United States Patent [19]

Hughes

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[54] **SPRINGS**

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[52] **U.S. Cl.** **267/103**

[51] **Int. Cl.** **F16k 3/02**

[58] **Field of Search** 267/103, 104, 105, 106, 267/107, 108, 109, 110

[56] **References Cited**

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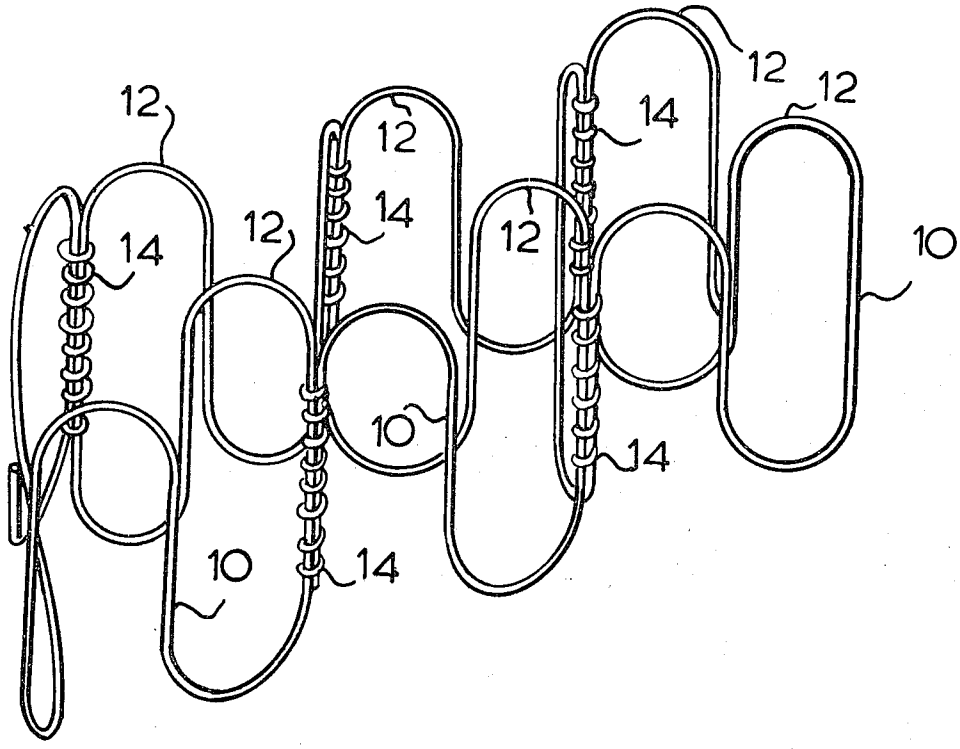
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[57] **ABSTRACT**

A spring unit primarily for use in motor vehicle seats, spring interior furniture, mattresses and the like comprises a single elongate serpentine member which is formed into a substantially rectangular block having substantially planar surface portions spaced apart by resilient cross members to provide a spring platform. The cross members are preferably inclined to the surface portions and define with the surface portions a series of triangular box sections. A number of such spring units may be combined to produce a spring platform having either uniform or varying resilience over its surface.

14 Claims, 3 Drawing Figures



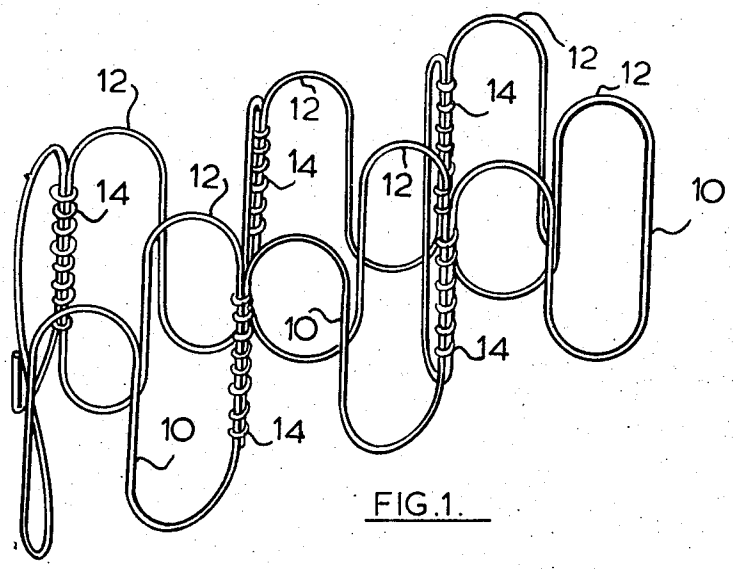


FIG.1.

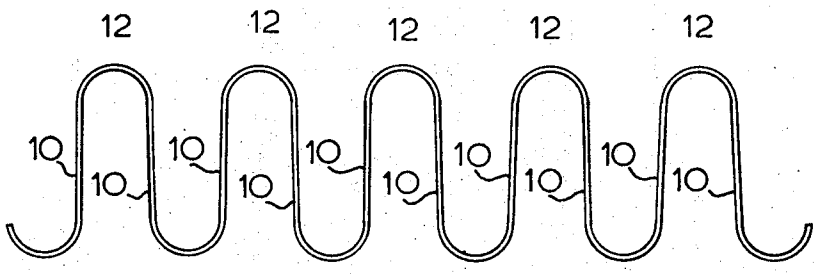


FIG.2.

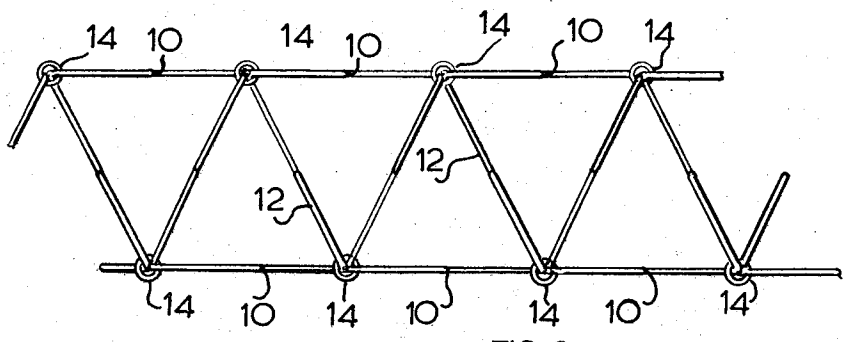


FIG.3.

SPRINGS

The present invention relates to springs.

One particular application of the present invention is to spring assemblies for motor vehicle seats, spring-interior furniture, mattresses and the like in which a spring platform is required. In an attempt to provide uniformity or a predetermined variation of resilience over the surface of a spring platform, many prior art designs of spring assembly have resorted to complex and weighty arrangements of interconnected spring elements such as coil springs. The present invention seeks to provide a spring unit which is substantially simpler in construction and lighter in weight than such prior art assemblies.

According to the present invention, a spring unit is formed of a single elongate serpentine member deformed and constrained to define a substantially rectangular prism having spaced substantially planar portions linked to one another by resilient cross members. The substantially planar portions are spaced apart by the cross members which resiliently deform when the planar portions are urged together.

In a preferred embodiment, the cross members are inclined to the planar portions, successive cross members preferably being inclined in opposite directions whereby a pair of adjacent cross members, together with a part of one or other of the planar portions, forms a three-sided box section.

The invention is further described, by way of example, with reference to the accompanying drawings, in which:

FIG. **1** is a perspective view of a section of a spring unit constructed in accordance with one embodiment of the invention, shown for clarity with its intended upper and lower surfaces as front and rear surfaces,

FIG. **2** shows an elongate serpentine member from which the spring of FIG. **1**, is formed, and

FIG. **3** is a side elevation of the spring shown in FIG. **1**.

The serpentine member shown in FIG. **2** is formed from high-tensile spring steel wire and comprises a plurality of substantially parallel straight portions **10** linked by substantially semi-circular bridging portions **12**. To form the spring unit shown in FIGS. **1** and **3**, the serpentine member of FIG. **2** is deformed to bring together certain of the straight portions **10** which are then joined together with fastenings such as helicals **14** which are also formed of spring steel wire.

As can be seen from FIG. **3**, the spring unit take the form of a series of triangular box sections. In the embodiment shown, each alternate straight portion is connected by a helical **14** to the sixth next straight portion so that each side of each triangle is formed from an s-shaped length of the serpentine member. Each triangle thus includes six straight portions **10** and six bridging portions **12**. Whilst the triangles shown are equilateral, it is not essential for the parts of the triangles constituting the outer surfaces to have a length equal to that of the cross members. The overall shape of the spring unit is that of a rectangular prism having substantially planar outer surfaces resiliently spaced apart by inclined cross members, compression of the spring to urge said outer surfaces together being accommodated by deformation of the inclined cross members.

The resilience of the spring depends upon the gauge of the wire the number of convolutions in the triangle sides and the length of the straight portions **10**, shorter portions **10** providing a harder spring. A spring assembly in which several spring units are held in a frame by means such as mild steel clips and linked together by common helicals to provide a sprung platform for use in, for example, motor vehicle seats, spring-interior furniture, mattresses or the like may include spring units having different characteristics so as to provide hard and soft areas in any one assembly.

A harder area may also be provided by combining two or more spring units, two or more contiguous serpentine members being formed into a composite spring assembly. It is of course possible to provide for consistent hardness over the entire surface of the assembly.

The sides of each of the triangular box sections may incorporate more than two convolutions, preferably three convolutions per side, in which case it may be advantageous to bow the cross members to prevent abutment between adjacent parts of successive convolutions, the triangular box sections thus having curved sides. This deformation may be effected regardless of the number of convolutions and may be effected intentionally to avoid the above problem or may arise accidently during manufacture. Similarly, the other various configurations described herein may be distorted so that, for example, the portions **10** are not exactly parallel or straight.

The serpentine member need not necessarily take the form shown in FIG. **2** other periodic undulating configurations being applicable to the invention. For example, the serpentine member, may have an angular, zig-zag configuration or other polygonal configuration. Accordingly, the word "serpentine" as used herein is to be construed to include such configurations. The resilience of a spring unit formed of a zig-zag member will depend inter alia upon the angles between successive inclined portions of the zig-zag, a larger angle providing greater hardness.

I claim:

1. A spring unit comprising a single elongate serpentine member which is deformed and constrained to define a substantially rectangular prism having spaced substantially planar portions linked to one another by resilient cross members.

2. A spring unit as claimed in claim **1** in which the resilient cross members are inclined to the substantially planar portions.

3. A spring unit as claimed in claim **2** in which each pair of adjacent cross members define, together with a part of one or other of the substantially planar portions, a three-sided box section.

4. A spring unit as claimed in claim **3** in which the serpentine member takes the form of a series of generally parallel straight portions linked by bridging portions, the serpentine member being constrained to form the spring unit by means connecting together certain of the straight portions.

5. A spring unit as claimed in claim **4** in which said means comprise wire helices.

6. A spring unit as claimed in claim **4** in which said bridging portions are generally semi-circular.

7. A spring unit as claimed in claim **4** in which each pair of adjacent cross members define, together with a part of one or other of the substantially planar portions, a three-sided box section, and in which each three-sided box section includes at least six of said straight portions and at least six of said bridging portions.

8. A spring unit as claimed in claim **7** in which each three-sided box section includes nine of said straight portions and nine of said bridging portions.

9. A spring unit as claimed in claim **7** in which at least the sides of the three-sided box sections constituting the cross members are bowed.

10. A spring assembly comprising a plurality of spring units as claimed in claim **1** connected together by fasteners.

11. A spring assembly as claimed in claim **10** including spring units having differing spring characteristics.

12. A method of forming a spring unit comprising deforming a single elongate serpentine member to define a substantially rectangular prism having spaced substantially planar portions linked to one another by resilient cross members, and constraining the serpentine member to maintain the shape of the spring unit by connecting together regions of the serpentine member.

13. A method as claimed in claim **12** in which the serpentine member comprises a series of generally parallel straight portions linked by bridging portions, including the step of connecting alternative straight portions to the sixth next straight portion to form a spring unit comprising a series of three-sided box sections.

14. A method as claimed in claim **12** in which the serpentine member comprises a series of generally parallel straight portions linked by bridging portions, including the step of connecting every third straight portion to the ninth next straight portion to form a spring unit comprising a series of three-sided box sections.

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