April 29, 1969 W. HENRICH 3,441,229

APPARATUS FOR THE CONTINUOUS WINDING OF WIRE ON SPOOLS

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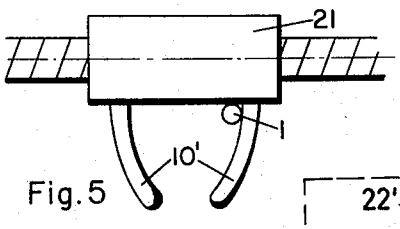

Fig. 5

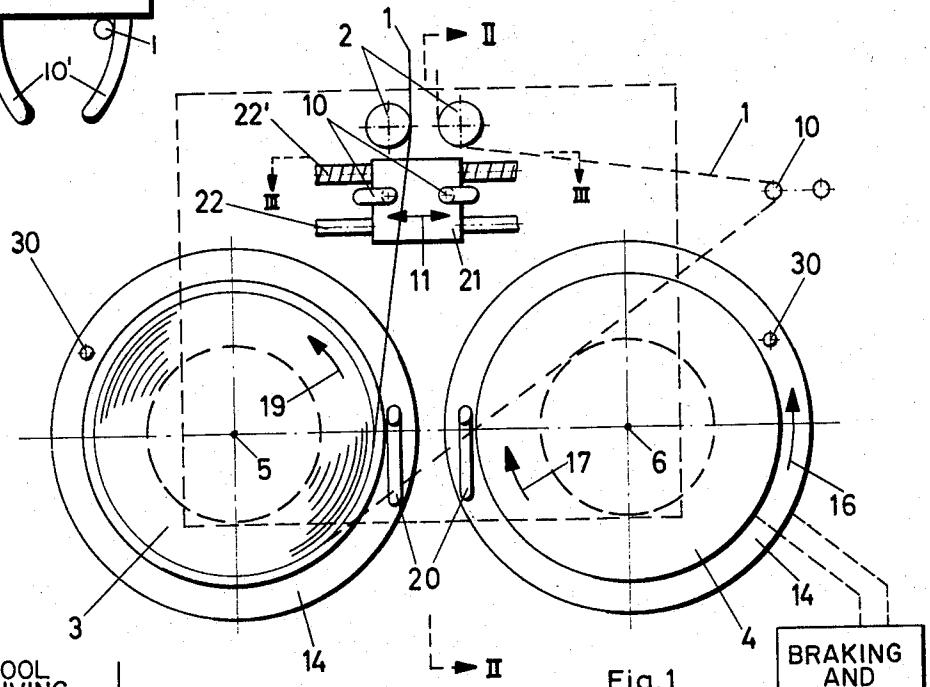

Fig. 1

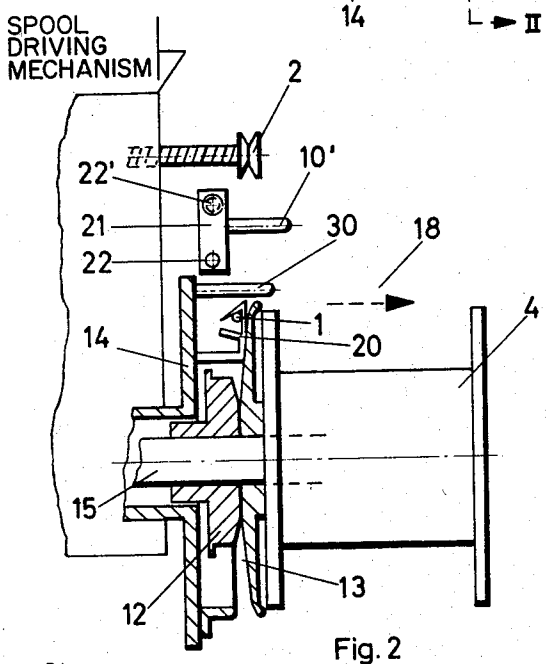

Fig. 2

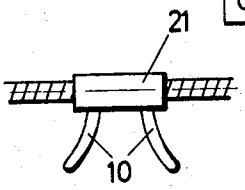

Fig. 3

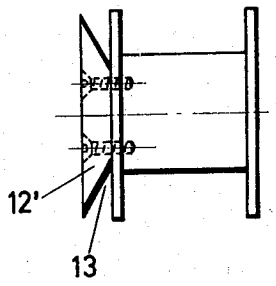

Fig. 4

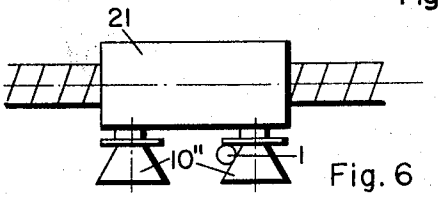

Fig. 6

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APPARATUS FOR THE CONTINUOUS WINDING OF WIRE ON SPOOLS

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ABSTRACT OF THE DISCLOSURE

A pair of spaced, parallel spools with the wire passing through a guide-way movable transversely of the spools and wound upon one spool. The guide-way is moved over the empty spool so that a hook on a rotating member adjacent the empty spool carries the wound wire into a gripper on the empty spool and the full spool is braked so that the wire is parted between the spools. A lifting pin on the same rotating member adjacent the empty spool then lifts the wire over the flange of the empty spool and the winding of the wire is continued on the empty spool.

The present invention relates to an apparatus for continuously winding a wire, tape and the like upon two spools, more particularly, to the positioning of the wire on the empty spool and severing the wire from the full spool so that the winding of the wire may continue upon the empty spool.

Various forms of apparatus have been devised for the clamping of a wire onto a rotating spool in order to change the winding of the wire from a full spool to an empty spool. Such arrangements generally comprise a clamping disk mounted on a spool which cooperates with a movable disk closely positioned thereby. The movable disk is urged into engagement with the clamping disk by means of electromagnets and released from the clamping disk by springs when the electromagnets are de-energized. The wire is positioned between the separated disk and then gripped or clamped tightly therebetween by bringing the disks close together. Such an arrangement has been generally unsatisfactory since it is necessary to provide a plurality of electromagnets for each disk in order to assure a uniform application of force around the disks. It was also necessary for the electromagnets to be accurately balanced with respect to each other and similarly, with the release springs. The necessity for a number of electromagnets thus resulted in an inefficient operation. The apparatus was further complicated by the necessary electric switching mechanism to control the application and release of the clamping disk. Since these electrical switching circuits and mechanisms required occasional repair, it would be necessary to interrupt the entire wire drawing operation because of such repairs.

Another feature of prior art disk clamping arrangements for spools was an arrangement to transversely shift the wire being wound so as to position the wire between the spaced apart disks. A commonly used structure for carrying out this function comprised a conical roll so positioned that the wire being wound upon the spool is urged over the flange of the spool and into position between the clamping disk. This structure, however, had the disadvantage of requiring that the clamping disks be spaced rather far apart from each other to insure that the wire will not slip out over the movable clamping disk. This wide spacing apart required a relatively large shifting movement to move the disks into clamping position and hence this wire clamping operation required a

rather long duration of time during which the wire was still being wound upon the spool.

It is therefore the principal object of the present invention to provide a novel and improved apparatus for changing the winding of the wire from a full spool to an empty spool without disrupting the winding of the wire.

It is another object of the present invention to provide a novel and improved arrangement for clamping a wire to a revolving spool, severing the wire and transferring the wire to an empty spool so that the winding operation may be continued on the empty spool.

The objects of the present invention are achieved and the disadvantages of the prior art are eliminated by the apparatus for the continuous winding of wire as disclosed in the present invention. In one aspect of the present invention there may be provided a pair of adjacent spools for the winding of wire thereon with the rotational axes of these spools being parallel. A guide-way is provided for feeding the wire upon a spool with the guide-way being movable in a direction perpendicular to the spool axes. Each spool is provided on one of its flanges with a wire gripping structure which may comprise a clamping disk fixed to the spool and having a V-shaped notch in its periphery for receiving the wire. Also mounted on each spool outwardly of the fixed clamping disk is a rotary member which is rotable about the rotational axis of its respective spool. Each rotary member is provided on preferably its inner face with a hook which engages the wire and moves the wire into the V-shaped notch of the gripping or clamping disk.

In addition, there is provided on the same face of each rotary member a pin extending parallel to the rotational axes of the spools which lifts the clamped wire above the flange of the empty spool so that the winding of the wire may be commenced on the body of the spool. The transverse movement of the wire with respect to the spools is accomplished by a wire guide which uniformly winds the wire in layers upon the spools. A control mechanism is provided which may frictionally brake the full spool after the wire has been clamped in the gripping mechanism of the empty spool so that the wire is severed between the two spools and the winding of the wire initiated upon the empty spool.

Other objects and advantages of the present invention will be apparent upon reference to the accompanying description when taken in conjunction with the following drawings, wherein:

FIGURE 1 is an elevational view of the wire winding apparatus according to the present invention;

FIGURE 2 is a sectional view taken along the line II—II of FIGURE 1 and showing the clamping disk structure and the rotary disk structure on a flange of the empty spool;

FIGURE 3 is a sectional view taken along the line III—III of FIGURE 1 and showing one form of the transverse guide-way which is movable perpendicularly to the rotational axes of the spools;

FIGURE 4 is an end elevational view of a spool having a modified clamping disk thereon;

FIGURE 5 is a view similar to that of FIGURE 3 and showing another form of the transverse guide-way; and

FIGURE 6 is a view similar to that of FIGURE 5 and showing still another form of the transverse guide-way.

Proceeding next to the drawings wherein like reference symbols indicate the same parts throughout the various views a specific embodiment and modifications of the present invention will be described in detail.

As may be seen in FIGURE 1, the wire 1 comes from the wire drawing machine and passes through a guide 2

which is movable transversely of spools 3 and 4 on a spindle shaft (partially shown) parallel to the rotational axes 5 and 6 respectively of the spools to wind the wire in successive and uniform layers on one of the spools. As may be seen in FIGURE 1, the wire has been wound upon spool 3 which is full and it is now necesary to transfer the winding of the wire to empty spool 4.

Below the wire guide 2 there is provided a transverse guide-way 10 which comprises two outwardly divergent curved bars as may be seen in FIGURE 3. The guide-way 10 is mounted on a body 21 which may be slidably mounted on rods 22 and 22' for movement perpendicularly to the rotational axes of spools 3 and 4 in the direction as indicated by the arrow 11. The movement of the guide-way 10 is under the control of a suitable control mechanism which is actuated to rotate the threaded spindle shaft 22' so as to move the guide-way to the position 10' when the spool 3 has been filled and it is desired to wind the wire upon spool 4. In position 10', the wire will be carried by the left pin or bar as viewed in FIGURE 1 and the wire will then be in the position shown by the dash lines 1' in FIGURE 1.

As may be seen in FIGURE 2, each spool is provided with a clamping disk 12 which is fixed to a flange of the spool as shown in FIGURE 2 and has a V-shaped notch 13 at its periphery which grips the wire positioned therein. The notch 13 is formed by the radius of the clamping disk 12 decreasing suddenly in the direction of the flange of the spool.

Also mounted adjacent the same flange of each spool is a rotary member 14 which is mounted for rotation in either direction on a hub of the clamping disk 12 coaxial with shaft 15 of the spool. The rotation of the rotary member 14 is controlled by a suitable control mechanism. On either its inner or outer face, each rotary member carries a gripping hook 20 which pulls the wire firmly into the clamping notch 13 during the rotation of rotary member 14 in the direction of the arrow 16.

In order to lift the wire from the gripping notch 13 to the spool to be wound thereon, the same face of each rotary member is also provided with a pin 30 which extends in a direction parallel to the rotational axes of the spools. The pin 30 is substantially diametrically opposite to the hook 20 but in FIGURE 2 the pin 30 is shown in a somewhat displaced position for the purposes of clarity. In the present embodiment both the hook 20 and pin 30 have been shown on the inner face of this respective rotary member.

The operation of the apparatus according to the present invention will be as follows:

When the spool 3 has been wound fully as shown in FIGURE 1 the control mechanism will displace the guide-way 10 to the dotted position. At the same time the wire guide 2 transversely moves the wire across the spool adjacent the left-hand flange of the spool as viewed in FIGURE 2. The wire will then be in the position as shown by the dash lines and indicated by 1'. As rotary member 14 on spool 4 is rotated in the direction of the arrow 16, its hook 20 will engage the wire and pull the wire down into the gripping notch 13 of its clamping disk 12. The spool 4 now begins to rotate in the direction of the arrow 17 to begin winding the wire and the full spool 3 is frictionally braked to a stop under the action of the control mechanism. The wire is thus severed or torn apart between the gripping notch 13 on empty spool 4 and full spool 3.

In order to lift the wire onto empty spool 4 from the clamping disk, 12, the pin 30 on rotary member 14 on spool 4 lifts the wire between the clamping disk 12 and the guide-way in the 10' position radially outwardly of the spool so that the wire is above the spool flange. Wire guide 2 will now move transversely in the direction of the arrow 18 and will carry the wire over the flange and onto the body of spool 4 where the winding operation proceeds in the usual manner.

The rotary member 14 will then return to its original position as shown in FIGURE 1 and concurrently transverse guide-way 10 will return to its initial position as indicated at 10 in FIGURE 1 where it will remain until the spool 4 has been fully wound.

During this time, the full spool 3 is replaced by an empty spool and after spool 4 has been filled the procedure is repeated. However, transverse guide-way 10 will be moved to the left as viewed in FIGURE 1 to a position similar to that of 10' and the rotary member 14 of spool 3 will then cause the wire between the two spools to be severed or torn apart in the same manner as described above so that the wire is now wound upon spool 3. It will be apparent that the direction of rotation of spool 3 is opposite to that of spool 4 and is indicated by the arrow 19.

The diverging pins or bars of transverse guide-way 10 are rounded to insure that when the wire is being wound up at the right hand flange of spool 4 as seen in FIGURE 2, for example, and after returning again to left hand flange of the same spool the wire will again be guided into the space between the two pins of guide-way 10.

As shown in FIGURE 4, the clamping disk may be fastened directly to the outer face of the spool flange as at 12'. The inner face of the disk 12' is beveled to form the notch 13.

In FIGURE 5, the guide-way 10 is shown with convergent curved bars 10'.

In FIGURE 6, the guide-way 10 is illustrated with conical wheels or pulleys 10'' in place of the curved bars or rods of FIGURES 3 and 5.

Thus it can be seen that the present invention has disclosed a simple yet effective arrangement for the continuous winding of wire when the wire is changed from a full spool to an empty spool. A wire gripping mechanism is provided which can readily grip the wire on the empty spool, cause the wire to be severed from the full spool and then lift the wire over the adjacent flange of the empty spool to permit the wire to be wound upon the body of the spool. The wire gripping or clamping mechanism and the structure for lifting the wire over the flange of the spool is relatively simple and has only a minimum of moving parts. As a result, the downtime of this winding mechanism is very low and there would be a minimum of disruptions to the wire drawing operation.

It is understood that this invention is susceptible to modifications in order to adapt it to different usages and conditions, and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. In an apparatus for the continuous winding of wire and the like upon spools wherein the winding of the wire is changed from a full spool to an empty spool, the combination of first and second adjacent spools for the winding of wire thereon with the rotary axes thereof being parallel, guide-way means for feeding the wire upon said spools and movably mounted for movement in a direction perpendicular to said spool axes, wire gripping means on a flange of each of said spools, rotary members rotatable about the respective axes of said spools adjacent the flanges thereof, means on each rotary member engageable with the wire for moving the wire into the wire gripping means of the empty spool when said guide-way has moved to a position over the empty spool, and means on each rotary member for lifting the wire engaged in said wire gripping means over the empty spool flange and onto the empty spool whereby the wire is wound thereon.

2. In an apparatus as claimed in claim 1 wherein said wire gripping means comprises a disk fixed to a spool flange, there being an annular V-shaped notch at the periphery of said disk.

3. In an apparatus as claimed in claim 2 wherein the radius of said disk decreases progressively from its outer

periphery to a minimum toward the flange to define said notch.

4. In an apparatus as claimed in claim 1 wherein said wire moving means comprises a hook.

5. In an apparatus as claimed in claim 1 wherein said wire lifting means comprises a pin parallel to axis of rotation of the spool.

6. In an apparatus as claimed in claim 1 wherein said guide-way means comprises a pair of spaced, diverging pins with the wire passing therebetween.

7. In an apparatus as claimed in claim 1 and further comprising control means for frictionally breaking the full spool after the wire is gripped in the gripping means of the empty spool so that the wire is parted between the spools.

8. In an apparatus as claimed in claim 2 wherein each

of said rotary members is positioned outwardly of its respective wire gripping disk, said wire moving means comprising a hook on a face of each rotary member, said wire lifting means comprising a pin on the same face of each rotary member and parallel to the axis of rotation of its spool, said hook and pin being substantially diametrically opposed from each other on the respective rotary members.

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NANTHAN L. MINTZ, *Primary Examiner.*