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FRICTION SPRING FOR RAILWAY CARS

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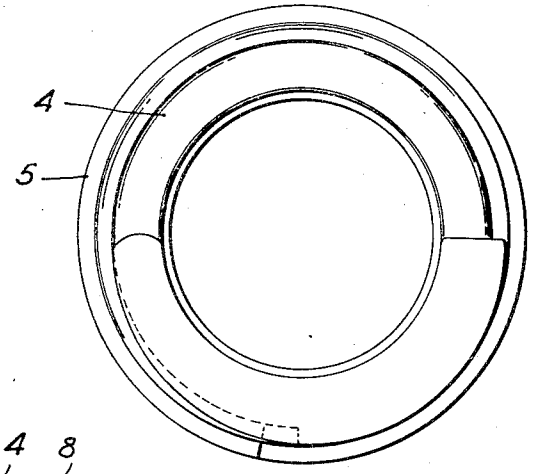



Fig. 1.

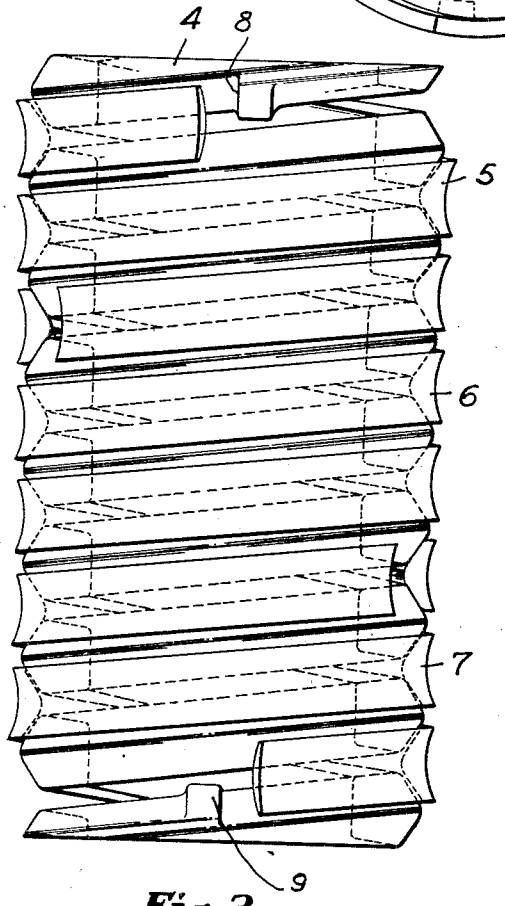



Fig. 2.

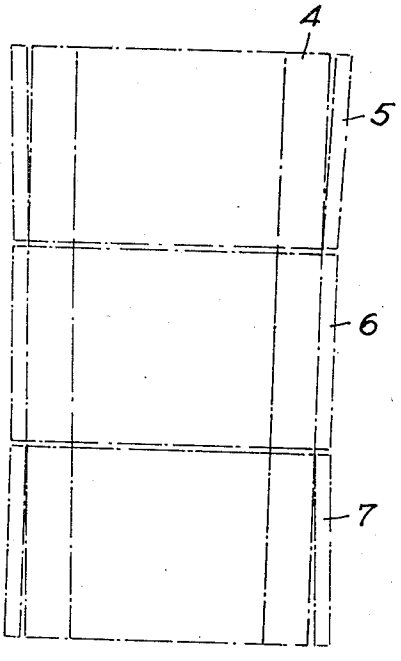



Fig. 3.

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## FRICTION SPRING FOR RAILWAY CARS

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5 Claims. (Cl. 267—61)

My invention relates to friction springs of the type wherein inner and outer coils are arranged in coaxial relation so that said coils will have frictional movement on one another and cooperate to serve as cushioning or snubbing elements. The invention is particularly useful on railway cars, when interposed between a bolster and truck frames, or can be incorporated in draft gears, but it will be understood that the springs may also have other uses.

The spring of the present invention is of the type described and claimed in my Patent 2,095,545 in that it comprises an inner helical spring surrounding which are a plurality of outer coil sections, each of which is so formed and assembled with the inner coil that the turns of the outer coils will have frictional engagement with the turns of the inner coils.

In the making of helical springs, the spring turns are formed by winding them upon a mandrel which in some cases is tapered from one end toward the other end to the extent of perhaps one-eighth inch in each 10 inches of length. That is, one end of the mandrel is of slightly smaller diameter than the other end, so that the spring can conveniently be removed from the mandrel after it has been formed thereon.

I have found that in springs of this character having an outer coil closely embracing an inner coil, there is a tendency for the turns of the outer coil to creep relative to the inner coil. Especially is this true if there is slight imperfections in the spring. Of course, if both outer and inner coils are perfect in contour, this creeping is minimized. Where a single inner coil and single outer coil are employed, this tendency to creep is prevented eventually by engagement of the extremities of the outer coil with the stops on the inner coil at each end. Thus, when the outer coil creeps, one of its ends comes against one of these stops, and this end pressure causes an expansion of the outer coil, this expansion being sufficient to entirely release the pressure on the friction surfaces of the coils. This clearance will extend clear to the other end of the outer coil and thus cause it to snap back away from the stop, when the load on the spring is released, and the spring will again act normally. However, this tendency to creep is not always present and can be accounted for by inaccuracy in manufacture.

I have found that I can control the direction of creep of the outer friction coil with respect to the inner coil. This is done by winding the outer coil on a different taper of mandrel than the inner coil. Thus if the inner coil were wound on a straight mandrel and the outer coil wound on a mandrel with taper of a slight amount and then assembled on the inner coil, the creep of the outer coil would be toward the end which was loosest on the inner coil, which had the lesser amount of pressure between inner and outer coil. This difference in taper does not have to be very great, but it must be great enough to compensate for slight imperfections which are usually unavoidable in manufacture, so that the "creep" can be controlled.

In my three-piece outer coil spring, I prefer to have the two end outer coils creep toward the stops at the ends of the inner coil spring, and to make the middle section of the outer coil of the exact taper of the inner coil, so that it will not tend to creep in either direction. Thus the two end coils which have a definite direction of creep toward the ends will release themselves as described above.

I have found that when the two end coils are made of the exact taper of the inner coil, there is a tendency at times for the two end coils to creep toward the middle of the spring, and this creeping can only be resisted by end pressure at each end of the center coil. This is sufficient at times to expand the center coil sufficiently to overstrain it and render it non-effective, so that in this invention I am deliberately designing my spring with outer coil sections of greater diameter at their outer ends, relative to the inner coil, than at their inner ends. Thus the two end coils will always creep toward the stops on the inner spring.

My invention has for its object the provision of a spring structure having a long coil in frictional engagement with the turns of a plurality of shorter coils, wherein creeping can be controlled properly.

In the accompanying drawing Figure 1 is an end view of a spring structure embodying my invention; Fig. 2 is a side view thereof, and Fig. 3 is a graphic view showing the dimensional relationship as between the inner coil and the outer coil sections.

The general functional characteristics of the present spring and the manner in which the coils are assembled are similar to those explained at length in my said patent, and need not be here repeated.

In the present case, the spring comprises a single inner helical coil 4 and three outer helical coil sections 5, 6 and 7 of different initial pitch than the inner coil, and placed on the inner coil with initial tensioned frictional engagement. The

inner coil 4, as graphically shown in Fig. 3, is of single-piece construction and may be shaped on a tapered mandrel, the upper end of the coil being of nearly one-eighth inch larger diameter than the lower end thereof, assuming the coil to have a normal length of about eight inches. The middle outer coil section 6 is shaped on a mandrel that may have the same degree of taper as the mandrel on which the coil 4 was wound.

The upper coil 5 is formed on a mandrel having a more pronounced taper than the mandrel on which the coil 4 is formed. For example, if the coil 4 is formed on a mandrel having a one-eighth inch taper in ten inches of length, the coil section 5 can conveniently be wound on a mandrel that tapers three-eighths inch in ten inches of length, and is assembled on the coil 4 in such position that the lower-most turns of the coil section 5 will engage the adjacent turns of the coil 4 more snugly than will the upper turns of said coil section.

The lower-most coil section 7 may be formed on a mandrel tapered to the same degree as the mandrel on which the inner coil is formed, and placed on the inner coil, but with its lower-most turn or turns of greater diameter relative to the adjacent turns of the inner coil than are its upper turns. The uper turns of the section 7 will therefore engage the turns of the inner coil with greater tension than do the lower turns of said coil section.

It will be understood that while the terms "upper" and "lower" have been employed, such designations have been for convenience of description, because the complete spring structure can be used with either of its ends uppermost, or be positioned horizontally.

From the foregoing it will be seen that the creeping tendency of the coil sections 5 and 7 will be in directions away from the coil section 6, thus avoiding the danger of crowding the coil section 6 such as sometimes occurs when the coil sections all are tapered in the same direction. Although there is a tendency for the coil sections 5 and 7 to creep in directions toward their looser turns, their extremities will abut the stop shoulders 8 and 9 on the inner coil, and the coil sections will be expanded, as heretofore explained. upon relief of compressive force on the springs, the expanded coil sections 5 and 7 will return to their normal positions.

With the outer coil sections 5 and 7 creeping toward the stops 8 and 9, there will never be a time when all three outer coil sections are in contact with one another. Of course at times the middle outer coil may creep toward one end or the other, but I have found that two coil sections will unwind and release themselves without overstraining either coil.

I claim as my invention:

1. Friction spring structure comprising a coil which is tapered in an axial direction, and a plurality of shorter coil sections positioned in end-to-end relation and with their turns in threaded engagement with the turns of the first-named coil, those turns of the coil sections adjacent to the extremities of the first-named coil being normally in less snug-fitting relationship to the said coil than are turns which are nearer to the middle of the spring structure.

2. Friction spring structure comprising a coil which is tapered in an axial direction, and three coil sections positioned in end-to-end relation and with their turns in threaded engagement with the turns of the first-named coil, the two end sections having those turns which are adjacent to the extremities of the first-named coil normally in less snug-fitting relationship to the said coil than are those turns which are adjacent to the middle coil section.

3. Friction spring structure comprising an inner coil which is tapered in an axial direction, and three shorter outer coil sections threaded on the inner coil, in end-to-end relationship, the diameter of the endmost turn of each outer coil section, relative to the diameter of the adjacent end of the inner coil being greater than the difference as between each said end section and the inner coil, at points adjacent to the middle coil section.

4. A friction spring structure comprising an inner coil and a plurality of outer coil sections threaded on the inner coil, all turns of the outer coil sections being assembled in contact with the inner coil, and those turns of the outer coil sections adjacent to the extremities of the inner coil being under less tension than those turns nearer to the middle of the structure.

5. A friction spring structure comprising an inner coil and a plurality of outer coil sections threaded on the inner coil, all turns of the outer coil sections being assembled in contact with the inner coil, and those turns of the outer coil sections adjacent to the extremities of the inner coil being under less tension than those turns nearer to the middle of the structure, the end turns of the inner coil carrying the full load.

LOUIS E. ENDSLEY.