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HIGH-SPEED WIRE TAKE-UP AND SPOOL CHANGER

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The present invention relates to machinery for the handling of wire and more particularly to a take-up device for winding wire on spools.

In the production of fine wire, for example of 40 to 48 gauge, it has been the practice to wind the wire on a rotating take-up spool and to monitor the winding by skilled personnel. The operator measures the amount of wire to be taken up on the spool, or judges the amount by eye, stops the spool after it has wound up the correct amount, removes the full spool from the spindle which rotates the spool, places an empty spool on the spindle, cuts the wire, winds the cut end of the wire around the empty spool and presses a switch to rotate the empty spool. In order to attain commercially acceptable speeds of about 200 feet per minute of 40 gauge wire, the operator must be skilled and possess a high degree of manual dexterity.

It is an objective of the present invention to provide a device which winds wire on a take-up spool and brings an empty take-up spool into position to be wound upon.

It is a further objective of the present invention that the device be simple to operate so that unskilled personnel may be used.

It is a further objective to increase the efficiency of the wire take-up mechanism so that a fine 40–48 gauge wire may be wound on a spool at a rate of 1,000 feet per minute or higher.

In accordance with the present invention a cage (a rotating spindle carrier) is provided upon which the shafts of a pair of independently rotating take-up spool spindles are mounted. The cage rotates when the first take-up spool is wound full of wire to shift the take-up spools relative to the source of wire, enabling an unskilled operator or automatic means to transfer the wire from the first take-up spool on which the wire is wound to a second take-up spool. Preferably, the device automatically cuts the wire between the full and empty spools.

Other objectives of the present invention will be apparent from the following detailed description taken in conjunction with the attached drawings, in which:

FIG. 1 is a plan view of the device of the present invention;

FIG. 2 is a side elevation view of the device of FIG. 1;

FIG. 3 is a perspective view looking at the device from the side;

FIG. 4 is a front elevation view of the device of FIG. 1;

FIG. 5 is a partial view of the wire cutting portion of the device;

FIG. 6 is a partial front view of the wire cutting portion of the device;

FIGS. 7–13 are side outline views showing the rotational progression of the cage of the illustrated device;

FIG. 14 is a perspective view of the spindle; and

FIG. 15 is a wiring diagram of the illustrated device.

The device of the present invention as illustrated comprises generally a wire take-up portion, a wire leveling portion, a wire cutting portion and electrical controls for each of the portions.

In FIGS. 1 and 3 the wire take-up portion of the present invention is shown as comprising a motor 1 having a shaft 2, the shaft being fixedly connected to rubber driving wheel 3 by bolt 4. Motor 1 is of the 110 volts A.C. type. An annular cage (rotating carrier) 6 is driven by

the rubber driving wheel 3 upon actuation of motor 1 and rotates about a fixed central axis. The cage 6 is maintained in its correct alignment by freely rotating cage support rollers 8 which rotate about fixed shafts 9, the shafts being fixedly attached to support member 10.

A separate motor 11, whose speed is variable is secured to support 10 and drives an eddy current clutch 12. Clutch 12 consists of two ceramic disc magnets 13 and 14 held together by bolt 15, the discs creating a strong magnetic flux field across the space between them. Two soft copper discs 16 and 17 protrude into the space between the ceramic discs 13 and 14. Biasing magnets 5 are provided near each of the discs 16–17 to compensate, by adjusting their distance to the discs, for variations in bearing friction, disc composition, disc thickness, and other magnetic variations. Preferably, the copper discs 16–17 are approximately equally spaced between the ceramic discs 13–14. The copper discs 16 and 17 are secured to shafts 18 and 19, respectively, rotatably mounted on cage 6 at diametrically opposed points relative to the cage axis. Shafts 18 and 19 carry removably affixed spindles 20 and 21, respectively. The spindles 20 and 21, which serve to mount the take-up spools, are attached to their shafts by means of threaded screw members 22 and may be changed so as to be adapted to the internal diameter of the take-up spools.

The wire leveling portion, shown generally at 23 (FIGS. 3 and 4), functions to feed the wire in a uniform and even manner over the surface of the take-up spool. It comprises a traverse driving motor 24 of the instantly reversible synchronous type. The shaft 24*a* of motor 24 drives threaded shaft 25 through coupling 26. Shaft 25 is threaded through tube 27 so that the latter rides in either direction along shaft 25, depending upon the direction of rotation of motor 24. Reversal switch 54 (FIG. 4), which can be operated from either of its sides, controls the direction of motor 24 and is operated by lugs 55 and 55′ which are adjustably attached to threaded lug rod 56. Rod 56 is fixedly attached to support member 57 which is attached to tube 27, so that lugs 55–55′ move with tube 27. Lugs 55 and 55′ may be adjusted on rod 56 to vary the length of traverse of tube 27 by motor 24, to correspond to the length of the spool being wound.

A bypass solenoid 51, having bypass arm 51*a* as its moving member, is mounted near the leveling portion 23 to deflect the wire upon activation of this solenoid. A brake 49 is positioned near the disc 16 so that, when activated, it prevents rotation of the disc.

A traverse support member 28 is fixedly attached by the mounting members 29 and 57 to external tube 27. Traverse member 28 is adapted to ride along the flat top of stationary support 10*a* (FIG. 4), which prevents the traverse assembly 27–28–29 from rotating with shaft 25. Mounting member 32, fixedly attached to support member 28 by mounting member 32′, has at its top portion a freely rotating pulley 30 which rotates on shaft 31. The wire to be wound on the take-up spool rides over pulley 30, which serves as a wire guide. Operation of motor 24, under control of reversing switch 54 and its actuating lugs 55–55′, causes reciprocating motion of tube 27, traverse support member 28, and pulley 30 causing the wire to be distributed evenly back and forth over the take-up spool.

The purpose of the wire cut-off portion of the device (FIGS. 2, 3, 5 and 6) is to cut the wire between the spools at the proper moment in the cycle. This mechanism, shown generally at 33, comprises a mounting member 34, an elongated arm 35 which pivots at its bottom about pivot point 36 on mounting member 34, and a saw-toothed end shown generally at 37 (FIG. 2) attached to arm 35. Saw-toothed end 37 includes a fixed member 65 having saw teeth which is rigidly attached to elongated arm 35.