(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 June 2006 (22.06.2006)

PCT

(10) International Publication Number
WO 2006/066190 A2

(51) International Patent Classification:
B60N 2/70 (2006.01) *B60N 2/66* (2006.01)

(21) International Application Number:
PCT/US2005/045889

(22) International Filing Date:
15 December 2005 (15.12.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/016,102 17 December 2004 (17.12.2004) US

(71) Applicant *(for all designated States except US)*: **L & P PROPERTY MANAGEMENT COMPANY** [US/US]; 4095 Firestone Boulevard, South Gate, California 90280 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **VAN-THOURNOUT, Olivier Freddy** [BE/BE]; Leopold Sabbestraat 32, B-8930 Lauwe (BE). **EKMAN, Anders Fredrik** [SE/SE]; Jollevagan 4, S-30272 Halmstad (SE).

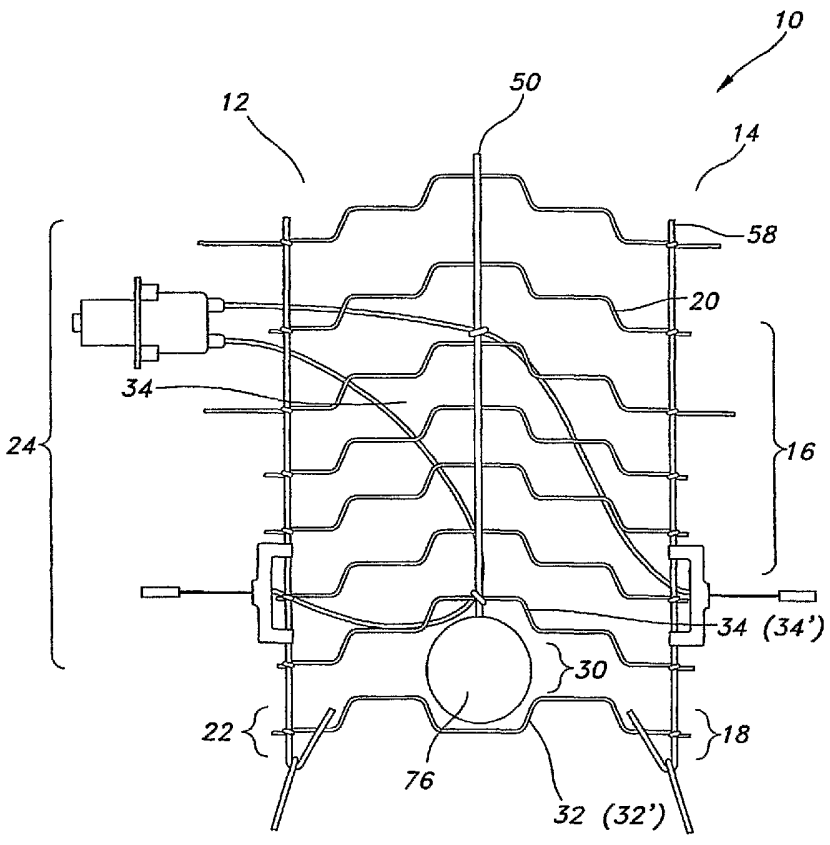
(74) Agents: **DONAHUE, III, Dennis J.M.** et al.; HUSCH & EPPENBERGER LLC, 190 Carondelet Plaza, Suite 600, St. Louis, Missouri 63105 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,

[Continued on next page]

(54) Title: DOUBLE CONVOLUTION SUPPORT SYSTEM



(57) Abstract: A support (10) for a seat (100) includes a pair of side margins (12, 14) and transverse wires (20) extending between the side margins (12, 14). There are different sets of transverse wires (22, 24) that each has a respective convolution pattern (32, 34). The convolution patterns (32, 24) are arranged to create an expanded traversing region (30) between adjacent transverse wires (20) and may also create an alignment section (46) along the transverse wires (20). In some embodiments, the respective base sections (86, 88) of the side margins (12, 14) may be extended to create the base support (80) which can form one of the convolution patterns.

WO 2006/066190 A2

RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

DOUBLE CONVOLUTION SUPPORT SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS:

[0001] Priority is claimed to US 11/016,102 filed with the USPTO on December 17, 2004.

BACKGROUND OF THE INVENTION

1. Field of the Invention.

[0002] This invention relates generally to a seat support system and, in particular, a support system having expanded space between select support elements within the support system, permitting other seat components to be assembled through the seat support system without reducing the number of support elements, the level of support or comfort of the seat occupant.

2. Description of Related Art.

[0003] A variety of seat suspension systems are known. It is known to use a plurality of transverse wires spaced along the side margins of the seat suspension systems to achieve the desired support, as described in: *Youngflex A.G.*, GB 2 342 287; *Deceuninck* US 5,988,745;and *Youngflex S.A.* EP 0 128 407 A1. It is also known to use transverse wires having one or more angled sections, permitting the transverse wires to extend resiliently in relation to the side margins, thereby providing resilient support and occupant comfort, as described in *Youngflex S.A.* EP 0 128 407 A1, *Deceuninck* US 6,601,919 B1 and *Deceuninck* US 6,152,531. It is also known to assemble components through a seat support system, including adjustment mechanisms, namely Bowden

cables as described in *Deceuninck* US 6,602,919 B1 and *Deceuninck* US 6,152,531.

[0004] There is increasing demand to incorporate additional advantageous components within a seat, such as ventilation system components. However, the advantageous components are necessarily limited by the space available within the seat platform or seat back. The presence of a support system within the seat platform or seat back further limits the space available for placement of advantageous components. Unless the component is of a size that it can pass between the support elements, the component is limited to placement on one side of the support system, namely the top or bottom of a seat platform or the front or back of a seat back. Therefore, the ability of seat components to pass through or be situated within the seat support system is highly advantageous. The placement of advantageous seat components within the seat support system provides an efficient use of available space and allows additional features to be added to the seat without increasing the seat dimensions.

[0005] In known support systems, assemblage of larger seat components through the support system may be accomplished if the support elements are spaced at greater distances along the side margins of the support system. The distancing of support elements results in fewer support elements in the support system, causing loss of support and decreased comfort for the seat occupant. Therefore, it is highly advantageous to provide a seat support system that permits larger seat components to be assembled through the support system without reducing the resilient support of the support system or the comfort of the seat occupant.

BRIEF SUMMARY OF THE INVENTION:

[0006] It is in view of the above problems that the present invention was developed. The invention provides a seat support system comprising a set of side margins coupled to sets of transverse wires having angled sections which are herein referred to as "convolutions". The pattern or arrangement of convolution sections on a particular transverse wire is referred to as the "convolution pattern" of the transverse wire. In the present invention, adjacent pairing of a transverse wire having different convolution patterns expands the traversing region between the transverse wires. The expanded traversing region becomes an enlarged opening for pass-through of seat components, such as ventilation system components, from one side of the support system to the other side. In an alternate arrangement, the base sections of the side margins are extended to form a traverse element having a convolution pattern. In yet another aspect of the invention, adjacent pairing of transverse wires having different convolution patterns also creates aligning sections of the transverse wires, bringing them in close proximity, such that the transverse wires may be fastened at the aligned section for greater stability of the transverse wires bounding the expanded traversing region. Another advantage of the invention is that other seat components, such as ventilation system components, may be secured to the support system by being fastened to the aligned sections of the adjacent transverse wires. Further features and advantages of the present invention, as well as the structure and operation of various embodiments of the present invention, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS:

[0007] The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and, together with the description, serve to explain the principles of the invention. In the drawings:

[0008] **Figure 1** illustrates a front view of the present invention;

[0009] **Figure 2A** illustrates a front view of an alternate arrangement of the present invention;

[00010] **Figure 2B** illustrates a detail of the embodiment illustrated by Figure 2A;

[00011] **Figure 2C** illustrates an alternative detail of the embodiment illustrated by Figure 2A;

[00012] **Figure 3** illustrates a front view of another alternative arrangement of the present invention; and

[00013] **Figure 4** illustrates a front view of yet another alternative arrangement of the present invention.

DETAILED DESCRIPTION OF THE INVENTION:

[00014] Referring to the accompanying drawings in which like reference numbers indicate like elements, the embodiments are illustrated with alternative designs. **Figure 1** represents a single convoluted transverse wire in combination with a plurality of opposing convoluted transverse wires. **Figure 2** represents a plurality of convoluted transverse wires in combination with a single opposing convoluted transverse wire. It will be appreciated that according to the present invention, any set of convoluted

transverse wires may be combined with a set of opposing convoluted transverse wires, and that under general set theory and in accordance with the invention, a set of transverse wires may include as few as a single wire. It will also be appreciated that the adjacent pairing of sets of convoluted and opposing convoluted transverse wires provides various advantages as illustrated in **Figures 1** and **2**.

[00015] In view of the foregoing, it will be seen that the several advantages of the invention are achieved and attained. Referring to **Figure 1**, the seat support system (10) comprises a pair of side margins (12, 14) between which extend a plurality of transverse wires (20) that are attached to the side margins by known attachment means, preferably by integral attachment where the ends of the transverse wire are wound around the side margins (58), by a clip or a bracket (54) having a ferrule for receiving the terminal end of the transverse wire. In a known manner, select ones of the transverse wires may extend through a longitudinal element (50) substantially parallel to and between the side margins (12, 14). The transverse wires (20) are provided in sets, with a first set of transverse wires (22) having a first convolution pattern (32) and a second set of transverse wires (24) having a second convolution pattern (34). The adjacent pairing of sets of transverse wires having different and opposing convolution patterns provides several advantages.

[00016] As shown in **Figure 1**, the pairing of a transverse wire having a convolution pattern (32) projecting in a direction ***A*** (32′) is paired with a transverse wire having a convolution pattern (34) projecting in a direction ***B*** (34′) and the convolution patterns are located substantially opposite each other, creating an expanded traversing region (30) with dimensions ***h*** and ***l*** between the opposing convolution patterns. This

arrangement permits larger seat components having dimensions smaller than ***h*** and ***l*** (76) to be assembled and passed through the pair of transverse wires. A preferred embodiment shown in **Figure 1** pairs a transverse wire having a single convolution projecting in a direction ***A*** with a transverse wire having two successive convolutions, or a double convolution, projecting in a direction ***B***. However, it will be appreciated that a numerous variations may be achieved by altering the convolution patterns, namely the number or direction of the convolutions. For example, a transverse wire having single convolution pattern projecting in a direction ***A*** may be paired with a transverse wire having a single convolution pattern projecting in a direction ***B***.

[00017] In an alternate arrangement shown in **Figure 2A**, the transverse wire (22) with the first convolution pattern (32) can be positioned between the transverse wires (24) with second convolution pattern (34) and another set of transverse wires (42) which can have the second convolution pattern projecting in a direction ***A*** (42′). One transverse wire pairing (22') is comprised of a transverse wire having a first convolution pattern (32) projecting in a direction ***A*** (32′) and a transverse wire having a second convolution pattern (34) projecting in a direction ***B*** (34′) and the convolution patterns are located substantially opposite each other creating an expanded traversing region (30) between the opposing convolution patterns. A second pair (40) comprises a first set of transverse wires (42) having a first convolution pattern projecting in a direction ***A*** (42′) and a second set of transverse wires (34) having a second convolution pattern projecting in a direction ***B*** (34′) creating a section of alignment (46) along the second pair of adjacent transverse wires. The second pair of transverse wires may be fastened to each other and to other seat components by known fastening means, preferably a clip (48). In

the embodiment shown in **Figure 2B**, the first convolution pattern comprises a single convolution and the second convolution pattern comprises a double convolution, and the second set of transverse wires is attached to the side margins by a bracket (54). As alternatively illustrated in **Figure 2C**, the pair of opposing transverse wires (40') surrounding expanded traversing region (30) can both be connected to the side margins by the same bracket (54).

[00018] In another embodiment, as shown in **Figures 3** and **4**, the base sections (18) of the side margins extend substantially perpendicular to and between the parallel section (16) of the side margins to form a base support (80) having a second convolution pattern (80'). The base support replaces a transverse wire without adversely affecting the resilient support of the support system (10). The pairing of a set of transverse wires having a first convolution pattern (32') with a base support having a second convolution pattern (80') creates an expanded traversing region (90) between the transverse wire (32) and base support (80). A flexcord (84) may be used to provide resiliency to the base support (80). As in the arrangements previously discussed, larger seat components having at least two dimensions smaller than the dimensions of the expanded traversing region may be assembled through the expanded traversing region (90). In a preferred embodiment, the base sections (18) of the side margins form an integral, unitary base support (80). In an alternate arrangement, the base sections (86, 88) of each side margin (12, 14) can be fastened to each other by fastening means, preferably a clip (48), to form the base support (80).

[00019] Various know and advantageous seat components may be incorporated in the seat support system. For example, as shown in **Figures 1** through **4**, various

known link means (60, 62) may be provided for attachment of the seat support system (10) to a seat frame (70). Known adjustable support, such as lumbar support, may be provided by adjustable link means, preferably Bowden cables (62), extending between the side margins (12, 14) and the seat frame (70) and coupled to the side margins by brackets (68), with an known adjustment means being coupled to the Bowden cables, preferably an actuator (74).

[00020] The embodiments were chosen and described in order to best explain the principles of the invention and its practical application to thereby enable others skilled in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

[00021] As various modifications could be made in the constructions and methods herein described and illustrated without departing from the scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative rather than limiting. For example, although the figures show a single convolution opposed to a double convolution, the invention is equally suited to providing a single convolution being opposite another single convolution projecting in an alternate direction. Similarly, the location of the opposing convolution patterns may occur at any point along the transverse wire, although the preferred embodiments are shown with the opposing convolutions located approximately medial to the side margins. Further, the dimensions of the traversing region (30, 90) may be varied by variation in the convolution patterns used and the placement of the convolution patterns in relation to each other. Also, although the embodiments shown provide expanded traversing regions (30, 90) at one

end of the support system, it will be appreciated that the arrangements may be achieved anywhere within the support system where expanded traversing regions are desirable. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims appended hereto and their equivalents.

CLAIMS:

The invention claimed is:

1. A support system for a seat, comprising:

a pair of side margins; and

a first set of transverse wires extending between said pair of side margins, wherein said first set of transverse wires comprises a plurality of transverse wires and each of said transverse wires has a first convolution pattern; and

a second set of transverse wires extending between said pair of side margins, wherein said second set of transverse wires comprises at least one transverse wire having a second convolution pattern different from said first convolution pattern, and wherein a first pair of adjacent transverse wires comprising said first convolution pattern and said second convolution pattern bound a traversing region.

2. A support system for a seat as in Claim 1, wherein said first convolution pattern is substantially opposite said second convolution pattern.

3. A support system for a seat as in Claim 1, wherein said first convolution pattern comprises a single-amplitude convolution and wherein said second convolution pattern is comprised of a double-amplitude convolution opposite from said single-amplitude convolution.

4. A support system for a seat as in Claim 1, wherein said pair of side margins further comprise a base section extending between and joining said side margins, said base section forming said transverse wire having said second convolution

pattern.

5. A support system for a seat as in Claim 1, wherein said first convolution pattern projecting in a direction ***A*** and said second convolution pattern projecting in an opposing direction ***B***, expands the traversing region between said first and second sets of transverse wires.

6. A support system for a seat as in Claim 1, wherein a second pair of transverse wires have a first set of transverse wires characterized by a first convolution pattern projecting in a direction ***A*** and a second set of transverse wires characterized by a second convolution pattern projecting in an opposing direction ***B***, creating proximal aligning sections along said second pair of transverse wires.

7. A support system for a seat as in Claim 1, wherein select ones of the transverse wires penetrate a longitudinal element extending substantially parallel to and between said pair of side margins.

8. A support system for a seat as in Claim 1, wherein the transverse wires are attached to said side margins by attachment means selected from the group consisting of a clip, a bracket having a ferrule for receiving a terminal end of said transverse wire and integral attachment whereby a terminal end of the transverse wire is wound around said side margins.

9. A support system for a seat as in Claim 1, further comprising a plurality of link means spaced along said side margins for linking said support system to a seat frame.

10. A support system for a seat as in Claim 9, wherein said link means are adjustable.

11. A support system for a seat as in Claim 10, wherein said adjustable link means are comprised of Bowden cables.

12. A support system for a seat as in Claim 11, wherein said Bowden cables extend between said side margins and said seat frame and are coupled to said side margins by a bracket, wherein said bracket has a ferrule for an outer sheath of said Bowden cables.

13. A support system for a seat as in Claim 1, wherein said traversing region has dimensions h and l and houses a seat component having dimensions h' and l', and wherein h is greater than h' and l is greater than l'.

14. A support system for a seat as in Claim 13, wherein said seat component is a ventilation component.

15. A support system for a seat as in Claim 1, further comprising a base support extending between and joining said side margins.

16. A support system for a seat as in Claim 15, wherein a flexcord supports said base support.

17. A support system for a seat as in Claim 16, wherein said flexcord is selected from the group of supports consisting of an integral, unitary base support and clipped terminal ends of said base support separately formed by the base sections of said side margins.

18. A support system for a seat as in Claim 115, wherein said base support is an integral extension of said pair of side margins forming a unitary base support.

19. A support system for a seat as in Claim 15, wherein said base support is a separate extension of each of said pair of side margins.

20. A support system for a seat as in Claim 1, wherein said first set of transverse wires and second set of transverse wires are spaced approximately equidistant from each other on said pair of side margins.

21. A support system for a seat as in Claim 20, wherein said first convolution pattern is substantially opposite said second convolution pattern.

22. A support system for a seat as in Claim 21, wherein said first convolution pattern is situated between two sets of transverse wires having said second convolution pattern.

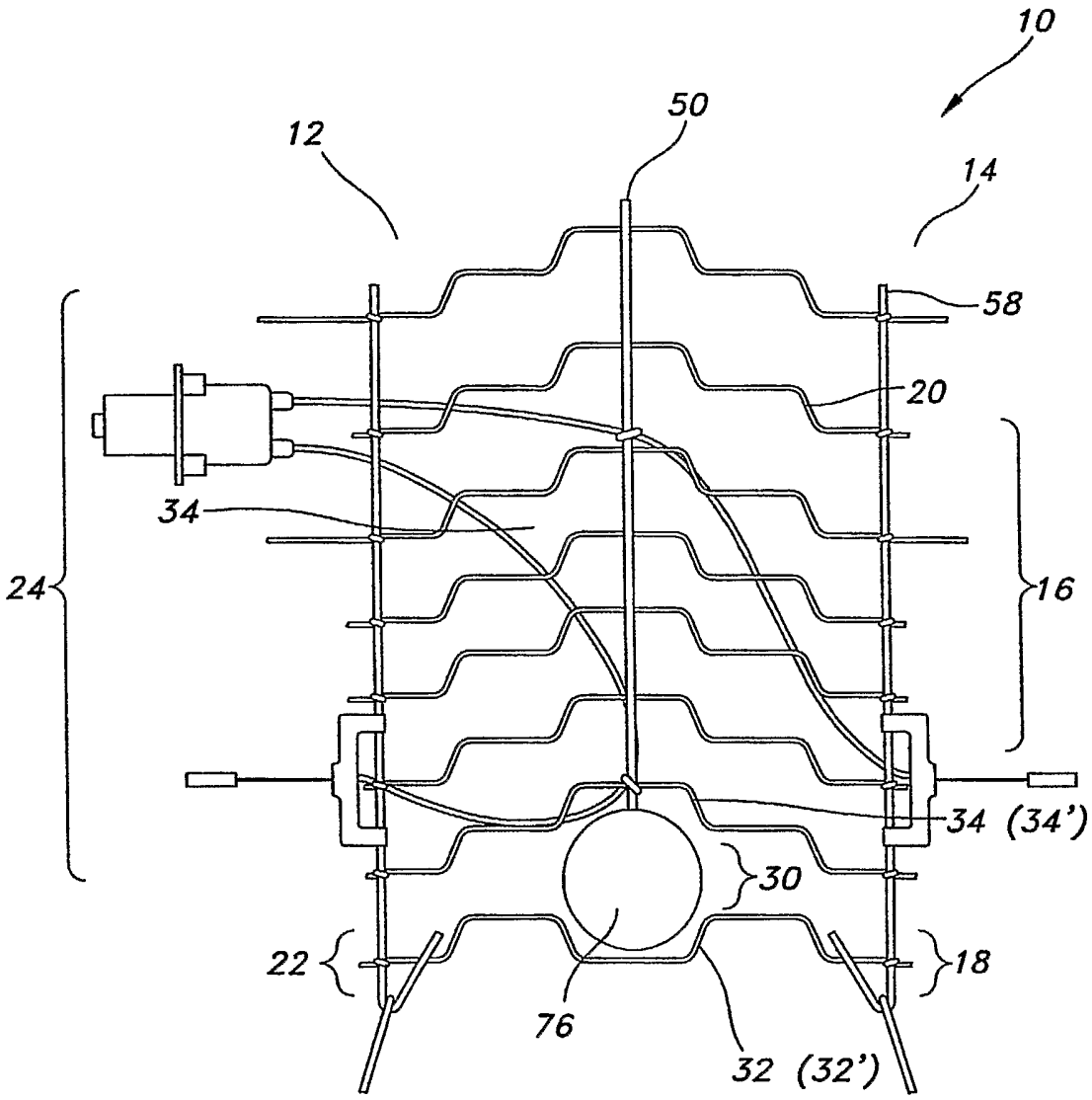


FIG. 1

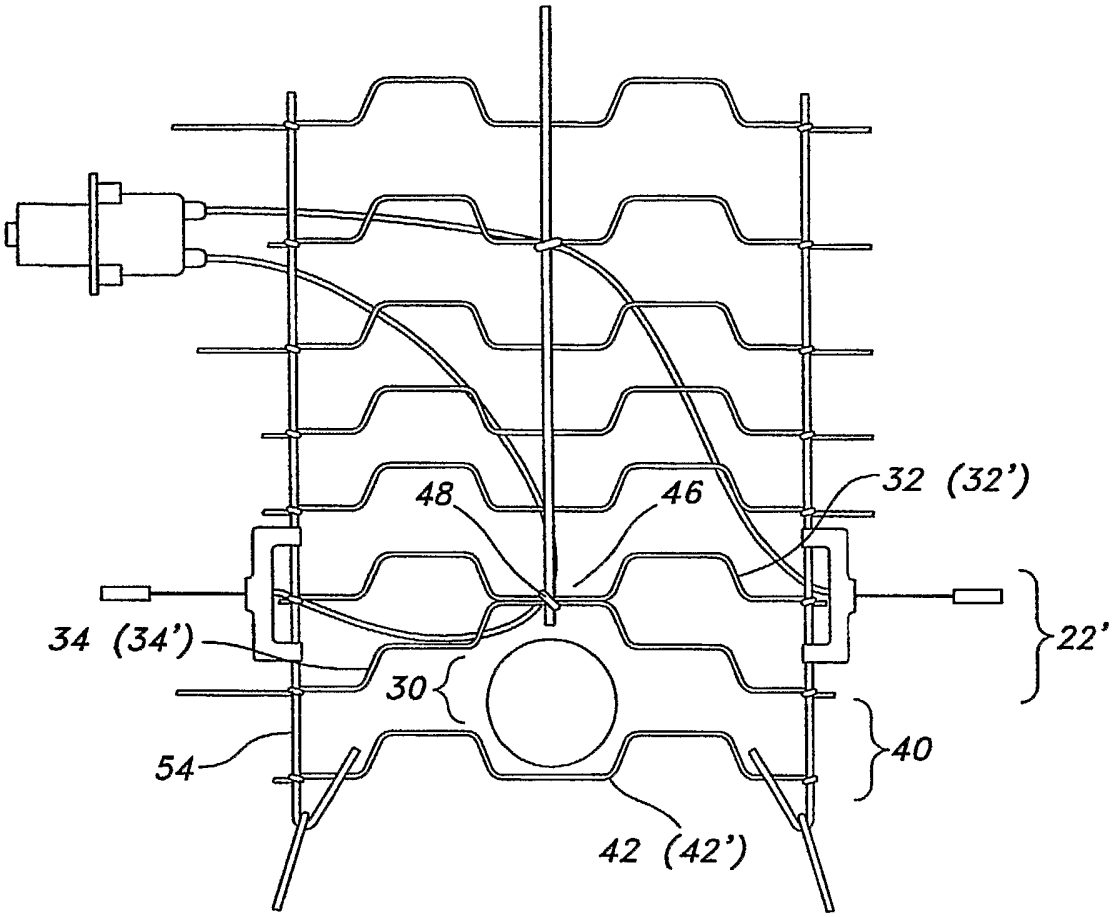


FIG. 2A

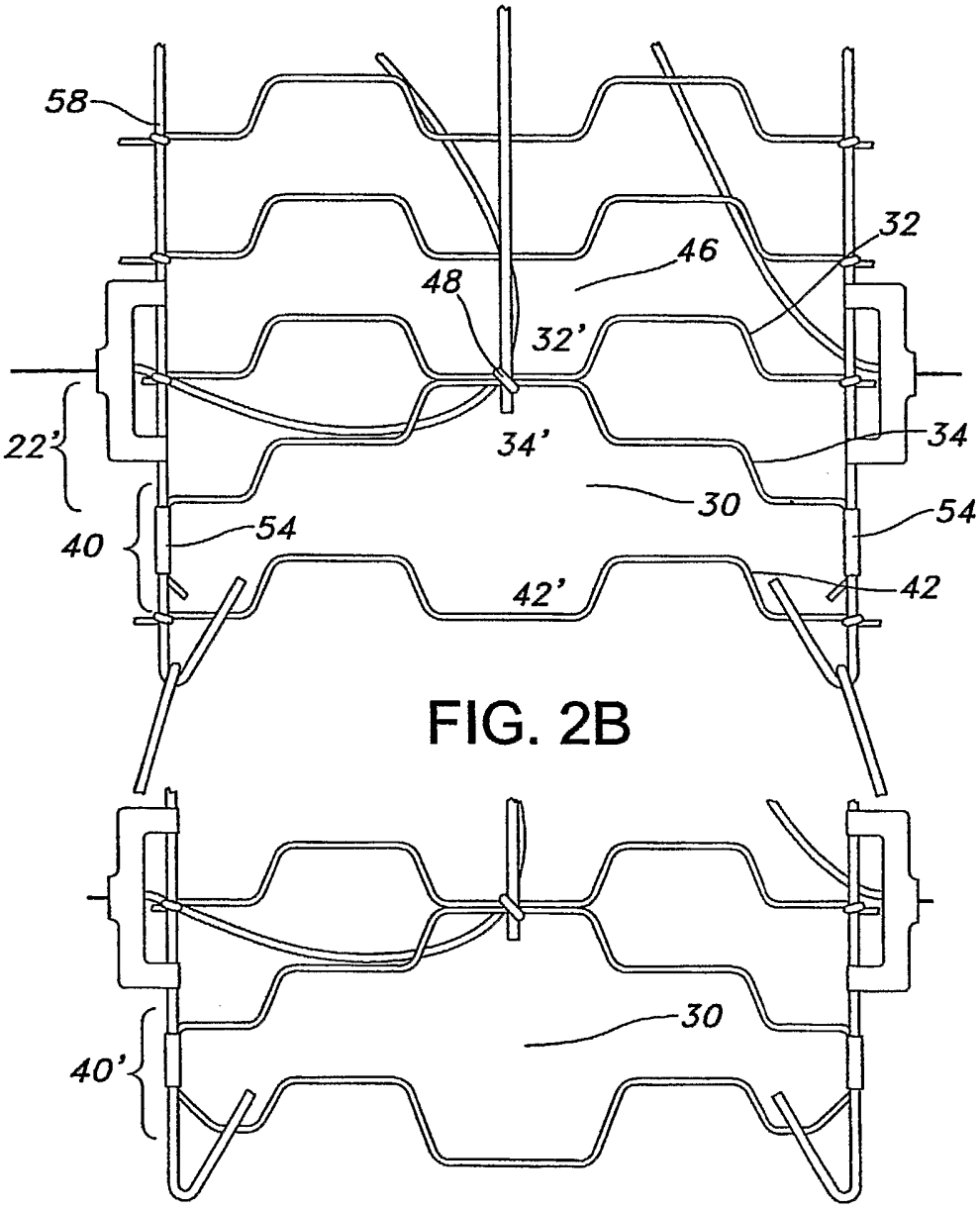


FIG. 2B

FIG. 2C

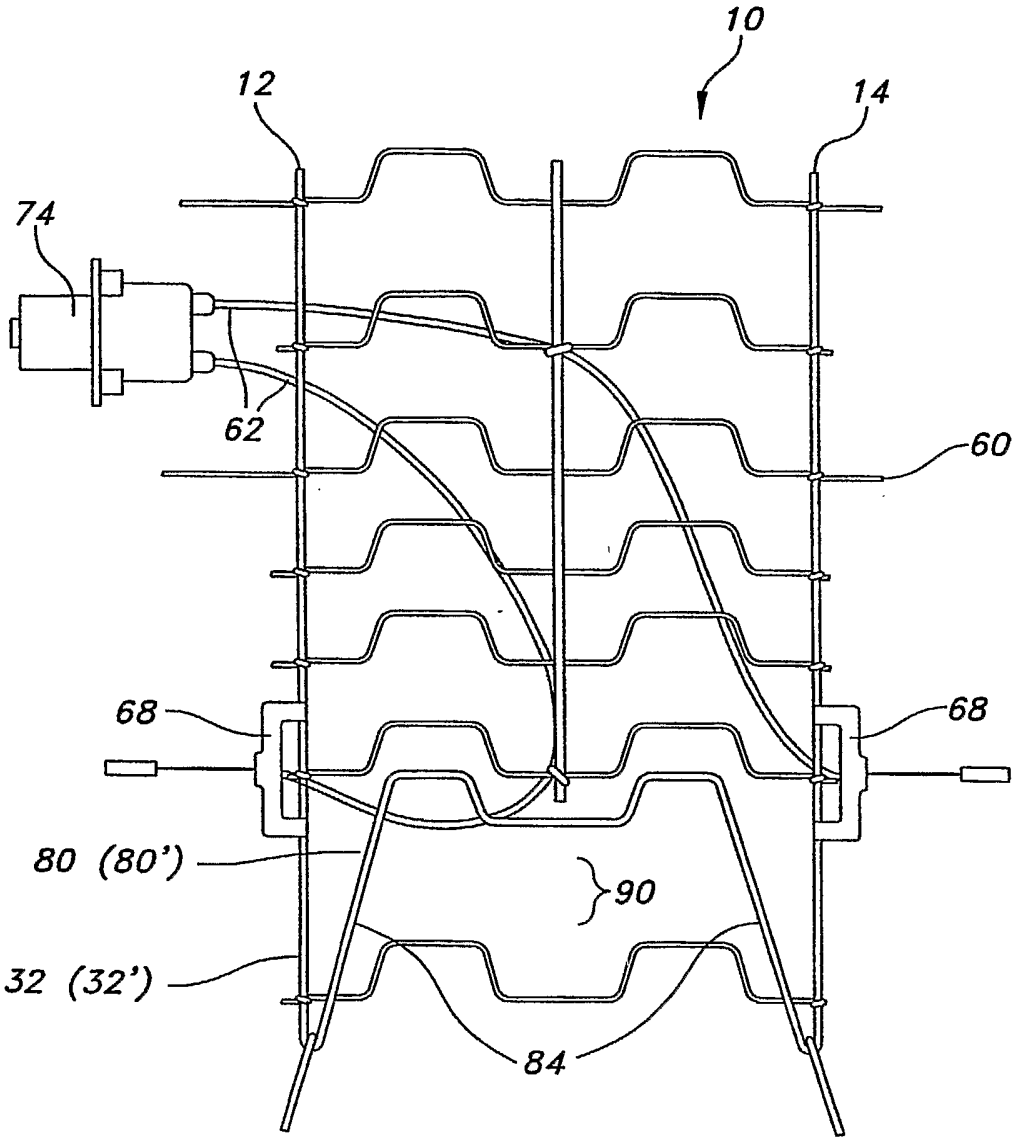


FIG. 3

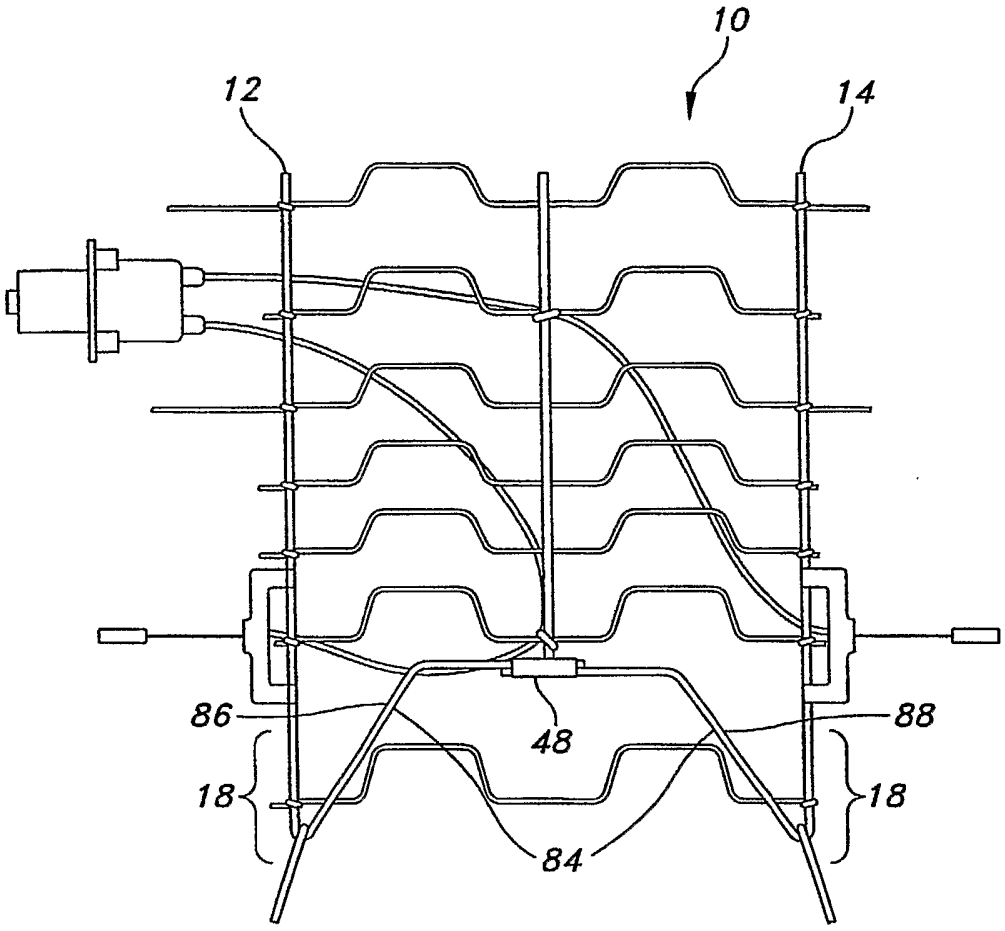


FIG. 4