

June 17, 1958

H. H. NORMAN ET AL
BULK ROLL OF ZIGZAG SPRING WIRE
AND METHOD OF MAKING SAME
Filed Sept. 1, 1955

2,839,187

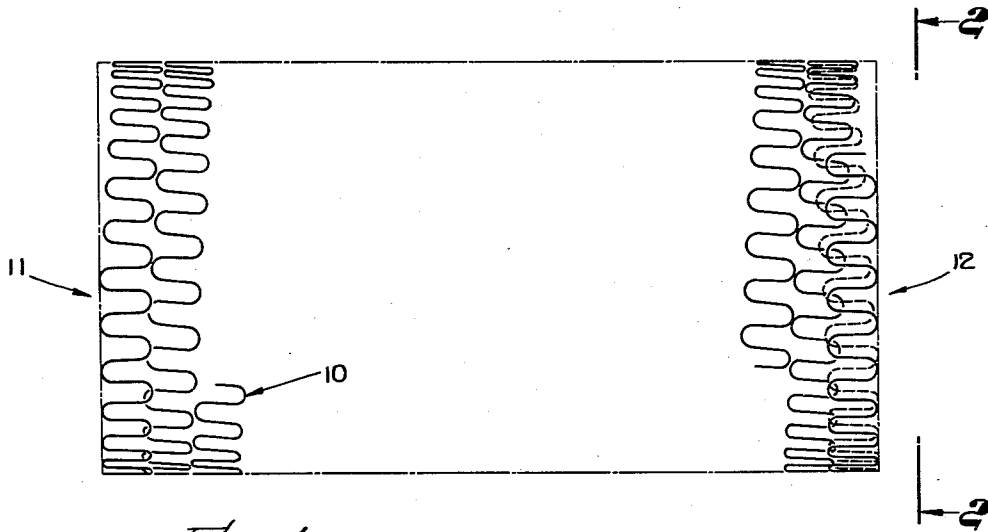


FIG. 1.

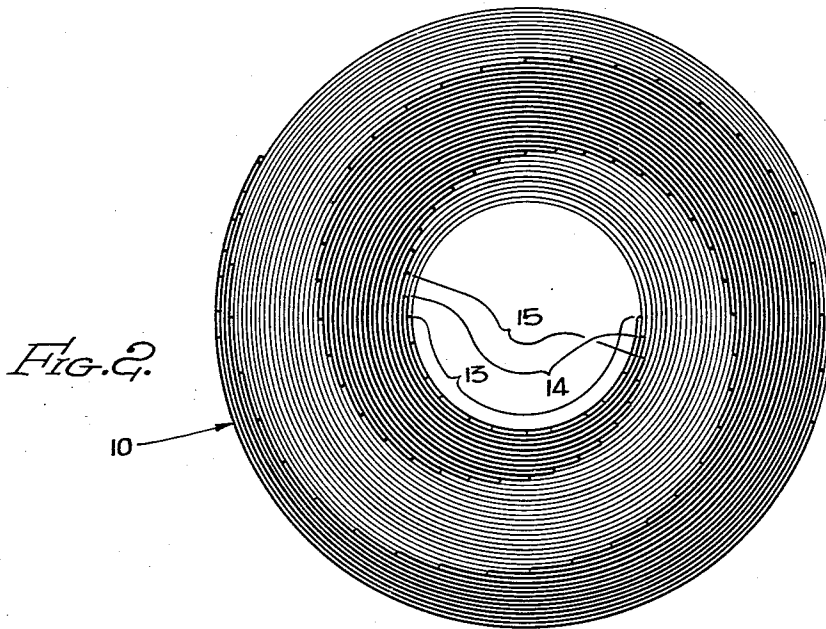


FIG. 2.

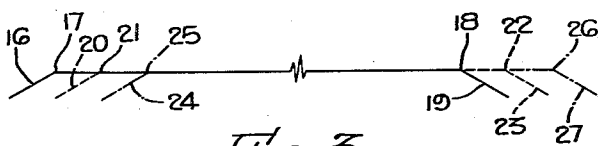


FIG. 3.

HARRY H. NORMAN,
HARRY B. SKLAR,
INVENTORS

BY

Hazard & Miller

ATTORNEYS

1

2,839,187

BULK ROLL OF ZIGZAG SPRING WIRE AND METHOD OF MAKING SAME

Harry H. Norman and Harry B. Sklar, Los Angeles, Calif., assignors to Zig Zag Spring Company, Los Angeles, Calif., a partnership

Application September 1, 1955, Serial No. 532,047

4 Claims. (Cl. 205—59)

This invention relates to a bulk supply roll of zigzag spring wire and to the method of making the same. The invention may be regarded as an improvement or further development of the invention disclosed in our application for United States Letters Patent Serial No. 442,232, filed July 9, 1954, entitled Method and Apparatus for Producing a Roll of Wound Spring Wire and the Resulting Product.

As disclosed in the above-mentioned application, springs have heretofore been manufactured in the form of strips of sinuous or zigzag spring wire. These strips are formed of wire possessing the proper ingredients and carbon content so that they may be normalized or stress-relieved to develop their spring characteristics to the fullest extent after the wire has been shaped. In their normal or unstressed condition these strips are longitudinally arched and are straight, and when applied to a seat frame, such as an automobile seat or a furniture seat, the strips are secured at their ends to the seat frame and are usually flattened or prestressed from their normal arched condition so that the arching of the spring is somewhat flatter than in the unstressed condition.

The above-mentioned application discloses our proposal to supply this type of spring wire in the form of a bulk supply roll wherein the wire is wound or spooled into the form of a roll of indefinite length which can be supplied to a furniture manufacturer and springs of the required length can be cut therefrom from time to time as occasion may require. In winding or spooling the wire into the form of a supply roll the wire is wound onto a core whose radius is equal to or slightly less than the radius of curvature of the arch of the wire. An initial course of the wire is helically wound on the core from one end of the core to the other and after a short dwell period during which the wire is wound about the core without any helix a second course of wire is wound over the first course in the opposite direction across the core to the first end thereof. Following a short dwell period at the first end during which no helix is imparted to the wire, a third course is wound over the second from the first-mentioned end of the core to the other and in the same direction as the first course. The wire is thus wound back and forth over the core until the roll is completed, following which the roll is removed from the core and may be stored or shipped as a bulk supply roll of longitudinally arched sinuous or zigzag spring wire.

When the bulk supply roll is removed from the core the innermost convolutions, if wound on a core having a smaller radius than the radius of curvature of the normal arch of the spring wire will tend to expand. Outer convolutions of the roll which due to the increase in size of the diameter of the roll are necessarily flexed and caused to assume a radius of curvature greater than the radius of curvature of the longitudinal arch. These outer convolutions consequently tend to return to their normal condition and consequently contract on inner convolutions. In this manner the roll is held by the springiness

2

of the arched wire itself in a compact and self-sustaining roll. Although the wire is laterally flexed while in roll form, due to the formation of right and left-hand helices in the course of winding it on the core the lateral flexing is not so great that the wire is caused to adopt a permanent set. Consequently, when one or more lengths of the wire are withdrawn from the roll and are cut to spring lengths these instantly return to their longitudinally straight shape.

We have found that if there are no dwell periods at the ends of the core during which the wire is wound straight and without helix and that if at the completion of one course the succeeding course is immediately started with a helix in the opposite direction that the wire may become laterally flexed at the point of immediate reversal to such an extent that it will tend to shorten the overall length of the roll. For this reason, we prefer to have a dwell period at the ends of the core during which the wire is not helically wound in either direction. This dwell period extends for approximately 180° around the core. If these dwell periods in succeeding courses are in direct alignment with each other considered radially of the roll, we find that when the roll is removed from the core the ends of the complete roll will not be normal or at right angles to the axis of the core but instead, will be inclined thereto. Consequently, if the roll, after it is removed from the core, is positioned on end the roll will tend to lean. On the other hand, if the dwell portions at the ends of the roll are completely disaligned with each other in succeeding courses, we find that the roll is sufficiently loose at its ends so that wraps at the ends will no longer be tight and will tend to "fall off" over the ends of the roll.

A primary object of the present invention is to provide a bulk supply of arched, normalized sinuous or zigzag spring wire wherein the wire is so wrapped on the core that the dwell periods at the ends of the roll will, in succeeding courses, be disaligned with respect to the dwell periods of subjacent courses but still largely in overlapping relationship. In this manner, when the completed roll is removed from the core it will be axially straight and will not tend to lean if positioned on end. Furthermore, these dwell portions which are of substantial length will tend to contract and grip on relatively solid dwell portions of subjacent courses and consequently convolutions of the wire at the ends of the roll will not tend to "fall off."

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a view in side elevation of a bulk supply roll of longitudinally arched sinuous or zigzag spring wire which has been normalized or stress-relieved, and which has been wound in accordance with the present invention;

Fig. 2 is a view in end elevation of the same; and

Fig. 3 is a diagrammatic development of three superposed courses at one end of the roll.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the spring wire 10 from which the roll is formed is bent into sinuous or zigzag shape. This wire is formed of spring wire stock of appropriate ingredients and carbon content so that it will develop its spring characteristics when subjected to stress-relieving or normalizing treatment. The spring wire stock, after having been bent into its sinuous or zigzag shape is then caused to pass over an arching roll which longitudinally arches it on a uniform radius of curvature. Thereafter, the wire is brought to a normalizing or stress-relieving temperature, and in so doing the wire is first looped or

coiled; first, in a left-hand direction and thereafter in a right-hand direction so that the finished strip of wire which is of indefinite length, is longitudinally straight except for the arching. The radius of curvature of the arch is uniform throughout the length of the strip.

In winding the wire strip to produce a bulk supply roll in accordance with the present invention, one end of the strip is attached to a core whose radius of curvature is either equal to or less than the radius of curvature of the arch. A first course of wire is wound on the core from the end 11 to the end 12 with adjacent convolutions disposed in side by side relationship and without overlap. At the end 12 a dwell period of preferably 180° occurs during which the wire is merely wound circumferentially on the core without helix in either direction. Such dwell period is indicated on Fig. 2 by the bracket 13. At the end of the dwell period the wire is then wound helically over the first course from the end 12 to the end 11 and on reaching the end 11 it undergoes a second dwell period of approximately 180° and is then wound helically to form a third course overlying the second from the end 11 to the end 12. On reaching the end 12 the wire is wound without helix through an arc of approximately 180° indicated by the bracket 14 on Fig. 2. Succeeding courses are wound on the core over the mentioned courses of the same manner and as the overall diameter of the roll increases in size, it will be appreciated that outer convolutions in the roll will be flexed slightly and caused to assume an arched condition that is somewhat flatter than the normal curvature of the spring wire. In other words, outer convolutions on the roll will be caused to assume a radius of curvature equal to the radius of the outer portion of the roll, and this radius is somewhat greater than the radius of curvature of the normal arch imparted to the wire and is greater than the radius of the core. Consequently, outer convolutions or outer courses intending to return to their normal condition will tend to contract on inner courses and inner convolutions will hold the roll in a self-sustaining condition when removed from the core. As the innermost courses or convolutions are wound on a core whose radius is smaller than the radius of curvature of the arch, these inner convolutions will tend to expand when the roll is removed from the core, and these expanding convolutions cooperate with the outer contracting or hugging convolutions in holding the roll in a self-sustaining condition. This is aided by the fact that succeeding courses are helically wound first in one direction and then in the other, and the expansion of inner courses and the contraction of outer courses so wound tends to bind the roll into a stiff, self-sustaining compact article.

It will be noted that the dwell period 14 which is at the end of the second course, overlies the dwell period 13 at the beginning of the first course but is not in direct radial alignment therewith. In other words, the ends of the dwell period 14 trail behind the ends of the dwell period 13. The major portion of the dwell period 14 overlies the dwell period 13. At the end of the fourth course there is a dwell period 15 which has its ends trailing behind the dwell period 14 and the largely overlapping, but disaligned, dwell periods at the ends of the roll continue outwardly until the roll is completed. The result is that at each end of the roll there will be largely overlapping dwell periods somewhat as illustrated on Fig. 2, which cooperate to form a type of spiral configuration wherein each dwell period is contracting upon and is in direct engagement with the dwell period of the subjacent course. Consequently, when the roll is removed from the core it will be found to retain its generally cylindrical shape and will not lean if positioned on end as would be the case if the dwell periods 14 and 15 were in direct radial alignment with the dwell period 13. Also, end convolutions on the roll will not tend to fall off as would be the case if the dwell period 14 were

spaced 180° from the dwell period 13 and the dwell period 15 were spaced 180° from the dwell period 14 and in direct alignment with the dwell period 13.

Considering Fig. 3 as a development of a typical group of three courses, at one end of the roll the inner course approaches the end in a helical manner as indicated at 16 and on encountering the end of the spool, the dwell period occurs from point 17 to point 18 following which the wire is wound in a helical manner in the opposite direction as indicated at 19. The next course, after the course that is commenced at 19, concludes at 20 and the dwell period is shown as existing between 21 and 22. Points 21 and 22 are spaced and in trailing relationship to the points 17 and 18, respectively. From the point 22 a course 23 commences and the next succeeding course thereafter concludes at 24. This course has its dwell period commence at 25 and conclude at 26, following which a succeeding course commences at 27.

With this arrangement the spiral formation of the staggered but largely overlapping dwell periods at the ends of the roll is developed so that the completed roll will not only possess its self-gripping and self-sustaining condition as above described, but it will be axially straight or substantially so and there is no tendency for convolutions at the ends of the roll to "fall off."

Various changes may be made in the details of construction without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A bulk supply roll of longitudinally arched zigzag spring wire which in its unstressed condition is uniformly arched to a single radius of curvature consisting of a plurality of courses of wire helically wound first in one direction from one end of the roll to the other and then in the other direction from said other end to the first-mentioned end, portions of the wire between reversals of the direction of the helices at the ends of the roll extending approximately 180° around the circumference of the roll, said portions in each course partially overlapping the corresponding portion in the subjacent course but being in staggered relation thereto, the innermost convolutions of the roll having a radius of curvature less than the radius of curvature of the arch of the spring wire when in unstressed condition so that these convolutions tend to expand against outer convolutions wound thereover, the outermost convolutions of the roll having a radius of curvature greater than the radius of curvature of the arch of the spring wire when in unstressed condition so that these convolutions tend to contract against inner convolutions therebeneath.

2. A bulk supply roll of longitudinally arched zigzag spring wire which is uniformly arched on a single radius of curvature when in unstressed condition consisting of a plurality of courses of wire helically wound first in one direction from one end of the roll to the other and then in the other direction from said other end to the first-mentioned end, portions of the wire between reversals of the direction of the helices at the ends of the roll extending approximately 180° around the circumference of the roll, said portions largely overlying the corresponding portions of subjacent courses but being progressively displaced from coinciding therewith in the same direction circumferentially of the roll, the convolutions from the innermost courses of the roll having radii of curvature less than the radius of curvature of the spring wire when in unstressed condition so that the innermost courses tend to expand against outer courses and hold the roll in assembled relationship, the outermost courses having a greater radius of curvature than the radius of curvature of the spring wire when in unstressed condition so that the outermost courses tend to contract against inner courses to hold the roll in assembled relationship.

3. A bulk supply roll of longitudinally arched zigzag spring wire uniformly arched upon a single radius of curvature when the wire is in unstressed condition con-

5

sisting of a plurality of courses of wire which has been normalized or stress-relieved and which has been longitudinally arched, helically wound first in one direction from one end of the roll to the other and then in the other direction from said other end to the first-mentioned end, inner convolutions of the roll being wound on a radius of curvature no greater than the radius of curvature of the longitudinal arch of the wire when in unstressed condition, portions of the wire between reversals of the directions of the helices at the ends of the roll extending a substantial distance circumferentially of the roll, said portions in each course partially overlying the corresponding portion in the subjacent course but being radially disaligned with respect thereto, the outermost convolutions having a radius of curvature greater than the radius of curvature of the wire when in unstressed condition so as to contract upon inner courses to hold the roll in assembled relationship.

4. The method of winding a bulk supply roll of uniformly arched zigzag spring wire which consists of winding helically on a core first in one direction and then in another superposed courses of wire, winding portions of

6

the wire at the ends of the roll circumferentially of the roll but without helix and causing the portions mentioned in each course to overlie major portions of the corresponding portions on a subjacent course but without being in radial alignment therewith, and continuing the winding until outer courses have radii of curvature greater than the radius of curvature to which the wire has been arched in its unstressed condition so that the outer courses will contract upon subjacent courses and hold the roll in assembled relationship.

References Cited in the file of this patent

UNITED STATES PATENTS

1,401,904	Griffin	Dec. 27, 1921
2,123,798	Podany	July 12, 1938
2,158,889	Annicq	May 16, 1939
2,483,865	Zimmerman	Oct. 4, 1949
2,604,986	Berg	July 29, 1952
2,614,764	Annicq	Oct. 12, 1952
2,639,097	Scott	May 19, 1953