July 16, 1940. R. C. PIERCE 2,208,052

MANUFACTURE OF RESILIENT SPRINGS

Original Filed April 17, 1936

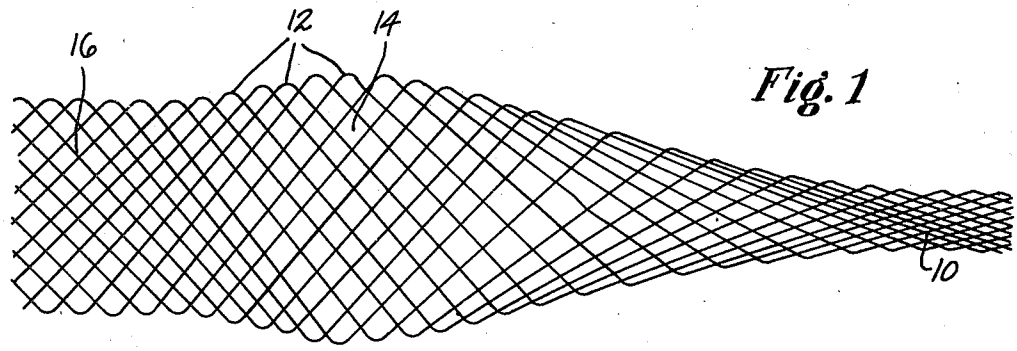


Fig. 1

Fig. 2

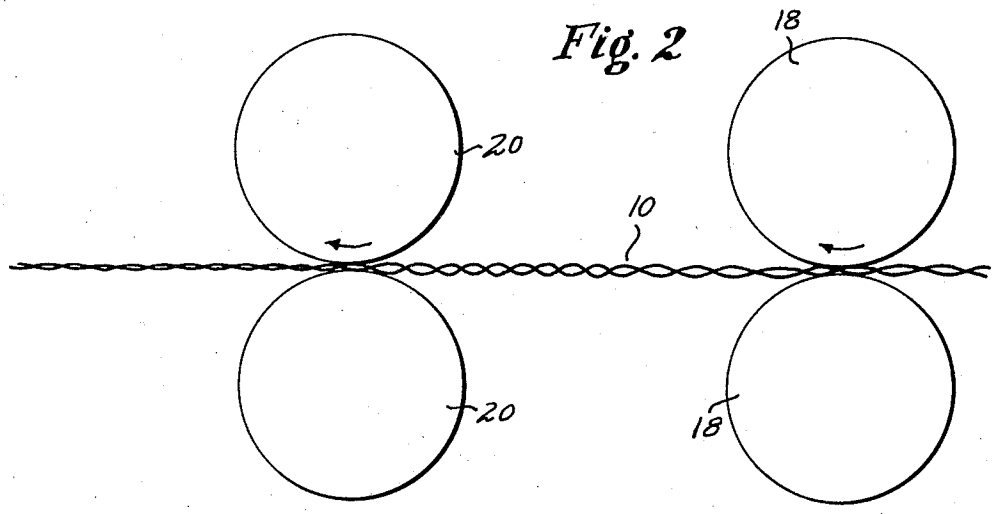


Fig. 3

Fig. 4

Fig. 6

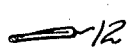
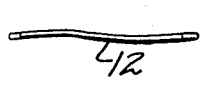


Fig. 7



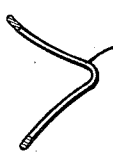


Fig. 5

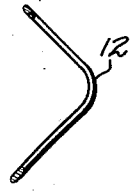


Fig. 8

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MANUFACTURE OF RESILIENT SPRINGS

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Original application April 17, 1936, Serial No. 74,844, now Patent No. 2,137,698, dated November 22, 1938. Divided and this application September 29, 1938, Serial No. 232,265

4 Claims. (Cl. 140—107)

This invention relates to springs and method of making the same and more particularly to resilient springs made of an open mesh braid of steel wire or the like.

One of the objects of the invention is to provide a simple and fast method of forming springs of braided wire. According to one important feature a wire braid is spread to form relatively sharp reverse bends in the wire at the edges of the braid and the wires are then permanently set to form a series of small springs.

Another object of the invention is to provide a spring formed of braided wires having reverse bends at the edges of the braid to form small resilient portions. The total resilience of the spring in this construction is the sum of the resilience of all of the reverse bends.

Other objects, advantages and novel features of the invention will be apparent from the following description of the accompanying drawing in which:

Figure 1 is an exaggerated plan view of a spring according to the invention showing portions incompleted;

Figure 2 is a diagram in side elevation illustrating the method of manufacture;

Figures 3, 4 and 5 are sections showing, before compression, from different points of view, one of the reverse bends of the wire at one edge of the braid; and

Figures 6, 7 and 8 are similar views showing the bend after compression.

The spring of the present invention is formed of a flat braid 10 of wires passing alternately over and under each other diagonally across the braid with relatively flat reverse bends at the edges of the braid and with all of the wires extending the full length of the braid. The wires are preferably of cold-drawn high carbon steel, which can be "set" in the desired spring formation by compressing the bends at the edges of the braid beyond the elastic limit of the steel, without further treatment. Good results can be obtained, however, by using lower carbon steel such as .45% or .50% carbon steel and tempering it after compression by heating it and quenching it in oil.

In carrying out the method the braid is first spread to increase the sharpness of the reverse bends as indicated at 12 and while so spread is compressed beyond the elastic limit of the wire to "set" the bends. Preferably the braid is spread beyond its ultimate width as shown at 14 and after compression is allowed to spring back slightly to its ultimate width as shown at 16.

The spreading and compressing steps may be performed by spaced sets of rolls 18 and 20 engaging the flat sides of the braid and driven in the same direction with the rolls 18 turning faster than the rolls 20. This causes the braid to be compressed lengthwise to spread it widthwise, suitable guides, not shown, preferably being provided between the sets of rolls to prevent the braid from buckling. The rolls 20 engage the braid with a heavy pressure to compress the reverse bends at the edges of the braid beyond the elastic limit of the wire to "set" them so that the braid will permanently retain its spread shape. These rolls 20 may be faced with rubber or the like which will yield sufficiently where the wires cross each other to insure that the edges will be adequately compressed or may be of reduced diameter at their center portions as more fully disclosed in my copending application, Serial No. 74,844, filed April 17, 1936 of which this application is a division.

As illustrated more fully in Figs. 3 to 8, the reversed bends 12 prior to compression are in the form of partial loops and the compression step flattens these loops into the plane of the braid and at the same time stresses the wires beyond their elastic limit so that they will take a permanent set. After compression, the braid has the permanent spread form indicated at 16 and is elastic in tension, its resilience being the sum of the resilience of all of the reverse bends. If a low carbon steel wire has been used, the braid is tempered after compression by being heated and quenched in oil.

If desired the spreading operation may be interrupted periodically along the length of the braid by periodically separating the rollers 20 to provide unspread portions through which the braid may be cut and which may be used for connection to suitable fastening devices.

While one embodiment of the invention has been illustrated and described in detail, it is not intended to limit the scope of the invention by that description nor otherwise than by the terms of the appended claims. This application is a division of my copending application Serial No. 74,844 filed April 17, 1936, now matured into Patent No. 2,137,698 issued November 22, 1938 which is in turn a continuation in part of my copending application Serial No. 41,199 filed September 19, 1935.

What is claimed is:

1. The method of making a resiliently extensible spring which comprises forming an open-mesh braid of wires passed alternately over and

under each other diagonally across the braid and formed at the edges of the braid with reverse bends, and compressing said bends heavily enough permanently to "set" them, whereby the braid forms a spring structure whose resilience is the sum of the spring action of all of said "set" bends.

2. That method of making a resiliently extensible spring which comprises forming an open-mesh braid of wires passed alternately over and under each other diagonally across the braid and formed at the edges of the braid with reverse bends, and spreading said braid to a width slightly greater than the desired final width of the spring, compressing said bends while the braid is so spread heavily enough permanently to "set" them, and allowing the braid to contract widthwise to its natural width, whereby the braid forms a spring structure whose resilience is the sum of the spring action of all of said "set" bends.

3. That method of making a resiliently extensible spring which comprises forming a flat braid of wires passed alternately over and under each other diagonally across the braid, compressing said braid longitudinally to spread it laterally and open up the braid so that the wires take relatively sharp reverse bends at the edges of the braid, and stressing said reverse bends beyond the elastic limit of the wire while the braid is so spread to "set" them whereby the braid forms a spring structure whose resilience is the sum of the resilience of all of said set bends.

4. A resiliently extensible spring comprising an open-mesh braid of steel wires passing alternately over and under each other diagonally across the braid and having each wire bent back at the points where it reaches the edges of the braid in permanently-set spring bends compressed beyond the elastic limit of the steel to bring the parts of the wire substantially into a plane, such bends forming spring elements whose total resilience is the resilience of the spring.

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