Jan. 3, 1956 E. FEINSTEIN 2,728,922

FOLDABLE BED CONSTRUCTION

Original Filed Feb. 19, 1948 2 Sheets-Sheet 1

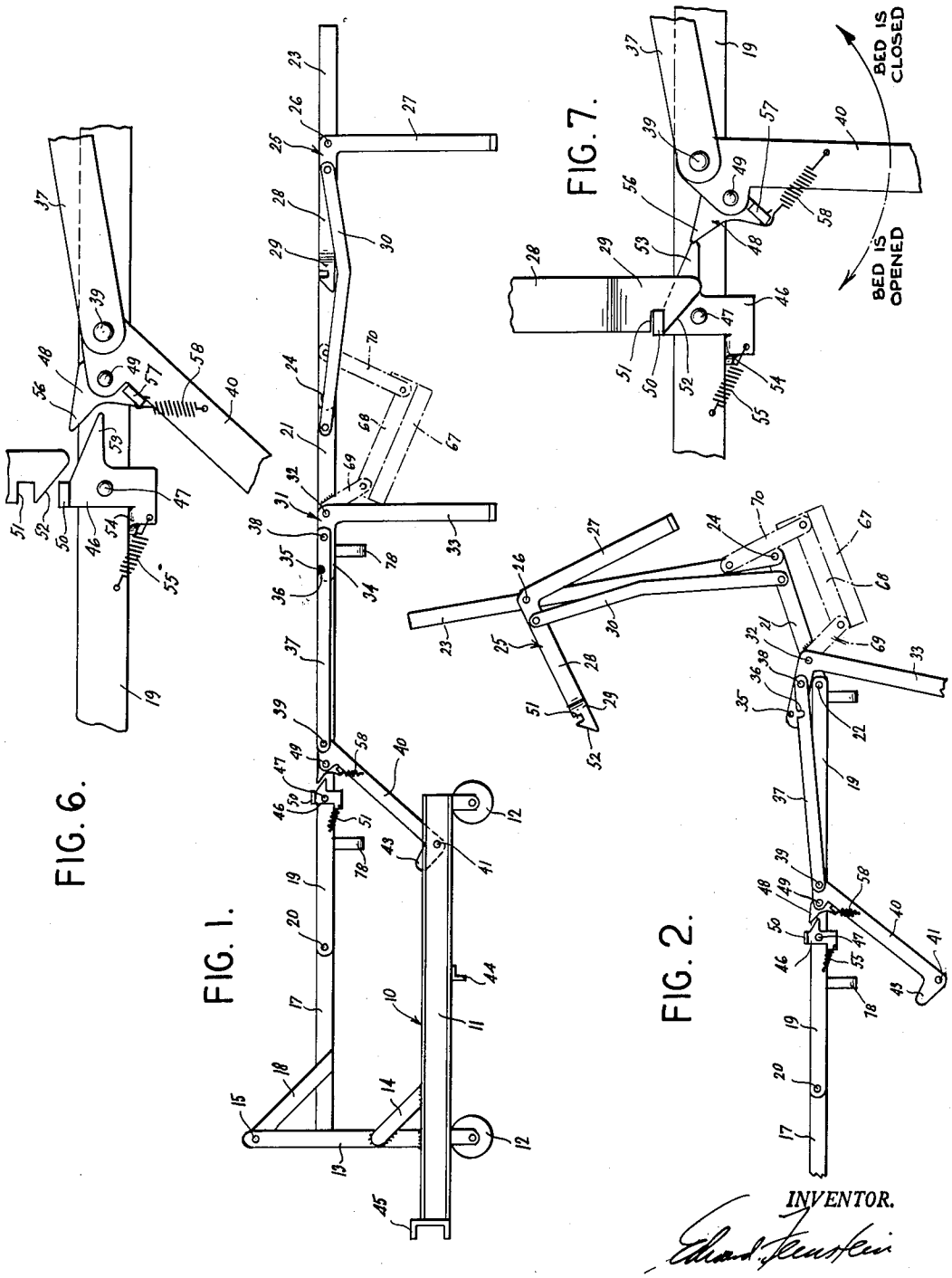


FIG. 6.

FIG. 1.

FIG. 7.

FIG. 2.

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FIG. 3.

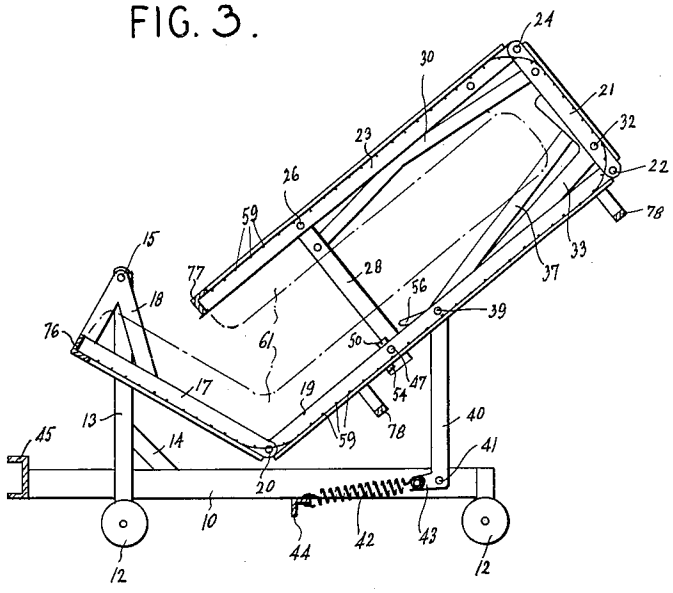


FIG. 5.

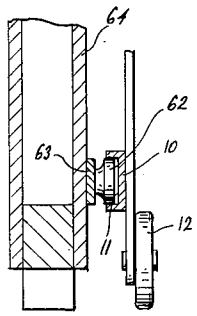
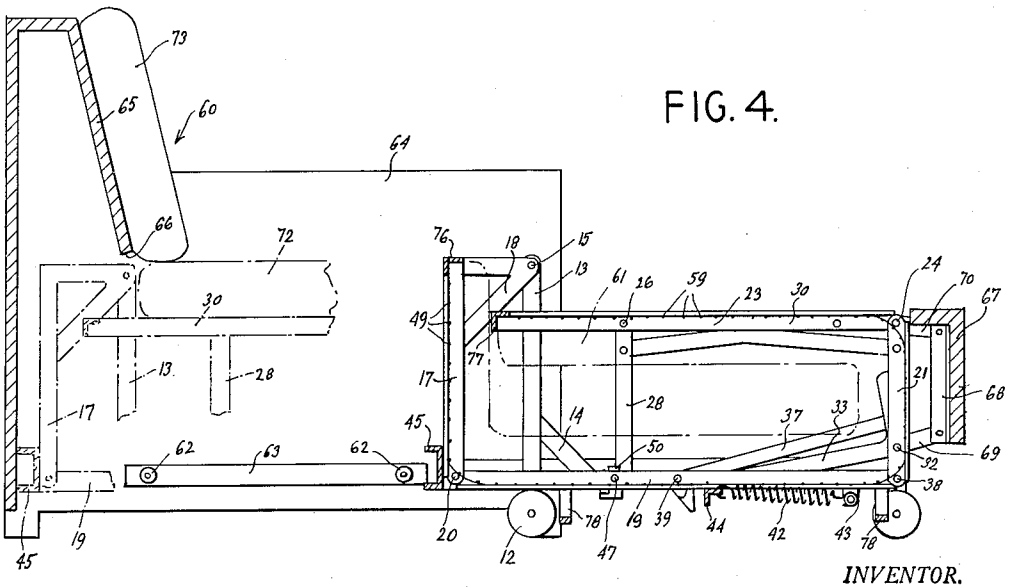


FIG. 4.



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FOLDABLE BED CONSTRUCTION

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Refiled for abandoned application Serial No. 9,481, February 19, 1948. This application August 10, 1953, Serial No. 373,256

3 Claims. (Cl. 5—13)

My invention relates to a new and improved foldable bed unit of the type which may be retracted within a couch, chair or similar article. This application includes subject matter contained in my prior U. S. patent application Serial No. 9,481, filed February 19, 1948, and now abandoned, and therefore constitutes a partial refiling of said application.

One of the principal objects of my invention is to provide a bed structure which can easily be folded into a compact unit of a predetermined size with a minimum of effort, and which can, with equal facility, be unfolded or extended to form a conventional bed.

Another object of the invention is the provision of a bed unit comprising a movable carriage carrying a foldable bed frame adapted to be retracted therein, the carriage being adapted to be used as a separate entity for storage in a closet or the like, or to be incorporated as part of a piece of furniture such as a sofa.

Still another object of the invention is to provide a bed unit of the character described having legs or floor supporting members adapted to fold automatically within the unit during the folding operation and also adapted to support the unit in its folded condition.

A further object of the invention is the provision of a bed unit of the character described in which latch means are provided to lock the bed unit automatically in its folded condition, the latch means being also adapted to unlock automatically when the folded bed unit is removed from its retracted position within the carriage.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which disclose by way of example an embodiment of the invention.

In the drawing:

Fig. 1 is a side elevation of the foldable bed unit assembly in its unfolded or extended position of use.

Fig. 2 is a side elevation similar to Fig. 1 with portions of the bed unit broken away, and showing the bed unit in a partially folded position.

Fig. 3 is a central longitudinal section showing the bed unit in a later stage of folding and partially retracted within its carriage.

Fig. 4 is a section similar to Fig. 3 showing the bed assembly in its fully folded and retracted position and also showing in broken line the manner in which it may be contained within a couch or sofa, the latter being also shown in section.

Fig. 5 is an enlarged section showing the means for mounting the bed assembly in a couch or the like.

Fig. 6 is an enlarged elevation showing the latch means of the bed unit in disengaged position.

Fig. 7 is an enlarged elevation similar to Fig. 6 but showing the latch means in engaged position.

Referring in detail to the drawings, and in particular to Figs. 1–3, the bed unit shown has a frame comprising a pair of base members or runners **10** which may be in the form of channel irons having guideways **11** for a

purpose which will be explained hereinafter. The base members **10** are provided with rollers or casters **12** by which the bed unit may be moved to a suitable location for storage or use.

An upstanding post **13** is secured adjacent the rear end of each respective base member **10**, each post being rigidly supported by a brace **14**. The base members **10** and the posts **13** together form a support carriage for the bed unit, being respectively joined by cross bars **44** and **45**.

The bed unit comprises pairs of inner section members **17**, middle section members **19**, intermediate section members **21**, and outer section member **23**, pivotally connected to each other. Since these members and their associated parts are identical on each side of the bed unit, only one side thereof will be described, it being understood that the description will apply equally to both members of each section.

To the upper end of each post **13** is pivoted an inner section member **17** at pivot point **15** by means of a suspension bracket **18**. The inner section member **17** is mounted to swing in a 90° arc as shown successively in Figs. 1, 3 and 4.

To the end of inner section **17** is pivoted the middle section member **19** at pivot point **20**, the other end of said middle section member being pivoted to the intermediate section member **21** at pivot point **22**. The latter section member is in turn pivoted at its front end to the outer folding section member **23** at pivot point **24**. Thus, the entire bed unit comprises an articulate or hinged structure, one end of which is pivoted to the posts **13**, from which and toward which it may be folded or unfolded.

The various section members may be made of angle iron or similar material for rigidity. To the outer folding section **23** is pivoted a bell crank **25** at pivot point **26**, one arm **27** of said bell crank **25** serving as a floor supporting leg when the bed unit is in extended position as shown in Fig. 1. In this extended position, the other bell crank arm **28**, which is perpendicular to the arm **27**, extends along the outer surface of the middle section members **21** in parallel relationship thereto. In order to limit the rotation of the bell crank **25** and maintain the arm **27** in its floor supporting position, the free end of arm **28** may be bent outwardly, as shown at **29**, to abut against a support bar **30** which has just enough of a bend to permit the arm **28** to lie parallel with the section members **21**. The bar **30** is pivoted at one end to the arm **28** and at the other end to the intermediate section members **21**.

A second bell crank **31** is pivoted to the intermediate section members **21** at a pivot point **32**, one bell crank arm **33** serving as a floor supporting leg when the bed unit is in its extended position of Fig. 1. The other bell crank arm **34** has a fixed pin **35** which fits within a slot **36** in the upper surface of support arm **37** whereby the bell crank arm **33** is locked in its vertical position. The support arm **37** is pivoted at one end to the bell crank **31** by a pivot pin or rivet **38** and at the other end to the middle section member **19** by a pivot pin or rivet **39**.

The pivot pin or rivet **39** also pivotally secures one end of a lever **40** to the middle section member **19**, adjacent the center thereof. Lever **40** is pivotally mounted adjacent its other end to the base member **10** at pivot point **41**. A coil tension spring **42** is connected at one end to a terminal lateral extension piece **43** of lever **40**, and at the other end to an angle iron **44** secured laterally between the pair of base members **10**, as shown in Figs. 3 and 4. This angle iron **44** together with an end lateral channel bar **45** connects the base members **10** and rigidly supports the carriage. The bed

unit is supported by a lateral angle iron 76 which connects the ends of the inner section members 17, an angle iron 77 connecting the ends of the outer section members 23, and a pair of U-shaped reenforcing bars 78 which connect the middle section members 19. The bed unit section members may also be joined by a continuous bed spring 59 extending the length of the bed unit upon which may be placed a mattress 61, shown in broken lines, the latter being folded together with the bed unit. Other bed clothes may of course be also stored within the folded unit.

Fig. 1 shows the bed unit in its fully extended position for use, the section members being supported from the carriage by the bracket 18, and lever 40, and being also supported upon the ground surface by the arms 27 and 33 of bell cranks 25 and 31.

When it is desired to fold the bed unit for storage, the outer folding section members 23 are raised and pushed rearwardly in the manner shown in Fig. 2, causing said outer section members 23 to move to a position above and parallel to the middle section members 19, with the intermediate section members 21 extending perpendicularly therebetween. In this folded position, the bell crank 25, under action of support bar 30, rotates in a clockwise direction until it assumes the position shown in Figs. 3 and 4 with its arm 28 extending perpendicularly between the section members 23 in this folded condition, as will be later described in greater detail. In this connection it may be noted that the arms 28 are of substantially the same length as the intermediate section members 21 so that the section member 23 will be level.

It will be seen from Figs. 2, 3 and 4 that as the bed unit is being folded, the bell crank 31 will pivot under action of the support arm 37 so that its long arm 33 assumes a position of rest along the outside of the middle section members 19, as shown in Fig. 4, and its short arm 34 similarly assumes a position of rest along the outside of the intermediate section members 21.

In this folded position of the bed unit, the section members 17 and 19 remain horizontal and co-extensive being supported spaced above the base members 10 by the suspension bracket 18 and the forwardly-inclined levers 40. The levers 40 are enabled to perform this supporting function since their upper pivot points 39 are forward of their lower pivot point 41.

After the bed unit has been folded in the manner heretofore described, it may be further retracted into the frame or carriage. For this purpose, the outer end of the folded bed unit is lifted manually as shown in Fig. 3, causing the joint between the inner section members 17 and middle section members 19 to be broken downwardly automatically at the pivot point 20, and said sections to fold toward one another. This movement is caused by the tilting action produced by the levers 40 which rotate in a counterclockwise direction about the pivots 41 and 39 aided by tension of spring 42, assuming a vertical position and raising the center of middle section members 19.

As was previously indicated, the springs 42 aid in the tilting of the middle sections 19 and the consequent breaking of the joint between the latter and the inner sections 17. It will be seen that spring 42 exerts a force on the lever arm 43 in the direction of the folding operation until the lever 40 reaches its vertical position of Fig. 3 in which the arm 43 is horizontal and the spring 42 is in its shortest condition. The folding operation of the bed then continues as the bracket 18 turns on its pivot 15 until the bed unit reaches its fully retracted position of Fig. 4, the spring 42 again being expanded and helping to cushion the final dropping movement of the folded bed unit. This final folding operation proceeds automatically under force of gravity until the inner section members 17 abut the channel iron 45 and are stopped thereby in a vertical position.

In this fully retracted position, the folded bed unit is supported on the carriage by the pivots 15 and also by the lateral angle iron 44 upon which rest the middle section members 19. In this position, the lever 40 lies parallel along the base members 10 as do the middle section members 19. When the bed unit is used as a separate entity without additional support, the channel iron 44 may be heavily weighted in order to prevent the carriage from toppling over due to the shifting of the center of gravity while the unit is being folded and retracted.

The spring 42 will also aid in the unfolding operation. It will be seen that when the bed unit is completely folded, as shown in Fig. 4, the arm 43 of lever 40 extends downwardly from the base member 10 so that the spring 42 through arm 43 will exert a force on the lever 40 in the direction of the unfolding operation. It will be understood that the force of spring 42 should be less than the force of gravity on the folding and unfolding section members.

The bed assembly also includes latch means which lock the bed unit in folded position, the latch means being also adapted to close automatically during the folding operation of the bed unit and to open automatically during the unfolding operation of the bed unit. The latch means comprises a latch member 46 pivoted at its center to the middle section member 19 by a pivot 47 and a detent 48 pivoted to the end of lever 40 by a pivot 49 adjacent the pivot 39. The member 46 has a top lateral latch plate 50 positioned to be engaged and held by a slot 51 in the outwardly-bent end 29 of arm 28. The arm 28 also has an inclined terminal cam surface 52 leading from the slot 51.

The latch member 46 has a forwardly projecting finger 53 having an inclined upper edge and a bottom lateral extension 54. A spring 55 biases the extension 54 into abutment with the bottom edge of middle section member 19 so that the member 46 is normally urged to the position shown in Fig. 6 in which its finger 53 is directed along the member 19 and parallel thereto.

The detent 48 has a finger 56 which faces the latch finger 53, and a lateral plate 57 to which is attached the end of a spring 58. The outer end of spring 58 is secured to the lever 40, so that tension of said spring 58 normally urges the detent 48 to the position of Fig. 6 in which its lateral plate 57 rests upon the edge of lever 40 and the finger 56 is located above the finger 53.

When the bed unit is being folded, the arm 28 carried by the outer section member 23 moves vertically downward, its inclined cam surface 52 engaging the latch plate 50 and pivoting the latch member 46 in a counter-clockwise direction, enabling the latch 50 to then snap into groove 51 under biasing force of spring 55, as shown in Fig. 7. When the folded bed unit is then retracted into its carriage, the lever 40 pivots in a counter-clockwise direction as indicated by the arrow in Fig. 7, the tip of finger 56 snapping past the tip of finger 53, but moving in such a direction as to not interfere with the locked condition of arm 28.

The folded bed unit remains in its locked position until it is lifted from the carriage, by raising the outer portion thereof, and again assumes the position of Fig. 3. At this time, the lever 40 pivots in a clockwise direction, carrying with it its finger 56. The top surface of finger 56 engages the bottom surface of finger 53, and since the edge of lever 40 abuts the plate 57 and thus restrains the finger 56 from pivoting, the rigidly-held finger 56 pivots the finger 53 away from it, moving the latch plate 50 out of the slot 51 and unlocking the arm 28.

By utilizing the movement of lever 40, therefore, the bed unit is automatically locked and unlocked during the respective folding and unfolding operations.

Since the bed unit and its carriage is able to operate as an independent assembly, it may be used separately without additional mounting. The unit may, on the other hand, be used in combination with an article of

furniture or the like, such as the couch **60** shown in Fig. 4. In such an instance, the base members **10** are provided with the channelled guideways **11** to engage rollers **62** which are mounted on bars **63** carried by the inner faces of the couch side walls **64**. The couch **60** has a hollow back, the front wall **65** of which has an opening **66** of sufficient size to allow the upstanding posts **13** to pass therethrough.

In order to enhance the appearance of the bed unit when the same is used as part of a chair, couch or similar article, a panel member **67** of wood or the like may be provided to cooperate with the article of furniture to hide the folded bed unit. This panel **67** is shown in Fig. 4 and in broken line in Figs. 1 and 2 as having end brackets **68** to each of which are pivoted levers **69** and **70**. The other ends of levers **69** are pivoted to the intermediate section members **21** at pivot points **32**, while the other end of levers **70** are pivoted to the outer section members **23**. It will be noted that the relative lengths of the levers **69** and **70** are so chosen that the panel **67** will extend in front of the intermediate section **21** when the bed unit is in folded position, as shown in Fig. 4. When the bed unit is unfolded, the panel **67** depends below said bed unit, as shown in Fig. 1.

It will be understood that both sides of the bed unit are identical, and wherever one part is found on one side, it has a corresponding part on the other side.

When the bed unit is folded within the frame of a couch, chair, or the like, the outer section **23** may be covered with a conventional cushion **72** (shown in broken line in Fig. 4) matching the back cushion **73** of the couch.

While a preferred embodiment of the invention has been shown and described herein, it is obvious that numerous additions, changes, and omissions may be made therein without departing from its scope.

I claim:

1. A foldable bed unit comprising a base, a pair of spaced posts extending from said base, an inner section pivoted at one end to said posts adjacent the upper end thereof, a middle section pivoted to the other end of said inner section, an outer foldable section and an intermediate section pivoted to said outer section and to said middle section, said outer section and said middle section forming the top and bottom respectively and said inner section and said intermediate section forming the rear and front ends respectively when said bed unit is in folded condition, a bell crank pivoted to said outer section, one leg of said bell crank serving as a supporting member for said outer section when in unfolded condition, the other leg of said bell crank engaging said middle section to support said outer section thereon in folded condition, a lever pivoted at one end to said base and at the other end to said middle section at a point forward of the base pivot point when the bed unit is in extended position, the leg of said bell crank which engages said middle section having a slot therein, said middle section having a pivotal latch member including a latch plate and spring means urging said latch member to a position in which the latch plate is receivable within said slot, said lever carrying pivoted detent means positioned to engage said latch means and move it out of engagement with said slot as the bed unit is unfolded.

2. A foldable bed unit comprising a base, a pair of spaced posts extending from said base, an inner section pivoted at one end to said posts adjacent the upper end thereof, a middle section pivoted to the other end of said inner section, an outer foldable section and an intermediate section pivoted to said outer section and to said middle section, said outer section and said middle section forming the top and bottom respectively and said inner section and said intermediate section forming the rear and front ends respectively when said bed unit is in folded condition, a bell crank pivoted to said outer section, one leg of said bell crank serving as a supporting member for said outer section when in unfolded condition, the other leg of said bell crank engaging said middle section to support said outer section thereon in folded condition, a lever pivoted at one end to said base and at the other end to said middle section at a point forward of the base pivot point when the bed unit is in extended position, the leg of said bell crank which engages the middle section having a slot therein, said middle section having a pivotal latch member including a latch plate, spring means urging said latch member to a locking position in which the latch plate is located to be received within said slot, and a projecting finger, said lever carrying a pivotal detent member having a projecting finger positioned to engage said latch member finger when said bed unit is folded and unfolded, said detent member having a stop member for limiting pivotal movement of said detent member upon engagement of the fingers only when said bed unit is unfolded, whereby said detent member finger moves said latch plate out of said slot when the bed unit is unfolded.

3. A foldable bed unit comprising a base adapted for insertion into a frame for a couch, chair or the like, a pair of posts extending from said base and spaced from one another to define the width of the bed unit, an inner section pivoted at one end to said posts adjacent the upper end thereof, a middle section pivoted to the other end of said inner section, an outer foldable section and an intermediate section pivoted to said outer section and to said middle section, said outer section and said middle section forming the top and bottom respectively and said inner section and said intermediate section forming the rear and front ends respectively when the bed unit is in folded condition, a bell crank pivoted to said outer section, one leg of said bell crank serving as a supporting member for said outer section when in unfolded condition, the other leg of said bell crank engaging said middle section to support said outer section thereon in folded condition and having a slot therein, means for limiting the rotation of said bell crank so as to maintain said legs in their respective supporting positions, a lever pivoted to said intermediate section, one arm of said lever serving as a support when the bed unit is in unfolded condition, means for causing the last mentioned lever to become folded within the bed unit during the folding operation, and means for automatically causing a folding action between said inner section and said middle section during the general folding operation, said means comprising a third lever pivoted at one end of said base and the other end to said middle section at a point forward of the base pivot point when the bed unit is in extended condition, said middle section carrying latch means and spring means urging said latch means to a position in which it engages the slot of said bell crank leg when the bed unit is in folded position, said third lever carrying pivoted detent means positioned to engage said latch means and move it out of engagement with said slot as the bed unit is unfolded.

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