

Aug. 6, 1946.

L. B. JAHN

2,405,356

SPRING CONSTRUCTION

Filed Dec. 24, 1943

2 Sheets-Sheet 1

Fig. 1.

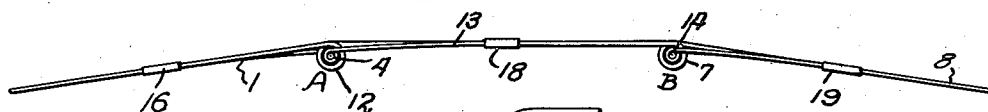


Fig. 2.

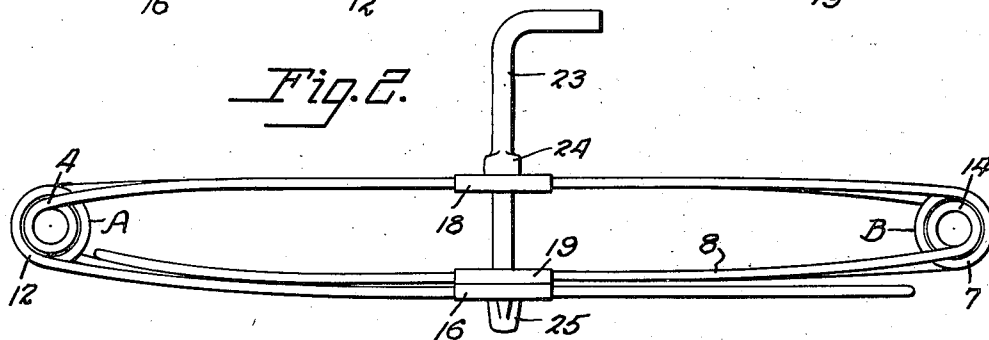


Fig. 3.

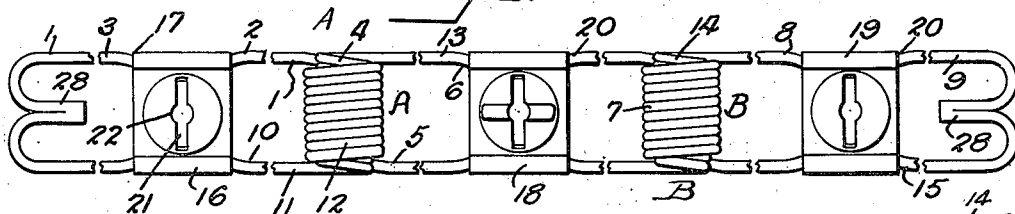


Fig. 4.

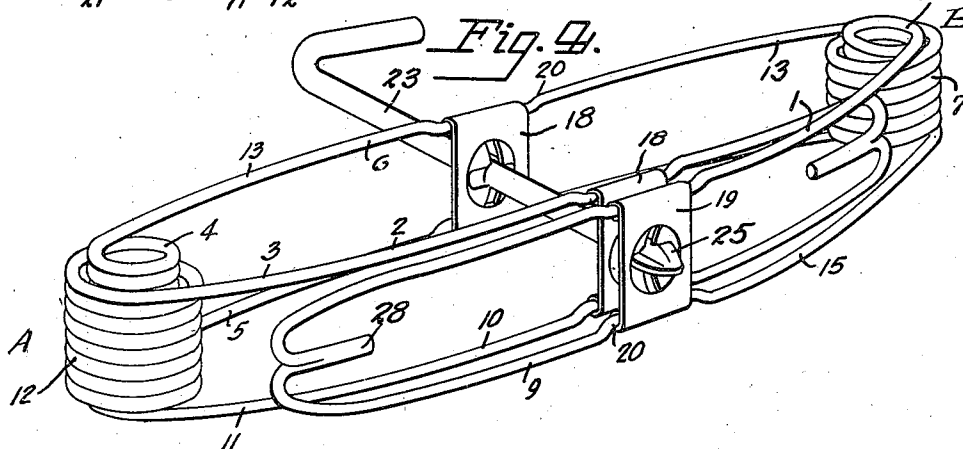
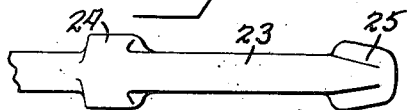


Fig. 11.



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2 Sheets-Sheet 2

Fig. 5.

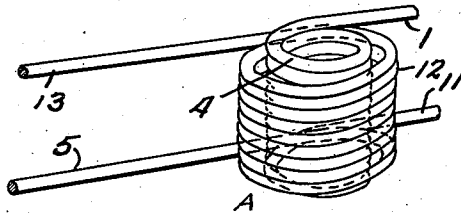
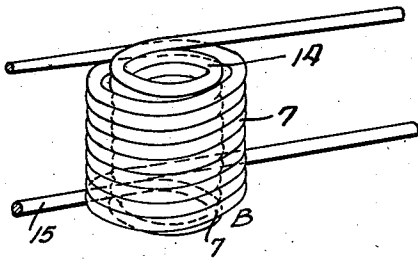


Fig. 6.

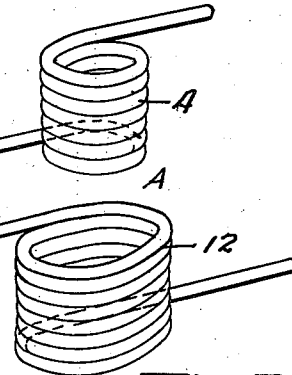
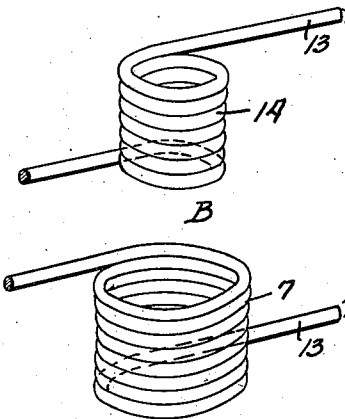


Fig. 7.

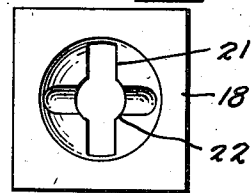


Fig. 8.

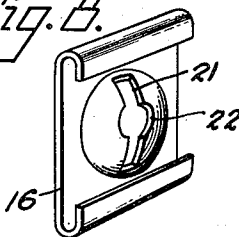


Fig. 9.

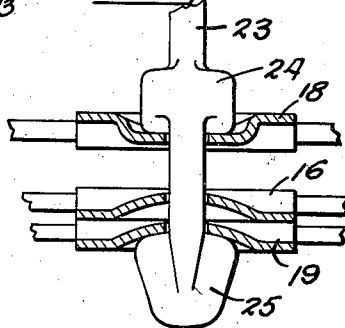
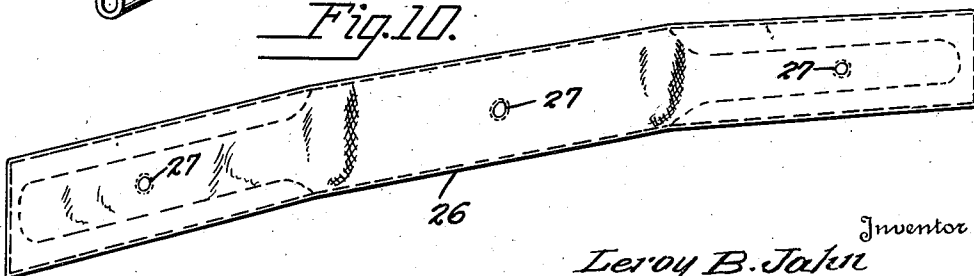


Fig. 10.



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UNITED STATES PATENT OFFICE

2,405,356

SPRING CONSTRUCTION

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10 Claims. (Cl. 267—1)

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This invention is directed to a spring construction designed particularly for use in a distending member but completed for use in other primary associations with other and different elements requiring spring action.

In the primary use as a distending member, the improved spring construction is particularly useful in compelling an immediate and automatic distension of a parachute in initial release from the pack to provide a sufficient spread of the parachute to insure a material shortened period of air distension, so that the user, following operation of the rip cord, is properly air borne in a much shorter period than otherwise possible. It is to be distinctly understood, however, that the improved spring construction is capable of and effectively serviceable in other and varied uses, and any and all such are to be considered as forming part of the present invention.

The primary object of the present invention is the provision of at least two sets of spring elements properly connected by spaced integral rod-like lengths forming a center arm, with each of the spring elements further provided with integral rod-like lengths forming end arms, to be operated by the spring tension, with each of the spring elements made up of inner and outer coils so related to the relative rod-like lengths as to be tensioned by such arms.

More specifically, the respective inner and outer coils are so formed from the lengths making up the center arm and end arms, that each length of the pair making up the center arm is merged at one end into forming one end of an inner coil, for example, and at the opposite end is merged into the similar end of the outer coil, with the other end of the arm reversed in respective coil formation, the remaining ends of the respective coils being continued beyond the coils to form the respective lengths of the end arms.

In other words, a single length of wire of sufficient rigidity is formed a sufficient length from the free end to provide an end arm, is formed into an outer coil of one spring set, then projected a sufficient length to form the center arm, again formed into the inner coil of the other spring set and projected beyond such coil to form one strand of the other end arm. The other length of wire, starting from the same original end of the structure, is arranged in spaced relation to the first wire to form therewith one end arm, and formed to provide an inner coil of one spring set, and from the end of this coil projected to form the outer spring coil of the

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other set, and then projected to form the remaining strand of the other end arm. Thus the strands at the same sides of the end arms are in alignment and form the inner and outer coils of the respective spring sets, while the lengths of strands forming the center arm are offset from the lengths forming the end arms and integral at one end with the inner coil of one spring set and at the opposite end with the outer coil of the other spring set. Thus one of the respective strands of the end arms and center arm is formed to first provide a relatively straight arm length, then coiled to provide say an inner coil of one spring axially at right angles to the arm length, then projected to form center arm length, then formed to provide an outer coil of the other spring set, and finally projected to form the remaining end arm length. Considered from the same end, the other strand is similarly formed except that the first spring formation is as an outer coil encircling somewhat loosely the first formed inner coil, and the second spring formation is as an inner coil fitting somewhat loosely within the first formed outer coil.

The primary object of the present invention, therefore, is the provision of a spring construction involving spaced coil sets of inner and outer coils simultaneously contracted when tensioned, with the inner coils, incident to its greater set when tensioned than that of the outer coil, draws the finished ends of the outer coils in and automatically creates a circular form of such outer coil ends to set the respective coils of each set for best non-distorting tensioning.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a plan of the improved construction showing the same distended.

Figure 2 is a similar view with the parts under tension.

Figure 3 is an elevation of the same with parts under tension, parts being broken out.

Figure 4 is an enlarged perspective view of the spring construction showing the parts temporarily locked under tension.

Figure 5 is a broken perspective view, showing particularly the relations of the coils in each spring set.

Figure 6 is a similar view, the coils of each spring set being separated to clearly illustrate each coil.

Figure 7 is a plan view of a tie plate.

Figure 8 is a perspective view of a tie plate.

Figure 9 is a plan view, partly in section, showing the locking key in operative position.

Figure 10 is a perspective view of a casing for the improved spring construction in some uses thereof.

Figure 11 is a broken plan of the locking key.

The spring construction of this invention is made of two appropriate lengths of rod-like material, such as wire of necessary rigidity. Reading the drawing in Figure 3 from left to right, one end of the one wire length 1 is first extended for a distance desired to form upper strand 2 of one end arm 3 of the construction. The wire length 1 is then formed at the end of strand 2 into an outer spring coil 12 of one spring set A, the axis of which is normal to strand 2. The wire length 1 at the opposite end of the coil 12 is projected to form the lower strand 5 of the center arm 6, and then formed into the inner coil 14 of the other spring set B, the axis of which coil 14 is parallel to that of coil 12. The wire length 1, beyond the end of coil 12, is projected to form the upper strand 8 of the other end arm 9.

Considered from the same end, the other wire length 10 is projected to form the lower strand 11 of end arm 3 and then formed into the inner coil 4 of spring set A, which somewhat loosely fits within coil 12. The wire length from the opposite end of coil 4 is projected to form the upper strand 13 of the center arm 6, then formed to provide an outer coil 7 of the other spring set B outwardly of and slightly spaced from the coil 14, then projected to form the lower strand 15 of the end arm 9.

The strands of the end arms 3 are secured in rigid spaced relation by a tie plate 16, the strands being preferably offset at 17 to hold the tie plate against movement longitudinally of the strands. Similar tie bands 18 and 19, secured in offsets 20, cooperate respectively with the strands of the center arm 6 and end arm 9.

The coils of the respective sets are tensioned by folding the end arms 6 and 9 in superimposed relation on the center arm, and the tie bars 16, 18 and 19 are so placed as to register when the arms are so folded. These tie plates, more particularly in the use of the spring construction in parachutes, are formed with slots 21, with side indentations 22, and a key 23 is provided with a collar 24 to bear against the tie plate at the top of the assembly and with a ward 25 to pass through the aligned slots 21 of the superimposed tie plates and hold the arms 3, 6 and 9 in superimposed relation and the coils of the spring sets A and B under tension. The indentations 22 enlarge the slots at a particular point to permit and localize the passage of the key in use and hold such key against bodily movement in a direction lengthwise of the slots.

In the use of the spring construction in a parachute, for example, two such spring constructions are housed in fabric casings 26, having openings 27 to expose the slots 21, and are secured by such casings 26 to diametrically-opposite portions of the free edge of the parachute. When the parachute is to be folded into pack form, the parts of each spring construction are folded and locked by the key 23. After being folded and strapped into pack form, the keys 23 are withdrawn, the folds of the parachute holding the spring constructions in coil tensioning folded condition.

When the pack fold is released by the usual rip cord, the spring constructions are free, and the

coils act to spread the end arms. This immediately and automatically opens opposite portions of the parachute to provide pockets for initial air entrance. This results in practically immediate full air distension and spread of the parachute, enabling safe jumping from lower altitudes than heretofore possible. If desired, and as preferred, the ends of the wire lengths may be turned inwardly at 28 and secured together. This provides rigidity and avoids wearing of fabric with which the construction may be used.

The important characteristic of the improved spring construction is that in folding the end arms onto the center arm, the small coil of each spring set A and B is less reduced in diameter when tensioned than is the larger coil, and as both coils are similarly responsive in tensioning, the smaller coil of each set A and B draws the finished end of the larger coil in, and automatically creates a circular form of such larger coil in more or less close contact with the inner coil. This insures complete and forceful spreading action and maintains most effective spring-coil form under strain of tensioning.

Of course, when the improved construction is to be used for other purposes, the length of the end and center arms, the size and strength of the material may be varied to suit the particular use so long as the form and relation of the inner and outer coil of each spring set is maintained.

What I claim is:

1. A spring construction, comprising two lengths of spring wire, each wire being formed at each of spaced points to provide one spring coil of a concentric combined inner and outer coil-spring set, each wire being formed at one point with one size spring coil of one set and at the other point with another size spring coil of the other set.

2. A spring construction, including spaced spring sets, each comprising spaced independent inner and outer concentric spring coils, and members extending between, connecting and forming part of the coils of the spring sets and extending beyond each spring set relative to the other spring set, each of said members being connected with an inner spring coil of one spring set and with an outer spring coil of the other spring set.

3. A construction as defined in claim 1, wherein the respective lengths of spring wire between and beyond the formed spring coils are secured together to provide relatively rigid center and end arms.

4. A construction as defined in claim 1, wherein the respective lengths of spring wire between and beyond the formed spring coils are secured together to provide relatively rigid center and end arms, the end arms being movable as coil tensioning members.

5. A construction as defined in claim 1, wherein the wire lengths between and beyond the spring sets are connected to provide respectively center and end arms, the end arms being selectively movable to simultaneously tension relatively different coils of both spring sets.

6. A spring construction, comprising two lengths of spring wire formed to provide at a distance from the ends spaced spring coils, with said coils of relatively different diameter, the coils of larger diameter of both lengths of spring wire encircling the coils of smaller diameter of such lengths.

7. A construction as defined in claim 6, wherein the lengths of spring wire between and beyond the coils are rigidly connected to provide respec-

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tively center and end arms, the end arms being movable to tension the coils.

8. A construction as defined in claim 6, wherein the lengths of spring wire between and beyond the coils are rigidly connected to provide respectively center and end arms, the coils bridging the space between the wire lengths forming the arms.

9. A construction as defined in claim 6, wherein the lengths of spring wire between and beyond the coils are rigidly connected to provide respectively center and end arms, the end arms being movable to tension the coils, and means for securing the end arms in coil-tensioning positions.

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10. A construction as defined in claim 6, wherein tie plates connect the wire lengths between and beyond the coils into relatively rigid center and end arms respectively, the end arms being movable into registry with the center arm to tension the coils, the tie plates in the tensioning positions of the end arms aligning with the center-arm tie plates, and removable means for securing such tie plates in such aligned positions.

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