Sept. 19, 1950 C. H. DICKSON 2,522,780

TUBE AND BOURDON SPRING

Filed July 15, 1947

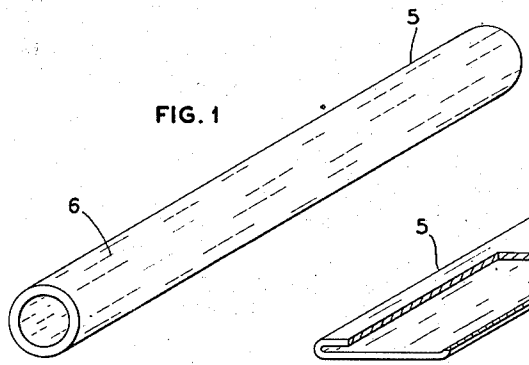


FIG. 1

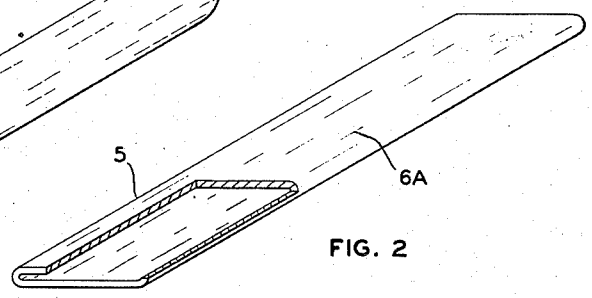


FIG. 2

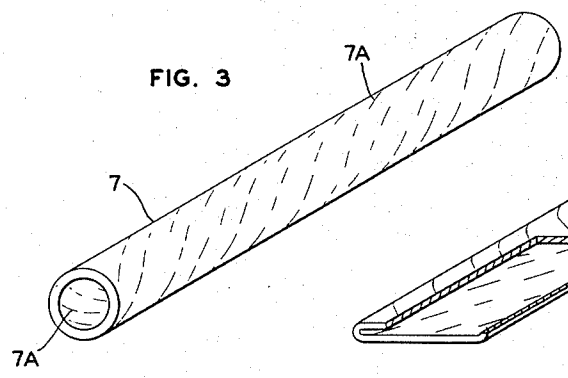


FIG. 3

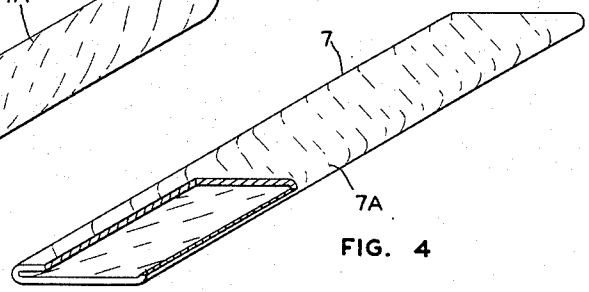


FIG. 4

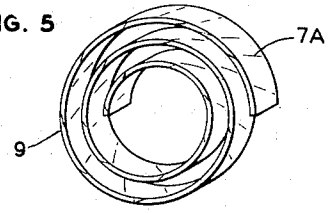


FIG. 5

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Patented Sept. 19, 1950

2,522,780

UNITED STATES PATENT OFFICE

2,522,780

TUBE AND BOURDON SPRING

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Application July 15, 1947, Serial No. 761,076

3 Claims. (Cl. 73—418)

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This invention relates to an improved tubing as well as to a Bourdon spring made therefrom.

The Bourdon spring which has long been used in measuring instruments is currently made from drawn metal tubing of circular cross section. Any scratch or defect present in the billet from which the tube is drawn frequently is present as a line of weakness in the finished tube. Usually this line of weakness is so minute that it is not observed until the failure of a Bourdon spring made from such a weakened tube.

An important feature of the present invention relates to a Bourdon spring in which minor weaknesses of the type mentioned are so distributed that they rarely cause failures.

Other features and advantages of the invention will appear from the detailed description and claims in which:

Fig. 1 is a perspective view of a metal tube having longitudinal lines of weakness therein;

Fig. 2 is a perspective view of such tubing that has been flattened, in readiness to be coiled into a Bourdon spring;

Fig. 3 is a perspective view of an improved tube of the present invention showing how any longitudinal lines of weakness in the tube will be spirally arranged around its axis; and

Fig. 4 is a perspective view of the improved tube of Fig. 3 after it has been flattened in readiness to be coiled into a Bourdon spring.

Fig. 5 discloses a Bourdon spring made from this improved tubing.

Tubing 5 and especially metal tubing that has been formed from a billet by successive draws in accordance with conventional metal working has surface defects in the form of seams or scratch marks extending lengthwise of the tube. These defects are indicated by the dotted lines 6 in Fig. 1 since frequently they are not visible to the naked eye until the tube is deformed by flattening, as shown in Fig. 2. These defects then become easily visible as parallel fissures or scratch marks 6a extending along the tube. Each fissure or scratch mark constitutes a line of weakness which, if it occurs at or near the edge of the flattened tube, will frequently initiate failure of the finished Bourdon spring.

In accordance with the present invention, a strengthened tube 7 is illustrated in Fig. 3. This strengthening is obtained by twisting the tubing around its longitudinal axis; such as by twisting between drawing passes, or simultaneously with drawing, or after drawing to the desired size.

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Preferably, the twisting is effected uniformly throughout the length of the tube. This is conveniently effected by gripping the tube at its ends and then twisting the tube until the lines of weakness which were previously linear, are uniformly and spirally arranged on the surfaces of the tube, as indicated at 7a.

The tube thus twisted can then be flattened in the usual manner and then wound into the well known Bourdon coil 9 (Fig. 5) of the helical or flat type, the flat type only being illustrated. It will be noted that the lines of weakness 7a extend across each convolution of the spring. In this way no line of weakness extends along the edges of the spring where failures usually develop.

What I claim is:

1. A Bourdon spring or the like comprising a curved, flattened tube, the material of which has been displaced spirally around the flattened tube throughout substantially the entire length thereof without substantially changing the physical shape of the tube.

2. A Bourdon spring or the like comprising a coiled, flattened tube, the material of which has been twisted throughout substantially its entire length around the passage through the tube without substantially changing the physical shape of the tube whereby any weakness extending lengthwise of the original tube from which the spring is made, is distributed across the convolutions of the coil of the finished spring.

3. A pressure responsive element comprising a partially collapsed tube, the material of which has been displaced spirally around the passage through the tube substantially throughout its entire length without substantially changing the physical shape of the tube.

CHARLES H. DICKSON.

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