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Metayer

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[54] **PIECE OF FURNITURE ADAPTED TO BE CONVERTED FROM A SEAT INTO A BED**

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[52] **U.S. Cl.** ..... **5/13,** 5/29, 5/57 B

[51] **Int. Cl.** **A47c 17/14**

[58] **Field of Search** ..... 5/12, 13, 14, 17, 5/18, 28, 29, 38, 48, 57 B; 297/462

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[57] **ABSTRACT**

The piece of furniture is adapted to constitute a bed which, in the folded position obtained by an easy maneuver ensuring the locking of the folded elements, presents very reduced overall dimensions. The bed base comprises two head elements followed by an horizontal element, an intermediary element and a final leg element. The locking in the folded position is ensured by side plates each directly pivoted on the intermediary element and, through links, on two legs the maneuver of which is automatically ensured when the bed base is actuated. The leg element comprises a flexible seating to be used in the seat position of the piece of furniture.

8 Claims, 15 Drawing Figures

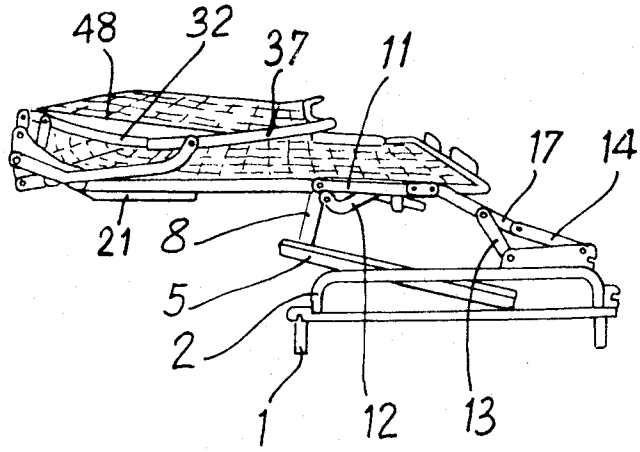

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Fig:1

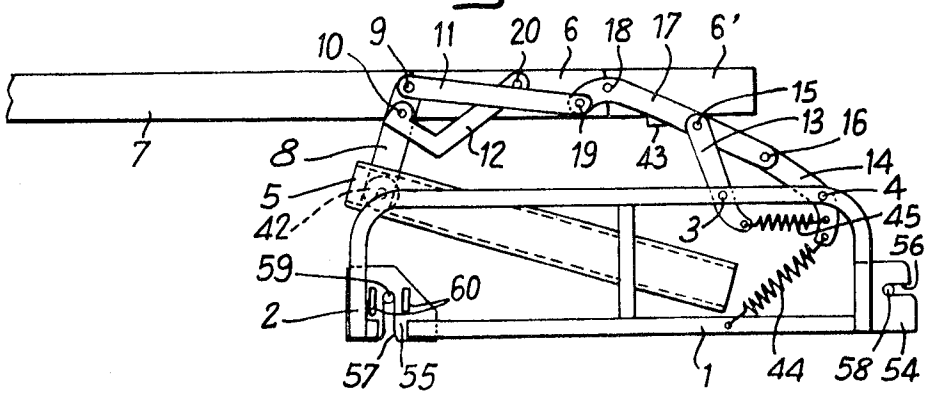

Fig:2

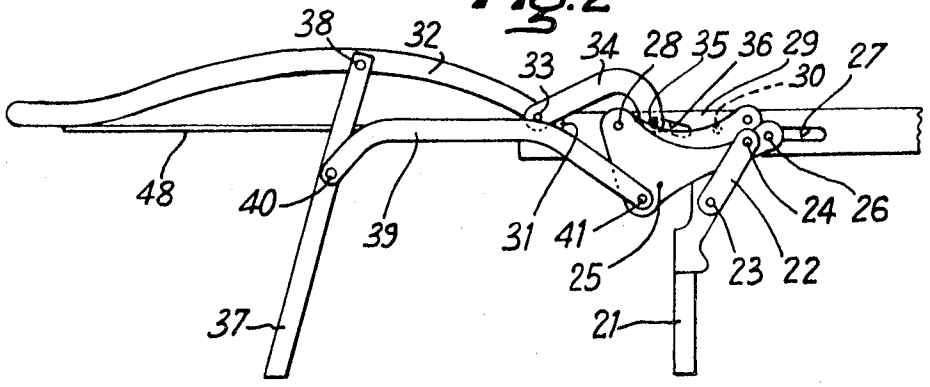

Fig:3

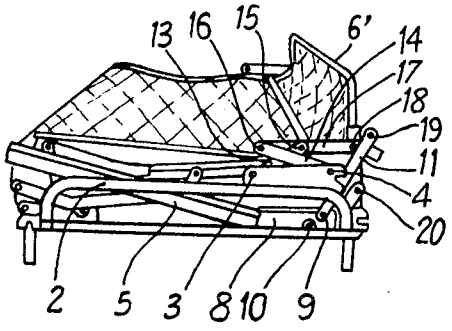

Fig:4

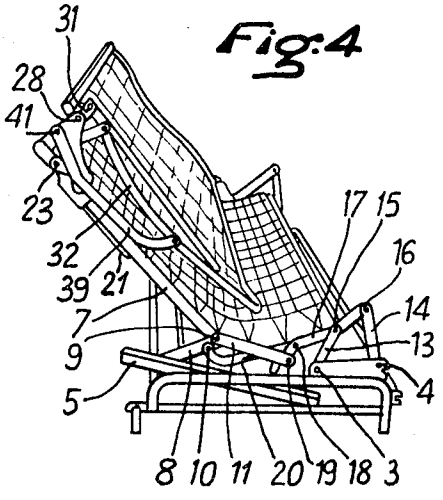

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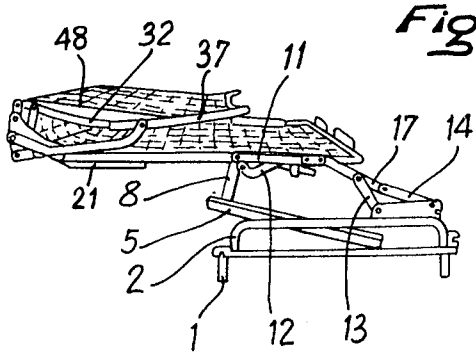
Fig: 5



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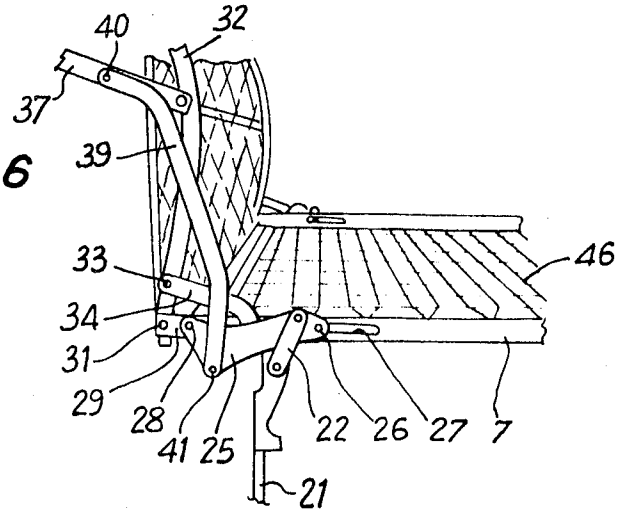

Fig: 7

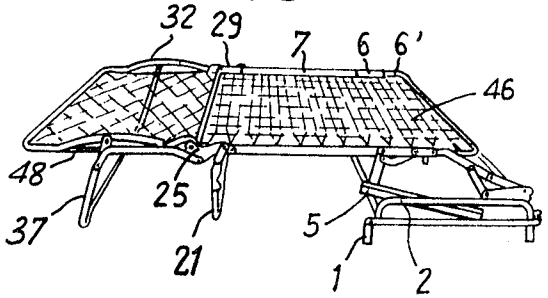

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Fig:8

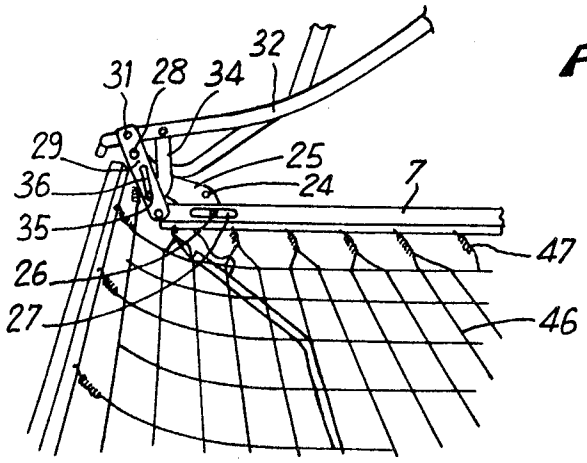

Fig:9

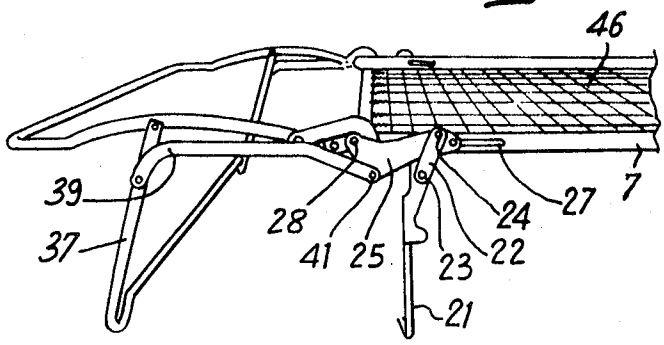

Fig:10

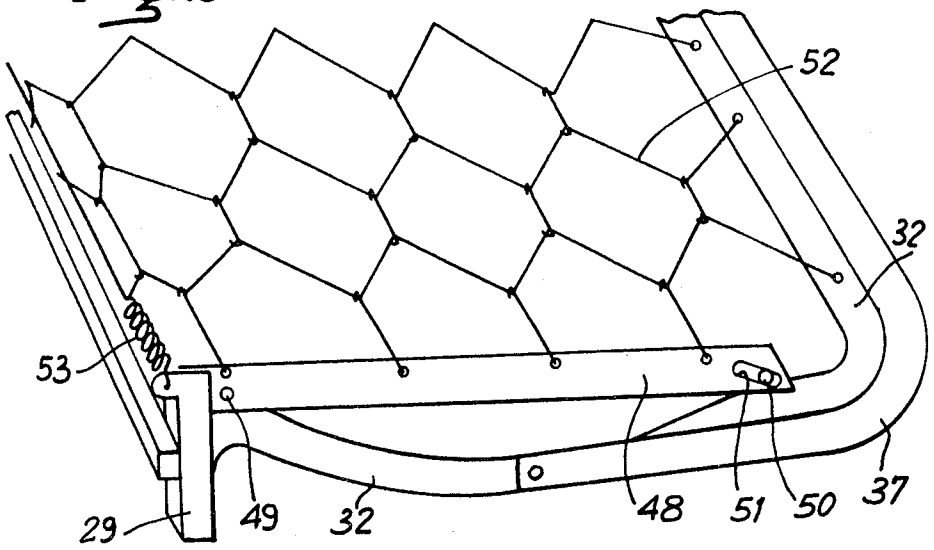

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Fig:11

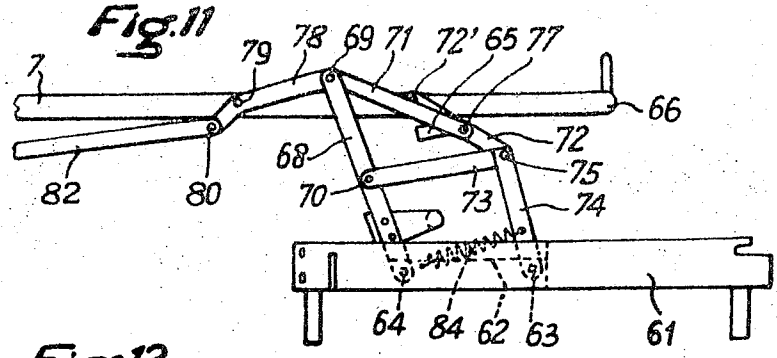


Fig:12

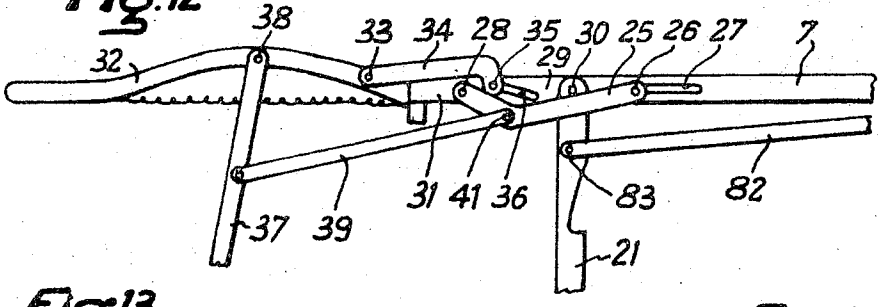


Fig:13

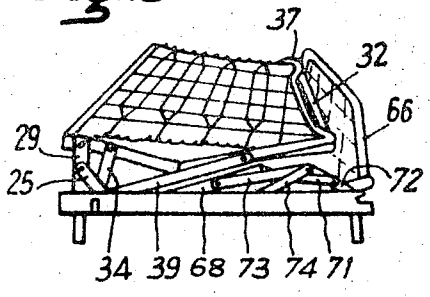


Fig:14

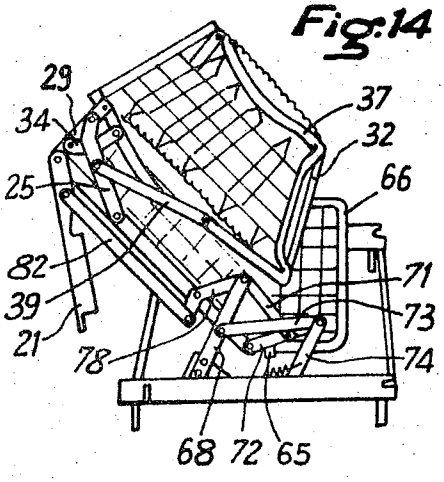
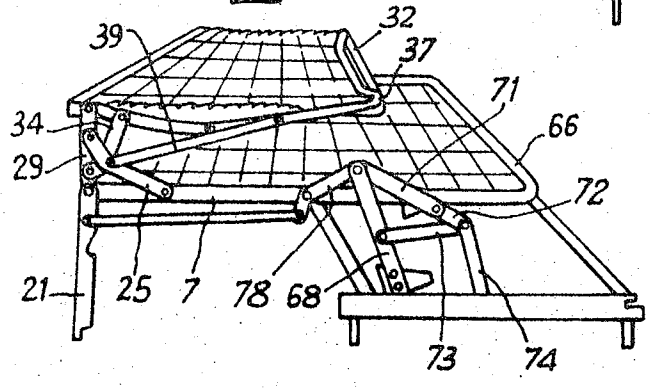


Fig:15



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PIECE OF FURNITURE ADAPTED TO BE CONVERTED FROM A SEAT INTO A BED

The object of this invention is a piece of furniture adapted to be converted from a seat into a bed by unfolding successive elements which form the bed base, from head to foot, and by unfolding legs designed to support the elements used in the bed outside the furniture piece's assembly.

The aim of this invention is to form a bed-base structure as simple and easy to handle as possible which can be used in a folded position as a seat in a beautiful "display" shell, and can be unfolded by pulling forward, passing over an attached front wooden-frame outside of which the legs automatically unfold. This convertible piece of furniture can be completely folded up into a very compact unit that requires as little space as possible for transporting.

Although, in the form of an easy-chair or couch, the seat's width may correspond to the bed's width or length, the invention is particularly designed for the first case ; the bed-base structure consists then of at least a head element which, in the seat position, is placed at the base of the back of the piece of furniture's assembly.

The essential purpose of the present invention is to offer a mechanism designed to form a seat in as discrete a way as possible so that the esthetics of a "set" seat can be kept in a transformable seat ; the mechanism folds up into the place where the seat's stuffing was and all seat forms can be fitted, offering an extraordinary operating flexibility because of all this. The mechanism is also designed to assure, when folded up into the seat position, locking of the folded up leg elements so that the bedding is clamped inside these folded elements, independently of the pushing of the unit back inside the piece of furniture.

In order to obtain the results stated above, the invention is designed so that in the folded up position the furniture piece's bed base has two main horizontally superimposed elements jointed to an intermediary vertical element that folds up to the furniture piece's front surface and has jointed side parts ; each one of these can slide longitudinally on the main element and folds up under the other main element ; each one is jointed to the intermediary element as well as to a small connecting bar with a front support leg ; the front support leg is jointed to the upper main element in such a way that the folding up of the unit is done by the two main elements and the intermediary element. They are locked and unlocked under the controlling action on the front support legs, independently of the folding up operations of the other elements.

According to a first form of embodiment of the invention, the bed base has two reduced-length head elements that are jointed to one another and to the main bed-base element that follows the two head elements, the first head element is designed to be placed horizontally in the folded up position, over the rear of the so-called main element and at the base of the seat's back ; the two head elements are connected to the attached support frame and to the following main element by two lateral linkage means that initially cause, when the piece of furniture is opened into the bed position, an immediate raising up of the main element which follows the two head elements due to the arrangement (on each side of the bed base) of a small bar jointed between this main element and a pivoting lever, this pivoting lever being held by two arms that pivot on an attached support until the main element is raised up to a certain level.

According to a second form of embodiment of the invention, the bed base has a single head element connected also to linkage means that assure, when the piece of furniture is open, a raising up of the main element following the single head element ; in the furniture piece's seat position, this head element comes to a vertical position for reentry into the back of the seat and forms a prop for the seating cushions of this seat. In the bed position, this head element can be either folded back horizontally to support the bedding or held obliquely giving a better head support to the user. In the transporting position, this head piece can be folded back (from rear to front) in order to come into position in the space designated between the two main superimposed elements and the intermediary element.

In order to make the invention appear clearer, it will be described hereafter, as examples, a form of embodiment thereof and a variation with reference to the attached drawings in which :

FIGS. **1** and **2** show diagrammatically a bed base, according to the invention, with the head part and the foot part of the mechanism in the unfolded position (bed position);

FIGS. **3** to **7** show the bed base (in prospective) in the successive positions during unfolding of the bed ;

FIGS. **8** and **9** show the details of the locking device in an intermediary position ;

FIG. **10** shows (in prospective) a leg element in the folded back position when the piece of furniture is used as a seat ; and

FIGS. **11** to **15** are views corresponding respectively to FIGS. **1–5**, of a variation of the bed base according to the invention.

To make the description easier, it will be noted first that for the represented piece of furniture, the bed-base structure is symmetrical with respect to a median vertical plane and that the jointed and guiding systems of the movable parts are located on both sides of the structure in symmetrical positions in such a way that it will be sufficient to describe only one of the two sides of the structure. The attached part is housed inside the furniture piece's shell which is not represented because it is not part of the invention and can be represented in any outside form whatsoever provided that the inside of the shell can accept the foldable bed base, following the invention.

Referring first to FIGS. **1–10**, a piece of furniture may be represented according to the invention in the following way : the fixed part, housed inside the furniture piece's shell (not represented), is composed of a rectangular metal frame **1** that has on each side a raised side support **2** which has toward the rear, that is, toward the back of the piece of furniture, two jointed points **3–4**, one in front of the other, in front of which is an oblique groove **5** on frame **1**. This groove goes from front to rear so that a roller **42**, of the jointed linkage connected to frame **7** of the bed-base element located in front of the two head elements, can slide (the frames of these head elements are shown in **6-6'**). This roller is secured to the end of an arm **8**, toward the other end of which are jointed at **9–10**, the ends of two small bars **11–12**. The ends of pivoting arms **13–14** are jointed to the points **3–4** and the other ends of **13–14** are jointed at **15–16** to a pivoting lever **17** jointed at **18**

on frames 6–6' and at 19 to the end of the small bar 11. The end of the small bar 12 is jointed to frame 6 at a point 20 located below joint 18 in the seat position and in front of this same joint in the bed position. Frame 7 is jointed by means of its rear end on joint 9.

In the seat position (FIG. 3), frame 7 is pushed back behind in such a way that its joint 9 on arm 8 is behind the fixed frame 1, the arm 8 being placed horizontally from the rear end of groove 5. By means of joint 19, the small bar 11 has pushed back toward the rear the pivoting lever 17, thus lifting frame 6 around joint 20, in such a way that the small bars 13–14 have an "X" configuration, since joint 15 is disposed between joints 16 and 18 of lever 17. When the folding up movement is completed, element 6' has pivoted on joint 18 and is folded back forward to an horizontal position.

If, starting from this seat position, one pulls up the intermediary frame 29 disposed vertically forward into the seat position, this frame 29 drives frame 7, and as a result joint 9, so that arm 8, drived by the small bar 11, is pulled upward, which immediately raises frame 7 causing lever 17 (FIG. 4) to pivot, while a continuation of pulling on frame 7 moves arm 8 toward the front along groove 5 and, during this operation, arm 8 is raised up to its final position (FIG. 2). A forward pulling thrust applied to frame 7 causes at the same time the folding back, in the rear direction, to the horizontal, of the frames 6 and 6' and the raising of the small bar 17 ; then the small bar 17 is inclined toward the rear by the small bar 11, joint 16 being held down in position by arm 14.

When frame 7 is completely pulled out and arm 8 has slid along groove 5 to its final position, then the small bar 17 is pulled forwards and upwards by its joint 19 on the small bar 11, and is an extension of the small bar 14. In this position, joint 20 of the small bar 12 is in front of joint 18 at the same height, and frames 6–7 are horizontal extensions of one another. Frames 6, 7 and 6' form the three head elements of the bed base in the bed position.

At the front end of frame 7 is pivoted a leg 21 which, in the seat position, is raised up under this frame 7. This leg is actuated by a small bar 22 which is jointed at 23 on leg 21 and at 24 on a control plate 25. Joint 24 is to the back of plate 25, but the former is still doted behind with an axis 26 which slides in a horizontal slot 27 housed in frame 7, towards its front end, but behind of the joint of leg 21. In front and toward the top, plate 25 is jointed at 28 on an intermediary frame element 29 jointed at 30 on frame 7 and at 31 on frame 32 of the leg element of the bed base. Near joint 31, the frame 32 is jointed at 33 to a small bar 34 which ends by an axis 35 sliding into an inclined slot 36 of the intermediary element 29.

Frame 32, towards the middle of its length, has a leg 37 jointed at 38, and a small bent bar 39 is jointed from one part at 40 on the leg 37 and at 41, at an angle in front of the bottom of the triangular plate 25. The leg 37 is in the shape of a transversal " U" frame two branches of which are jointed at 38 on both sides of frame 32.

When the bed base is in the seat position, frame 32 is folded up above frame 7 and leg 37 is folded back toward the rear on frame 32, the sliding axis 26 being located at the bottom of the running surface in the guiding slot 27. If leg 37 is raised, the sliding axis 26 can slide in front of plate 25, which folds back leg 21 by means of the small bar 22 and, when plate 25 has completely slid by, leg 21 is in the vertical support position. A continuation of pulling forwards on leg 37 has then for an effect a raising of frame 32 (FIG. 6) during which the sliding axis 35 of the small bar 34 is moved into its guiding slot 36 toward the front. When frame 32 is completely lowered to the horizontal position (FIG. 7), the small bar 39 has brought leg 37 into the vertical support position on the ground.

In order to assure the folding up of the mechanism from the bed position, first of all frame 32 is raised, so that the small bar 34 slides toward the rear into the inclined slot 36 of the intermediary element 29, with the effect of maintaining the elements 32 and 39 at right angles ; at this time, locking is not done.

By pushing on element 32, part 25 slides into the slot 27 of element 7, but this sliding is not done until it is at the bottom of the running surface. A pressure towards the bottom on leg 37 in the direction of element 32 is required so that there is complete sliding. Pressure on leg 37 drives the small bar 39 which pivots part 25 and the former goes to the bottom of the running surface of slot 27. At this time, locking is completed and the bedding is clamped between elements 32 and 7.

In order to make the drawing clearer, in FIG. 3 the frame 6' is represented in the raised position when the mechanism is in the seat position. However, another improvement in the invention is provided for in this seat position ; the frame 6' is folded back in front, horizontally above the bed base part located then in back ; this folding back is assured automatically by the stop 43 of lever 17 (FIG. 1) acting behind frame 6'. As soon as the reentry movement begins, element 6' is supported on stop 43 and, as the movement continues, the small bar 17 pivots toward the rear so that stop 43 folds back element 6' which comes to the horizontal position, serving thus as a prop for the seat cushions and preventing them from sliding under the back. Moreover, in the transporting position of the mechanism — without bedding — the element 6' is folded back even more obliquely under element 32, which assures a very favorable reduction in space.

The mechanism so far described is completed by the set up of spring 44, hooked between frame 1 and the end of lever 14, and spring 45, hooked between the lever ends of 13–14. These springs are designed to make unfolding and folding maneuvers easier.

The various bed-base elements 6', 6, 7, and 29 support a steel-wire (or another type of material) network 46 connected to the corresponding frame by means of helical springs 47. On the front end (in the seat position as shown at FIG. 10) of each side of frame 32, the end of a flexible steel strip 48 is attached by a rivet 49 while, at the other end of this steel strip, a rivet 50 secured to frame 32 slides into a slot 51 provided on this flexible strip. The two lateral flexible strips 48 of FIG. 10 are interconnected by a flexible network 52 which forms in front (in the seat position shown at FIG. 10) a flexible front surface held on each side by a spring 53 which is attached to the intermediary element 29. It will be understood that in the seat position, the flexible strips 48 make up a flexible seating bent by sliding on the rivets 50.

The base support 1 has four vertical steel plates at its corners which make up the two rear plates 54 and the two front plates 55 (FIG. 1). Plates 54–55 have slots 56 and 57, horizontal and vertical respectively, which are

designed to lock into long bolts **58–59** attached to the wooden furniture piece's frame. In addition, straps can be provided for on the plates, such as the straps indicated at **60** on plate **55**, to receive for each plate a cotter-pin which is placed against the associated long bolt to strengthen the attachment.

A variation of the piece of furniture according to the invention is indicated now in FIGS. **11–15**. In this variation, identical or analogous members to those represented in FIGS. **1–10** (for this type of operation) are designated by the same reference numerals. On frame **61**, there is attached a side support **62** to which is jointed at two points **63** and **64** (the first toward the rear and the second toward the front) the lateral linkage of the mechanism, this latter being thus a carrier of the furniture piece's "furnished unit". It will be understood that, without pulling out the invention's framework, the side support **62** could be mounted on the inside part of the furniture piece's shell and, in this case, the mechanism is carried by the furniture piece's "furnished unit".

On support **62**, the end of pivoting arm **74** is jointed at **63**, while the other end of **74** is jointed at **75** to the small bars **72** and **73** ; and the end of pivoting arm **68** is jointed at **64** on support **62** while the other end of **68** is jointed at **69** to a pivoting lever **71** jointed at **77** to the small bar **72**, which is jointed in turn at **75** to the small bar **73** and to the arm **74**, and, at **72'**, to the end of the single head element **66**. A spring **84** is attached by its rear end to the pivoting arm **74**, and, in the front, to support **62**. Frame **7** of the middle element is jointed at **72'** to the head element **66**, and a bent small bar **78** is jointed, on the one hand at **69** to the arm **68** and to the lever **71** and, on the other hand, at **79** to the frame **7**, and finally at **80** to a small bar **82** the other end of which is jointed at **83** to leg **21**, this latter being also jointed at **30** to the rear end of frame **7**. This joint **30** acts also as a connection between frame **7** of the middle element and the intermediary element **29**.

The control mechanism for folding and locking the middle element **7**, the intermediary element **29**, and the leg element **32** will not be described, for it is exactly the same as that described in FIGS. **1–10**, only if the control device **25**, instead of in the form of a triangular plate jointed by means of a small bar to leg **21** of element **7**, is in the form of a bent part which is no longer connected to leg **21**, the movement of this last one being then controlled by the small bar **82**.

When the piece of furniture is in the seat position (FIG. **13**), frame **7** of the middle element is placed toward the rear so that joint **69** to arm **68** is behind support **62**. Lever **71** is pushed into the horizontal position and the small bar **72** pushes the head element **66** into the vertical position, lever **71** and arm **74** being then in an "X" configuration. As shown above, elements **7** and **32** are superimposed in the horizontal position and element **29**, set in the vertical position, forms the bedding recess. Leg **21** is folded back against element **7**. If, starting from this seat position, the vertically set intermediary element **29** is pulled upwards, this element **29** drives in this movement the frame of element **7** and, as a result, joint **69**, so that arm **68** drives lever **71** and is pulled upwards, that immediately raises frame **7** (FIG. **14**), causing arm **74** to pivot, while spring **84**, which is extended when in the seat position of the furniture piece, returns to its initial position, driving arm **74** forward. In this movement, arm **74** drives the small bar **72**, pivoting horizontally the head element **66** which engages the stop **65**, the small bar **78**, and in its extension the small bar **82** which pushes leg **21** back towards the front until it is brought up into the vertical position when the maneuver is completed (FIG. **15**). The unfolding of the leg part of the furniture piece as well as its folding up and its locking into a folded position are executed in the way already described in reference to FIGS. **1–10** and will not be described again.

In order to fold the head part of the furniture piece, the terminal transversal bar of element **32** (FIG. **15**) is grasped to raise it and push it back. As soon as the reentry movement is started, the head element **66** is supported on stop **65** which is on the small bar **72** and the head element **66** then comes to the vertical position inside the back of the furniture piece forming the seat.

It will be noted that, in order to transport the mechanism in the folded position, the head element **66** folds back from rear to front around its joint **72'**, coming to rest against two pinions attached to the middle element **7** and housed in the space designed for the bedding, that is, between element **7**, the seated element **32**, and the intermediary element **29**. The folded mechanism, therefore, is in the form of a rectangle-parallelepiped, particularly good for transporting it.

It will also be noted that in the unfolded position of the furniture piece (for making the bed), the head element **66** can either, as described, be folded back horizontally to support the bedding or be held in an oblique position to assure the user a suitably relaxing position.

It will be pointed out that the examples of execution described above and represented in the attached drawing have no specific restrictions and that certain elements could be replaced by equivalent ones. In addition, in order to make the drawing clearer, certain figures have been simplified by omitting elements represented on other figures.

What I claim is :

1. A bed base for a piece of furniture adapted to be converted from a seat into a bed comprising a fixed frame, at least one head element, levers pivotally connecting said head element to said fixed frame in such a manner that said head element moves inside the back of the piece of furniture in the seat position, a main frame pivotally connected at its back end to said head element, an intermediate element pivotally connected to the forward end of said main frame, a leg element pivotally connected at one end to said intermediate element, a first leg, a bed base, means pivotally connected said bed base to said first leg at its upper end to said main frame in such a manner that said first leg folds under said main frame when said bed base folds from the bed position to the seat position, a second leg pivotally connected at its upper end to said leg element and capable of being folded forward along said leg element, a bar pivotally connected at one end to said leg element, said intermediate element having an inclined side slot, a pin on said bar slideably positioned in said slot for folding said leg element at right angles to said intermediate element, a control member pivotally connected at one end to said intermediate member, a transverse pin on the other end of said control member, said main frame having a side slot with said control member pin slideably positioned therein, a bar pivotally connected at one end to an intermediate part of said control member and at its other end to said second leg whereby the thrust exerted on said second leg at the

end of the folding movement of said leg element brings said leg element parallel to said main frame causing the abutment of said transverse pin of said control member against the back end of said main frame slot and thus the locking in their folded positions of said main frame, intermediate element and leg elements.

2. A bed base as claimed in claim **1** including two head elements, a lever pivotally connected to said head elements, a pair of arms pivotally connected to said lever and said fixed frame, a grooved bar, a roller in said grooved bar, a roller arm carrying said roller and pivotally connected to said main frame, a small bar pivotally connected to said roller arm and said lever whereby the pulling forward of said main frame causes said head elements to be raised upwardly.

3. A bed base as claimed in claim **2** wherein support legs are pivotally connected to said main frame, small bars are pivotally connected to said support legs and said intermediate elements whereby said legs are automatically extended to vertical positions during sliding of said intermediate elements from the rear to the front of said main frame.

4. A bed base comprising a fixed base support, a main frame, a head element pivotally connected to said main frame, a first arm pivotally connected to said base support, a small bar pivotally connected to said first arm and to said head element where said head element is pivotally connected to said main frame, a second arm pivotally connected to said base support, a second arm pivotally connected to said second arm and said small bar, a bent control lever pivotally connected to said main frame, said second arm and a connecting arm pivotally connected to said second arm and said first arm.

5. A bed base as claimed in claim **4** including a spring means connecting said first arm to said base support tending to draw said first arm towards the front of said base support in order to permit an easier unfolding of the head element.

6. A bed base as claimed in claim **4** including support legs pivotally connected to said main frame, connecting arms pivotally connected to said support legs and said bent control lever.

7. A bed base as claimed in claim **4** including a flexible seating on said support legs, providing a spring support for the bed base in the bed position and a cushion support in the seat position.

8. A bed base as claimed in claim **7** wherein said leg elements have the form of a frame with concave sides, resilient means moveably connected to said frame sides and attached to said flexible seating whereby said seating can bend under the weight of users of the bed base when used as a seat.

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