Feb. 24, 1953 H. C. FLINT 2,629,431

SPRING SUPPORTING STRIP HAVING A TOP SEATING PORTION SPACED ABOVE A BOTTOM REINFORCING PORTION

Filed March 29, 1950 3 Sheets-Sheet 1

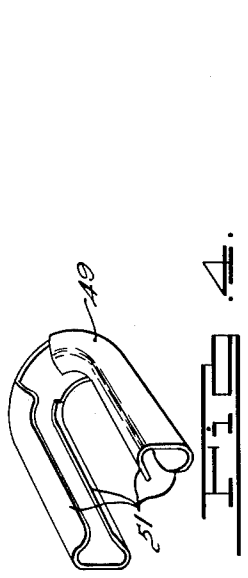

Fig. 4.

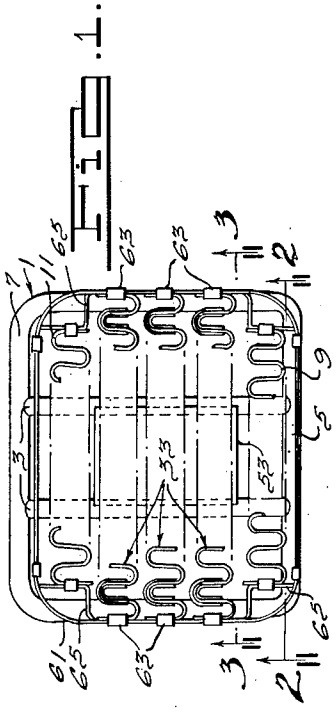

Fig. 1.

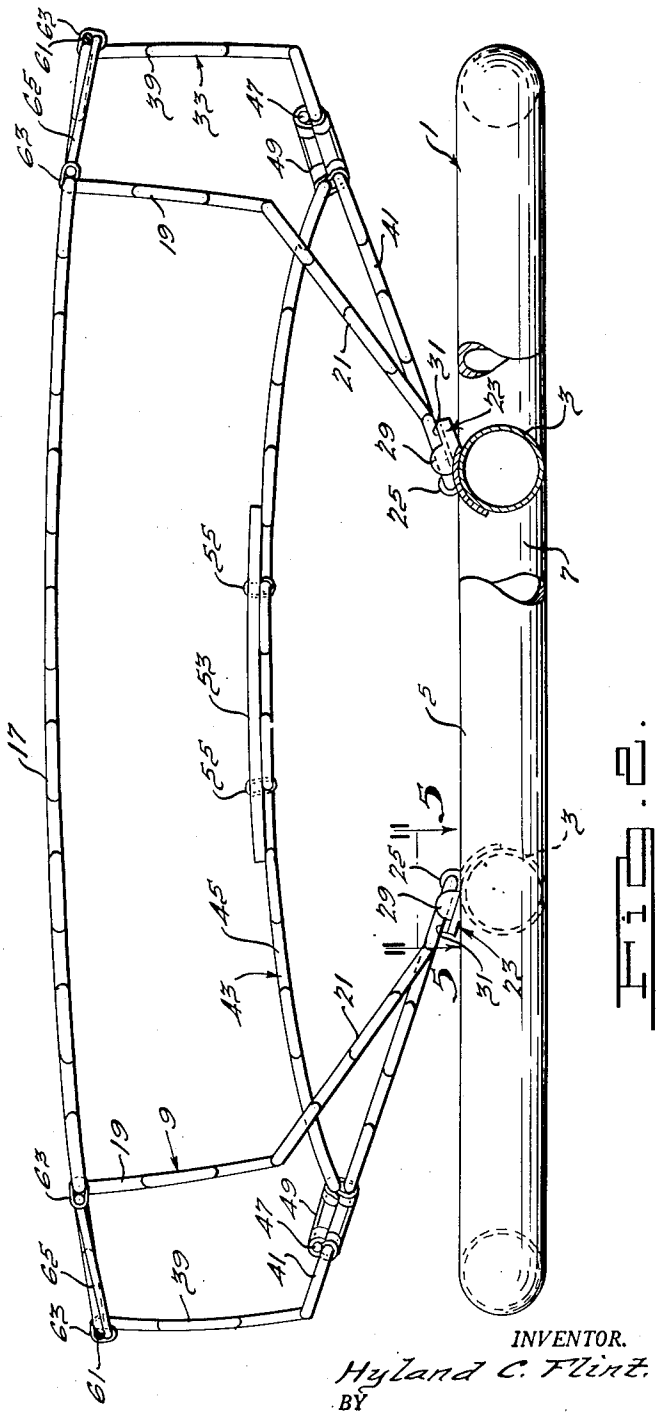

Fig. 2.

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Filed March 29, 1950 3 Sheets-Sheet 2

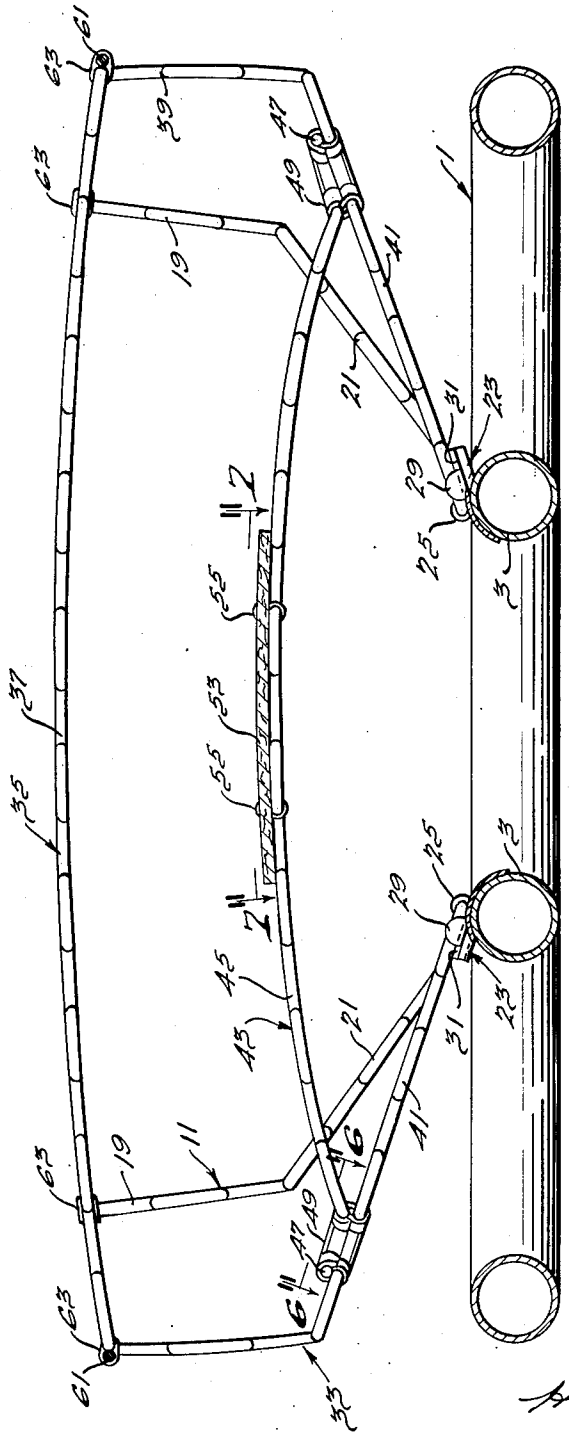

FIG. 3.

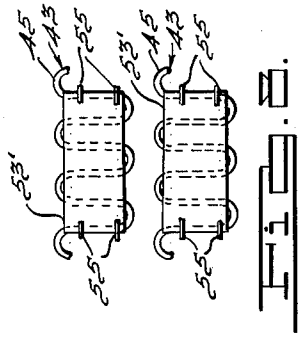

FIG. 2.

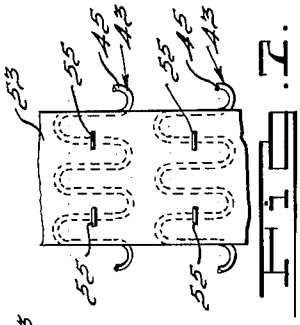

FIG. 7.

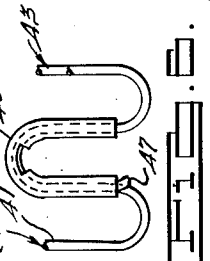

FIG. 6.

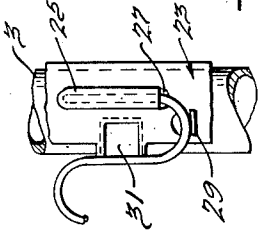

FIG. 5.

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Filed March 29, 1950 3 Sheets-Sheet 3

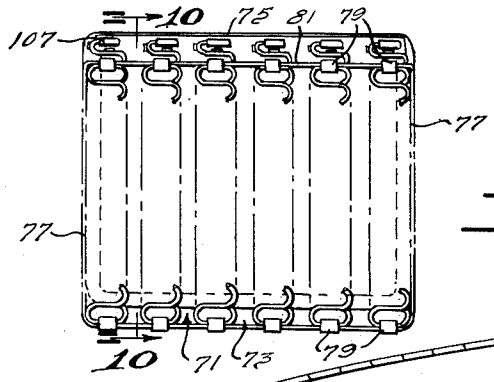

Fig. 9.

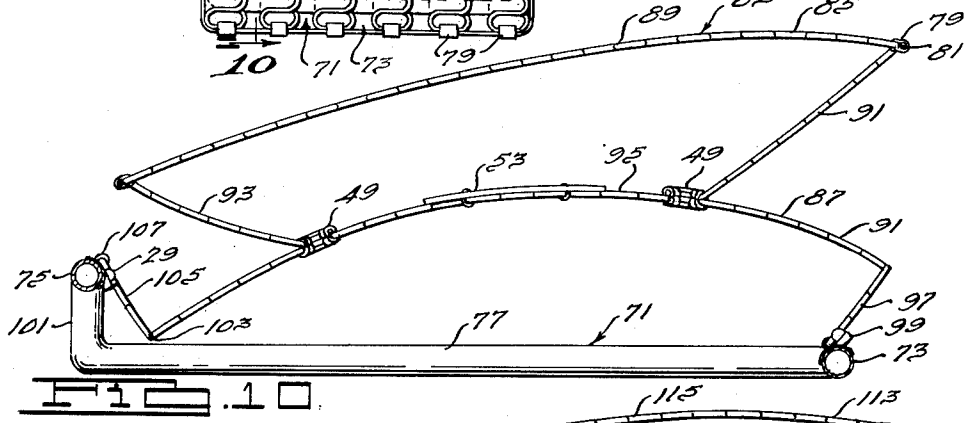

Fig. 10.

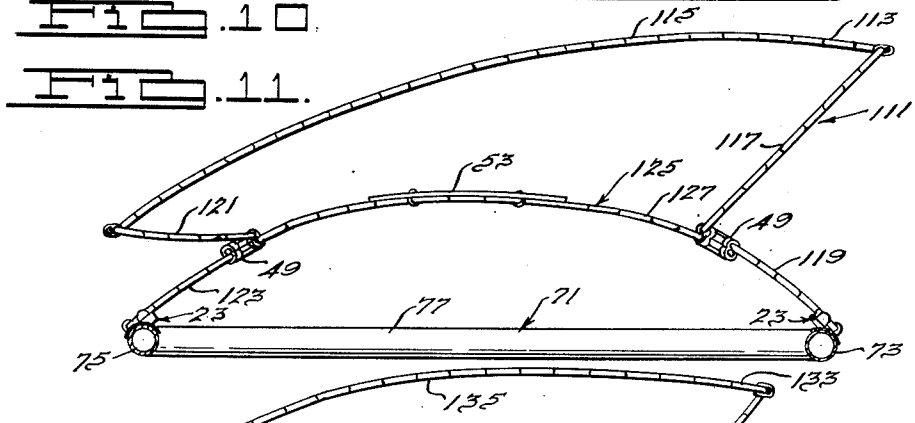

Fig. 11.

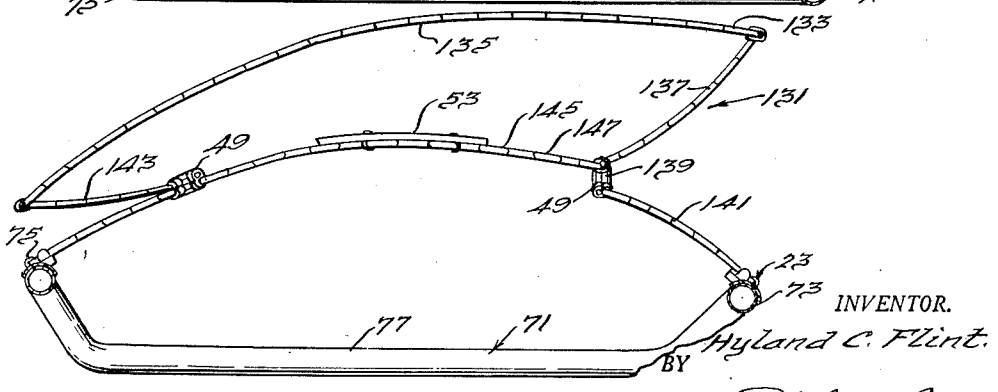

Fig. 12.

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UNITED STATES PATENT OFFICE

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SPRING SUPPORTING STRIP HAVING A TOP SEATING PORTION SPACED ABOVE A BOTTOM REINFORCING PORTION

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Application March 29, 1950, Serial No. 152,727

13 Claims. (Cl. 155—179)

1

This invention relates to spring construction and in particular to those embodying sinuous or zigzaz springs of the type disclosed and claimed in Kaden Reissue Patent No. 21,263.

The present invention provides a zigzag spring unit having at least two vertically spaced web portions, the upper of which defines the resilient load supporting surface. The webs are resiliently connected together and jointly connected in a resilient manner to the frame. During the application of seat loads below a predetermined value, the lower web serves merely as a resilient reaction member to support the upper web. However, when the loads exceed this value, the upper web is deflected into engagement with the lower so that both directly receive and resiliently support the seat loads. This construction therefore automatically furnishes an additional load receiving web to directly assist in the support of loads above a predetermined magnitude and increase the stiffness of the spring unit or its rate of deflection relative to the load. This concept virtually eliminates the danger of non-resilient "bottoming" of the seat under abnormal loads. It therefore serves as an automatic safety or overload device that enables the engineer to concentrate upon the characteristics desired in the normal load range and design the spring units to more efficiently supply them.

As a further advantage, the structure of the invention adapts itself to spacing above the floor without sacrifice in resiliency or increase in the complexity of manufacture. This provides toe or foot room beneath the seat and also space for underseat air circulation.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a plan view of a tractor seat embodying spring units constructed in accordance with the principles of the invention;

Figs. 2 and 3 are sections taken, respectively, on lines 2—2 and 3—3 of Fig. 1;

Fig. 4 is a detail view in perspective of a suitable clip for interconnecting the spring comprising the spring unit of this invention;

Figs. 5, 6 and 7 are views taken, respectively, on lines 5—5, 6—6 and 7—7 of Figs. 2 and 3;

Fig. 8 is a view similar to that of Fig. 7 showing a modified form of deadening pad;

Fig. 9 is a plan view of a seat, such as an automobile seat, embodying modified forms of spring units constructed in accordance with the principles of the invention;

Fig. 10 is a cross-section taken on line 10—10 of Fig. 9; and

2

Figs. 11 and 12 are sections similar to that of Fig. 10 illustrating modified forms of spring units constructed in accordance with the invention.

The zigzag spring unit of this invention is illustrated first in a novel tractor seat construction shown in Figs. 1 and 2 of the drawing. The seat has a frame 1 of suitable construction that may be mounted upon the platform of the tractor. Preferably, the frame comprises an endless rectangular tube that has transversely spaced longitudinally extending tubes or support bars 3 welded thereto at intermediate transverse portions of the front and rear cross-members 5 and 7 respectively of frame 1.

The zigzag spring units which form the resilient seating surface extend transversely of the frame, and those springs which form the front edge and the rear edge of the resilient surface may be constructed in accordance with the principles of the prior art. Thus the front spring 9 and the rear spring 11, which may, for the sake of illustration, be assumed to be identical, are formed from continuous or zigzag spring wire of the type disclosed and claimed in the Kaden Reissue Patent No. 21,263. Each consists of a longitudinal series of oppositely opening U-shaped turns, or, as they are commonly referred to, adjacent oppositely disposed loops comprising straight sections joined by arcuate sections. Both the front and rear springs 9 and 11 have an intermediate web portion 17 and end portions that are bent beneath the web portion. The end portions comprise sections 19 that are preferably bent at substantially right angles to the web portion 17. In the embodiment shown in the drawings, since the web portion is crowned slightly, the end portions are slanted inwardly slightly from the vertical. The length of the end portion 19 is determined by the desired height above the frame 1 of the seating surface provided by the web 17, and, in the illustrations, consists of three turns or loops of wire. The transverse length of the web 17 on each of the front and rear springs, while less than that of the remaining zigzag units to be presently described, is substantially greater than the transverse spacing of the longitudinal support bars 3. Hence, the end portions of the front and rear springs include sections 21 that are bent inwardly from the lower end of the substantially upright section 19. The extremities of the sections 21 and thus also the extremities of the springs 9 and 11 are secured to the support bars 3 by suitable means. As illustrated in Figs. 2 and 5, this means may comprise stampings 23 that are formed or contoured

to fit the surface of the bars 3, and which are welded or otherwise fixedly secured thereto. Each stamping 23 has dimples 25 pressed therein which are apertured at 27 so that the straight portion at the extremity of the springs may be slipped through the aperture beneath the dimple 25 and confined against the vertical movement between the under surface of the dimple 25 and the upper surface of the support bar 3. Sidewise movement of each of the springs 9 and 11 at the ends thereof is prevented in one direction by abutment of the end of the straight portion in the dimple 25 with the end of the dimple 25 and in the opposite direction by an upright ear or nib 29 struck from the stamping 23 which engages the arcuate loop or bend adjacent to the end of the spring. Downward pivotal movements of the end section 21 of the front and rear springs relative to the support bar 3 is prevented by a landing or flange 31 which is formed in the stamping 23 and extends upwardly in the direction of the section 21 and which is engaged by the straight section adjacent to the straight section confined in the dimple 25. As may be noted from Fig. 2, the last loop of the end of section 21 of the front and rear springs, which are connected to the stamping 23, is bent slightly relative to the remainder of the section 21. As will become self-apparent hereinafter, this is principally to account for the difference in slopes between the end section 21 and the corresponding end section on the intermediate zigzag spring unit and enable the stamping 23 to be readily manufactured and employed to attach all of the zigzag springs to the support bar 3.

The zigzag spring units 33 intermediate the front and rear springs 9 and 11 that have just been described, are constructed in accordance with the principles of this invention and carry the major share of the seat load. Each of the units 33 includes a spring 35 that is similar in shape to the front and rear springs 9 and 11. Thus each has a web portion 37 and end portions bent beneath the web each of which comprise a substantially vertical section 39 corresponding to section 19 and an inclined section 41 bent inwardly from the vertical section 39 in a manner similar to the formation of the section 21. The lower extremities of each section 41 are attached to the support bar 3 by the stamping 23 in the same manner as has been already described for the front and rear springs. However, in addition to the spring 35, each of the spring units 33 has a second zigzag spring 43 that provides a web 45 which is spaced vertically below the web 37 and which may be regarded as lying substantially entirely in the area of projection of the upper web 37, i. e., the upper and lower webs 37 and 45 lie in a vertical row or in the region bounded by two planes, each tangent to corresponding outermost curves of the respective loops of one of the webs. The web 45 of the spring 43 is preferably arched or crowned upwardly a slight amount as illustrated, and the endmost loops 47 of these springs are bent upwardly from the web 25 so that they are parallel to the section 41 of the spring 35 to which they are rigidly attached by suitable means.

Preferably and conveniently, each end loop 47 of the spring 43 may be arranged to overlie similar loops in the section 41 so that the two loops may be clamped together by means of a U-shaped clip 49 such as shown in detail in Fig. 4. The clip 49 is formed from sheet metal into U-shape in plan and cross-section and has a thickness equivalent to that of the two loops combined and fits around the outside of the loops. The cross-section includes ears or arms 51 that may be bent around the inside of the straight portions of the loops to tightly clamp the straight portions together and against the clip. It may be seen that the intermediate spring units 33 might be regarded as polygons, formed of zigzag springs, having a side 37 which is adapted to provide a resilient surface and a base 45 which has depending legs 41 by means of which the polygon is mounted on a frame.

A sound deadening buffer pad 53 of suitable material, such as thick fibre, may be attached by hog rings 55 to a central portion of the web 45 of the lower spring 43. As indicated in Fig. 7, there may be a common pad 53 for all of the spring 43, or as indicated in Fig. 8, a separate pad 53' may be provided for each of the zigzag spring units 33.

The usual border wire 61 may be placed around the edges of the webs 37 and attached thereto by clips 63, the edges of the webs of the front and rear springs 9 and 11 being attached to support wires 65 by clips 63, the wires 65 being, in turn, secured by suitable clips to the border wire 61.

As already indicated, the major share of the seat load is taken by the zigzag spring units 33. This load is applied to the web 37 of each unit and is transmitted through the vertical end portions 39 to the end portions 41 that are connected to the support bar 3. The load applied by the sections 39 to the sections 41 causes the latter to bend downwardly on lands 31 thus imparting some resiliency to the spring units. Downward bending of the sections 41 tends to increase, of course, the distance between the point of attachment of the ends 47 of the spring 43 to the section 41. Due to the rigid connection 49, this extension or expansion is resisted by the spring 43, which tends to flatten as the load increases. When the load on the web 37 reaches a predetermined value, the web 37 will have been deflected downwardly to the point where it contacts the web 45 through the medium of the pad 53. At this point, the springs 43 and 35 both directly take the load, and the tendency of the web 45 to downward deflection causes an inward pull on the ends 47 which is in opposition to the outward pull on these ends caused by deflection of the web 37. Thus there is a substantial stiffening of the unit 33 at this point so that excessive loads on the seat can be withstood in a resilient manner and without bottoming of the springs on the frame or platform.

Figs. 9 to 12 show the use of modified forms of the zigzag spring units of this invention in a conventional automobile seat construction. The seat of Fig. 9 has a frame 71 that is formed of endless tubular stock and includes the front supporting bar 73 and a rear supporting bar 75 joined by side supporting bars 77. The zigzag spring units extend longitudinally of the frame and thus have suitable portions by means of which they are attached at one end to the front bar 73 and at the other end to the rear bar 75. The front and rear edges of the webs of the zigzag spring units, as well as the side edges of the border units, may be attached in conventional manner by clips 79 to a border wire 81.

Several modified forms of units for use in the seat of Fig. 9 are shown in Figs. 10–12. The zigzag spring unit 83 of Fig. 10 consists of vertically spaced zigzag spring elements 85 and 87. The

upper spring 85 has a web 89 and end portions 91 and 93 bent inwardly beneath the front and rear edges respectively of the web 89. The lower spring 87 has an arcuate web 95, and the last loops on the end portions 91 and 93 of the upper spring are bent parallel to the web portion 95 and secured thereto by means of clips 49 in a manner already described in connection with Fig. 4. The web 95 of the lower spring 87 is extended forwardly and rearwardly of the points in connection with the upper springs, and, at the forward end, a portion 97 of the spring is bent beneath the web and secured by clip 99 to the front supporting bar 73. In the embodiment of Fig. 10, the rear supporting bar 75 is jogged or elevated above the front supporting bar by means of uprights 101 formed in the frame. The rear bar 75 is then spaced above the floor of an automobile and thus provides toe room for occupants of the rear seat. In order to obtain the desired resiliency, while at the same time obtaining the toe room, the web 95 of the lower spring 87 is extended downwardly from its point of connection with the end portion 93 and then at point 103 is bent upwardly in a section 105 that is secured by means of a suitable clip 107 to the rear supporting bar 75.

It will be observed that the spring unit 83 is a modification of the spring unit 33, previously described, in that the end portions on the lower spring 87 are connected to the frame, and the upper spring is supported on the lower spring. The seating load applied to the upper web 85 is therefore resisted by the end portions 91 and 93 of the upper spring as well as by the entire lower spring 87. After a predetermined deflection of the upper web 85, it will contact the lower web 95 through the medium of a pad 53 so that at this point the two webs 89 and 95 will act in series to resist the load and prevent solid bottoming of the spring.

Fig. 11 illustrates another modified form of zigzag spring unit 111 constructed in accordance with the principles of this invention which is essentially the same as the unit 33 already described. Thus, it comprises a zigzag spring 113 having a web 115 and end portions at the front and rear thereof which are secured at their lower extremities to the front and rear supporting bars 73 and 75 of the frame. The front supporting section for the web 115 consists of a portion 117 that is bent inwardly beneath the front end of the web 115 and then outwardly to form section 119 that is connected by a suitable clip, such as stamping 29 to the front supporting bar 73. The end portion of the spring 113 for supporting the rear of the web 115 comprises a section 121 which is bent inwardly beneath the web and then outwardly in a section 123 which is joined by clip 29 or the like to the rear supporting bar 75. A second zigzag spring 125 is connected to the end portion of the upper spring 113 and provides a web 127 that is spaced vertically beneath the upper web 115. The endmost loops of the lower spring 125 are rigidly and non-pivotally connected to the front section 119 and the rear section 123 of the spring 113 by means of clips 49 or the like. A pad 53 may be applied to the upper surface of the web 127 to engage the web 115 and prevent noisy contact between the springs. It is evident that the spring unit 111 functions in the same manner as the spring unit 33 already described.

The zigzag spring unit 131 of Fig. 12 represents a combination of the units 83 and 111 shown in Figs. 10 and 11 wherein an upper zigzag spring and a lower zigzag spring each has one end portion secured to a supporting bar, the upper spring being illustrated as attached to rear bar 75 while the lower spring is shown attached to front bar 73. In the embodiment of Fig. 12, both the front and rear supporting bars 73 and 75 are shown elevated above the side supporting bar 77 so as to provide toe room or space beneath the seat construction. The upper spring 133 has a web 135 and a front end portion comprising a section 137 that is bent inwardly from the end of the web 135 and connected by means of a vertical spacer loop 139 to a section 141 of the upper spring that is bent outwardly and forwardly with respect to the web 135 and secured by means of a clip 23 or the like to the front supporting bar 73. At the rear end of the web 135, there is merely a section 143 that is bent beneath the web. The lower spring 145 has a web 147 which is connected by means of a clip 49 to the end of the section 143 whereby it serves to support the upper spring 133. The web 147 extends rearwardly beyond its point of connection with the end section 143 and is secured by means of a suitable clip to the rear support bar 75. The front of the web 147, however, is connected to the front end portion of the spring 133. This is conveniently accomplished by bending the last forward loop of the spring 145 so that it is parallel to the spacer loop 139 and rigidly connecting it thereto by means of a clip 49. A buffer pad 53 may be secured to the web 147 as before.

As in the other spring units, the lower spring 145 of the spring unit 131 serves to assist in the resilient support of the load upon the upper web 135 and when that web has been deflected a sufficient amount, it contacts the lower web 147 so that both supply a stiffened but yieldable support to the seat load.

It is evident from the modifications shown and described herein that the invention is susceptible of variations, hence, is not intended to limit it to the specific structures shown and described by way of illustration of the principles of the invention.

What is claimed is:

1. A zigzag spring unit comprising an upper zigzag spring having a web portion and end portions bent beneath the web portion, a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, means rigidly connecting the lower spring to the end portions of the upper so that the webs are spaced, and spring portions for attachment to a frame beneath the lower web integral with at least one of the springs.

2. A zigzag spring unit comprising an upper zigzag spring having a web portion and ends bent beneath the web portion, a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, and means rigidly connecting the ends of the lower spring to intermediate points on the ends of the upper spring whereby the portions of the ends beneath the second web may serve as means to attach the unit to a frame.

3. A zigzag spring unit comprising an upper zigzag spring having a web portion and ends bent beneath the web portion, a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web and ends extending below the second web portion, and means rigidly interconnecting the second web to the extremities of the upper spring so that the ends of the second spring

extend beneath the webs and serve as means to attach the unit to a frame.

4. A zigzag spring unit comprising an upper zigzag spring having a web portion and end portions bent beneath the web portion, and a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, means rigidly connecting the lower spring to the end portions of the upper so that the webs are spaced, one of said end portions and a portion of said lower spring extending beneath the lower web for attaching the unit to a frame.

5. A zigzag spring unit comprising an upper zigzag spring having a web portion and end portions bent beneath the web portion, and a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, means rigidly connecting the lower spring to the end portions of the upper so that the webs are spaced, and spring portions for attachment to a frame beneath the lower web integral with at least one of the springs, one of the spring portions being bent outwardly and upwardly.

6. A zigzag spring unit comprising a first zigzag spring having a web defining a resilient load supporting surface, a second zigzag spring having a web spaced below said web and lying substantially in the area of projection thereof, zigzag spring elements non-pivotally interconnecting the webs to yieldably space them apart and transmit load from the first or upper web to the second or lower web, said spacing being such that the application of loads exceeding a predetermined maximum on the upper web overcomes the resistance of said elements to allow said web to deflect into engagement with the lower web, and zigzag spring elements non-pivotally interconnected to the webs and extending therebeneath to serve as legs or supports for attachment to a frame.

7. The invention as claimed in claim 6 wherein the zigzag spring elements are integral with the springs.

8. In a spring construction, the combination of a frame having longitudinal members and transverse members, one of the transverse members being spaced above the plane of the longitudinal members, a plurality of substantially parallel, longitudinally extending zigzag spring units secured to the transverse members, said units each including upper and lower vertically spaced longitudinally extending webs and resilient elements interconnecting and spacing the webs and capable of permitting the upper web to contact the lower when loads exceeding a certain value are applied to the upper web.

9. In a spring construction, the combination of a frame having longitudinal members and transverse members, a plurality of substantially parallel transversely extending spring units secured to the longitudinal members, said units including upper and lower vertically spaced transversely extending webs and resilient elements interconnecting and spacing the webs and capable of permitting the upper web to contact the lower when loads exceeding a certain value are applied to the upper web.

10. In a spring construction, the combination of a frame including spaced spring supporting members, a plurality of substantially parallel spaced zigzag spring units, each of said units comprising an upper zigzag spring having a web portion and end portions bent beneath the web portion, each of said units including a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, each of said units including means rigidly connecting the lower spring to the end portions of the upper so that the webs are spaced, and spring portions beneath the lower web integral with at least one of the webs, and means rigidly securing the extremities of the spring portions to the supporting members.

11. In a spring construction, the combination of a frame including spaced spring supporting members, one of the members being higher than the other with respect to the plane of the frame, a plurality of substantially parallel spaced zigzag spring units, each of said units comprising an upper zigzag spring having a web portion and end portions bent beneath the web portion, a lower zigzag spring beneath the upper having a web portion lying substantially entirely in the area of projection of the upper web, means rigidly connecting the lower spring to the end portions of the upper so that the webs are spaced, and spring portions beneath the lower web integral with at least one of the webs, one of the spring portions extending downwardly and outwardly from the lower web and then being bent upwardly to terminate adjacent the higher of the supporting members, and means rigidly securing the extremities of the spring portions to the supporting members.

12. In a spring construction, the combination of a first sinuous spring element, a second sinuous spring element spaced below a central portion of the first, each of said elements comprising adjacent oppositely opening U-shaped turns of spring wire, end portions of the first element bent beneath the central portion of the first element, U-shaped turns of the end portions engaging and congruent with at least certain U-shaped turns on the second spring, U-shaped clips extending around the engaging pairs of turns having arms bent around and clamped to the legs of the turns to rigidly and non-pivotally interconnect the elements, and resilient means connected to the elements for mounting them on a frame.

13. A zigzag spring unit comprising a closed polygon formed of zigzag spring wire and having a side adapted to provide a resilient cushion surface, the opposite side of said polygon constituting a base and having depending legs of zigzag spring wire extending away from the side forming the resilient surface and being adapted for mounting on a frame.

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