Oct. 16, 1934. S. R. W. ALLEN 1,977,370

BED SPRING

Filed April 5, 1932 2 Sheets-Sheet 1

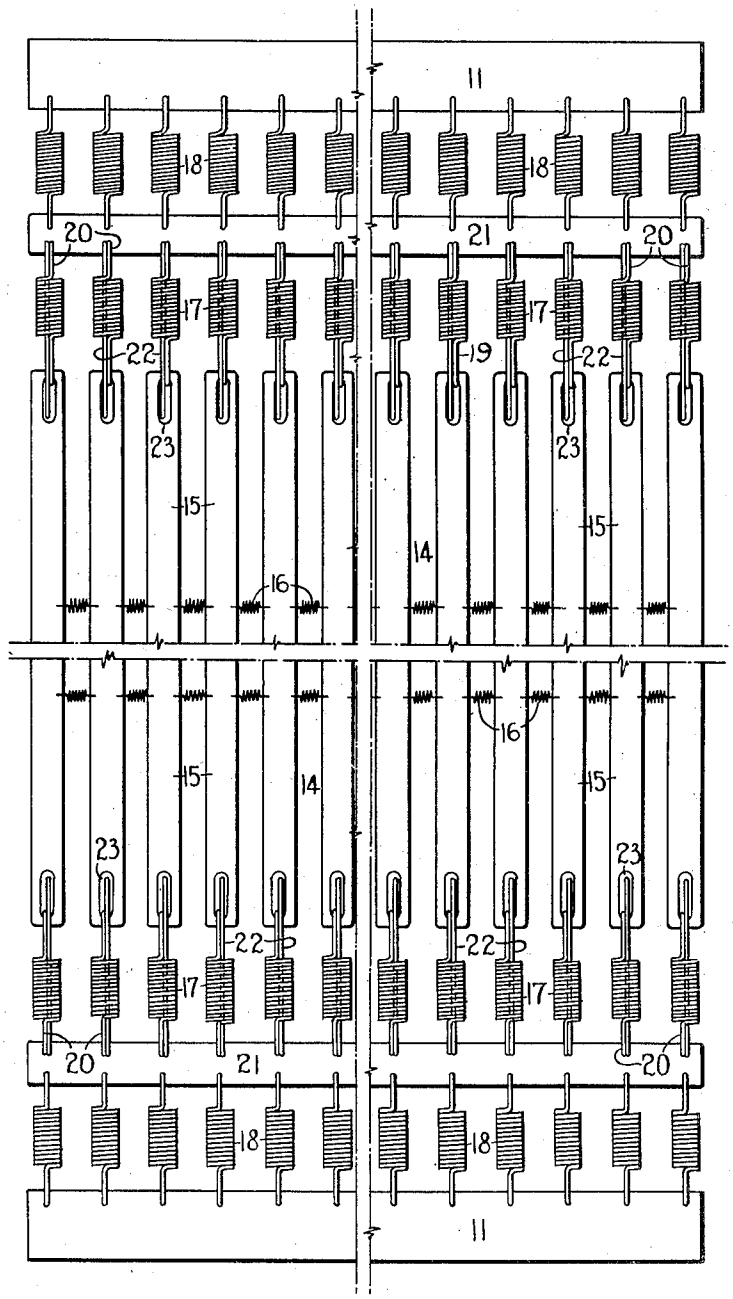

FIG. 1.

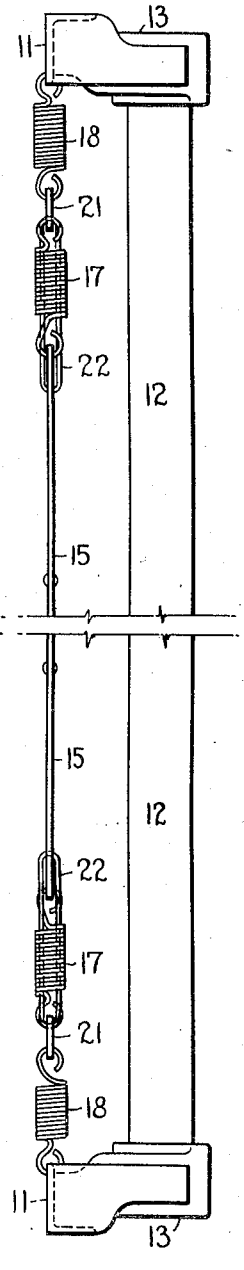

FIG. 2.

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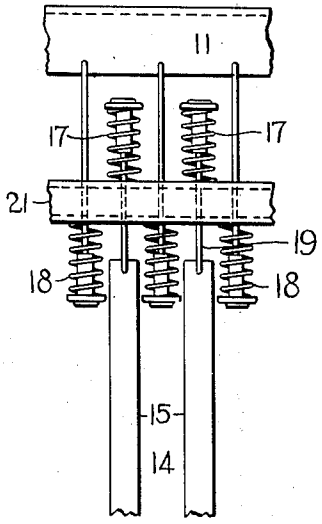

FIG. 3.

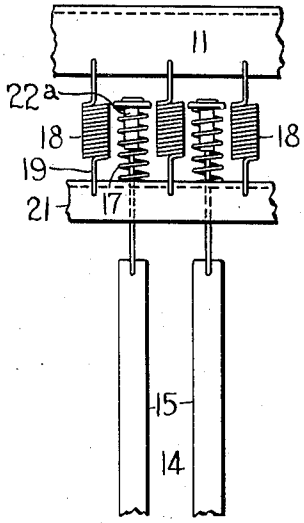

FIG. 4.

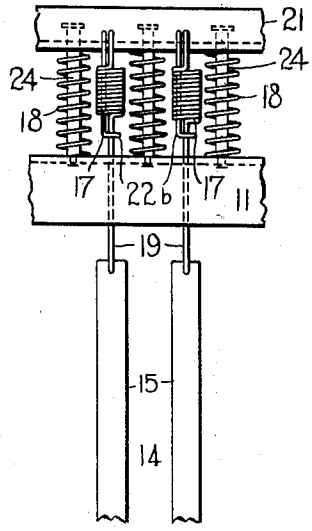

FIG. 5.

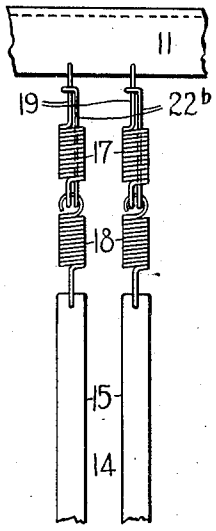

FIG. 6.

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UNITED STATES PATENT OFFICE

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BED SPRING

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Application April 5, 1932, Serial No. 603,339

6 Claims. (Cl. 5—191)

This invention relates to improvements in bed springs or bed bottoms and an object of the invention is to provide a bed bottom which will be equally comfortable for persons of light weight and persons of heavy weight. A further object is to provide a bed bottom which will be proof against excessive deflection or sagging when occupied by a person of heavy weight but will be comfortably yielding when occupied by a person of light weight. A still further object is to provide, in a bed bottom, means for transferring load from primary spring structure of relatively low flexion resistance to secondary spring structure of higher flexion resistance when the load on the primary structure exceeds a predetermined amount. Another object is to provide, in a bed bottom, primary and secondary fabric tensioning spring structures and means whereby the tension in a flexion of the primary spring structure is limited to a predetermined amount without impairment of the comfort of the bed bottom. Still another object is to provide in a bed spring or bed bottom embodying primary and secondary spring structures of relatively low and high flexion resistances, respectively, means to positively limit the load to be sustained by the primary spring structure. A further object is to provide in a bed bottom embodying primary and secondary spring structures of relatively low and high flexion resistances, respectively, means to transmit all load in excess of a predetermined amount to the secondary spring structure exclusively.

Various other objects and the advantages of the invention may be ascertained from the following description and the accompanying drawings.

Bed bottoms or bed springs may be divided, according to structural characteristics, into three main classes or types, namely, upright coil spring structures, woven wire fabrics and longitudinal strand fabrics. The latter class, to which this invention particularly applies, includes link fabrics, cable fabrics and band fabrics. In each case, the longitudinal members of the fabric are tensioned between the end rails of a frame by means of helical springs which are usually connected severally to the longitudinal fabric members.

The disadvantage of the usual types of strand fabrics is that tensioning springs which will comfortably and yieldingly support a person of light weight, will yield excessively under the weight of a heavy person and permit the fabric to sag excessively from its normal plane. Conversely, springs which will support a heavy person without permitting excessive deflection of the fabric, will hold the fabric unyieldingly under a person of light weight. It has therefore been customary to make such bed springs to comfortably support persons of average weight with the result persons below and above the average weight do not obtain the same measure of comfortable support as those of average weight.

This invention overcomes the foregoing disadvantages by providing a structure embodying with the frame and fabric, a plurality of series of springs and means for apportioning the load between the several series of springs according to the load imposed on the fabric, thereby to afford substantially equally yielding support to persons of all weights and to avoid substantially greater deflection of the strands by heavy loads than by light loads.

More specifically, the invention comprises primary springs and secondary springs arranged operatively in series so that load on the fabric is transmitted through the primary to the secondary springs and thence to the frame end rails, and means to positively limit the flexion and tension of the primary springs to a predetermined amount and to transmit to the secondary springs, independently of the primary springs, all load in excess of the predetermined amount.

In a companion application Serial No. 603,338 executed and filed of even date herewith, the converse condition is disclosed, namely, one in which the primary springs exclusively are tensioned up to a predetermined amount and in which the load, when it exceeds the predetermined amount, is divided in predetermined ratio between the primary and secondary springs.

In general, the invention comprises the features and combinations of features as herein described and claimed and as illustrated in the accompanying drawings, together with all such modifications thereof and substitutions therefor as fall within the scope of the claims.

The invention is capable of realization in a great number of embodiments or modifications, certain only of which are herein disclosed, wherefore it will be understood the invention is not confined to the embodiments herein disclosed nor to the details thereof, as various other embodiments and modifications of detail and of feature combination are contemplated.

In the accompanying drawings which illustrate certain embodiments selected as indicative of the scope of the invention:—

Fig. 1 is a plan view of a bed spring constructed according to the invention and characterized

firstly by arrangement of the primary and secondary springs in separate rows, and secondly by means to distribute load between any one or more of the primary springs and all or a considerable number of the secondary springs.

Fig. 2 is a side elevation of the structure shown in Fig. 1.

Fig. 3 is a fragmentary plan view illustrating an arrangement similar to Figure 1, excepting that the springs are adapted for compression instead of for elongation as in Figure 1.

Figs. 4 and 5 are fragmentary plan views showing arrangements of primary and secondary springs in a single row, Figure 4 showing compressible primary springs and elongatable secondary springs and Figure 5 showing the reverse condition.

Fig. 6 is a fragmentary plan view showing a modification of the structure illustrated in Fig. 1.

Referring more particularly to the drawings, 11 designates the end rails of a bed spring and 12 the side rails holding the end rails spaced apart, the side rails being located in a plane below the plane of the end rails and connected to the end rails by the risers 13. It will be understood the form of frame is immaterial to this invention as long as it will support the fabric and springs in the desired tension when in use, wherefore the frame may be separate from a bed, as shown, or may be an integral part of a bed and may be either permanently rigid or folding.

A mattress supporting structure is connected to and between the end rails and comprises a fabric 14, herein shown as composed of longitudinal flat spaced bands 15 connected at intervals by transverse links 16, and spring means connecting one or both ends of the fabric to the adjacent end rails and embodying primary springs 17 and secondary springs 18. It will be understood the invention is not confined to the particular form of fabric illustrated but is applicable equally to cable fabrics and link fabrics. In each of the embodiments illustrated in Figures 1 to 3, the primary springs and secondary springs are arranged in separate rows, the row of secondary springs being disposed between the end rail and the row of primary springs in Figures 1 and 2 and the reverse being the case in Figure 3. In Figures 4 and 5, the primary and secondary springs are arranged in a single row.

In all forms (excepting that of Figure 6), the primary springs are connected directly to the fabric strands and through the secondary springs to the end rails, the tails 19 of the primary springs being of suitable lengths for this purpose. Connection between primary and secondary springs is established through the medium of any suitable number of load distributing members, such as the bars 21 disposed in the plane of the fabric, edgewise to the direction of tension, which members operate to distribute the load transmitted by any one or more of the primary springs among all the secondary springs connected to the member. As shown in Figure 1, the bar 21 extends continuously from side to side of the bed but it will be obvious that it may be of any lesser length. In the case of a double bed, use of two bars each extending from a side to the longitudinal centre of the structure has considerable advantage in that movements or weight of one person do not affect the structure supporting a co-occupant of the bed. It will be obvious from the teaching of my companion application that even shorter load distributing means or distributing means of other forms may be substituted for the bar 21 or that such means may be omitted, for example by connecting the primary and secondary springs of Figure 1 (this application) directly together. The secondary springs are connected directly to the end rails and indirectly to the fabric by the means now to be described.

In order that the fabric may be suitably resiliently supported under loads below a predetermined amount, which may be termed "light loads", the resilient support for such loads is afforded substantially solely by the primary springs, the associated secondary springs being substantially rigid and unyielding. In order to avoid excessive flexion of the primary springs and deflection of the fabric by loads over the predetermined amount, which may be termed "heavy loads", which are capable of flexing the secondary springs, means is provided to transmit load over the predetermined amount from the fabric directly to the secondary springs, and independently of the primary springs when the load on the fabric exceeds the predetermined amount. This means may be separate from the primary springs or may be inherent to the primary springs. In the embodiment shown in Figures 1 and 2, the direct load transmitting means comprises links 22 connected with the secondary springs and having lost motion connection or slip connection with the fabric through engagement in slots 23 in the strands 15, whereby fabric deflection and primary spring elongation is permitted up to such extent as will move the links 22 into engagement with the outer ends of the slots 23. Once this engagement of the links and slot ends is established, load on the fabric is transmitted directly to the secondary springs, the primary springs being positively held by the links against further flexion and further tensioning. Thus, resiliency of support of heavy loads on the fabric is afforded by the secondary springs exclusively, the primary springs being substantially inactive in this respect (though tensioned) owing to the transmission of load through the links 22. In the compression type of primary springs shown in Figure 3, no special means such as the links 22 is necessary, since the springs when fully compressed provide inherent means for transmitting load to the secondary springs without further flexion of the primary springs, but lost motion connection such as the sleeves 22^a of Figure 4 may be provided. In the form shown in Figure 5, the lost motion connections 22^b are arranged to have sliding engagement with the tails 19 of the primary springs 17. When the primary springs are elongated to predetermined extent, they engage the lost motion links 22^b and load is then transmitted through the springs and links to the bar 21 which, it will be noted, is arranged outside the end rail 11 with the secondary springs 18 in compression between the end rail and bar and supported against buckling by the core pins 24.

If the lost motion links 22^b of Figure 5 are omitted and the springs 17 made sufficiently stiff and the springs 18 sufficiently soft, a reversal of function will result by which the springs 17 directly connected to the fabric become secondary springs and the springs 18 become primary springs. A similar reversal of function may be obtained in the structure of Figure 3 by a mere judicious proportioning of the strengths of the springs and may be likewise obtained in the structure of Figure 4 if lost motion links, such as 22^b of Figures 5 and 6, are incorporated with the springs 18. In Figure 6, there is shown a re-

versal of arrangement as compared with Figure 1, in that the relative positions of the primary and secondary springs are reversed. Also the load distributor 21 is omitted and the associated primary and secondary springs are connected directly to each other.

While only single rows of primary and secondary springs have been shown, it will be obvious the number of rows may be increased and appropriate lost motion connection provided between each two adjacent rows.

Numerous modifications of construction and of relative positioning and connection of the springs may be made, some of which will be suggested or taught by my companion application, wherefore it will be understood the invention is not confined to the details of construction and arrangement shown in the drawings.

The detail operation of the various embodiments and modifications will be obvious from the foregoing description and the drawings. In every case load imposed on any strand or group of strands of the fabric is transmitted through the springs connected to the loaded strands to the springs connected to the end rail. When the load on each primary spring is less than a predetermined amount, only the primary springs are flexed, the associated secondary springs remaining not visibly flexed. If the load on the primary springs exceeds the predetermined amount, the primary springs are flexed to the limit determined by the lost motion connections or equivalent and the load being over the predetermined amount flexes the secondary springs slightly, so that resiliency of support is afforded for the heavily loaded fabric while deflection thereof is limited to little more than that caused by a light load. It will be noted that in the case of the form shown in Figure 6, the secondary springs will be bodily moved as the primary springs flex but without visible flexion and that, when flexion of the primary springs is checked by the lost motion connection, the bodily movement of the secondary springs will cease and their flexion will commence.

It will be obvious the flexion resistance of the individual secondary springs should be different as between the forms of Figures 1 to 5 and the form of Figure 6, since the overload on any primary spring is distributed to different numbers of secondary springs in the different arrangements. The relative elongation resistances of the primary and secondary springs may be obtained in any of the ways well known to spring makers, for example, by different gauges or tempers of wire, by different numbers or diameters of the helices, by the "set" of the springs or by any other means.

Having thus described my invention, what I claim is:—

1. A bed spring or bed bottom comprising a frame, a mattress supporting structure carried by the frame including a fabric and spring means connecting the end of the fabric to the frame and comprising a rigid transverse member, secondary helical springs connected to said member and to the frame, primary helical springs connected to said member and to the fabric and means adapted to limit flexion of the primary springs and to transmit load from the fabric to the secondary springs independently of the primary springs.

2. A bed spring or bed bottom comprising a frame and a mattress supporting structure carried by the frame and including a fabric and spring means arranged between the fabric end and adjacent frame end and tensioning the fabric, said spring means comprising primary springs connected to the end of the fabric, secondary springs connected to the end of the frame, and means connecting said secondary springs to the primary springs and to the fabric and operative upon predetermined flexion of any one of said primary springs to hold said primary spring against further flexion and to transmit additional load on the fabric directly to a plurality of said secondary springs.

3. A bed spring or bed bottom comprising a frame including end rails and a mattress supporting structure tensioned between the end rails and including a fabric and spring means connecting the end of the fabric to an end rail, said spring means comprising a rigid transverse member, a series of helical springs connected to the end rail and to said member and a second series of helical springs connected to said member and to the fabric, and means to positively limit the flexion of the springs of the second series individually.

4. A bed spring or bed bottom comprising a frame including end rails and a mattress supporting structure including a slotted fabric and spring means connecting the fabric to an end rail, said spring means comprising secondary springs connected to the end rail, primary springs connected to the secondary springs and to the fabric, and links connected to the secondary springs and having limited sliding engagement in the fabric slots thereby to limit flexion of the primary springs.

5. A bed spring or bed bottom comprising a frame including end rails and a mattress supporting structure including a fabric and spring means connecting the end of the fabric to an end rail, said spring means comprising a rigid transverse member, secondary helical springs disposed between and connected to an end rail and to said member, primary springs connected to said member and to the fabric and means connected to said member and to the fabric having limited lost motion capacity and adapted to limit flexion of the primary springs and to transmit load from the fabric to said member and secondary springs independently of the primary springs.

6. A bed spring or bed bottom comprising a frame including end rails and a mattress supporting structure including a fabric formed of spaced longitudinal strands, and spring means connecting the end of the fabric to an end rail, said spring means comprising a rigid transverse bar, primary springs each connected to one strand of the fabric and to said bar, secondary springs connected to said bar and to an end rail, a flexion limiter for each of said primary springs operatively related with the fabric strands and with said bar in suchwise as to transmit load in excess of a predetermined amount from the fabric to the bar and secondary springs without increase of flexion of the primary springs.

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