July 12, 1949. J. O. CHARLES 2,476,180

APPARATUS FOR MAKING WIRE ROPE OF PREFORMED FLATTENED STRANDS

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FIG. 1.

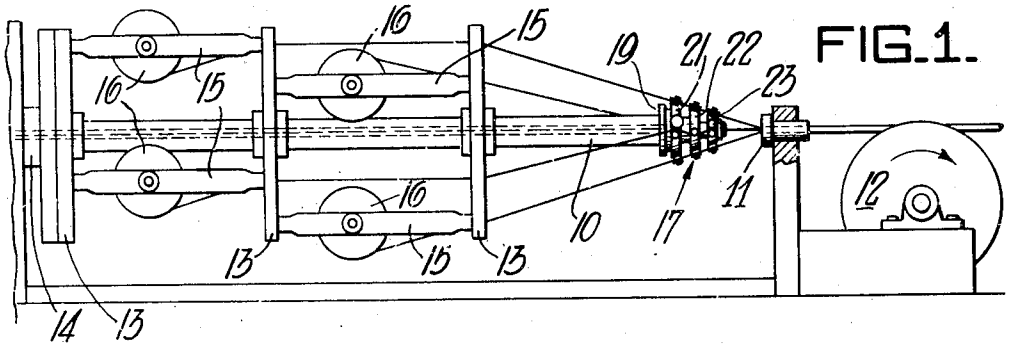


FIG. 2.

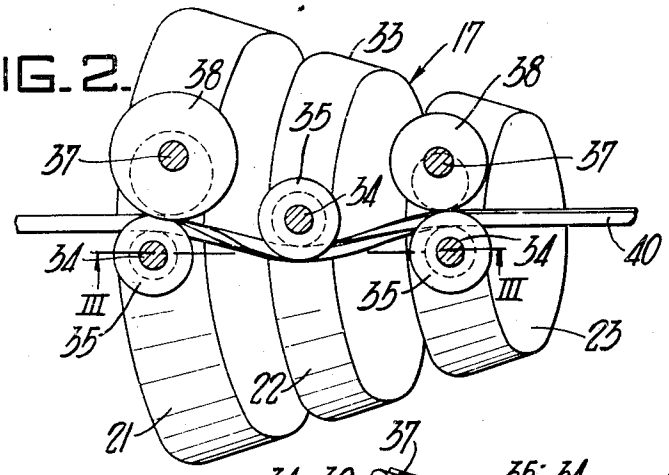
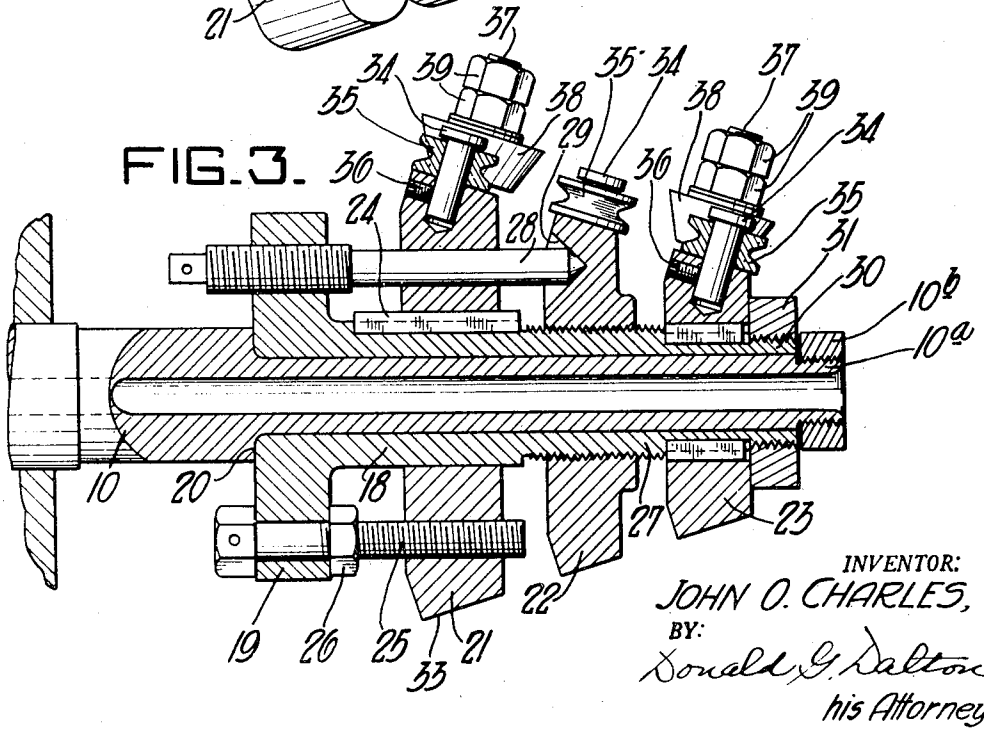


FIG. 3.



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APPARATUS FOR MAKING WIRE ROPE OF PREFORMED FLATTENED STRANDS

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FIG. 4.

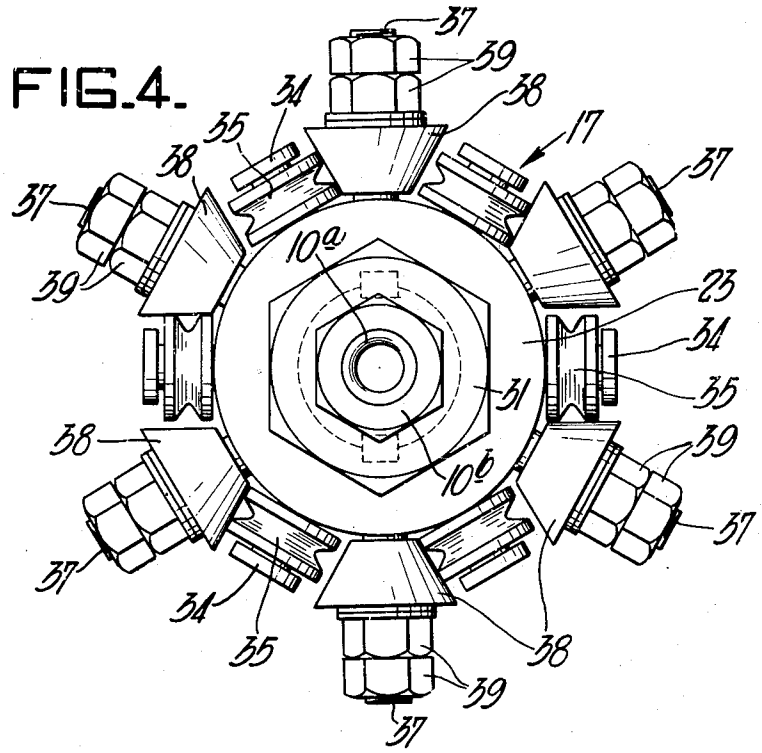


FIG. 5a

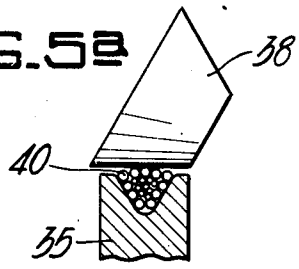


FIG. 5b

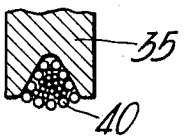


FIG. 5c

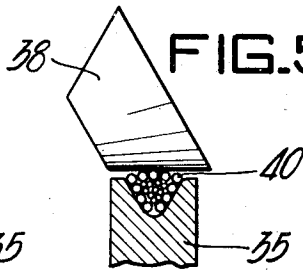
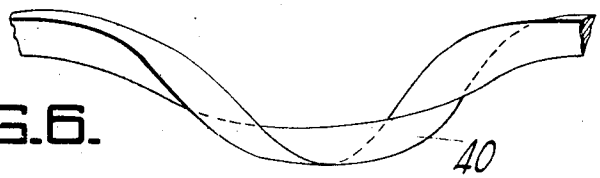


FIG. 6.



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Patented July 12, 1949 2,476,180

UNITED STATES PATENT OFFICE

2,476,180

APPARATUS FOR MAKING WIRE ROPE OF PREFORMED FLATTENED STRANDS

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Application January 31, 1948, Serial No. 5,604

2 Claims. (Cl. 57—9)

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This invention relates to the manufacture of wire rope and, in particular, to the making of rope of flattened strands and to the preforming of the strands before laying them about a core.

It has long been common practice to preform ordinary or round strands of wire rope as they are laid. For this purpose, the laying machine is provided with a rotary preforming head adjacent the closing die. Preforming heads are usually of either the quill or the roller type. In actual practice, however, preforming of the strands of flattened-strand rope as carried out heretofore has been done at the stranding machine. The preformed strands are coiled, the coils are placed in the cradles of a laying machine, and the strands are laid into a rope in the usual manner. This practice is unsatisfactory because it is impossible to make sure that the lay or radius and pitch of the helices into which the strands are preformed will be maintained until they are laid in the rope. In fact, the tension applied to the rope by the haul-off block, which is exerted directly on the strands, except for the force required to overcome the friction of the closing die, tends to increase the pitch and decrease the radius of the helices. As a result, it is necessary to subject the rope to a heavy roll-straightening as it emerges from the layer to eliminate liveliness or twistiness.

I have invented a novel apparatus for making rope of preformed flattened strands whereby the aforementioned objections to the prior practice are overcome. According to my invention, I provide novel preforming means just ahead of the closing die, which preforms the strands into helices having the pitch and radius desired in the finished rope. I preferably employ a rotary preforming head having one or more closed passes for each strand, shaped to fit the strands snugly and so disposed as to insure that the strands shall be twisted one full turn for each pitch length and of proper dimensions to impart the desired radius and pitch thereto. The preforming head conveniently comprises at least three discs coaxially mounted on the layer mast adjacent the exit end, spaced apart therealong and fitted with a grooved tangential roller for each strand adapted to maintain the sections of the strands in proper position relative to the core of the rope as the strands advance toward the closing die and are progressively laid around the core. The grooves in the

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rollers are shaped to conform to the section of the strands being laid. The first and last discs have plain rollers cooperating with the grooved rollers to form closed passes therebetween. The intermediate disc may be similarly fitted but plain rollers will ordinarily not be needed thereon.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating a preferred embodiment.

In the drawings,

Figure 1 is a diagrammatic side elevation of a laying machine having the improved preforming head of my invention incorporated therein;

Figure 2 is a diagrammatic perspective view of the discs of the preforming head with parts omitted;

Figure 3 is a view of the preforming head partly in section taken along the plane of line III—III of Figure 2 with parts in side elevation;

Figure 4 is an end elevation of the head looking from the delivery end of the mast of the machine, showing only the outermost disc;

Figures 5^a, 5^b and 5^c, respectively, are sections through one of the grooved rollers journaled on each of the three discs of the preforming head showing in elevation the plain rollers cooperating with the grooved rollers on the first and last discs; and

Figure 6 is an elevation of an elongated triangular prism simulating a flattened strand, representing the condition of a pitch length thereof after preforming in accordance with the invention.

Referring now in detail to the drawings and for the present to Figure 1, the laying machine there illustrated comprises generally a tubular mast 10, a closing die 11 and a haul-off drum 12. The mast is provided with spaced wheels 13 resting on supporting rollers (not shown) in the usual manner and is driven by any suitable mechanism, indicated at 14. Cradles 15 are pivotally mounted between adjacent wheels 13. Spools 16 carrying the strands to be laid in the rope are journaled in the cradles. The type of laying machine illustrated as an example contains two sets of three cradles each, the cradles of each set being spaced 120° about the axis of the mast. The apparatus

described so far is wholly conventional and forms no part of my invention.

For the purpose of preforming flattened strands drawn from the spools 16 and laid about a central core passing through the mast 10, on rotation thereof, I provide a novel preforming head, indicated generally at 17, the details of which are more clearly shown in Figures 2 through 4. Flattened strands for making rope are either sector-shaped or elliptical in section. Strands of sector-shaped section, of course, should be laid in the rope with their sides radial at all points. Elliptical strands are laid with their major axes tangential to the circumference of a pitch circle concentric with the rope. The embodiment of the invention illustrated in the accompanying drawings is designed for preforming strands of sector-shaped section but it will be understood that the principles of the invention may be utilized equally well in the performing of flattened strands of elliptical section.

As shown in Figures 2 through 4, my improved preforming head comprises a sleeve 18 secured on the reduced forward end 10a of the mast 10 by a nut 10b and having a flange 19 at its rear end abutting a shoulder 20 on the mast. The sleeve 18 has a plurality of discs 21, 22 and 23 disposed coaxially in spaced relation therealong. The disc 21 is splined on the sleeve adjacent the flange 19, the spline being indicated at 24, and is adjustable axially by a screw 25 which extends freely through a hole in the flange 19 and is threaded into the disc. A lock nut 26 on the screw secures it in adjusted position. Disc 22 is screwed on a threaded intermediate portion of the sleeve 27 which is smaller than the portion adjacent the flange 19 on which the disc 21 is seated. The disc 22 is locked in adjusted position by a clamping pin 28 theaded through a hole in the flange 19 and extending freely through a hole in the disc 21 into a recess 29 formed in the rear face of disc 22. Disc 23 is keyed on a portion 30 of the sleeve smaller in diameter than the threaded portion 27 and is secured in position by a nut 31 threaded on the extreme end of the sleeve.

Each of the discs 21, 22 and 23 has its edge beveled, as at 33, on an angle approximating that between the axis of the mast and the portions of the strands intermediate the preforming head and the nearest wheel 13 of the laying machine. Circumferentially spaced holes are drilled radially into the discs normal to the beveled edges thereof to accommodate bearing pins 34. Grooved rollers 35 are journaled on the pins tangentially of the discs. There is a roller 35 on each disc for each strand, being laid and the rollers have circumferential grooves therein conforming generally in shape to the section of the strands to be preformed, sector-shaped in the example illustrated. The pins 34 are secured in position on the discs by set screws 36. Bearing pins 37 are set in radial holes normal to the beveled edges of the discs 21 and 23 and have frusto-conical plain rollers 38 journaled thereon cooperating with the grooved rollers 35. The disc 22 may also be provided with plain rollers but usually this will not be necessary. The pins 37 are similar to the pins 34, except that their outer ends are threaded to accommodate nuts 39 instead of being headed.

It will be apparent that each pair of rollers 35 and 38 on the discs 21 and 23 defines a closed pass adapted snugly to fit a strand of sector-shaped section. As shown in Figure 2, the disc 22 is turned on the sleeve 27 to a position such that the rollers 35 thereon are offset circumferentially from the corresponding rollers on the other discs. As a result, a strand entering the pass between the rollers on disc 21 is deformed in passing around the roller on the disc 22 before entering the pass between the rollers on disc 23. The strand is started so that it will not only be deformed, but actually turned or twisted 180° about its own axis in passing from the rollers on disc 21 to the roller on disc 22 and further twisted a similar amount on passing therefrom to the rollers on disc 23.

This action is illustrated in Figures 5a, 5b and 5c, which may conveniently be read with Figure 6. Figure 5a shows the section of a sector-shaped strand 40 with its vertex pointed in one direction corresponding to the location of the rollers 35 and 38 on disc 21. Figure 5b shows the section of the same strand reversed as it passes around the roller 35 on disc 22. Figure 5c shows the completion of the twist which restores the strand section to its original position as it passes between the rollers 35 and 38 on disc 23. The location of Figure 5b relative to Figures 5a and 5c conforms generally to the offsetting of the rollers 35 on disc 22 from the corresponding rollers on the other discs. Figure 6 represents generally the conformation of a strand as it passes around the series of grooved rollers, one on each of the discs 21, 22 and 23. It will be observed that the triangular prism which is shown to represent the strand of sector-shaped section, is formed into a helix and is actually twisted one full turn for each pitch length of the helix. The various parts of the preforming head are designed to preform each of the strands into a helix having the radius and pitch of the strands in the desired finished rope. In order to guide the strand more effectively in its sinuous path around the several rolls 35, the pins 37 have their axes not in the same surface of revolution as the axes of pins 34, but offset slightly therefrom toward the disc 22.

By virtue of the preforming head described above, each of the strands drawn from the spools 16 in the cradles of the laying machine is continuously and progressively shaped into a helix of the desired radius and pitch and twisted one turn for each pitch length immediately prior to being laid about the usual fibre core which is drawn through the mast 10, and finally compressed together by the closing die 11, each strand being subjected to deformation in a closed pass including a plurality of grooved rollers, one on each of the three discs 21, 22 and 23. As a result of this method of fabrication, the finished rope is free from objectionable liveliness or twistiness as it leaves the haul-off drum and need not, therefore, be subjected to roll-straightening as has been necessary heretofore. All the strands are preformed simultaneously to the same extent and immediately laid directly onto a core to form the finished rope. This insures that the preforming will be uniform among the several strands. Since the preforming of all strands occurs simultaneously, it necessarily follows that the helices into which they are deformed will be so related longitudinally as to fit neatly together about the core and form a smooth rope as the laying operation proceeds.

The construction of the preforming head described permits adjustments to deform the strands into helices of different radius and pitch. The radius is determined by the offsetting of the circumferential rollers 35 of disc 22 relative to the rollers 35 of the other discs. The pitch of

the helix is adjusted by moving the discs along the sleeve 18. Additional sets of rollers 35 and 38 may be provided to accommodate strands of different sizes or shapes.

The invention has the further advantage that it is well adapted for cooperation with a conventional rope-laying machine. The construction of the preforming head is simple and does not add materially to the cost of the equipment or involve much, if any, additional maintenance. The primary advantage, as already pointed out, is the capability of uniformly preforming the strands immediately prior to the laying thereof thus insuring proper orientation of the strands at every point therealong relative to the axis of the rope and avoiding the necessity for roll-straightening.

While the foregoing explanation has dealt only with the preforming of strands composed of a plurality of wires, the invention is also applicable to the preforming of single wires of non-circular section, the only change involved being the shape of the closed passes formed by the cooperating rollers for deforming the wire into a helix.

Although I have illustrated and described but a preferred embodiment of the invention, it will be recognized that changes in the details of construction may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A rotary preforming head for the mast of a strand-laying machine comprising a plurality of discs mounted adjacent the delivery end of the mast and spaced therealong, a series of rollers for each strand, one roller of each series being journaled tangentially on each of said discs, said rollers having circumferential grooves conforming substantially to the sectional shape of the strands, and additional plain rollers journaled tangentially on certain of said discs for cooperation with the grooved rollers thereon to define substantially closed sector-shaped passes therebetween.

2. The apparatus defined by claim 1 characterized by the grooves of said first-mentioned rollers being V-shaped and said additional rollers being frusto-conical.

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