Sept. 7, 1943. G. G. EISENBEIS 2,328,792

WINDING TOOL

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Fig. 2.

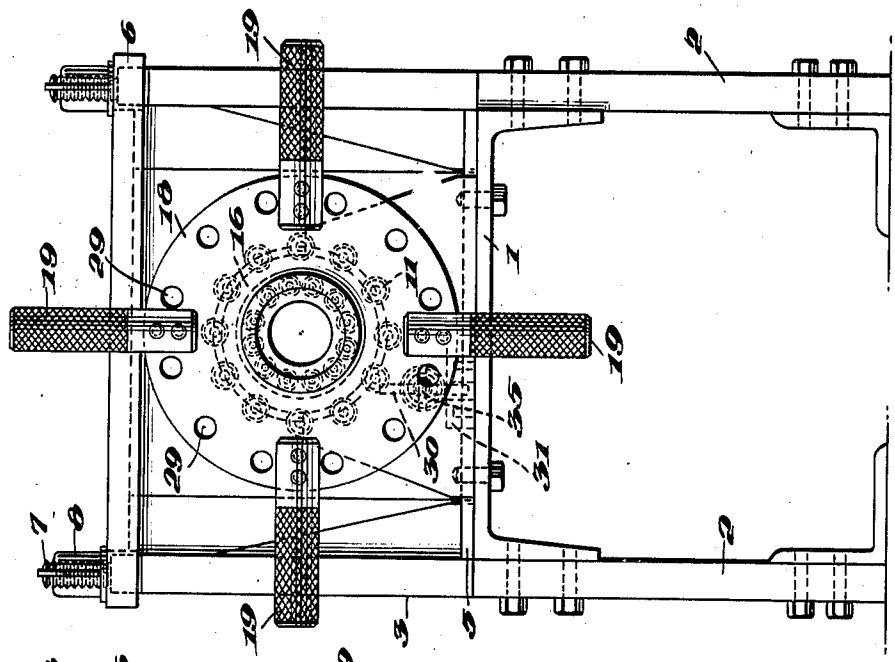
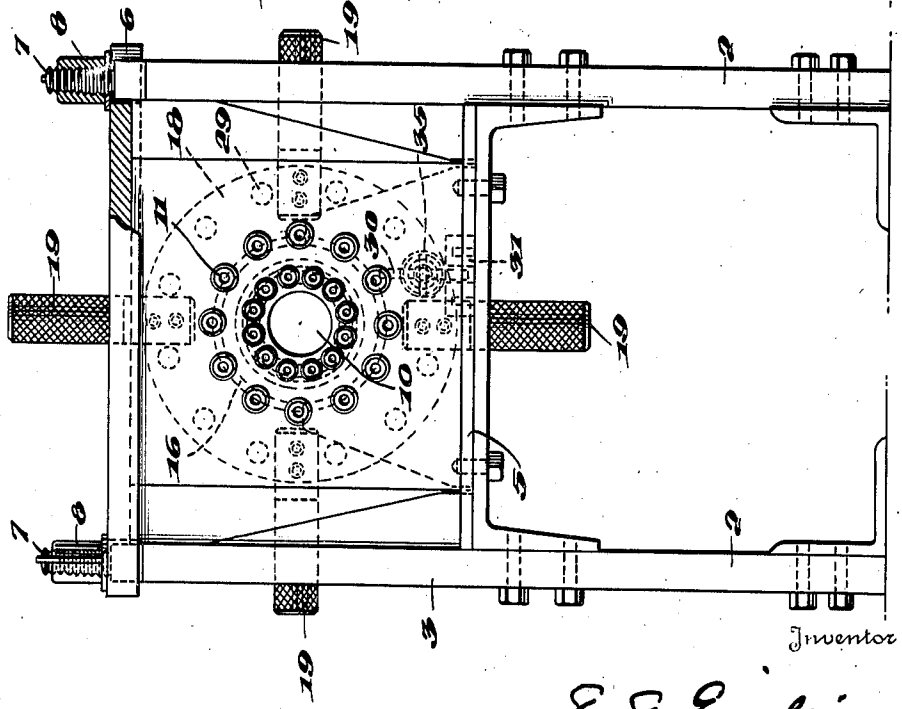


Fig. 1.



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Fig. 3.

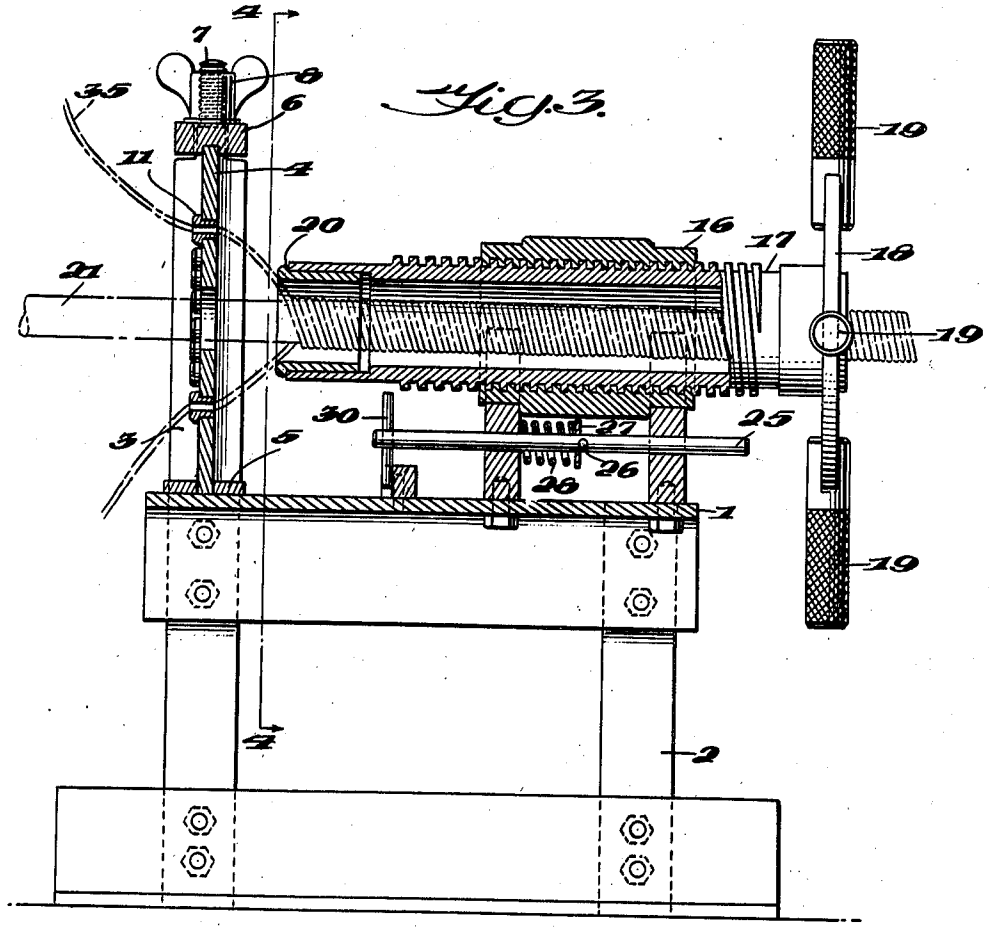


Fig. 4.

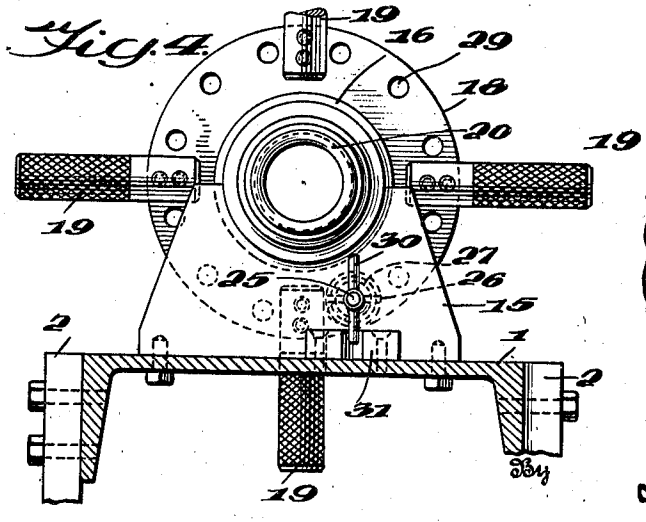
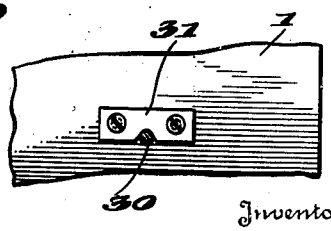


Fig. 5.



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UNITED STATES PATENT OFFICE

2,328,792

WINDING TOOL

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Application December 8, 1942, Serial No. 468,259

9 Claims. (Cl. 57—10)

This invention relates to a winding tool for use in applying concentric layers of wire to a core, or the underlayers of flexible shafting, wire rope, and the like. More especially, the device has particular application in applying a plurality of wires at a desired pitch upon a core or a previously formed flexible shaft in such a manner that the laying up of the wires may be regulated and smoothly and expeditiously applied.

An object of the invention is to construct the tool whereby the draw or die plate through which the wires forming the layer are drawn may be readily removed and replaced with a plate of different die bushing circle as the openings in the draw plate are a factor in controlling the pitch of the convolutions of the wire as it is wound on the core or previously formed shafting.

A further object of the invention is to provide a winding device through which the core or previously formed shaft passes as the wire is laid thereon and to provide means for properly starting the winding operation and thereafter adjusting the device for continuous and rapid winding.

Additional novel features of the device will reveal themselves from a study of the accompanying drawings and specification.

In general, a flexible shaft or wire rope is formed of a plurality of superimposed concentric layers of continuous wire strands. In preparing flexible shafting of this type for use in operating valves, concrete vibrators, portable grinders, driven instrumentalities and other devices, it is customary to feed the central core of the shafting past a given fixed point and to lay up on the core and succeeding layers of wire as they are wrapped upon the core a plurality of suitable gauge wires to form the successive laminations of the shafting. Some of the difficulties of previous devices has been this inability to lay up the wires of a layer in a close, continuous convolution by reason of the friction created in initially laying on the wires as they pass through the die or draw plate onto the core, and the impossibility of adjusting the device during the winding operation. The angle upon which the wires are laid up as the succeeding layers are wound in starting the winding operation, while overcoming the substantial friction created in the draw plate openings, does not permit the wires to be laid up smoothly, although this is accomplished after the base core has attained sufficient linear movement or momentum. It is necessary to initially start the laying up at a greater or more acute angle than desired for the normal winding and, therefore, as the diameter of the shaft increases as successive layers are laid thereon the angle on which the layers are applied changes. These changes of angle require adjustment of the position of the winding tool and the point at which the wires are laid on. The adjustability of the present device during winding takes care of all of these factors and, after adjustment, the tool can be located at the desired position so that during a continuous run the angle will not change.

Referring to the drawings:

Fig. 1 is a vertical plan of the draw plate showing two concentric diameters of wire-directing guides together with the removable manner of supporting the draw plate;

Fig. 2 is a vertical elevation looking at the device from the opposite end from Fig. 1 and shows the handwheel for adjusting the position of the winding tube and the manner of locking the handle in adjusted position;

Fig. 3 is a side elevation partly in cross section illustrating the core passing through the device and the manner in which the wires pass through the draw plate and are applied to the core, including the manner of adjusting the winding tube;

Fig. 4 is a detail of the winding tube taken on line 4—4 of Fig. 3 in the direction of the arrows; and

Fig. 5 is a detail disclosing the stop plate for the locking bar.

Specifically, in the drawings, numeral 1 denotes a horizontal platform for supporting the draw plate and winding tool. The platform is secured to vertical bars 2 terminating at the height of the platform at one end thereof. Elongated vertical bars 3 support the platform at the opposite end thereof. These vertical bars 3 are of greater height than the bars 2 for the purpose of forming side-securing means for the removable draw plate which will be hereinafter described. The draw plate 4 rests upon the upper surface of the horizontal platform 1 and is secured in fixed position thereon by spaced flanges 5. As shown in the drawings, the draw plate 4 has its entire bottom surface resting on the platform between the spaced flanges 5. The upper edge of the draw plate is fitted in a grooved bar 6 mounted over the upper ends of the vertical bars 3. These bars terminate in a screw threaded portion and carry thumb screws 8.

The removable draw plate itself is provided with a central opening 10 of somewhat greater size than the diameter of the shafting which is to be made and this insures that the core and succeeding layered shafting may pass freely

therethrough. A plurality of spaced, concentrically arranged openings are formed in the draw plate 4 through which the wires of the layers of the shafting are passed from a suitable source of supply not shown. The drawings illustrate two concentric circles of openings each of which is fitted with a hardened bushing or guide 11. The smaller diameter circle of spaced bushings is used when the core is of comparatively small diameter, while the larger diameter circle of openings is used after the diameter of the shafting has increased.

Also affixed to the platform 1 is a pair of spaced vertical supporting members 15 the upper ends of which are provided with semi-circular cut-away portions for the reception and retention of an internally screw threaded sleeve 16. The members 15 are rigidly secured to the platform by means of bolts while it is preferable to mount the sleeve 16 thereon by means of welding. An externally threaded tube 17 is mounted within the internally threaded sleeve 16 with a perforated disk 18 secured to the outer end thereof provided with radial spokes 19 for applying rotative movement to the tube 17. The opposite end of the tube 17 adjacent the draw plate is fitted with a hardened bushing 20, having a rounded outer edge for contact with the wires being laid up on the core or initially formed cable passing through the device. It will be observed that when movement is given the spokes 19 the tube 17 may be relatively adjusted toward or away from the draw plate 4 and it is this adjustment, together with the contact of the bushing 20 and the particular series of openings 11 through which the wires are fed through the draw plate, that determines the angle at which the wires are wound up upon the core. When the core or initially wound cable 21 is first started through the winding tool the bushing 20 on the tube 17 is spaced a substantial distance away from the draw plate to reduce the friction created by the wires passing through the draw plate and, consequently, the wires are not wound tightly against each other but are at a somewhat different angle than that which is desired but this adjustment permits the cable to be pulled freely through the device. As soon as substantial linear movement is applied to the core or initially wound shafting, the tube 17 and bushing 20 are adjusted nearer to the draw plate, whereupon the wires are wound upon the core or initially wound shafting in such a manner that each wire is laid up tight against the succeeding helix.

It is essential that the initial and adjusted positions of the tube 17 be maintained and for this purpose the device is provided with a locking bar for securing the device in adjusted position. This locking means comprises a horizontal spring projected rod 25 mounted in registering openings in the sleeve supporting members 15. A pin 26 carrying a washer 27 and having a concentrically arranged spring 28 bearing against one of the sleeve supporting members normally projects the rod 25 outwardly. When so projected, one of the plurality of concentrically arranged openings 29 in disk 18 is brought into registry with the outer end of the rod and the resulting engagement holds the disk in fixed position. The opposite end of the rod 25 carries a transverse pin 30 adapted to engage a grooved stop plate 31 when the rod is retracted against the tension of the spring 28 and turned to vertical position. This retracted position is maintained while the tube 17 is being adjusted and, after adjustment, the rod is disengaged from the stop 31 and allowed to project into the nearest registering opening 29.

As shown particularly in Fig. 3, the core or initially wound shafting passes through the device from left to right and is pulled therethrough by any suitable machine or mechanism. As the core or initially wound cable 21 passes through the device, a plurality of wires 35 are led through the bushings 11 in the draw plate and, due to the rotation applied to the core or initially formed cable 21, the wires are layered up or wound thereon. The continued linear and rotative movement of the core or initially wound cable carries the same through the device until the end of the core or initially formed shaft is reached and thereafter the wires 35 are cut and the free ends thereof brazed onto the core or initially formed cable. This comprises a complete cycle, after which the wound core is removed from the draw plate and winding tube and again run through the winding tool for application of a further layer.

What I claim is:

1. A winding tool for applying a wire helix to a linear moving and revolving member comprising a horizontal sleeve, a tube mounted in said sleeve through which said member is drawn, a vertical plate positioned in spaced relation to one end of said threaded tube, said plate having a central aperture aligned with the said tube and a series of wire directing openings therein circumferentially arranged in spaced relation to said central aperture, and means for moving said tube to vary its relative position with respect to said vertical plate.

2. A winding tool for applying a wire helix to a linear moving and revolving core or previously wound helix comprising a horizontal internally screw threaded sleeve having an externally screw threaded tube mounted therein through which said core or previously wound helix is drawn, a vertical plate positioned in spaced relation to one end of said threaded tube, said plate having a central aperture aligned with the said threaded tube and a series of wire directing openings circumferentially arranged in spaced relation to said central aperture, and means for rotating said threaded tube to vary its relative position with respect to said vertical plate.

3. A winding tool as defined in claim 1 wherein the end of the said horizontal tube adjacent the said vertical plate is provided with a bushing having a flared end lip extending over the end of the tube, the said flared end lip being of rounded contour.

4. A winding tool as defined in claim 1 wherein the said vertical plate is positioned between side bars and held in removable relation by a grooved top bar engaging the upper end of said plate, the upper end of the said side bars having detachable means thereon for binding said top bar against the said plate.

5. A winding tool as defined in claim 2 wherein the end of the said horizontal tube opposite the said vertical plate is provided with a hand wheel thereon whereby rotation of the hand wheel varies the relative position of the threaded tube with respect to the said vertical plate.

6. A winding tool as defined in claim 1 wherein the end of said horizontal tube opposite the said vertical plate is provided with an apertured disk thereabout and a plurality of spaced apart radially extending handles secured over the periphery of said disk.

7. A winding tool comprising a horizontal platform, a horizontal internally screwed sleeve secured in elevated position above said platform, an adjustable externally screw threaded tube carried in said sleeve, a vertically positioned plate mounted on said platform and in spaced relation to said sleeve, said plate having a central aperture in axial alignment with said tube, and a series of spaced apart circumferentially arranged openings in said plate whereby wires may be passed therethrough and pass into said tube.

8. A winding tool as defined in claim 7 wherein a circular plate having circumferentially arranged openings therein is affixed to said adjustable tube at the end thereof opposite the said vertical plate, a slidable rod mounted above said platform, and means for projecting said rod through an opening in said circular plate.

9. A winding tool as defined in claim 7 wherein a circular plate having a plurality of transverse openings therein is affixed to one end of said tube, a spring projected horizontal rod mounted above said platform in such a manner that said rod engages one of the openings in said circular plate when said rod is spring projected, and a latch for maintaining said rod in retracted position.

GEORGE G. EISENBEIS.