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FOLDING BED STRUCTURE

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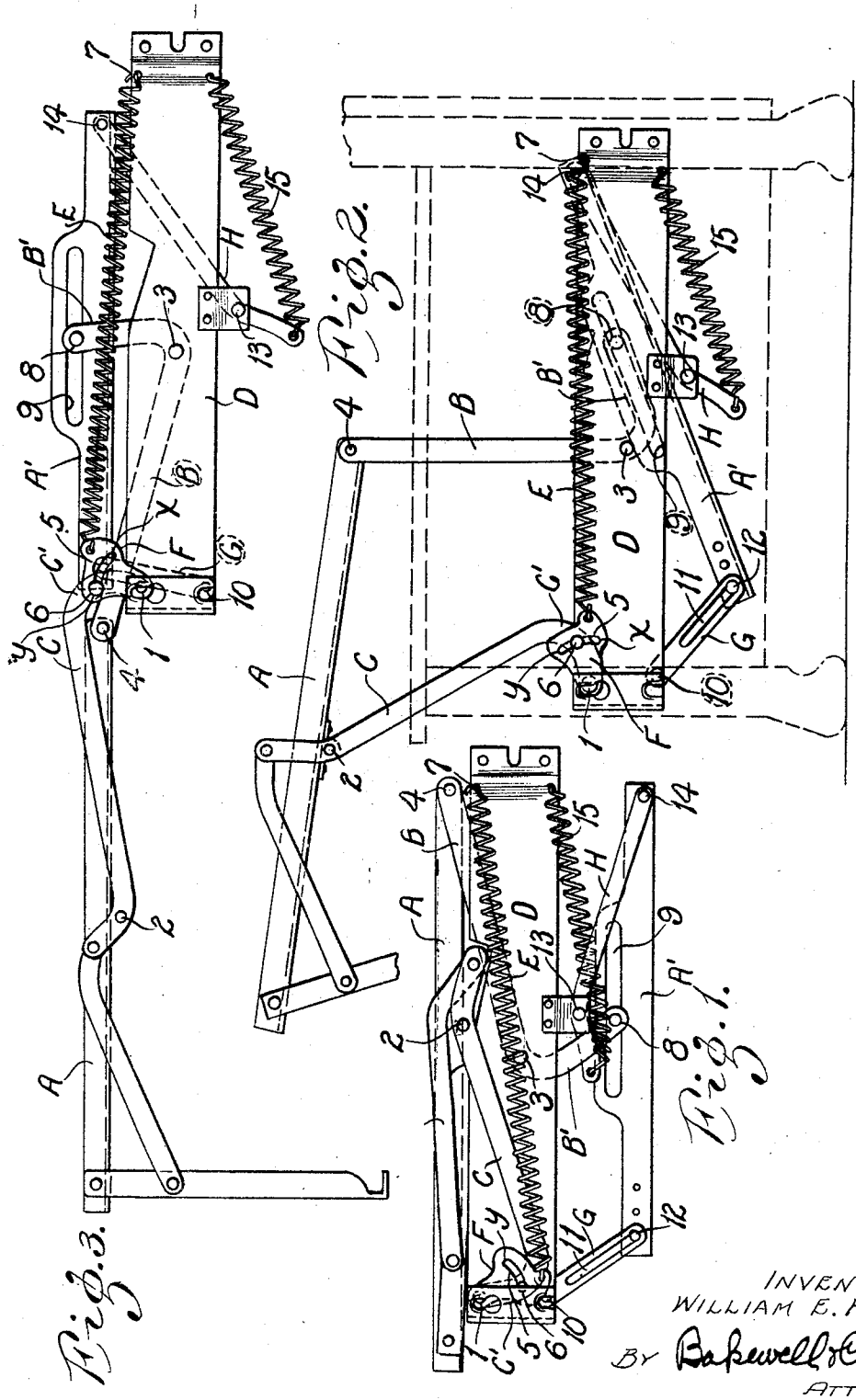


Fig. 3.

Fig. 2.

Fig. 1.

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FOLDING BED STRUCTURE

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This invention relates to folding couches, davenports and daybeds of the type in which the mattress supporting means is composed of two sections arranged in superimposed relation, when the couch is closed, and an operating mechanism for causing said sections to lie in the same horizontal plane when the structure is to be used as a bed and for restoring said sections to their normal superimposed relationship when the structure is to be used as a couch, davenport or the like.

In order to facilitate the operation of opening and closing the structure and prevent the top section or extensible section of the mattress supporting means from coming to rest with a sudden shock or jar, both in the opening operation and in the closing operation, it has been common practice to equip the operating mechanism with a spring, or with duplicate springs, arranged so that in the first portion of both the opening operation and closing operation they will assist in the movement of the levers or links that impart movement to the extensible section, and in the final portion of both the opening operation and the closing operation, they will check or retard the movement of said levers or links. The springs referred to are usually attached at one end to a stationary part of the structure and attached at the other end to swinging links, levers or rockable elements in such a manner that they are under considerable tension at all times, even when the swinging links, levers or rockable elements are passing through their dead center position in the operation of opening or closing the structure. Accordingly, an operating mechanism of the kind referred to, after being set in operation, either to open or close the structure, has a tendency to hesitate or slow down when the rockable elements to which the said springs are attached are passing through their dead center position, due, of course, to the fact that the spring or duplicate springs that are used to arrange and also check the movement of certain rockable elements of the mechanism exert considerable force or pull on the same, even in the midway position or dead center position of said rockable elements.

In folding couches, davenports and similar bed structures it is highly important that the operating mechanism for the mattress supporting means acts substantially uniformly throughout its entire cycle and be free from what is commonly referred to as a "hard spot" in its midway position, and the main object of my invention is to provide a folding couch, davenport, daybed or the like whose operating mechanism has this desirable characteristic.

To this end I have devised a folding bed structure of the general type previously referred to, whose operating mechanism comprises a combined actuating and shock absorbing spring, or a pair of such springs, which, instead of being connected at one end directly to the rockable elements which they move or retard the movement of, are attached to connecting members that are capable of moving or shifting relatively to said rockable elements in such a manner when said rockable elements are passing through their dead center position, that said springs will not impose a load on said rockable elements at such times, or produce what is commonly referred to as a "hard spot" in the cycle of the operating mechanism of the structure. My invention is applicable to any type or kind of folding bed structure in which the operating mechanism comprises a spring or duplicate springs arranged so that the same spring which assists in the movement of a rockable element of the mechanism at one point in the cycle of its operations, will also check or retard the movement of said element at a different point in its cycle.

Figure 1 of the drawings is a side elevational view, more or less diagrammatic, of my improved operating mechanism for folding bed structures, showing the parts of said mechanism in the position they assume when the structure is closed.

Figure 2 is a similar view, showing the parts of the operating mechanism in their midway position, either in the operation of opening or closing the structure; and

Figure 3 is a similar view, showing the parts of the operating mechanism in the position they assume when the structure is open.

In the accompanying drawings, which illustrate the preferred form of my invention, A and A′ designate the top and bottom sections, respectively, of the mattress supporting means of a folding couch, davenport, daybed or the like, each of said sections usually consisting of a rigid frame equipped with any suitable kind of means for sustaining a pad or mattress. When the structure is closed, as shown in Figure 1, the bottom section A′ is arranged directly underneath the top section A and far enough below the same to enable a mattress to be maintained in a folded condition upon the bottom section A′, the top section A at such times usually serving as a support for a removable upholstered seat (not shown). To open the structure the top section A of the mattress supporting means is raised and pulled forwardly, as shown in Figure 2, which operation causes the bottom section A′ to move upwardly into horizontal alignment with the top section so as to form a flat supporting surface for the mattress. I have herein illustrated my invention embodied in a folding bed structure of the type in which the bottom section of the mattress supporting means is arranged at a point considerably below the top section of the mattress supporting means when the structure is closed, and is caused to assume an angular position or downwardly inclined position during the opening operation and during the closing operation so as to eliminate the possibility of the rear edge of the top section A striking against or rubbing upon the folded mattress carried by the bottom section A′. I wish it to be understood, however, that my present invention is not limited to a folding bed structure of the particular type herein illustrated, and that it is immaterial how the underneath section of the mattress supporting means is mounted and operated, so long as the operating mechanism of the structure comprises a spring (or plurality of duplicate springs) that performs the dual function of assisting in the movement and retarding or checking the movement of an oscillating element of the operating mechanism

The operating mechanism of the structure herein illustrated comprises a pair of swinging members C arranged at the opposite ends of the top section A of the mattress supporting means, and a pair of swinging members B also arranged at the opposite ends of said top section A. In view of the fact that the complete operating mechanism of the structure comprises duplicate members or elements arranged at the opposite ends of the sections A and A′, I will hereinafter refer only to one set of the elements or members of the operating mechanism. The swinging member C consists of a link or lever which is provided at one end with an angularly-disposed arm C′ that is pivotally connected at 1 to a stationary supporting plate D carried by one of the end frames of the structure which is shown in broken lines in Figure 2. Adjacent the opposite end of said swinging member or lever C is a pivot pin 2 that pivotally connects it to the top section A of the mattress supporting means intermediate the front and rear edges of said top section. The swinging member B also consists of a lever or link that is pivotally connected at 3 to the supporting plate D and pivotally connected at 4 to the rear edge of said top section A. At the lower end of said lever B is an angularly-disposed arm B′ arranged at the opposite side of the pivot 3.

A coiled contractile spring E is combined with the swinging member or lever C in such a way that when the structure is in its closed position, as shown in Figure 1, said spring exerts a pull on the member C in a direction tending to swing it forwardly, so as to move the top section A into its extended position, and when said top section is approaching its extended position, the spring E checks or retards the forward movement of the member C. Likewise, when the structure is open, as shown in Figure 3, the spring E exerts a pull on the swinging member C in a direction tending to assist in the rearward movement of said member C, during the operation of closing the structure, and when the top section A is approaching its closed or retracted position, the spring E checks or retards the rearward movement of the swinging member C. Instead of connecting the front end of the spring E directly to the angularly-disposed arm C′ of the lever C, as has heretofore been the usual practice, I connect the front end of the spring E to a shiftable or movable member F that is combined with the lever C in such a way that it will move with said lever during the first portion of its forward stroke, will then stop and remain at rest while the lever C is traveling through its dead center position, and thereafter, will be picked up and moved forwardly by the lever C during the latter portion of the forward stroke of said lever. Likewise, when the lever C is swinging rearwardly from the position shown in Figure 3 into the position shown in Figure 1, the member F will move with the lever C during the first portion of its stroke, it will then stop and remain at rest while said lever is traveling through its dead center position, and thereafter, will be picked up and moved by the lever C during the final portion of the return stroke of said lever. In this way I eliminate a "hard spot" in the operating mechanism, for when the lever C is passing through its dead center position, the spring E exerts no tension or load on said lever. In other words, in my improved operating mechanism, the spring E assists in the movement of the lever C during the first portion of the cycle of said

lever to extend or retract the top section A of the mattress supporting means; it also checks or retards the final portion of the stroke of said lever and prevents the top section A from coming to rest with a sudden shock or jar, but at the time when the lever C is passing through its neutral, intermediate or dead center position, either in the opening or closing operation, the spring E is automatically rendered inactive so far as the lever C is concerned.

The shiftable member F can be mounted and can be combined with the lever C in various ways to attain this highly desirable result. Preferably, the member F is pivotally mounted on the fulcrum pin 1 that is used to attach the lever C to the supporting plate D, and said member F is provided with an elongated, arc-shaped slot 5 that receives a pin 6 which projects laterally from the arm C′ of the lever C. When the structure is closed, as shown in Figure 1, the pin 6 bears against the end x of the slot in the member F, and thus holds said member F in such a position that the spring E is maintained under considerable tension. As soon as the user starts to raise the top section A of the mattress supporting means and move it forwardly in the operation of opening the structure, the spring E materially assists in the forward movement of the lever C, due, of course, to the fact that said spring exerts a pull on the member F whose surface x bears against the pin 6 on the lever C. At approximately the time the lever C reaches its midway position, the member F reaches such a position that its point of connection with the spring E is located in longitudinal alignment with the pivot 1 about which the member F turns and the point of connection 7 between the rear end of the spring E and the supporting plate D or other stationary part of the structure to which the rear end of the spring E is anchored. Accordingly, the member F will stop or come to rest, but the lever C will continue to move forwardly. While the pin 6 on the lever C is traveling lengthwise of the slot 5 in the member F, the spring E will be inactive, so far as the lever C is concerned, and will exert no pull or load on said lever, but as soon as said pin comes into engagement with the other end y of the slot in the member F, said member F will start to move forwardly with the lever C, and thus place the spring E under tension, with the result that said spring will effectively check or retard the forward movement of the lever C sufficiently to prevent the top section A of the mattress supporting means from coming to rest in its extended position, with a sudden shock or jar.

When the structure is open, as shown in Figure 3, the spring E is maintained under considerable tension by the engagement of the pin 6 with the end y of the slot in the member F, and accordingly, the spring E will be in readiness to assist in the rearward movement of the lever C in the operation of restoring the top section A to its normal position over the bottom section A′. During this rearward movement of the lever C the member F travels with the lever C until said lever reaches its midway position, and during the time the lever C is passing through its dead center position, the member F remains at rest, with the result that the spring E is maintained in an inactive condition, so far as the lever C is concerned. When the pin 6 on the lever C engages the end x of the slot in the member F, said member F will start to move with the lever in a direction to increase the tension on the spring E and cause said spring to check or retard the movement of the lever C during that portion of its final stroke when the top section A is moving into superimposed relationship with the bottom section A′.

From the foregoing it will be seen that my improved operating mechanism is superior to and an improvement on prior operating mechanisms of the type in which a spring, or a plurality of duplicate springs, are used to assist in the movement of some rockable element of the mechanism in the first portion of its opening or closing cycle, and also to retard or check the movement of said rockable element at the end of its cycle, by reason of the fact that my mechanism is so designed that the spring or springs referred to automatically become ineffective and impose no load on said rockable element when it is traveling through its dead center position.

As previously stated, the operating mechanism of the folding bed structure herein illustrated is so constructed and arranged that it will cause the bottom section A′ of the mattress supporting means to assume a downwardly inclined or tilted position during the opening operation and during the closing operation, thereby effectively preventing the rear edge of the top section A of the structure from bearing upon or rubbing against the folded mattress that is sustained by the bottom section A′. This tilting action of the bottom section A′ is obtained by supporting said bottom section by a swinging link G and bell crank lever H, and providing the arm B′ of the lever B with a roller 8 that travels in an elongated guideway 9 on the bottom section A′. The link G is pivotally connected at 10 to the supporting plate D and is provided with an elongated slot 11 that receives a laterally-projecting pin 12 on the bottom section A′ located adjacent the front edge of said section. The bell crank lever H is pivotally connected at 13 to a depending bracket on the supporting plate D and is pivotally connected at 14 to the bottom section A′ adjacent the rear edge of said section, the short arm of said lever H being prefer-

ably attached to a spring 15 that constantly exerts pressure on said lever H in a direction tending to swing the long arm of same upwardly. When the structure is closed, as shown in Figure 1, the link G and the long arm of the bell crank lever H project downwardly, and thus hold the bottom section A′ of the mattress supporting means in a horizontal position considerably below the top section A of said mattress supporting means. When the top section A is moved forwardly during the operation of opening the structure, the rear edge of the bottom section A′ swings upwardly, thereby causing said bottom section to assume an inclined position, with its front edge titled downwardly, and during the latter portion of the forward movement of the top section A the roller 8 on the arm B′ of the lever B co-acts with the elongated guideway 9 in which it is arranged to bodily raise the front edge of said bottom section, with the result that said bottom section moves upwardly into horizontal alignment with the top section A. In the closing operation, or in the reverse movement of the top section A, the bottom section A′ swings downwardly while the roller 8 on the arm B′ of the lever B is traveling rearwardly in the elongated guideway 9, thus permitting the rear edge of the top section A to clear the mattress on the bottom section A, which has been doubled over to folded preparatory to restoring the top section to its normal position, the final portion of the closing cycle causing the rear edge of the bottom section A′ to swing downwardly, with the result that said bottom section will come to rest in a horizontal position directly beneath the top section A.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A folding bed structure provided with a mattress supporting means that comprises two sections arranged in superimposed relationship when the structure is closed, an operating mechanism constructed so as to move the top section into and out of its extended position and also cause the bottom section to be held in an inclined position with its front edge tilted downwardly while the rear edge of the top section is traveling over said front edge, a spring associated with an oscillating element of said operating mechanism that has a dead center position, a connecting member interposed between said spring and oscillating element, and a lost motion connection between said connecting member and oscillating element that permits said connecting member to remain at rest when said oscillating element is passing through its dead center position.

2. In a folding bed structure, an extensible section, an operating mechanism comprising a pivotally mounted lever provided with an angularly-disposed arm, a rockable member mounted on the pivot of said lever and arranged at one side of the arm on the lever, a spring attached to said rockable member for exerting pressure on same, and co-acting means on said arm and rockable member for causing the spring to be maintained in an active condition when said lever is in either of its extreme positions and to be maintained in a neutral or inactive condition when said lever is passing over dead center.

3. In a folding bed structure, an operating mechanism comprising a pivotally mounted lever, a rockable member mounted on the pivot of said lever, a spring attached at one end to a stationary part of the structure and attached at its opposite end to said rockable member, and a slot and pin connection between said rockable member and lever.

4. In a folding bed structure, an extensible section, an operating mechanism comprising a swinging lever that has a dead center position, a rockable member whose axis coincides with the axis of said lever, a spring connected to said rockable member for exerting pressure on same, and co-acting means on said rockable member and lever for causing the spring to be normally active for assisting in the opening and closing operation and also check or retard the movement of said mechanism when said extensible section reaches its extended or retracted position and to be inactive or inoperative at approximately the midway position of said operating mechanism.

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