Aug. 6, 1957 S. P. CRANE 2,801,681

VENTILATING CUSHION

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Fig. 1

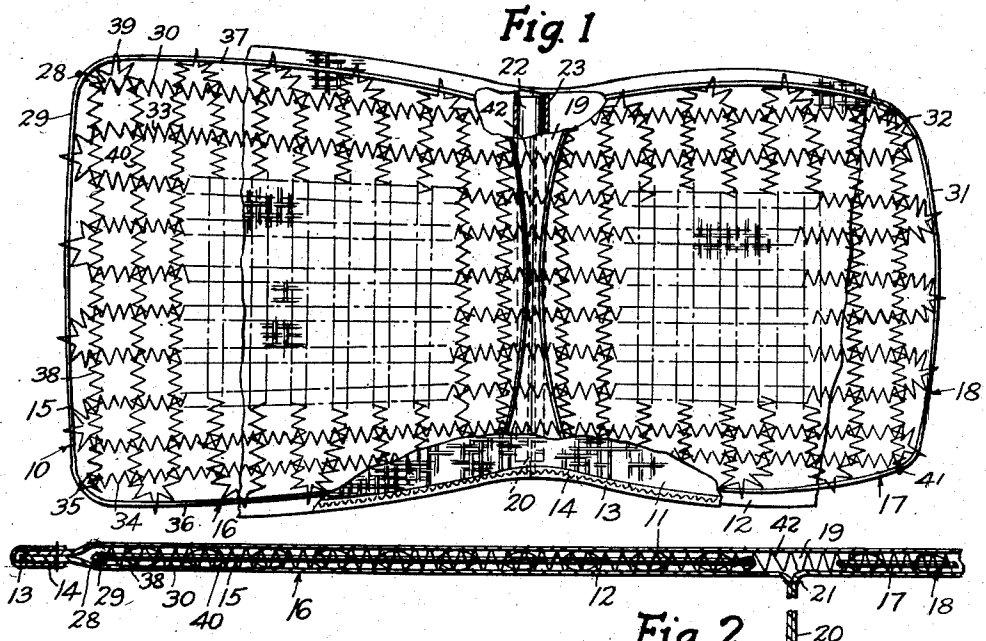


Fig. 2



Fig. 4

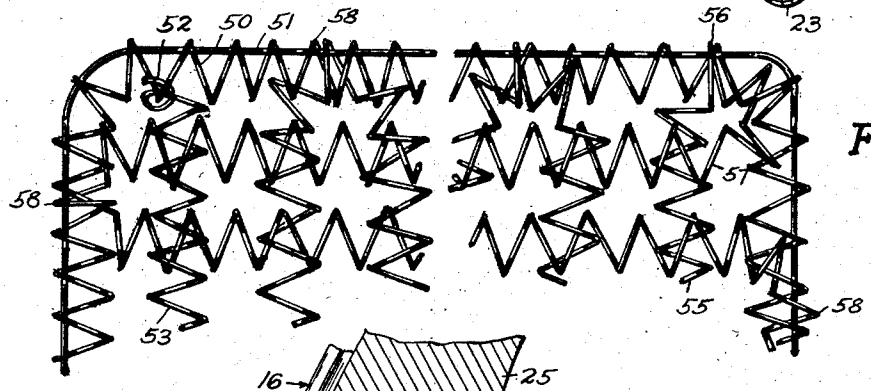
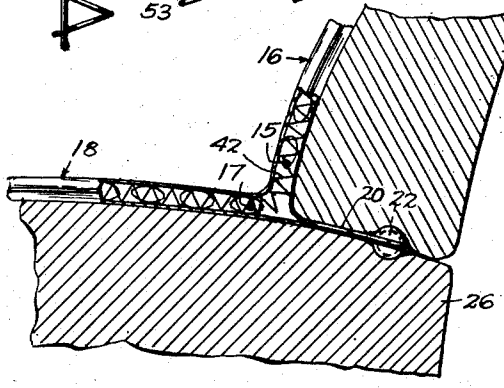


Fig. 3



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Fig. 5

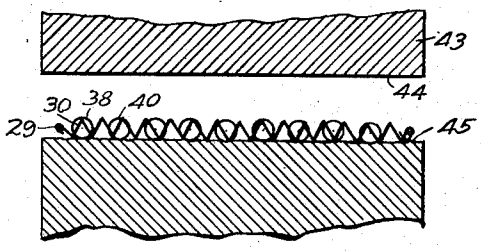


Fig. 6

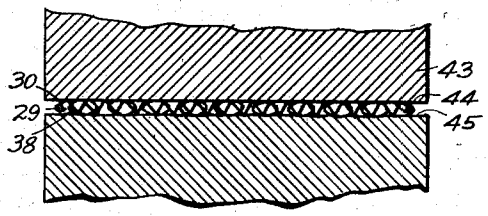


Fig. 7

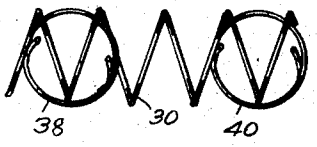


Fig. 8

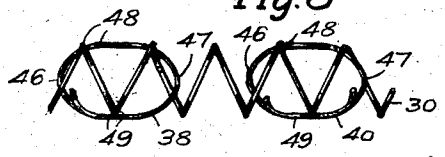


Fig. 10

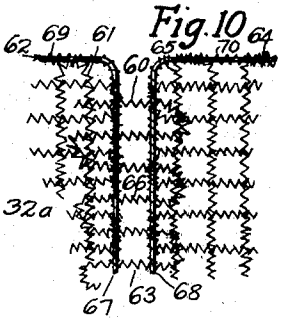
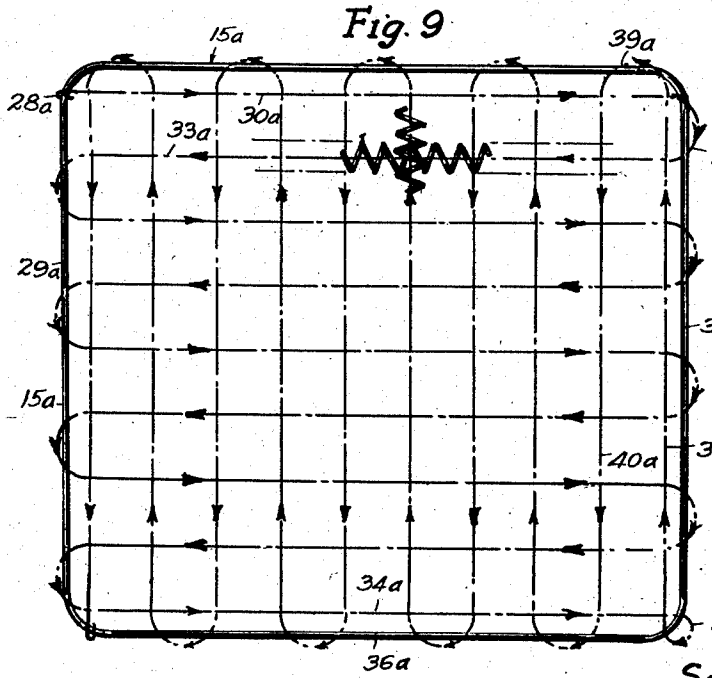


Fig. 9



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2,801,681

VENTILATING CUSHION

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Application November 28, 1955, Serial No. 549,414

9 Claims. (Cl. 155—182)

This invention relates to ventilating cushions and to the inner spring units thereof, and particularly to the type intended to space the body of the user away from the seat and back cushions of an automobile, chair, bed or the like to permit air to circulate therebetween.

The invention contemplates the provision of a spring unit in a ventilating cushion in which one or more long springs are wrapped back and forth and from side to side across spaced apart frame members to form intersecting entangled rows of spring coils, the rows being mutually interlocked at the intersections thereof without the need for extraneous devices.

The invention further contemplates the provision of rows of spring coils in the cushion which connect the seat portion of the cushion to the back portion and which act as spring hinges between said portions.

The invention further contemplates the provision of a cushion self maintained against undesired collapse of the back portion upon the seat portion and provided with means for holding the cushion in its proper operative position.

The invention further contemplates the provision of a simple, rapid and inexpensive method of making the cushion entailing a minimum amount of labor and eliminating free ends on the springs or rows of coils, which ends might work through the cushion cover and cause discomfort to the user, the method including wrapping a long coiled wire spring back and forth and across opposite spaced apart frame members to form a first set of spaced apart rows of spring coils and a second similar set intersecting the first set, and then locking the sets together by pressure on the thus assembled coils.

The invention further contemplates the provision of an effective though inexpensive method of interlocking intersecting coil springs by crushing the coils sufficiently to impart a permanent set thereto and to elongate the coils transversely and thereby to entangle the coils of the intersecting rows sufficiently to make it difficult to separate them under normal usage, especially when the cover of the cushion is in place.

The various objects of the invention will be clear from the description which follows and from the drawings, in which—

Fig. 1 is a top plan view of a ventilating cushion embodying the invention, the cover being broken away in parts to show the underlying structure.

Fig. 2 is a fragmentary cross sectional view of the cushion showing the hinging portions of the rows of spring coils between the seat frame and the back frame and also showing the wedging block to hold the frames in place on a seat.

Fig. 3 is a fragmentary vertical sectional view of a seat such as an automobile seat showing the wedging block frictionally held between the back cushion of the seat and the seat cushion.

Fig. 4 is a fragmentary top plan view on an enlarged scale of a spring unit for the cushion in which a border spring is employed.

Fig. 5 is a diagrammatical vertical sectional view of a typical press by means of which the crushing step upon the coils of the assembled rows of coils and frames may be performed.

Fig. 6 is a similar view of the same at the completion of the crushing step.

Fig. 7 is a fragmentary enlarged view of a pair of adjacent rows of coils and of an intersecting locking row as they appear in Fig. 5 in circular form.

Fig. 8 is a similar view of the coils as they appear after the crushing and widening of the coils.

Fig. 9 is a top plan view of a wire border frame of the spring unit showing diagrammatically by means of dash-dot lines the positions assumed by the axes of the rows of coils as the spring is wrapped across the frame to form two sets of intersecting rows, the arrows indicating the alternating opposite directions in which the wrapping proceeds.

Fig. 10 is a similar fragmentary view of a modified form of the spring hinge in which a separate spring is used.

In my copending application Serial No. 466,258, is disclosed a locking spring intersecting a number of parallel or concentric rows of spring coils and locked thereto by the transverse elongation of the coils. However, in the present invention the individual rows are adequately anchored in an extremely simple manner at both ends thereof to a border frame, so that the transverse elongation of the coils for insuring locking of the rows becomes optional. In other words, the present invention is adapted for use with the coils in their initially circular form as well as with crushed coils. It is also adapted for use with frames of any desired outline, polygonal, rectangular or curved or combinations thereof since the border spring serves to resist shifting of the rows. It also has the advantage of eliminating many of the cut and bent spring ends necessary in prior known units thereby lessening the danger of some spring end piercing the covering fabric and tearing garments or seat covers or causing discomfort to the seated person, as well as reducing the cost of cutting and bending spring ends. Briefly, a long spring is wound or wrapped back and forth and from side to side across and around a border wire or frame or across separate seat and back frames to form a relatively large number of rows of spring coils intersecting each other at closely spaced points. The number of spring ends is also reduced to a minimum of two with the use of a single wrapping spring. The border spring often employed in cushions of this type may be omitted or retained as may be found desirable. In addition, one set of rows of spring coils is carried across separate adjacent frames to connect them and to form a spring hinge therefor, as has already been indicated and as will be pointed out more fully hereinafter.

Referring now to that form of the invention shown in Figs. 1 and 2, the spring unit designated by the numeral **10** is arranged inside of a loosely woven fabric cover comprising the upper sheet **11** and the under sheet **12**. Suitable edge binding **13** is folded about the adjacent edges of the sheets and stitched thereto as by the stitching **14**. A generally rectangular border wire or frame **15** is provided for the back portion **16** of the cushion and a similar frame **17** for the seat portion **18**, the frames being preferably slightly separated to provide the space **19** therebetween, thereby to permit said portions to swing relatively to each other into the operative positions thereof shown in Fig. 3. At said space **19**, a folded flap **20** projects from the under sheet **12** and is doubled on itself and stitched as at **21**, the flap extending transversely across the sheet and the cover. A rigid preferably cylindrical block **22** is arranged at the bend **23** of and inside of the flap and there held as by the stitching **24**. As seen in Fig. 3, the flap **20** and the block **22** are inserted between

the bottom edge of the back cushion **25** of the automobile or other seat and the seat cushion **26**, the cushions yielding to receive the block and flap, which are wedged and held therebetween and which prevent the seat and back units from shifting as the user moves about while seated.

As has been indicated, the entire spring arrangement of Figs. 1, 2 and 3 may optionally be constructed of a single long spring to reduce the number of spring ends to a mere two. As seen in Fig. 1, one end **28** of the spring is secured to the left hand side or member **29** of the border frame **15**, by bending said end thereabout. The first row **30** of spring coils is then carried to the right from the side **29** over the tops of the frames to the opposite right hand member or side **31** of the other border frame **17** without subjecting the coils to any material tension. There the spring is turned through an angle of 180° as by forming the bend **32** having a loop or fold passing half way around the outside of the side **31**, the spring being carried thereunder to the left back across the under sides of the frame members to the left hand side **29** of the frame **15** to form the next substantially parallel row **33**. At said side **29**, the spring is again bent through 180° half way around the outside of and up over the top of said side and carried across the frames to the right and up to the side **31** of the frame **17**. The spring without being stretched appreciably is wrapped in this manner back and forth in opposite directions alternately across the frames to form additional rows and to complete one set of substantially horizontal parallel rows of spring coils spaced as closely together or as widely apart as may be advisable.

In Fig. 9 is shown by means of dash-dot lines, the directions of wrapping above explained, but as applied to a single border frame **15***a*. The bends **32***a* at and around the opposite sides **29***a* and **31***a* of the single frame are similar to the bends **32** at the sides **29** and **31** of the two frames **15** and **17**. The spring end **28***a* is similar to the end **28** of Fig. 1 and the first horizontal row **30***a* is similar to the row **30**. The remaining numbered parts with the character "*a*" are similar to the correspondingly numbered parts of Fig. 1.

Obviously, some means are desirable to maintain the rows against shifting relatively to each other and to the border frame and also to fill more completely any excessively large gaps between the rows. As shown in Fig. 1, after the last horizontal row **34** has been formed to complete the first set of rows, the vertical rows are formed, preferably though not necessarily, using the same spring. For example, at the left hand end of the row **34**, the spring is bent through an angle of 270° to form the bend **35** after passing at least half way around the frame side **29**, the spring being then carried up and across from the lower side **36** of the frame **15** to the opposite side **37** to form the first vertical row **38**. The 180° bend **39** at the side **37** connects the row **38** to the next vertical row and is similar to the bend **32**. The formation of the remainder of the set of vertical rows extending alternately in opposite directions then proceeds in the same manner as the first set of rows is formed until the space within the frame is adequately filled with rows corresponding to the warp and fill of a woven fabric. Finally, the spring is cut off at the end of the last row and the second end portion **41** secured to the frame **17** in the same manner as the first end **28** is secured.

It will be noted that the vertical rows are omitted at the space **19** between the seat and back frames, but that the horizontal rows **30**, **33**, **34** and the like bridge said space as at **42**. The bridging portions **42** serve as spring hinges urging the seat and back portions **16** and **18** toward the coplanar positions thereof. In the operative position of the cushion on a seat as shown in Fig. 3, the springs are just strong enough to prevent the back portion **18** from collapsing or folding down on to the seat portion **17** as it frequently would if said portions were connected only by the cover in the usual manner.

The sharpness or bulkiness of the securing loop or loops of the bends **32**, **32***a*, **35**, **35***a*, **39**, **39***a* and the like is desirably kept at a minimum to reduce the maximum thickness of the cushion to a practical limit sufficient to give the desired ventilation without excessively increasing the height of the seat. Such bend sharpness depends on the characteristics of the spring coils and the wire from which the coils are formed. For example, the metal alloy used, the wire gage or diameter, the wire temper and resilience all influence the initial sharpness of the bends. The positions assumed by the rows are also determined to a considerable extent by the direction in which the spring coils are wound and bent around the frame as will later be pointed out. Said bends are optionally further reduced in bulkiness by folding the loop or loops thereof on themselves to the desired sharpness at the folds by the coil crushing step soon to be described in connection with the interlocking of the coils of the rows at the intersections thereof.

The degree of the interlocking action of the intersecting rows depends on the relation between the diameters of the circular coils of the rows and the pitch of the coils. Since the coil diameters of both sets of rows are the same or nearly the same, the spring coils need merely be pressed together at the intersections to make the respective axes thereof coplanar thereby attaining a lock as shown in Fig. 7 which is adequate for many purposes, especially since the cover usually resists separation of the entangled coils at the intersections. The diameter of the coils is preferably greater than the pitch. Consequently, when the rows are forced together or preassembled to make the axes thereof coplanar, the relatively large coil of one row acts as a wedge to spread that coil of the other row into which said one row is forced, or vice versa. Sometimes it is the coil of the locking row which spreads to receive one or more coils of the other row. At other times, interengaged coils of both rows spread apart. This may depend on the relative positions assumed by the coils when the locking row is arranged in place as set forth in my said copending application. After the locking coil passes the coil of the other row, the spreading pressure on the interengaged coils is suddenly released and the coils snap back into their normal initial circular shapes, the stretched or spread coils also contracting into the initial dimensions thereof. It will be understood that the rows rest on a supporting surface during the assembling step so that the required pressure may be exerted on the rows after they have been arranged in the desired directions as shown in Fig. 9.

It is difficult to determine with accuracy the exact positions assumed by the interlocking, entangled and wedged parts of the coils under all conditions. Suffice it to say that the coils are sufficiently locked together for practical purposes, but since they have been assembled by lateral or vertical pressure, they can be disassembled by similar pressure in the reverse direction which causes the opening or spreading apart of the coils in a manner which is the reverse of that described above in connection with the assembling operation. In any case, the diameter of the coils should be greater than the pitch thereof, otherwise the intersection of the coils at right angles would cause no interengagement of the coils as will now be understood. Flattening of the coils causes them to elongate transversely but such elongation may be insufficient to attain a satisfactory lock if the pitch is too great. The flattening or crushing operation on the coils in connection with proper proportioning of the diameters and pitch of the coils, aid in the attainment of a satisfactory lock at the intersections of the rows.

For the crushing step, the unit is transferred to a suitable press shown diagrammatically in Figs. 5 and 6 having a vertically reciprocating ram as **43** provided with

a flat under surface as 44 and a relatively fixed bed plate having a roughened upper surface 45 to prevent slipping of the coils during the crushing operation. The press ram strikes the top surface of the unit a blow sufficient to distort the coils permanently into the generally elliptical shape shown in Figs. 2, 3, 6 and 8. To attain the permanent set of the coils into the new shapes thereof, the ram 43 preferably moves downwardly past the position in which the unit is compressed to the required final height.

It will be noted that after such crushing operation, relatively sharp bends or "breaks" as 46, 47 are formed at the sides of the coils and substantially flat tops 48 and flat bottoms 49 are also formed and that the coils are elongated transversely and reduced in height. If a border spring around the wire of the border frame is employed, as in the forms shown in Figs. 4 and 10, the crushing step also reduces the height of said spring to that of the remainder of the unit, thereby making the unit of uniform thickness or height throughout except at the bound edges of the finished cushion. Crushing the coils also reduces the bulkiness of the anchoring bends which secure the rows to the frame at the ends of the rows. The loops 32 and 32a and the like encircling the wire of the frame are folded through a 180° angle and substantially closed or doubled on themselves by the crushing step and the sharpness of the bends increased to aid in arranging the rows in a coplanar position should the bends urge the rows somewhat out of said position.

In this connection, it should be pointed out that the direction of the pitch of the coiled wire spring forming the rows determines the direction in which the spring should be wrapped across and around the wire of the frame in order that the bulk at the bends be kept at a minimum and that the rows are maintained with their axes coplanar. If the proper wrapping direction is not followed, the rows will bulge out considerably from the proper plane of the cushion and will become difficult to handle. As shown herein, all of the wire coils are wound in the direction taken by a left hand screw thread, though it will be understood that the pitch may be that of a right hand screw thread if the direction of wrapping be changed accordingly. For the pitch corresponding to that of a left hand screw, which will herein be termed a "left hand" pitch, or a direction in which the coils recede from the observer when wound in a counterclockwise direction, the wrapping should also have a left hand pitch. In other words, the wrapping proceeds across and around the frame to form the bends in a general direction corresponding to the direction of the pitch of the spring coils. For coils of right hand pitch, the wrapping should also have a right hand pitch. In Fig. 9, coils of left hand pitch are shown and the pitch of the wrapped spring is also shown as left hand or in the direction taken by a left hand screw thread. If the pitch direction of the coils differs from that of the wrapped spring, then the rows can be forced into coplanar position with additional labor and expense. Each individual coil passing around the border wire may be manually distorted or shaped by a tool to a shape and position which accomplishes the purpose, but proper winding eliminates the need for such distortion and additional operations.

In the form of Fig. 4, a border spring 50 is passed around a separate seat or back frame 51. One end 52 of the wrapping spring is secured to the border spring. The first row 53 of coils of left hand pitch is shown vertical and 180° bends 58 of left hand pitch are employed at the end of each row, the bends being similar to the bends 32 previously described. At the end of the last vertical row 55, which is shown to be at the top right hand corner of the unit, a 270° bend 56 is made in the spring to start the first top horizontal row 57. Since the bends 58 come between coils of the border spring, said bends and the rows of coils extending therefrom are prevented by the border spring from shifting materially

along the border frame or relatively to each other. It therefore becomes possible to use the warp and fill rows of coils in variously shaped frame members to make cushions of polygonal or curved outline without danger of the rows shifting to any material extent, and without loss of the anchoring effect of the row bends.

In Fig. 10 has been shown a form of spring hinge using a separate spring 60. The spring is suitably interlocked with the vertical row 61 of one frame 62, then carried across the space 63 between the frames 62 and 64 to the vertical row 65 of the wrapping spring for the frame 64 where it is wrapped about said row a number of times. The spring is then carried back to the frame 62 where it is wrapped around the row 61, and is then again carried back and forth across the space 63 to form a number of row portions 66 serving to urge the frames into a coplanar position. The portions 66 cross the adjacent sides 67 and 68 of the respective frames and pass therebeyond, being suitably anchored at each end of each row to parts of the units. The border spring 69 passes around the wire of the frame 62 and a similar spring 70 passes around the wire of the frame 64. If desired, the border spring may be part of the wrapping spring in this form of the invention as well as in the other forms, it being merely necessary to prolong the wrapping spring forming the warp and fill rows and to insert the frame thereinto.

It will now be obvious that the rows may start at any corner of the border frame but that wrapping should proceed in the same direction as that of the pitch of the coils of the wrapping spring to form the sets of intersecting rows akin to the warp and fill of a woven fabric. It will also be understood that in the case of large cushions wherein a single spring for the border, the intersecting rows and possibly for the spring hinge, would be unwieldly and because of its excessive length difficult to handle and bend, it may be desirable to employ more than one spring, as for example, one for each set of rows, another for the border and possibly another for the spring hinge. It will further be seen that there has been provided hereby, an inexpensive but efficient cushion in which intersecting rows and a spring hinge are formed by the simple process of merely winding a wrapping coiled spring about one or more border frames and pressing the coils at the intersections together with or without flattening or crushing the entire unit to give the coils a permanent set and to further entangle and interlock the coils.

While certain specific forms of the invention have herein been shown and described, various obvious changes may be made therein without departing from the spirit of the invention defined by the appended claims.

I claim:

1. In a ventilating cushion, a spring unit comprising a frame, a coil spring wrapped continuously across the frame in two sets of intersecting and entangled rows of coils, an integral bend at the end of each row directly connecting said row to the adjacent row of the same set of rows, each of the bends passing half-way around a side of the frame, the frame, the rows and the bends having substantially coplanar axes, each of the outermost rows of each set being substantially parallel to the adjacent side of the frame and anchoring the bends of the rows intersected thereby against permanent shifting out of the initial positions thereof on the frame.

2. The cushion of claim 1, the coils being upright and non-circular and having a lesser height than width, the pitch of the coils being less than said width, the intermediate parts of the rows between the bends being held in position against transverse movement relatively to the adjacent and intersecting rows solely by the entangled coils of the rows, and the bends constituting the sole means connecting the coils to the frame.

3. In a ventilating cushion, a wire frame member, a coil spring extending across the member in one direction

and forming a row of substantially upright coils, a bend in the spring at the end of the row, said bend having a loop passing less than a complete turn around the wire of the member, a second row of substantially upright coils at the end of the bend passing across the member in the opposite direction, and a third row of substantially upright coils substantially perpendicularly intersecting the first and second rows and having a substantially straight axis coplanar with the axes of the other rows, the coils of the third row being wedged into the coils of the other rows and being thereby locked thereto, the least diameter of the coils being greater than the pitch thereof, and the coils being sufficiently resistant to lateral deformation to maintain the thickness of the cushion substantially constant when loaded.

4. The cushion of claim 3, the frame member including a seat frame and a back frame, and means hingedly connecting the frames, said means comprising a plurality of spaced parallel rows of coils each row having a portion extending between and beyond the adjacent sides of the seat frame and the back frame and tending to straighten the axis thereof and thereby urging said frames toward a coplanar position.

5. The cushion of claim 3, a coiled spring around all of the sides of the frame member, the coils of the border spring engaging the bend loop at the end of each row and resisting shifting of said loop and the border spring along the sides of the frame member.

6. In an inner spring unit for a ventilating cushion, frame means, a coil spring extending across said means and forming a pair of substantially straight and parallel adjacent rows of spring coils integrally connected to each other at the adjacent ends thereof by a bend, said bend passing partway around the frame means and directly connecting the rows, and a third substantially straight row of coils intersecting the pair of rows and wedged thereinto and constituting the sole means for preventing transverse movement of the pair of rows relatively to each other and to the intersecting row at the intersections.

7. The cushion of claim 6, all of the coils being resistant to lateral deformation and elongated transversely

sufficiently to engage a plurality of spaced points on the intersecting row at each intersection, the coils all being of the same height and having a pitch less than the greatest diameter thereof.

8. In a ventilating cushion, a seat frame, a back frame in longitudinal alignment with and in longitudinal spaced relation to the seat frame, a coil spring extending between and across the lengths of and connecting said frames and forming a pair of adjacent rows of spring coils integrally connected to each other at the corresponding ends thereof, said spring passing half way around the outer side of the back frame at one of the ends of the rows and passing half way around the outer side of the seat frame at the opposite ends of the rows, the portions of said rows between the frames being parallel and constituting a spring hinge for the frames, and means entering the coils for resisting relative shifting of said rows.

9. In a ventilating cushion, an inner coiled wire seat unit, an inner coiled wire back unit in longitudinal spaced relation to the seat unit, and means hingedly connecting said units and urging said units toward a position wherein the units are substantially coplanar, said means comprising transversely spaced rows of coiled wire, each of said rows having a longitudinal axis bridging the space between the units, each row being of sufficient length to extend past the end of a unit into the unit and being entangled with the coils of the wire of said unit.

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