

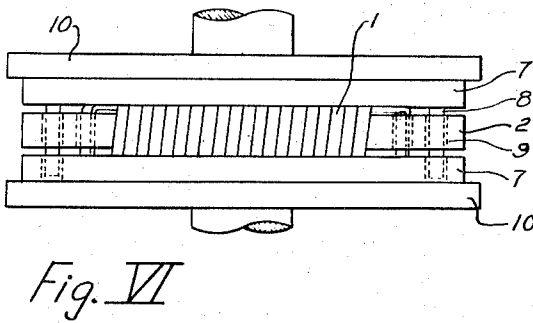
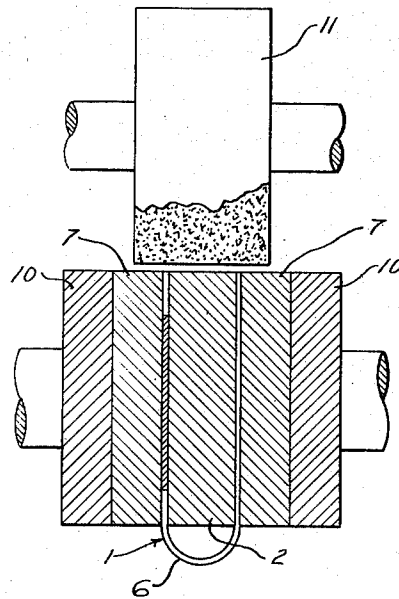
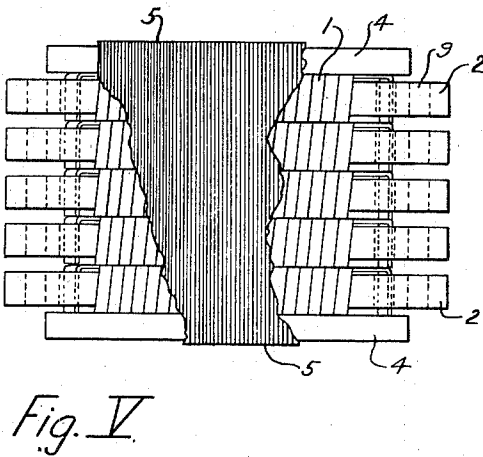
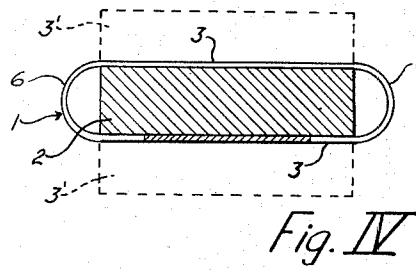
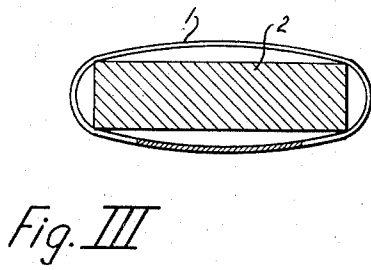
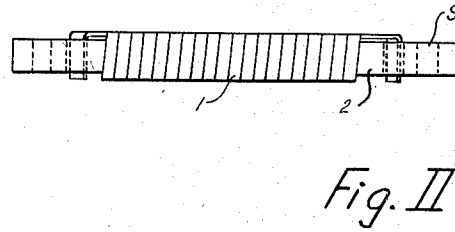
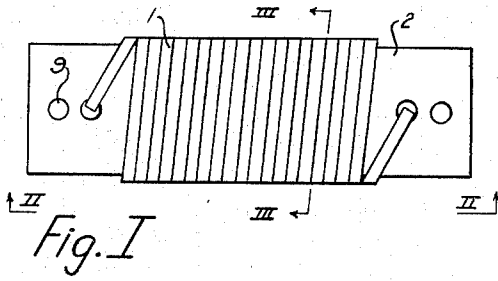
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2,363,113

SPRING FORMATION

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SPRING FORMATION

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5 Claims. (Cl. 29-173)

This invention relates to springs and has particular reference to springs formed in quantity with dimensional uniformity and the method of producing such springs.

An object of this invention is to provide, simply and inexpensively, springs of dimensional uniformity in quantity.

Another object is to simultaneously form a quantity of substantially flat springs of uniform and equal dimensions.

Another object is to provide a method of forming springs including the steps of winding a relatively long section of material about a holder and severing each turn of the winding.

Another object is to provide a method of forming substantially flat springs including the steps of winding a relatively long and narrow flat spring about a holder having at least one substantially flat surface, heat treating the holder and spring thereon and thereafter severing at least a portion of the flat surface overlying section of each turn of the winding.

Other and further objects will be clearly apparent from the following specification and from the drawing.

Referring to the drawing:

Fig. I illustrates a holder and spring wound thereon, as embodied in this invention;

Fig. II is an elevation taken on line II—II of Fig. I;

Fig. III is a section taken on line III—III of Fig. I;

Fig. IV is a view similar to Fig. III, showing the wire contour when under compression as in Figs. V, VI and VII.

Fig. V is an illustration of the stacking of a group of spring wound holders preparatory to the heat treatment of this invention;

Fig. VI is an illustration of the clamping of a spring wound holder of this invention, after heat treatment and preparatory to cutting the spring into short lengths; and

Fig. VII is an illustration of the operation of cutting the spring to length, showing one cut as completed.

This invention is particularly directed to springs and the method of forming them wherein the unprocessed spring is in the form of a coil of relatively flat, long and narrow material, and the finished springs are relatively short, flat, uncurved and uniform with each other in particular with respect to length dimension. Although many variations of the contour, shape and dimension of the finished springs as well as the method of making them and their uses are readily possible, for

the purposes of illustration of the invention, the following description will deal with relatively short, flat, and uncurved springs.

The finished spring is a flat piece of wire approximately .003" x .020" x 1.00" and when producing these in quantity it has heretofore been difficult to keep within the allowable .003" tolerance in length. The present method overcomes the difficulties heretofore presented and produces 10 springs of exact length in lots of 5,000. This, of course, could be varied with the size and quantity of the necessary apparatus, but for a disclosure of the method the daily production of 5,000 will be sufficient.

Such springs may be made from flat coiled wire strips whose dimensions are approximately .003" x .020" and any desired length. The raw material is processed spring wire in suitable length. It is generally furnished in spools and must be absolutely clean. As an illustration of this invention such wire may be wound in tight spiral like contour about steel strips whose dimensions are approximately 10" x 1/8" x 1". From such a winding 1000 1" long straight sections of the spring may be obtained.

It is to be understood, however, that this invention is not limited to wire or strips of small dimension.

The process briefly comprises stacking and heat treating a group of such spring wound steel holder strips under compression on the 1" sides thereof, and thereafter clamping each holder strip with the heat treated wire thereon, on the 1" sides and grinding off those parts of the spring winding which form the end sections, or those which, at least in part, overlie the 1/8" faces of the holding strips.

Fig. III illustrates a coil of the wire 1 wound on the holder 2 and shows the coil as it appears when not under compression, and Fig. IV illustrates the difference in contour of the spring under compression as in Figs. V, VI, and VII, and shows the flat portions 3, which, when cut off, form the finished short straight springs.

The spring 1 is first wound about the holder 2 in a tight spiral like contour. The width dimension of the spring being only .020", the pitch of the spiral is minute, and the uniformity of length of the finished short springs is not affected thereby.

Having wound the long springs 1 about the holders 2, a group of these spring wound holders are stacked on each other as shown in Fig. V and clamped between end plates 4 and held by wire windings 5 or other suitable holding means.

This clamping action on the wire 1 flattens it against the holder 2 as at 3, Fig. IV, through the action of compressors 3' and extends the end loops as at 6, Fig. IV.

The stack of spring wound holders is then heat treated to harden and set the spring 1 to its compressed form as shown in Fig. IV.

Subsequent to this heat treatment, each of the spring wound holders is clamped between end plates 7 having aligning dowels 8 extending through dowel openings 9 in the holders 2, and this assembly is mounted in a chuck 10 of a grinding machine in such a manner as to provide access to the end loops 6 for a grinding wheel 11.

The end loops 6 are then ground off on both sides of the holder 2 flush with the edges of the holder 2 and clamps 7 and 10. Accuracy in the length dimension of the finished springs may, in some instances, be more easily obtained if the end loops 6 are so ground off as to also grind away a part of the edge of the holder 2, to a depth of the order of .0005".

Upon removal from the clamps a group of substantially flat, hardened, short springs of uniform dimension are obtained, representing the straight portions 3, Fig. IV, of the wound wire 1.

It is to be understood that many variations in dimension, winding, stacking and the like may be used if desired, as for instance the stack of holders of Fig. V may be doweled for position as is the holder of Fig. VI, or the holders may be clamped and heat treated singly or clamped and ground in groups, as is desirable or convenient to suit particular conditions, such as furnace size or grinding machine dimension or capacity.

It is to be understood that wire or other suitable material of circular, elliptical, or other cross section may readily be wound about a holder and severed instead of the flat spring used herein as an illustration of the invention.

Also the finished form of the relatively short, cut out pieces of the long spring may be other than straight in their length dimension. They may be, for example, semi-circular, part of an ellipse, or other desired form providing that the holder and clamping members are formed to the desired finished contour of the springs.

The method of this invention accordingly provides comparatively simple, inexpensive and quick means of forming short flat springs in large quantities and with sufficient uniformity of dimension as to be readily duplicable in precision devices.

What I claim is:

1. A method of forming a plurality of straight spring strips of substantially exact uniformity, consisting in providing a holder having a flat face conforming in width to the length of the desired spring strips, winding a length of material on said holder to cause the material to conform to

the flat surface of the holder, clamping the material on the holder to fix the material relative thereto, heat treating the material and holder while in their relatively fixed relation, and severing the winding beyond the flat face of the holder to leave a series of independent spring strips in accurate conformation with the one side of the holder and of exact uniformity in physical characteristics.

2. A method of simultaneously forming a plurality of independent spring strips of exactly uniform characteristics, consisting in providing a holder having opposite flat faces conforming in width to the length of the desired spring strips, winding said length of material on a holder to cause the material to conform to the flat surfaces of the holder, clamping the material with respect to the holder, subjecting the holder and clamped material to heat treatment and removing the portions of the material beyond the flat faces of the holder, to thereby have a series of flat spring strips exactly uniform in length.

3. A method of forming a series of flat spring strips of exact conformity in size and spring function, consisting in rigidly confining an indefinite length of spring material to present and maintain throughout the indefinite length of material, flat portions of the desired spring strip length and portions connecting the flat portions in successive order, heat treating the formed indefinite length while rigidly confined in the defined formation, and cutting away those portions of the formed length which connect the flat portions to thereby leave the flat portions as independent spring strips of exact uniformity.

4. A method of simultaneously forming a plurality of spring strips of exact relative uniformity, consisting in winding a strip of material of indefinite length on and in conformity with a holder formed to present opposing flat sides of the desired length of the spring, rigidly maintaining the wound relation of the strip and holder, heat treating the strip while rigidly held in conformity with the holder and cutting away those portions of the strip beyond its flat sides while maintaining the rigid conformity of the strip and holder, to thereby leave a plurality of flat spring strips of relative exact physical uniformity.

5. A method of simultaneously forming a plurality of identical spring strips consisting in wrapping a flat wire about a holder to form a series of short straight length and a series of alternate connecting curved portions, maintaining the short straight lengths in close relation to and in exact conformity with the holder, heat treating said wire and holder and removing said curved portions to leave a plurality of identical short straight spring lengths.

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