

[54] **SPRING IN THE FORM OF STACKED SHEET METAL PLATES**

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FOREIGN PATENTS OR APPLICATIONS

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[22] Filed: **May 14, 1973**

[21] Appl. No.: **331,013**

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[30] **Foreign Application Priority Data**

May 24, 1972 Germany..... 2225131

[52] U.S. Cl..... **267/162; 151/38**

[51] Int. Cl..... **F16f 3/02**

[58] Field of Search 267/162, 165, 161; 151/38

[57] **ABSTRACT**

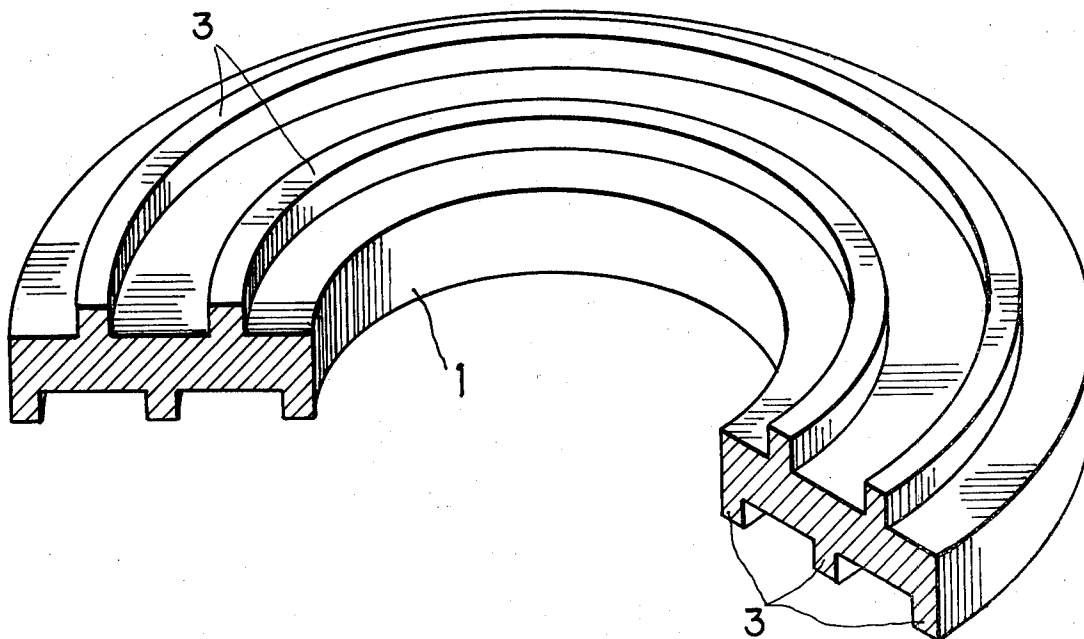
A spring in the form of stacked ribbed and flat sheet metal plates. Ribbed plates having curved ribs produced by etching on both faces with ribs on one face of the plate being staggered in relation to the ribs on the other face of the plate.

[56] **References Cited**

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1 Claim, 6 Drawing Figures



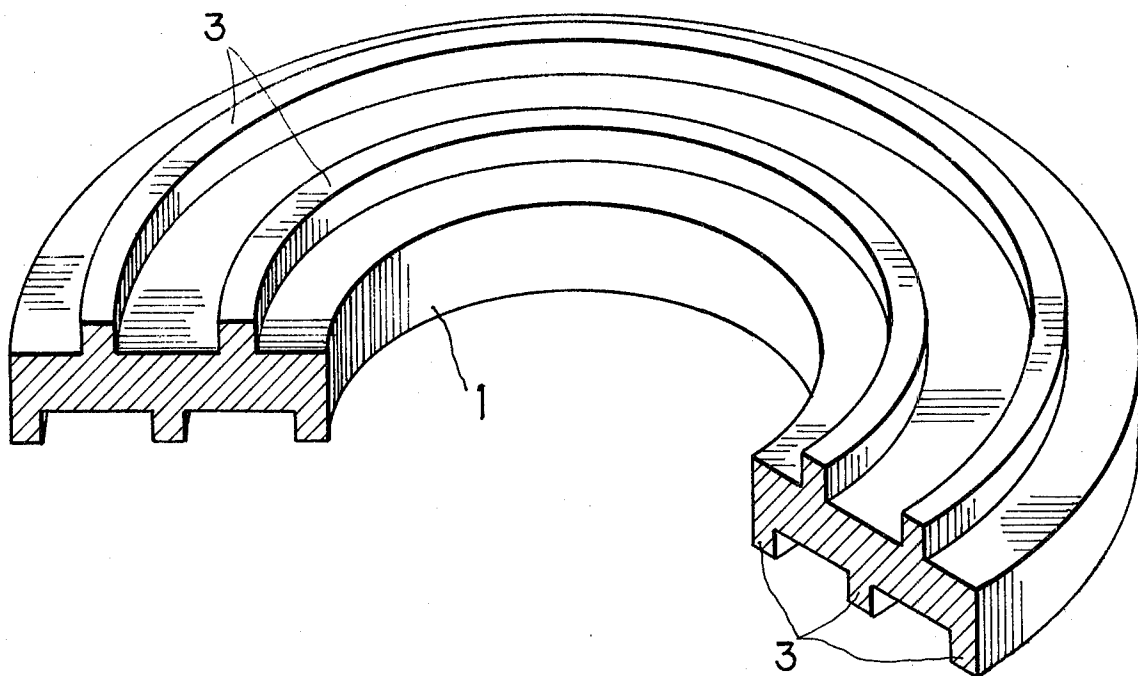


FIG. 1

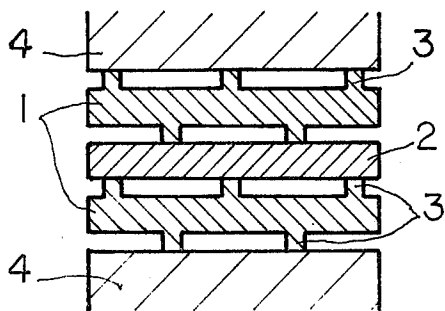


FIG. 2

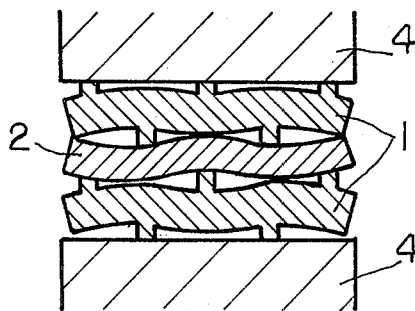


FIG. 3

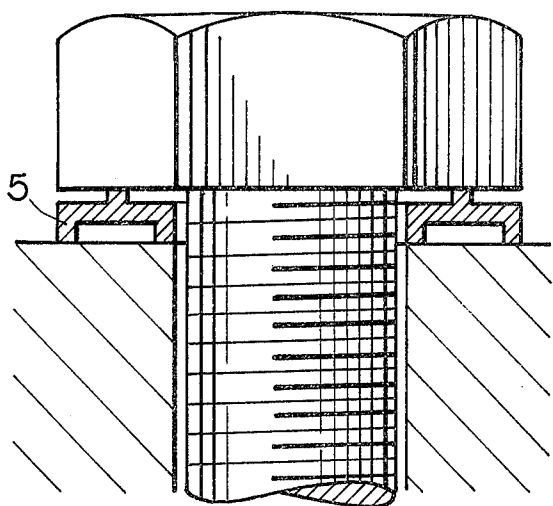


FIG. 4

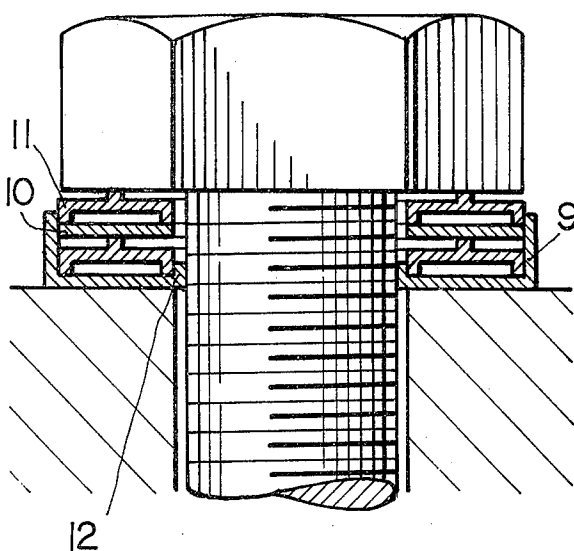


FIG. 6

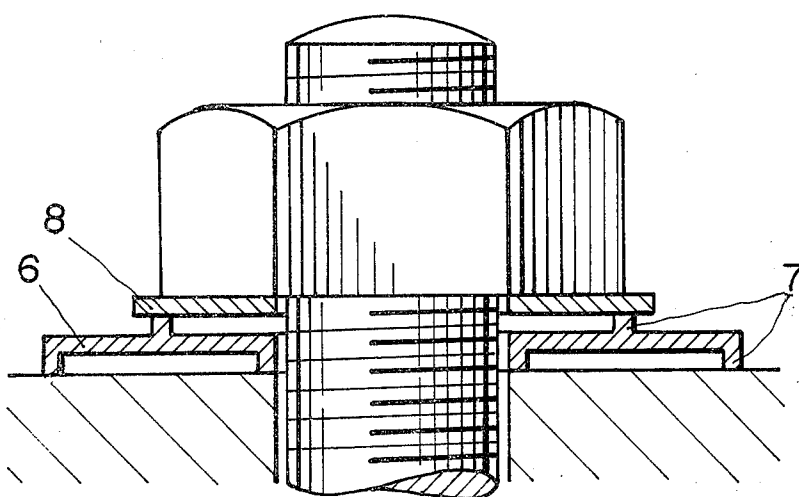


FIG. 5

SPRING IN THE FORM OF STACKED SHEET METAL PLATES

This invention relates to an improvement in the design of springs made out of stacked sheet metal plates and the method of making the same. Such springs have many and varied applications in industry, particularly in those cases which require a strong spring fitted in a very limited space. One such case is the securing of the bolts to prevent loosening by maintaining the tension. This is achieved by using one or more stacked resilient ribbed metal plates as described in the following application. The main object of the invention is to provide a spring structure made of metal plates with curved ribs produced easily by known etching techniques.

With these and other objects in view, the invention consists substantially of the devices illustrated in the accompanying drawings together with such modifications thereof as come within the scope of the invention as defined in the appended claim.

IN THE DRAWINGS

FIG. 1 is a perspective view of a sheet metal plate which forms one of the elements of the device;

FIG. 2 is a view in cross section of a stack of elements such as that illustrated in FIG. 1, showing the relative position of the elements when no load is applied;

FIG. 3 is a view similar to FIG. 2 showing the flexing of the individual elements of the stack under load;

FIG. 4 shows the relative position of a spring metal plate when used for securing the bolts against loosening;

FIG. 5 is a view similar to FIG. 4 showing a simple method of stacking the metal plates;

FIG. 6 shows another form of stacking the elements with means for maintaining the plates in stacked relation.

The stacked spring of my invention consists of stacking ribbed spring metal plates 1 shown in FIG. 1 with the flat spring metal plates 2 in between, as illustrated in FIG. 2.

In FIG. 1 the plate 1 is provided with a number of curved ribs 3 on both faces of the plate whose ribs are in such spaced relationship to one another so as to leave between the adjacent ribs a certain unsupported plate portion, and that the stack may be compressed under the conditions of load. In other words, the ribs on either face of the plate 1 are staggered in respect to each other. The curved ribs 3 are produced easily by

known etching techniques, and may be made as deep or as shallow as desired, depending upon the load conditions for which the device is intended. The curved ribs 3 could extend parallelly or with variable distance among them or they could be completely omitted at some places to achieve the desired spring action.

In FIG. 2 the ribbed spring metal plates 1 are assembled into a stack with the flat spring metal plates 2 in between them. By this arrangement the flat portions of the plates in between the ribs will be flexed so that under the load the stack will look in cross section substantially the way it is illustrated in FIG. 3.

In FIGS. 2 and 3, the reference numeral 4 indicates diagrammatically load members which are resting on the top and the bottom plate of the stack. These load members may be anything at all that needs to be resiliently supported.

In FIG. 4, I have shown one of the possible applications of my device. The ribbed spring metal plate 5 is assembled in a fastening structure to maintain the torque and prevent the loosening of the nut. The thickness of the ribbed spring metal plate is so designed that it will be properly guided by the screw-thread of the fasteners. This is achieved by selecting the thickness of the spring metal plate approximately equal to the pitch of the screw thread.

In FIG. 5 is shown one way of stacking the plates. The device consists of a plate 6 provided with ribs 7 and a flat spring metal plate 8 to achieve a higher resiliency of the fastened structure.

FIG. 6 shows another method of assembling the plates into a stack. The stack is placed in a guide chamber or a receptacle 9 which serves to keep the plates 10 and 11 in proper stacked relation and prevent their relative movement. Receptacle 9 is guided at the bore by the screw thread and has the edge 12 whose height approximately equals the pitch of the screw thread.

I claim as my invention:

1. A spring in the form of stacked sheet metal plates comprising a number of resilient ribbed metal plates provided with ribs, said ribs extending curvilinearly across both faces of the said ribbed metal plates, said ribs on one face being in staggered relation to the ribs on the opposite face, and flat metal plates having no ribs on either face thereof, said ribbed metal plates being stacked with flat metal plates in between them, and means for maintaining said plates in stacked relation.

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