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(54) METHOD AND SYSTEM FOR FORMING STRINGS OF POCKETED COIL SPRINGS

VERFAHREN UND SYSTEM ZUM HERSTELLEN EINER KETTE VON TASCHENFEDERN

PROCEDE ET SYSTEME PERMETTANT DE FORMER DES BANDES DE RESSORTS HELICOIDAUX ENSACHES

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(56) References cited:
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Description

Background of the Invention

[0001] This invention relates generally to spring assemblies for mattresses, cushions and the like, and, more particularly, to a method and system for making a string of connected individually pocketed coil springs for mattresses, cushions, spring units and the like.

[0002] Pocketed coil springs are often referred to as a Marshall construction in which each coil spring is encased within its own fabric sack or pocket. The sack or pocket is typically defined between two plies of a fabric strip connected together at intervals along transverse lines spaced along the strip. The two-ply fabric strip is generally formed by folding a strip of double width fabric upon itself along a longitudinal centerline, leaving the overlapped plies along the unjoined opposite edges of the strip to be connected to each other along a longitudinal seam to close the pockets defined between the transverse lines of connection after the springs are inserted between the plies.

[0003] A variety of techniques have evolved for the manufacture of pocketed springs, some contemplating the creation of the pockets within the fabric plies prior to insertion of the wire spring and others contemplating the insertion of compressed wire springs between the plies of the strip and the subsequent creation of the pockets by stitching or otherwise joining the two plies to each other along transverse lines between adjacent springs. Irrespective of the technique used, the fabric is closed around the spring after the insertion of the spring, usually by stitching or welding the two plies together along a line parallel to the free edges of the plies. Joining the plies together by stitching has largely been replaced in more recent times by the use of a heat sensitive fabric and ultrasonic welding techniques. Examples of known systems and techniques for manufacturing strings of pocketed coil spring are disclosed in U.S. Patent Nos. 4,439,977; 4,234,983; and 5,613,287.

[0004] Specifically, in U.S. Patent No. 4,439,977, a method and apparatus are disclosed for making coil springs enclosed within individual pockets in an elongate fabric strip comprised of two overlying plies capable of being thermally welded together. The fabric strip is fed along a guide path during which compressed springs are inserted between the plies with the axes of the springs substantially normal or perpendicular to the planes of the plies. Thereafter, the fabric plies are thermally welded together longitudinally and transversely while the spring remains compressed to form a string of pocketed coils. After thermal welding, the pocketed coils are passed through a turner assembly during which the springs are reoriented typically about 90° within the fabric pockets to positions wherein the axes of the springs are transverse to the fabric strip.

[0005] One specific disadvantage of this method of manufacturing pocketed coil springs is that during the turning process, springs tend to become entangled or hooked together and do not achieve their proper positions. As such, additional and costly labor is required to reorient and disentangle the springs to place them into their desired configurations and orientations. Even if the springs do not become entangled or hooked, difficulties may still arise in correctly aligning them to their desired positions with the longitudinal axes of the springs being substantially parallel to one another and the transverse seams defining individual pockets.

[0006] Another common problem with this type of operation is that during the turning of the pocketed springs, whether or not the springs become hooked or entangled and the turning process is successful, the fabric surrounding the spring is often damaged, torn, punctured or the like. In one form, the springs are beaten by paddles as disclosed in U.S. Patent No. 4,439,977 to effect the turning of the spring within the pocket. Obviously, the repeated beating on the pocket with the paddles may cause significant damage to the fabric material and prove to be unreliable to accurately position the spring within the fabric pocket. When this happens, the damaged pocket should be repaired or removed from the string thereby interrupting the process and requiring significant operator intervention and down time for the production of pocketed coil springs.

[0007] Therefore, a need exists for a method and system for forming strings of pocketed coil springs which overcomes the above described disadvantages of the prior art and does not require the turning of the springs within the pockets for alignment of the spring axes in a generally parallel and ordered arrangement nor operator intervention to unhook or disentangle the springs nor repair the damaged fabric surrounding the springs. Further, a need has always existed to provide commercially viable methods and systems for producing strings of pocketed coil springs which are cost and labor effective by requiring a minimal amount of labor intervention and associated resources.

[0008] WO98/11015 discloses a method for forming pocketed springs in which fabric is formed into an envelope and compressed springs inserted into the envelope. The flap is then folded over and attached with a longitudinal seam. Individual pockets are created with transverse seams and the springs rotated within their pockets to make their longitudinal axes parallel to the transverse seams.

Summary of the Invention

[0009] The present invention overcomes the above described and other disadvantages in the prior art by providing an improved method and system for producing strings of pocketed coil springs which are effective in performance, yet cost effective in that it requires a minimum amount of materials and labor. The manner in which the springs are inserted into the fabric and the formation of the pocket according to this invention avoids the need for turning or repositioning the springs within the pockets while still providing an efficient and reliable manufacturing system and associated method for reliably producing consistently aligned springs within undamaged fabric pockets.

[0010] The present invention preferably begins with the insertion of a compressed coil spring between upper and lower plies of a folded thermally welded fabric. The present invention is a continuous production process such that the fabric is indexed or pulled past a spring insertion station so that the compressed springs are individually inserted between the plies of the folded fabric at spaced intervals as the fabric passes the spring insertion station. The springs are maintained in a compressed configuration between the plies of the fabric while a longitudinal seam is formed in the fabric to join the two plies together proximate free edges of the plies opposite from a longitudinal fold line of the fabric. Since the fabric is a thermally weldable material, preferably the longitudinal seam is formed by a cooperating thermal weld head and anvil combination. After the spring has advanced past the longitudinal weld station, it is allowed to relax and expand within the fabric into an upright position in which a longitudinal axis of the spring is generally perpendicular to the longitudinal seam of the fabric. Preferably, the relaxation and expansion of the springs within the fabric is controlled by a pair of rotating members on opposite sides of the springs according to various alternative embodiments of this invention. The rotating members in presently preferred embodiments may be a pair of oppositely rotating wheels with axes of rotation generally parallel to the longitudinal axes of the springs. The wheels include a plurality of arcuate-shaped recesses which combine to partially surround each spring during the expansion. Alternatively, the rotating members may include a pair of bands each passing over a pair of spaced rollers. The fabric and springs pass between the bands and a separation distance between the bands increases in a downstream direction to thereby control the expansion of the springs between the bands. In either embodiment, the springs are supported during their expansion into an upright position.

[0011] After the springs have expanded within the fabric, individual pockets are formed preferably by a transverse weld head sealing the fabric between each of the springs generally parallel to the spring axes. The transverse seams are formed in the fabric to complete the individual pockets for the individual springs. Finally, a pair of opposing and rotating transport wheels indexes or moves the string of pocketed springs forwardly thereby advancing the fabric and enclosed springs through the various stations as described.

[0012] Advantageously, the orientation of the springs remains generally unchanged throughout the pocketing process so that reorientation, turning or the like of the springs within the pockets is avoided. Moreover, the longitudinal seam formed in the fabric is positioned on a side face of the individual spring pockets in the resulting string of pocketed coil springs thereby avoiding the problem known in the art known as "false loft". False loft occurs when the longitudinally extending seams maintain the cover material at a certain distance away from the ends of the springs so that when the mattress is first purchased, this distance is fairly uniform. However, after the mattress or cushion has been in use for a period of time, the longitudinally extending seams or other excess fabric in the pocketed coil string may become crushed thus leaving areas or regions of depression. With continued use of the mattress or cushion, the entire support surface of the mattress or cushion will similarly be crushed and will appear substantially flat. A user may not realize the source of this phenomenon and consider it to be a defect in the mattress or cushion.

[0013] The problem of false loft is thereby avoided in the present invention by positioning the longitudinal seam of the string of springs on a side thereof while still avoiding the need to turn or reorient the individual springs within the pockets and the resulting damage to the fabric and other associated problems.

[0014] Another feature of this invention which also aids in the reduction of false loft and related problems is particularly useful for barrel shaped springs or other such springs which have a non-linear profile. With such springs, the transverse seam between adjacent springs in the string is shaped to conform to the profile of the springs and thereby produce a tighter, more conforming fabric pocket around the spring to avoid bunching or excess loose fabric around the spring.

Brief Description of the Drawings

[0015] The objectives and features of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a top plan view of a schematic representation of a system and associated method according to a first embodiment for producing a string of pocketed coil springs of this invention;

Fig. 2 is a side elevational view of the system and method of Fig. 1;

Fig. 3 is a view similar to Fig. 1 of a second presently preferred system and associated method according to this invention;

Fig. 4 is a side elevational view of the system and method of Fig. 3;

Fig. 5 is a perspective view of a string of pocketed coil springs produced according to this invention;

Fig. 6 is a cross-sectional view of an individual coil spring encased within a fabric pocket as taken along line 6-6 of Fig. 5;

Fig. 7 is a side elevational view of a string of pocketed coil springs produced according to an alternative embodiment of this invention; and

Fig. 8 is a partial perspective view of a weld head used to weld a transverse seam in the string of Fig. 7.

Detailed Description of the Invention

[0016] Referring to Fig. 1, a first presently preferred embodiment of a system 10 and associated method for forming a string 12 of pocketed coil springs 14 according to this invention is shown. Fabric 16, preferably thermally weldable as is well known in the art, is fed from a supply roll 18 around a roller 20 as shown in Fig. 1. Alternatively, the fabric 16 could be cotton or another suitable material. The fabric 16 is folded generally in half longitudinally about a longitudinal fold line 22 which coincides approximately with a longitudinal centerline of the fabric 16. The fabric 16 is folded about the longitudinal fold line 22 to produce a first, upper ply 24 and a second, lower ply 26 of fabric 16 each with a free edge 28 spaced from the longitudinal fold line 22. The folded fabric 16 passes upper and lower input rollers 30, 32 prior to entering a spring insertion station 34. The rollers 20, 30 and/or 32 may be rotationally driven.

[0017] The spring insertion station 34 includes a reciprocating insertion plunger 36 having a cup-shaped spring receiving leading end 38 to receive therein a compressed coil spring 14. The plunger 36 extends to insert the compressed spring 14 between the plies 24, 26 and retracts to receive another compressed spring 14 for subsequent insertion. The spring 14 is formed and compressed and loaded onto the spring insertion plunger 36 and the fabric 16 is folded according to one of any number of well known systems and methods for doing so. Alternatively, the spring insertion station 34 may comprise two U-shaped profiles which keep the spring 14 compressed and lead the springs 14 inside the folded fabric 16. In this method, the spring 14 is held with a horn (not shown) while the profiles return.

[0018] As the fabric 16 advances through the system 10, the springs 14 inserted between the plies 24, 26 are maintained in a compressed configuration between upper and lower support plates 40, 42 on the upper and lower faces, respectively, of the fabric 16 as particularly shown in Figs. 1 and 2. Preferably, the support plates 40, 42 are centered between the free edges 28 and longitudinal fold line 22 of the fabric 1 6 and may include a wider region 44 proximate the spring insertion station 34 which tapers downwardly to a region of smaller separation 46 between the plates 40, 42 as the fabric 16 and springs 14 advance through subsequent portions of the system 10.

[0019] Additionally, a plurality of spaced alignment wheels 48 which are mounted for rotation proximate the longitudinal fold line 22 and free edges 28 of the fabric 16 control and direct the movement of the fabric 16 through the system 10. The alignment wheels preferably include a plurality of projections 50 which engage the fabric 1 6 to maintain the movement of the fabric 16 in an aligned orientation with respect to the various stations and components of the system 10.

[0020] A longitudinal seam forming station 52 is located downstream from the spring insertion station 34 proximate the free edges 28 of the fabric 16, as shown in Figs. 1 and 2. After the compressed springs 14 are inserted between the plies 24, 26, the longitudinal seam forming station 52 joins the upper and lower plies 24, 26 of the fabric 16 together proximate their respective free edges 28 thereby initially enclosing the springs 14 within the fabric 16. In a presently preferred embodiment, a longitudinal seam 54 is formed between a thermal weld head 56 which reciprocates downwardly and upwardly for cooperating welding engagement and disengagement, respectively, relative to an anvil 58 positioned below the lower ply 26. The reciprocating weld head 56 and anvil 58 cooperate to form the longitudinal seam 54 in the fabric 16 by welding the respective plies 24, 26 together ultrasonically, thermally, or the like as is well known by those skilled in the art. Alternatively, the anvil 58 is moved reciprocally while the thermal weld head 56 remains stationary. The springs 14 remain compressed during the formation of the longitudinal seam 54 and weld with their longitudinal axes 60 generally perpendicular to the longitudinal seam 54. It should be appreciated that other means for joining the plies 24, 26 together to form the seams may be used such as stitching, staples.

[0021] A first transport station 62 is located downstream from the longitudinal seam forming station 52 and, in a presently preferred embodiment, includes four transport bands 64. Each band 64 passes over spaced forward and trailing rollers 66, 68, at least one of which is rotationally driven. A first pair of bands 64a at the first transport station 62 contacts the fabric 16 proximate the longitudinal fold line 22 passing therebetween. Another pair 64b of transport bands 64 contacts the fabric 16 proximate the longitudinal seam 54 as shown in Figs. 1 and 2. As the bands 64 pass around the spaced rollers 66, 68 in contact with the fabric 16, the fabric 16 is pulled from the supply roll 18 through the upstream stations and is advanced toward a downstream spring expansion station 70.

[0022] The compressed springs 14 are permitted to relax and expand within the fabric 16 at the spring expansion station 70. In a first embodiment, the expansion of the springs 14 is controlled by a pair of oppositely rotating rotational members 72 on opposite sides of the springs 14 as shown in Fig. 1. An axis of rotation 74 of each of the rotational members 72 according to the first presently preferred embodiment of Fig. 1 is generally parallel to the longitudinal axes 60 of the springs 14. Each rotational member 72 includes a plurality of arcuate-shaped recesses 76, each of which combine, with a similarly configured recess 76 in the corresponding rotation member 72 on the opposite side of the spring 14 to partially surround each spring 14 and thereby control the expansion thereof. Additionally, the rotational members 72 assist in advancing the springs 14 and fabric 16 toward a transverse seam forming station 78 located downstream therefrom.

[0023] The transverse seam forming station 78 forms a transverse seam 80 in the fabric 16 between each of the adjacent springs 14 which have expanded within the fabric 16 from their compressed configuration. Preferably, the transverse seam forming station 78 includes a transverse seam weld head 82 and a cooperating transverse seam anvil 84 located on opposite sides of the forming string 12 of pocketed coil springs 14 from each other, as shown in Fig. 1. As the springs 14 advance toward and through the transverse seam forming station 78, the fabric 16 between the springs 14 is joined together thereby completing individual pockets 86 for each of the springs 14 and enclosing the springs 14 within the fabric 16. Once again, it should be readily appreciated that other means for forming the transverse seam 80 such as stitching, staples or the like may be used . While the transverse seam 80 is formed, the fabric 16 is needed or gathered. As such, the string 12 of pocketed coil springs 14 must give in or contract somewhat to accommodate the seam forming process. This can be accomplished with an active mechanism such as a driven transport system or with in a passive manner such as friction between the fabric 16 and the transport rotational members 72.

[0024] The longitudinal axes 60 of the springs 14 remain generally parallel to the transverse seams 80 in the fabric 16. However, due to the expansion of the springs 14, the longitudinal seam 54 formed at the free edges 28 of the fabric 16 is positioned generally on a side face 88 of the string 12 of pocketed coil springs 14 between top and bottom ends 90, 92 of the pocketed coil spring 14 as shown particularly in Figs. 5 and 6. With the longitudinal axes 60 of the springs 14 generally aligned and parallel with one another within individual fabric pockets 86, the present invention avoids the need for turning the springs 14 within the fabric pockets 86 as is required in many prior art systems.

[0025] Referring to Figs. 5 and 6, the longitudinal seam 54 preferably becomes attached to the pockets 86 when the transverse seam 80 is formed by the transverse seam forming station 78. As such, in the region of the fabric 16 proximate the transverse seam 80, four layers of fabric 16 are welded together at the transverse seam forming station 78. It should be appreciated that there are other methods to fix the seam 80 in this manner, for example, the longitudinal seam 54 could be positioned prior to entering the transverse seam forming station 78 even if it is not welded to the pockets 86 with the transverse seam 80. Further, the longitudinal seam 54 may be located anywhere between the top and bottom of the string although it is shown in the drawings as approximately in the middle thereof.

[0026] A downstream or second transport station 94 preferably includes a pair of oppositely rotating transport wheels 96 each with an axis 98 of rotation generally parallel to the longitudinal axes 60 of the springs 14. A plurality of arcuate recesses 100 on the periphery of the transport wheels 96 cooperate to at least partially surround the pocketed springs 14 and advance them from the upstream transverse seam forming station 78 for discharge and subsequent packaging, storage or processing into a mattress, cushion or innerspring unit.

[0027] An alternative embodiment of this invention is shown in Figs. 3 and 4 and components of the system 10 of Figs. 3 and 4 which are similar to those of the first embodiment shown in Figs. 1 and 2, are identified by identical reference numerals and the previous detailed description with respect to those items provided hereinabove is likewise applicable to the embodiment of Figs. 3 and 4. The second presently preferred embodiment shown in Figs. 3 and 4 includes divergent transport bands 102 located above and below the fabric 16 and enclosed springs 14 at the spring expansion station 70. The transport mechanism could be embodied with wheels as in Figs. 1 and 2 and/or transport bands as in Figs. 3 and 4 which are located on the too and bottom of the string or the lateral side surfaces as desired. Each of the transport bands 102 of Figs. 3 and 4 pass over forward and trailing rollers 104, 106, as shown particularly in Fig. 4. Furthermore, a separation distance between the transport bands 102 increases in a downstream direction thereby permitting the controlled expansion of the springs 14 positioned in the fabric 16 between the transport bands 102. The relaxed and expanded springs 14 are then advanced to the downstream transverse seam forming station 78 so that the transverse seam 80 may be positioned between the adjacent springs 14 to complete the individual fabric pockets 86.

[0028] An additional feature of this invention is shown in Figs. 7 and 8 and is particularly adapted for use in constructing strings 12 of pocketed coil springs 14a having a barrel shaped configuration as shown in Fig. 7. Barrel shaped springs 14a are well known in the industry and include a profile 108 in which the middle turns 110 of the spring 14a have a greater diameter than the top turn 112 and bottom turn 114 of the spring 14a. For example, the top and bottom turns 112, 114 of the barrel shaped spring 14a may have a diameter of about 1.625 inches (4.1275cm) and the middle turn 110 have a diameter of about 2.5 inches (6.35cm). When barrel shaped springs 14a are used in the string 12, the transverse seam 80a adjacent to the spring 14a conforms to the profile 108 of the spring 1 4a as shown in Fig. 7. With the transverse seam 80a conforming to the profile 108 of the spring 14a encased in the pocket a tighter pocket is produced with less loose fabric 16 in the string 12 and a better overall product, especially with springs 14a having a non-linear profile. With barrel shaped springs 14a, the transverse seam 80a adjacent thereto has a concave shape and because the transverse seam 80a is located between adjacent barrel shaped springs 14a the seam 80a may have a pair of outwardly facing concave shapes forming an X or similar configuration. A weld head 82a suitable for forming the transverse seam 80a is shown in Fig. 8 in which a number of studs 116 are arranged in the pattern shown so that adjacent studs 116 proximate the top and bottom of the weld head 82a are spaced farther apart than those in the middle to conform with the profiles 108 of the adjacent barrel shaped springs 14a. Although the transverse seam 80a of Fig. 7 is symmetric, other configurations are contemplated. Moreover, in another sense, this feature of the invention is useful not only for barrel shaped springs 14a to form a tighter, more conforming fabric pocket, but also for springs having a non-linear profile in general such as the barrel shaped springs and hour glass shaped springs in which the middle turns have a lesser diameter than the top and bottom turns.

[0029] From the above disclosure of the general principles of the present invention and the preceding detailed description of at least one preferred embodiment, those skilled in the art will readily comprehend the various modifications to which this invention is susceptible.

Claims

1. A method of forming a string of pocketed coil springs comprising feeding a supply of fabric (16) such as to provide first and second generally parallel fabric plies (24, 26), inserting a series of axially compressed springs (14, 14a) between the first and second plies (24, 26), joining the first and second plies together by forming a longitudinal seam (54) proximate free edges (28) of the first and second plies (24, 26), the plies being joined at the opposite edges to the free edges (28), allowing the springs (14, 14a) to at least partially axially expand within the fabric in the same orientation as they are inserted between the plies (24, 26) so that the longitudinal axis (60) of each of the springs is generally perpendicular to the longitudinal seam (54), and forming a transverse seam (80, 80a) in the fabric between adjacent springs (14, 14a) to thereby enclose each of the springs within a fabric pocket (86), **characterised in that** the springs (14, 14a) are allowed to at least partially expand after joining the first and second plies (24, 26) by forming the longitudinal seam (54), and **in that** the transverse seams (80, 80a) are formed generally parallel to the longitudinal axes (60) of the at least partially expanded springs (14, 14a).

2. The method of Claim 1 wherein the springs (14, 14a) are allowed to at least partially expand prior to forming the transverse seams (80, 80a).

3. The method of either Claim 1 or Claim 2 wherein the springs (14, 14a) are allowed to expand along their longitudinal axes (60).

4. The method of Claim 2 wherein the springs (14, 14a) are allowed to expand in the same orientation as they are inserted between the plies (24, 26).

5. The method of any preceding claim wherein the orientation of the longitudinal axes (60) of the springs (14, 14a) remains generally unaltered during the entire process.

6. The method of any preceding claim wherein the expansion of the springs (14, 14a) is controlled by a pair of rotating members (72, 102) on opposite sides of the springs within the fabric.

7. The method of Claim 6 wherein the axes of rotation of the rotating members (72) is generally parallel to the longitudinal axes (60) of the springs and each rotating member (72) comprises a plurality of arcuate shaped recesses (76) which combined to partially surround each spring.

8. The method of Claim 6 wherein the axes of rotation of the rotating members is generally perpendicular to the longitudinal axes (60) of the springs and each rotating member comprises a band (102) passing over spaced rollers (104, 106), wherein a separation distance between the bands (102) increases in a downstream direction to thereby control the expansion of the springs (14, 14a) between the bands.

9. The method of any preceding claim further comprising pulling the fabric between a pair of rotating transport members (96) spaced on opposite sides of the fabric and located downstream from a position at which the transverse seams (80, 80a) are formed, the rotating transport members (96) comprising a plurality of arcuate shaped recesses (100) which combine to partially surround each spring.

10. The method of Claim 9 wherein the step of pulling the fabric is performed after forming the transverse seams (80, 80a).

11. The method of any preceding claim wherein the inserting further comprises inserting compressed springs (14a) which have a generally non-linear shaped profile adjacent to the transverse seam and the forming of the transverse seam further comprises forming the transverse seam (80a) to generally correspond to at least a portion of the profile of the adjacent springs (14a).

12. The method of Claim 11 wherein the springs (14a) being inserted are barrel shaped.

13. The method of any one of Claims 1 to 10 wherein the inserting further comprises inserting compressed barrel shaped springs (14a) and the form-

ing of the transverse seam further comprises forming the transverse seam (80a) to have a generally concave configuration adjacent to the barrel shaped springs (14a).

14. The method of any preceding claim wherein the fabric is a thermally weldable fabric (16) and the joining and forming steps are performed by welding the fabric together.

15. The method of any preceding claim wherein the step of feeding the fabric comprises folding the fabric (16) about a longitudinal fold line (22) into the first and second plies (24, 26) such that the opposite edges are joined by the fold line (22).

16. The method of any preceding claim wherein the longitudinal seam (54) is positioned generally on the side of the springs (14, 14a) between top and bottom ends thereof in the formed string (12) of pocketed coil springs.

17. A system for forming a string (12) of pocketed coil springs, each of the springs (14, 14a) being enclosed within a pocket (86) formed of fabric, the system comprising a fabric supply station for providing first and second generally parallel fabric plies (24, 26), a spring insertion station (34) at which axially compressed springs (14, 14a) are individually inserted between the first and second plies (24, 26), a longitudinal seam forming station (52) located downstream from the spring insertion station (34), the longitudinal seam forming station (52) joining the first and second plies (24, 26) of the fabric together by forming a longitudinal seam (52) proximate free edges (28) of the first and second plies, the plies being joined at the opposite edges to the free edges, a spring expansion station (70) permitting the springs (14, 14a) to at least partially expand between the first and second plies (24, 26) in the same orientation as they are inserted between the plies (24, 26) so that the longitudinal axis (60) of each spring is generally perpendicular to the longitudinal seam (54), a transverse seam forming station (78) forming a transverse seam (80, 80a) in the fabric to separate each pair of adjacent springs (14, 14a) and thereby enclose each of the springs within a fabric pocket (86) when inserted therein, and a transport station (62, 94) which advances the fabric (16) and springs (14, 14a) contained therein through the respective stations, **characterised in that** the spring expansion station is downstream of the longitudinal seam forming station, and **in that** the transverse seam forming station (78) forms the transverse seams (80, 80a) generally parallel to the longitudinal axes (60) of the at least partially expanded springs.

18. The system of Claim 17 wherein the transverse seam forming station (78) is downstream of the spring expansion station (70).

19. The system of either Claim 17 or Claim 18 wherein the spring expansion station (70) permits the springs to expand along their longitudinal axes (60).

20. The system of any one of Claims 17 to 19 wherein the springs (14, 14a) are allowed to expand in the same orientation as they are inserted between the plies (24, 26).

21. The system of any one of Claims 17 to 20 wherein the orientation of the longitudinal axes (60) of the springs (14, 14a) remains generally unaltered from the spring insertion station (34) through formation of the string (12) of pocketed coil springs.

22. The system of any one of Claims 17 to 21 wherein the transport station (62, 94) further comprises a pair of rotating transport members (96) spaced on opposite sides of the fabric and located downstream from the spring expansion station (70), the rotating transport members (96) comprising a plurality of arcuate shaped recesses (100) which combine to partially surround each spring (14, 14a) and the surrounding fabric to thereby pull the fabric and springs contained therein through the respective stations.

23. The system of any one of Claims 17 to 22 wherein the spring expansion station (70) further comprises a pair of rotating members (72, 102) on opposite sides of the springs (14, 14a) within the fabric.

24. The system of Claim 23 wherein the axes of rotation of the rotating members (72) are generally parallel to the longitudinal axes (60) of the springs and each rotating member (72) comprises a plurality of arcuate shaped recesses (76) which combine to partially surround each spring.

25. The system of Claim 24 wherein the axes of rotation of the rotating members (102) are generally perpendicular to the longitudinal axes (60) of the springs and each rotating member comprises a band (102) passing over spaced rotational mounted rollers (104, 106), wherein a separation distance between the bands (102) increases in a downstream direction to thereby control the expansion of the springs between the bands (102).

26. The system of any one of Claims 17 to 25 wherein the transverse seam forming station (78) forms a transverse seam (80a) which conforms to a non-linear profile of the adjacent spring (14a).

27. The system of any one of Claims 17 to 26 wherein the longitudinal seam forming station (52) and the transverse seam forming station (78) each further comprise a cooperating thermal weld head and anvil (56, 58, 82, 84) to form thermal welds in the fabric.

28. A string (12) of pocketed coil springs comprising two elongate fabric plies (24, 26) joined together by a longitudinal seam (54) proximate free edges (28) of the plies, the plies (24, 26) being joined at the edges opposite the free edges and having transverse seams (80, 80a) to form pockets (86), and, a spring (14, 14a) encased in each pocket and having a longitudinal axis (60) generally perpendicular to the longitudinal seam (54), the longitudinal seam (54) being positioned on the side of the springs between the ends thereof, **characterising in that** the fabric between the free edge (28) of each ply and the longitudinal seam (54) is folded to overlap the other to form a two layer strip in contact with the pockets (86) and the strip is attached to the pockets (86) by the transverse seams (80, 80a).

29. The string of Claim 28 wherein the longitudinal seam (54) is positioned approximately midway between the ends of the springs (14, 14a).

30. The string of either Claim 28 or Claim 29 wherein the fabric (16) is thermally weldable and the seams (54, 80, 80a) are thermal welds.

31. The string of any one of Claims 28 to 30 wherein the opposite edges of the plies (24, 26) are integral.

32. The string of any one of Claims 28 to 31 wherein each of the springs (14a) has a non-linear profile between a top and a bottom thereof and the transverse seams (80a) have a non-linear profile conforming to that of the springs.

Patentansprüche

1. Verfahren zum Herstellen einer Folge von Spiralfedern in Taschen, umfassend das Zuführen eines Vorrats von Gewebe (16), um erste und zweite allgemein parallele Gewebelagen (24, 26) zu bilden, Einführen einer Reihe von axial komprimierten Federn (14, 14a) zwischen die erste und die zweite Lage (24, 26), Verbinden der ersten und der zweiten Lage miteinander durch Erzeugen einer Längsnaht (54) in der Nähe der freien Ränder (28) der ersten und der zweiten Lage (24, 26), wobei die Lagen an den den freien Rändern (28) gegenüberliegenden Rändern miteinander verbunden werden, Zulassen, dass die Federn (14, 14a) wenigstens teilweise axial in dem Gewebe in derselben Ausrichtung expandieren, in der sie zwischen die Lagen (24, 26) eingeführt wurden, so dass die Längsachse (60) jeder der Federn allgemein lotrecht zur Längsnaht (54) verläuft, und Erzeugen einer Quernaht (80, 80a) in dem Gewebe zwischen benachbarten Federn (14, 14a), um dadurch jede der Federn in einer Gewebetasche (86) einzuschließen, **dadurch gekennzeichnet, dass** zugelassen wird, dass die Federn (14, 14a) nach dem Verbinden der ersten und der zweiten Lage (24, 26) durch Erzeugen der Längsnaht (54) wenigstens teilweise expandieren, und dadurch, dass die Quernähte (80, 80a) allgemein parallel zu den Längsachsen (60) der wenigstens teilweise expandierten Federn (14, 14a) erzeugt werden.

2. Verfahren nach Anspruch 1, wobei zugelassen wird, dass die Federn (14, 14a) wenigstens teilweise vor dem Erzeugen der Quernähte (80, 80a) expandieren.

3. Verfahren nach Anspruch 1 oder Anspruch 2, wobei zugelassen wird, dass die Federn (14, 14a) entlang ihrer Längsachsen (60) expandieren.

4. Verfahren nach Anspruch 2, wobei zugelassen wird, dass die Federn (14, 14a) in derselben Ausrichtung expandieren, in der sie zwischen die Lagen (24, 26) eingeführt wurden.

5. Verfahren nach einem der vorherigen Ansprüche, wobei die Ausrichtung der Längsachsen (60) der Federn (14, 14a) während des gesamten Prozesses allgemein unverändert bleibt.

6. Verfahren nach einem der vorherigen Ansprüche, wobei die Expansion der Federn (14, 14a) durch ein Paar rotierender Elemente (72, 102) auf gegenüberliegenden Seiten der Federn in dem Gewebe gesteuert wird.

7. Verfahren nach Anspruch 6, wobei die Rotationsachsen der rotierenden Elemente (72) allgemein parallel zu den Längsachsen (60) der Federn sind und jedes rotierende Element (72) eine Mehrzahl von bogenförmigen Aussparungen (76) umfasst, die in Kombination jede Feder teilweise umgeben.

8. Verfahren nach Anspruch 6, wobei die Rotationsachsen der rotierenden Elemente allgemein lotrecht zu den Längsachsen (60) der Federn sind und jedes rotierende Element ein Band (102) umfasst, das über beabstandete Rollen (104, 106) passiert, wobei ein Trennabstand zwischen den Bändern (102) in einer Abwärtsrichtung zunimmt, um dadurch die Expansion der Federn (14, 14a) zwischen den Bändern zu steuern.

9. Verfahren nach einem der vorherigen Ansprüche, ferner umfassend das Ziehen des Gewebes zwischen einem Paar rotierender Transportelemente (96), die auf gegenüberliegenden Seiten des Gewebes beabstandet sind und sich unterhalb von einer Position befinden, in der die Quernähte (80, 80a) gebildet sind, wobei die rotierenden Transportelemente (96) eine Mehrzahl von bogenförmigen Aussparungen (100) umfassen, die in Kombination jede Feder teilweise umgeben.

10. Verfahren nach Anspruch 9, wobei der Schritt des Ziehens des Gewebes nach dem Erzeugen der Quernähte (80, 80a) durchgeführt wird.

11. Verfahren nach einem der vorherigen Ansprüche, wobei das Einführen ferner das Einführen von komprimierten Federn (14a) umfasst, die ein allgemein nichtlineares gestaltetes Profil neben der Quernaht aufweisen, und das Bilden der Quernaht ferner das Bilden der Quernaht (80a) auf eine solche Weise umfasst, dass sie allgemein wenigstens einem Teil des Profils der benachbarten Federn (14a) entspricht.

12. Verfahren nach Anspruch 11, wobei die eingeführten Federn (14a) zylinderförmig sind.

13. Verfahren nach einem der Ansprüche 1 bis 10, wobei das Einführen ferner das Einführen von komprimierten zylinderförmigen Federn (14a) umfasst und das Erzeugen der Quernaht ferner das Erzeugen der Quernaht (80a) auf eine solche Weise umfasst, dass sie eine allgemein konkave Konfiguration neben den zylinderförmigen Federn (14a) hat.

14. Verfahren nach einem der vorherigen Ansprüche, wobei das Gewebe ein thermoschweißbares Gewebe (16) ist und die Verbindungs- und Erzeugungsschritte durch Verschweißen des Gewebes miteinander durchgeführt werden.

15. Verfahren nach einem der vorherigen Ansprüche, wobei der Schritt des Zuführens des Gewebes das Falten des Gewebes (16) entlang einer Längsfalzlinie (22) zu der ersten und der zweiten Lage (24, 26) umfasst, so dass die gegenüberliegenden Enden durch die Falzlinie (22) verbunden werden.

16. Verfahren nach einem der vorherigen Ansprüche, wobei die Längsnaht (54) allgemein auf der Seite der Federn (14, 14a) neben deren oberem und unterem Ende in der hergestellten Folge (12) von Spiralfedern in Taschen positioniert ist.

17. System zum Bilden einer Folge (12) von Spiralfedern in Taschen, wobei jede der Federn (14, 14a) in einer aus Gewebe gebildeten Tasche (86) eingeschlossen ist, wobei das System Folgendes umfasst: eine Gewebezufuhrstation zum Erzeugen einer ersten und einer zweiten allgemein parallelen Gewebelage (24, 26), eine Federeinführstation (34), in der axial komprimierte Federn (14, 14a) individuell zwischen die erste und die zweite Lage (24, 26) eingeführt werden, eine Längsnahterzeugungsstation (52), die sich unterhalb der Federeinführstation (34) befindet, wobei in der Längsnahterzeugungsstation (52) die erste und die zweite Lage (24, 26) des Gewebes miteinander verbunden werden, um eine Längsnaht (52) in der Nähe der freien Ränder (28) der ersten und der zweiten Lage zu bilden, wobei die Lagen an den den freien Rändern gegenüberliegenden Rändern verbunden werden, eine Federexpansionsstation (70), in der die Federn (14, 14a) wenigstens teilweise zwischen der ersten und der zweiten Lage (24, 26) in derselben Ausrichtung expandieren können, in der sie zwischen die Lagen (24, 26) eingeführt wurden, so dass die Längsachse (60) jeder Feder allgemein lotrecht zur Längsnaht (54) ist, eine Quernahterzeugungsstation (78) zum Bilden einer Quernaht (80, 80a) in dem Gewebe, um jedes Paar benachbarter Federn (14, 14a) zu trennen und dadurch jede der Federn nach dem Einführen in einer Gewebetasche (86) einzuschließen, und eine Transportstation (62, 94), die das Gewebe (16) und die darin enthaltenen Federn (14, 14a) durch die jeweiligen Stationen bewegt, **dadurch gekennzeichnet, dass** sich die Federexpansionsstation unterhalb der Längsnahterzeugungsstation befindet, und dadurch, dass die Quernahterzeugungsstation (78) die Quernähte (80, 80a) allgemein parallel zu den Längsachsen (60) der wenigstens teilweise expandierten Federn bildet.

18. System nach Anspruch 17, wobei sich die Quernahterzeugungsstation (78) unterhalb der Federexpansionsstation (70) befindet.

19. System nach Anspruch 17 oder Anspruch 18, wobei die Federexpansionsstation (70) es zulässt, dass die Federn entlang ihrer Längsachsen (60) expandieren.

20. System nach einem der Ansprüche 17 bis 19, wobei zugelassen wird, dass die Federn (14, 14a) in derselben Ausrichtung expandieren, in der sie zwischen die Lagen (24, 26) eingeführt wurden.

21. System nach einem der Ansprüche 17 bis 20, wobei die Ausrichtung der Längsachsen (60) der Federn (14, 14a) von der Federeinführstation (34) durch die Herstellung der Folge (12) von Spiralfedern in Taschen allgemein unverändert bleibt.

22. System nach einem der Ansprüche 17 bis 21, wobei die Transportstation (62, 94) ferner ein Paar von rotierenden Transportelementen (96) umfasst, die auf gegenüberliegenden Seiten des Gewebes beabstandet sind und sich unterhalb der Federexpansionsstation (70) befinden, wobei die rotierenden Transportelemente (96) eine Mehrzahl von bogenförmigen Aussparungen (100) umfassen, die in Kombination jede Feder (14, 14a) und das umgebende Gewebe teilweise umgeben, um dadurch das Gewebe und die darin enthaltenen Federn durch die jeweiligen Stationen zu ziehen.

23. System nach einem der Ansprüche 17 bis 22, wobei die Federexpansionsstation (70) ferner ein Paar rotierender Elemente (72, 102) auf gegenüberliegenden Seiten der Federn (14, 14a) in dem Gewebe umfasst.

24. System nach Anspruch 23, wobei die Rotationsachsen der rotierenden Elemente (72) allgemein parallel zu den Längsachsen (60) der Federn liegen und jedes rotierende Element (72) eine Mehrzahl von bogenförmigen Aussparungen (76) umfasst, die in Kombination jede Feder teilweise umgeben.

25. System nach Anspruch 24, wobei die Rotationsachsen der rotierenden Elemente (102) allgemein lotrecht zu den Längsachsen (60) der Federn sind und jedes rotierende Element ein Band (102) umfasst, das über beabstandete rotational montierte Rollen (104, 106) passiert, wobei ein Trennabstand zwischen den Bändern (102) in einer Abwärtsrichtung zunimmt, um die Expansion der Federn zwischen den Bändern (102) dadurch zu steuern.

26. System nach einem der Ansprüche 17 bis 25, wobei die Quernahterzeugungsstation (78) eine Quernaht (80a) bildet, die einem nichtlinearen Profil der benachbarten Feder (14a) entspricht.

27. System nach einem der Ansprüche 17 bis 26, wobei die Längsnahterzeugungsstation (52) und die Quernahterzeugungsstation (78) jeweils einen Thermoschweißkopf und einen Amboss (56, 58, 82, 84) umfassen, die zum Bilden von Thermoschweißnähten in dem Gewebe zusammenwirken.

28. Folge (12) von Spiralfedern in Taschen, umfassend zwei längliche Gewebelagen (24, 26), die durch eine Längsnaht (54) in der Nähe der freien Ränder (28) der Lagen miteinander verbunden werden, wobei die Lagen (24, 26) an den den freien Rändern gegenüberliegenden Rändern verbunden sind, und mit Quernähten (80, 80a) zum Bilden von Taschen (86), und Federn (14, 14a), von denen jeweils eine in jeder Tasche steckt, und mit einer Längsachse (60) allgemein lotrecht zu der Längsnaht (54), wobei die Längsnaht (54) auf der Seite der Federn zwischen deren Enden positioniert ist, **dadurch gekennzeichnet, dass** das Gewebe zwischen dem freien Rand (28) jeder Lage und der Längsnaht (54) so gefaltet ist, dass es die andere überlappt, um einen zweilagigen Streifen in Kontakt mit den Taschen (86) zu bilden, und der Streifen durch die Längsnähte (80, 81a) mit den Taschen (86) verbunden ist.

29. Folge nach Anspruch 28, wobei die Längsnaht (54) etwa in der Mitte zwischen den Enden der Federn (14, 14a) positioniert ist.

30. Folge nach Anspruch 28 oder Anspruch 29, wobei das Gewebe (16) thermogeschweißt ist und die Nähte (54, 80, 80a) Thermoschweißnähte sind.

31. Folge nach einem der Ansprüche 28 bis 30, wobei die gegenüberliegenden Ränder der Falten (24, 26) integral sind.

32. Folge nach einem der Ansprüche 28 bis 31, wobei jede der Federn (14a) ein nichtlineares Profil zwischen einer Ober- und einer Unterseite davon hat und die Quernähte (80a) ein nichtlineares Profil haben, das dem der Federn entspricht.

Revendications

1. Procédé permettant de former une bande de ressorts hélicoïdaux ensachés comportant l'avance d'une réserve de tissu (16) de telle manière à procurer une première et une deuxième couches de tissu en général parallèles (24, 26), l'insertion d'une série de ressorts comprimés de manière axiale (14, 14a) entre la première et la deuxième couches (24, 26), l'assemblage de la première et de la deuxième couches ensemble par la formation d'une couture longitudinale (54) à proximité des bords libres (28) de la première et de la deuxième couches (24, 26), les couches étant assemblées au niveau des bords opposés aux bords libres (28), la possibilité donnée aux ressorts (14, 14a) de se détendre au moins partiellement de manière axiale à l'intérieur du tissu dans la même orientation que celle adoptée lorsqu'ils sont insérés entre les couches (24, 26) de telle manière que l'axe longitudinal (60) de chacun des ressorts est en général perpendiculaire par rapport à la couture longitudinale (54), et la formation d'une couture transversale (80, 80a) dans le tissu entre des ressorts adjacents (14, 14a) afin, de ce fait, de renfermer chacun des ressorts à l'intérieur d'une poche de tissu (86), **caractérisé en ce que** les ressorts (14, 14a) ont la possibilité de se détendre au moins partiellement après l'assemblage de la première et de la deuxième couches (24, 26) par la formation de la couture longitudinale (54), et **en ce que** les coutures transversales (80, 80a) sont formées en général de manière parallèle par rapport aux axes longitudinaux (60) des ressorts détendus au moins partiellement (14, 14a).

2. Procédé selon la revendication 1, dans lequel les ressorts (14, 14a) ont la possibilité de se détendre au moins partiellement avant la formation des coutures transversales (80, 80a).

3. Procédé selon la revendication 1 ou la revendication 2, dans lequel les ressorts (14, 14a) ont la possibilité de se détendre le long de leurs axes longitudinaux (60).

4. Procédé selon la revendication 2, dans lequel les ressorts (14, 14a) ont la possibilité de se détendre dans la même orientation que celle adoptée lorsqu'ils sont insérés entre les couches (24, 26).

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'orientation des axes longitudinaux (60) des ressorts (14, 14a) reste en général inchangée au cours de l'intégralité du processus.

6. Procédé selon l'une quelconque des revendications précédentes, dans lequel la détente des ressorts (14, 14a) est contrôlée par une paire d'organes rotatifs (72, 102) sur les côtés opposés des ressorts à l'intérieur du tissu.

7. Procédé selon la revendication 6, dans lequel les axes de rotation des organes rotatifs (72) sont en général parallèles par rapport aux axes longitudinaux (60) des ressorts et chaque organe rotatif (72) comporte une pluralité d'évidements à forme arquée (76) qui se combinent pour entourer partiellement chaque ressort.

8. Procédé selon la revendication 6, dans lequel les axes de rotation des organes rotatifs sont en général perpendiculaires par rapport aux axes longitudinaux (60) des ressorts et chaque organe rotatif comporte une courroie (102) passant sur des rouleaux espacés (104, 106), dans lequel une distance de séparation entre les courroies (102) augmente en direction de l'aval afin, de ce fait, de contrôler la détente des ressorts (14, 14a) entre les courroies.

9. Procédé selon l'une quelconque des revendications précédentes, comportant par ailleurs le tirage du tissu entre une paire d'organes de transport rotatifs (96) espacés sur les côtés opposés du tissu et situés en aval d'une position à laquelle les coutures transversales (80, 80a) sont formées, les organes de transport rotatifs (96) comportant une pluralité d'évidements à forme arquée (100) qui se combinent pour entourer partiellement chaque ressort.

10. Procédé selon la revendication 9, dans lequel l'étape de tirage du tissu est réalisée après la formation des coutures transversales (80, 80a).

11. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'insertion comporte par ailleurs l'insertion des ressorts comprimés (14a) qui ont un profil en général de forme non linéaire de manière adjacente à la couture transversale et dans lequel la formation de la couture transversale comporte par ailleurs la formation de la couture transversale (80a) afin de correspondre en général à au moins une portion du profil des ressorts adjacents (14a).

12. Procédé selon la revendication 11, dans lequel les ressorts (14a) insérés sont en forme de fût.

13. Procédé selon l'une quelconque des revendications 1 à 10, dans lequel l'insertion comporte par ailleurs l'insertion des ressorts comprimés en forme de fût (14a) et dans lequel la formation de la couture transversale comporte par ailleurs la formation de la couture transversale (80a) afin d'obtenir une configuration en général concave de manière adjacente aux ressorts en forme de fût (14a).

14. Procédé selon l'une quelconque des revendications précédentes, dans lequel le tissu est un tissu thermosoudable (16) et dans lequel les étapes d'assemblage et de formation sont réalisées par le soudage du tissu.

15. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'étape d'avance du tissu comporte le pliage du tissu (16) autour d'une ligne de pliage longitudinale (22) dans la première et la deuxième couches (24, 26) de telle manière que les bords opposés sont joints par la ligne de pliage (22).

16. Procédé selon l'une quelconque des revendications précédentes, dans lequel la couture longitudinale (54) est positionnée en général sur le côté des ressorts (14, 14a) entre l'extrémité supérieure et l'extrémité inférieure de ceux-ci dans la bande (12) de ressorts hélicoïdaux ensachés qui est formée.

17. Système permettant de former une bande (12) de ressorts hélicoïdaux ensachés, chacun des ressorts (14, 14a) étant renfermé à l'intérieur d'une poche (86) formée de tissu, le système comportant une station de réserve de tissu destinée à fournir la première et la deuxième couches de tissus en général parallèles (24, 26), une station d'insertion des ressorts (34) au niveau de laquelle les ressorts comprimés de manière axiale (14, 14a) sont insérés individuellement entre la première et la deuxième couches (24, 26), une station de formation des coutures longitudinales (52) située en aval de la station d'insertion des ressorts (34), la station de formation des coutures longitudinales (52) effectuant l'assemblage de la première et de la deuxième couches (24, 26) du tissu ensemble par la formation d'une couture longitudinale (52) à proximité des bords libres (28) de la première et de la deuxième couches, les couches étant assemblées au niveau des bords opposés aux bords libres, une station de détente des ressorts (70) donnant aux ressorts (14, 14a) la possibilité de se détendre au moins partiellement entre la première et la deuxième couches (24, 26) dans la même orientation que celle adoptée lorsqu'ils sont insérés entre les couches (24, 26) de telle manière que l'axe longitudinal (60) de chaque ressort est en général perpendiculaire par rapport à la couture longitudinale (54), une station de formation des coutures transversales (78) formant une couture transversale (80, 80a) dans le tissu afin de séparer chaque paire de ressorts adjacents (14, 14a) et afin, de ce fait, de renfermer chacun des ressorts à l'intérieur d'une poche de tissu (86) lorsqu'il y est inséré, et une station de transport (62, 94) qui fait avancer le tissu (16) et les ressorts (14, 14a) s'y trouvant au travers des différentes stations, **caractérisé en ce que** la station de détente des ressorts est en aval de la station de formation des coutures longitudinales, et **en ce que** la station de formation des coutures transversales (78) forme les coutures transversales (80, 80a) en général de manière parallèle par rapport aux axes longitudinaux (60) des ressorts détendus au moins partiellement.

18. Système selon la revendication 17, dans lequel la station de formation des coutures transversales (78) est en aval de la station de détente des ressorts (70).

19. Système selon la revendication 17 ou la revendication 18, dans lequel la station de détente des ressorts (70) donne aux ressorts la possibilité de se détendre le long de leurs axes longitudinaux (60).

20. Système selon l'une quelconque des revendications 17 à 19, dans lequel les ressorts (14, 14a) ont la possibilité de se détendre dans la même orientation que celle adoptée lorsqu'ils sont insérés entre les couches (24, 26).

21. Système selon l'une quelconque des revendications 17 à 20, dans lequel l'orientation des axes longitudinaux (60) des ressorts (14, 14a) reste en général inchangée depuis la station d'insertion des ressorts (34) jusqu'à la formation de la bande (12) de ressorts hélicoïdaux ensachés.

22. Système selon l'une quelconque des revendications 17 à 21, dans lequel la station de transport (62, 94) comporte par ailleurs une paire d'organes de transport rotatifs (96) espacés sur les côtés opposés du tissu et situés en aval de la station de détente des ressorts (70), les organes de transport rotatifs (96) comportant une pluralité d'évidements à forme arquée (100) qui se combinent pour entourer partiellement chaque ressort (14, 14a) et le tissu enveloppant afin, de ce fait, de tirer le tissu et les ressorts s'y trouvant au travers des différentes stations.

23. Système selon l'une quelconque des revendications 17 à 22, dans lequel la station de détente des ressorts (70) comporte par ailleurs une paire d'organes rotatifs (72, 102) sur les côtés opposés des ressorts (14, 14a) à l'intérieur du tissu.

24. Système selon la revendication 23, dans lequel les axes de rotation des organes rotatifs (72) sont en général parallèles par rapport aux axes longitudinaux (60) des ressorts et chaque organe rotatif (72) comporte une pluralité d'évidements à forme arquée (76) qui se combinent pour entourer partiellement chaque ressort.

25. Système selon la revendication 24, dans lequel les axes de rotation des organes rotatifs (102) sont en général perpendiculaires par rapport aux axes longitudinaux (60) des ressorts et chaque organe rotatif comporte une courroie (102) passant sur des rouleaux espacés montés de manière rotationnelle (104, 106), dans lequel une distance de séparation entre les courroies (102) augmente en direction de l'aval afin, de ce fait, de contrôler la détente des ressorts (14, 14a) entre les courroies (102).

26. Système selon l'une quelconque des revendications 17 à 25, dans lequel la station de formation des coutures transversales (78) forme une couture transversale (80a) qui est conforme à un profil non linéaire du ressort adjacent (14a).

27. Système selon l'une quelconque des revendications 17 à 26, dans lequel la station de formation des coutures longitudinales (52) et la station de formation des coutures transversales (78) comportent chacune par ailleurs un ensemble coopérant de tête et enclume de thermosoudage (56, 58, 82, 84) destiné à former des thermosoudures dans le tissu.

28. Bande (12) de ressorts hélicoïdaux ensachés comportant deux couches de tissu allongées (24, 26) assemblées ensemble par une couture longitudinale (54) à proximité des bords libres (28) des couches, les couches (24, 26) étant assemblées au niveau des bords opposés aux bords libres et ayant des coutures transversales (80, 80a) afin de former des poches (86), et, un ressort (14, 14a) encastré dans chaque poche et ayant un axe longitudinal (60) en général perpendiculaire par rapport à la couture longitudinale (54), la couture longitudinale (54) étant positionnée sur le côté des ressorts entre les extrémités de ceux-ci, **caractérisée en ce que** le tissu entre le bord libre (28) de chaque couche et la couture longitudinale (54) est plié pour recouvrir l'autre afin de former une bandelette à deux couches en contact avec les poches (86) et la bandelette est attachée aux poches (86) par les coutures transversales (80, 80a).

29. Bande selon la revendication 28, dans laquelle la couture longitudinale (54) est positionnée approximativement à mi-chemin entre les extrémités des ressorts (14, 14a).

30. Bande selon la revendication 28 ou la revendication 29, dans laquelle le tissu (16) est thermosoudable et les coutures (54, 80, 80a) sont des thermosoudures.

31. Bande selon l'une quelconque des revendications 28 à 30, dans laquelle les bords opposés des couches (24, 26) sont intégrés.

32. Bande selon l'une quelconque des revendications 28 à 31, dans laquelle chacun des ressorts (14a) a un profil non linéaire entre une extrémité supérieure et une extrémité inférieure de ceux-ci et les coutures transversales (80a) ont un profil non linéaire conforme à celui des ressorts.

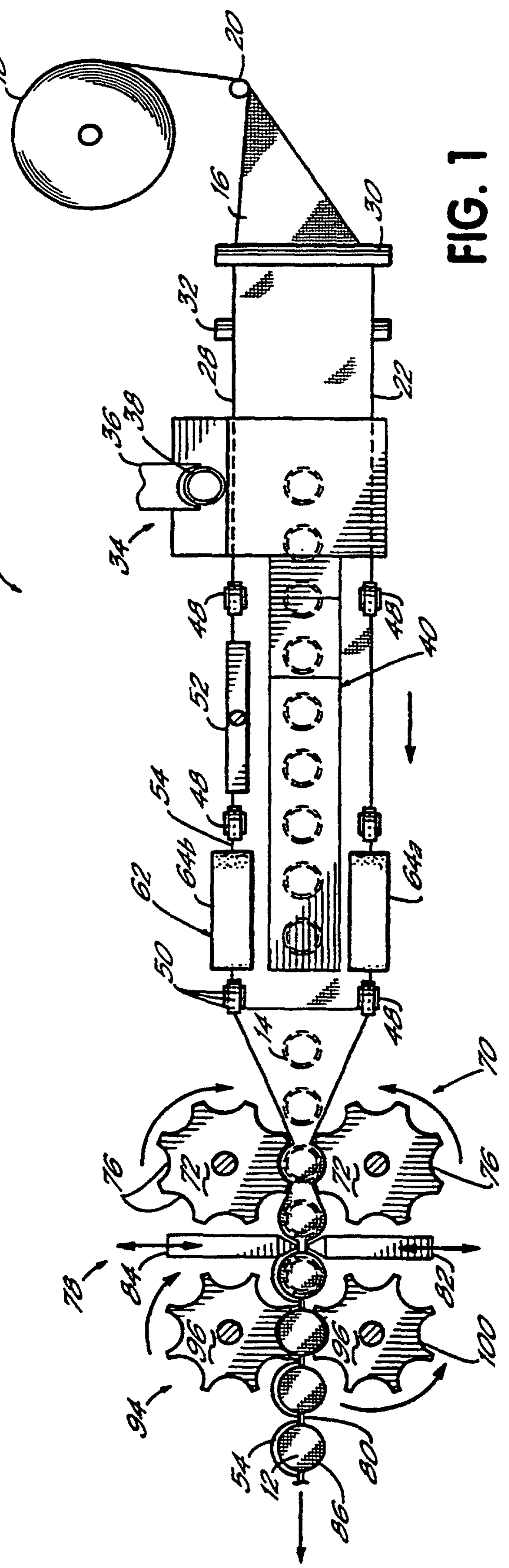

FIG. 1

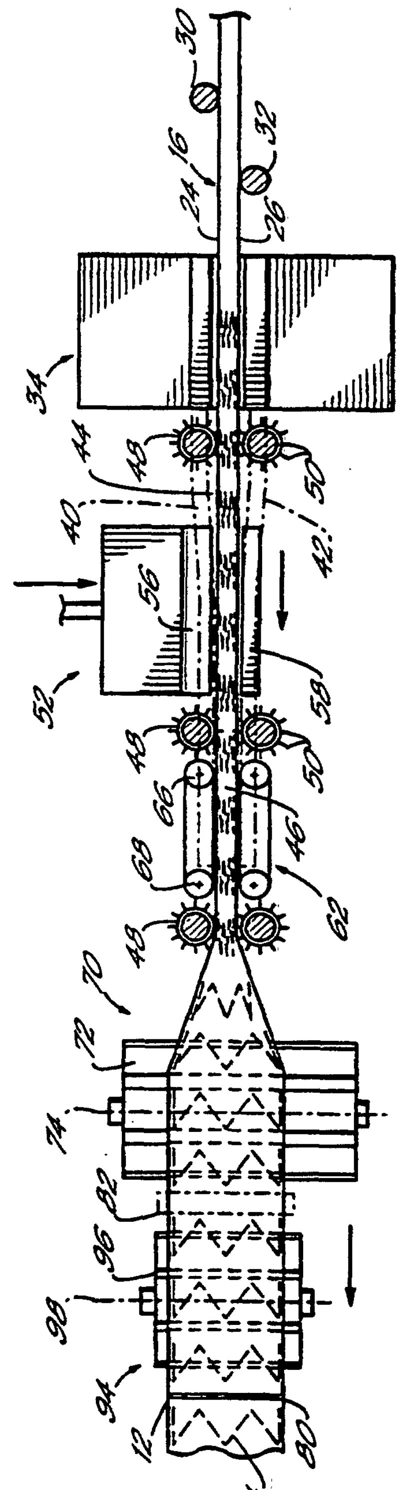

FIG. 2

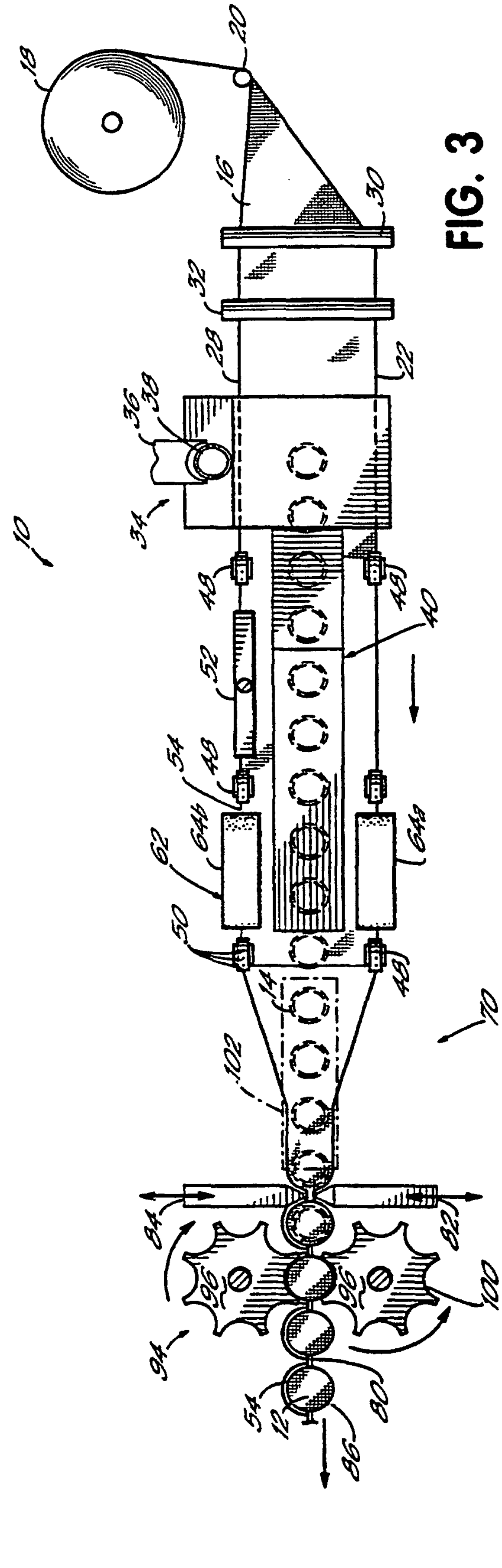

FIG. 3

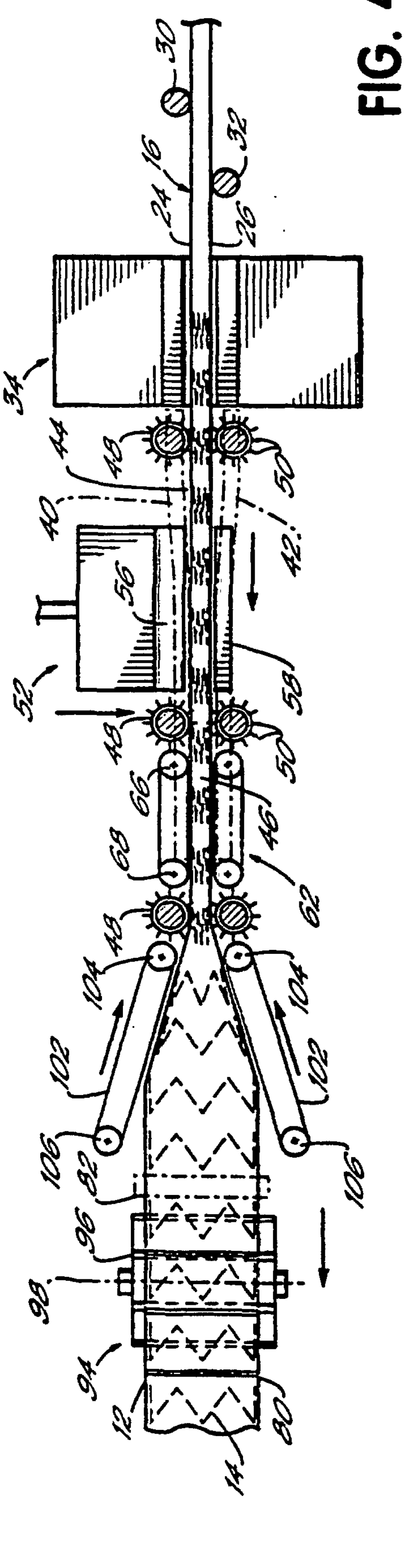

FIG. 4

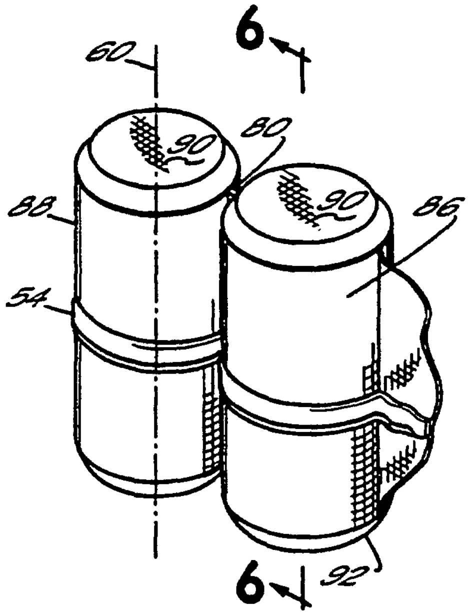

FIG. 5

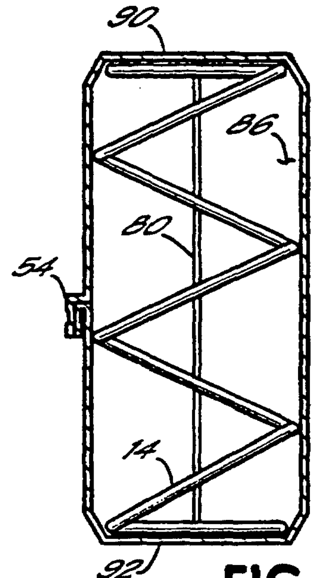

FIG. 6

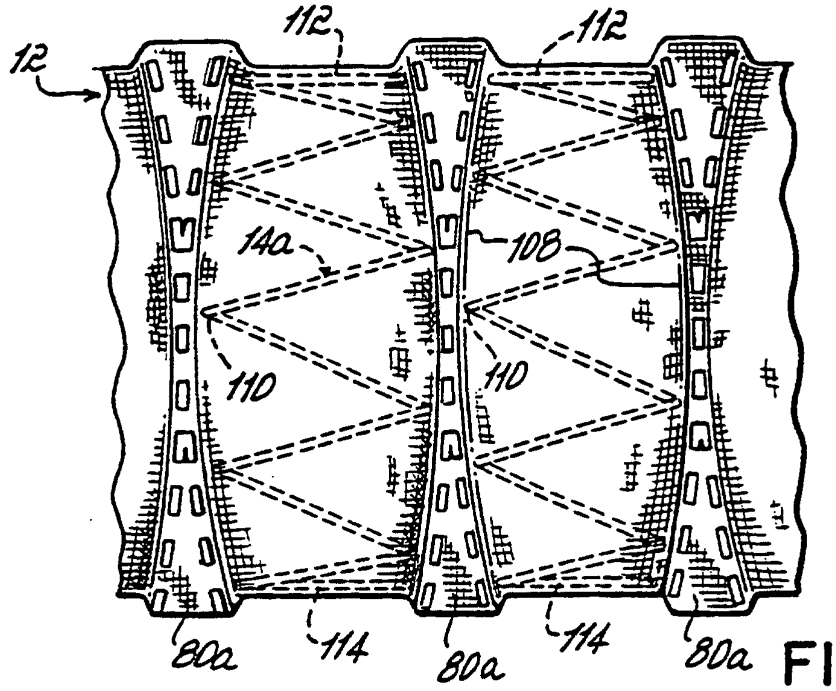

FIG. 7

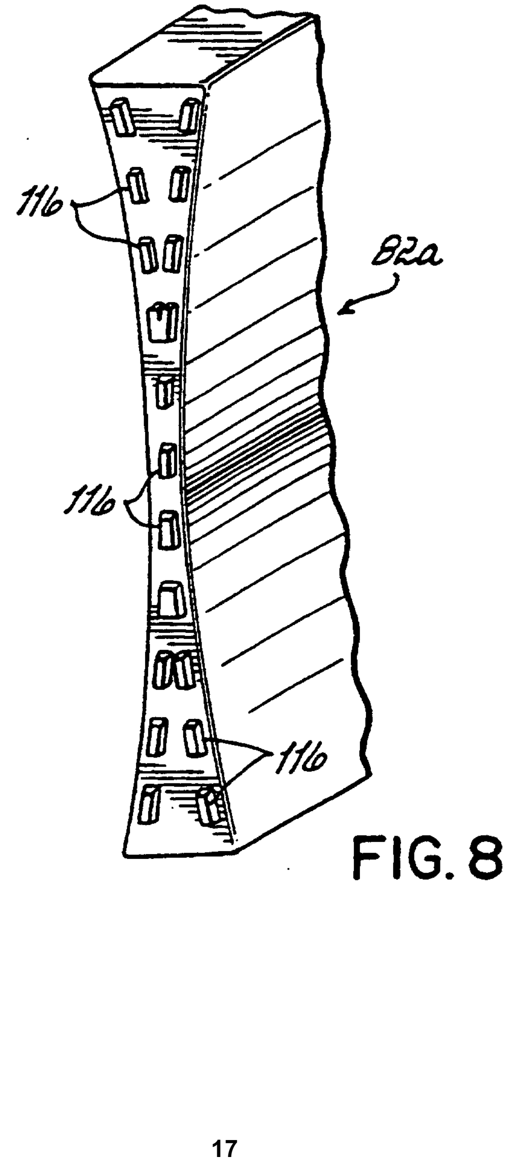

FIG. 8