United States Patent [19]

Hirschfelder et al.

[11] **3,770,025**

[45] **Nov. 6, 1973**

[54] **WIRE-LOOP STACKER**

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[22] Filed: **Dec. 27, 1971**

[21] Appl. No.: **211,984**

[30] **Foreign Application Priority Data**

Dec. 28, 1970 Germany..... P 20 64 049.7

[52] **U.S. Cl.**..... **140/2,** 242/47.01, 242/83, 266/3 R

[51] **Int. Cl.**..... **B21f 3/02**

[58] **Field of Search** ..... 140/1, 2; 242/47.01, 242/47.12, 79, 80, 81, 82, 83, 84; 266/3 R; 198/220

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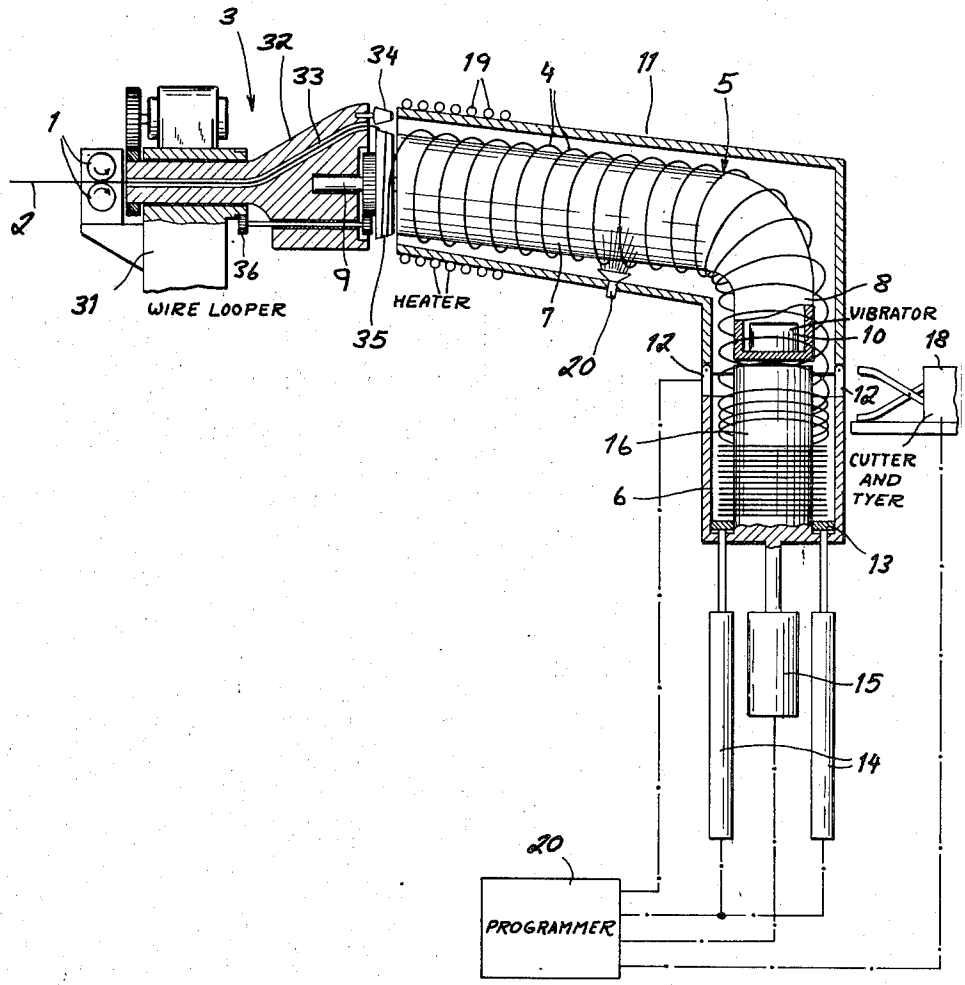
[57] **ABSTRACT**

Helicoidally wound wire coming hot from a looping machine is fed axially onto a vibrating elbow-shaped mandrel with a slightly downwardly sloping entrance leg and a vertically decending exit leg. The turns of the looped wire leaving the mandrel are deposited on a verticlly movable annular platform, surrounding a cylindrical core, which is periodically raised to compress a number of turns aginst lugs swung in laterally between the mandrel and the core. A cutting and tying device binds the compressed turns into a coil which, upon a lowering of the core, is laterally discharged from the platform.

10 Claims, 2 Drawing Figures



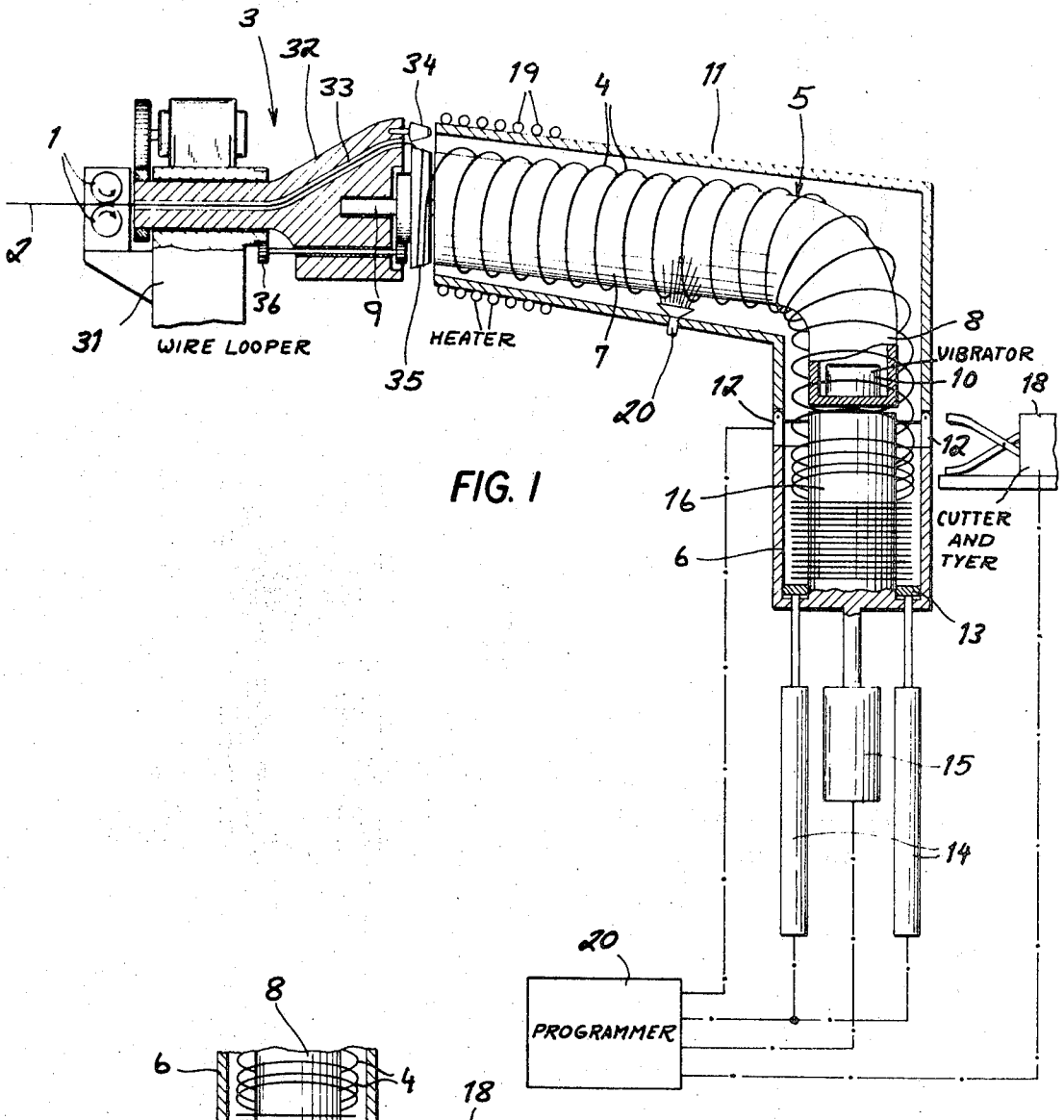


FIG. 1

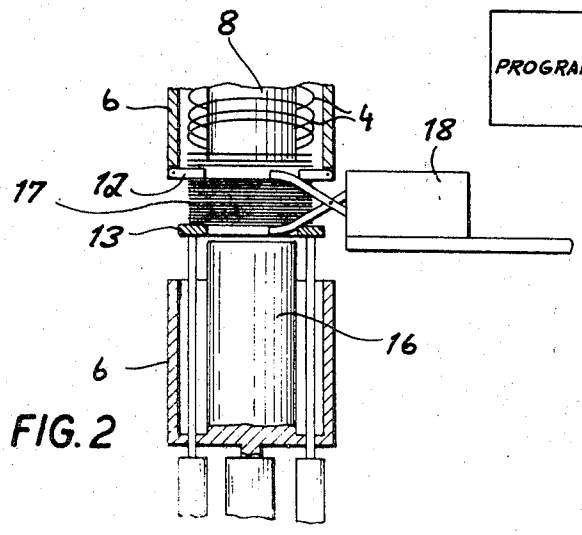


FIG. 2

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WIRE-LOOP STACKER

Our present invention relates to a device for conveying loose turns of wire which has been helicoidally wound in a looping machine after coming hot from a rolling mill.

It is generally desirable to subject such wire to a heat treatment (tempering or annealing) as it leaves the loop winder on its way to a stacking device. If this heat treatment is carried out on a conveyor grid over which the loops are spread prior to stacking, the crossover points of adjoining loops are not exposed to the same ambient temperature as the remainder of the wire so that nonuniformity of treatment and therefore of structure results.

The general object of our present invention is to provide an improved conveying device establishing an elongate path over which the loosely wound wire passes in a controlled atmosphere with avoidance of all contact between its loops.

A more particular object is to provide a device of this nature having means for bundling a certain number of turns of the looped wire into coils and removing these coils from the treatment path without interfering with the continuous formation of fresh wire loops traveling over the same path.

These objects are realized, pursuant to the present invention, by the provision of a preferably elbow-shaped mandrel with a generally horizontal entrance leg confronting a looping machine and with a substantially vertically descending exit leg overhanging a recovery station, the mandrel being equipped with a vibrator maintaining it in an oscillatory condition which facilitates the advance of the loops therealong.

Advantageously, the entrance leg of the mandrel is slightly inclined in a downward direction and has a diameter about equal to the inner loop diameter, decreasing somewhat at the exit leg. This insures the maintenance of a relatively wide average spacing along the downwardly sloping mandrel portion between successive loops which, owing to the resiliency of the wire material (e.g., steel), tend to move intermittently over the surface of the vibrating mandrel with alternate contractions and expansions of the helix. If the wire is fed to the looping machine at such a rate (compared with the speed of rotation of its eccentric outlet) that the emerging helix turns about the axis of rotation besides advancing along that axis, then the helix will come to rest on the entrance leg of the mandrel at points of contact progressively moving along the turns to insure uniform exposure.

According to another feature of our invention, the mandrel is spacedly surrounded by a loop-guiding tube also serving as a treatment chamber. Thus, the environment of the wire loops within the tube may be controlled to provide a desired tempering effect, as by heating the front part of the sloping tube portion to maintain an approximately constant temperature level and then quenching the hot metal by a water spray in an intermediate zone of that portion, followed by gradual cooling of the wire in the rear part thereof. The treatment chamber may be filled with an inert gas to prevent scaling of wire of high-grade steel or the like.

The recovery station adjoining the exit leg of the mandrel comprises, in accordance with a further feature of our invention, an annular platform centered on a cylindrical core and vertically slidable therealong, the

core being of substantially the same diameter as the exit leg of the mandrel with which it is coaxially aligned. Normally, this platform rests near the bottom of the core to receive a multiplicity of wire turns accumulating between the core and a sleeve spacedly surrounding same. When a predetermined number of loops have been stacked in this space, one or more normally withdrawn supporting elements are extended into the path of the wire helix at the lower end of the mandrel for temporarily retaining subsequently arriving loops. As the platform is raised, the supporting elements hold down the top of the stack which is thereby transformed into a compressed coil. At this point, with the core and its sleeve lowered to or beneath the level of the elevated platform or pressure ring, the coil thus produced may be severed from the following length of wire and tied, preferably automatically, prior to removal from the recovery station.

The invention will be described in detail hereinafter with reference to the accompanying drawing in which:

FIG. 1 is a side-elevational view, partly in section, of a treating and stacking device embodying our invention; and

FIG. 2 is a fragmentary view similar to part of FIG. 1 but showing the assembly in a different operating position.

FIG. 1 shows a pair of counterrotating transport rollers 1 feeding a freshly rolled wire 2 to a looping machine 3 which may be of conventional construction but, advantageously, is of the type disclosed in commonly owned copending application Ser. No. 196,962, filed by one of us, Horst-Dieter Hirschfelder, on Nov. 9, 1971. Such a machine comprises a fixed base 31 and a rotary head 32 centered on a horizontal axis and drive by a motor 37, an eccentric wire-dispensing duct 33 passing through that head and terminating at an off-axial location where the wire is gripped between a revolving roller 34 and a frusto-conical central disk 35 held stationary by a planetary-gear train 36 having a sun gear rigid with the base 31.

In accordance with the present invention, we provide a tubular mandrel 5 having a substantially horizontal, slightly downwardly sloping entrance leg 7 and a vertical exit leg 8. The left-hand end of leg 7, confronting the rotor 32 of looping machine 3, is cantilevered on a stationary supporting shaft 9 integral with disk 35. This arrangement facilitates the oscillation of mandrel 5 by means of a vibrator 10 attached to the free lower end of leg 8.

The wire 2, emerging from the looping machine 3 loosely wound into helicoidal turns 4, envelops the mandrel 5 while advancing therealong in a treatment chamber formed by a surrounding tube 11. The front end of this tube carries a heating coil 19 designed to prevent a sharp drop in the wire temperature until the helix reaches an intermediate zone where one or more sprinklers 20 spray water upon its turns. Upon reaching the lower end of leg 8, the loops 4 are transferred by gravity to a cylindrical core 16 which is spacedly surrounded by a sleeve 6 aligned with the bottom end of tube 11. At that bottom end a plurality of lugs 12 are hinged to the tube 11 so as to be swingable (e.g., electromagnetically) into a coplanar position, illustrated in FIG. 2, under the control of programmer 20. The descending loops accummulate on a platform constituted by a pressure ring 13 which may be raised from its normal position (FIG. 1) into an elevated position (FIG. 2)

by a plurality of hydraulic or pneumatic jacks **14** also controlled by the programmer **20.** The core **16** and the sleeve **6** are likewise vertically reciprocable, with the aid of a jack **15,** in response to a signal from the programmer.

In operation, a number of loops **4** are allowed to accummulate on the pressure ring **13** while the lugs **12** are withdrawn so as not to interfere with the descent of the loops into the space between sleeve **6** and core **16.** Thereafter, the lugs are swung up into a plane just below the bottom end of mandrel **8,** whereupon jacks **14** are operated to raise the ring **13** into the position of FIG. **2,** thereby compressing the stacked loops into a coil **17.** A cutting and tying device **18,** which may be one of several such devices peripherally spaced about the core **16,** then goes into action while the core **16** and the sleeve **6** are lowered to facilitate the operation of that device and to permit the lateral discharge of the bundled coil. Ring **13** may have surface grooves or gaps giving access to the tying tools of mechanism **18.**

After the discharge of the coil **17** just formed, the position of FIG. **1** is restored so that the loops meanwhile accumulating in somewhat bunched condition on the horizontally extended lugs **12** are free to drop onto the receding pressure ring **13.**

We claim:

1. A device for conveying loose turns of helicoidally wound wire coming from a looping machine, comprising:

a mandrel with an essentially horizontal entrance leg supported at one end and a substantially vertically descending exit leg terminating in a free end, said entrance leg being positioned to receive the oncoming wire loops via its supported end;

vibrating means mounted on said free end for oscillating said mandrel; and

recovery means underneath said free end for receiving wire loops descending along said exit leg and around said vibrating means.

2. A device as defined in claim **1** wherein said mandrel is generally elbow-shaped, said entrance leg sloping downwardly from said supported end at a small angle of inclination.

3. A device as defined in claim **1** wherein said entrance leg has a slightly larger diameter than said exit end.

4. A device as defined in claim **1,** further comprising a loop-guiding tube spacedly surrounding said mandrel.

5. A device as defined in claim **4,** further comprising temperature-control means on said tube in the region of said entrance leg and spray means in said tube at an intermediate section of said mandrel.

6. A device as defined in claim **1** wherein said recovery means comprises a cylindrical core of a diameter substantially equaling that of said exit leg and aligned therewith, an annular platform surrounding said core and slidable therealong, and normally withdrawn support means positionable adjacent the lower end of said exit leg for temporarily retaining descending wire loops and resisting the rise of loops stacked on said core upon a raising of said platform to convert a plurality of stacked loops thereon into a compressed coil.

7. A device as defined in claim **6** wherein said support means comprises a plurality of peripherally spaced lugs swingable into a horizontal plane underneath said exit leg.

8. A device as defined in claim **6** wherein said recovery means comprises cutting and tying means for said coil at a level below said lower end but above a normal level of said platform, the latter being elevatable to a raised level just below said cutting and tying means.

9. A device as defined in claim **6** wherein said core is vertically reciprocable for downward withdrawal from the vicinity of said exit leg to form a gap for the lateral removal of said coil.

10. A device as defined in claim **9** wherein said core is provided with a sleeve spacedly surrounding same and vertically reciprocable jointly therewith.

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