J. B. KNUDSEN.

COIL SPRING.

APPLICATION FILED NOV. 16, 1907.

917,770. Patented Apr. 13, 1909.

Fig. 1.

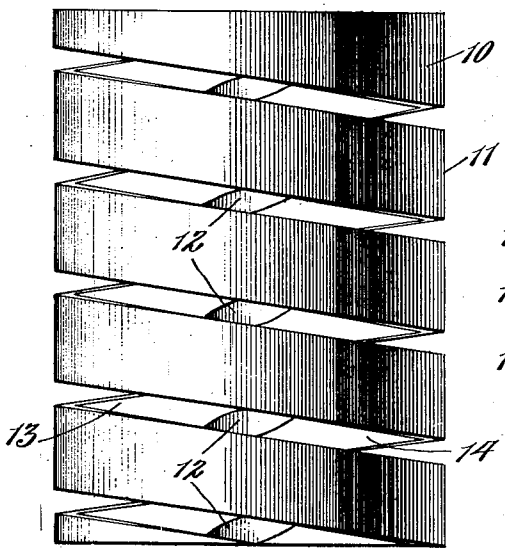


Fig. 3.

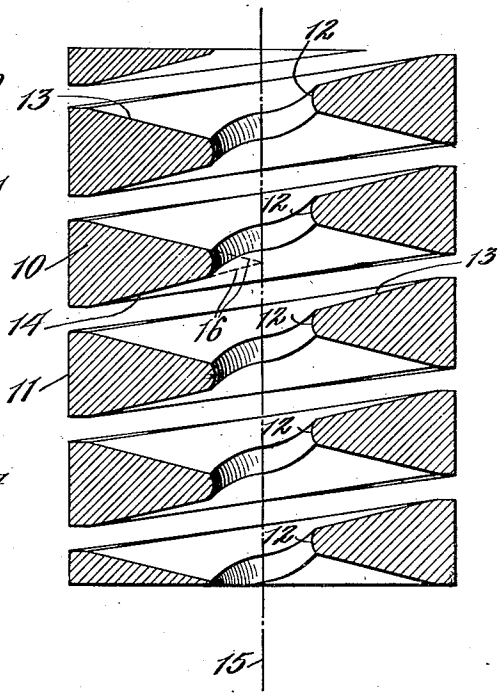
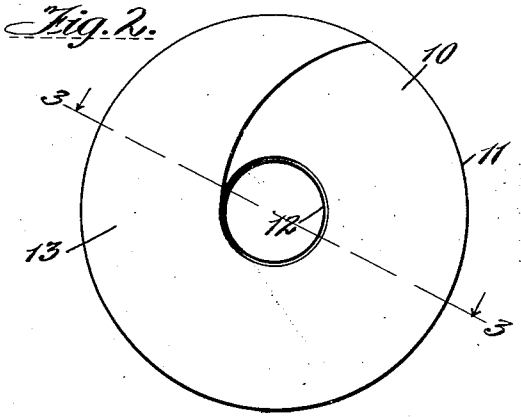


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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COIL-SPRING.

No. 917,770. Specification of Letters Patent. Patented April 13, 1909.

Application filed November 16, 1907. Serial No. 402,520.

To all whom it may concern:

Be it known that I, JACOB B. KNUDSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Coil-Springs, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to coil springs, and contemplates improvements over earlier devices of this class whereby certain defects therein, as hereinafter pointed out, are eliminated.

My invention finds its most advantageous embodiment in springs which are employed to support very heavy structures. Of this class are car springs which are disposed between the car body and axle to absorb the jars and jolts which would otherwise be communicated from the wheels to the car.

In the earlier art coiled car springs were usually constructed of material of quite large dimensions so that substantial support for the car could be afforded. It was found, however, that these springs could be given sufficient resiliency for the purpose for which they were to be used only by making the spiral of large and impractical diameter, and that when the diameter of the spiral was reduced to a more practicable size, the spring almost entirely lost its yielding characteristics. In order to overcome these difficulties and to provide more practical and serviceable springs, it became the practice to construct and use what is now known as a nest of springs. This improved structure consisted of a plurality of coiled springs of different diameters, each disposed within the next in order. The dimensions of the material of which the springs were constructed varied also in the different springs, and the relation between the diameters of the spirals and the dimensions of the material of which the springs were constructed, was such that the spring having a coil of the greatest diameter was constructed of material of the greatest dimensions, and the dimensions of the material of construction diminished with the diameter of the spiral. With the dimensions of the material of construction properly proportioned in the various springs, it is apparent that all of the springs may be made to have approximately the same coefficient of resiliency even though they be of different diameters. The supporting strength would be the aggregate of the supporting strength of all the springs. Being interdisposed, as pointed out, a compact device of practical size is obtained.

While the desired result of proper resiliency and sufficient support was obtained in the prior art devices above described, it has been found that such devices, being complicated, necessitated the expenditure of considerable time, labor and expense in construction and involved complications in applying the same to their practical use.

It is the object of my invention, therefore, to provide a structure which will have the desirable characteristic of resiliency and the necessary supporting qualities, but which will not involve the disadvantages presented by the use of a nest of springs. To this end I provide a resilient structure which consists of but a single spiral bar, and my invention resides in the particular form of the bar. By the "form" of the spiral bar I mean the particular shape of a transverse section thereof. The shape of such a transverse section is such that the bar has greater thickness toward the outside of the spiral than at the inside, that is, the thickness of the bar diminishes from the outside of the spiral toward the inside. Thus, as the diameter of the coil decreases, the thickness of the bar also decreases and the rate of decrease may be such that, as the diameter decreases, the thickness of the bar is decreased in such proportion as to compensate therefor and thus maintain the same coefficient of resiliency throughout.

In the accompanying drawings, Figure 1 is an elevational view of a coil spring embodying the features of my invention; Fig. 2 is a plan view thereof; and Fig. 3 is a longitudinal sectional view on the line 3—3 of Fig. 2.

The structure consists of a spiral bar 10, the outer part of which is considerably thicker than the inner part. While the particular form illustrated is not essential, I have, in the drawings, shown the bar 10 to be of approximately trapezoidal cross-section, the outer side 11 being the base of the trapezoid and the inner side 12 being the top thereof. The rate of decrease in thickness of the bar from the outer to the inner side must, to attain the greatest theoretical efficiency, be properly proportioned to maintain the same coefficient of resiliency throughout the various intermediate thicknesses of the bar,

but I have found it sufficient and most practical to determine this rate of decrease approximately and without theoretical and mathematical precision. I have found it sufficiently accurate in practice to form this bar so that a radial line coincident with one side 13 will intersect a similar line coincident with the opposite surface 14 at the axis 15, as indicated in dotted lines at 16. This is merely an exemplary method of determining the rate of decrease in the thickness of the bar approximately and practically, therefore I do not wish to be understood as defining or limiting my invention by such practice.

My invention involves the broad proposition that the thickness of the bar decreases toward the center of the coil so as to compensate, by decreasing the amount of resisting material, for the increase in stiffness of the individual convolutions, resulting from the decrease in diameter.

It is to be understood that my invention in practical application does not necessarily involve theoretical precision in construction. It is apparent that the bar 10 may be of substantial dimensions to form a proper support and that even though the spiral be of limited diameter the resiliency of the device is in no way lessened, the transverse form of the bar providing for this maintenance of resiliency.

I claim as new and desire to secure by Letters Patent:

1. A resilient structure consisting of a spirally curved bar the thickness of which decreases toward the inside of the spiral substantially proportionately with the decrease in diameter.

2. A resilient structure consisting of a spirally curved bar having upper and lower faces which, if extended, would meet in a common point in the axis of the spiral.

3. A resilient structure comprising a spirally curved bar the thickness of which decreases toward the inside of the spiral at such a rate as to maintain substantially the same coefficient of resiliency of the structure at all distances from the center of the spiral.

4. A resilient structure consisting of a spirally curved bar of substantially trapezoidal cross-section, the thickness of said bar decreasing from the outside diameter toward the inside diameter thereof with the decrease in diameter.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

JACOB B. KNUDSEN.

Witnesses:
M. L. FARRAR,
CHARLES L. HOPKINS.