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APPARATUS FOR SPOOLING

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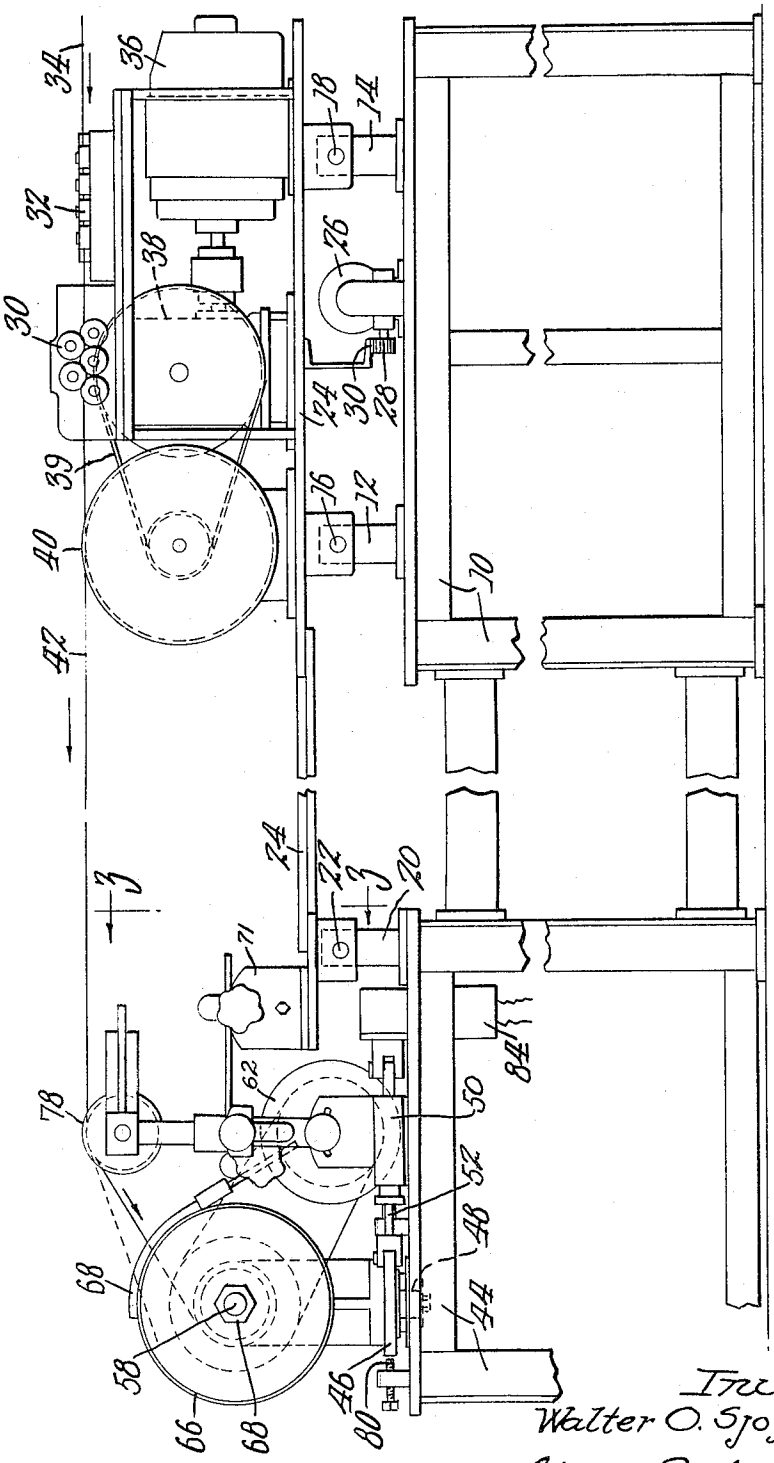


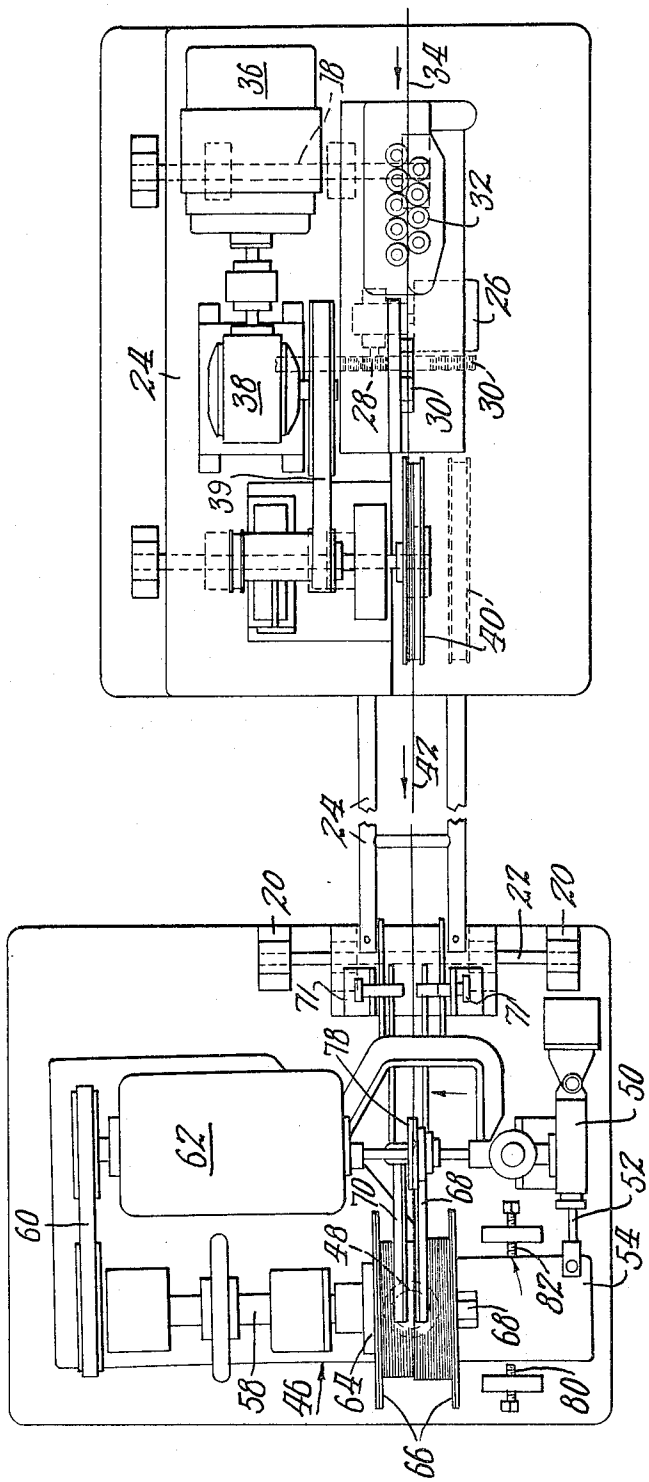
Fig. 1

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Fig. 2



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Fig. 3

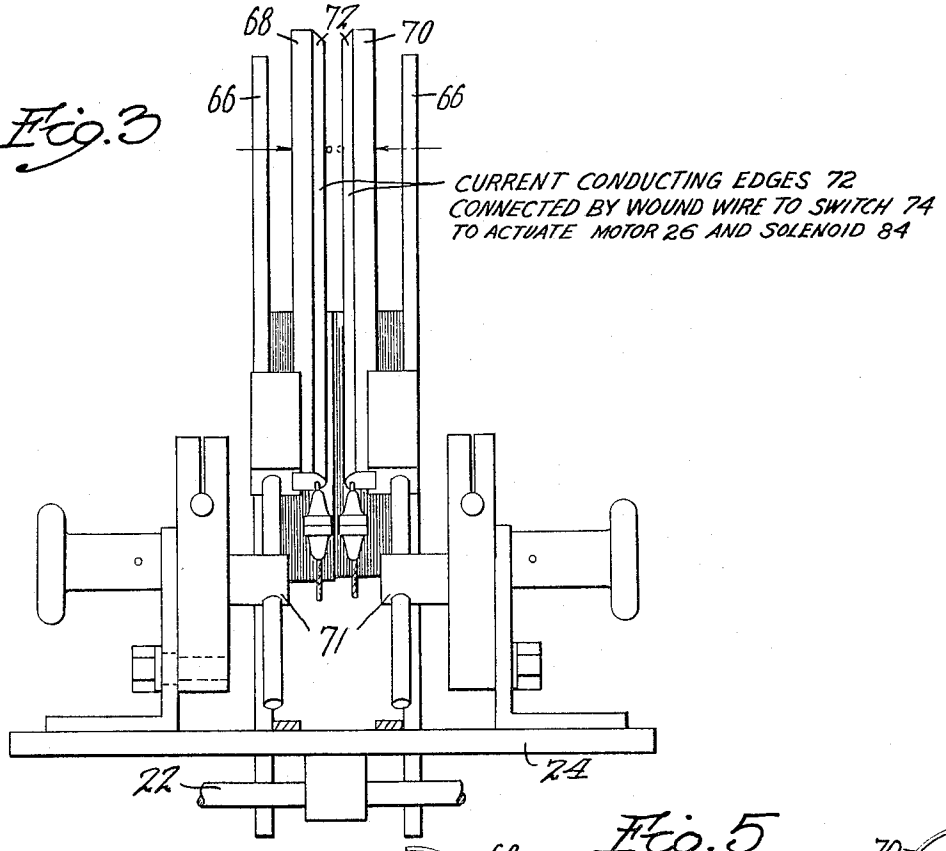


Fig. 4

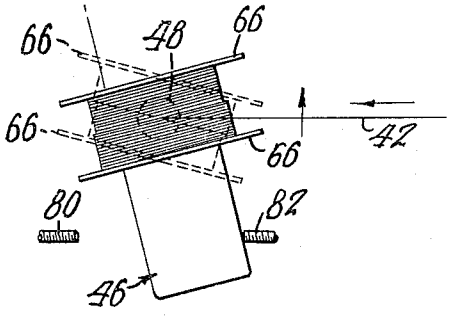
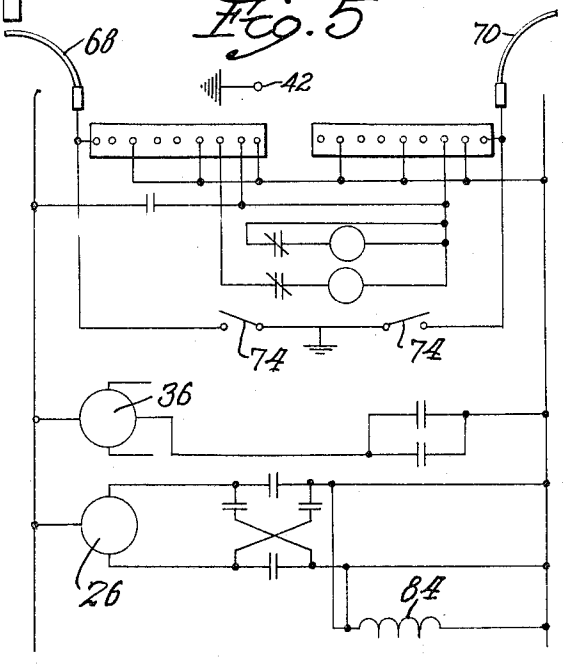


Fig. 5



United States Patent Office

3,289,956

Patented Dec. 6, 1966

3,289,956

APPARATUS FOR SPOOLING

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Filed Jan. 18, 1965, Ser. No. 426,272

9 Claims. (Cl. 242—25)

This invention relates to the spooling of filaments, for instance wire, from a supply or coil, and the principal object of the invention resides in the provision of means for spooling the filament evenly in tight convolutions on the spool from end to end thereof, an including means for causing it to be reversed at the ends or flanges of the spool, continually casting on convolutions in layers, one layer on the other, in a continuous manner, to the end that spools can be economically provided with the material more accurately and evenly wound than can be done in the prior art and also at higher rates of speed.

Another object of the invention resides in the provision of a spooling machine which includes means for rotating the spool with wire attached thereto under tension as from a capstan or the like, and the spool being rotated, the wire or similar material is taken up on the spool, there being means provided for inclining the axis of the spool slightly with respect to the line or path or direction of the motion of the wire thereto so that the convolutions tend to climb, keeping them very neatly and snugly against one another as they progress along the spool, there being means to reverse the inclination when the end of the spool is reached so that due to the angular relationship, there is one convolution directly above another at the end of the spool, the wire or other material being wound then slipping from this layer and proceeding in the reverse direction to the opposite end of the spool.

A further object of the invention resides in the provision of an apparatus for winding materials as above described and including means automatically maintaining the line of advance of the wire or other material being wound directly in line with the particular convolution being wound on the spool. That is, the wire in-feeding apparatus is laterally displaced in a direction to correspond to the inclination of the axis of the spool so that as the convolutions continue along the length of the spool, the in-feeding apparatus of the wire moves therewith, always maintaining the wire aligned with the convolution being wound at the point of casting on.

A still further object of the invention reside in the provision of means for controlling the transverse motion of the wire in-feeding apparatus above described, this comprising movable sensing members, one at either side of the wire as it is fed to the spool. As the wire touches a sensing member and moves it, this action in turn is transmitted instantly to power-operated means for bodily moving the wire in-feeding apparatus transversely to the extent of touch or contact of the wire therewith. There are two such sensing members, one at each side of the wire so that as the wire turns at the end of the spool to reverse the direction due to the reversal of tilt of the spool axis, then the opposite sensing device will be engaged by the wire and start to move the wire in-feeding apparatus correspondingly therewith in the reverse direction.

A still further object of the invention resides in the provision of a sensing apparatus as above described which controls the position of the in-feeding device to keep it aligned with the particular convolution of wire being wound at the cast-on point, such control device comprising an electric means at either side of the wire, the wire being grounded and there being a circuit of low voltage for a control mechanism connected to said sensing means so that when the wire touches it a contact is made and the circuit closed, which circuit controls an electric motor

in turn translating the wire in-feeding means laterally in either direction under the control above recited.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings in which:

FIG. 1 is a view in side elevation showing the apparatus;

FIG. 2 is a top plan view thereof;

FIG. 3 is a sectional view on the line 3—3 of FIG. 1, showing the sensing means;

FIG. 4 is an exaggerated diagrammatic view showing how the takeup spool is swung, and

FIG. 5 is a partial wiring diagram for the apparatus.

Referring now to FIGS. 1 and 2, the main parts of the machine are here shown. Any kind of framework **10** may be utilized in order to support the apparatus at a convenient height. At one end of the machine there is provided a series of supports **12**, **14** on which are mounted transverse rods **16** and **18** and this rod support construction is also utilized as at **20** and **22** respectively, in advance of the supports **12** and **14**. The rods **16**, **18** and **22** are horizontal and mount a platform generally indicated at **24** which can be of any desired construction but which is adapted to move back and forth laterally or transversely of the framework on the respective rods under influence of a motor **26** having a pinion gear **28** in mesh with a rack **30** that is secured to the under side of platform **24**. The motor **26** is reversible and it will be seen that it therefore can be utilized under proper control to move the entire platform **24** and whatever is mounted on it in a transverse direction from side to side of the machine.

Mounted on the platform **24** by any desired supports there is a more or less conventional wire straightener device **30**, **32**, the wire being shown at **34**, and these can be mounted in any way desired to move with the platform. Also the motor at **36** is mounted on the platform and directly drives a speed reducer **38** which in turn is connected to drive through belt **39** or the like, a capstan **40** The capstan **40** takes several wraps of the wire **34** before proceeding to the spool in the direction indicated by reference numeral **42**, and it is to be understood that all of the parts described are mounted on the platform **24** and move laterally therewith as is indicated in the solid and dotted line positions shown in FIG. 2 as to the capstan.

The takeup section of the device is shown at the left-hand ends in FIGS. 1 and 2, being mounted on another part of the framework provided with the reference numeral **44**. In this case there is another platform indicated at **46** which is pivoted on a vertical bearing **48** and is moved from one position to the other by means of a cylinder **50** having a piston rod or the like **52** connected to an extension **54** of platform **46**. On platform **46** there is a shaft generally indicated at **58**. This may be mounted in any desired manner and it is driven through gearing or belts as at **60** from a motor **62** which is also mounted on the platform **46**. The motor **62** imparts a good deal of tension to the shaft so that when the wire is wound it is wound under tension; but this tension is equalized as for instance by the capstan as will be recognized by those familiar with the art.

The shaft **58** carries the spool which is applied in a well-known manner to the flange **64** on the shaft **58**, there being a pair of spool flanges as at **66** and these may be of different sizes and secured in position in a well-known manner as by nut **68**.

There are a pair of relatively fixed elongated arms **68**, **70** which are mounted in any desired manner with respect to the left-hand end of the platform **24** and they extend upwardly and to the left, see FIG. 1. These two members are adjustable to and from each other and toward and

away from the spool on their mounts 71, 71. They are generally parallel and extend in a direction toward the spool to receive therebetween the thread or the wire. These two members are each provided with a current-conducting edge facing inwardly as indicated by the reference numeral 72, and these edges are connected to a switch device 74 in such a way that when the wire 42 which is grounded touches either of them a circuit is made which energizes the motor at 26. The effect of one of the elements is to turn the shaft of the motor 26 in one direction, and the other operates to cause it to turn in the other direction so as to reverse the motion of platform 24. Thus it will be seen that when the spooling takes effect, and the thread or wire moves relatively to the axis of the spool as it is being wound on it, eventually the thread or wire will touch the respective electrical element, energizing the circuit and causing thereby the entire platform at 24 and all the parts on it to move correspondingly transversely of the machine, i.e., to move laterally of the path or direction of the in-coming wire which is being cast on the spool. This in turn insures that the wire is at all times directed or aligned exactly with the point on the spool that the casting-on is actually occuring.

There is a free running guide roll at 78 located above the contact fingers described above mounted on a fixed shaft and moving back and forth, leading the wire from the capstan onto the spool.

It is pointed out that the exact details of the spool construction are not germane to the present invention and any kind of spool can be used as may be required; but the spool must be driven by shaft 58 and must have tension or torque applied thereto so as to apply some tension to the thread or wire moving toward the spool.

When the thread or wire reaches one of the flanges of the spool, it will build up one convolution thereon and then slip off the convolution starting the reverse action or layer of convolutions back in the other direction, at which time the air cylinder at 50 is energized to slightly shift the entire platform 46 including the shaft 58 and the spool to reverse the inclination thereof, so that the thread or wire tends to climb up the crown and due to the torque applied to the shaft 58 the layers of the wire or thread are forced to lie in neat and tight arrangement with respect to one another in smooth even layers across the spool.

Stops 80 and 82 regulate the amount that the plate 46 swings in either direction, and the solenoid valve 84 is actuated to operate air cylinder 50, by the respective electric conductor edges 72.

FIG. 4 is very greatly exaggerated, it being usually necessary to use but a single degree or two to accomplish the results described, but the action of the spooling operations can be readily understood from this view.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. The method of winding an elongated filamentary material onto a spool in close, even convolutions including leading the filamentary material along a substantially straight-line path to the spool, inclining the axis of the spool slightly with respect to the direction of motion of the filamentary material so that as the latter is cast on, it tends to rise with respect to said axis to be cast on the spool in winds that progress along the spool, the material also tightening relative to the spool, bodily moving the on-coming filamentary material relative to the spool in a direction transverse to the direction of travel of the filamentary material and in accord with the progressive windings on the spool so that the material is cast straight onto the spool at all times at the point that the filamentary material is in the act of being cast onto the spool, and controlling the degree of transverse travel of the filamentary material according to the position of the latter relative to its cast-on position on the spool.

2. The method of spooling filamentary material by casting the filamentary material onto the spool in contiguous even turns from one end of the spool to the other in a succession of even layers, said method comprising the step of moving the filamentary material in a substantially straight line to the spool while holding the same under tension, inclining the axis of the spool slightly with respect to the line of advance of the filamentary material so that the respective individual convolutions of the filamentary material about the spool travel along it and tend to ride upwardly as represented by the steadily receding surface of the spool as the filamentary material is wound thereon from one end to the other of the spool, reciprocating bodily the advancing filamentary material maintaining it even with the point of casting-on as the filamentary material proceeds to be wound along the spool, reversing the relative motion of the line of filamentary material relative to the spool at each end thereof, and reversing the inclination of the spool relative to a line at right angles to the direction of advance of the filamentary material.

3. Apparatus for spooling comprising means rotatably mounting a spool, means to rotate the spool on its axis, means providing a substantially straight in-line path of advance for a substantially continuous filamentary material to the spool, said path being substantially at a right angle to the spool axis, means providing for bodily transverse motion from side to side of said advancing filamentary material as it approaches the spool to ensure that the point of casting-on with respect to the spool is always in line with the substantially straight, advancing filamentary material, means mounting the spool on an inclination with respect to the path, means for reversing the inclination of the spool and the direction of travel of the filamentary material each time that the point of casting-on of the filamentary material with respect to the spool reaches an end of the spool, and means actuated by the filamentary material controlling the reversal of the inclination of the spool axis.

4. The spooling apparatus recited in claim 3 wherein said last-named means comprises a pair of spaced members through which the material passes, and including means to energize the reversing means upon contact of the material with either of the spaced members.

5. The spooling apparatus recited in claim 3 wherein said controlling means comprises two spaced members through which the filamentary material is trained just prior to being cast onto the spool, and including means to energize the means that provides the transverse motion upon contact of the filamentary material with either of the spaced members.

6. The spooling apparatus recited in claim 3 wherein said controlling means comprises two spaced members through which the filamentary material is trained just prior to being cast onto the spool, and including means to energize the means that provides the transverse motion upon contact of the filamentary material with either of the spaced members, and means mounting the spaced members for motion together along the spool under action of said filamentary material in engaging one or the other thereof.

7. The spooling apparatus recited in claim 3 wherein said controlling means comprises two spaced members through which the filamentary material is trained just prior to being cast onto the spool, means to energize the means that provides the transverse motion upon contact of the filamentary material with either of the spaced members, and means mounting the spaced members for motion together along the spool under action of said filamentary material in engaging one or the other thereof and thereby causing travel of the incoming filamentary material in the same direction.

8. A spooling apparatus comprising a source of wire, means for straightening the wire, means for traveling the straight wire longitudinally substantially in a straight line, means applying tension to said wire as it advances, a spool, means mounting the spool, means rotating the spool, the

means mounting the spool being pivotable on an axis generally at right angles to the plane in which the advancing straight line of wire is located and having the effect of tilting the spool slightly from a full right angle relationship with respect to said line, means supporting the straight wire as it approaches the spool for motion in a transverse direction of the line of advance thereof and substantially along the spool from end to end of the spool in both directions, power operated means reversing the motion thereof at the ends of the spool, power operated means for reversing the tilt of the spool, and means for controlling both said reversing means, said controlling means comprising a pair of electrically conducting arms between which the wire passes as it approaches the spool, said arms being in circuit with the power operated motion reversing means and with the tilt reversing means.

9. The spooling apparatus of claim 8 wherein the arms are bodily movable under influence of the wire as it moves along the spool.

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