July 24, 1956 M. H. HARMAN 2,755,487

SOFA BED HINGE

Filed Oct. 17, 1952 3 Sheets-Sheet 1

FIG. 1.

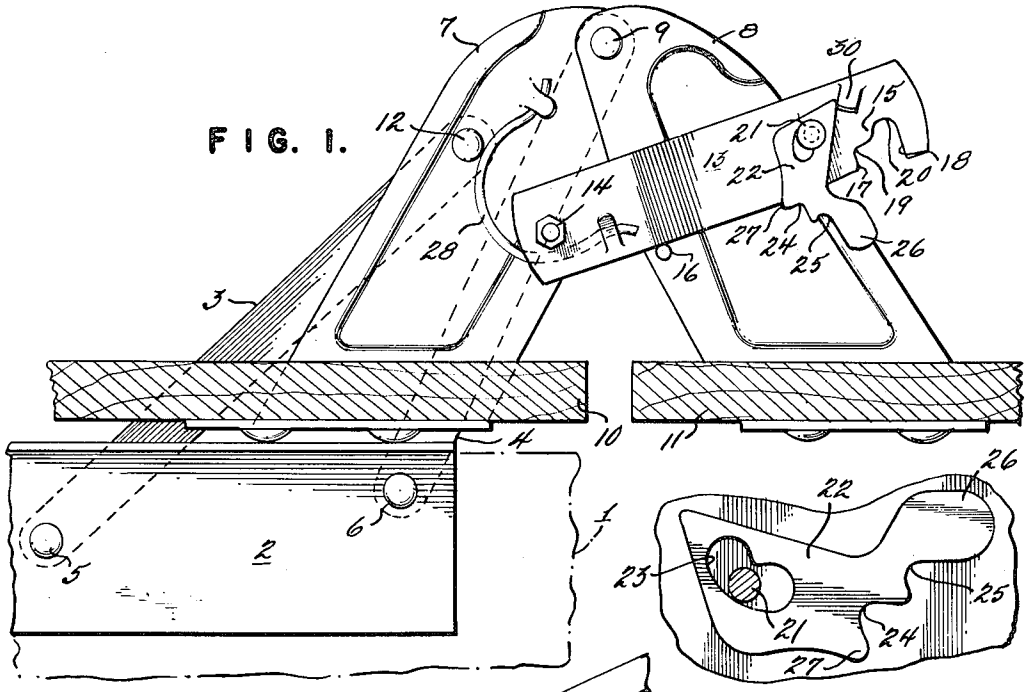


FIG. 2

FIG. 3.

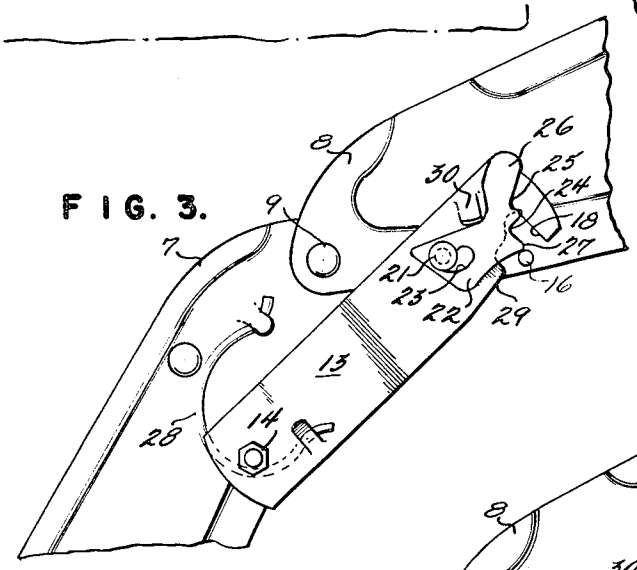
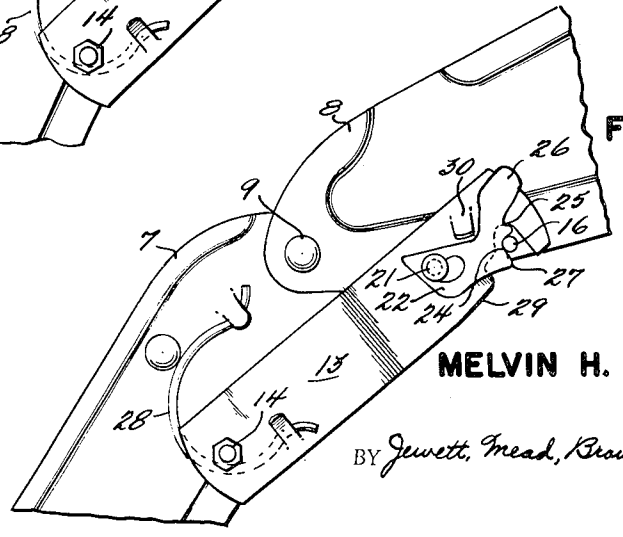


FIG. 4.



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July 24, 1956 M. H. HARMAN 2,755,487

SOFA BED HINGE

Filed Oct. 17, 1952 3 Sheets-Sheet 2

FIG. 5.

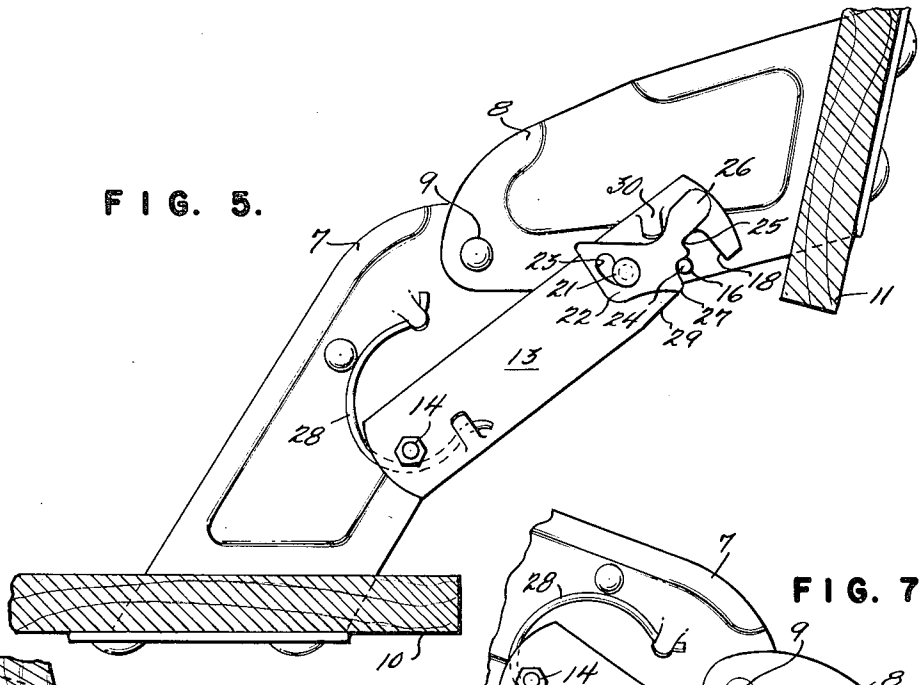


FIG. 7.

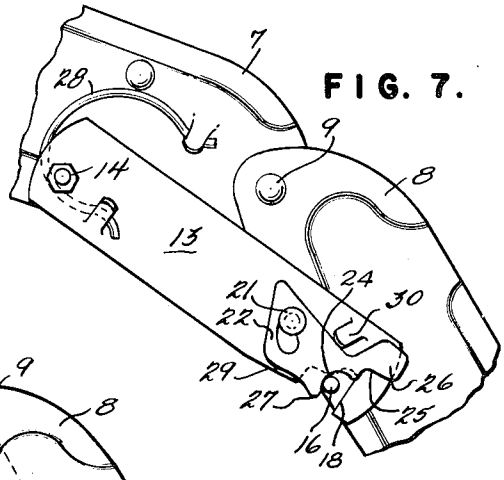


FIG. 6.

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Filed Oct. 17, 1952 3 Sheets-Sheet 3

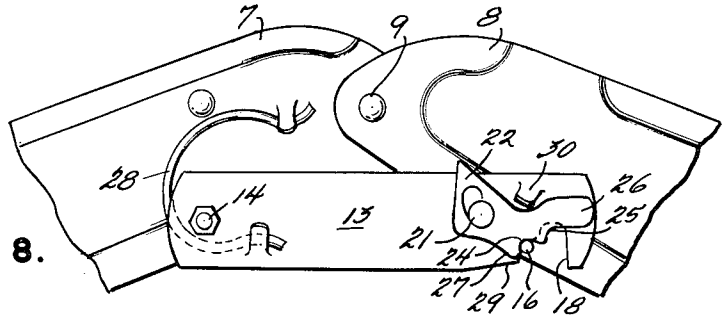


FIG. 8.

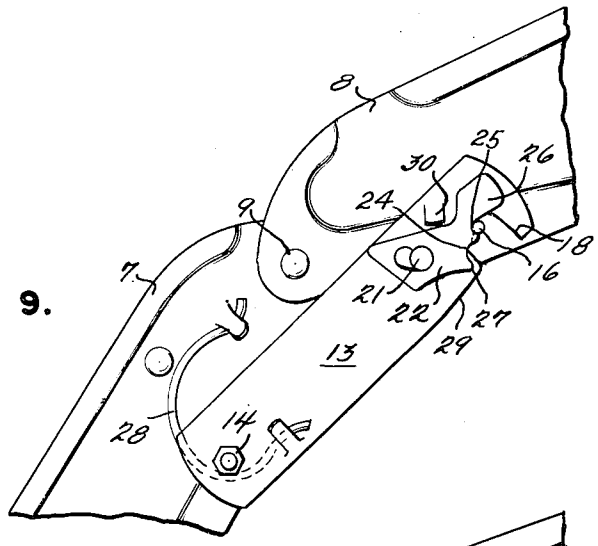


FIG. 9.

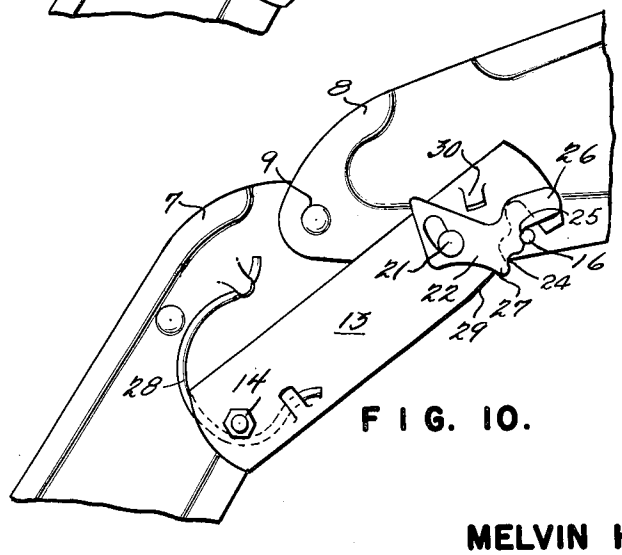


FIG. 10.

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SOFA BED HINGE

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Application October 17, 1952, Serial No. 315,377

6 Claims. (Cl. 5—57)

This invention relates to sofa bed hinges and particularly to a hinge locking mechanism of the type disclosed in my United States Letters Patent No. 2,495,413, issued January 24, 1950.

In the locking control mechanism shown in that patent, the latch releasing tumbler depends upon gravity for some of its operations. It has been found, in a few instances, that excessive accumulation of dirt and dust around the pivotal mounting for the releasing tumbler may result in failure of the tumbler to respond to the force of gravity with a corresponding failure of the tumbler to perform its releasing operation.

A major object of the present invention is to provide a hinge locking mechanism wherein the releasing tumbler is at all times operated by movement of parts of the locking mechanism without being dependent upon the force of gravity thereby ensuring effective operation of the mechanism at all times regardless of the accumulation of dirt and dust.

In the attainment of this object, one important feature of the invention resides in the provision in the hinge latching arm of separate locking and releasing steps with the tumbler so arranged that its releasing shoulder is engaged upon movement of the abutment into the releasing step of the notch whereas the locking shoulder of the tumbler is effective to prevent movement of the abutment into the releasing step except during pivotal movement of the hinge plates while in their intermediate position. Another feature of the invention resides in the provision of an arcuately-shaped locking shoulder on the releasing tumbler for engaging the periphery of the abutment to cause movement of the tumbler with the abutment upon relative movement of the hinge plates. Still another feature of the invention resides in the arrangement of the locking shoulder near the center of the releasing tumbler so the tumbler is approximately balanced on the abutment except when the hinge plates are in their intermediate position at which time the tumbler is overbalanced toward its pivotal end permitting the abutment to ride over the locking shoulder into the releasing step and engaging the releasing shoulder for releasing the latch.

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

Fig. 1 is a partial sectional view of a sofa bed showing a sofa bed hinge embodying the invention in its preferred form;

Fig. 2 is an enlarged view of the tumbler showing the relation of the tumbler to its pivot pin; and

Figs. 3–10 inclusive are diagrammatic views showing the arrangement and relative movements of the parts of the hinge in various positions in a cycle of operation.

Generally, the preferred form of the invention includes back and seat hinge plates for attachment to the back and seat frames of the sofa bed. The hinge plates are pivotally connected together and are also pivoted to a pair of links connected to the base of the bed in a well-known manner for shifting the back and seat frames relative to the base when moving from sofa to intermediate positions. One of the hinge plates has pivoted thereon a hinge latching arm, the free end of which has a notch for engaging an abutment on the other hinge plate to lock the hinge plates in fixed angular relation corresponding to the angular relation thereof when the back and seat frames are in sofa position.

In accordance with the invention, the notch in the latching arm has spaced end walls permitting relative sliding movement of the abutment in the notch. In the base of the notch are formed locking and releasing steps with the releasing step being deeper and nearer the free end of the arm. A releasing tumbler pivoted on the arm for longitudinal and lateral sliding movements has locking and releasing shoulders corresponding generally to the locking and releasing steps of the notch. A stop limits movement of the shoulders toward the steps by engaging the side of the tumbler. Preferably, the releasing shoulder is of arcuate shape for engaging the cylindrical abutment and is also centrally located of the tumbler so the tumbler is approximately balanced on the abutment except when the hinge plates are in their intermediate position. Normally, the locking shoulder prevents movement of the abutment onto the releasing step but, upon reaching the intermediate position, the relative pivotal movement of the hinge plate permits movement of the abutment into the releasing step where it engages the releasing shoulder so movement in the opposite direction causes movement of the releasing shoulder with the abutment to remove the abutment from the notch and release the hinge from the latching arm.

Turning now to the drawings, I have shown a base 1 of a sofa bed having attached thereto a supporting bracket 2. A pair of links 3 and 4 are pivotally connected to the supporting bracket 2 at pivot points 5 and 6 respectively. Links 3 and 4 shiftably support a back hinge plate 7 and a seat hinge plate 8 which are pivotally connected together at 9 and are attached to back frame 10 and seat frame 11, respectively, of the sofa bed. Link 3 is pivotally connected to back hinge plate 7 at point 12. Link 4 is pivotally connected to the pivot point 9 of the hinge plates.

As shown in Fig. 1, the back and seat frames 10 and 11 are in a horizontal position and have been shifted forwardly of the base 1 to their bed position. From this position the seat frame 11 may be moved relative to the back frame 10 about pivot 9. To control the amount of this movement and to secure the back and seat frames in a fixed angular position corresponding to their sofa position, a hinge latching arm 13 is pivoted at one end, as at 14, to the back hinge plate 7. At the free end of latching arm 13 is a notch 15 for engaging an abutment 16 on seat hinge plate 8 to lock the hinge plates in the aforementioned fixed angular position.

Notch 15 is formed with spaced end walls 17 and 18 to permit relative sliding movement of the abutment 16 in the notch between locking and releasing positions during the operation of the mechanism. The base of the notch is formed with a locking step 19 and a releasing step 20, the releasing step being somewhat deeper than the locking step and located nearer the free end of the latching arm. Pivoted on the latching arm by means of a pivot pin 21 is a releasing tumbler 22 which serves to control the operation of the latching arm 13 and abutment 16. In order that the tumbler 22 may have a sliding movement relative to the latching arm 13 as well as a pivoting movement, I have provided an arcuate-shaped slot 23 for supporting the tumbler 22 on the pivot pin 21. Tumbler 22 is formed with a locking shoulder 24 and a releasing shoulder 25 which corresponds to the locking step 19 and the releasing step 20 in the notch 15 of latching arm 13. Both locking shoul-

der 24 and releasing shoulder 25 are of arcuate shape to insure positive engagement with abutment 16. The free end of the tumbler 22 terminates in an enlarged portion 26 of a length such that the locking shoulder 24 will be approximately centrally located on the tumbler 22. Adjacent the locking shoulder 24 on the side nearest the pivoted end of tumbler 22 is a projecting corner 27, the purpose of which will be explained hereinafter.

To hold the latching arm 13 in engagement with the abutment 16, there is provided a spring 28 connected between back hinge plate 7 and latching arm 13 in any suitable manner so as to urge latching arm 13 in a clockwise direction as best seen in Fig. 1.

Having described the construction of my locking control mechanism, the operation thereof will now be explained with particular reference to Figs. 3–10.

When the sofa is in bed position as shown in Fig. 1, and it is desired to move it to seat or sofa position, the operator grasps the seat frame 11 and moves it in a counter-clockwise direction about pivot 9. During this movement, abutment 16 will ride along the arcuate under side of latching arm 13 until it engages the projecting corner 27 on tumbler 22. In order to insure a more positive engagement between abutment 16 and corner 27, the under side of latching arm 13 has a slightly inclined portion 29 adjacent the notch 15. Continued counter-clockwise movement of the seat frame 11 and seat hinge plate 8 will cause the abutment 16 to positively engage corner 27 and move the tumbler 22 in a counter-clockwise direction about pivot pin 21 until the upper side of tumbler 22 engages a stop member 30, as best seen in Fig. 3. When the movement of tumbler 22 is thus arrested, abutment 16 will ride over projecting corner 27 and into locking shoulder 24 on tumbler 22, as shown in Fig. 4. Due to the position of slot 23 on pin 21, locking shoulder 24 of the tumbler overlies releasing step 20 of the latching arm and prohibits entry of abutment 16 into the deeper releasing step 20. Spring 28 acts to urge shoulder 24 and abutment 16 into positive engagement with each other. While in the intermediate position, further counter-clockwise movement of the seat frame 11 will merely result in compressing spring 28, and will have no further effect on the operation of tumbler 22. When the operator reverses the movement of seat frame 11 about pivot 9, seat frame 11 is moved in a clockwise direction from the intermediate position, and causing tumbler 22 to slide in relation to its pivot pin 21 until abutment 16 engages end wall 17 and locking step 19 of the latch arm as shown in Fig. 5. The enlarged portion 26 of tumbler 22 is so proportioned and the location of locking shoulder 24 is such that gravitational forces cause tumbler 22 to remain in engagement with abutment 16 during this movement from the intermediate position and hence locking shoulder 24 and abutment 16 remain in positive engagement as tumbler 22 slides with relation to pin 21. Abutment 16 is held in positive engagement with end wall 17 and locking step 19 of the latching arm by the action of spring 28. Seat hinge plate 8 and back hinge plate 7 are now locked in fixed angular relationship, and as seat frame 11 is lowered to its sofa position, back frame 10 will be raised to its sofa position, as best seen in Fig. 6.

When it is desired to convert from sofa position to bed position, the operator grasps seat frame 11 and moves it in a counter-clockwise direction about pivot 9. Initially, abutment 16 will tend to ride out of locking step 19, and tumbler 22 moves with abutment 16 by engagement of arcuate locking shoulder 24 with abutment 16, as shown in Fig. 7. Since tumbler 22 is in engagement with stop member 30, locking shoulder 24 prevents movement of abutment 16 into releasing step 20 of the latch arm. However, due to the weight of back frame 10 and the action of spring 28, the abutment 16 and locking step 19 will almost immediately be forced into engagement as

shown in Fig. 8. When the intermediate position shown in Fig. 9 is reached, the back frame 10 is in bed position. Continued counter-clockwise movement of the seat frame 11 will cause the tumbler 22 to be overbalanced to the left as viewed in Fig. 9 so that it will no longer follow abutment 16, and abutment 16 will move out of engagement with locking shoulder 24 and into engagement with releasing step 20 and releasing shoulder 25, as best seen in Fig. 9. Thus, abutment 16 is positively moved into engagement with releasing shoulder 25; the engagement with shoulder 25 is not dependent upon gravitational or other movement of tumbler 22. Further counter-clockwise movement will cause tumbler 22 to strike stop 30, preventing releasing shoulder 25 from becoming disengaged from abutment 16. When this point is reached, any further movement of seat frame 11 in a counter-clockwise direction will merely act to compress spring 28. The operator now reverses the direction of movement of seat frame 11 about pivot 9. When this movement in a clockwise direction occurs, releasing shoulder 25 being held in positive engagement with abutment 16 by the force exerted on the seat frame, tumbler 22 will pivot about pin 21 and act to swing abutment 16 completely out of notch 15, as best seen in Fig. 10. Continued clockwise movement of seat frame 11 will cause abutment 16 to drop out of locking shoulder 25 when the pivoted end of tumbler 22 strikes stop 30, thereby arresting the movement of the tumbler, and abutment 16 will ride along the under side of arm 13 to the position shown in Fig. 1, at which time the sofa is in bed position.

It will be readily apparent from the foregoing that at no time during the cycle of operation is the back frame free to respond to the force of gravity and slam down onto the base of the sofa, with a consequent likelihood of damage to the sofa.

What is claimed is:

1. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking mechanism comprising an abutment on one of said plates, a latching arm pivoted to the other of said plates, said latching arm being formed with a notch for receiving said abutment and having spaced end walls limiting relative movement of said plates with said abutment disposed in said notch, a locking step in the base of said notch, a releasing step in the base of said notch nearer the free end of said latching arm, said releasing step being deeper in the notch than said locking step, a tumbler pivotally mounted on said latching arm by engagement of a pin with an arcuate slot, a releasing shoulder at the free end of said tumbler engageable by said abutment for releasing said abutment from said notch upon movement of said abutment onto said releasing step, and a locking shoulder adjacent said releasing shoulder shiftable upon movement of said tumbler when said plates are moved from said bed position to said intermediate position to overlie said releasing step and engage said abutment to prevent movement of said abutment onto said releasing step.

2. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking mechanism comprising an abutment on one of said plates, a latching arm pivoted to the other of said plates, a notch in the free end of said latching arm having spaced end walls limiting relative movement of said plates with said abutment disposed in said notch, a locking step in the base of said notch, a releasing step in the base of said notch nearer the free end of said arm, said releasing step being deeper in the notch than said locking step, a tumbler pivoted on said arm by engagement of a pin with an arcuate slot, a releasing shoulder at the free end of said tumbler engageable by said abutment for releasing said abutment from said notch upon movement of said abutment onto said releasing step, a locking shoulder adjacent

said releasing shoulder shiftable by movement of said tumbler when said plates are moved from said bed position to said intermediate position to overlie said releasing step, and a stop on said arm for engaging said tumbler when said locking shoulder overlies said releasing step to prevent movement of said abutment onto said releasing step.

3. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking mechanism comprising an abutment on one of said plates, a latching arm pivoted on the other of said plates, a notch formed in the free end of said latching arm having spaced end walls permitting sliding movement of said abutment within said notch, a releasing step at the base of said notch, said releasing step being deeper in the notch than said locking step, a tumbler having an arcuately shaped slot pivotally mounting said tumbler on said arm for longitudinal and lateral sliding movements, a releasing shoulder at the free end of said tumbler engageable by said abutment upon movement of said abutment onto said releasing step for releasing said abutment from said notch, a locking shoulder on said tumbler adjacent said releasing shoulder shiftable by movement of said tumbler when said plates are moved from said bed position to said intermediate position to overlie said releasing step, and a stop on said arm limiting movement of said tumbler with said locking shoulder overlying said releasing step to prevent movement of said abutment onto said releasing step.

4. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking mechanism comprising a latching arm pivoted to one of said plates, an abutment on the other of said plates, a notch formed in the free end of said arm for receiving said abutment, said notch having spaced end walls permitting sliding movement of said abutment within said notch, a releasing step in the base of said notch near the free end of said arm, a locking step in the base of said notch adjacent said releasing step, said releasing step being deeper in the notch than said locking step, a tumbler pivoted on said arm by engagement of a pin with an arcuate slot for longitudinal and lateral pivotal and sliding movements relative to said arm, an arcuately shaped releasing shoulder on the free end of said tumbler arranged to engage said abutment when in said releasing step for releasing said abutment from said notch, an arcuately shaped locking shoulder on the free end of said tumbler shiftable by movement of said tumbler when said plates are moved from said bed position to said intermediate position to overlie said releasing step to prevent movement of said abutment onto said releasing step, and a stop on said latching arm for engaging said tumbler to limit movement thereof and prevent movement of said abutment into said releasing step when said locking shoulder overlies said releasing step.

5. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking

mechanism comprising a latching arm pivoted to one of said plates, an abutment on the other of said plates, a notch in the free end of said arm for receiving said abutment, said notch being formed with spaced end walls limiting relative movement of said plates with said abutment in said notch, a releasing step formed in the base of said notch near the free end of said arm, a locking step in said notch adjacent said releasing step, said releasing step being deeper in the notch than said locking step, a tumbler pivoted on said arm by engagement of a pin with an arcuate slot for longitudinal and lateral movements, an arcuately shaped releasing shoulder on the free end of said tumbler engageable by said abutment when in said releasing step for releasing said abutment from said notch, an arcuately shaped locking shoulder on said tumbler adjacent said releasing shoulder and shiftable by movement of said tumbler when said plates move from said bed position to said intermediate position to overlie said releasing step, and a stop on said latching arm for engaging said tumbler to limit movement thereof and prevent movement of said abutment into said releasing step when said locking step overlies said releasing step.

6. In a sofa bed hinge having pivotally connected back and seat hinge plates adjustable to a seat position, a bed position, and an intermediate position, a hinge locking mechanism comprising a latch arm pivoted to one of said plates, an abutment on the other of said plates, a notch in the free end of said arm for receiving said abutment, said notch being formed with spaced end walls permitting relative sliding movement of said abutment with respect to said arm and limiting relative movement of said plates, locking and releasing steps in the base of said notch, said releasing step being deeper than said locking step and being positioned nearer the free end of said arm, a pin on said arm, a tumbler formed with an arcuately shaped slot pivotally mounting said tumbler on said pin for longitudinal and lateral sliding and pivotal movements, an arcuately shaped releasing shoulder on the free end of said tumbler arranged to engage the periphery of said abutment when on said releasing step for releasing said abutment from said notch, an arcuately shaped locking shoulder on said tumbler adjacent said releasing shoulder and shiftable by movement of said tumbler when said plates are moved from said bed position to said intermediate position for overlying said releasing step to prevent movement of said abutment onto said releasing step, said locking and releasing shoulders substantially conforming in size and shape to said locking and releasing steps, and a stop on said latching arm for engaging said tumbler to limit movement thereof and prevent movement of said abutment into said releasing step when said locking shoulder overlies said releasing step.

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