United States Patent

Falkenau

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[54] **SPRING**

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[52] **U.S. Cl.** **5/351**, 5/237, 5/247, 5/260

[51] **Int. Cl.** **A47c 23/04**, A47c 25/00

[58] **Field of Search** 5/236, 238, 239, 247, 255, 5/259, 260, 345, 351, 360

[56] **References Cited**

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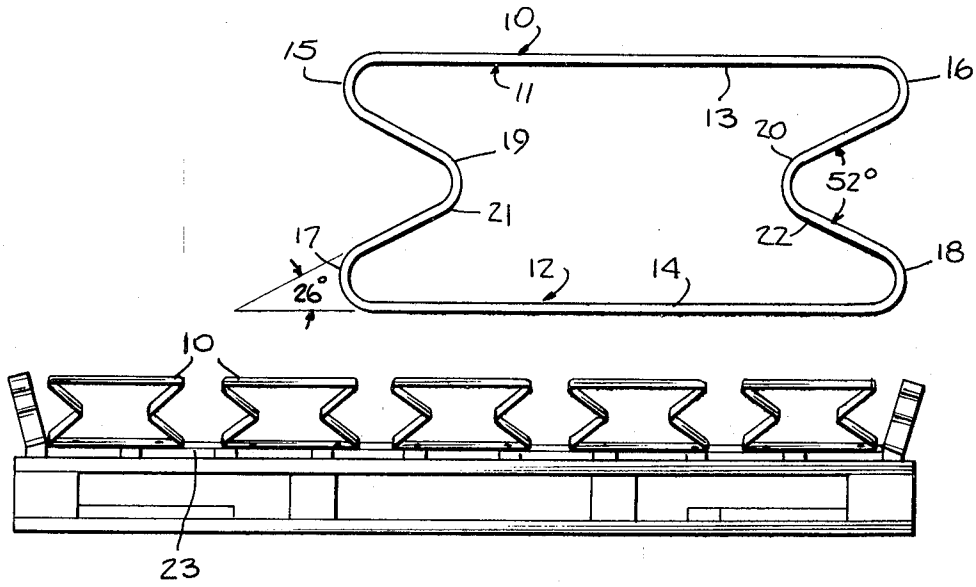
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[57] **ABSTRACT**

A plastic spring having two longitudinal sides joined by transverse sides having curved portions. The upper and lower halves of the spring are symmetrical. Upper curved portions are disposed directly over lower curved portions to cause vertical deflection of the spring without horizontal roll in response to load. A mattress foundation utilizing such springs has border springs so mounted as to tend to slant outwardly but held in a vertical position by the foundation cover, thereby keeping the cover taut.

6 Claims, 7 Drawing Figures



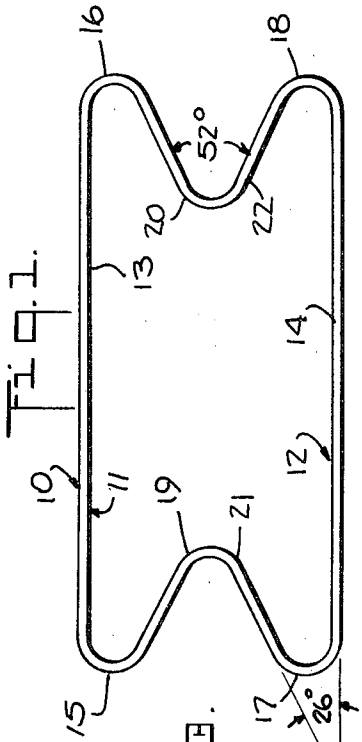


Fig. 1.

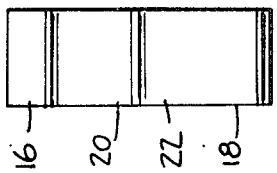


Fig. 3.

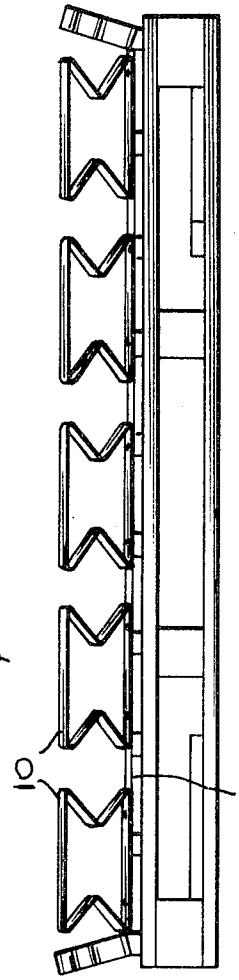


Fig. 6.

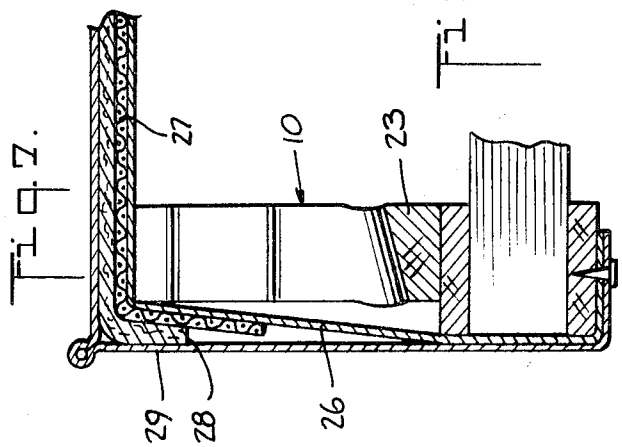


Fig. 7.



Fig. 2.

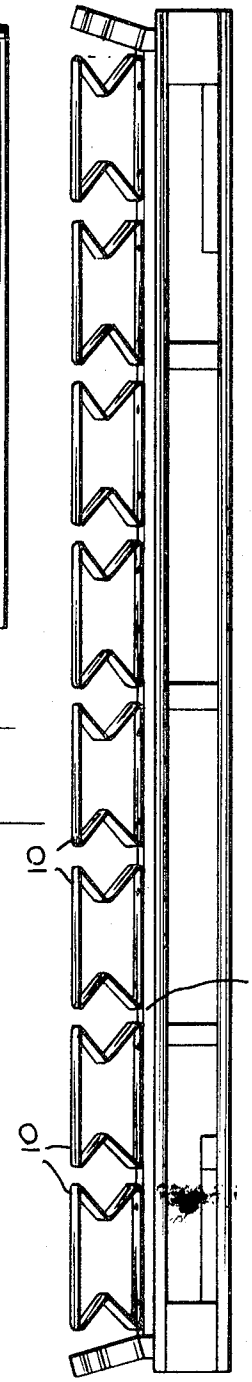


Fig. 5.

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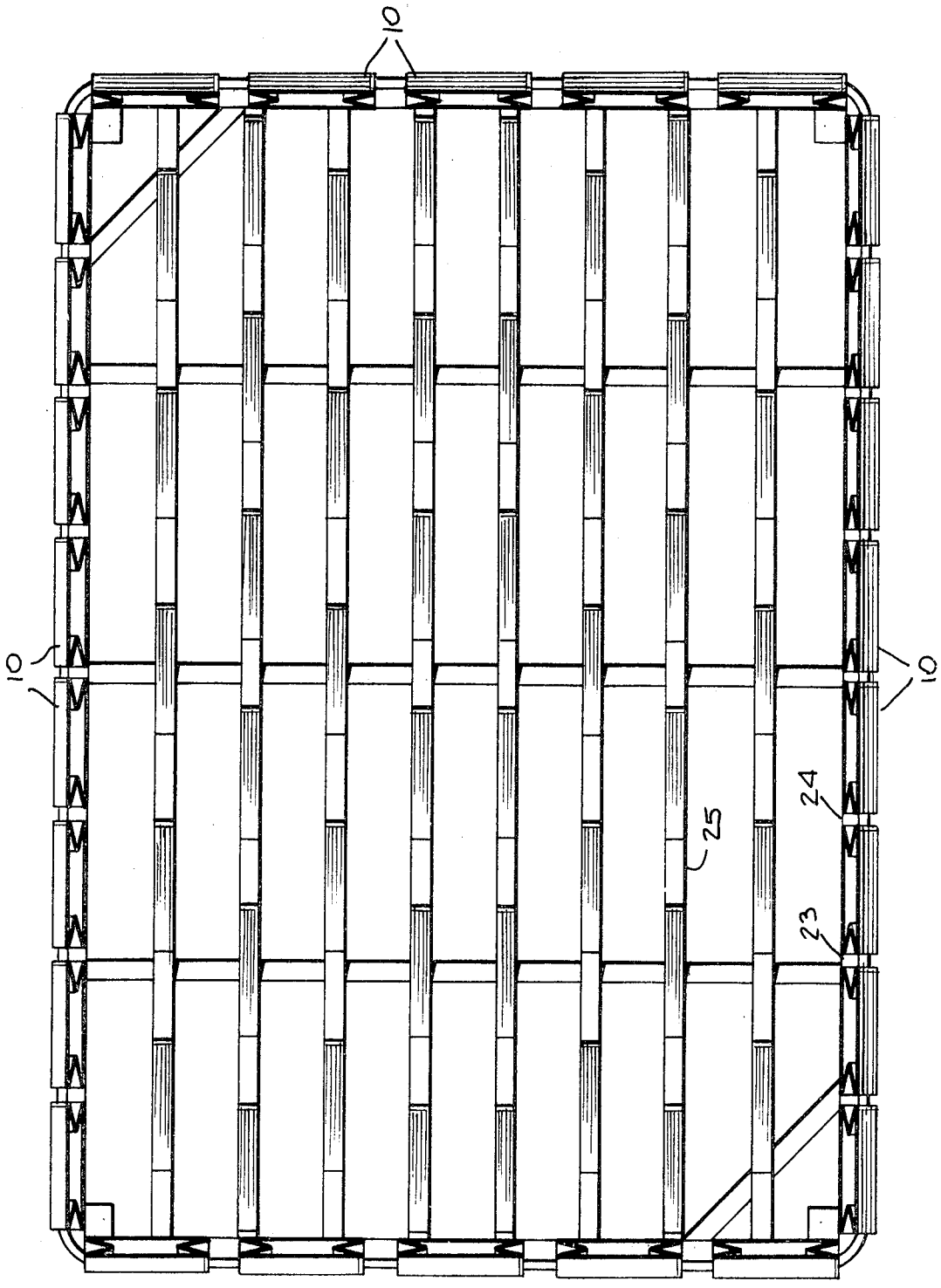


Fig. 4.

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SPRING

This invention relates to springs and to spring supports, for example, cushions or mattress foundations utilizing such springs.

Prior springs have, in general, been of more complex construction than is desirable for some applications. Some prior plastic springs are subject to permanent cold flow or set of the plastic material upon cycling under stress with loss of resilience or are subject to premature failure under stress. Also, prior cushions and mattress foundations have been subject to collapse at their edges due to stresses placed on the edges by, for example, persons sitting on the edges. Further, covers of mattress foundations or cushions have become loose after use.

It is an object of the present invention to provide a new and improved spring of simplified construction which may be readily formed by, for example, injection molding of plastic material.

It is another object of the invention to provide a new and improved spring support such as a cushion or mattress foundation providing improved support at the edges of the cushion or mattress foundation.

It is another object of the invention to provide a new and improved spring support such as a cushion or mattress foundation which keeps the cover thereof taut.

It is another object of the invention to provide a new and improved spring support which is quiet compared with prior spring systems having coils of steel.

In accordance with the invention a spring comprises a plastic member of substantially constant width having symmetrical half portions with a pair of approximately parallel longitudinal sides, each half portion having a bounding transverse side region and a central transverse side region at each end of each longitudinal side. The central and bounding transverse side regions have curved portions and the central transverse side regions join the longitudinal sides. The curved portions of the central transverse side regions are more closely disposed than the curved portions of the bounding transverse side regions at opposite ends of the longitudinal sides in the absence of stress on the spring. The outermost portions of the transverse side regions at each end of the longitudinal sides are disposed substantially in the same transverse plane normal to the longitudinal sides at each end of the longitudinal sides. The height of the aforesaid member is substantially greater than the width thereof.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring now more particularly to the drawings:

FIG. 1 is a side elevational view of a spring constructed in accordance with the invention;

FIG. 2 is a plan view of the FIG. 1 spring;

FIG. 3 is an end elevational view of the FIG. 1 spring;

FIG. 4 is a plan view of a mattress foundation utilizing the FIG. 1 spring with the cover removed from the mattress foundation;

FIG. 5 is a side elevational view of the FIG. 4 mattress foundation;

FIG. 6 is an end elevational view of the FIG. 4 mattress foundation; and

FIG. 7 is a fragmentary cross-sectional view of FIG. 4 mattress foundation with the cover thereon.

Referring now more particularly to FIGS. 1, 2 and 3 of the drawings, a spring **10** in accordance with the invention comprises a member of substantially constant width having symmetrical half portions **11, 12** with a pair of approximately parallel longitudinal sides **13, 14**. Each half portion has bounding transverse side regions **19, 20** and **21, 22** at the ends of each longitudinal side **13, 14**. The central and bounding transverse side regions **19, 20, 21, 22** and **15, 16, 17, 18** have curved portions and straight portions. The central transverse side regions **19, 21** join the bounding transverse side regions **15, 17** and the central transverse side regions **20, 22** join the bounding transverse side regions **16, 18**. The transverse side regions **15, 19, 21, 17** and **16, 20, 22, 18** join the longitudinal sides **13, 14**. The curved portions of the central transverse side regions **19, 20** are more closely disposed than the curved portions of the bounding transverse side regions **15, 16** at opposite ends of the longitudinal sides **13, 14** in the absence of stress on the spring. The curved portions of the central transverse side regions **21, 22** are more closely disposed than the curved portions of the bounding transverse side regions **17, 18** at opposite ends of the longitudinal sides **13, 14** in the absence of stress on the spring. The outermost portions of the transverse side regions **15, 19, 21, 17** and **16, 20, 22, 18** at each end of the longitudinal sides **13, 14** are disposed substantially in the same transverse plane normal to the longitudinal sides **13, 14** at each end of the longitudinal sides **13, 14**.

The curved portions of the bounding transverse side regions **15, 16** are such that the longitudinal side **13** and the straight portions of the bounding transverse side regions **15, 16** preferably are disposed at angles of approximately 26° relative to each other. Similarly, the curved portions of the bounding transverse side regions **17, 18** are such that the longitudinal side **14** and the straight portions of the bounding transverse side regions **17, 18** preferably are disposed at angles of approximately 26° relative to each other. The curved portions of the central transverse side regions **19, 21** are such that the straight portions of the central transverse side regions **19, 21** preferably are disposed at an angle of approximately 52° relative to each other. Similarly, the curved portions of the central transverse side regions **20, 22** are such straight portions of the central transverse side regions **20, 22** preferably are disposed at an angle of approximately 52° relative to each other. The angles between the longitudinal sides **13, 14** and the bounding transverse side regions **15, 16** and **17, 18** preferably are in the range of 15° to 40°. The angles between the central transverse side regions **19, 21** and **20, 22** preferably are in the range of 30° to 80°.

The spring **10** is of a suitable plastic material, preferably polypropylene, or, for example, polyvinyl chloride.

Referring now more particularly to FIGS. **4, 5, 6** and **7**, a spring support in accordance with the invention comprises, for example, a suitable wooden frame **23** having an outer border **24** and an inner portion **25**. Outer ones of the springs **10** are so mounted, for example, by nailing to the wooden frame on the outer border of the frame, as to tend to slant outwardly of the frame as represented in FIG. **4**. Preferably the springs tend to slant outwardly of the frame at an angle of approximately 14°. As represented in FIG. **5**, the angle of 14° is provided by approximately shaping the wooden border of the frame at a 14° angle.

Referring to FIG. **7**, a cover is provided over the springs and is attached to the frame. The cover comprises for example, an unstretchable fabric **26** as an inner layer over which a polypropylene open-mesh fabric **27** is attached. An additional layer of a suitable cotton batting **28** may be attached to the polypropylene open mesh fabric and an outer covering layer **29** of a suitable fabric may be attached to the frame **23**.

The cover over the springs is pulled tautly against the outer ones of the springs bending the outer ones of the springs in the direction of the inner portion of the frame, that is, into an upright or vertical position on a horizontal mattress foundation. The outer ones of the springs mounted on the outer border of the frame preferably are more closely spaced than those of the springs mounted on the inner portion of the frame to strengthen the spring support at the edges thereof. Also, the springs in adjacent rows, except the adjacent center rows, preferably are so positioned that the springs of one row are adjacent the spaces between the springs of the adjacent row to provide an even support over the surface of the mattress foundation. The adjacent center rows of springs have the springs slightly more closely spaced in order to prevent sagging in the center under load.

The relationship of the number of springs per unit area of foundation and the angles between the bounding transverse side regions and the longitudinal sides and between the central transverse side regions are such that polypropylene springs deflect less than 50 percent under correct load. With 50 percent deflection or more some permanent set or deformation of the springs would occur under dead load.

If desired, springs with different angles between the bounding transverse side regions and the longitudinal sides and between the curved portions of the central transverse side regions can be utilized in different regions of the foundation to provide different amounts of support, for example, for the hip and leg regions of a body on the mattress over the foundation. Also, the number and location or arrangement of springs per unit area may be varied to provide different amounts of support.

Because on a horizontal mattress foundation the outermost portion of the transverse side region **15, 19** is directly vertically over the outermost portion of the transverse side region **17, 21** and the outermost portion of the bounding transverse side region **16, 20** is vertically directly over the outermost portion of the bounding transverse side region **18, 22**, under load the same deflection occurs in each outermost portion of the spring without any tendency for horizontal roll of the spring. Also, with the outer springs being held tautly by the cover in a vertical position, the outer springs provide vertical support and cannot move outwardly under load.

In some embodiments of the spring the central portion of the longitudinal side attached to the frame may be omitted. Such springs are considered to have symmetrical half portions within the scope of the invention.

While there have been described what are at present considered to be preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A spring comprising:

A plastic member of substantially constant width having symmetrical half portions with a pair of approximately parallel longitudinal sides, each half portion having a bounding transverse side region and a central transverse side region at each end of each longitudinal side, said central and bounding transverse side regions having curved portions, said central transverse side regions joining said bounding transverse side regions and said transverse side regions joining said longitudinal sides, said curved portions of said central transverse side regions being more closely disposed than said curved portions of said bounding transverse side regions at opposite ends of said longitudinal sides in the absence of stress on the spring, the outermost portions of said transverse side regions at each end of said longitudinal sides being disposed substantially in the same transverse plane normal to said longitudinal sides at each end of said longitudinal sides, the height of said member being substantially greater than said width thereof.

2. A spring in accordance with claim **1** in which said central and bounding transverse side regions have straight portions and in which said curved portions of said bounding transverse side regions are such that said longitudinal sides and said straight portions of said bounding transverse side regions are disposed at angles of approximately 26° relative to each other in the absence of stress on the spring and in which said curved portions of said central transverse side regions are such that said straight portions of said central transverse side regions are disposed at angles of approximately 52° relative to each other in the absence of stress on the spring.

3. A spring in accordance with claim **1** which is of polypropylene.

4. A spring support comprising:

a frame having an outer border and an inner portion;

a plurality of springs mounted on said frame, each spring comprising a plastic member of substantially constant width having symmetrical half portions with a pair of approximately parallel longitudinal sides, each half portion having a bounding transverse side region and a central transverse side region at each end of each longitudinal side, said central transverse side regions joining said bounding transverse side regions and said transverse side regions joining said longitudinal sides, said curved portions of said central transverse side regions being more closely disposed than said curved portions of said bounding transverse side regions at opposite ends of said longitudinal sides in the absence of stress on each spring, the outermost portions of said transverse side regions at each end of said longitudinal sides being disposed substantially in the same transverse plane normal to said longitudinal sides at each end of said longitudinal sides, the height of said member being substantially greater than said width thereof;

outer ones of said springs being so mounted on said outer border of said frame as to tend to slant outwardly of said frame;

and a cover over said springs and attached to said frame and pulled tautly against said outer ones of said springs and bending said outer ones of said springs in the direction of said inner portion of said frame.

5. A spring support in accordance with claim **4** in which said outer ones of said springs are so mounted on said outer border of said frame as to tend to slant outwardly of said frame at an angle of approximately 14°.

6. A spring support comprising:

a frame having an outer border and an inner portion;

a plurality of springs mounted on said frame, each comprising a plastic member of substantially constant width having symmetrical half portions with a pair of approximately parallel longitudinal sides, each half portion having a bounding transverse side region and a central transverse side region at each end of each longitudinal side, said central and bounding transverse side regions having curved portions, said central transverse side regions joining said bounding transverse side regions and said transverse side regions joining said longitudinal sides, said curved portions of said central transverse side regions being more closely disposed than said curved portions of said bounding transverse side regions at opposite ends of said longitudinal sides in the absence of stress on each spring, the outermost portions of said transverse side regions at each end of said longitudinal sides being disposed substantially in the same transverse plane normal to said longitudinal sides at each end of said longitudinal sides, the height of said member being substantially greater than said width thereof;

outer ones of said springs being mounted on said outer border of said frame and being more closely spaced than those of said springs mounted on said inner portion of said frame to strengthen said spring support at the edges thereof.

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