United States Patent [19]

Tyhanic

[11] **3,916,464**

[45] **Nov. 4, 1975**

[54] **PRE-STRESSED SPRING MATRIX**

[76] Inventor: **Stephen Tyhanic,** 7761 E. Oxford Ave., Denver, Colo. 80237

[22] Filed: **Apr. 11, 1974**

[21] Appl. No.: **459,916**

[52] **U.S. Cl.** **5/351;** 5/248; 267/93

[51] **Int. Cl.²** **A47C 23/02;** A47C 23/00

[58] **Field of Search** 5/351, 263, 360, 264, 248; 267/85, 89, 93

[56] **References Cited**

UNITED STATES PATENTS

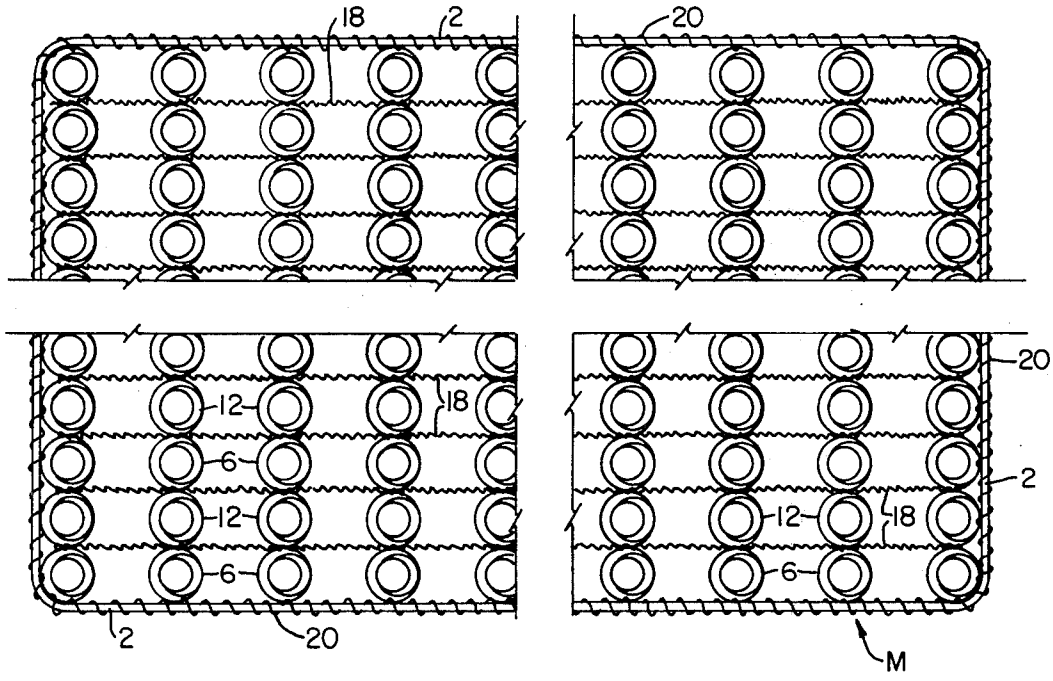
837,751	12/1906	Summers	5/263 X
2,910,114	10/1959	Levine	267/93

Primary Examiner—Paul R. Gilliam
Assistant Examiner—Andrew M. Calvert
Attorney, Agent, or Firm—Sheridan, Ross & Fields

[57] **ABSTRACT**

The present invention relates to a spring matrix for use in mattress and box spring constructions. Alternating adjacent rows of high and low springs are provided which are located in abutting relationship, a high and low spring of each adjacent row being interconnected so that each high spring is placed under a compressive force and each low spring is placed under a tensile force due to the interconnection with adjacent springs.

10 Claims, 7 Drawing Figures



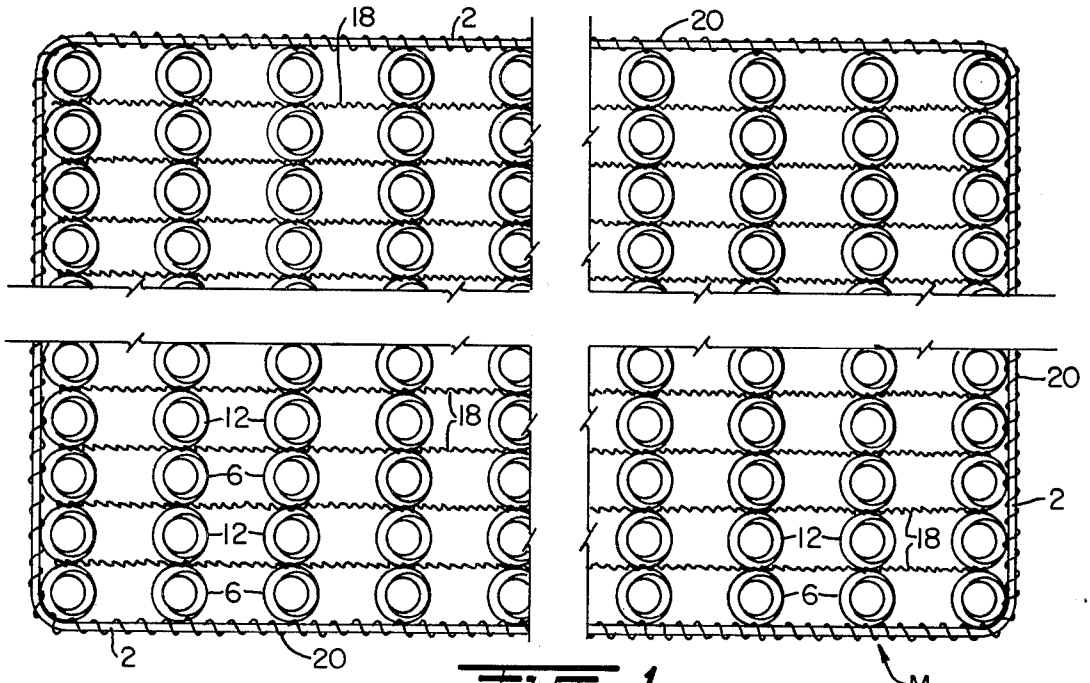


FIG. 1

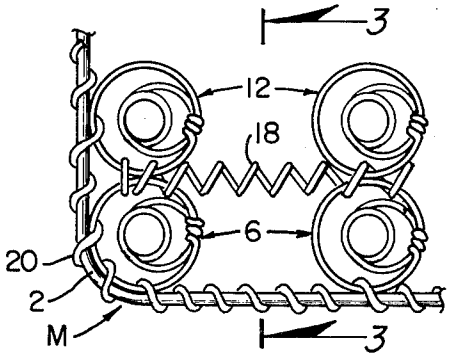


FIG. 2

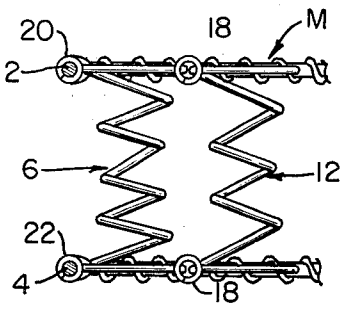


FIG. 3

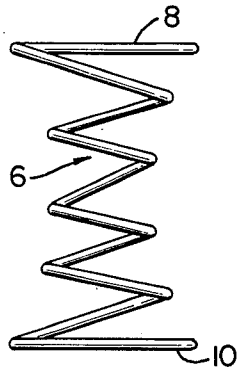


FIG. 4

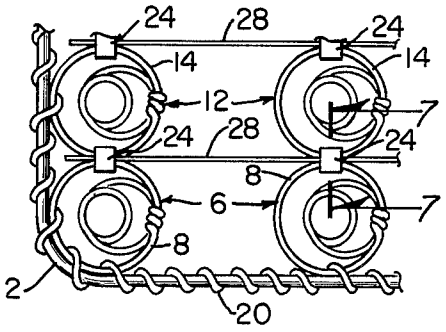


FIG. 6

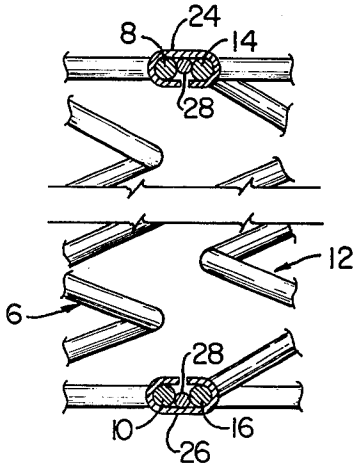


FIG. 7

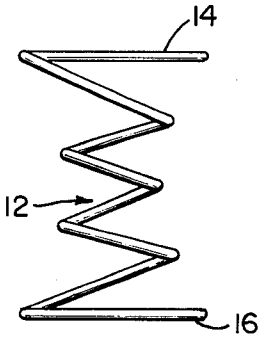


FIG. 5

PRE-STRESSED SPRING MATRIX

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improved spring matrix for mattress and box spring construction and more particularly to an improved spring matrix wherein the springs are arranged in a pre-stressed condition.

2. DESCRIPTION OF THE PRIOR ART

Various attempts have been made to provide spring matrixes for seats and beds which will comfortably support the human body and will do so without undue sagging in the area where the greatest load is applied. Attempts to overcome this have included providing springs of different gauge and stiffness so that heavier gauge or stiffness springs are in the area which are subjected to the greatest loads. Also, springs of different length have been provided which are covered at opposite ends so that the longer springs are under constant compressive forces. Such an arrangement causes only the higher or longer springs to come under compressive forces until the force reaches a sufficient magnitude also to be applied to the shorter springs. As a result, prior art mattresses and box springs have lack of firmness and lack of lateral stability. The cost of assembly can be prohibitive for many uses because of the high labor involved in assembly which must necessarily be done essentially by hand in prior art constructions attempting to overcome the above-mentioned problems.

SUMMARY OF THE INVENTION

In accordance with this invention a pre-stressed spring matrix is provided which includes at least one high coil spring and one low coil spring whose bases are connected together so that a compressive force is exerted on the high spring and a tensile force on the low spring. More particularly, the spring matrix of this invention includes a plurality of alternating rows of high and low coil springs whose bases are in engagement with each other and interconnected by means of a pigtail or helix coiled member so that a compressive force is exerted on all of the high rows of springs and a tensile force is exerted on all of the low rows of springs.

This construction results in increased firmness because the high springs are compressed enough so that they provide more resistance to further compression than would be true if they were extended their full length. Furthermore, less side sway or more lateral stability is provided by having all of the coils prestressed as described above. The spring matrix lends itself to an automated assembly procedure wherein a coiled member or pigtail can easily be threaded so as to interengage adjacent coils in adjacent rows to connect them together. Alternatively, the adjacent springs can be connected together by means of clips, this operation also being performed automatically.

Additional advantages of this invention will become apparent from the description which follows, in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of a pre-stressed spring matrix for use in a mattress constructed in accordance with this invention the longitudinal spacing of the springs being exaggerated for clarity of illustration.

FIG. **2** is an enlarged fragmentary top plan view of one corner of the spring matrix of FIG. **1** showing further details of the construction wherein the coil springs are interconnected by coiled members;

FIG. **3** is a vertical section taken along line **3—3** of FIG. **2** showing still further detail of the coil spring matrix construction;

FIG. **4** is a side elevation of a high or tall coil spring used in connection with this invention;

FIG. **5** is a side elevation of a coil spring, similar to FIG. **4,** but showing a low or short coil spring as used in this invention;

FIG. **6** is a fragmentary, enlarged top plan view, similar to FIG. **2,** but showing clip means for interconnecting adjacent rows of high and low springs; and

FIG. **7** is a horizontal section, taken along line **7—7** of FIG. **6** showing the way the clip engages the bases of adjacent high and low coil springs to hold the coil springs in pre-stressed condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with this invention, a pre-stressed coil spring matrix is provided in which a plurality of high and low rows of coil springs are interconnected to place the high springs under a compressive force and the low springs under a tensile force as more fully described below.

As a force is applied to a conventional coil spring, the resistive force of the spring is low during the initial compression but as the spring is further compressed, the torque in the spring wire increases thereby providing an increased resistance to further compression. In a conventional mattress, this characteristic may result in sagging in a matress which has been used for some period of time. By arranging alternating rows of high and low coil springs so that they are positioned with the bases of the springs in each row in contact with and connected to the bases of corresponding coil springs in the adjacent rows, a compressive force is exerted on the higher springs by the lower springs and, conversely, a tensile force is exerted on the low springs by the higher springs thereby creating a pre-stressed coil spring matrix.

A high or tall coil spring **6** is shown in FIG. **4** which has an upper base (convolution) **8** and a lower base (convolution) **10** and a low or short coil spring **12** is shown in FIG. **5** having an upper base (convolution) **14** and a lower base (convolution) **16.** Conveniently, high coil spring **6** may have six convolutions whereas low coil spring **12** only has five convolutions. Of course, it will be understood that other convolution combinations could be used, for example, high coil spring **6** could have seven convolutions and low coil spring **12** could have six convolutions. Also, the coil springs have been illustrated as being of the double cone shape but it will be understood that they could be of other desirable shapes as is commonly used in mattress and box spring construction.

It has been found that a satisfactory coil spring size includes a high double cone spring made of 8½ gauge steel wire wherein the upper and lower bases are 5¼ inches in diameter and the center convolution is 2⅜ inches in diameter. The overall uncompressed coil spring height is 6¾ inches. The low double coil spring is made of 9 gauge steel wire having upper and lower bases which are 5¼ inches in diameter and the center convolution is 2⅜ inches in diameter. The overall uncompressed height is 5¾ inches. It will be understood that for many applications, the same gauge wire may be

used for both the high and low springs. However, better edge support is obtained by using heavier springs around the perimeter.

During assembly, the alternating high and low rows are placed adjacent each other. The high springs are then compressed until the bases of both the high and low springs are in substantially the same plane and in contiguous or substantially abutting relationship as shown in FIGS. **1–3.** The adjacent bases thereof are interconnected by a coiled helical wire **18,** often called a lacing helical or pigtail, which holds the high springs **6** in a compressed condition and the low springs **12** in tension as in FIG. **3.** The springs are connected to upper-lower border members **2** and **4** by means of helical wire or pigtail connectors **20** and **22** as shown in FIGS. **2** and **3,** or this connection could be effected by clip means like **24** and **26** to be described. The border members may be made of larger diameter wire than the coil springs. Conveniently, a high row of springs is provided along each longitudinal edge of the spring matrix with alternating low and high rows extending inwardly therefrom. This provides more firmness along the longitudinal edges. By running pigtails **18** longitudinally rather than laterally, they act as hinges and permit the coils to conform more closely to the contour of the body. Additional surface contact with the body reduces body pressure per unit area for added comfort.

An alternative connecting means is shown in FIGS. **6** and **7** for interconnecting the high and low rows of springs wherein high springs **6** are connected to low springs **12** by means of clips **24** which are generally C-shaped in configuration as best seen in FIG. **7.** These clips can be crimped around the upper bases **8** and **14** as shown, and also a similar clip **26** can be used to interconnect lower bases **10** and **16** to hold the spring matrix in prestressed condition, as described above, a conventional supporting wire **28** being positioned as shown.

The invention has been illustrated and described with reference to a pre-stressed coil spring matrix for innerspring mattress construction. However, it will be understood, as is common in the art that the pre-stressed coil spring matrix can be used in box spring construction by replacing lower border member **4** with a wooden frame construction to which the coil springs are attached by conventional means.

From the foregoing, the advantages of this invention are readily apparent. A spring matrix has been provided wherein alternating rows of high and low springs are placed in adjacent position and interconnected by means which causes the low springs to apply compressive force to the high springs and the high springs to apply a tensile force to the low springs. Such a pre-stressed spring matrix can be used in either innerspring mattress construction or box spring construction to provide a unit which has increased firmness. With the coils of the spring matrix under load there will be more lateral stability. In addition, since adjacent rows of springs are stressed in opposite directions, a pressure will be applied to the connecting means, such as the pigtail or clip which will reduce the tendency for any noise between the various parts of the matrix so that the tension between the adjacent springs will hold everything in a tight, stressed condition.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

What is claimed is:

1. A pre-stressed spring matrix for use in innerspring mattress and box spring construction, said matrix comprising:

at least one high coil spring having a first base at one end thereof and a second base at the other end thereof, said bases each being in the form of a convolution;

at least one low coil spring positioned adjacent said high coil spring in side by side relationship thereto, said low coil spring having a first base at one end and a second base at the opposite end, said bases each being in the form of a convolution, with the first base thereof lying in substantially the same plane as the first base of the high coil spring with the respective convolutions of said bases in contiguous relationship therewith;

a first connecting means connecting the convolution of said first base of said high spring to an adjacent portion of the convolution said first base of said low spring; and

a second connecting means connecting said convolution of said second base of said high spring to an adjacent portion of the convolution of said second base of said low spring placing said high spring in compression and said low spring under tension so that both springs are pre-stressed in opposite directions.

2. A pre-stressed spring matrix, as claimed in claim **1,** wherein said first and second connecting means each includes a coiled helical member extending around adjacent portions of said first and second bases.

3. A pre-stressed spring matrix, as claimed in claim **1,** wherein said first and second connecting means include clips extending around adjacent portions of said first and second bases, respectively to interconnect said high spring and said low spring.

4. A pre-stressed spring matrix for use in innerspring mattress and box spring construction, said matrix comprising:

a series of alternating high and low coil springs each having a first base at one end and a second base at the other end, said high and low springs being positioned in side-by-side abutting relationship so that said first base of each of said high springs abuts the first base of said low springs, said first bases of each of said springs lying in substantially the same plane;

a first connecting means interconnecting said first base of each of said high springs to said first base of each adjacent low spring along abutting portions thereof; and

second connecting means interconnecting said second base of each of said high springs to said second base of each of said adjacent low springs along abutting portions thereof so that said high springs are placed under a compressive force and said low springs are placed under tensile force due to the interconnection between adjacent high and low springs.

5. A pre-stressed spring matrix, as claimed in claim **4,** wherein said first and second connecting means each includes a coiled helical member extending around adjacent portions of said first and second bases.

6. A pre-stressed spring matrix, as claimed in claim **4,** wherein said first and second connecting means include clips extending around adjacent portions of said first

and second bases to interconnect said high spring and said low spring.

7. A pre-stressed spring matrix for use in innerspring mattress and box spring construction, said matrix comprising:

a plurality of rows of high springs, each of said springs having a first base at one end and a second base at the opposite end;

a plurality of rows of low springs positioned in alternating relationship with said rows of high springs and in contiguous relationship therewith, each of said low springs having a first base at one end and a second base at the opposite end;

a first connecting means interconnecting the first base of each high spring with a contiguous portion of a first base of a corresponding low spring in an adjacent row;

a second connecting means interconnecting the second base of each high spring with a contiguous portion of a second base of each adjacent low spring so that each of said high springs is placed under a compressive force and each of said low springs is placed a tensile force so that said respective first bases and second bases of adjacent high and low springs are in contiguous relationship;

a first border wire extending around the perimeter of the connected alternating rows of high and low springs adjacent said first bases thereof;

first means attaching said first border wire to said first base of said springs around said perimeter;

a second base wire extending around the perimeter of said alternating rows of high and low springs adjacent said second base of said springs; and

second means attaching said respective second bases of said springs around said perimeter to said second border wire.

8. A pre-stressed spring matrix, as claimed in claim **7**, wherein said first and second connecting means each includes a coiled member extending longitudinally between said adjacent high and low rows of springs and extending around adjacent portions of said upper and lower bases.

9. A pre-stressed spring matrix, as claimed in claim **7**, wherein said first and second connecting means include clips extending around adjacent portions of said upper and lower bases of high and low springs in adjacent rows to interconnect them.

10. A pre-stressed spring matrix, as claimed in claim **7**, wherein a high row of springs is positioned along each longitudinal edge of the spring matrix with alternating rows of low and high springs therebetween.

* * * * *