

Oct. 23, 1962

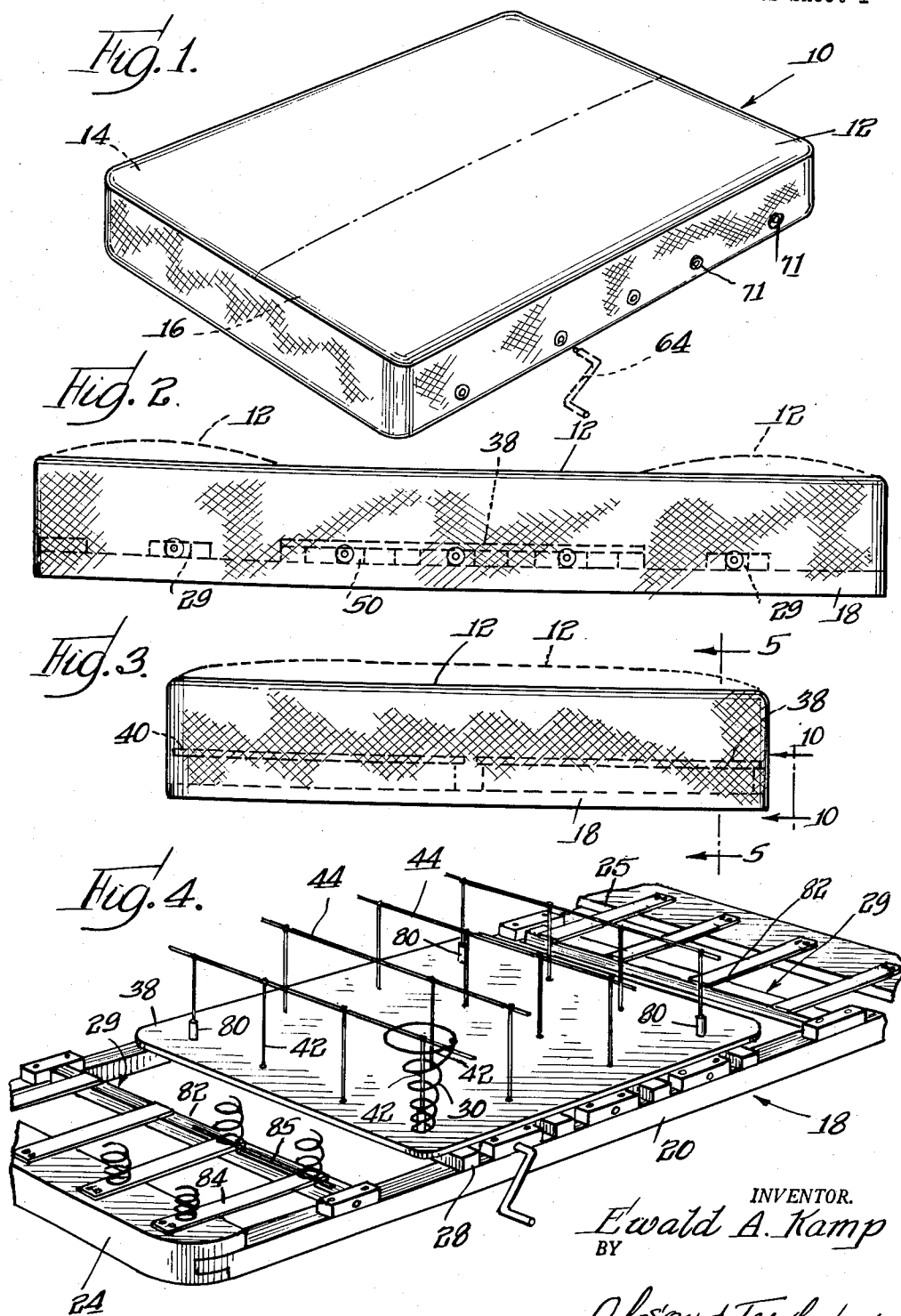
E. A. KAMP

3,059,249

ADJUSTABLE BOX SPRING

Filed April 23, 1959

4 Sheets-Sheet 1



Oct. 23, 1962

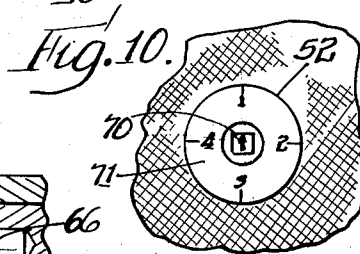
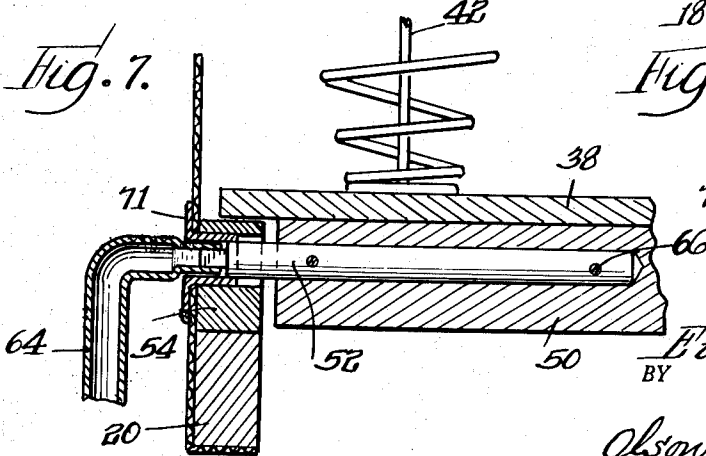
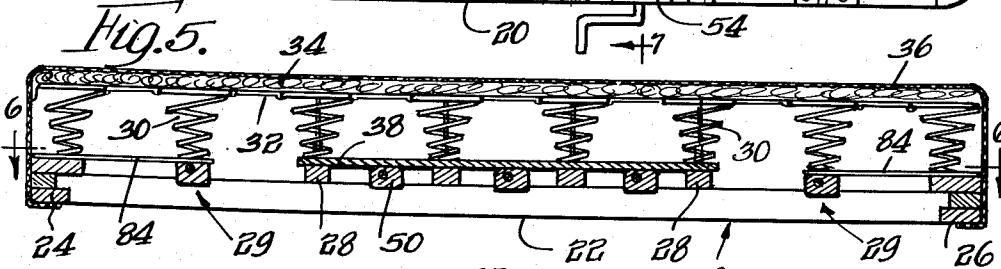
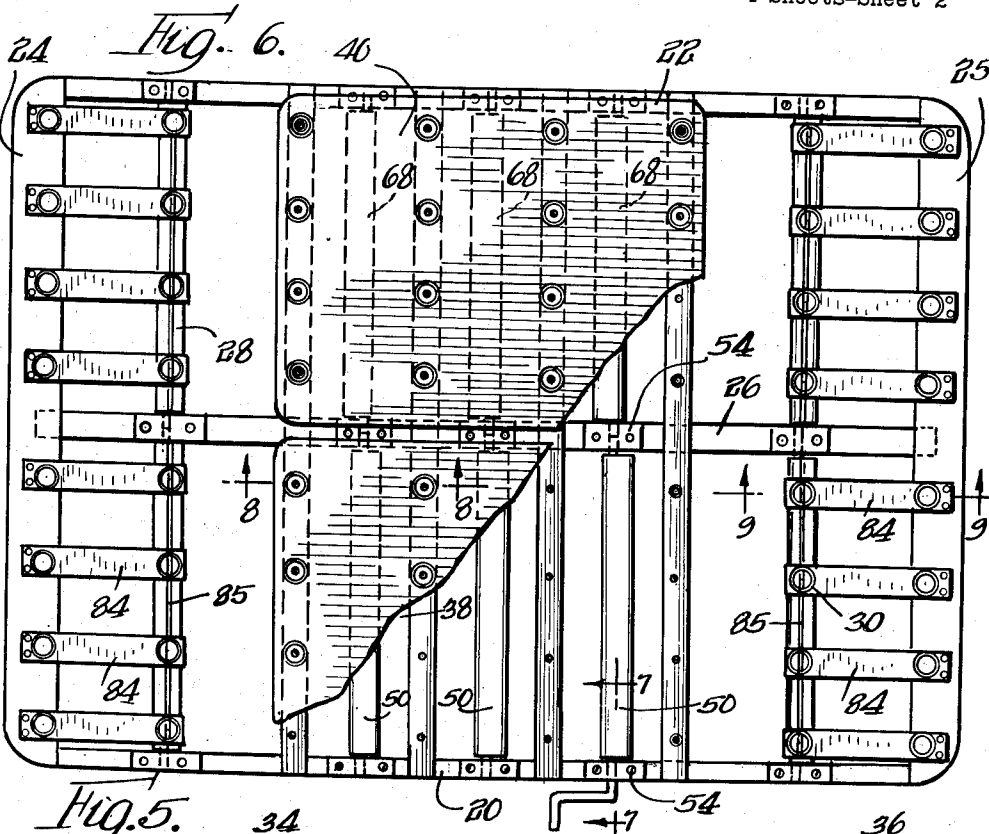
E. A. KAMP

3,059,249

ADJUSTABLE BOX SPRING

Filed April 23, 1959

4 Sheets-Sheet 2



INVENTOR.

Ewald A. Kamp

BY

Olson & Trephel attys.

Oct. 23, 1962

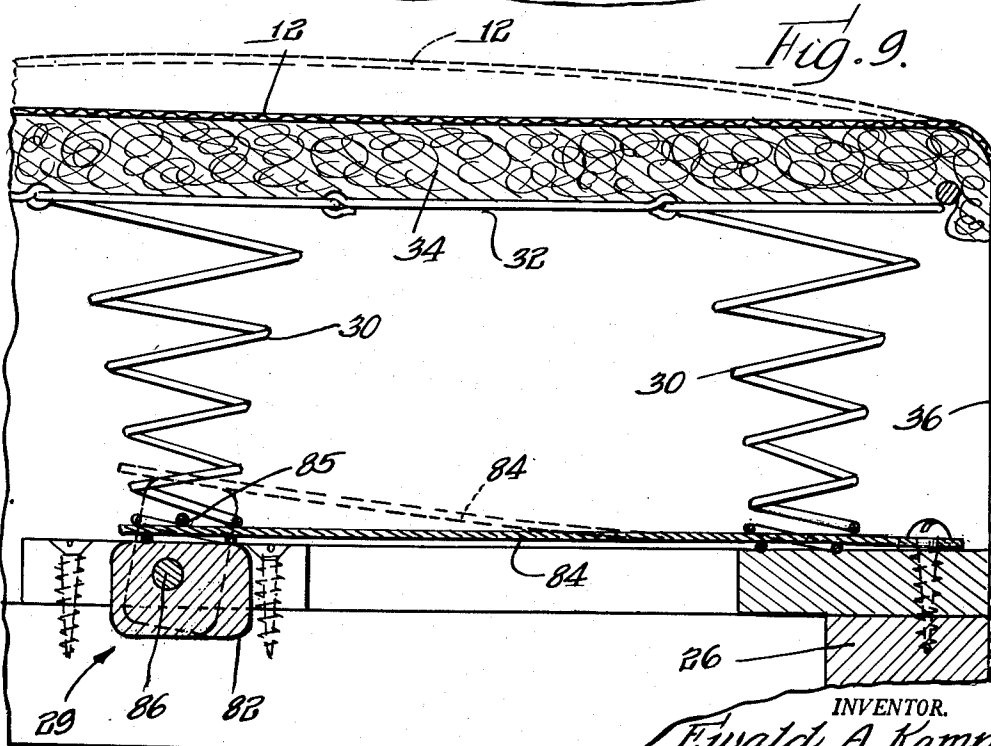
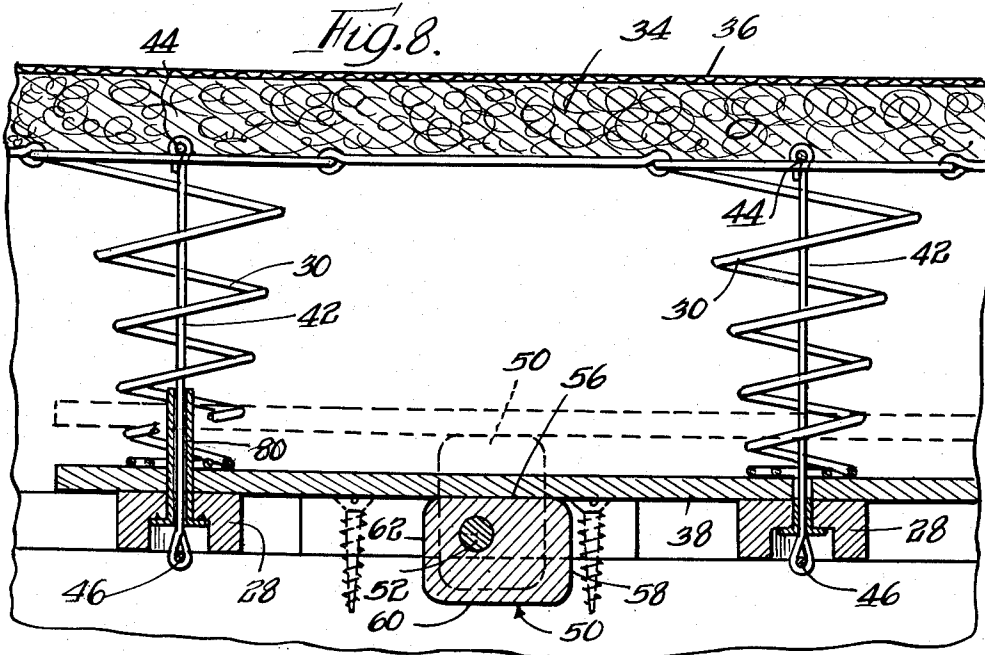
E. A. KAMP

3,059,249

ADJUSTABLE BOX SPRING

Filed April 23, 1959

4 Sheets-Sheet 3



INVENTOR.

Ewald A. Kamp

BY

Olson & Trenchard attys.

Oct. 23, 1962

E. A. KAMP

3,059,249

ADJUSTABLE BOX SPRING

Filed April 23, 1959

4 Sheets-Sheet 4

Fig. 12.

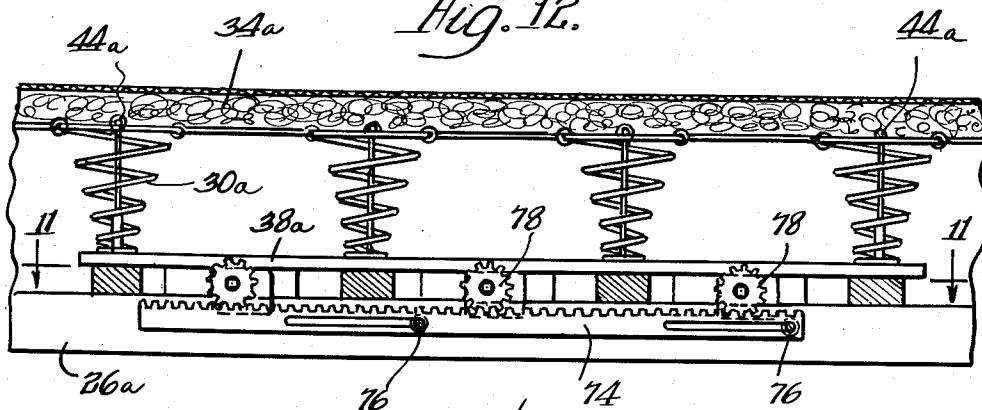


Fig. 11.

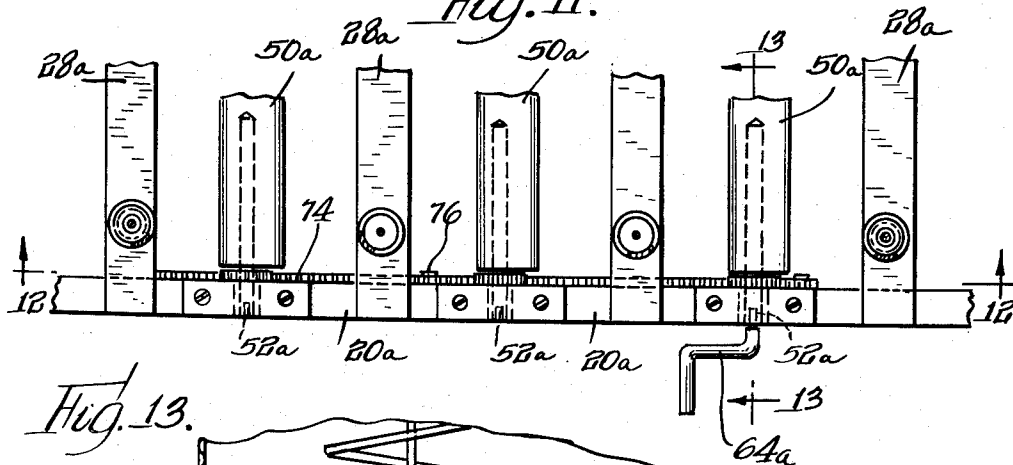
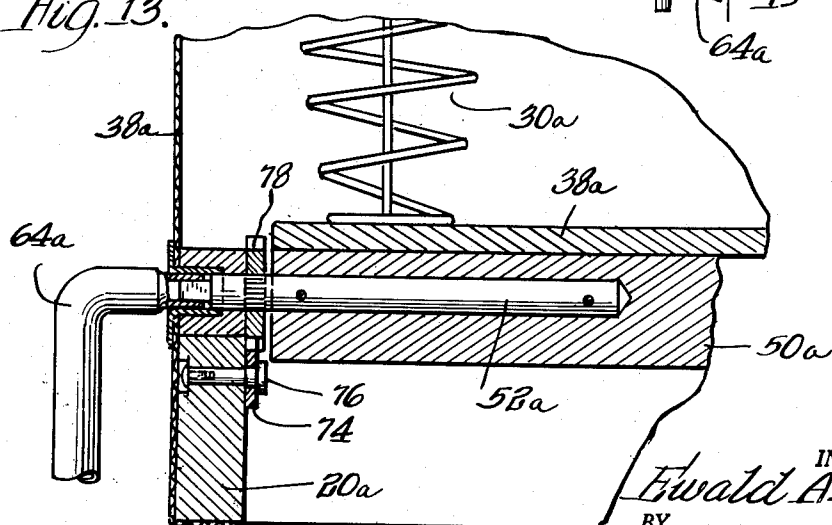


Fig. 13.



INVENTOR.
Ewald A. Kamp
BY

Olson & Trephel attys.

1

3,059,249

ADJUSTABLE BOX SPRING

Ewald A. Kamp, Chicago, Ill., assignor to The Englander Company, Inc., Chicago, Ill., a corporation of Delaware

Filed Apr. 23, 1959, Ser. No. 808,411

4 Claims. (Cl. 5—246)

The present invention relates to box springs used to support mattresses.

One object of the invention is to provide for supporting a mattress, a new and improved box spring which can be readily adjusted to vary the firmness of the spring support for a mattress.

Another object is to provide a box spring having an improved construction which provides a ready adjustment of the degree of effective firmness of the box spring without disturbing the normal level of its mattress supporting surface.

A further object is to provide an adjustable box spring as recited in the above objects which is so constructed that a box spring of double bed size can be adjusted to vary the effective firmness of the two longitudinal half-sections of the box spring independently of each other.

Another object is to provide a new and improved box spring as set forth above which provides for varying the firmness of the spring support for a mattress progressively along the length of the box spring.

An additional object is to provide an adjustable box spring, as recited, having extremely simple and economical means for adjusting the effective firmness of the box spring, which has an inherent self-locking action that will effectively maintain any position of adjustment to which it is set.

Another object is to provide an improved box spring of the above character having a new and improved construction which can be adjusted to provide a controlled elevation of the feet and head of a person lying on a mattress supported by the box spring.

Other objects and advantages will become apparent from the following description of the exemplary form of the invention illustrated in the drawings, in which:

FIG. 1 is a perspective view of a box spring forming the exemplary embodiment of the invention;

FIG. 2 is a side elevational view of the box spring showing certain internal parts in dotted lines and illustrating in phantom the curvature assumed by the top surface of the box spring for one condition of adjustment;

FIG. 3 is an end view of the box spring;

FIG. 4 is a fragmentary perspective view of frame structure and adjustable spring support means incorporated into the box spring;

FIG. 5 is a longitudinal sectional view taken along the line 5—5 of FIG. 3;

FIG. 6 is a horizontal sectional view taken generally along the line 6—6 of FIG. 5;

FIG. 7 is a fragmentary sectional view of adjustable spring support structure taken along the line 7—7 of FIG. 6;

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 6;

FIG. 9 is a fragmentary sectional view taken along the line 9—9 of FIG. 6;

FIG. 10 is a fragmentary side view taken with reference to line 10—10 of FIG. 3 and showing on an enlarged scale means for indicating the condition of adjustment of the box spring;

FIG. 11 is a fragmentary horizontal sectional view taken with reference to line 11—11 of FIG. 12 and showing a modified form of the adjustable spring support means;

FIG. 12 is a fragmentary sectional view of the modified construction taken along the line 12—12 of FIG. 11; and

2

FIG. 13 is a fragmentary sectional view taken along the line 13—13 of FIG. 11.

Referring to the drawings in greater detail, the adjustable box spring 10 forming the exemplary form of the invention, FIG. 1, is of the standard size for a double bed. As will presently appear, provision is made in the construction of the box spring 10 in accordance with the present invention for adjusting the effective firmness of the spring support which the box spring will provide to a mattress (not shown) supported on the generally horizontal top surface 12 of the box spring.

Moreover, as will presently appear, provision is made for adjusting the firmness of the two longitudinal half sections 14, 16 of the box spring 10 independently of each other. This makes it possible for two people sleeping on the box spring to effect adjustments of the box spring 10 which will provide the optimum degree of firmness in the box spring support desired by each person even though there may be a radical difference in the degree of firmness preferred by the two individuals.

Structurally, the box spring 10 forming the exemplary embodiment of the invention comprises a wooden base or support frame 18, FIGS. 4, 5 and 6, having, as such, a generally conventional construction which includes two longitudinal side rails 20, 22 extending between and connected to two transverse end elements 24, 25 of the frame. A central longitudinal rail 26 is supported at opposite ends by the transverse frame elements 24, 25.

A plurality of stationary slats 28 and two adjustable slats 29 extend transversely across the frame 18 between the side rails 20, 22 in evenly spaced relation with respect to each other and with respect to the two end frame elements 24 and 25. In this instance the frame 18 includes four centrally located stationary slats 28 and two adjustable slats located between the stationary slats and the respective end frame elements 24, 26.

The frame 18 thus formed supports eight transverse rows of eight springs 30 each, the successive transverse rows of springs being disposed in overlying relation to the slats 28 and 29 and the frame elements 24 and 25 as shown in FIGS. 4 to 6.

The individual springs 30 have a generally conical shape and are arranged with the small end of the springs extending downwardly into overlying relation in to the supporting frame structure. The relatively large upper end of the springs 30 are connected together in a conventional manner as by means of connecting links 32, FIG. 5.

The upper ends of all the springs 30 together with the connecting means 32 between the springs provides resilient support to an overlying layer of padding 34 similar to that used in conventional box springs. The padding 34 is covered in a conventional manner by ticking 36 which extends downwardly in covering relation to all four sides of the box spring.

To adjust the effective firmness of the spring support provided by the two longitudinal half sections 14, 16 of the box spring 10, FIG. 1, provision is made for adjusting the residual compression of the springs 30 located on opposite sides of the central longitudinal rail 26, FIG. 6.

However, it has been found that it is not necessary to adjust the residual compression in all the springs 30 on one side of the central rail 26 in order to provide an effective adjustment of the firmness of the spring support provided to a mattress by one longitudinal half section of the box spring. Since the weight of a reclining person supported on one longitudinal side of the box spring is concentrated along the medial portion of that longitudinal side, it is necessary to adjust the residual compression in only those springs 30 which bear the heaviest load in order to provide an effective adjustment of the firmness of the box spring support to the person.

3

It is not necessary that the residual compression of the more likely loaded springs near the ends of the box spring be adjusted in order to effect a desired adjustment of the overall firmness of one longitudinal side of the box spring.

For the box spring 10 illustrated, which has eight transverse rows of springs 30, provision is made for adjusting the residual compression of the springs in the four central rows only, the springs on opposite sites of the central rail 26 being adjusted independently of each other.

For this purpose two rectangular spring support and adjusting boards 38, 40 are placed in overlying relation to the four central slats 28 on opposite sides of the central rail 26 to underlie and support the springs 30 in the four central transverse rows.

Each of the boards 38, 40 is formed of a construction which has sufficient flexibility to permit a substantial degree of bending of the board while at the same time having sufficient strength to support the lower ends of the overlying springs 30 in adjusted positions as will presently appear. It has been found that boards formed of plywood may be successfully used for this purpose.

Adjustment of the firmness of one longitudinal half section of the box spring 10 is effected by raising or lowering the spring adjusting board on that side of the box spring while at the same time anchoring the upper ends of the springs 30 overlying the board against vertical displacement, thus varying the residual compression of the central springs and the firmness of their support action in the box spring.

Referring to the illustrated construction, it will be noted that the upper ends of the springs 30 overlying the board 38, for example, are held against vertical movement above their normal positions by means of vertical ties 42, FIGS. 4 and 8 anchored to the underlying slats 28 and extending upwardly through the individual springs to connect with relatively stiff cross wires 44 overlying the upper ends of the springs as shown. Each tie 42, FIG. 8, extends downwardly through its underlying slat 28 and is free to move downwardly with the upper end of its coacting spring 30 when the latter is forced down by externally applied pressure. However, upward movement of each tie is limited by engagement of suitable anchoring means 46 on the tie with the coacting slat 28 to provide the desired limitation of upward movement of the upper end of the associated spring.

As previously intimated, the two spring boards 38 and 40 are adjusted independently of each other. Extremely simple yet highly effective means are provided for this purpose, which provides an inherent adjustment locking action that is effective to hold a spring adjusting board in any one of a plurality of positions of vertical adjustment.

The adjusting means for the board 38, for example, comprises three transverse adjusting bars 50 extending between the side rail 20 and the central rail 26 in the spaces between the four slats 28. Each adjusting bar 50 is rotatively supported by a pair of coaxial trunnions 52 in opposite ends of the bar which are journaled in bearing blocks 54 on the frame rails 20 and 26. The transverse bars 50 are rectangular in transverse section, as shown in FIG. 8, and have slightly rounded corners. The two support trunnions 52 for each bar 50 are mounted off center with respect to the adjusting bar so that the common axis of the trunnions has a different spacing from each of the four longitudinal sides 56, 58, 60 and 62 of the bar as shown in FIG. 8.

The ends of the adjusting bar trunnions 52 journaled in the bearing blocks 54 on the outside rail 20 are adapted, as shown in FIG. 7, to receive a detachable adjusting crank 64 used to rotate each individual adjusting bar 50 to any one of four positions of adjustment bringing its longitudinal sides 56, 58, 60 and 62 respectively into engagement with the spring support board 38. The trunnion 52

4

to which the adjusting crank 64 is applied is nonrotatably connected to the adjusting bar 50 by pins 66.

Three adjusting bars 68, similar to the adjusting bars 50 are similarly mounted on the opposite side of the frame 18 to adjust to the vertical position of the spring adjusting board 40, FIG. 6.

To provide the desired degree of firmness of the spring support provided by the respective longitudinal sides 14, 16 of the box springs 10 it is necessary merely to adjust the positions of the adjusting bars 50 and 68 on the respective sides of the frame 18 using the detachable handle 64 for this purpose.

Moreover, the height adjustment of each spring board 38, 40 and hence the firmness of the overlying springs 30 can be varied along the length of the frame 18 by turning the three adjusting bars supporting each board to different positions of adjustment. While the boards 38, 40 have sufficient resistance to bending to support the overlying springs 30 between the adjustable support bars, the boards will nevertheless bend sufficiently to accommodate different positions of adjustment of its three support bars.

Suitable means are provided for visually indicating the position of adjustment of each spring board adjusting bar. Thus, as shown in FIG. 10, the outer end of the adjusting bar trunnions 52 adapted to receive the adjusting crank 64, is provided with a suitable reference mark 70 which registers with one of an annular series of four reference numerals inscribed on a disc 71 and corresponding to the four positions of adjustment of the associated bar 50.

If desired, provision can be made for adjusting all of the adjustable support bars under one of the spring support boards 38, 40 at one time from a single point of adjustment. Means illustrating this mode of adjustment of three support bars is shown in the modified construction illustrated in FIGS. 11 to 13, in which component parts corresponding to those previously described are designated by the same reference numerals with the addition of the suffix "a".

As shown in FIGS. 11 to 13, a longitudinal adjusting rack 74 is slidably supported by guides 76 on the inner face of the side rail 20a below the adjacent adjusting bar trunnions 52a. Pinions 78 nonrotatably connected to the three overlying adjusting bar trunnions 52a engage the rack 74 in such fashion that rotation of one of the trunnions 52a by a detachable adjusting crank 64a as shown in FIGS. 11 and 13 effects a simultaneous adjustment of all three adjusting bars 50a.

It may be noted with reference to FIG. 4 that the spring adjusting board 38 is guided for vertical movement by four guide sleeves 80 extending upwardly through the four corners of the board from the underlying slats 28 in surrounding relation to four of the spring hold down ties 42. (See FIG. 8.) Similar means are used to vertically guide the other adjusting board 40.

Further provision is made in the construction of the box spring 10 for adjustably raising the portions of the box spring and more particularly its mattress supporting surface 12 which supports the head and feet of the reclining individuals supported by the box spring. The vertically adjusted or raised positions of the head and feet supporting portions of the support surface 12 are indicated in phantom in FIGS. 2, 3 and 9.

As shown, the structure used to effect a vertical adjustment of these portions of the mattress surface 12 comprises the two previously mentioned adjustable slats indicated generally by the numerals 29 and located at opposite ends of the spring firmness adjusting boards 38, 40. Each adjustable slat 29 is formed in two independently adjustable parts 82, each of which is similar in construction to the spring firmness adjusting bars 50, previously described, and similarly mounted between the central rail 226 and one of the side rails 20, 22. Each of the springs 30 overlying and adjusting bar 82, FIGS. 4

5

and 9, is connected at its lower end to one end of a flexible positioning band 84 extending to and anchored to the adjacent one of the frame end elements 24, 25 as shown. Also, as shown, the lower ends of the springs resting on each adjustable support 82 are connected together by a transverse tie wire 85, FIGS. 4 and 9.

It will be observed here that no tie down means is provided to positively limit upward movement of the upper ends of the springs 30 supported by the adjustable bars 82. Hence, rotary adjustment of a bar 82 from its normal position, shown in solid lines in FIG. 9, to a different position about its eccentrically located support trunnions 86, illustrated in phantom, lifts the overlying springs 30, an overlying portion of the padding 34, and the corresponding portion of the support surface 12 to the raised positions indicated in phantom. The straps 84 and the cross tie 85 maintains the lower ends of the springs in overlying engagement with the adjusting bar 82 as it is rotated from one position of adjustment to another. The same crank 64 is used to effect the desired vertical adjustment of the foot portions of each longitudinal side of the box spring 10.

While the disclosed embodiment of the invention is applied to a box spring of double bed size, it is equally susceptible of application to a box spring of single bed size. Moreover, the number of transverse rows of springs 30 used in the box spring can be varied from that shown. Also, the number of rows of springs supported and adjustable compressed by the boards 38, 40 can be varied from the precise number shown.

While certain specific advantages are realized from the particular embodiment of the invention illustrated, it will be appreciated that the invention is not necessarily limited to the exact structure shown but includes structural variants and equivalents falling within the spirit and scope of the invention as defined by the appended claims.

The invention is claimed as follows:

1. An adjustable firmness box spring comprising, in combination, a support frame, a flexible spring support board positioned on a medial portion of said frame for vertical adjustment with respect to the frame, a plurality of at least three transverse support bars rotatably disposed on said frame in immediately underlying supporting relation to said board, each of said bars being shaped to have a plurality of flat generally longitudinal sides individually engageable with said board, means rotatably supporting each of said support bars on said frame for rotatable adjustment about a longitudinal axis eccentrically located in relation to the transverse form of the bar to have a different spacing from each longitudinal side of the bar whereby the respective sides of the bar upon being rotated into opposing relation to said board support the adjacent portion of the latter in different vertical positions of adjustment and whereby downward force of the board applied to any flat longitudinal side of the bar tends to hold the latter against rotation, a medial group of compression springs overlying said board in a plurality of at least several rows of at least several springs each, all of said springs of said medial group having lower ends supported by said flexible board and having upper ends extending upwardly therefrom, tie-down means connected with the upper ends of said springs and extending downwardly therefrom to interconnect with said frame for positively precluding upward movement of the upper ends of said springs above a predetermined normal level relative to said frame as an incident to vertical adjustment of said board, said support board being dimensioned to limit resistance of the board to bending to a value less than bending moment applicable to the board by the reactions thereon of said support bars and said medial group of springs, individual rotary adjusting means accessible from one side of said frame and coacting with each of said bars to rotate the bar independently of the other bars for effecting vertical adjustment of the adjacent portion of said flexible board whereby the position

6

and shaping of said board is determined by the rotary positions of adjustment of the respective support bars and the downward reaction of the springs on the board, padding supported by the upper ends of said springs by spring force having a firmness determined by the vertical position and shaping of said flexible board, additional compression springs located beyond said medial group of springs toward one end of said frame, padding overlying the upper ends of said additional springs, adjustable means on said frame supporting the lower ends of said additional springs in different vertical positions relative to said frame determined by the position of adjustment of said adjustable means, and the upper ends of said additional springs and the padding overlying the additional springs being free to move a limited distance upwardly as an incident to raising of the lower ends of said additional springs by said adjustable supporting means therefor.

2. An adjustable firmness box spring comprising, in combination, a support frame, a flexible spring support board positioned on a medial portion of said frame for vertical adjustment with respect to the frame, a plurality of at least three transverse support bars rotatably disposed on said frame in immediately underlying supporting relation to said board, each of said bars being shaped to have a plurality of flat generally longitudinal sides individually engageable with said board, means rotatably supporting each of said support bars on said frame for rotatable adjustment about a longitudinal axis eccentrically located in relation to the transverse form of the bar to have a different spacing from each longitudinal side of the bar whereby the respective sides of the bar upon being rotated into opposing relation to said board support the adjacent portion of the latter in different vertical positions of adjustment and whereby a downward force of the board applied to any longitudinal side of the bar tends to hold the latter against rotation, a medial group of compression springs overlying said board in a plurality of at least several rows of at least several springs each, all of said springs of said medial group having lower ends supported by said flexible board and having upper ends extending upwardly therefrom, tie-down means connected with the upper ends of said springs and extending downwardly through said board to interconnect with said frame for positively precluding upward movement of the upper ends of said springs above a predetermined normal level relative to said frame as an incident to vertical adjustment of said board, said support board being dimensioned to limit resistance of the board to bending to a value less than bending moment applicable to the board by the reactions thereon of said support bars and said medial group of springs, individual rotary adjusting means coacting with each of said bars to rotate the bar independently of the other bars for effecting vertical adjustment of the adjacent portion of said flexible board whereby the position and shaping of said board is determined by the rotary positions of adjustment of the respective support bars and the downward reaction of the springs on the board, padding supported by the upper ends of said springs by spring force having a firmness determined by the vertical position and shaping of said board, additional compression springs located beyond said medial group of springs toward one end of said frame, padding overlying the upper ends of said additional springs, a vertically flexible spring stabilizing element connected between the lower end of each of said additional springs and said frame, a support bar underlying said additional springs and defining a plurality of flat longitudinal sides, means supporting said last mentioned bar on said frame for rotary adjustment about an eccentric longitudinal axis having a different spacing from each of said longitudinal sides of the bar whereby said respective bar sides last mentioned upon being rotated into supporting relation to said additional springs support the latter at different heights, and the upper ends of said additional springs and the padding overlying the additional springs

being free to move a limited distance upwardly as an incident to raising of the lower ends of said additional springs by said adjustable support bar therefor.

3. An adjustable firmness box spring comprising, in combination, a support frame, a flexible spring support element positioned on a medial portion of said frame for vertical adjustment with respect to the frame, a plurality of at least three elongated adjusting elements rotatably disposed on said frame in transverse positions immediately underlying said support element, each of said adjusting elements defining a plurality of angularly spaced support faces individually engageable with said support element to support the latter, means rotatably supporting each of said adjusting elements on said frame for rotatable adjustment about a longitudinal axis having a different spacing from each support face of the adjusting element whereby the respective support faces upon being rotated into opposing relation to said support element support the adjacent portion of the latter in different vertical positions of adjustment and whereby a downward force of the support element applied to any support face of the adjusting element ends to hold the latter against rotation, a plurality of compression springs disposed in a plurality of rows of several springs each overlying said flexible support element and all having lower ends supported by said flexible support element, tie-down means connected with the upper ends of each of said springs and extending downwardly therefrom to interconnect with said frame for positively precluding upward movement of the upper ends of said springs above a predetermined normal level relative to said frame as an incident to vertical adjustment of said support element, said flexible support element being shaped and dimensioned to limit the bending resistance of the support element to a value less than the bending moment applicable to the support element by the reactions thereon of said adjusting elements and said rows of overlying springs, individual rotary adjusting means coaxing with each of said adjusting elements to rotate the latter independently of the other adjusting elements for effecting vertical adjustment of the adjacent portion of said flexible support element whereby the position and shaping of said flexible support element is determined by the rotary positions of adjustment of the respective adjusting elements and the downward reaction of the springs on the support element, padding supported by the upper ends of said springs by spring force having a firmness determined by the vertical position and shaping of said flexible support element as effected through rotary adjustment of the individual adjusting elements.

4. An adjustable firmness box spring comprising, in combination, an elongated support frame, two flexible spring support elements each extending over an extensive

horizontal area and having extensive dimensions both longitudinally and transversely with respect to said support frame, said flexible support elements being disposed on opposite longitudinal sides of said frame for vertical adjustment with respect to the frame, two different pluralities of at least three elongated adjusting elements disposed in underlying relation to said respective spring support elements, each of said adjusting elements defining a plurality of angularly spaced support faces, means rotatably supporting each of said adjusting elements on said frame for rotatable adjustment about a longitudinal axis having a different spacing from each support face of the adjusting element whereby the respective support faces of the adjusting element upon being rotated into opposing relation to the overlying spring support element support the adjacent portion of the latter in different vertical positions of adjustment and whereby downward force of each spring support element applied to a support face on an underlying adjusting element tends to hold the latter against rotation, a plurality of compression springs overlying each of said spring support elements in a plurality of at least several rows of several springs each, all the springs of each of said pluralities having lower ends supported on the underlying support element, tie-down means connected with the upper ends of said springs and extending downwardly therefrom to interconnect with said frame for positively precluding upward movement of the upper ends of the springs above a predetermined normal level relative to said frame as an incident to vertical adjustment of said flexible support elements, operating means for turning said adjusting elements individually to different positions of rotary adjustment, and each of said flexible support elements being shaped and dimensioned to limit resistance thereof to vertical bending to a value less than the bending moment applicable to the support element by the reactions on the board of the overlying springs and underlying adjusting elements.

References Cited in the file of this patent

UNITED STATES PATENTS

2,107,205	McLendon	Feb. 1, 1938
2,302,514	Atkinson	Nov. 17, 1942
2,327,829	Sternberg et al.	Aug. 24, 1943
2,445,158	Sparhawk	July 13, 1948
2,558,288	Backus	June 26, 1951
2,595,072	Gottschalk	April 29, 1952
2,804,128	Barath	Aug. 27, 1957
2,985,895	Bloom	May 30, 1961

FOREIGN PATENTS

447,794	France	Nov. 7, 1912
---------	--------	--------------