Oct. 23, 1962 D. V. BENFER ETAL 3,059,404

MACHINE FOR WRAPPING HELICALLY SPLIT TUBING

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Fig. 1

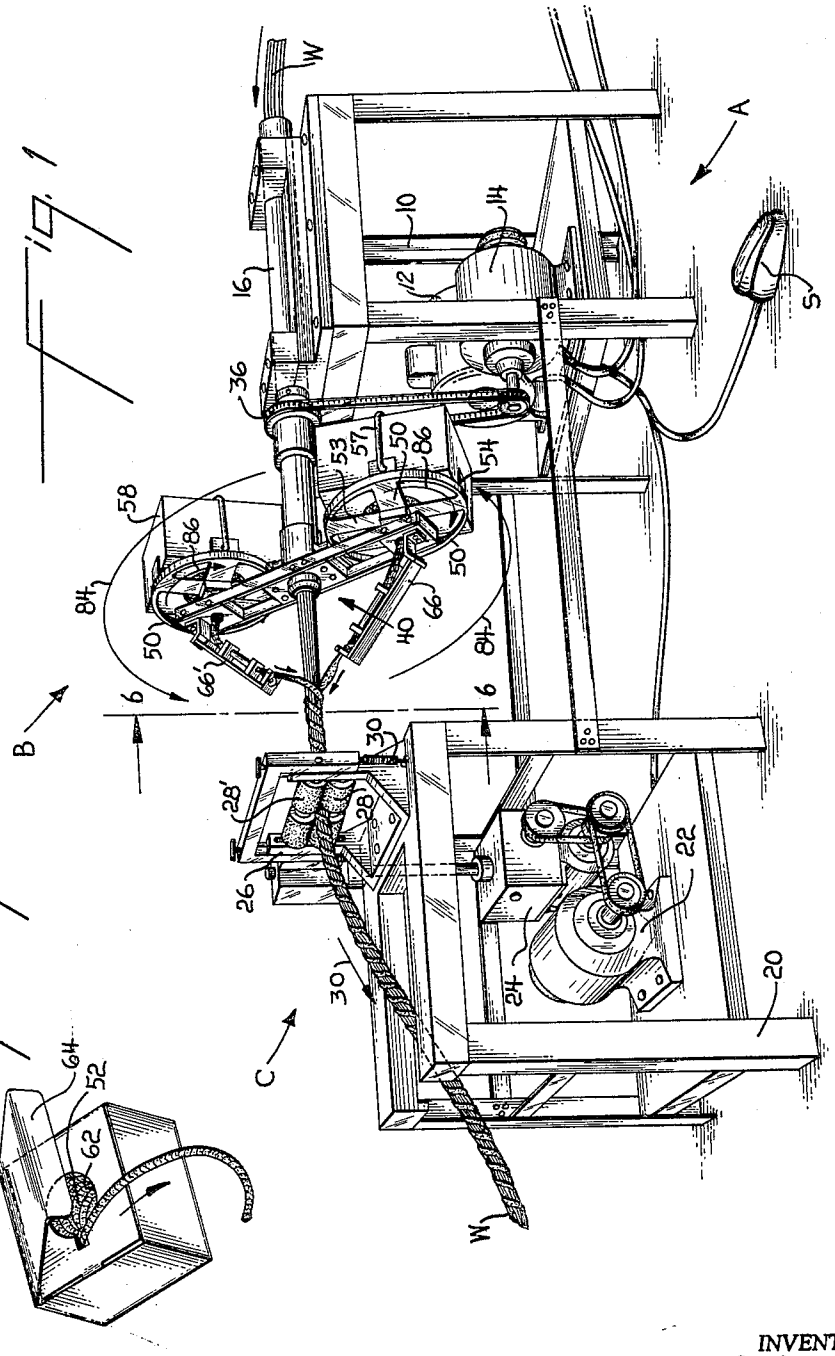


Fig. 2

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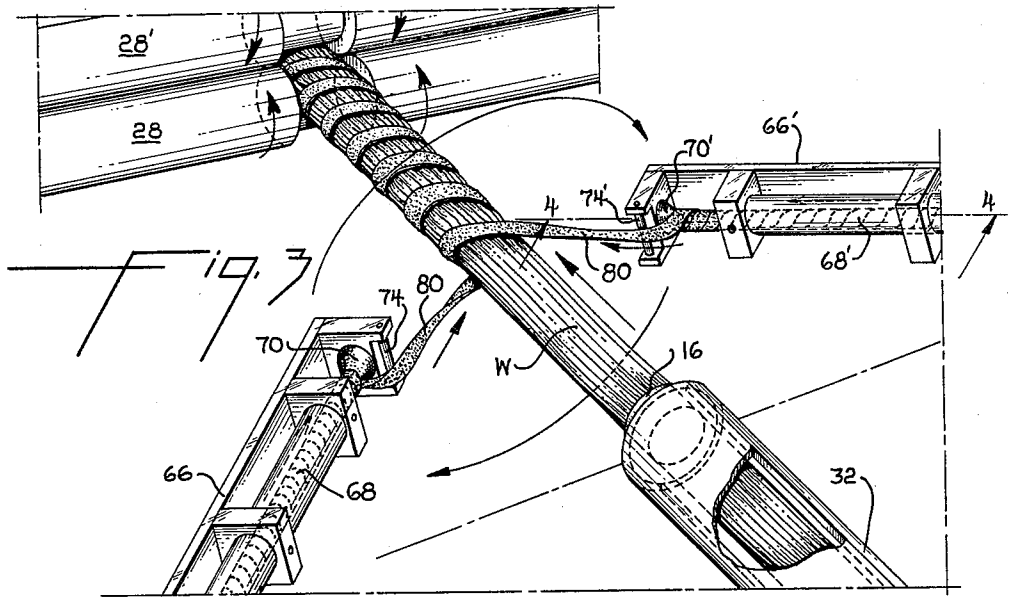


Fig. 3

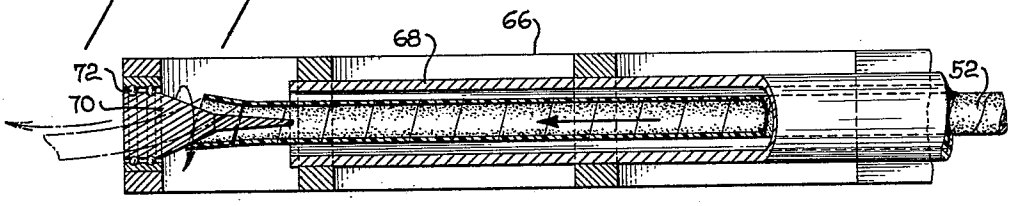


Fig. 4

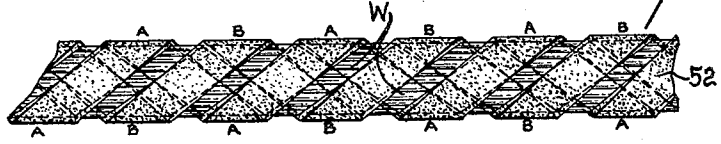


Fig. 5

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MACHINE FOR WRAPPING HELICALLY SPLIT TUBING

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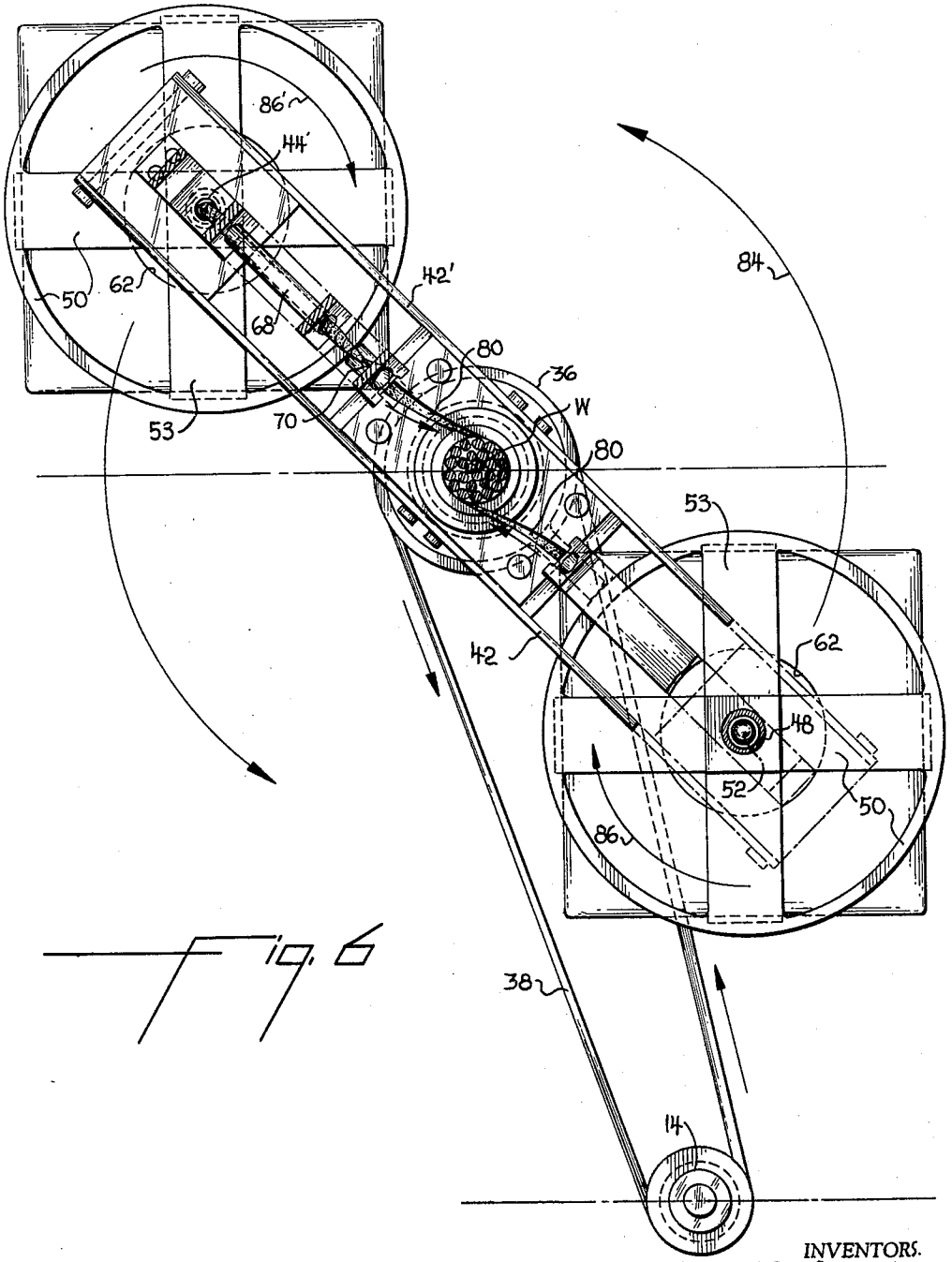


Fig. 6

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MACHINE FOR WRAPPING HELICALLY SPLIT TUBING

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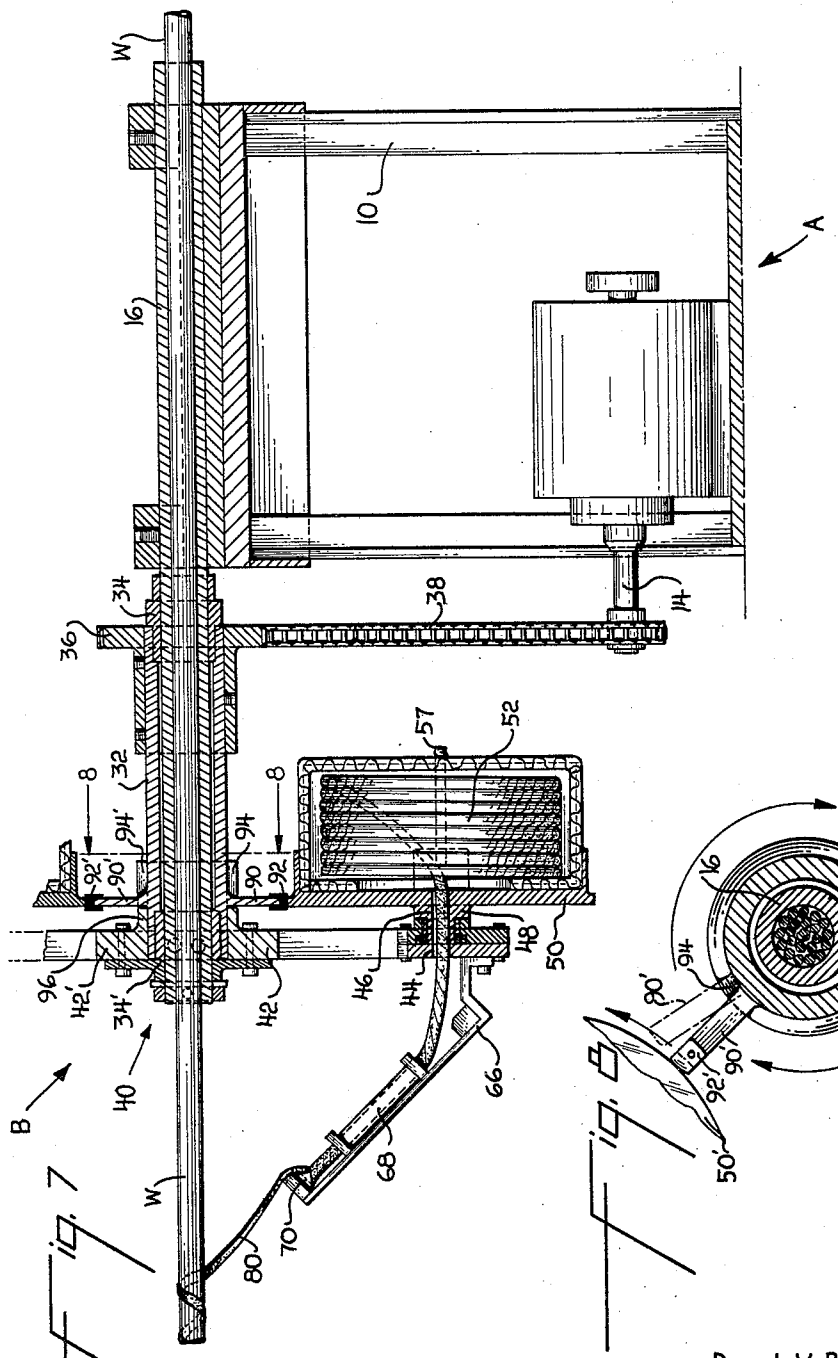


Fig. 7

Fig. 8

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United States Patent Office 3,059,404 Patented Oct. 23, 1962

3,059,404
MACHINE FOR WRAPPING HELICALLY SPLIT TUBING

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Filed Jan. 23, 1959, Ser. No. 788,634
1 Claim. (Cl. 57—6)

This invention relates to a device for wrapping helically split tubing about one or more wires or similar objects such as cables, tubing hoses, etc. to form what is known in the trade as a "harness." See application S.N. 565,651; filed February 15, 1956, by William Wolfson.

It is an object of this invention to provide a machine for continuously wrapping such tubing. It is also an object of this invention to provide such a device wherein the tubing is uncurled prior to its application and such uncurling transmits a torque to the wrapping material to rotate it about the axis of the tubing as it is fed to the wires.

It is also an object of this invention to provide a balanced machine for simultaneously feeding a number of spools of material.

It is also an object of this invention to provide a means for feeding the wires which controls the pitch of the wrapped material as well as its tightness.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of a machine illustrating the principles of this invention;

FIGURE 2 is a spool of material adapted to be used in the machine shown in FIGURE 1;

FIGURE 3 is a fragmentary view of the device shown in FIGURE 1, illustrating the wrapping material feeding mechanism;

FIGURE 4 is a sectional view taken along plane 4—4 of FIGURE 3;

FIGURE 5 illustrates a bundle of wires with helical split tubing applied thereto;

FIGURE 6 is a view taken along plane 6—6 of FIGURE 1, partially broken away;

FIGURE 7 is a side elevation view similar to FIGURE 1 showing the wrapping assembly in section;

FIGURE 8 is a sectional view taken along plane 8—8 of FIGURE 7.

As shown in FIGURE 1 the device consists of three basic units, the driving unit A; the wrapping unit B; and the feeding unit C.

The driving unit is comprised of a base member 10 which houses a standard power means 12 (e.g. electric motor) and if necessary, gear reduction means 14. The base member also supports a guide tube 16 fixed thereto which serves as part of the wrapping unit which will be described later.

The feeding unit also includes a base 20 which houses a motor 22 and gear reducer 24. The base 20 supports an assembly 26 with a pair of rotatable rollers 28, 28'. The upper roller 28' is driven by the power means 22 in a clockwise direction. A spring tensioning means 30

cause the lower roller 28 to engage the upper roller 28' and thereby be driven by it in a counterclockwise direction (as seen in FIGURE 1). Thus a bundle of wires W introduced into the rollers from the direction of the guide tube 16, is caused to move longitudinally in the direction indicated by arrow 30 in FIGURE 1.

Directing attention to FIGURE 7, the fixed tubing 16 has a rotatable cylinder 32 mounted with bearings 34, 34' which permit it to rotate with respect to the fixed tubing 16. The rotatable cylinder is disposed on one end of the fixed tubing 16 and has a sprocket 36 secured to the free end. The sprocket is driven by a chain belt 38 which is connected to the gear reducer 14.

A material carrying member 40 is secured to the outer end of the rotatable cylinder 32 and revolves therewith. The member 40 has a pair of arms 42, 42' extending radially outwardly. Since they are identical, only one of them need be described. However it is understood that any number of such arms may be employed. A material feeding opening 44 is located near an extremity of the arm 42. A bearing 46 is secured to the arm adjacent to the opening 44 and has a material supporting hub or spindle 48 journalled to it. The hub 48 is attached to a supporting bracket 50 which retains a supply of wrapping material 52.

As shown in FIGURE 1, the support 50 has a crosspiece 53 with each end 54 deformed at a right angle. A spring strap 57 joins the ends of the cross pieces so that a box of material 58 may be braced to the support and retained therein by the spring straps. An opening 62 in the center of the box (see FIGURE 2) permits feed from the coiled material. It is obvious (FIGURE 2) that the box of material may be used as a shipping container and when ready for use the top flap 64 may be removed and the carton applied to the support 50 and attached thereto by straps 57 as shown in FIGURE 7. The tubing may be fed from the coil 52, through the bearing 46 to the opening 44 in the arm 42.

A guide bracket 66 is also secured to the arm 42 on the opposite side from the material supply 52. The guide bracket 66 extends in a direction toward the material to be wrapped (in the illustrative embodiment use of the device on a bundle of wires "W" will be described). The guide bracket has a tubular member 68 (see FIGURE 4), secured thereto for aligning the tubing. A pin 70 is located at the free end of the guide bracket 66 so that it is coaxial with the tubular member 68. The pin is formed by a smooth conical surface which tapers to a sharp point. The pin may be rotatably disposed on the bracket by means of a ball bearing raceway 72. Also a roller bar 74 (FIGURE 3) is positioned on the bracket at right angles to the pin.

When the machine begins operation it is desirable to deliver an initial impetus to the support 50 so that it attains a rotational speed somewhere near the rotational speed of the rotatable tubing 32. Otherwise the speed of the rotatable tubing, compared with the "at rest" inertia of the support 50 will cause an abrupt tension on the helically split tubing and tend to break it. After synchronism is achieved, the support 50 and tube 32 will continue to rotate harmoniously.

Conversely when the mechanism is stopped the tube 32 will be stopped rather abruptly while the supports 50 continue to rotate freely. Accordingly a combination starter and brake for the supports 50 is provided. This comprises a pair of arms 90, 90' (FIGURE 7) with a rubber tip 92, 92' which form brake shoes on each arm. In their "at rest" position the tips 92, 92' each bear against one of the supports 50 slightly off center with sufficient pressure to prevent free rotation of the support. The arms extend through slots 94, 94' in a collar 96 which is fixedly secured to the arms 42, 42'. The slots

94, 94' are sufficiently wide to permit about 15° relative rotation between the arms 90, 90' and the collar 96, or an amount sufficient to permit the arm to rotate from a position wherein it prevents rotation of the support to a position wherein it is clear of the support, note FIGURE 8.

With the mechanism in the position shown in FIGURE 7, actuation of the driving means 14 et al. causes rotation of tube 32. The arms 90, 90' rotate about 15° before the support 42 starts to rotate. The action of the rubber tips 92, 92' moving from a position of compression against their respective supports to the center point and then to positions wherein they are disposed from the support (FIGURE 8) delivers an impetus to the support which causes the supports to rotate. The arms 90 and 90' drive the collar 96 and thus cause the arms 42, 42' to be rotated by the drive means.

When the device is stopped the rotation of tubing 32 is prevented so that collar 96 will tend to continue to rotate due to inertia. This will cause the collar 96 to rotate relative to the lugs 90, 90' so that they will be aligned with the supports. The rubber tips 92, 92' will functionally engage the supports under compression so that they will act as a braking means to halt rotation of the supports. The brake shoes are of sufficient length to pass over center relative to the supports' tangent points holding the rubber tips under compression thereby locking the supports.

This arrangement provides a means for causing the spools of tubing to start rotating prior to the rotation of the arms about the wire. Also it prevents the spools from freely rotating after the device is stopped. The tendency of the tubing to fracture because of a sudden jerk in the starting or stopping cycle is thus eliminated.

Operation

The wires to be assembled into a harness are fed into the rotatable cylinder 32 and fed into the feeding rollers 28, 28'. The motor 12 may be actuated by a foot switch "S" to rotate the cylinder 32 via chain 38 and gear reducer 14. Rotation of the cylinder 32 also causes rotation of the arms 90, 90' fixed thereto. As previously described rotation of these arms gives the spools a rotational spin. The lugs 90, 90' then drives the collar 96, arms 42, 42' etc.

The helical tubing may be drawn from the coil 52 through the opening 44, through guide tube 68, across the pin 70, and roller 72 and onto the wires "W." The drawings illustrate concurrent feeding by two spools of material. However any number of spools, i.e. one or more may be used. Drawing the helically split tubing across the pin 70 causes it to uncurl so that it is in the form of a flat strip 80 under tension and tending to return to its helical form, something like a coil spring which is held in an uncoiled position. As the material is rotated about the wires it is permitted to return to its helical shape but since the outside diameter of the bundle of wire is greater than the original inside diameter of the tubing, the material is tightly wrapped about the wires, note FIGURE 5.

A few turns of the material are applied to the wires before the machine is turned on. Thereafter the feed is continuous. The motor 22 drives the rollers 28, 28'

to move the wires longitudinally through the path of the wrapping unit. The motor 14 drives the rotatable cylinder 32 to rotate the supply of tubing around the wires in the direction shown by arrows 84 (FIGURE 6) to effect the wrapping action. The tubing grips the wires so tightly that longitudinal movement of the wires pulls the tubing out of the coil 52 to provide a continuous feed. The action of pulling the tubing across the pin 70 not only prepares the tubing for the wrapping cycle but transmits the torque resulting from uncurling the tubing back through the coil 52 so that the coil (and its assembly) rotates in the direction indicated by arrows 86. This action of rotating the coil in combination with the longitudinal movement of the wires "W" effects feeding of the helically split tubing. Thus the arrangement not only provides an outlet for bleeding off the torque generated by uncurling the tubing but applies it to feed the coil thus eliminating the need for a separate feeding means.

By maintaining a constant speed rotation of the arm 42, the speed at which the wires are fed through the device may be varied to determine the pitch of the wrapped material as well as how tightly it is bound to the wires, alternatively the wire feed may be maintained as a constant and the speed of rotation varied to change the pitch, and tightness of wrap or both may be varied according to the requirements of the particular application.

As previously described when the device is shut down the relative rotation between the arms 90, 90' and the collar 96 permits the braking action to prevent free rotation of the spools.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claim when viewed in their proper perspective against the prior art.

We claim:

A device for wrapping helically split tubing around elongated objects having a longitudinal axis in the direction of elongation, including: a base, means on said base for feeding the objects in the direction of their longitudinal axis, a rotary arm which revolves about the axis of the objects, rotary means on said arm for holding a supply of helically split tubing, means for uncurling said tubing as it is fed onto the objects, and means for rotating the means for holding a supply of tubing when the machine is initially started and to prevent such rotation when the machine is stopped.

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