Aug. 6, 1957 S. P. CRANE 2,801,679

VENTILATING SPRING CUSHION

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Fig. 1

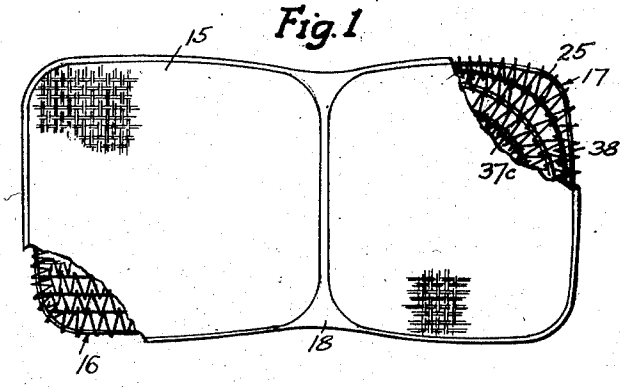


Fig. 3

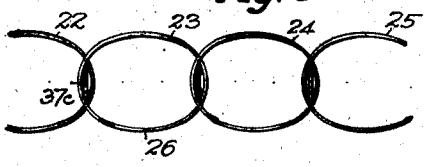


Fig. 2

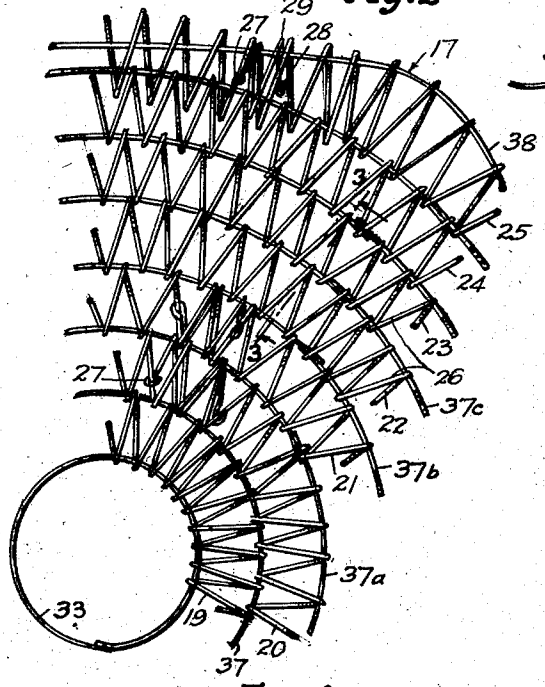


Fig. 5

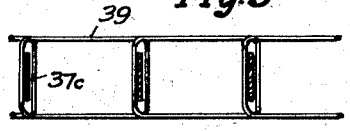


Fig. 7

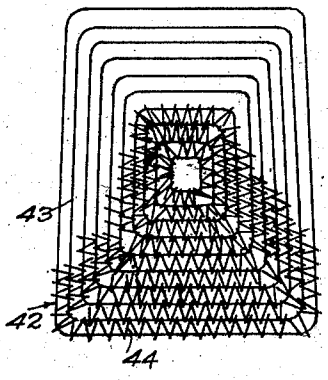
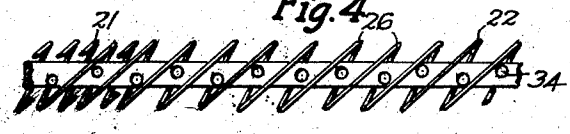


Fig. 4



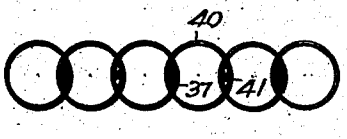


Fig. 6

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Fig. 8

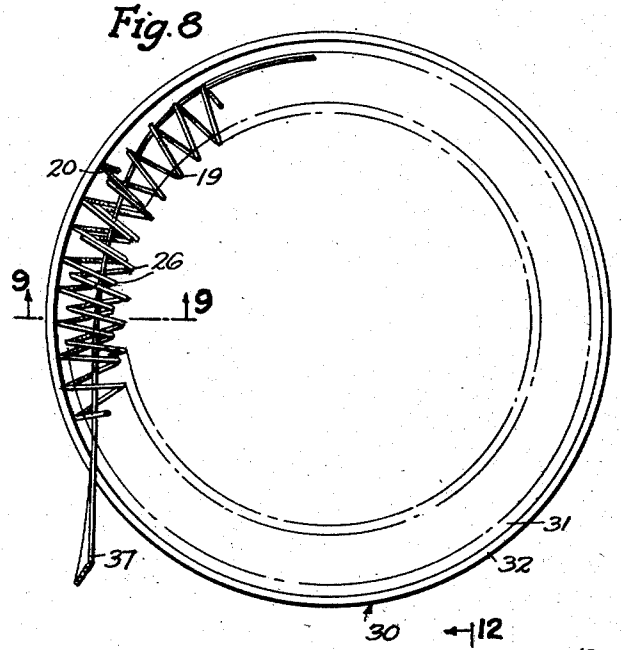


Fig. 10

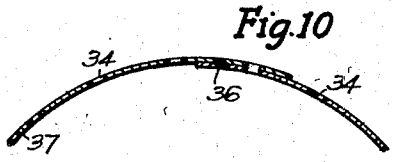


Fig. 13

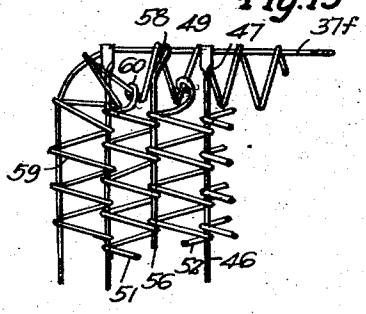


Fig. 9

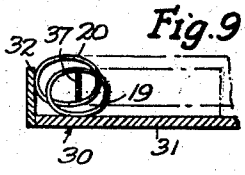


Fig. 12

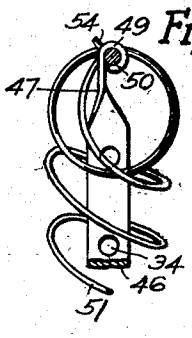
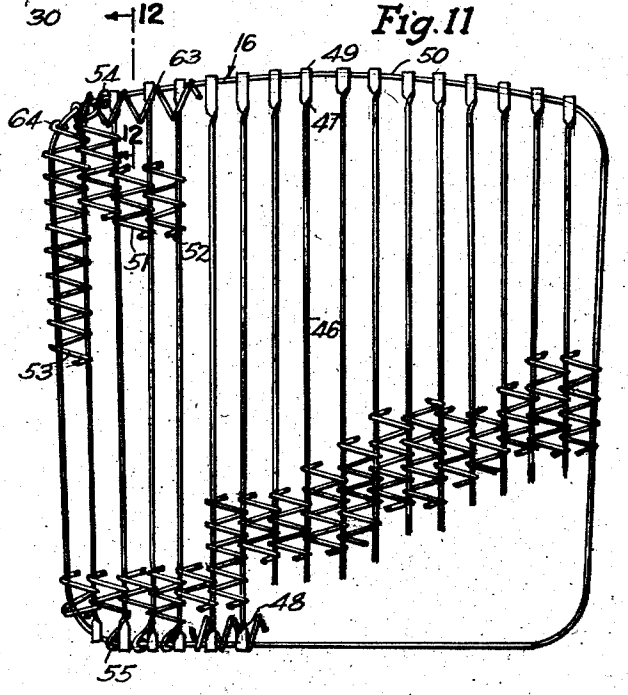


Fig. 11



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Fig. 14

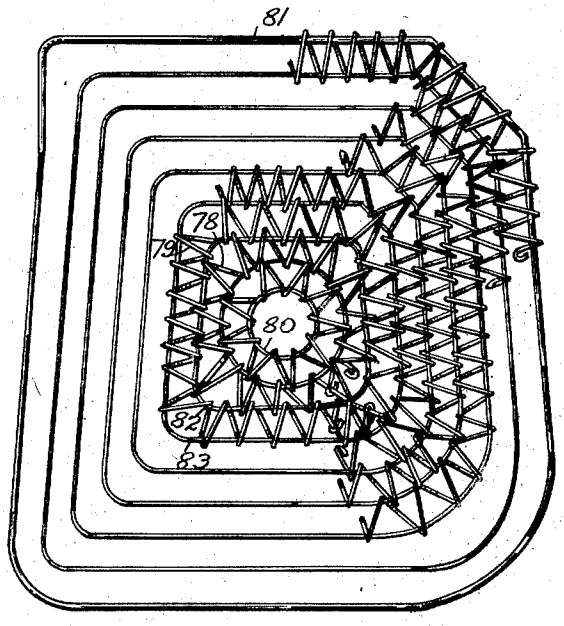
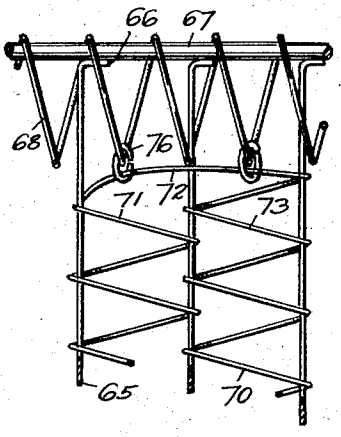


Fig. 16



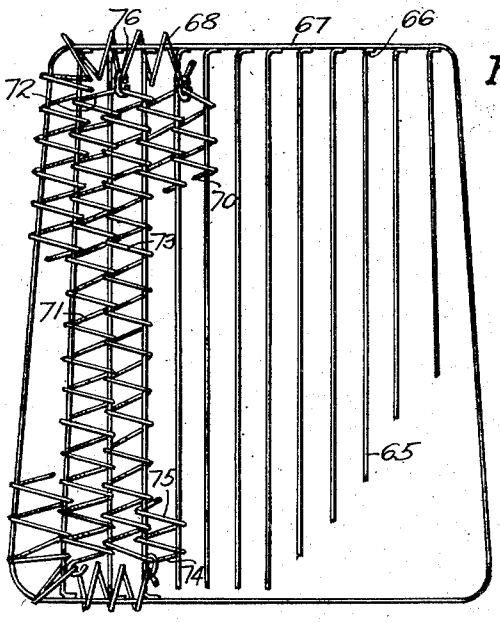
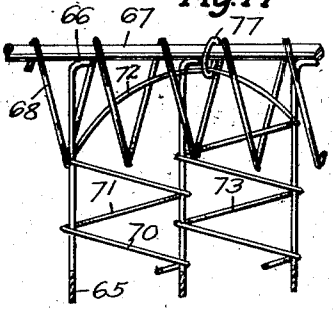


Fig. 15

Fig. 17



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Patented Aug. 6, 1957

2,801,679

VENTILATING SPRING CUSHION

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Application October 15, 1953, Serial No. 386,340

6 Claims. (Cl. 155—182)

This invention relates to ventilated spring cushions and particularly to that type designed to be interposed between the body of a person and the cushioned seat bottom and seat back of a vehicle, chair, sofa, bed or the like upon which the person sits and leans.

While such seat cushions are intended to space the persons's body away from the seat bottom and seat back sufficiently to allow the circulation of air therebetween for the purpose of keeping the person comfortably cool, the cushions heretofore in use have been inefficient for that purpose because the spring coils collapse completely at areas where pressure is applied, thereby cutting off the ventilating effect. Such cushions also tend to become permanently flattened with consequent loss of the ventilating effect after comparatively little use.

The operation of assembling the springs in such cushions is also excessively exasperating owing to the necessity and difficulty of manually handling and threading a tie wire through the coils of adjacent rows of such coils of a continuous spirally shaped spring.

The present invention therefore contemplates the provision of a fast, simple and easy as well as economical method of assembling the adjacent rows of coil springs into a cushion of the desired shape by forming the springs into individual rows of coils either in the general form of annular rings of various diameters or into straight lengths, then pressing together a pair of rows which are to be side by side in the finished cushion to bring the rows into approximate registration, then inserting a spring-shaping tying strip into the thus assembled pair of rows and repeating the operation with the remaining annular or straight rows until all the rows have been assembled.

The invention further contemplates the provision of a spring cushion which resists complete collapse under the maximum loads normally put thereon in ordinary use, there being provided in the cushion spring-tying strips of greater width or depth than the thickness of the strips, the ends of the strips being so tied in the cushion that the strips effectively resist abnormal twisting out of the normal planes of the strips, whereby the ventilating air space is always present when the cushion is in use.

The invention further contemplates the provision of a ventilating spring cushion adapted to be constructed of rows of spring coils and to have the rows quickly and easily assembled, the rows being adapted to be shaped to any desired outline by tying strips of generally rectangular cross section to form a cushion of any desired shape.

The invention further contemplates the provision of a relatively thin, light weight but strong and durable cushion resistant to lateral deformation to a sufficient extent to maintain the required ventilating space when interposed between the person's body and the seat bottom and seat back of a vehicle seat, bench, chair, sofa or the like or the mattress of a bed or similar support.

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

Fig. 1 is an elevational view of a ventilating cushion to which the invention has been applied, the cover being partly broken away to show two forms of the interior springs and the individual tying strips therefor.

Fig. 2 is a fragmentary elevational view of a typical portion of one form of the spring cushion structure wherein individual circular springs and individual circular tying strips are employed.

Fig. 3 is a vertical sectional view of a number of rows of the partially flattened springs in the structure, taken on the line **3—3 of Fig. 2.**

Fig. 4 is an elevational view of part of one of the rows of spring coils, showing the tying strip provided with staggered ventilating holes, and showing also part of the coils in one row and the coils of the adjacent row, all of the coils being partly flattened in the normal positions thereof.

Fig. 5 is a sectional view similar to Fig. 3, of several adjacent rows having coils of substantially rectangular outline.

Fig. 6 is a similar view of a modified form of the spring structure wherein round tie wires alternate with the relatively wide tying strips in the rows.

Fig. 7 is a diagrammatic elevational view of a cushion of generally trapezoidal outline, showing the tie strips bent into generally trapezoidal form and holding the rows of coils in that form.

Fig. 8 is a top plan view of a spring-assembling fixture or tool, showing the larger of a pair of springs pressed down into the smaller of the springs and showing the tie strip being inserted into both springs preparatory to tying the springs together.

Fig. 9 is a fragmentary vertical sectional view of Fig. 8 taken on the line **9—9** of Fig. 8.

Fig. 10 is a fragmentary horizontal sectional view of one of the annular tying strips showing how the ends thereof are overlapped and spot welded.

Fig. 11 is an elevational view of a modified form of the spring structure wherein the rows of coils and tying strips are straight, portions of the individual coil springs and tying strips being omitted for clarity.

Fig. 12 is a fragmentary vertical sectional view of an edge portion of the spring structure taken on the line **12—12** of Fig. 11.

Fig. 13 is a fragmentary elevational view similar to Fig. 11 of a modified form of the spring structure wherein tie strips and tie wires alternate as in Fig. 6 and the end portions of individual springs are bent around a marginal coil spring.

Fig. 14 is a fragmentary elevational view similar to Figs. 2 and 7 of a spring structure of irregular outline showing how circular and polygonal tying strips are used in the same spring structure to obtain the required outline on the spring cushion.

Fig. 15 is a similar view of another modified form of the spring structure wherein a continuous coil spring is bent into generally zig-zag form and end portions of the rows thereof secured to the marginal coil spring by means of hog rings.

Fig. 16 is a similar fragmentary view on an enlarged scale of the marginal portion of Fig. 15.

Fig. 17 is a view similar to Fig. 16 of a modified form of the means for securing the zig-zag spring in place at the ends of the rows of coils.

In the practical embodiment of the invention shown by way of illustration and referring particularly to Figs. 1 to 4, the optional outer loosely woven fabric or the like covering **15** of any suitable material, encloses the spring structure **16** for the back portion and the spring structure **17** for the seat portion, the flexible connecting portion **18** of the cover serving as a hinge in the usual manner. While the structures **16** and **17** have been shown as differ-

ent in construction, it will be understood that both may be alike, or that the structure **17** may be used in the back and the structure **16** in the seat if found convenient or desirable. However, the annular or ring-like forms of the individual tie strips being somewhat stiffer and less likely to collapse completely, such forms are preferably used in the more heavily stressed spring structure **16** of the seat portion as shown. For simplicity of illustration, the coils of the springs **19**, **20**, **21**, **22**, **23**, **24** and **25** constituting the respective rows of coils have been shown conventionally by means of straight lines, but it will be understood that said coils are helical and are each preferably flattened or arranged in a generally inclined plane so that the individual coils **26** of each of said springs (Fig. 4) are biased toward but not into a horizontal position and tend to move toward but not to reach such position on the loading of the structure by the pressure of the user's body thereon. The initial flattening of the unloaded coils imparts the requisite softness to the structure.

Each of the individual annular springs **19**—**25** is cut from a longer spring to the proper length, then bent into circular form by overlapping the end portions of the cut length as at **29** and forming hooks or similar bends **27**, **28** on the ends of said length whereby the spring is maintained in its ring-like form until it is tied into place. In this manner, a complete set of annular springs of different diameters is obtained, each spring comprising a circular row of spring coils. To tie the adjacent springs together to form the concentric rows of coils in the cushion, suitable simple tools or fixtures **30** (Figs. 8 and 9) of various diameters are used. Each of the fixtures may have a bottom **31** and an upstanding cylindrical wall **32** of the required diameter.

It will be understood that the innermost tying or shaping strip **33** (Fig. 2) for the innermost spring **19** is merely inserted into the coils of the spring **19** since there is no row of coils further inside the structure and hence the fixture need not be used to insert the strip **33** into said spring **19**. All of the typing strips, in this form of the cushion are of greater width or depth than thickness and each is arranged with its wider face extending through the thickness of the cushion (Fig. 3). In other words, the wide faces of the strip are perpendicular to the plane passing through the axes of the springs, said axes being coplanar. The diameter of the annular strip **19** is as small as possible to avoid an excessively large unsupported central area in the cushion, but large enough to avoid overcrowding of the inner edges of the rows of coils. Preferably, the strip is perforated throughout the length thereof as by means of the spaced apart holes **34**, either staggered as in Fig. 4 or aligned as in Fig. 10, for ventilating purposes, all of the strips being similarly perforated if desired. The ends of the tying strips are overlapped and permanently joined in any suitable manner as by spot welding **36** best seen in Figs. 2 and 10. In Figs. 7 and 14, the respective end portions of the various strips are also similarly overlapped and welded, though the overlap is not shown in the drawing for the sake of simplicity.

As shown in Fig. 8, a spring as **19** is tied to the next outer spring **20** by first inserting said spring **19** and into the fixture **30**, then pressing the larger spring **20** down on the spring **19** while squeezing the larger spring against the wall **32** thereby to carry the coils of the respective springs into approximate registration as shown in Fig. 9, and to permit the insertion of the larger spring into the fixture. The tying strip **37** is then inserted into the coils of both overlapped springs, the strip being bent more or less gradually into circular form while being so inserted and the ends of the strip being overlapped and joined as above described in connection with the strip **33**. However, before the ends are welded together but after the strip has been shaped and overlapped, the strip is stretched or spread enough to take up the slack in the springs **19** and **20** which it ties together. The rest of the individual springs **21**—**24** are similarly tied one at a time, on the outside of the next smaller spring, larger fixtures **30** being used if necessary to hold the springs, until the outmost spring **25** has been tied into place by the last tying strip. It will be noted that after the pair of springs have been tied together by a tying strip such as **37**, **37***a*, **37***b*, **37***c* and the like passed through the overlapped springs, said springs are moved apart radially of the cushion thereby to separate them into their proper relative positions in the cushion as shown in Fig. 2, with the tying strip contacting the inner parts of the coils of the outer spring and outer parts of the coils of the inner spring of the pair of springs which have been tied by the strip. To finish the edge of the cushion, the outermost spring **25** is not tied to its adjacent spring **24** until a marginal member as **38** which forms the periphery of the structure, is first passed through the coils of said outermost spring while the axis of said spring is still straight. After the marginal member has been positioned within the outermost spring, said member is bent into the desired shape and the ends thereof joined in a well known manner. The thus assembled marginal member and the spring **25** is then tied in place as a unit in the manner previously explained. The marginal member may be a wire of a shape other than circular, as shown, the outermost spring **25** accommodating itself to such shape, or said member may be a strip of rectangular cross section and similar to the tying strips.

As shown in Fig. 5, the individual coils **39** of the various springs may assume various shapes such as the rectangular shape shown intsead of the elliptical shape shown in Fig. 3 or the generally circular shape of the coils **40** in Fig. 6. By reason of the use of the relatively wide strips **37**, **37***a* and the like, the individual spring coils can never be completely flattened or collapsed in ordinary use regardless of the cross sectional shape of the spring, because the relatively wide or deep strip cannot be turned down or twisted into a completely flat position. This is true even when a softer cushion is desired and attained by the omission of the relatively wide tying strips at some points and the substitution therefor of round tying wires **41** of little depth as shown in Fig. 6 and also in Fig. 13. Nor need the marginal member **38** necessarily be in the form of a heavy round wire, since as shown in Fig. 13, a rectangular strip **37***f* may be used instead.

It will be understood that the individual annular springs of the cushion may be formed into polygonal shapes other than circular, thereby to shape the cushion into the desired outline without depending entirely on the outline given to the marginal wire. As shown in Fig. 7, the generally trapezoidal outline given the cushion **42** is attained by shaping each of the tying strips **43** into such outline, preferably after the strip has been passed through two overlapped springs **44** in the manner already described. Imparting the desired shape to the strip also shapes the springs connected thereby since the shape of the strip determines the shapes of the axes of the springs tied thereby to a considerable exent. In Fig. 2, the circular forms of the springs are maintained by the circulars strips. In the structures of Figs. 2, 7 and 14, adjacent strips are connected solely by a row of coils and hence they may be said to float in the cushion.

In that form of the invention shown in Figs. 11 to 13, the cushion sections are made in straight lengths instead of in circular or polygonal form. Each end portion of each of the tying strips as **46** is twisted through a quarter turn as at **47** and **48** to provide an intermediate transversely yieldable portion and an end portion which is bent into a hook **49** or the like into engagement with the marginal member **50**. The tying strip **46** is passed through two adjacent springs as **51** and **52** in the manner hereinbefore described, except that a straight wall may replace the cylindrical wall **32** of the assembling fixture **30** during the tying operation. The marginal or peripheral member **50** is passed through a marginal coil spring **63** as well as through the outermost coil spring **53**. At the sides of the cushion, the spring **53** also passes

through or around the outermost tying strip. The ends of the spring 53 are shown secured to the marginal member 50 by means of a suitable hook-like bend 64. The ends of the straight springs are also secured to said member 50 by similar hooks or bends 54 and 55. As has been indicated, this form of the cushion is illustrated as being used in the back-supporting portion of the combined cushion shown in Fig. 1.

Obviously, as has been described in connection with Fig. 6, round tying wires 56 (Fig. 13) may replace selected flat tying strips 46 where not needed to shape the springs. In that case, the ends of the tying wires 56 are hooked as at 58 around the marginal member 37*f* which may be of any desired cross sectional shape. The outermost spring 59 may be continuous and constitute a marginal spring around the marginal member 37*f* and only its ends fastened to the marginal member. The ends of the straight springs may be fastened either as shown in Figs. 11 and 12 to the marginal member, or instead they may be fastened directly to the marginal spring 59 as shown in Fig. 13 by suitable hooks or bends 60.

In that form of the invention shown in Figs. 15–17, the relatively wide and thin tying strips 65 are not twisted at their end portions, but instead, a suitable end bend 66 is suitably welded directly to the marginal member 67. Said member passes through the marginal coil spring 68 which is in turn secured to the ends of the various rows of coils. However, instead of using separate individual springs for each straight row of coils, a single spring 70 is bent into zig-zag shape to form a number of rows or all of the rows. The row 71 for example, is provided with an end bend 72 connecting said row at one end integrally to the next row 73. At the other end of the row 73 is a similar bend 74 connecting the row 73 to the row 75. The bend 72 is connected to the marginal spring in any suitable manner as by the hog ring 76 (Fig. 16) the bend 74 being similarly connected to said marginal spring by one or more similar rings. As shown in Fig. 17, the ring 77 secures the bend 72 directly to the marginal member 67 instead of to the marginal spring 68.

In Fig. 14 as shown another form of the invention similar to those of Figs. 2 and 7 in that separate individual springs 78, 79 and the like and individual tying strips of polygonal form are used for each row of coils. The innermost or smaller strips as 80 are circular and need not be shaped into the particular polygonal outline assumed by the marginal member 81. Between said member and the innermost tying strips 80, the intermediate tying strips 82, 83 and the like assume transition outlines leading more or less gradually from the circular to the irregular required outline. By properly shaping the intermediate tying strips, a cushion of any desired outline is provided without the necessity for unduly distorting or stretching the coils at any point.

It will now be seen that while the invention may take various forms, the relatively wide individual tying strips prevent complete collapse and permanent flattening of the coils at any loaded area and consequently prevent cutting off the ventilation; that the adjacent rows of spring coils are quickly and easily tied together on the overlapping of the straight or polygonal sections; that the tying strips may be reshaped to the form desired after tying adjacent rows of spring coils together and when so shaped, serve to shape the axes of the rows of coils, and that the various purposes which the invention is designed to accomplish have been adequately attained.

While certain 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 spring cushion, a plurality of rows of spring wire coils arranged with the axes of the rows in coplanar relation, the coils of one row overlapping the coils of adjacent rows, a plurality of individual tying strips one for each pair of adjacent rows, each of said strips engaging the outer parts of the coils of one row and engaging the inner parts of the coils of the adjacent row of said pair of rows, each of said strips being of greater width than the thickness thereof and being resistant to twisting and arranged with the wider faces thereof perpendicular to the common plane of the axes of said rows whereby material collapse of said coils and consequent substantial decrease of the thickness of the cushion is prevented by the tying strips.

2. In a spring cushion, a tying strip having a width greater than the thickness thereof, and a plurality of rows of spring coils, each of the coils having a pair of substantially straight parallel edges arranged respectively at the faces of the cushion, the rows being arranged in side by side relation, the strip passing through the respective substantially alternating coils of a pair of adjacent rows, the axes of the rows being coplanar, the strip being arranged with the width thereof perpendicular to the common plane of said axes and adjacent the space between said straight edges.

3. In a spring cushion, a tying strip having a width greater than the thickness thereof, and adjacent rows of spring coils, the rows being arranged in side by side relation, the strip passing through the coils of adjacent rows, said coils alternating respectively throughout the major part of the row, the axes of the rows being coplanar, and the strip being arranged with the width thereof perpendicular to the common plane of said axes and extending from a point near one face of the cushion to a point near the opposite face whereby collapse of said coils to a position substantially flat and substantially parallel to said plane is prevented, the strip being sufficiently wide to resist effectively twisting of said strip to a position substantially parallel to said plane under the normal stresses imposed thereon when the cushion is in use while permitting the cushion to conform to the shape of the surface of the body of the user when in use.

4. The spring cushion of claim 3, the coils being non-circular and having respective major and minor axes differing in length.

5. In a spring cushion, an elongated tying member of substantial depth and of lesser thickness than said depth, and a pair of overlapping rows of otherwise separable spring coils arranged in side by side relation and tied together by said member, said member passing through the overlapped portions of said rows and arranged with said depth extending across the thickness of the cushion and between the faces of the cushion, opposite parts of the coils of each row being substantially parallel respectively to said faces.

6. In a spring unit for a cushion having substantially parallel horizontal faces, a pair of adjacent rows of upright non-circular spring coils, each having a pair of mutually perpendicular axes one of the axes of each of the coils being substantially horizontal and of a different length from the other upright axis of each coil and arranged between and substantially parallel to said faces, the top and bottom parts of the coils being substantially horizontal, and means of material other than the rows engaging the coils and tying said rows together against separation.

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