

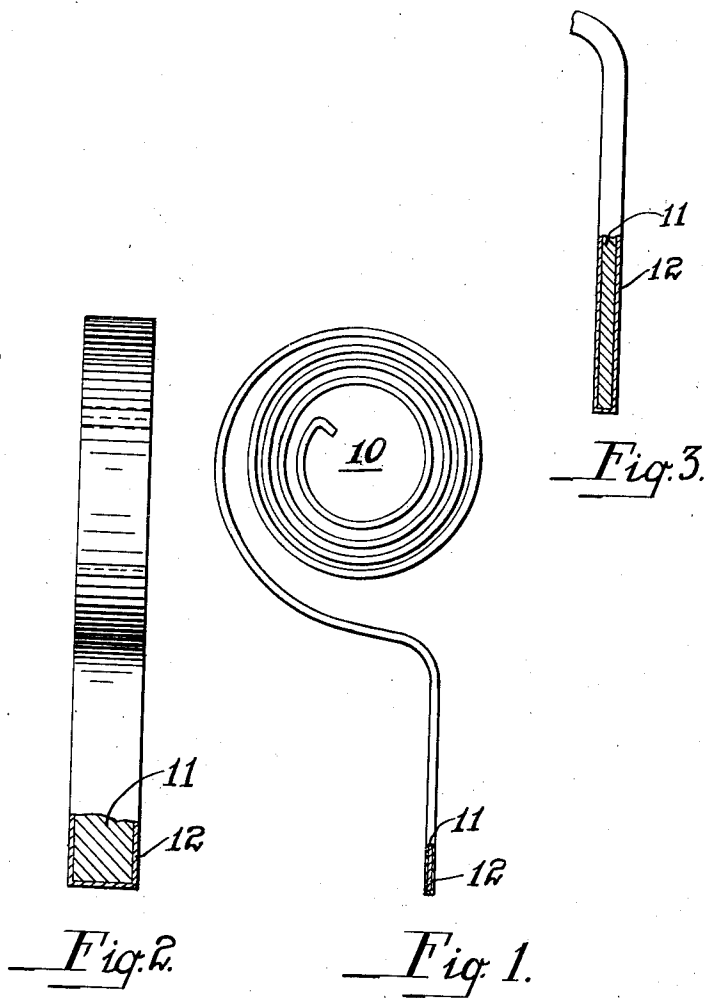
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METHOD OF MAKING NONCORRODIBLE SPRINGS

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METHOD OF MAKING NONCORRODIBLE SPRINGS

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This is a division of my copending application, Serial No. 417,924, filed January 2, 1930.

This invention relates to steel springs and more particularly to a method of making non-corrodible steel springs.

It has been recognized not only as highly desirable but as essential that springs be made free from corrosion, tarnish, oxidation and the like but so far results to achieve such springs have been very unsatisfactory and incomplete. Many methods have been tried such as galvanizing, tin, lead and cadmium plating but even the expensive methods and materials have proved only partially efficient. Moreover, attempts to temper and anneal such springs have proved fatal to the finish and to assist in the deterioration rather than retard the same. Such springs often have a high carbon steel center or core and by such treatments as above outlined either the core or the plating or coating is spoiled. Chemical and physical reactions are enhanced and solid solutions sometimes brought about with concomitant disadvantages. Tempering of the core must therefore be done before the plating or coating but the application of the same ruins the temper, whereas tempering after the plating or coating operation ruins the plating or coating.

I, therefore, have as an object of my invention the provision of a non-corrodible steel spring and a method of making the same.

Another object of my invention is the provision of a steel spring having a core fashioned regardless of corrodibility and a non-corrodible steel alloy envelope, the latter being resistant to deterioration.

Another object of my invention is a method of applying a deterioration-resistant envelope to a steel core so as to obtain the advantages of both without the hitherto accompanying disadvantages.

Other and further objects and advantages will be apparent to those skilled in this art or will be pointed out as the description proceeds.

In the accompanying drawing forming part thereof:

Figure 1 is an elevation of a steel spring

embodying the present invention and having a portion broken away to show the construction thereof;

Fig. 2 is a view taken from the left of Fig. 1; and

Fig. 3 is a view somewhat enlarged of the lower portion of the spring.

Similar numerals refer to similar parts throughout the several views.

The particular embodiment of this invention which has been chosen for purposes of illustration is shown in the drawing as consisting of a steel spring, designated in its entirety by 10. This spring comprises a core 11 of ordinary spring steel and a protective envelope 12 for the core. The envelope 12 has extremely good deterioration-resisting properties, i. e., resistance to rust, corrosion, etc.

One method of fabrication of the embodiment of this invention shown in the accompanying drawing will now be set forth.

First, ingot steel of preferably a steel billet, say a "round" thereof, is prepared having the necessary carbon, tungsten, or other content for spring purposes. This "round" need not be tempered. Next, a non-corrodible metal alloy of steel is given a tubular shape and a sufficient diameter so that it can be slid over the steel "round". The cooperating faces of the steel "round" and the envelope are preferably matched to provide a smooth fit.

To enable those skilled in the art to more readily utilize this invention, a preferred non-corrodible alloy contains, say 8% nickel and 18% chromium. The carbon content may be any suitable one. The steel, which makes up the balance of the percentage, of course, should be as pure as conditions permit.

Now the tube is slid completely over the "round" or preferably shrunk fit thereover in any desired manner so as to form a substantially unitary element. The difference in the coefficient of expansion of the envelope or tube is such as to result in close cohesion of the parts and a strong and practically unitary construction, especially where the core has a relatively higher carbon content than the envelope. The diameter of the "round" may be made approximately equal to the inside diameter of the tube. By heating the tube be-

fore sliding it on, a very tight fit is secured which adheres or welds during the subsequent rolling.

The combination thus formed may be rolled to any suitable shape, such as a "flat" shown in Figures 1 and 2, in one or a plurality of steps and preferably gradually by alternate flattening and rounding reducing steps and then formed into a spiral or coil. A spiral is shown in Figure 1. The tempering may take place at any stage in the process so as to produce the necessary strength and elasticity, and to free the material of any coarseness of structure originally present or resulting from the rolling, etc., and results in no deterioration or damage to the composite spring. Thus, each portion (core and envelope) will retain its respective characteristics as a distinct metal during and after tempering, yet there will be a definite cohesion between these layers which cannot be overcome by even the severest shock, bending, or the like. A cross section taken through the spring would show layers of metal, each layer having perfect cohesion with the adjacent layer.

The metal envelope 12 will encase the spring core 11 and will protect it from rust, corrosion, etc. The envelope 12, is not so elastic as its core 11, yet, since it has a smaller area of cross section and is more ductile and malleable than the core, it will not break, crack, etc., even when the spring is flexed to its limit.

The liability of the core 11 to corrosion is substantially immaterial as the envelope or shell 12 is non-corrodible. Hence any desired steel or the like may be used for the core, whether relatively high or low carbon, as it is fully protected by the shell 12. While the ends of the core may be protected if desired by closing the ends of the shell after formation of the spring, as by welding or fusing, such has been found not to be required as any such corrosion is only very minute thereat and does no damage.

Although I have described a protecting envelope for springs, it will be understood that one of suitable characteristics may be employed for other purposes and with other types of steel or the like metals, and it will also be understood that a plurality of envelopes may be employed. Other non-corrodible alloys may be used for the shell 12 or various other chromium-nickel ranges of the same alloy.

What I claim as new and desire to secure by Letters Patent is:

1. A method of making non-corrodible springs including the steps of preparing an untempered core of suitable steel regardless of corrodibility, preparing a non-corrodible tube of alloy steel having a composition of about 18% chromium, about 8% nickel and suitable carbon, of such a diameter that it can be slid over the core, so assembling said core

and tube, the cooperating surfaces cohering closely and having been matched to provide a smooth fit, whereby a substantially unitary element is secured, rolling the element to an eventual flat shape by alternate flattening and rounding reducing operations, forming the final "flat" into spring form, and tempering the whole at any suitable stage.

2. A method of making non-corrodible springs including the steps of preparing a core of suitable steel, preparing a tube of non-corrodible alloy steel, of predetermined diameter, assembling said tube over said core so that close cohesion exists between the cooperating surfaces, in effect forming a unitary element, rolling said element by reducing steps to an eventual "flat", forming a spring therefrom and tempering the whole at any suitable stage.

3. The method of making a non-corrodible steel spring including the steps of forming a steel core, forming a non-corrodible chromium-nickel steel alloy tube of a size just to receive said core, assembling said core and tube, reducing said so-assembled core and tube to size, finishing to final form and tempering the whole at any suitable stage.

4. The method of making a non-corrodible steel spring including the steps of forming a core, forming a chromium-nickel steel alloy tube, inserting said core in said tube, rolling said so-assembled core and tube, finishing to final form and tempering the whole at any suitable stage.

In testimony whereof, I have hereunto subscribed my name this 27th day of July, 1931.

VERE B. BROWNE.