Feb. 20, 1923. 1,445,669

L. M. DIETERICH

NONMETALLIC SPRING

Original Filed Oct. 25, 1918

Fig. 1.

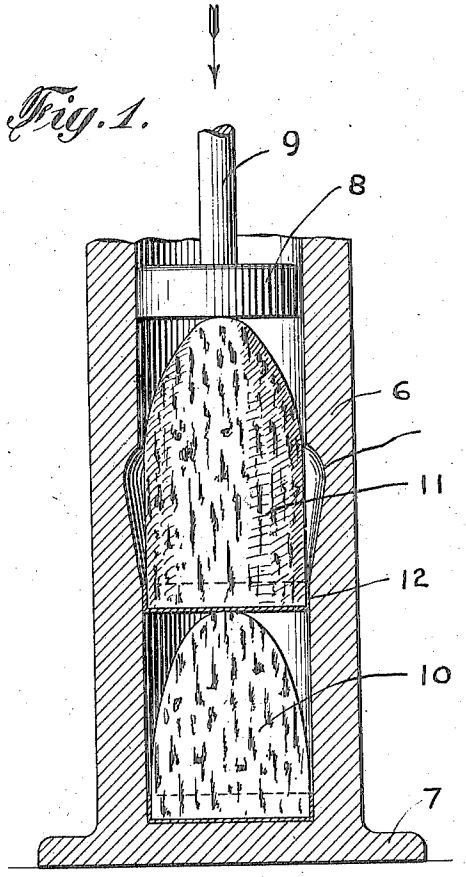


Fig. 2.

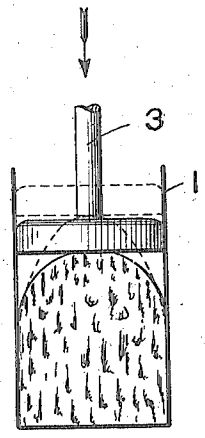
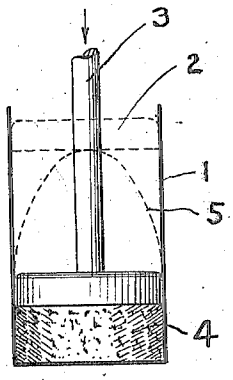


Fig. 3.



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UNITED STATES PATENT OFFICE.

LUDWIG M. DIETERICH, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNOR OF ONE-HALF TO ROBERT S. BLAIR, OF SOUTH ORANGE, NEW JERSEY.

NONMETALLIC SPRING.

Application filed October 25, 1918, Serial No. 259,632. Renewed December 6, 1922.

To all whom it may concern:

Be it known that I, LUDWIG M. DIETERICH, a citizen of the United States, and a resident of New Brunswick, in the county of Middlesex and State of New Jersey, have invented an Improvement in Nonmetallic Springs, of which the following is a specification.

This invention relates to non-metallic springs. One of the objects thereof is to provide a spring of the above type of simple and inexpensive construction and highly efficient action. Another object is to provide a non-metallic spring which shall be light and adapted readily to give the desired curve of resistance to distortion. Another object is to provide a simple and practical art for forming a spring of the above type. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts, and in the several steps, all illustratively described in this application and defined in the following claims.

Referring now to the drawing, in which is shown one of various possible embodiments of the mechanical features of this invention,

Figure 1 is a vertical sectional view of a compound spring;

Figure 2 is a similar view in diagrammatic form showing the action of a spring element; and

Figure 3 is a diagrammatic representation of one of the steps of my process.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Referring now to Figure 3 of the drawing, there is shown diagrammatically a cylindrical container 1 having mounted for reciprocation therein a piston 2 actuated by a rod 3. Confined within this casing is a body of cork 4 which may be assumed in this case normally to have the shape indicated by the dotted line 5. The cork is preferably arranged with its grain substantially parallel to the axis of the cylinder, although many of the advantages of this invention may be attained with the grain of the cork otherwise disposed.

Assuming the natural cork to occupy the position and shape indicated by the dotted line down to the bottom of the cylinder, I subject it by downward movement of the piston 2 to an extreme pressure. Such pressure preferably amounts to many tons to the square inch. In fact, it has been my experience that the greater the pressure exerted on the cork in carrying on this process, the more excellent the results in the product. It is to be understood that by the expression "high pressure" as used herein and in the following claims, is meant a pressure of not less than five hundred pounds to the square inch. When this pressure is relieved, the cork partially recovers its original size and shape but not fully. Its characteristics and presumably its internal structure are markedly changed by this extreme pressure. It now possesses the properties of a highly resilient spring, particularly in meeting stresses imposed in the direction of its original high compression.

It is to be understood that by the expression "permanently" as used herein to define a reduction of volume due to the above compression is meant a reduction of volume of such substantial degree that the member acted upon will not of itself regain its former shape.

Referring now to Figure 1 of the drawing, there is shown a heavy container 6 having a suitable base 7 with the reciprocating piston 8. The rod 9 of this piston is connected by any suitable means through which the shock or stress which it is desired to cushion may be transmitted to the parts shown. It may be assumed, for example, that this shock is applied directly to the piston 8.

Within the cylinder or container 6 are a pair of cork springs 10 and 11. These springs are assumed to have been treated by the process above described and are assumed to have their grain preferably arranged parallel to the axis of the cylinder. The member 10 is preferably of the semi-elliptical form shown, and supports a slidable cup 12. Within the cup 12 is mounted the spring member 11 which is cylindrical for a portion of its length and terminates at its upper end substantially in the shape of the lower spring member. On the upper end of the member 11 the piston 8 rests.

These two spring members 10 and 11 are of different shapes and due to their shape, any desired curve of resistance to compres-

sion may be attained. The variation of resistance to compression of the individual member may be changed with its shape, and by compounding two or more as here shown, their joint action may be made such as to give substantially any desired curve or variation in resistance to compression.

As the piston 8 travels downwardly, the lower spring member is compressed substantially as diagrammatically indicated in Figure 2 of the drawings. Its shape is such that friction between the cork and the walls of the cylinder is substantially avoided as the desired clearance is given to permit the cork to expand. As the upper spring member 11 travels downwardly, the cup 12 serving to permit binding at its lower end, it will also tend to expand at its upper end. Furthermore the expansion of its cylindrical portion is provided for by a suitably shaped recess 13 in the walls of the cylinder.

The action of the above apparatus will, it is believed, be clear from the foregoing description. Upon a relief in pressure on the piston 8, the spring moves it upwardly and the device is in condition for subsequent downward impulses on the rod 9. The cork, after being prepared by my process, exhibits many of the characteristics of an air spring, due perhaps to the confinement therein of a great number of extremely minute bodies of air. The pressure exerted is such that the cells or particles of the cork are permanently flattened to a substantial extent. A spring of the foregoing type is especially adapted to receive shocks and sudden stresses as distinguished from a long-continued pressure.

It will thus be seen that there is provided an art and apparatus in which the several objects of this invention are achieved.

As various possible embodiments might be made of the features of my invention, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A non-metallic spring formed of cork compressed in a single direction to a permanently reduced volume.

2. A non-metallic spring formed of cork having its cells permanently flattened by pressure.

3. A spring device comprising a cork member pre-compressed to a permanently reduced volume and a mounting adapted to subject said member to shocks substantially in the direction in which the pressure of its original compression was exercised.

4. A spring device comprising a plurality of cork members superposed one upon another and pre-compressed to a permanently reduced volume, a receptacle in which said cork members are mounted, and means adapted to exert pressure upon said members.

5. A cork spring comprising a member formed of cork, a member against which said first member rests provided with walls embracing said first member, and a relatively movable member engaging the opposite end of said cork member and movable within said walls to compress said cork member against the member on which it rests, said cork member having been pre-compressed to a permanently reduced volume.

6. A cork spring comprising a member formed of cork, a member against which said first member rests provided with walls embracing said first member, and a relatively movable member engaging the opposite end of said cork member and movable within said walls to compress said cork member against the member on which it rests and said cork member having been pre-compressed to a permanently reduced volume, said walls and the adjacent surfaces of said cork member being so disposed with relation one to the other as to permit lateral expansion of said cork member as it is compressed.

7. A spring device comprising a pair of relatively movable members, a member formed of cork interposed between said movable members to be compressed thereby, a member fitted about said cork to prevent excessive distortion thereof during compression and means to prevent lateral displacement of said cork.

In testimony whereof, I have signed my name to this specification this 14th day of October, 1918.

LUDWIG M. DIETERICH.