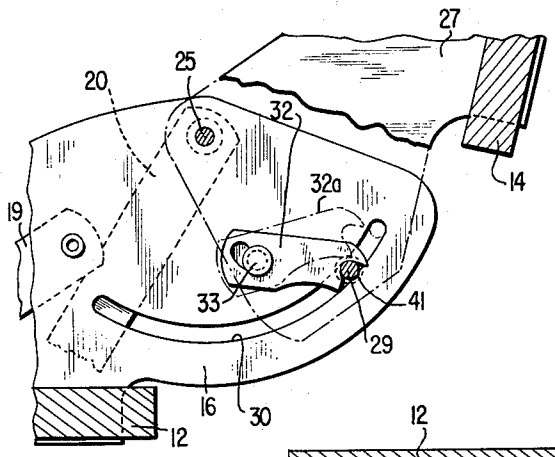


FIG. 5B

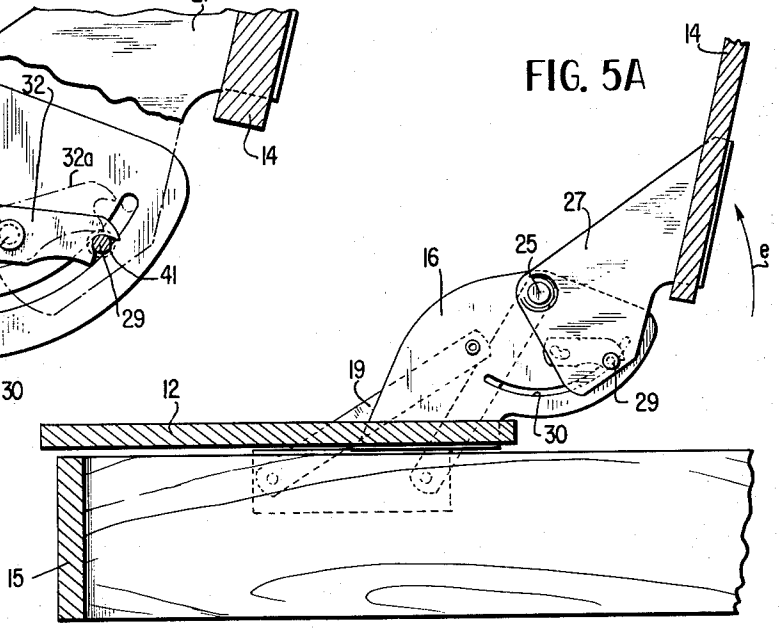


FIG. 5A

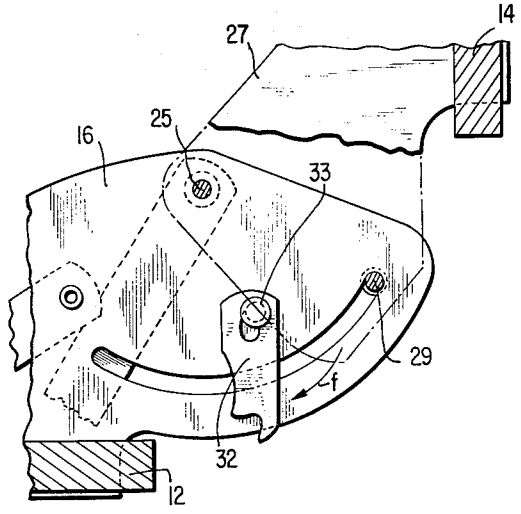


FIG. 6B

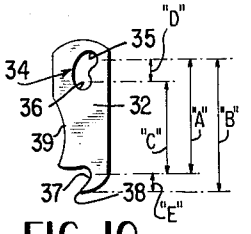


FIG. 10

FIG. 6A

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FIG. 7B

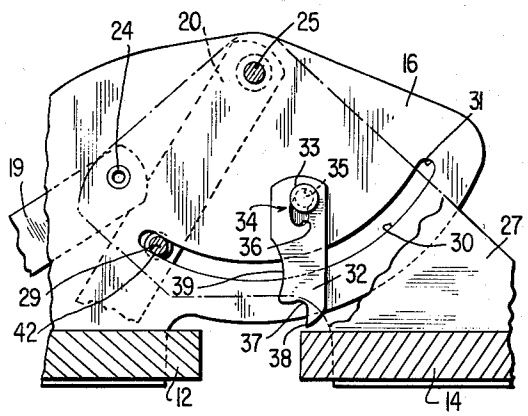


FIG. 7A

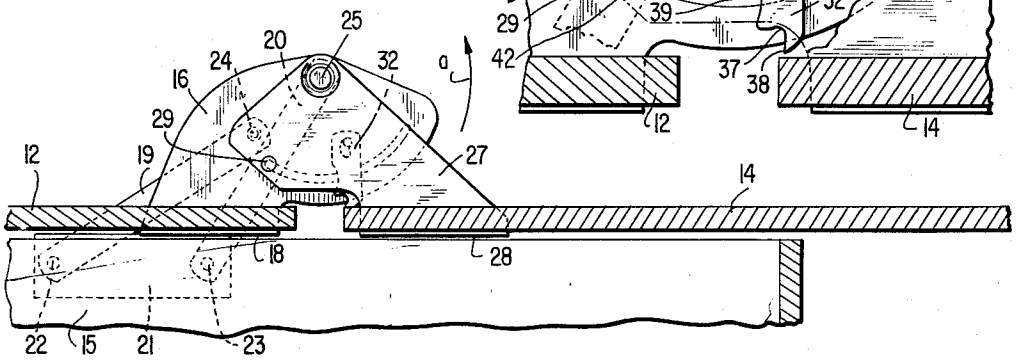


FIG. 8B

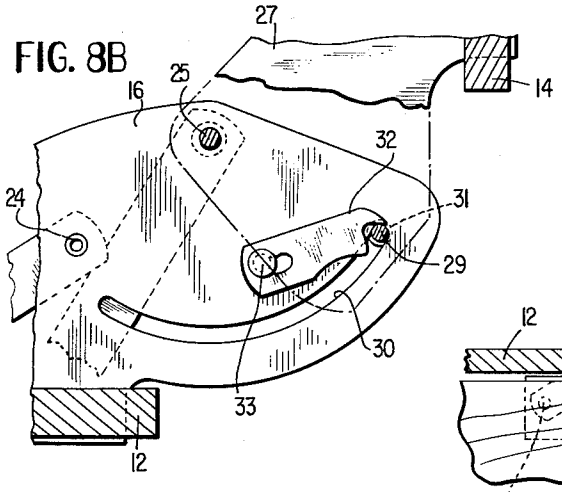


FIG. 8A

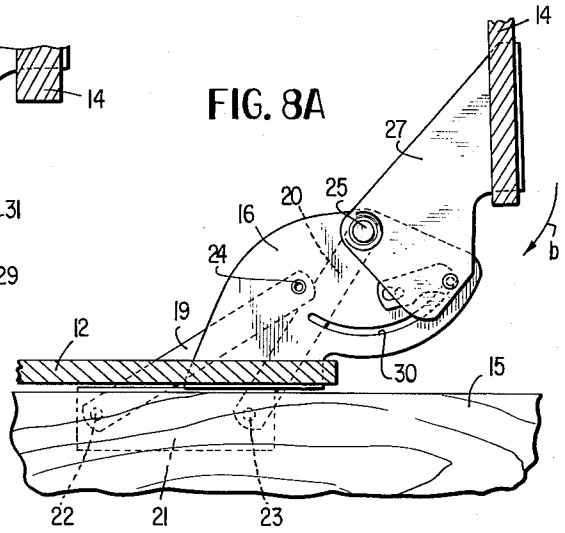
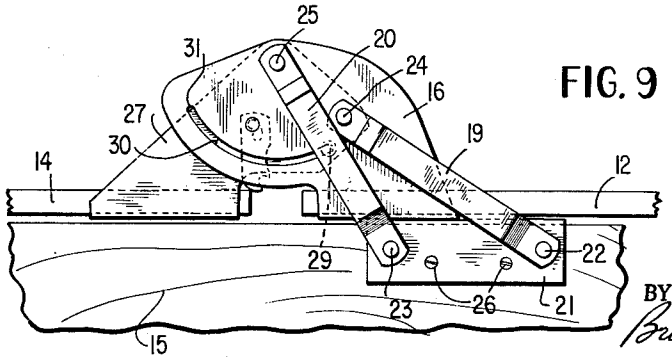


FIG. 9



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3,247,527

SOFA BED HINGES

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Filed Nov. 13, 1963, Ser. No. 323,467
13 Claims. (Cl. 5—57)

This invention relates to selectively locking, dual position sofa bed hinges used in convertible sofas of the type wherein the back rest may be moved downwardly so as to lie flatly alongside the seat to form a bed.

The hinge of this invention is of the so called "non-click" type, i.e. the operator does not have to stop the relative motion of the back and seat rests when he hears the click of the hinge locking mechanism as it latches so as to avoid an over run of the locking mechanism and an unlocking of the hinges. The operator of the "non-click" type hinge may move the seat and back rest through the full range of its permissible movement and the hinge locking mechanism operates to perform its designed function without becoming inadvertently unlocked.

U.S. Patents 2,755,487 and 2,495,413 are representative of the previously used sofa bed hinge arrangement of the "non-click" type which were a decided improvement of the "click" type of hinge. However, the hinge and locking mechanism disclosed in each of these aforementioned patents has certain disadvantages. The latch mechanism is moderately bulky and the end of the latch protrudes beyond the hinges and the cover plate installed over the latching mechanism when the sofa is in the bed position. Furthermore, the latch mechanism and its cover plate protrude from the side of the hinge as an overhang so it presents an interference and the hinges cannot be mounted flush against the end of the seat and back rests. The latch, being in a moderately exposed position to one side of the hinges, will collect foreign matter and become clogged. Since the latch moves in a relatively short arc, foreign matter which collects in the latch mechanism is easily not dislodged. A still further disadvantage of the former locking mechanism is the spring arrangement which eventually loses tension so that the locking mechanism becomes sluggish in operation.

Accordingly, an object of this invention is to provide a lockable sofa bed hinge arrangement of the "no-click" type which is simpler, lighter, less bulky and costs less to produce than the prior hinge arrangement.

Another object is to provide a hinge assembly in which no springs are necessary.

Yet another object is to provide a hinge assembly having no side protrusions so that it can be mounted flush with the end of the sofa.

A further object is to provide hinge assembly which is self cleaning.

Other objects and advantages of the invention will become apparent from the following specification taken in conjunction with the accompanying drawings wherein:

FIG. 1A is a schematic end view of the sofa in the normal upright position;

FIG. 1B is a schematic end view of the sofa with the back cushion lowered to lie flatly along side the seat cushion in the bed position;

FIG. 2 is a view from above of the top of one hinge assembly mounted on the back and seat frames at one end of the sofa base;

FIG. 3A is a side elevation section of the sofa and hinge assembly with the back and seat rest in the normal upright position illustrated in FIG. 1A as viewed looking toward one end of the sofa from a transverse section near one end;

FIG. 3B is a fragmentary view of the assembly of FIG. 3A with the seat hinge plate partially cut away;

FIG. 4 is a fragmentary view of the hinge assembly similar to FIG. 3A with the hinges in an intermediate position between the normal upright and the bed positions;

FIG. 5A is a side elevation section similar to FIG. 3A with the hinge assembly in a second intermediate position between the normal upright and bed positions;

FIG. 5B is a fragmentary view of the assembly of FIG. 5A with the seat hinge plate partially cut away;

FIG. 6A is a side elevation section similar to FIG. 3A with the hinge plate assembly in still another intermediate position between the normal upright and the bed positions;

FIG. 6B is a fragmentary view of FIG. 6 with the seat hinge plate partially cut away;

FIG. 7A is a side elevation section similar to FIG. 3A with the hinge assembly in the bed position;

FIG. 7B is a fragmentary view of FIG. 7A with the seat hinge plate partially cut away;

FIG. 8A is a side elevation section similar to FIG. 3A with the hinge assembly in an intermediate position in raising the back rest from the bed position to the normal upright position;

FIG. 8B is a fragmentary view of FIG. 8A with the seat hinge plate partially cut away;

FIG. 9 is a side elevation of the hinge plate assembly in the bed position, showing the opposite side of the hinges from the view of FIG. 7A;

FIG. 10 is a flat profile view of the locking latch.

FIG. 1A illustrates the sofa in the normal seat position. The back cushion **11**, mounted on the back frame **12**, is affixed at a fixed angular relationship "X" to the seat cushion **13** mounted on the seat frame **14**, the angle being measured counterclockwise from the seat frame. FIG. 1B illustrates the sofa in the bed position in which the angular relationship between the back cushion **11** and the seat cushion **13** has been increased so they lie flatly adjacent each other in the same plane subtending an angle between the frames of approximately 180°. The back frame **12** and the seat frame **14** are pivotally mounted on the sofa base **15** at each end of the back and seat frames by hinges of the nature disclosed below.

An understanding of the hinges and their operation is best gained by first referring to FIG. 9 in which the hinges are shown in the position wherein the sofa components are arranged in the bed position with the back frame **12** lying flatly adjacent the seat frame **14** on the sofa base **15** such that the frames subtend an angle of approximately 180°. A back hinge plate **16** is rigidly attached to one end of the back frame **12** along one edge by rivets or similar connections **17** through the bottom flange portion **18** of the back hinge plate which extends partially beneath the back frame at right angles to the remainder of the hinge plate (see FIGS. 2 and 3). Links **19** and **20**, respectively, pivotally interconnect the back hinge plate **16** at pivot points **24** and **25** to a support bracket **21** at pivot points **22** and **23**. The support bracket **21** is attached to the side of the base **15** by screws **25**, whereby the back hinge plate **16** is swingably connected to the sofa base **15** through the movable links **19** and **20** as best seen in FIG. 9.

A seat hinge plate **27** is mounted to one end of the seat frame **14** along one edge, in much the same manner as the back hinge plate is mounted on the back frame, by rivets or other connections through a bottom flange portion **28** of the seat hinge plate which partially extends under the seat frame **14**. The seat hinge plate **27** is pivotally connected to the back hinge plate **16** at a pivot point **25**, the same point at which the link **20** is pivotally mounted to the back hinge plate **16**, and the two hinges are thereby pivotable with respect to each other about the point **25**

unless restrained. A latch engaging element in the form of a projecting abutment 29 affixed to and protruding from the side of the seat hinge plate 27 extends through an arcuate slot 30 in the back hinge plate 16. The slot 30 is an arc of a circle about the center 25, with the extent of the slot being such that the seat hinge plate 27 and back hinge plate 16 are movable relative to each other about the pivot point 25 between a position in which the back and seat frames are side-by-side in the bed position with an angular relationship of approximately 180°, as illustrated in FIG. 7B, and a position in which the frames attached to the hinge plates subtend an angle a little less than the fixed angular relationship "X" of the seat position (FIG. 1A). The minimum angular relationship of the hinge plates, or the trip position, is established when the stop pin 29 engages the end 31 of the slot 30 farthest from the links, as illustrated in FIGS. 4 or 8B.

A locking latch 32, illustrated in FIG. 10, is slidably and pivotally mounted on the back hinge plate 16 from a pin connection or coupling 33 to hang between the two hinge plates 16 and 27. The latch 32 has a generally heart-shaped, arcuate cutout or slot 34 near one end with the two similar halves 35 and 36 of the slot arranged lengthwise of the latch with the pin 33 being contained in either one of the two halves of the cutout as the latch is moved lengthwise. The cutout 34 is a little wider than the diameter of the pin 33 so as to loosely support the latch for both free pivotal movement and limited lengthwise sliding movement between the two halves of the cutout. Thus the latch has two basic positions about which it may pivot, an extended position with the coupling pin positioned within the outer half 35 of the heart-shaped cutout and a retracted position with the coupling pin positioned within the inner half 36 of the cutout, the latch 32 being slidable between these two positions. That end of the latch 32 which is at the opposite end from the pinned connection has a notch 37, the notch terminating in a point 38 at the extreme end of the latch. The underside of the latch 32 toward the notched end is cut away to form the inclined portion 39. As can be best seen in FIG. 2, the seat hinge plate 27 is dimpled in the area 40 around the pivot point 25 to provide a clearance between the two hinge plates to accommodate the latch 32 between the two hinge plates 16 and 27 so the latch is free to pivot about its pinned connection 33 between the hinge plates.

The pin coupling connection 33 is affixed to the back hinge plate 16 in the area between the pivot point 25 and the slot 30 at the intersection of (1) a radius extending from the position occupied by the abutment 29 at the far end 31 of the slot 30 a distance which is no less than the spacing "A" from the outer cutout half 35 to the notch 37 of the latch nor greater than the spacing "B" from the outer cutout half 35 to the tip end 38 of the latch, and (2) a radius extending from the point 41 on the slot where the abutment 29 is positioned when the hinge plates are at the angular relationship "X" assumed in the seat position a distance equal to the spacing "C" from the inner cutout half 36 to the notch 37 of the latch. The length of the latch 32 is such that the tip end 38 of a latch pivotally mounted on the coupling pin 33 will clear the abutment 29 as the abutment moves to the location 42 on the slot 30 it occupies when the hinge plates are displaced to the bed position angle. The spacing "D" between the central portions of the two halves 35 and 36 of the heart-shaped cutout, occupied by the coupling pin 33 in the extreme positions of the latch, is a little greater than the spacing "E" from the central portion of the latch engaged by the abutment 29 to the tip end 38 of the latch. The reasons for these dimensions will become apparent from the subsequent description of the operation of the hinge.

Having described the construction of the hinge mechanism, the operation thereof will now be explained with particular reference to FIGS. 3A to 8B. The operation will be explained starting with the sofa arranged in the bed position.

When the sofa is in the bed position, illustrated in FIGS. 7A and 7B, and it is desired to move it to the seat position, the operator grasps the seat 13 attached to the seat frame 14 and raises the frame 14 in the direction of the arrow "*a*" rotating the hinge plates relative to each other to their minimum angular relationship in the trip position with the abutment 29 in contact with the slot end 31, placing the assembly in an intermediate position with the back frame 12 resting on the base 15 in a horizontal position and the seat frame 14 raised at a substantial angle to the horizontal as illustrated in FIG. 8A. In the bed position, the latch 32 is inactive and freely hangs by gravity from the pinned connection 33 in its extended or outer pivoting position 35 and the seat hinge plate 27 is free to pivot relative to the back hinge plate 16 about the hinge pivot 25, the abutment 29 moving along the arcuate slot 30 toward the opposite end 31 of the slot. As the abutment 29 moves along the slot 30, it engages the freely hanging extended latch 32 in the inclined area 39 and carries the latch upwardly while the extended latch pivots about the outer pivoting position 35 of the elongated cutout 34. The latch 32 is thereby rotated upwardly to the position shown in FIG. 8B and the abutment 29 engages the end 31 of the slot in the back hinge plate to prevent further relative movement of the two hinge plates past the trip position when the assembly reaches the intermediate position of the raised seat frame. The seat frame 14 cannot be further lifted inasmuch as the two hinge plates are locked together by contact of the abutment 29 in the end 31 of the slot and the back frame 16 is further restrained in any movement downwardly by the base 15 on which the back frame rests. Due to the specified relationship of the latch dimensions and the location of the latch coupling pin 33, when the latch is in the extended position supported in the outer half 35 of the cutout 34, the notched portion 37 of the latch is in contact with the abutment 29 when the hinge plates reach their minimum angular relationship in the trip position with the abutment 29 in engagement with the end 31 of the slot 30 in the back hinge plate (see FIG. 8B).

The raised seat frame 14 is then pushed downwardly from the position of FIG. 8A in the direction of the arrow "*b*" to rotate the hinge plates 16 and 27 relative to one another about the point 25 in the direction of increasing their angular relationship from the trip position and the abutment 29 moves away from the slot end 31 to firmly engage the latch 32 in the notch 37. The abutment 29 in engagement against the inside of the latch notch 37 moves the latch 32 longitudinally from its extended position to the retracted position with the pin 33 occupying the inner half 36 of the cutout, which position is illustrated in FIG. 5B. The hinge plates rotate relative to each other until the abutment or stop pin 29 reaches the point 41 on the slot 30 where further latch movement is prevented by the engagement of the pinned connection 33 against the inner end of the inner latch cutout half 36. When the stop pin 29 reaches point 41 on the slot 30, at which point the sofa and back frames assume the angular relationship of the normal seat position but are reversed in position in the intermediate position, the latch becomes immobilized in an active restraining position to prevent further relative motion between the hinge plates in the direction of increasing their angular relationship. The latch cannot move longitudinally due to the impingement of the pin 33 on the inside of the inner half 36 of the latch cutout. The longitudinally directed pressure from the abutment 29 at one end of the latch and the pin coupling 33 at the other end jams the activated latch and prevents it from rotating about its coupling. Further downward pressure on the seat frame causes the two hinge plates, which remain locked in this fixed angular relationship by the immobilized latch, to swingably pivot together as a unit about the two links 19 and 20 until the seat frame contacts the base 15 of the sofa and the frames are arranged in the seat position illustrated in FIG. 3A. The seat frame 14

is retained in its lowered position by the weight of the seat and cushion.

When converting the sofa from the seat position to the bed position, the operator raises the seat frame **14** in the direction of the arrow "*b*" in FIG. 3B. As the seat is lifted, the hinge plates **16** and **17** will rotate as a unit about the links **19** and **20** from the seat position illustrated in FIGS. 3A and 3B to the intermediate position of FIGS. 5A and 5B (full lines). During this pivoting motion, the weight of the back frame maintains the hinge plates **16** and **17** in their normal seat position angular relationship, with the immobilized latch **32** remaining at its retracted position supported within the inner cutout half **36**. On reaching the position illustrated in FIGS. 5A and 5B, further movement of the back hinge plate **16** is prevented by contact of the back frame **12** with the base **15** so that continued upward movement of the seat frame **14** pivots the seat hinge plate **27** about the pivot point **25** toward a decreased angular displacement in the trip position and moves the abutment **29** along the slot **30** toward the slot end **31**. The motion of the abutment engaged in the slot **37** of the latch **32** pivots the retracted latch about the pin **33** in the inner cutout half **36** until the hinge plates are displaced to their minimum angular relationship at the trip position with the abutment **29** occupying the end **31** of the slot at which position the abutment **29** passes beyond the trip end **38** of the retracted latch, as illustrated in dashed lines in FIG. 5B, so that the latch falls in the direction of the arrow "*f*" to be freely supported by the pin **33** in the outer cutout half **35** in an extended position as shown in FIGS. 6A and 6B. Since the spacing between the portion of the cutout halves **35** and **36** occupied by the coupling pin **33** is greater than the distance from the engaging position of the abutment **29** in the notch **37** to the tip end **38** of the latch, when the hinge plates are moved relative to each other from the angular displacement of the seat position to the lesser angular displacement of the trip position with the latch in the retracted position instead of its extended position, the end of the latch will not reach the abutment **29** when it occupies the end **31** of the slot in the trip position. The released and inactivated latch **32** having fallen to the freely hanging position illustrated in FIG. 6, the hinge plates may be moved relative to each other from their trip position with the seat and back frames in the intermediate position and pivot in the direction of increasing their angular relationship to move the assembly to the bed position in which the seat frame **14** lies horizontally alongside the back frame **12** atop the base **15** as illustrated in FIG. 7A. During the downward movement of the seat frame **14** to the bed position, the abutment **29** contacts the back side of the latch **32** and rotates the freely pivotable extended latch to pass across the lower end **38** of the latch to the lower side of the latch, after which the latch returns to the vertical, freely hanging position indicated in FIG. 7B. At this point the cycle is complete.

Although the above mode of operation for converting the sofa from the seat to the bed position is the one for which the unit is intended, if the back frame is not sufficiently heavy, or if there is an undue amount of friction in the pivoting links **19** and **20**, the hinge plates will not rotate as a unit on the links **19** and **20** when the seat frame is first raised from the seat position but the seat hinge plate will pivot relative to the back hinge plate and the angular relationship between the hinge plates and frames will decrease until the stop pin **29** engages the end **31** of the slot in the trip position, as illustrated in FIG. 4, whereupon further relative displacement of the hinge plates in that direction is prevented. Since the center of gravity of the latch **32** is below its pivotal support by the pin **33** when the assembly is in the seat position, the latch **32** will slide downwardly from its retracted position to the extended position when the abutment **29** moves from point **41** to the end **31** of the slot with the abutment **29** remaining in contact with the latch notch **37** indicated in FIG. 4.

As the seat frame continues to be raised in the direction of the arrow "*c*" in FIG. 4, the two hinge plates, locked together by the engagement of the stop pin **29** in the slot end **31**, will swingably pivot as a unit about the links **19** and **20** in the direction of the arrow "*c*" to the intermediate position illustrated in FIGS. 8A and 8B, where further displacement is prevented by the back frame **12** contacting the base **15**. During this movement from the seat to the intermediate position, the angular relationship between the seat and back frames and their hinge plates is that of the trip position.

The seat frame **14** is then lowered a short distance to pivot the seat hinge frame **27** relative to the back hinge frame **16** in the direction of increasing their angular relationship to that of the seat position and pressure from the abutment **29** on the notch **37** shifts the latch **32** from its extended position to its retracted position where the latch is momentarily returning to its active condition engaged between the stop pin **29** and the coupling pin **33** in the manner illustrated by the full lines of FIG. 5B. The seat frame **14** is then again lifted in the direction of the arrow "*e*" on FIG. 5A and the abutment **29** moved along the slot **30** to pivot the latch **32** about its inner pivot point **36** until it falls free as shown in FIG. 6, as heretofore described. The remainder of the cycle is the same as before. As noted, this is not the normal mode of operation and the added step is necessary only if there is sufficient friction in the pivoting movement of the links **19** and **20** or the back is not sufficiently heavy for the back and seat hinge plate to maintain their normal seat relationship when the seat is lifted.

While the above matter describes and illustrates preferred embodiments of the invention, it should be understood that the invention is not restricted solely to the described embodiment but that it covers all modifications which would be apparent to one skilled in the art which would fall within the scope and spirit of the invention.

What is claimed is:

1. A sofa bed hinge for supporting seat and back frames on the base of a sofa bed for movement of the frames between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto and a bed position with both frames resting on the base, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to the frames,

means for pivotally mounting said first hinge plate to the base for rotational movement of said plates between the seat and intermediate positions,

a pivot connecting said hinge plates together for relative movement between the intermediate and bed positions,

a latch engaging element on said second hinge plate,

a latch having a slot elongated lengthwise of said latch near one end and means for engaging said element near the other latch end,

and a pin projecting from said first hinge plate and contained within said slot to couple said latch to said first hinge plate for free pivotal movement and limited sliding movement lengthwise of the slot moving said latch between an active position and an inactive position,

said active position engaging said latch with said element and positioning said pin at the end of said slot most remote from said latch one end to restrain relative movement between said hinge plates by the connection of said latch immobilized by oppositely directed engagements of said pin and element,

said inactive position disengaging said latch from said element and positioning said pin at the end of said slot nearest said latch one end to free said latch for pivotal movement permitting relative movement between said hinge plates,

said latch being in said inactive position when said hinge plates are in the bed position and shifted by said engaging element to said active position during relative movement of said hinge plates from the bed position to the intermediate position, remaining in said active position restraining relative movement of said hinge plates during movement from the intermediate to the seat position and from the seat position to the intermediate position and returning to said inactive position to permit relative movement between said hinge plates for movement from the intermediate position to the bed position.

2. A sofa bed hinge for supporting seat and back frames on the base of a sofa bed for movement between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto and a bed position with both frames resting on the base, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to the frames,

means for pivotally mounting said first hinge plate to the base for rotational movement of said plates between the seat and intermediate positions,

a pivot connecting said hinge plates together for relative movement between the intermediate and bed positions,

an abutment on said second hinge plate protruding through and movable along an arcuate slot in said first hinge plate when said plates are relatively moved about said pivot,

a latch having a cutout elongated lengthwise of said latch adjacent one end of the latch and means for engaging said abutment near the other end of the latch,

and a pin projecting from said first plate and contained within elongated cutout to couple said latch to said first hinge plate for free pivotal movement and for limited sliding movement lengthwise of the latch moving said latch between an active position and an inactive position,

said active position engaging said latch with said abutment and positioning said pin at the end of said cutout most remote from said latch one end to restrain relative movement between said hinge plates by the connection of said latch immobilized by oppositely directed engagements of said pin and abutment,

said inactive position disengaging said latch from said abutment and positioning said pin at the end of said cutout nearest said latch one end to free said latch for pivotal movement and permit relative movement between said hinge plates,

said latch being in said inactive position when said hinge plates are in the bed position and shifted by contact with said abutment to said active position during relative movement of said hinge plates from the bed position to the intermediate position, said latch remaining in said active position restraining relative movement of said hinge plates during movement between the intermediate and seat positions and returning to said inactive position to permit relative movement between said hinge plates during movement from the intermediate position to the bed position.

3. A sofa bed hinge supporting seat and back frames on the base of a sofa bed for movement of the frames between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto and a bed position with both frames resting on the base, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to the frames,

means for pivotally mounting said first hinge plate to the base for rotational movement of said plates between the seat and intermediate positions,

a pivot connecting said hinge plates together for relative movement between the intermediate and bed positions,

an abutment on said second hinge plate protruding through and movable along an arcuate slot in said first hinge plate when said plates are relatively moved about said pivot,

a latch having a cutout elongated lengthwise of the latch near one end and means for engaging said abutment near the other end,

and a pin projecting from said first plate and contained within said elongated cutout to couple said latch to said first hinge plate for free pivotal movement and for limited sliding movement lengthwise of the cutout moving said latch between an active position and an inactive position,

said active position engaging said latch with said abutment and positioning said pin at the end of said cutout most remote from said latch one end to restrain relative movement between said hinge plates by the connection of said latch immobilized by oppositely directed engagements of said pin and abutment,

said inactive position disengaging said latch from said projection and positioning said pin at the end of said cutout nearest said latch one end to free said latch for pivotal movement permitting relative movement between said hinge plates,

said latch being in said inactive position when said hinge plates are in the bed position and shifted by said projection to said active position during relative movement of said hinge plates from the bed position to the intermediate position,

said latch remaining in said active position restraining relative movement of said hinge plates during movement from the intermediate position to the seat position,

said second hinge plate abutment engageable with one end of said slot in the first hinge plate for restraining relative movement between said hinges during movement from the seat position to the intermediate position,

and said latch returning to said inactive position to permit relative movement between said hinge plates during movement from the intermediate position to the bed position.

4. In a sofa bed having a base upon which seat and back frames are supported and connected by a hinge for relative movement on said base between an open position defining a large angle and a closed position defining a substantially smaller angle, said hinge comprising:

a pair of hinge plates respectively affixed to said frames,

a pivot connecting said hinge plates together for relative rotational movement between said open position and a trip position in which said frames define an angle slightly less than in said closed position,

a latch engaging element on one of said hinge plates movable about said pivot,

a latch,

and coupling means mounting said latch on the other of said hinge plates for both free pivotal movement and limited sliding movement lengthwise of the latch between an extended position wherein said engaging element engages said latch when said hinge plates are in said trip position and a retracted position wherein said engaging element engages said latch when said hinge plates are in said closed position and said latch contacts no portion of said engaging element when said hinge plates are in said trip position,

said latch being in said extended position freely suspended from said coupling means when said hinge plates are in said open position and pivoted in said extended position into engagement with said engag-

ing element during relative movement of said hinge plates from said open to said trip position,

said engaging element being shifted from said extended to said retracted position during movement of said hinge plates from said trip to said closed position and into a locked condition jammed between said coupling means and said engaging element to restrain further relative movement of said hinge plates toward said open position,

said retracted and engaged latch being pivoted and freed from contact with said engaging element during relative movement of said hinge plates from said closed to said trip position to fall into said extended position freely suspended by said coupling means and permit relative motion of said hinge plates from said trip to said open position.

5. A sofa bed hinge for pivotally connecting a back and a seat frame supported on the base of a sofa bed for relative movement of the frames between an open position in which said frames define a large angle and a closed position in which a substantially smaller angle is defined, said hinge comprising:

a pair of hinge plates respectively adapted for affixing to the frames,

a pivot connecting said hinge plates together for relative rotational movement between said open position and a trip position in which the frames define an angle slightly less than in said closed position,

a latch engaging element on one of said hinge plates movable about said pivot in an arc during movement of said hinge plates between said open and trip position,

coupling means on the other of said hinge plates between said pivot and said arc,

and a latch engageable at one end with said engaging element and connected to said coupling means at its other end for both free pivotal movement and limited sliding movement lengthwise of the latch between an extended position wherein said latch one end contacts said engaging element when said hinge plates are in said trip position and a retracted position wherein said latch one end engages said engaging element when said hinge plates are in said closed position and said latch contacts no portion of said engaging element when said hinge plates are in said trip position,

said latch being in said extended position freely suspended from said coupling means when said hinge plates are in said open position and pivoted in said extended position to bring said one latch end into positive engagement with said engaging element during relative movement of said hinge plates from said open to said trip position,

said engaged latch being shifted from said extended to said retracted position during movement of said hinge plates from said trip to said closed position and into a locked condition jammed at both ends between said coupling means and said engaging element to restrain further relative movement of said hinge plates toward said open position,

said retracted and engaged latch being freed from contact from said engaging element during relative movement of said hinge plates from said closed to said trip position to fall into said extended position freely suspended from said coupling means and permit relative motion of said hinge plates from said trip to said open position.

6. A sofa bed hinge for pivotally connecting a back and a seat frame supported by the base of a sofa bed for movement of the frames between a bed position with both frames substantially horizontal to define an angle of approximately 180° and a seat position with one frame substantially horizontal on the sofa bed and the other frame angularly disposed thereto to define an angle between the frames of substantially less than 180°, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to the frames,

a pivot connecting said hinge plates together for relative rotational movement between said bed position and a trip position in which the frames define an angle slightly less than in said seat position,

a latch engaging element on said first hinge plate movable about said pivot in an arc during movement of said hinge plate between said bed and trip position,

a coupling pin on said second hinge plate between said pivot and said arc,

a latch engageable at one end with said engaging element and near its other end containing a slot elongated generally lengthwise of the latch into which said pin is loosely secured to permit both free pivotal movement and lengthwise latch movement between an extended position and a retracted position,

in said extended position said pin contacting the end of said slot nearest said latch other end and said latch one end contacting said engaging element when said hinge plates are in said trip position,

in said retracted position said pin contacting the end of said slot most remote from said latch other end and said latch one end engaging said engaging element when said hinge plates are in said seat position, and said latch contacting no portion of said engaging element when said hinge plates are in said trip position,

said latch being in said extended position freely suspended by said pin when said hinge plates are in said bed position and pivoted while in said extended position by contact of said engaging element moving along said arc into positive engagement with said engaging element during relative movement of said hinge plates from said bed to said trip position,

said latch being shifted from said extended to said retracted position by said engaging element during movement of said hinge plates from said trip to said seat position into a locked condition jammed at both ends by the contact of said pin against said slot end and by the positive engagement of said engaging element to restrain further relative movement of said hinge plates toward said bed position,

said locked latch being freed from contact with said engaging element during the last portion of relative movement of said hinge plates from said seat to said trip position and falling into said extended position freely suspended by said pin to permit relative motion of said hinge plates from said trip to said bed position.

7. A sofa bed hinge for pivotally connecting adjacent seat and back frames supported by the base of a sofa bed for relative movement of the frames between a bed position in which both frames define a large angle between them approximating 180° and a seat position in which the frames define an angle substantially less than said bed position angle, said hinge comprising:

a pair of hinge plates respectively adapted for affixing to said frames,

a pivot connecting said hinge plates together for relative rotational movement between said bed position and a trip position in which the frames define a smaller angle than said seat position angle,

a latch engaging element on one of said hinge plates movable relative to the other of said hinge plates about said pivot along the arc of a circle which is the locus of said element during relative movement of said hinge plates,

a latch engageable with said engaging element at a point near one end of the latch and adjacent the other end containing a generally arcuate slot having two similarly shaped communicating halves arranged side-by-side lengthwise of said latch with a first half

adjacent said latch other end and a second half oppositely disposed,

said first half being spaced a first dimension from said latch engaging point and a second dimension from said one latch end,

said halves being separated by greater than the distance from said latch engaging point to the tip of said latch one end,

and a coupling member affixed to said other hinge plate between said pivot and said arc at a point spaced a distance no less than said first dimension and no greater than said second dimension from the position on said arc occupied by said engaging element at said trip position, spaced a distance equal to said first dimension decreased by the spacing between said halves from the position on said arc occupied by said engaging element at said seat position and spaced a distance greater than said second dimension from the position occupied by said engaging element at said bed position,

said member loosely fitting within said slot and free to move between said halves mounting said latch on said member for both pivotal movement and limited lengthwise latch movement between an extended position in which said member is contained within said first half and a retracted position in which said member is contained within said second half,

said latch freely hanging from said member in an extended position when said hinge plates are in said bed position, being pivoted in said extended position by said engaging element to bring said latch point into contact with said engaging element during relative movement of said hinge plates from said bed to said trip position, being moved to said retracted position while engaging said engaging element during relative movement of said hinge plates from the angle of said trip position to the angle of said seat position and jammed between said engaging element and said member to prevent relative displacement of said hinge plates in excess of said seat position angle, and being pivoted in said retracted position to a position at which said engaging element passes beyond the tip of said latch one end and said latch falls to hang freely from said member in an extended position during relative movement of said hinge plates from said seat position angle to said trip position angle to permit relative movement of said hinge plates from said trip to said bed position.

8. A sofa bed hinge for pivotally connecting adjacent seat and back frames supported by the base of a sofa bed for relative movement of the frames between a bed position in which both frames are essentially horizontal to define an angle between them of approximately 180° and a seat position in which one of the frames is substantially horizontal and the other frame is angularly disposed thereto to define an angle between the frames substantially less than said bed position angle, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to said frames,

a pivot connecting said hinge plates together for relative rotational movement between said bed position and a trip position in which the frames define an angle slightly less than said seat position angle,

an abutment affixed to said second hinge plate movable relative to said first hinge plate about said pivot along the arc of a circle which is the locus of said abutment during relative movement of said hinge plates between said bed and trip positions,

said first hinge plate having an arcuate slot conforming to said arc and along which said abutment moves between a terminal end of said slot corresponding to the trip position of said arc and a point on said slot corresponding to the bed position of said arc,

a latch having a notch on one side adjoining one end of the latch and adjacent the other end having a generally heart-shaped cutout with two similar halves arranged side-by-side lengthwise of the latch, a first of the cutout halves being adjacent said latch other end and a second cutout half being opposite thereto,

said first cutout half being spaced a first dimension from said notch and a second dimension from said latch end,

said cutout halves being separated by greater than the distance from said notch to the tip of said latch one end,

and a coupling pin smaller in diameter than said cutout halves affixed to said first hinge plate between said pivot and said slot at a point which is spaced from said slot terminal end by a distance no less than said first dimension and no greater than said second dimension, is spaced from the point on said slot occupied by said abutment in said seat position by a distance equal to said first dimension decreased by the spacing between said cutout halves and is spaced from the point on said slot occupied by said abutment at said bed position by a distance greater than said second dimension,

said pin being loosely contained within said cutout for both pivotal movement of said latch and limited lengthwise latch movement between an extended position with said pin contained within said first cutout half and a retracted position with said pin contained within said second cutout half,

said latch freely hanging from said pin in an extended position when said hinge plates are in said bed position, being pivoted in said extended position by said abutment bringing said notch into contact with said abutment during relative movement of said hinge plates from said bed to said trip position, being moved to said retracted position while in engagement with said abutment during relative movement of said hinge plates from the angle of said trip portion to the angle of said seat position and jammed between said abutment and said pin to prevent relative hinge plate movement in the direction of increasing the angle defined by the frames in excess of said seat position angle, and being pivoted while in said retracted position engaged with said abutment to a position at which said abutment passes beyond the tip of said latch one end and said latch falls to hang freely from said pin in an extended position during relative movement of said hinge plates from said seat position angle to said trip position to permit relative movement of said hinge plates from said trip to said bed position.

9. A sofa bed hinge for supporting adjacent seat and back frames on the base of a sofa bed for movement of the frames between a bed position in which both frames are substantially horizontal atop said base and define an angle between them approximately 180° and a seat position in which one frame is substantially horizontal atop said base and the other frame is angularly disposed thereto to define an angle between the frames substantially less than said bed position angle, said hinge comprising:

a pair of hinge plates respectively adapted for affixing to said frames,

means for pivotally mounting said hinge to the base for relative rotational movement thereto,

a pivot connecting said hinge plates together for relative rotational movement between said bed position and a trip position in which the frames define an angle a little less than said seat position angle,

a latch engaging element affixed to one of said hinge plates movable relative to the other of said hinge plates about said pivot along the arc of a circle which is the locus of said element during relative movement of said hinge plates between said bed and trip positions,

a latch engageable with said engaging element at a point near one end of the latch and adjacent the other

end containing a generally arcuate slot having two similarly shaped communicating halves arranged side-by-side lengthwise of said latch with a first half adjacent said latch other end and a second half oppositely disposed,

said first half being spaced a first dimension from said latch engaging point and a second dimension from said one latch end,

said halves being separated by greater than the distance from said latch engaging point to the tip of said latch one end,

and a coupling member affixed to said other hinge plate between said pivot and said arc at a point spaced a distance no less than said first dimension and no greater than said second dimension from the position on said arc occupied by said engaging element at said trip position, spaced a distance equal to said first dimension decreased by the spacing between said halves from the position on said arc occupied by said engaging element at said seat position and spaced a distance greater than said second dimension from the position occupied by said engaging element at said bed position,

said member loosely fitting within said slot and free to move between said halves mounting said latch on said member for both pivotal movement and limited lengthwise latch movement between an extended position in which said member is contained within said first half and a retracted position in which said member is contained within said second half,

said latch freely hanging from said member in an extended position when said hinge plates are in said bed position, being pivoted in said extended position by said engaging element to bring said latch point into contact with said engaging element during relative movement of said hinge plates from said bed to said trip position, being moved to said retracted position while engaging said engaging element during relative movement of said hinge plates from the angle of said trip position to the angle of said seat position and jammed between said engaging element and said member to prevent relative displacement of said hinge plates in excess of said seat position angle, and being pivoted in said retracted position to a position at which said engaging element passes beyond the tip of said latch one end and said latch falls to hang freely from said member in an extended position during relative movement of said hinge plates from said seat position angle to said trip position angle to permit relative movement of said hinge plates from said trip to said bed position.

10. A sofa bed hinge for supporting adjacent seat and back frames on the base of a sofa bed for movement of the frames between a bed position in which both frames are substantially horizontal atop said base and define an angle between them of approximately 180° and a seat position in which one frame is substantially horizontal atop said base and the other frame is angularly disposed thereto to define between the frames an angle substantially less than said bed position angle, said hinge comprising:

a first and a second hinge plate respectively adapted for affixing to said frames,

a pair of links each pivotally connected at one end to said first hinge plate and at the other end to said base for rotational movement of said first hinge plate relative to said base,

a pivot connecting said hinge plates together for relative rotational movement between said bed position and a trip position in which the frames define an angle slightly less than said seat position angle,

an abutment affixed to said second hinge plate movable relative to said first hinge plate about said pivot along the arc of a circle which is the locus of said abutment during relative movement of said hinge plates between said bed and trip positions,

said first hinge plate having an arcuate slot conforming to said arc and along which said abutment moves between a terminal end of said slot corresponding to the trip position of said arc and a point on said slot corresponding to the bed position of said arc,

a latch having a notch on one side adjoining one end of the latch and adjacent the other end having a generally heart-shaped cutout with two similar halves arranged side-by-side lengthwise of the latch, a first of the cutout halves being adjacent said latch other end and a second cutout half being opposite thereto,

said first cutout half being spaced a first dimension from said notch and a second dimension from said latch one end,

said cutout halves being separated by greater than the distance from said notch to the tip of said latch one end,

and a coupling pin smaller in diameter than said cutout halves affixed to said first hinge plate between said pivot and said slot at a point which is spaced from said slot terminal end by a distance no less than said first dimension and no greater than said second dimension, is spaced from the point on said slot occupied by said abutment at said seat position by a distance equal to said first dimension decreased by the spacing between said cutout halves and is spaced from the point on said slot occupied by said abutment at said bed position by a distance greater than said second dimension,

said pin being loosely contained within said cutout for both pivotal movement of said latch and limited lengthwise latch movement between an extended position with said pin contained within said first cutout half and a retracted position with said pin contained within said second cutout half,

said latch freely hanging from said pin in an extended position when said hinge plates are in said bed position, being pivoted in said extended position by said abutment bringing said notch into contact with said abutment during relative movement of said hinge plates from said bed to said trip position, being moved to said retracted position while in engagement with said abutment during relative movement of said hinge plates from the angle of said trip position to the angle of said seat position and jammed between said abutment and said pin to prevent relative hinge plate movement in the direction of increasing the angle defined by the frames in excess of said seat position angle, and being pivoted while in said retracted position engaged with said abutment to a position at which said abutment passes beyond the tip of said latch one end and said latch falls to hang freely from said pin in an extended position during relative movement of said hinge plates from said seat position angle to said trip position to permit relative movement of said hinge plates from said trip to said bed position.

11. A sofa bed hinge for supporting seat and back frames on the base of a sofa bed for movement of the frames between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto at a normal seating angle, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto at the seating angle and a bed position with both frames resting on the base, said hinge comprising:

a pair of hinge plates respectively adapted for affixing to the frames,

a pivot connecting said hinge plates together for relative rotational movement between the bed position and a trip position in which the frame include an angle less than the normal seating angle,

means for pivotally mounting said plates to the base

for pivotal movement between the seat and intermediate position,
a latch engaging element on one of said plates,
a latch,
and coupling means for connecting said latch with the other of said hinge plates for rotational movement and limited translational movement of the latch relative to said other hinge plate in moving between an extended position in which said latch contacts said engaging element when said hinge plates are in the trip position and a retracted position in which said latch engages said engaging element when said hinge plates are in the intermediate position but said latch does not contact said engaging element when said hinge plates are in the trip position,
said latch in the extended position contacting said engaging element and pivoting about said coupling means when said hinge plates are rotated relative to one another in moving from the bed position to the trip position,
said latch being shifted from the extended to the retracted position by said engaging element when said hinge plates are rotated relative to one another in moving from the trip to the intermediate position, whereby said latch is compressively jammed between said coupling means and said engaging element to establish a rigid connection between said hinge plates and prevent said plates rotating relative to one another when pivoted about said pivotal mounting means between the intermediate and seat position,
said latch in the retracted position being released from said engaging element when said hinge plates are rotated relative to one another to the trip position after said hinge plates are pivoted about said pivotal mounting means from the seat to the intermediate position, whereby said hinge plates may be rotated relative to one another from the trip to the bed position.

12. A sofa bed hinge for supporting seat and back frames on the base of a sofa bed for movement of the frames between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto at a normal seating angle, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto at the seating angle and a bed position with both frames resting on the base, said hinge comprising:
a first and a second hinge plate respectively adapted for affixing to the frames,
a pivot connecting said hinge plates together for relative rotational movement between the bed position and a trip position in which the frames include an angle less than the normal seating angle,
means for pivotally mounting said first hinge plate to the base for pivotal movement of said plates between the seat and intermediate position,
a latch engaging element on said first hinge plate,
a latch,
and coupling means for connecting said latch with said second hinge plate for rotational movement and limited translational movement of the latch relative to said second hinge plate in moving between an extended position in which said latch contacts said engaging element when said hinge plates are in the trip position and a retracted position in which said latch engages said engaging element when said hinge plates are in the intermediate position but said latch does not contact said engaging element when said hinge plates are in the trip portion,
said latch in the extended position contacting said engaging element and pivoting about said coupling means when said hinge plates are rotated relative to one another in moving from the bed position to the trip position,
said latch being shifted from the extended to the retracted position by said engaging element when said hinge plates are rotated relative to one another in moving from the trip to the intermediate positions, whereby said latch is compressively jammed between said coupling means and said engaging element to establish a rigid connection between said hinge plates and prevent said plates rotating relative to one another when pivoted about said pivotal mounting means between the intermediate and seat position,
said latch in the retracted position being released from said engaging element when said hinge plates are rotated relative to one another to the trip position after said hinge plates are pivoted about said pivotal mounting means from the seat to the intermediate position, whereby said hinge plates may be rotated relative to one another from the trip to the bed position.

13. A sofa bed hinge for supporting seat and back frames on the base of a sofa bed for movement of the frames between a seat position with the seat frame resting on the base and the back frame angularly disposed thereto at a normal seating angle, an intermediate position with the back frame resting on the base and the seat frame angularly disposed thereto at the seating angle and a bed position with both frames resting on the base, said hinge comprising:
a pair of hinge plates respectively adapted for affixing to the frames,
a pivot connecting said hinge plates together for relative rotational movement between the bed position and a trip position in which the frames include an angle less than the normal seating angle,
means for pivotally mounting said hinge plates to the base for pivotal movement between the seat and intermediate position,
a latch engaging element on one of said hinge plates,
a latch having means at one end portion for engaging said engaging element,
and coupling means for connecting the other end portion of said latch with the other of said hinge plates for rotational movement and limited translational movement of the latch relative to said other hinge plate in moving between an extended position in which said latch engaging means contacts said engaging element when said hinge plates are in the trip position and a retracted position in which said latch engaging means engages said engaging element when said hinge plates are in the intermediate position but no portion of said latch contacts said engaging element when said hinge plates are in the trip position,
said latch in the extended position being contacted by said engaging element and pivoting about said coupling means when said hinge plates are rotated relative to one another in moving from the bed position to the trip position,
said latch being shifted from the extended to the retracted position by the engagement of said engaging element with said latch engaging means when said hinge plates are rotated relative to one another in moving from the trip to the intermediate position, whereby said latch is compressively jammed between said coupling means and said engaging element to establish a rigid connection between said hinge plates and prevent said plates rotating relative to one another pivoted about said pivotal mounting means between the intermediate and seat position,
said latch in the retracted position being released from contact with said engaging element when said hinge plates are rotated relative to one another to the trip position after said hinge plates are pivoted about said pivotal mounting means from the seat to the intermediate position, whereby said hinge plates may be rotated relative to one another from the trip to the bed position.

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