

Description

[0001] The present invention relates to a coil spring assembly wherein a plurality of coil springs are enclosed within a fabric. Such coil spring assemblies are for example used for manufacturing spring mattresses, and are for example known from US 7,194,777 B2, US 1,250,892, US 7,178,187 B2, US 2004/0103479 A1 or US 2004/0128773 A1.

[0002] There is a general need for coil spring assemblies which are easy to manufacture, are reliable and/or which provide increased comfort when incorporated into a mattress.

[0003] The present invention provides a coil spring assemblies as defined in claim 1 or 8, and corresponding manufacturing methods as defined in claim 17 or 19. The dependent claims define further embodiments and a mattress comprising the coil spring assembly.

[0004] According to a first aspect of the present invention, a coil spring assembly is provided comprising:

a plurality of coil springs, each coil spring comprising a first end and a second end, a longitudinal axis of each coil spring being defined between said first end and said second end, a diameter of each coil spring at said first end being greater than a diameter of said coil spring at said second end, said plurality of coil springs being arranged side by side to form a string of coil springs, the longitudinal axes of said coil springs being substantially parallel and the first ends of said coil springs facing substantially in the same direction,

a fabric enclosing said coil springs, and

connections connecting opposite sides of said fabric between two adjacent coil springs, said connections being arranged between said coil springs along connecting lines which are slanted relative to said longitudinal axes of said coil springs.

[0005] The coil springs may have frustro-conical shapes, although other shapes are also possible.

[0006] The fabric may be folded to surround the coil springs, and further connections may be provided to close the fabric along a further connecting line substantially perpendicular to the longitudinal axis of said coil springs. Said further connecting line may be arranged in the vicinity of said first and/or said second ends.

[0007] Between two coil springs, two of said connecting lines may run in a V-shape.

[0008] According to a second aspect, a coil spring assembly is provided, said coil spring arrangement comprising a plurality of first coil springs, each of said first coil springs comprising a first end and a second end, a longitudinal axis being defined between said first end and said second end, a diameter of each coil spring at said first end being greater than a diameter of each coil spring

at said second end,

a plurality of second coil springs, each of said second coil springs comprising a first end and a second end, a longitudinal axis being defined between said first end and said second end, a diameter of each coil spring at said first end being greater than a diameter at said second end, said first coil springs and said second coil springs being arranged besides each other in an alternating manner with the longitudinal axes of the first coil springs being parallel to the longitudinal axes of the second coil springs such that the first ends of the first coil springs face in the same direction as the second ends of said second coil springs, said first ends of said first coil springs defining a first plane, said second end of said second coil springs defining a second plane, said first plane being spaced apart from said second plane, and

a fabric enclosing said first and second coil springs.

[0009] Said second ends of said first coil springs may define a third plane, and said first ends of said second coil springs may define a fourth plane, said fourth plane being spaced apart from said third plane.

[0010] A distance between said first plane and said second plane may be equal to a distance between said third plane and said fourth plane, although this is not required.

[0011] A distance between said first plane and said third plane may be equal to a distance between said second plane and said fourth plane.

[0012] The coil spring assembly may comprise connections connecting opposite sides of said fabric to enclose each of said first and second coil springs in a respective individual pocket.

[0013] The first coil springs and/or second coil springs may be frustro-conical springs.

[0014] A dimension of said first coil springs may be equal to a dimension of said second coil springs or, in other words, the first coil springs and the second coil springs may be designed equal, but differ only in their orientation and position within the coil spring assembly. However, the first coil springs may also be designed different from the second coil springs.

[0015] According to third and fourth aspects, methods for manufacturing coil spring arrangements according to the first and second aspect, respectively, are provided.

[0016] The coil spring assembly according to the first and/or second aspect may be incorporated in a mattress.

[0017] Further features and properties of the present invention may be taken from the following detailed description of embodiments thereof in connection with the accompanying drawings, said description and said drawings are given as examples only and are not to be construed as limiting the scope of the present invention, and wherein:

Fig. 1 shows a front view of a coil spring assembly according to a first embodiment of the present invention,

Fig. 2 shows a side view of the embodiment of Fig. 1,

Fig. 3 shows a front view of a coil spring assembly according to a second embodiment of the present invention,

Fig. 4 shows a side view of the embodiment of Fig. 3,

Fig. 5 shows a top view of the embodiment of Fig. 3,

Fig. 6 shows a schematic view of a spring usable in embodiments of the present invention,

Fig. 7 shows a schematic view of another spring usable in embodiments of the present invention, and

Fig. 8 shows a flow diagram of a method according to an embodiment of the present invention.

[0018] In the following, embodiments of coil spring assemblies and of methods for manufacturing the same will be described. In the following description, directional terms like "top", "bottom", "left", "right", "side" or "front" are used to designate directions with respect to the drawings only. Depending on the application, coil spring assemblies according to embodiments of the present invention may be oriented in any direction as required. With reference to Figs. 1-7, embodiments of coil spring assemblies in the form of strings of pocketed coil springs will be disclosed. "String of pocketed coil springs" in this respect relates to a plurality of springs enclosed in a fabric and arranged side by side. Such strings of pocketed coil springs for example may be used to manufacture mattresses.

[0019] In Fig. 1, a front view of a coil spring assembly 10 according to a first embodiment of the present invention is shown. Fig. 2 shows a side view of the embodiment of Fig. 1.

[0020] In the first embodiment of Figs. 1 and 2, a plurality of springs 12 are enclosed by a fabric 11. In Figs. 1 and 2 as well as in the other Figures, the fabric is depicted as being transparent to make the springs visible. However, the fabric needs not be transparent, and a non-transparent fabric may be used. Fabric 11 may be made of nonwoven material, woven material, plastic material or any other fabric suitable for enclosing or holding coil springs 12 in place. While in Fig. 1 four coil springs 12 are shown, in embodiments of the present invention any number of coil springs starting from two coil springs up to a hundred coil springs or more may be provided. Coil springs 12 may be made of metal or any other material suitable for forming coil springs. In the coil spring assembly 10 of Figs. 1 and 2, coil springs 12 are frusto-conical coil springs arranged side by side within fabric 11, wherein longitudinal axes 17 of coil springs 12 are substantially parallel. It should be noted that longitudinal axes 17 are not a physical feature of coil springs 12, but are depicted in the Figs. merely for explanatory purposes.

[0021] Since coil springs 12 are frusto-conical, their diameter at a first end (bottom end in Figs. 1 and 2) is larger than the diameter at a second end (top end in Figs. 1 and 2). In the embodiment of Figs. 1 and 2, coil springs 12 are arranged such that their respective first ends face in the same direction, and their respective second ends face in the same direction, such that the orientation of all the coil springs is substantially the same. In Fig. 1, all second ends are arranged at the bottom, and all first ends are arranged at the top.

[0022] In the embodiment of Figs. 1 and 2, the fabric 11 is folded around the bottom of the springs and closed with connections 14 running along a straight line substantially perpendicular to the longitudinal axes 17. In an embodiment, fabric 11 is a weldable material, and connections 14 are weld spots or strips. Above connections 14 in the embodiment of Figs. 1 and 2 a fabric portion 16 is left.

[0023] In order to enclose the springs 12 in individual pockets, furthermore connections 13 are provided along connection lines slanted with respect to the longitudinal axes 17 of springs 12. In the embodiments of Figs. 1 and 2, connections 13 between two springs 12 are arranged in a V-shape substantially following the frusto-conical shape of the springs. In other embodiments, other arrangements may be used, for example connections arranged along a single slanted line. Like the connections 14, in the embodiment of Figs. 1 and 2 connections 13 are also weld spots or strips. However, in other embodiments other connections for connecting different portions of fabric 11 may be used, like application of adhesive, stitching, sewing and the like.

[0024] With connections 13 arranged in a V-shape as in the embodiment of Figs. 1 and 2, springs 12 are held securely in place.

[0025] Next, with reference to Figs. 3, 4 and 5, a coil spring assembly 20 according to a second embodiment of the present invention will be described. Fig. 3 shows a front view and Fig. 4 shows a side view of coil spring assembly 20. Fig. 5 shows a top view wherein the coil spring assembly is arranged such that two strings of pocketed coil springs are arranged side by side.

[0026] In the coil spring assembly 20 of Figs. 3-5, similar to the already described coil spring assembly 10 of Figs. 1 and 2 frusto-conical coil springs 26, 27 are arranged side by side and enclosed by a fabric 21. Conical coil springs 26 and 27 each have a first end, and a second end, a longitudinal axis 31 being defined between the first end and the second end, wherein the longitudinal axis 31 does not correspond to a physical feature but is only used for illustrating and explaining the orientation of coil springs 26, 27. The diameter of coil springs 26, 27 at their respective first ends is larger than the diameter at the respective second ends.

[0027] Similar to the coil spring assembly 10 of Figs. 1 and 2, while four coil springs in each coil spring assembly 20 are shown in Figs. 3-5, any number of coil springs starting from two coil springs may be provided.

[0028] In coil spring assembly 20 of the second embodiment, the coil springs 26 are oriented in the opposite direction to the coil springs 27. While the longitudinal axes of the coil springs 26 and 27 are parallel, the second ends of the coil springs 26 face in the same direction as the first ends of coil springs 27, and the first ends of coil springs 26 face in the same direction as the second ends of coil springs 27. The individual coil springs 26 and 27 in the embodiment of Figs. 3-5 are arranged in an alternating manner, i.e. with the exception of the start and the end of the string of pocketed coil springs, each coil spring 26 is surrounded by two coil springs 27 and vice versa.

[0029] Furthermore, in the embodiment of Figs. 3, 4 and 5 while the lengths of coil springs 26 and 27 in the state as enclosed in the fabric are approximately equal, coil springs 26 are shifted towards the bottom with respect to coil springs 27. In other words, a plane defined by the first ends of coil springs 26 is below a plane defined by the second ends of coil springs 27, and a plane defined by the first ends of coil springs 27 is above a plane defined by the second ends of coil springs 26. This position in the coil spring assembly 20 is secured by folding fabric 21 around the bottom of the springs and connecting opposite sides of fabric 21 at the top end, i.e. the upper side of Fig. 3, by connections 28 and 29, wherein connections 29 are closer to the top than connections 28 thus securing a position of coil springs 26 shifted towards the bottom compared with coil springs 27. Correspondingly, on the bottom side portions 24 corresponding to positions of coil springs 27 are shifted towards the top with respect to portions 25 corresponding to positions of coil springs 26.

[0030] Each of coil springs 26, 27 is enclosed in an individual pocket formed by connections 23 running between two adjacent coil springs in a slanted manner with respect to longitudinal axis 31 following the frusto-conical shape of coil springs 26 and 27.

[0031] Similar to the connections 13 and 14 of the coil spring assembly 10 of Figs. 1 and 2, connections 23, 28 and 29 individually may be any type of connection suitable for connecting two opposing portions of fabric 21, for example weld spots or strips, continuous weld lines, or connections formed by stitching, sewing, applying adhesive and the like. Fabric 21 may be any suitable material like nonwoven material, woven material or plastic material.

[0032] The arrangement of springs as shown in Figs. 3-5 provides a "high low effect". Through using frusto-conical springs the positioning of the springs and thus the manufacture of the coil springs is facilitated.

[0033] In Fig. 5, two strings of pocketed coil springs 20A, 20B corresponding to coil spring assembly 20 are shown in a side-by-side arrangement. The coil springs are arranged in a so-called "chess board" pattern such that a coil spring 26 of coil spring assembly 20A is placed adjacent to a coil spring 27 of coil spring assembly 20B. It should be noted that coil spring assembly 20A and coil spring assembly 20B may be portions of the same coil spring assembly 20 which is arranged accordingly, or

may be separate coil spring assemblies. By continuing the structure shown in Fig. 5, i.e. placing coil spring assemblies adjacent to each other, a structure to be incorporated into and forming a mattress may be built.

[0034] In the arrangement of Fig. 5, adjacent coil spring assemblies 20A and 20B may be fixed to each other for example by glueing or may be arranged without fixation.

[0035] Coil spring assemblies 10 and 20 discussed with reference to Figs. 1-5 are merely examples of embodiments of the present invention, and a plurality of variations and modifications are possible to form other embodiments of the present invention, some of which will be discussed below.

[0036] For example, in the coil spring assemblies 10 and 20, all springs have the same shape. In other embodiments, springs of different designs may be used, for example having different dimensions, different spring constants and the like. For example, in coil spring assembly 10, different types of springs 12 may be used, or in coil spring assembly 20, coil springs 26 may be different from coil springs 27, different types of coil springs 26 may be used and/or different types of coil springs 27 may be used. Furthermore, while in coil spring assemblies 10 and 20 frusto-conical springs are shown, other forms of springs having a first end with a diameter greater than a diameter at a second end may be used. Examples for such other spring types which may be used in embodiments of the present invention are shown in Figs. 6 and 7.

[0037] In Fig. 6, a spring 40 suitable for use in embodiments of the present invention comprises a portion with constant diameter 41 and a frusto-conical portion 42. In Fig. 7, a spring 50 usable in embodiments of the present invention comprises a first constant diameter portion 51, a changing diameter portion 52 and a second constant diameter portion 53, wherein the diameter of portion 53 is smaller than the diameter of portion 51. Other types of springs, for example combining the variants shown, are also feasible.

[0038] In the coil spring assemblies 10 and 20, the fabric 11 and 21, respectively, is folded around the bottom of the coil springs and opposing portions of the fabric are connected by connections 14 and 28, 29, respectively, which are arranged at the top of the assembly. In other embodiments, two separate sheets of fabric may be provided which are then connected together by connections e.g. at the top and bottom portions of the structure. In yet other embodiments, the connection(s) may be positioned at a different position than the top or bottom position. For example, a fabric may be folded around the coil springs such that portions of the fabric overlap at a side of the structure, and then connections may be provided at said side. In general, any possibility leading to an enclosing of the coil springs by the fabric is generally possible.

[0039] In another embodiment, adjacent coil springs 12 of Fig. 1 are shifted along their longitudinal axis with respect to each other such that an up and down effect like in coil spring assembly 20 is created.

[0040] Turning now to Fig. 8, methods for forming coil

spring assemblies according to embodiments of the present invention will be discussed. In a step 60, a fabric and coil springs are provided, the fabric and coil springs for example being the ones already described with respect to Figs. 1-7.

[0041] In step 61, the coil springs are enclosed in the fabric, and in step 62, connections are formed for forming the individual pockets. The arrangement of the coil springs in the fabric and the connections may be the ones described already with reference to Figs. 1-7.

[0042] It should be noted that steps 60, 61 and 62 may be performed in an entangled manner, for example coil springs may be inserted into a fabric one after the other, and after and/or before the insertion the connections around the respective coil springs may be formed. For example, with respect to the embodiment of Fig. 1, a portion of connections 40 may be formed, then a spring may be inserted in the thus resulting tube-like portion of fabric 11, and then the connections 13 around the inserted coil spring may be formed. By repeating this process, an elongated string of pocketed coil springs may be produced. As a matter of course, in a different embodiment the order may be different, for example both connections 14 and 13 may be formed after inserting the coil springs.

[0043] Further modifications than the ones discussed above are possible, and the scope of the present application is not intended to be limited by the embodiments disclosed, which are of an exemplary nature only.

Claims

1. A coil spring assembly (10), comprising:

a plurality of coil springs (12), each coil spring (12) comprising a first end and a second end, a longitudinal axis (17) of each coil spring (12) being defined between said first end and said second end, a diameter of each coil spring (12) at said first end being greater than a diameter at said second end, wherein said coil springs are arranged side by side to form a string of coil springs such that said longitudinal axes (17) of said coil springs (12) are substantially parallel and said first ends of said coil springs (12) face in substantially the same direction, a fabric (11) enclosing said coil springs (12), and connections (13) connecting opposite sides of said fabric between two adjacent coil springs (12), wherein said connections (13) are arranged along connecting lines which are slanted relative to said longitudinal axes (17) of said coil springs (12).

2. The coil spring assembly (10) according to claim 1, wherein said connections (13) between said adjacent coil springs (12) are arranged in a V-shape.

3. The coil spring assembly (10) according to claim 1 or 2, wherein said connections (13) are arranged to follow the contour of said coil springs (12).

4. The coil spring assembly (10) according to any one of the preceding claims, wherein said connections (13) are chosen from the group comprising weld lines, weld strips, weld spots, sewed portions, stitched portions, and portions connected by an adhesive.

5. The coil spring assembly (10) according to any one of the preceding claims, wherein said coil springs (12) are frustro-conical springs.

6. The coil spring assembly (10) according to any one of the preceding claims, wherein said fabric (11) is folded around said coil springs (12) and closed by at least one further connection (14).

7. The coil spring assembly (10) according to any one of the preceding claims, wherein said further connections (14) are arranged adjacent to said second ends of said coil springs (12).

8. A coil spring assembly (20) comprising:

a plurality of first coil springs (26), each of said first coil springs (26) comprising a first end and a second end, a longitudinal axis (31) of each of said first coil springs being defined between said first and said second end, a diameter of each of said first coil springs (26) at said first end being greater than a diameter at the second end,

a plurality of second coil springs (27), each second coil spring (27) comprising a first end and a second end, a longitudinal axis (31) of each of said second coil springs being defined between said first end and said second end, a diameter of each of said second coil springs (27) at said first end being greater than a diameter at said second end,

a fabric (21) enclosing said first and second coil springs (26, 27),

wherein said first and second coil springs are arranged side by side in an alternating manner such that their longitudinal axes (31) are substantially parallel,

said first ends of said first coil springs (26) facing in substantially the same direction as said second ends of said second coil springs (27),

said first ends of said first coil springs (26) defining a first plane,

said second ends of said second coil springs (27) defining a second plane, wherein said first plane is spaced apart from said second plane.

9. The coil spring assembly (20) according to claim 8, wherein said second ends of said first coil springs (26) define a third plane, wherein said first ends of said second coil springs (27) define a fourth plane, wherein said third plane is spaced apart from said fourth plane. 5
10. The coil spring assembly (20) according to claim 9, wherein a distance between said first plane and said second plane is equal to a distance between said third plane and said fourth plane. 10
11. The coil spring assembly (20) according to any one of claims 8-10, wherein said first coil springs (26) and/or said second coil springs (27) are frusto-conical springs. 15
12. The coil spring assembly according to any one of claims 8-11, further comprising connections (23, 28, 29) connecting different portions of said fabric (21) to enclose said first and second coil springs (26, 27) in individual pockets. 20
13. The coil spring assembly (20) according to claim 12, wherein said connections comprise first connections (28) adjacent to said first ends of said first coil springs (26) and second connections (29) adjacent to said second ends of said second coil springs (27). 25
14. A coil spring assembly, comprising: 30
- a first coil spring assembly (20A) according to any one of claims 8-13,
- a second coil spring assembly (20B) according to any one of claims 8-13, 35
- said first and second coil spring assembly being arranged side by side such that a first coil spring (26) of said first coil spring assembly (20A) is adjacent to a second coil spring (27) of said second coil spring assembly (20B). 40
15. The coil spring assembly according to claim 14, wherein said first coil spring assembly (20A) and said second coil spring assembly (20B) are connected to form a common coil spring assembly. 45
16. A mattress comprising at least one coil spring assembly according to any one of claims 1-15.
17. A method for manufacturing a coil spring assembly, comprising: 50
- providing a plurality of coil springs (12), said coil springs comprising a first end and a second end, a longitudinal axis (17) of said coil springs being defined between said first end and said second end, a diameter of each of said coil springs (12) at said first end being greater than a diameter
- at said second ends,
- arranging said coil springs (12) such that their longitudinal axes (17) are substantially parallel and said first ends of said coil springs (12) face substantially in the same direction,
- enclosing said coil springs (12) in a fabric (11), and
- connecting opposing portions of said fabric between said coil springs along connection lines which are slanted with respect to said longitudinal axes (17).
18. The method according to claim 17, wherein the method is adapted to manufacture the coil spring assembly according to any one of claims 1-7.
19. A method for manufacturing a coil spring assembly, comprising:
- providing a plurality of first coil springs (26), each of said first coil springs comprising a first end and a second end, a longitudinal axes (31) of each first coil spring (26) being defined between said first end and said second end, a diameter of each of said first coil springs (26) at said first end being greater than a diameter at said second end,
- providing a plurality of second coil springs (27), each of said second coil springs comprising a first end and a second end, a longitudinal axis (31) of each second coil spring (27) being defined between said first end and said second end, a diameter of each of said second coil springs (27) at said first end being greater than a diameter at said second end,
- arranging said first coil springs (26) and said second coil springs (27) alternately such that the longitudinal axes (31) are substantially parallel and the first ends of the first coil springs (26) face in substantially the same direction as the second ends of the second coil springs (27) and such that a plane defined by said first ends of said first coil springs (26) is spaced apart from a plane defined by said second ends of said second coil springs (27), and
- enclosing said first and second coil springs (26, 27) in a fabric (21).
20. The method according to claim 19, wherein the method is adapted to manufacture a coil spring assembly according to any one of claims 8-15.

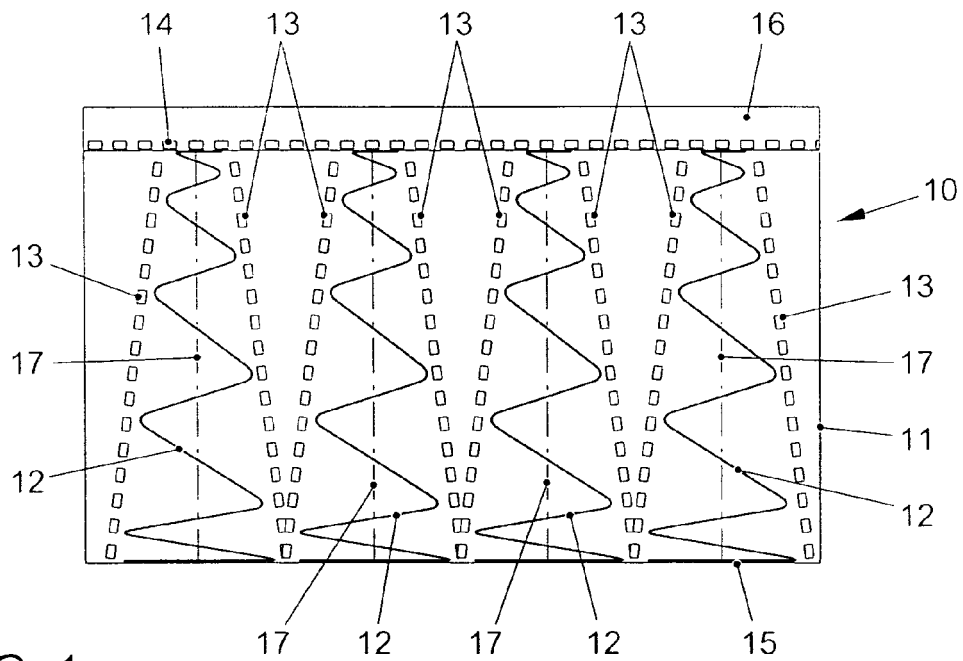


FIG. 1

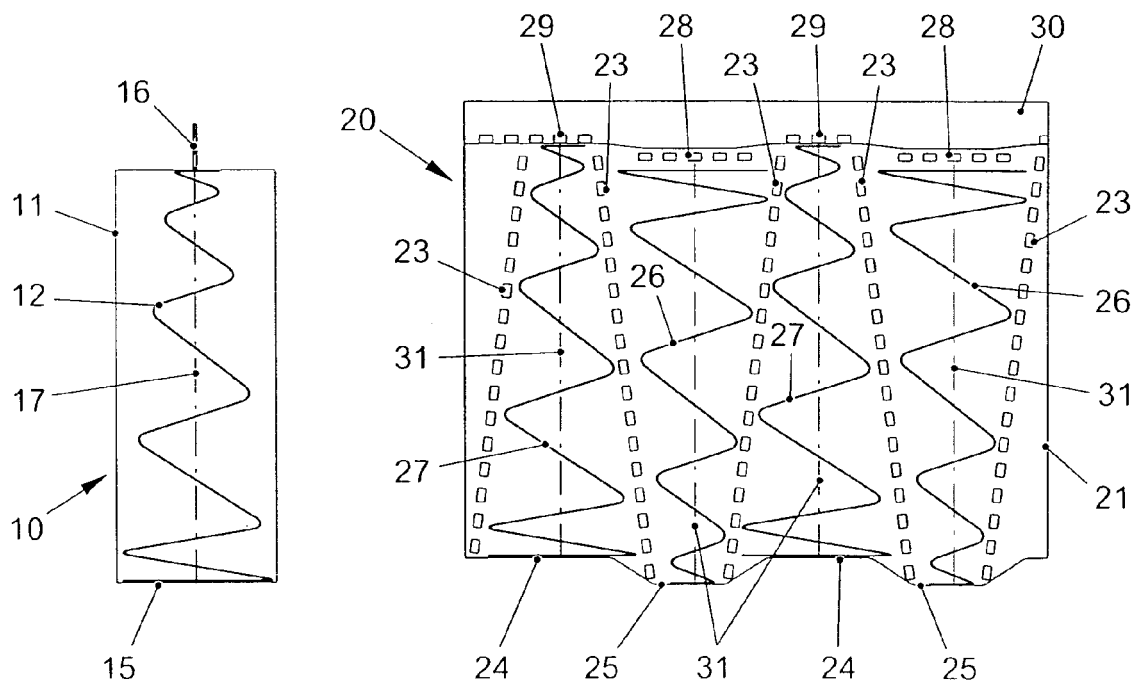


FIG. 2

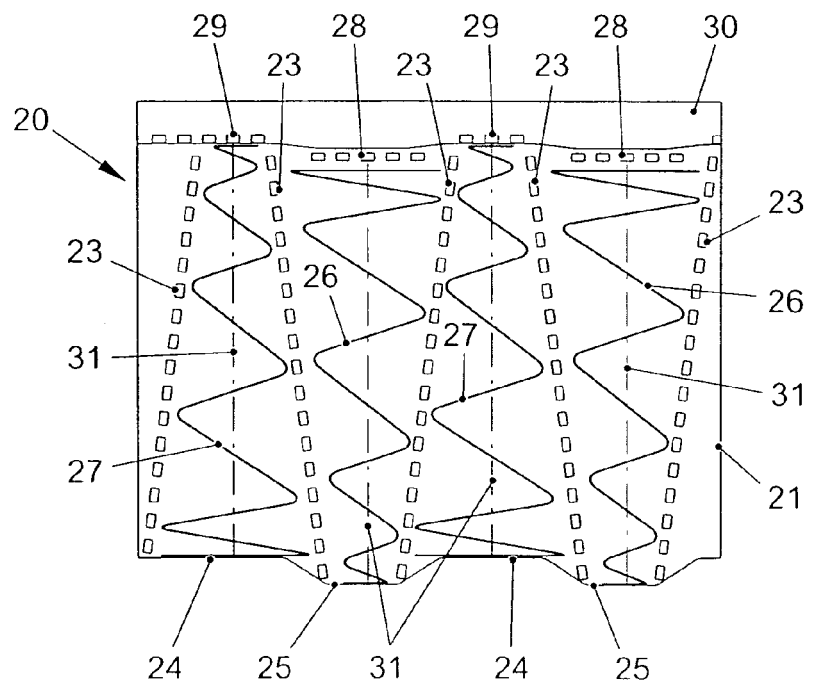


FIG. 3

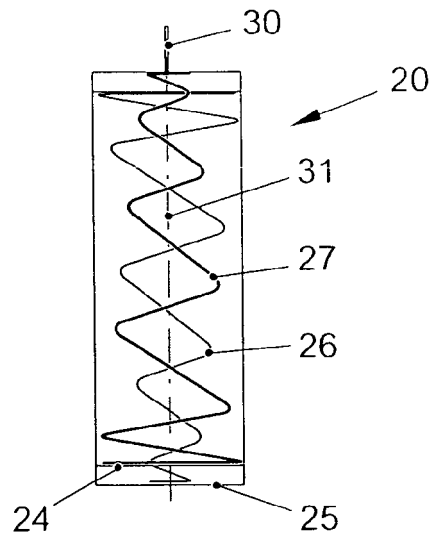


FIG. 4

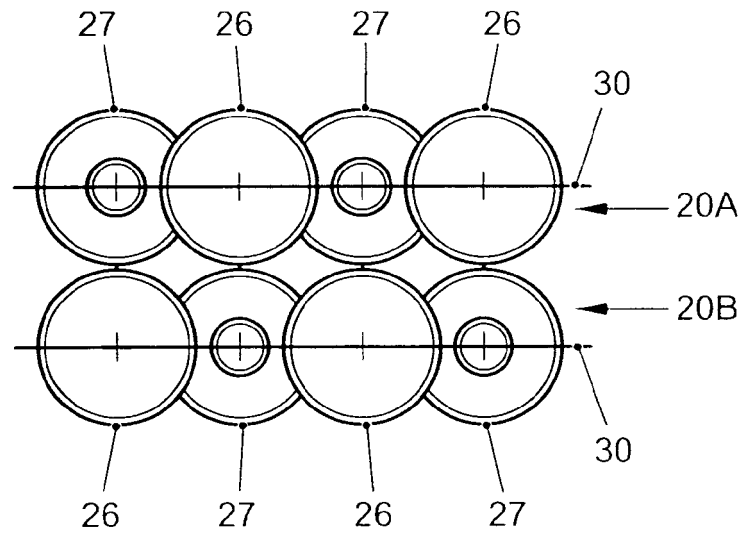


FIG. 5

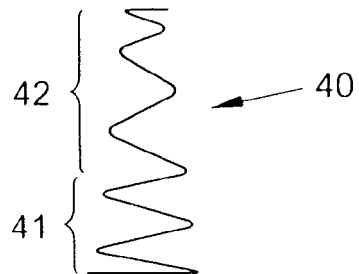


FIG. 6

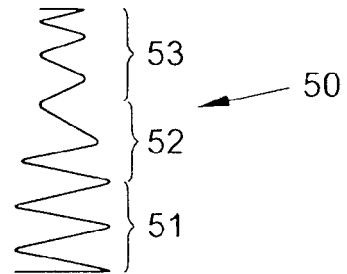


FIG. 7

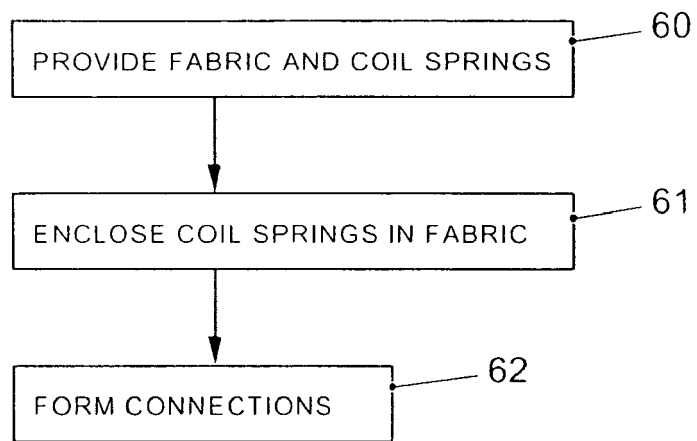


FIG. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 00 5511

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			A47C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 August 2008	Examiner Alff, Robert
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 00 5511

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21-08-2008

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