United States Patent

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[54] **METHOD OF AND MEANS FOR STACKING LOOPED WIRE**
8 Claims, 4 Drawing Figs.

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[51] Int. Cl. B21f 3/04
[50] Field of Search 140/2, 120, 120.5, 124

[56] **References Cited**

UNITED STATES PATENTS

3,103,237 9/1963 Crum 140/2
3,452,785 7/1969 McLean et al. 140/2

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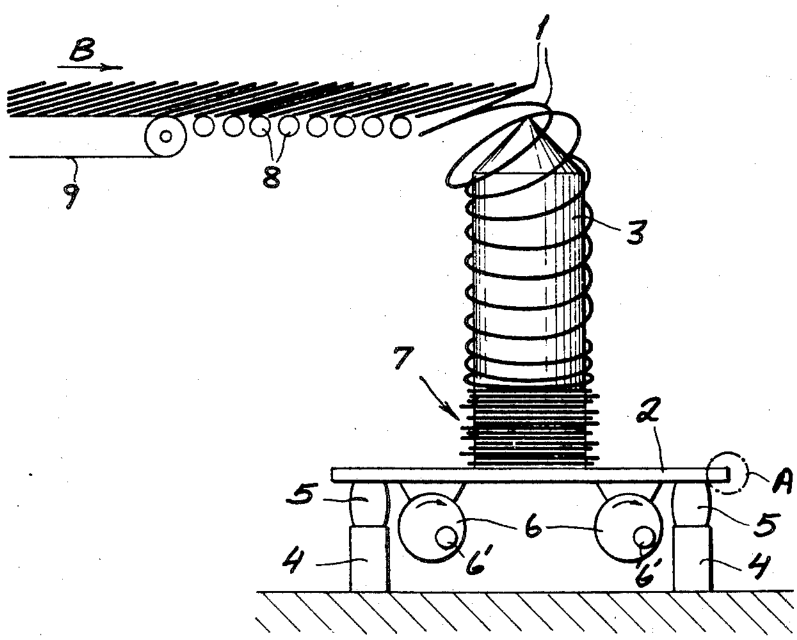
ABSTRACT: Steel wire, arriving in the form of spreadout loops on a conveyor from a treatment zone, is stacked with loose fit around an upstanding mandrel or within an upwardly open receptacle mounted on a vibratile platform to form a compact coil with mutually staggered turns, the oscillations of the platform having a frequency on the order of 10 cycles per second (substantially corresponding to the rate of deposition of wire loops) and of an amplitude with a horizontal component about equal to or greater than the wire thickness.



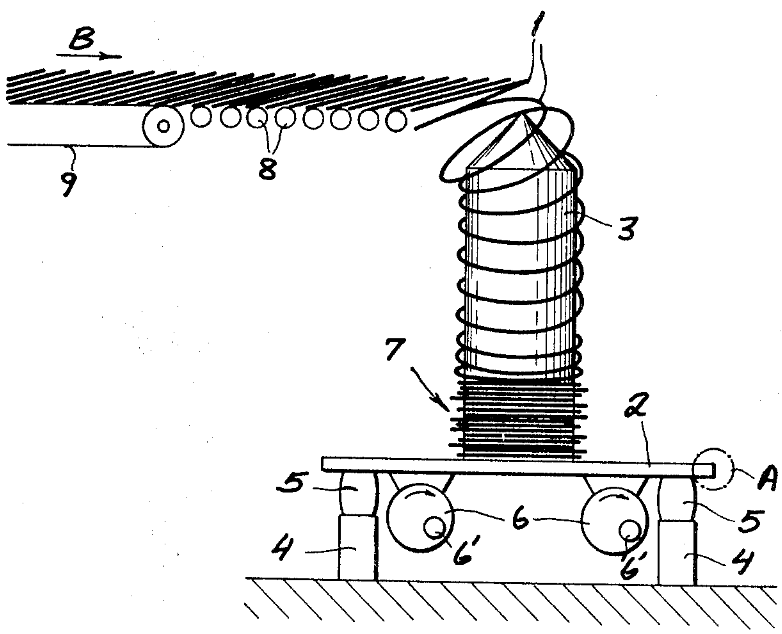


FIG. 1

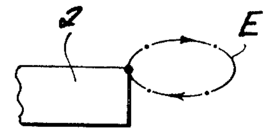


FIG. 1A

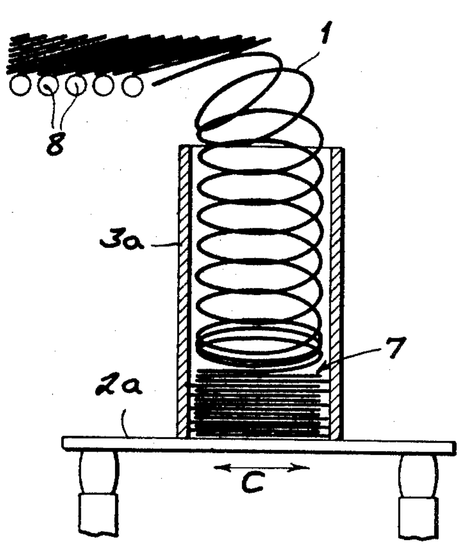


FIG. 3

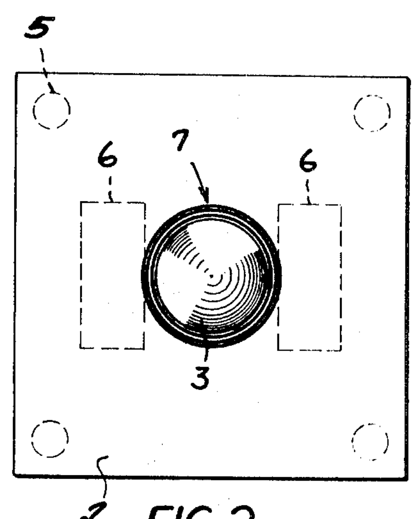


FIG. 2

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METHOD OF AND MEANS FOR STACKING LOOPED WIRE

Our present invention relates to a method of stacking a looped wire, e.g. a steel wire coming from an annealing, patenting, pickling or other treatment zone in which it has been placed on a conveyor in the form of spreadout loops, as well as to an apparatus for implementing the method.

In commonly assigned application Ser. No. 675,405 filed by three of us on 16 Oct. 1967, for example, there has been disclosed a system for the cooling of hot wire wherein the wire is deposited in loops, with the aid of an oscillating dispenser, on a continuously moving conveyor belt for passage through a cooling tunnel. The oscillatory frequency of the dispenser is so related to the rate of loop deposition that the loops are spread out on the conveyor surface with minimum overlap.

To facilitate the subsequent handling of the treated wire, it is necessary to reassemble the loops into a stack by substantially coaxially depositing them on a table or other supporting surface with the aid of a centering device, such as an upstanding mandrel or an upwardly open receptacle, rising from that surface. The loops then become the turns of a continuous coil which, if desired, can be axially compacted in a press to reduce its height. Even so, however, the loops tend to remain superposed in a cylindrical array so as to occupy considerable space during storage and transportation.

The object of our invention, therefore, is to provide a method of and means for tightly stacking a looped wire so that the resulting coil, even before compaction, is of reduced axial extension compared with coils produced by the conventional technique.

We have found, pursuant to the present invention, that this object can be realized by designing the supporting surface for the centering device as a vibratile platform which, during successive deposition of the loops of a continuous wire, is oscillated with an amplitude having a horizontal component approximately equal to or greater than the thickness of the wire, the frequency of oscillation being on the order of the rate of deposition of the loops. Given a loose fit between the centering mandrel or receptacle and the wire loops, the latter are mutually staggered by the vibrations so as to support one another only at isolated points rather than along their entire circumference. As successive loops are piled one upon the other, their unsupported portions sag under the weight of the overlying loops so that the resulting coil assumes a very compact character. A final compression step may then be used mainly for the purpose of further compacting the top layers of the coil.

In the system specifically described in the copending application mentioned above, the number of loops formed by the dispenser preceding the treatment zone is one the order of 10 per second; this rate is typical for the usual wire-treating plants of the general type referred to so that the preferred vibrating frequency in a coil builder according to our invention is on the order of 10 c.p.s. This oscillatory frequency will usually not correspond exactly to the rate of loop deposition so that the contact points between successive turns are distributed over the circumference of the coil in a more or less random fashion; the effect of compaction is thereby made substantially uniform over the entire coil periphery. In practice, the operating frequency advantageously ranges between 5 and 20 c.p.s. but may go as high as 30 c.p.s., a more rapid oscillation being usually unsatisfactory. The rate of loop formation tends to decrease with heavier wires which, therefore, call of oscillating frequencies in the lower part of the range.

With the common wire thicknesses, the horizontal component of the oscillation amplitude may range between about 2 and 10 mm.; the heaviest steel wire to be handled in this way may have a thickness of about 12 mm.

If the vibrations imparted to the coil-building assembly have a vertical component in addition to the aforementioned horizontal component, the assembled loops are shaken apart so as to fall more readily into a relatively staggered position. The vertical component may be of the same order of magnitude as the horizontal one but generally should be substantially larger than the latter.

The above and other features of the invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a side elevational view of a coil-building assembly embodying the invention;

FIG. 1A is an enlarged detail view of a portion of the assembly within circle A of FIG. 1, diagrammatically illustrating its oscillation;

FIG. 2 is a top plan view of the assembly of FIG. 1; and

FIG. 3 is a sectional elevational view of part of a modified assembly according to out invention.

In FIGS. 1 and 2 we have shown a vibratile platform 2 supported on legs 4 through the intermediary of resilient spacers 5 of the rubber-metal type. A mandrel 3 rises midway from platform 2 to the level of an elevated transport surface represented by a set of rollers 8 along which a succession of wire loops 1 continuously arrive in the direction of arrow B. The loops 1, whose inner diameter is slightly larger than the diameter of the mandrel 3, are part of an indefinite length of wire subjected to treatment at a zone not shown ahead of the rollers 8; these loops are delivered to the rollers by an endless conveyor belt 9 passing through that zone.

As the loops slide off the last roller 8, they are deposited on the platform 2 around the mandrel 3 with which they are in loose contact. Oscillations are set up in the assembly 2, 3 via a pair of synchronized vibrators 6 having rotary bodies with eccentrically positioned weights 6′. These vibrators, suspended from the platform 2 on opposite sides of the mandrel axis, effectively operate in parallel in the vertical direction and in tandem in the horizontal direction so that an elliptical motion E, FIG. 1A, is imparted to the table 2 and the mandrel 3. The horizontal component of the motion (greatly exaggerated in FIG. 1A) should be at least equal to substantially the thickness of the looped wire.

In FIG. 3 we have shown a similar platform 2*a* supporting an outwardly open receptacle 3*a* in which the wire loops 1 are deposited, again with loose contact, substantially in the manner described above; the oscillatory motion of the platform 2*a* has been diagrammatically indicated by an arrow C. The inner diameter of receptacle 3*a* somewhat exceeds the other loop diameter.

With the frequency of vibration corresponding approximately to the rate of reception of the loops 3, successive loops are relatively staggered so as to settle into a compact coil 7.

In the specific example, the wire had a thickness of 5 mm. and a loop diameter of about 1,100 mm.; the vibrations had a frequency of 16⅔ c.p.s. and a horizontal amplitude of 8 mm. The resulting coils had a height of 620–650 mm. compared with 750**800 mm. without vibration, corresponding to a specific axial length of 1.1 mm./kg. Upon subsequent compaction, this axial length was further reduced to 0.7–0.8 mm./kg.

We claim:

1. A method of stacking wire continuously arriving in the form of spreadout loops over an elevated transport surface, comprising the steps of successively depositing said loops on a platform below said transport surface in generally coaxial relationship and loose contact with a centering device rising from said platform, and vibrating said platform and device at a frequency on the order of the rate of deposition of said loops and with an amplitude having a horizontal component at least equal to substantially the thickness of the wire to assemble said loops into a compact coil with mutually staggered turns.

2. A method as defined in claim 1 wherein said frequency is on the order of 10 c.p.s.

3. A method as defined in claim 1 wherein the amplitude of vibration also has a vertical component of the same order of magnitude as said horizontal component.

4. An apparatus for stacking wire continuously arriving in the form of spreadout loops over an elevated transport sur-

face, comprising a vibratile platform at a level below said transport surface, means including a centering device rising from said platform for successively receiving said loops in coaxial relationship and loose contact with said device, and vibrating means coupled with said platform for oscillating same and said device at a frequency on the order of the rate of reception of said loops and with an amplitude having a horizontal component at least equal to substantially the thickness of the wire to assemble said loops into a compact coil with mutually staggered turns.

5. An apparatus as defined in claim 4 wherein said centering device is an upstanding mandrel with a diameter smaller than the inner diameter of said loops.

6. An apparatus as defined in claim 5 wherein said centering device is an upwardly open receptacle with an inner diameter larger than the outer diameter of said loops.

7. An apparatus a as defined in claim 4 wherein said platform is provided with spaced-apart resilient support means, said vibrating means being mounted below said platform between said support means.

8. An apparatus as defined in claim 4 wherein said vibrating means comprises a pair of synchronized eccentrically weighted rotating bodies journaled on opposite sides of the axis of said centering device.