

April 8, 1952

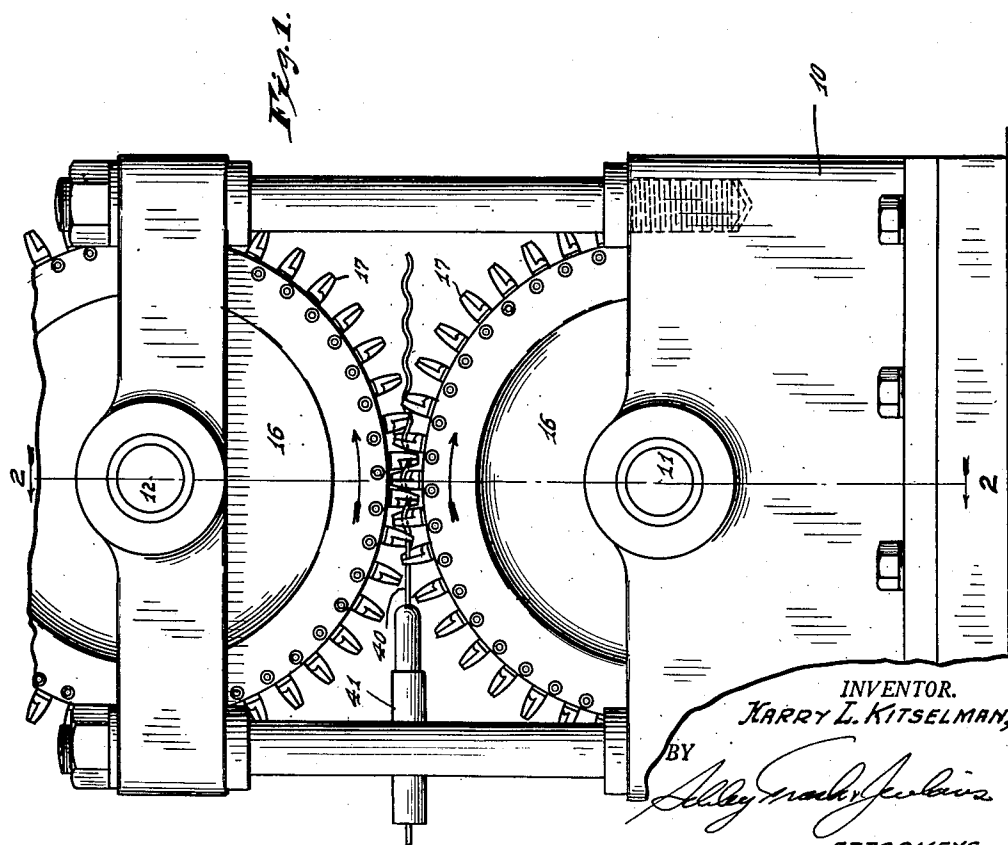
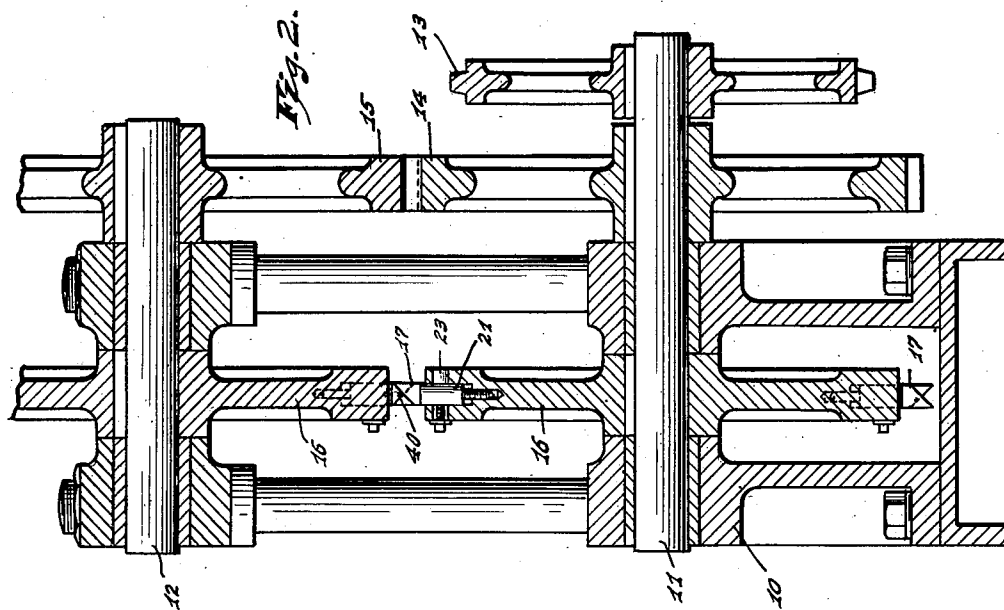
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2,591,943

HELIX FORMER

Filed Sept. 21, 1948

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

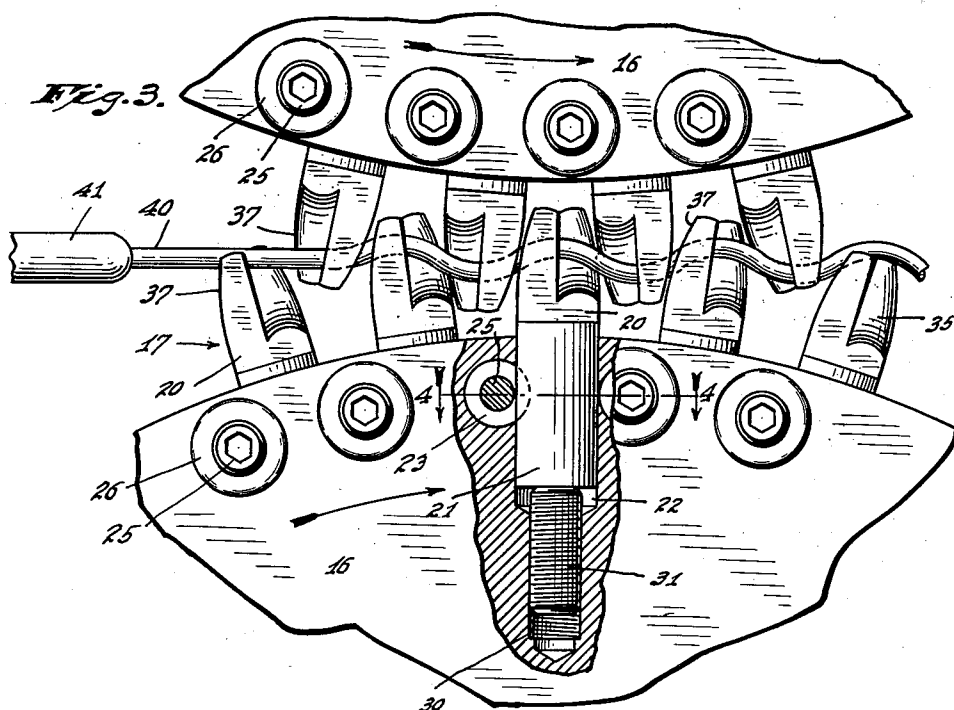


Fig. 4.

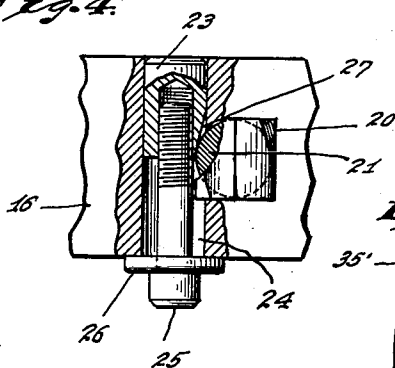


Fig. 5.

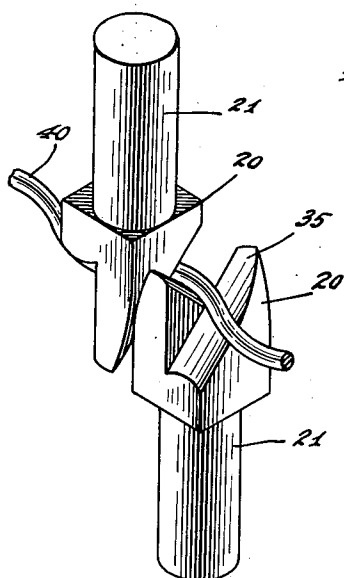


Fig. 6. Fig. 7.

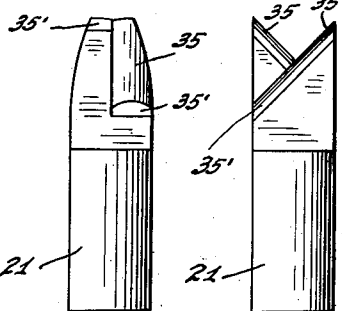
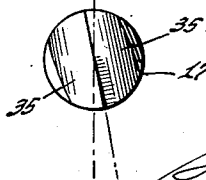


Fig. 8.



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UNITED STATES PATENT OFFICE

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HELIX FORMER

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6 Claims. (Cl. 153—64)

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2

This invention relates to a machine for forming wire into helixes of relatively long pitch, of relatively small diameter, and of any desired length. Such helixes, frequently used as line-wire reinforcements, may have an internal diameter approximating the diameter of the helix-wire and a pitch equal to at least several times the diameter of the helix-wire.

It has heretofore been proposed to form helixes of the type mentioned by deflecting the wire laterally of itself in a direction which changes from point to point along the helix-axis. Usually, the deflection of the wire is effected by two series of teeth which are brought into meshing engagement with the wire between them, the wire-engaging surfaces of the teeth being formed to deflect the wire into the desired helical form. So far as I am aware, the teeth of prior helix-forming machines have been provided with wire-receiving grooves the bottoms of which conform to the inner surface of the desired helix for approximately one-half a helix-turn and the sides of which flare outwardly to receive the wire and guide it into the groove-bottoms as the teeth move into full meshing engagement. Considerable difficulty has been experienced in producing such teeth with properly shaped grooves. Because of the complicated shape of each tooth-groove it is practically impossible to finish it by machining; and as a result, the groove-surfaces must either be finished by hand or the tooth must be formed as a casting. Because of the difficulty in estimating the degree of over-bending which must be imparted to the wire in order that the helix will have the proper dimensions when released from the forming teeth, it is exceedingly difficult to form by casting teeth which will possess the necessary groove-shape.

It is the object of my invention to provide a helix-forming machine of the type indicated with teeth having wire-deflecting surfaces which can be shaped by simple machining operations. Another object of my invention is to simplify and lessen the cost of machines which form helixes by lateral deflection of a wire. Still another object of my invention is to produce a machine in which it is possible to correct or compensate for inaccuracies in tooth formation and, within limits, to vary the shape of the helix produced without changing the form of the teeth.

In carrying out my invention, I employ two series of meshing teeth, desirably mounted on the peripheries of two co-planar disks. Each of such teeth is formed with a pair of convex wire-deflecting surfaces cylindrical in the sense that

each can be regarded as traced by a straight line, called generatrix or element, moving always parallel to a fixed straight line. The rectilinear elements of each wire-deflecting surface are generally parallel to the common plane of the axes of the two disks, and the elements of adjacent wire-deflecting surfaces make equal and opposite angles with the plane in which the two disks rotate. Desirably, each tooth is mounted in its associated disk for rotative adjustment about an axis radial of such disk and also for rectilinear adjustment along a disk-radius. Means are provided for guiding wire into association with the meshing teeth; and as the disks are rotated, the oppositely disposed wire-deflecting surfaces on the meshing teeth deflect the wire into the form of a helix.

The accompanying drawings illustrate my invention:

Fig. 1 is a side elevation of a helix-forming machine; Fig. 2 is a vertical section on the line 2—2 of Fig. 1; Fig. 3 is a fragmental elevation similar to Fig. 1 but on an enlarged scale, showing a portion of one of the disks broken away to illustrate the tooth-mounting; Fig. 4 is a fragmental section on the line 4—4 of Fig. 3; Fig. 5 is an isometric view illustrating a pair of meshing, helix-forming teeth; Figs. 6 and 7 are side and end elevations respectively of a tooth of modified construction; and Fig. 8 is an end elevation of a tooth of modified shape.

The machine shown in the drawings comprises a frame 10 rotatably supporting two vertically spaced horizontal shafts 11 and 12. One of the shafts, shown as the shaft 11, is adapted for connection to a driving means, as by mounting rigid with it a drive sprocket 13; and the two shafts are operatively interconnected to rotate at equal speeds by gears 14 and 15.

Each of the shafts 11 and 12 carries a disk or wheel 16 provided with a circumferentially extending series of wire-deflecting teeth 17. The wheels 16 are shown as of the same diameter and the shafts 11 and 12 as so spaced that the teeth 17 on one wheel mesh with the teeth 17 of the other wheel as the wheels rotate. Each of the teeth 17 (see Fig. 3) embodies a head 20 and a cylindrical shank 21, and the wheels 16 are provided in their outer faces with annular series of cylindrical recesses 22 adapted to receive the shanks 21 of the respective teeth. Desirably, the shanks 21 and the recesses 22 are circular in cross-section, so that each tooth can be rotated about its own axis. If such a construction is employed, means are provided for clamping each

3

tooth in fixed position about its axis of mounting in the associated wheel 16. One form of suitable clamping mechanism is illustrated in Fig. 4 and embodies a clamp member 23 slidably mounted in a hole 24 extending through the wheel 16 at one side of the recess 22. The clamp 23 is provided with an axial, screw-threaded hole for the reception of a clamp-screw 25 which extends through a washer 26 into the hole 24. One side of the clamp member 23 is beveled, as indicated at 27 to engage the side of the associated tooth-shank 21 and clamp such shank in fixed position when the clamp screw 25 is tightened.

In addition to being adjustable about its own axis, each of the teeth is desirably adjustable radially of its associated wheel 16. To this end, a screw-threaded hole 30 extends inwardly of the wheel 16 from the bottom of each recess 22, such hole receiving an adjusting screw 31 upon the outer end of which the shank 21 of the associated tooth is seated. To adjust any tooth in its associated wheel, the clamp screw 25 adjacent such tooth is loosened, and the tooth is removed from the recess 22. The screw 31 is then adjusted inwardly or outwardly to the desired extent and the tooth is replaced in the recess 22. With the inner end of the tooth-shank seated on the screw 31, the tooth is adjusted about its own axis to the desired angular position, and the clamp-screw 25 is retightened.

The head 29 of each tooth is shaped to provide two wire-deflecting surfaces 35 each of which is convex and cylindrical in the sense that it may be regarded as generated by a straight line moving always parallel with itself. The surfaces 35 may be provided on the tooth-body itself, as in the teeth shown in Figs. 3, 4, and 5, or they may be provided on inserts 35' of wear-resistant metal secured to the tooth-body as by soldering or brazing, as shown in Figs. 6 and 7. The two wire-engaging surfaces 35 of each tooth lie on opposite sides of the median plane of the tooth with the surface-elements parallel thereto, and the rectilinear elements of each surface make equal and opposite angles with a second plane which contains the tooth-axis and is perpendicular to the median plane. Preferably, such angles are approximately 45° so that in one elevation (see Fig. 7) the two surfaces 35 appear to define a groove having sides disposed at approximately 90° to each other. Each surface, however, continues inwardly of the tooth well beyond the bottom of such groove.

The teeth are set in the disks 16, as indicated in Fig. 3, so that as the disks rotate a wire fed between them from a guide 41 will be received in the grooves formed by the oppositely sloping surfaces 35 of the successive teeth. The teeth mesh to a depth sufficient to cause the wire to be deflected alternately in opposite directions in the common plane of the disks 16; and as such deformation of the wire is effected by surfaces which are inclined to such plane, the wire is also deflected alternately in opposite directions away from that plane. The thickness of each tooth at the pitch line is approximately equal to one-half of the pitch of the helix to be formed, and each individual surface 35 forms one-fourth of a helix turn. To prevent interference between the teeth as they revolve with the disks, the flanks of the teeth are relieved, as indicated at 37.

The precise shape, in end elevation, of a helix produced by my machine will depend principally on the cross-sectional shape of the surfaces 35. The depth to which the teeth mesh affects the

4

diameter of the helix produced and can be varied considerably without materially altering the cross-sectional shape of the helix. In general, to produce a helix of approximately circular cross-section the crown or camber of each surface 35 should be appreciably greater than that of a similarly disposed surface which would fit against the inner surface of the helix-wire. In some cases the cross-sectional shape of the helix can be made more nearly circular by rotating the teeth slightly about their respective axes in the disks 17 so that the median plane of each tooth will be at a slight angle to the disk-axis. To provide for such tooth-adjustment, the heads of the teeth may be of circular cross-section, as shown in Fig. 8.

As the wire-deflecting surfaces of my improved teeth are cylindrical, they can be produced by forming cutters or tools or by properly shaped grinding wheels. Where the inserts 35' of Figs. 6 and 7 are used, those inserts may be lengths of strip stock of proper cross-section.

In the machine shown in the drawing, the wire-forming teeth constitute a continuous series extending for the entire periphery of each disk 16 and are therefore adapted to form a continuous helix of any desired length. It will be appreciated, however, that by the omission of a limited number of successive teeth, the machine can be adapted to form a wire to provide spaced helical portions. Further, by providing between successive groups of helix-forming teeth other types of wire-bending elements, a stretch of wire between two helically formed portions can be bent into any of a wide variety of forms.

These and other possible modifications of the machine illustrated form no part of my present invention, which is directed to a type of helix-forming tooth and to a machine employing two series of such teeth to deform a wire progressively into a helical shape.

I claim as my invention:

1. In a machine for forming a wire into a helix by lateral deflection, two series of spaced teeth movable successively into meshing engagement from opposite sides of the wire to be deflected, each of said teeth having a pair of oppositely inclined, convex cylindrical, wire-deflecting surfaces which lie on opposite sides of a medial plane generally normal to the wire being formed and which are adapted to form contiguous fourths of a helix-turn.

2. The invention set forth in claim 1 with the addition that said machine embodies two coplanar, rotatable disks and means for rotating such disks in opposite directions, said two series of teeth being mounted respectively on said disks in circumferentially extending arrangement.

3. The invention set forth in claim 1 with the addition that said machine includes a movable supporting means for each series of teeth, said supporting means having for each tooth a mounting in which the tooth is rotatably adjustable to vary the angular relationship between its median plane and its path of movement.

4. The invention set forth in claim 1 with the addition that said machine includes a movable supporting means for each series of teeth, said supporting means including for each tooth a mounting in which the tooth is adjustable toward and away from the axis of the helix being formed whereby to vary the depth to which it meshes with the teeth of the other series.

5. The invention set forth in claim 1 with the addition that said machine includes a movable

5

supporting means for each series of teeth, each said supporting means being provided with a cylindrical recess for each of its associated teeth, the teeth being provided with cylindrical shanks rotatably receivable in said recesses, adjustable means for locating each tooth-shank axially of its associated recess, and releasable means for clamping each tooth-shank in fixed position.

6. The invention set forth in claim 1 with the addition that the wire-deflecting surfaces of each tooth are provided respectively on inserts secured to the tooth.

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