

Feb. 16, 1954

E. J. McILVRIED ET AL
CONTINUOUS TAKE-UP BLOCK

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2 Sheets-Sheet 1

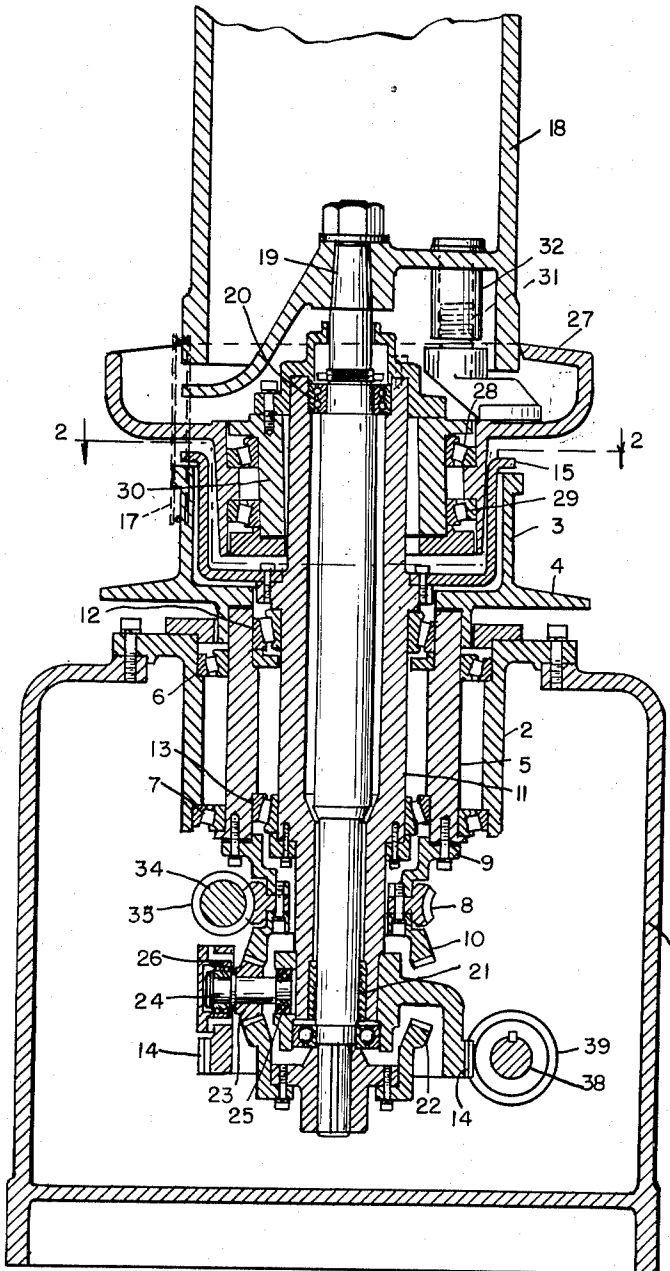


Fig. 1

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2 Sheets-Sheet 2

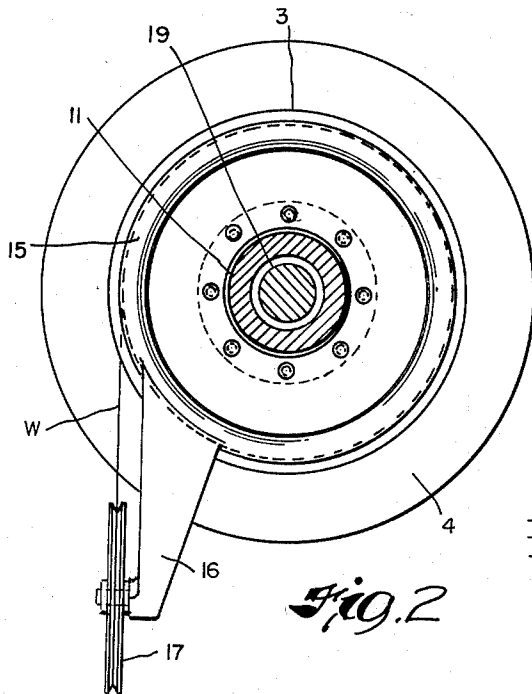


Fig. 2

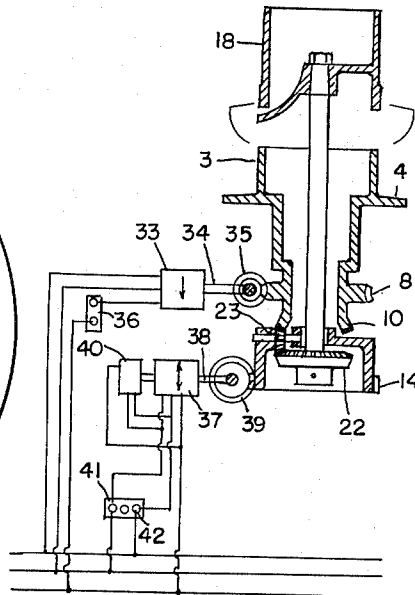


Fig. 4

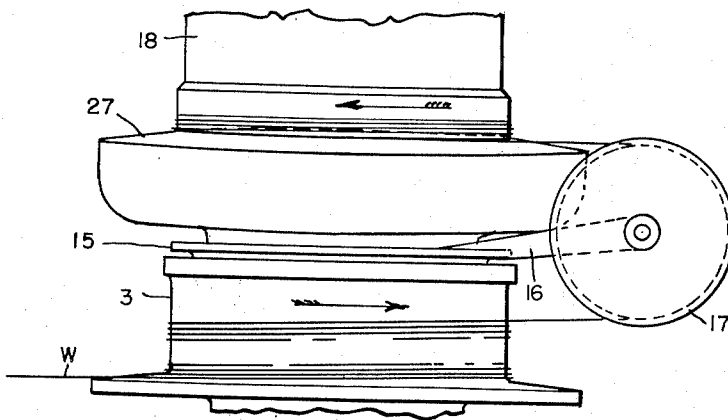


Fig. 3

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UNITED STATES PATENT OFFICE

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CONTINUOUS TAKE-UP BLOCK

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12 Claims. (Cl. 205—20)

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This invention relates as indicated to a continuous take-up block, and more particularly to take-up means especially adapted for use in conjunction with wire drawing machines and the like.

Modern wire drawing machines are adapted for continuous high speed operation, and their efficiency is considerably reduced when it becomes necessary to stop the same for reasons such as the filling up of the take-up block or reel, etc. Similarly, in the case of wire coating operations such as galvanizing, it is most important for the travel of the wire through the galvanizing tank to be continuous and at an easily regulated rate in order to ensure a coating of the desired thickness. With these and like problems in mind, workers in the art have devised certain take-up devices adapted to permit continued accumulation of the wire thereon even when a previously accumulated bundle is in course of being removed therefrom. In one such device comprising an upper and a lower rotatable block, the wire after being wound on the lower block is carried about a sheave and then wound on the upper block in the opposite direction. Friction means interposed between the two blocks tends to drive the upper block in the same direction as the lower block but it is possible to stop the upper block and hold the same against rotation temporarily while stripping an accumulated bundle of wire therefrom. This type of mechanism, however, has not proven any too satisfactory in some regards since it is incapable of positive and accurate control, and it is frequently desirable to be able to regulate both the actual and relative speeds of rotation of the two blocks in order to determine the number of turns maintained on the lower block. Furthermore, in order to stop rotation of the upper block, it has been necessary to attach the end of the wire taken therefrom to some outside stationary support.

It is accordingly a principal object of our invention to provide novel take-up means for wire and the like enabling the accumulation of a large number of turns thereon before it becomes necessary to remove the same, and permitting removal of such accumulation without stopping of the take-up means.

Another object is to provide such take-up means, the elements of which are under the positive and direct control of the operator to ensure operation in the most efficient manner at all times.

A further object is to provide such take-up means comprising an upper and lower rotatable

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block together with drive means therefor adapted to be regulated to ensure optimum drawing ability of the lower block and maximum storage of accumulated wire on the upper block.

Still another object is to provide such dual wire drawing and take-up means wherein the relative speeds of rotation of the upper and lower blocks may be regulated as desired but requiring employment of but a single electric motor or equivalent drive means during normal operation.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a vertical transverse sectional view through the blocks and associated mechanism comprising one embodiment of our invention;

Fig. 2 is a horizontal section taken on the line 2—2 on Fig. 1;

Fig. 3 is a fragmentary elevation showing the sheave whereby the wire may be transferred from a lower to an upper block; and

Fig. 4 is a schematic diagram of the control means for the machine.

Referring now more particularly to such drawing and especially Fig. 1 thereof, the mechanism there illustrated comprises a main frame 1 of welded box construction carrying an upper annular frame member 2 bolted thereto in which the operating elements of the machine are journaled.

A draw block or drum 3 having a lower inclined peripheral flange 4 is mounted upon a downwardly extending annular member 5 for rotation therewith, such later member being journaled in annular frame member 2 by bearings 6 and 7. A worm gear 8 is secured to the lower end of member 5 by means of member 9 bolted to the latter to drive block 3 in the manner explained below. Also carried by member 9 below worm gear 8 is a bevel gear 10 adapted to turn therewith.

An outer tubular spindle 11 is journaled in bearings 12 and 13 in member 5 and extends downwardly through annular frame member 9 and gears 8 and 10 carried by the latter. To its lower end is keyed a gear 14 through which such

tubular spindle is adapted to be driven in the manner more fully described below.

Bolted to tubular spindle 11 within the confines of block 3 is an annular shell or ring 15 having an upper outturned edge portion carrying an outrigger bracket 16 (see Fig. 3) having a sheave 17 rotatably mounted at its outer end. As best shown in Fig. 2, such sheave 17 is mounted for rotation about a horizontal axis and is tangential to the respective peripheries of lower drum 3 and upper drum 18 so that a wire W wound on such lower drum may be conducted about the sheave and then wound on the upper drum in the opposite direction.

Such upper drum 18 is keyed to an inner spindle 19 extending downwardly through tubular spindle 11 and journaled therein at 20 and 21 for rotation relative thereto. Keyed to the lower end of spindle 19 is a bevel gear 22 opposed to but spaced from bevel gear 10, and of the same diameter. A small bevel gear 23 is mounted on a short shaft 24 carried by tubular spindle 11 and journaled freely for rotation in bearing 25 on such spindle and bearing 26 carried by gear 14 (likewise carried by such tubular spindle). Bevel gear 23 engages both ring bevel gears 10 and 22 to provide a differential action.

To assist in forcing the accumulated wire up tall block 18, a push-up apron 27 will desirably be provided therefor journaled for rotation on bearings 28 and 29 on inner shell 30 secured to the upper end of tubular spindle 11. Such shell and bearings are disposed at a slight angle to the axis of spindles 11 and 19 so that push-up apron 27 will likewise be somewhat inclined relative to drum 18. Such drum and apron are interconnected for rotation together by means of a heavy coil spring 31 secured in a tubular member 32 in drum 18 and entering a corresponding recess in apron 27. Due to the inclination of bearings 28 and 29, as drum 18 is caused to turn through rotation of spindle 19, apron 27 will be turned therewith but with a relative rocking action. The lowermost turn of wire wound upon drum 18 will therefore be engaged by such apron and forced upwardly with each revolution of the drum.

A similar push-up apron may be provided for lower drum 3 and will sometimes be desirable particularly when there is not a great deal of tension on the wire. The wire wound on drum 18 will ordinarily be under considerably less tension than the wire initially wound on lower drum 3 and since a very heavy bundle of wire may be accumulated on the tall upper drum, positive push-up means such as apron 27 is there very desirable and frequently essential.

Operation

It is believed that the remaining elements of the mechanism may best be described in connection with an explanation of the operation of the same.

Referring now more particularly to Figs. 1 and 4 of the drawing, an electric motor 33 is adapted to drive shaft 34 to which worm 35 is keyed in engagement with gear 8. Operation of motor 33 (controlled by the usual pushbutton switch 36) is accordingly effective to turn shell 5 and with it the lower block 3 to wind wire or the like thereon which may be issuing from a galvanizing tank or wire drawing machine, for example.

Another and smaller reversible electric motor 37 is operative to drive shaft 38 to which worm 39 is keyed in driving engagement with worm gear

14. A normally operative brake 40 is adapted to hold motor 37 and accordingly worm 39 against rotation except when the electric circuit including such brake and motor is closed by closing of either the forward drive switch 41 or reverse drive switch 42. Thus, whenever motor 37 is energized, in either direction, brake 40 will automatically be released but when the motor is stopped such brake will automatically be applied. Electrically energized brakes of the type indicated are conventional and commercially available.

Assuming for the moment that motor 37 has not been energized and brake 40 is accordingly operative to hold worm 39 stationary, it will be apparent that gear 14 engaging worm 39 will likewise be held stationary, and tubular spindle 11 carrying ring 15 will be unable to turn. Sheave 17 about which wire W passes will thus be held in one position.

Rotation of gear 8 by worm 35, however, not only serves to turn block 3 as above described, but likewise serves to turn differential gear 23 journaled in the member comprising gear 14. Such latter gear being held stationary by worm 39, rotation of gear 23 is operative to drive gear 22 on spindle 19 at the same speed but in the opposite direction to block 3. In the embodiment illustrated, drums 3 and 18 are of the same diameter so that if several turns of wire are first taken around block 3, and the wire then conducted around sheave 17 to block 18, the wire will accumulate on such upper block while maintaining the established number of turns about lower block 3. The end of the wire will ordinarily be temporarily secured to block 18, as by winding it about one of the pins (not shown) generally provided thereon. A riding stripper such as that shown and described in co-pending application Serial No. 196,806 of Edwin J. McIlvried, "Wire Drawing Block and Stripper Assembly" may be employed in conjunction with block 18 if desired, although this is not necessary. Reference may also be had to such co-pending application for further details of the push-up apron 27.

If for any reason it should become desirable either to increase or decrease the number of turns of wire on block 3 without altering the speed of rotation of the same, this may be accomplished by energizing motor 37 to drive worm 39 and gear 14, thereby both turning tubular spindle 11 and sheave 17 carried thereby and also either increasing or decreasing the speed of rotation of upper drum or block 18 depending on the direction in which the axis of differential gear 23 is caused to travel around the axis of spindle 19.

When a sufficiently large bundle of wire has accumulated on upper drum 18 and it is desired to remove the same from the machine, motor 37 will be energized to drive worm 39 and thereby gear 14 in a direction and at a rate calculated exactly to offset the driving action imparted to differential gear 23 by gear 10. Consequently, while gear 10 of course continues to turn as before, differential gear 23 will merely roll around on gear 22 without driving the latter, and drum 18 will be stationary. The operator thereupon will cut the wire on drum 18 and after removing the accumulated bundle therefrom will secure the new leading end to drum 18 and stop motor 37 so that drum 18 will again be driven at an equal rate but in an opposite direction to drum 3.

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While drum 18 remained stationary, however, tubular spindle 11 carrying sheave 17 was being rotated at the same speed and in the same direction as lower drum 3 with a consequent build-up of turns of wire upon such lower drum. In order to reduce the number of turns on the lower drum to a desired minimum in order that the apparatus may be in readiness for repeated stripping of the bundle of wire from drum 18, the operator will now energize motor 37 to drive worm 39 and gear 14 to turn tubular spindle 11 in a direction opposite to that in which drum 3 turns. This will have the effect of carrying sheave 17 around block 3 in a direction to unwind the top-most turns from such drum while at the same time increasing the revolutions of differential gear 23 in engagement with gear 22 to increase the rate at which upper drum 18 turns in a direction opposite to lower block 3 to take up the additional wire thus unwound from block 3.

It will be seen from the foregoing that we have provided novel take-up means for wire and the like whereby a large bundle of wire may be accumulated and then removed from the machine without, however, stopping the take-up operation. The mechanism is, moreover, at all times under the direct and positive control of the operator so that the number of turns on the lower block may be precisely regulated. While a relatively large and powerful motor 33 will be required to drive the mechanism, the reversible motor 37 may be relatively small and much less powerful since much less work is required of it and it will be but intermittently operated. Block 3 may accordingly be driven for long periods of time without interruption and at optimum speed for the particular process or operation in conjunction with which the take-up means is being utilized, as for example a galvanizing or other coating operation.

Of course, other well-known forms of differential drive means may be utilized, such as the pinion type, instead of the bevel gear type illustrated and described, although the latter is preferred. The intermediate gear of the differential not only interconnects the two drums for driving in opposite directions but also, through orbital movement, may be caused to vary the ratio of the relative speeds of such drums. Various forms of wire guiding means other than pulley 17 may be employed, mounted for rotation about the axis of the drums, such as a simple loop, for example. The drums may be of different diameters but will preferably be of equal diameters to facilitate construction and operation of the mechanism.

If it is desired to employ blocks of different diameters, the gear ratio may merely be changed to afford equal peripheral speeds of the blocks, or the normally inactive motor may be energized and driven at the proper speed to compensate for such difference in diameters. Obviously, a combination of both such adjustments may be employed.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

We therefore particularly point out and distinctly claim as our invention:

1. Continuous take-up mechanism for wire and the like comprising a supporting frame, a hollow drum journaled in said frame for rotation about a vertical axis, an inclined peripheral apron en-

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circling the lower end of said drum, an annular member secured to said drum and extending axially downwardly therefrom, a worm gear secured to and coaxial with said member, an electric motor, a worm driven by said motor in engagement with said gear to drive said drum, a vertical tubular spindle journaled for rotation within said annular member and projecting upwardly through said drum and downwardly through said member, a worm gear secured to and coaxial with the lower end portion of said tubular spindle, a second less powerful reversible electric motor, a worm driven by said latter motor in engagement with said latter gear to drive said tubular spindle, normally operative brake means for said latter motor, control means operative to release said brake means and energize said latter motor for operation in a selected direction, a second vertical spindle journaled within said tubular spindle and projecting from the upper and lower ends of the latter, an upper drum mounted on the upper end of said second spindle for rotation therewith above said first drum and of the same diameter but substantially greater vertical extent than said first drum, a downwardly facing bevel gear fixed on the lower end of said annular member, a similar upwardly facing bevel gear on the lower end of said second spindle opposed thereto, a bevel gear carried by said tubular spindle and mounted for rotation about an axis normal to that of said spindles interposed between and engaging said opposed bevel gears to form a universal drive unit, a separate apron encircling the lower end of said upper drum and journaled on the upper end portion of said tubular spindle at a slight angle to the axis of said spindle and drum, means interengaging said upper drum and associated apron for rotation together, whereby a relative rocking action of said latter apron is afforded effective to push up wire wound on said upper drum, an arm mounted on said tubular spindle and projecting laterally between the upper end of said lower drum and said push-up apron, and a pulley carried by said arm for rotation about a horizontal axis, the periphery of said pulley being tangential to the work-engaging surfaces of said respective drums.

2. Continuous take-up mechanism for wire and the like comprising a supporting frame, a hollow drum journaled in said frame for rotation about a vertical axis, an annular member secured to said drum and extending downwardly therefrom, a gear secured to and coaxial with said member, an electric motor, a gear driven by said motor in engagement with said first gear operative to drive said drum, a vertical tubular spindle journaled for rotation within said annular member and projecting downwardly therefrom, a gear secured to and coaxial with the lower end portion of said tubular spindle, a second reversible electric motor, a gear driven by said latter motor in engagement with said gear on said spindle, brake means operative to prevent rotation of said spindle, a second vertical spindle journaled within said tubular spindle, an upper drum mounted on the upper end of said second spindle for rotation therewith above said first drum and of the same diameter but substantially greater vertical extent than said first drum, a downwardly facing bevel gear fixed on the lower end of said annular member, a similar upwardly facing bevel gear on the lower end of said second spindle opposed thereto, a bevel gear carried by said tubular spindle and mounted for rotation about an axis normal to that of said

spindles interposed between and engaging said opposed bevel gears to form a universal drive unit, a separate apron encircling the lower end of said upper drum and journaled on the upper end portion of said tubular spindle at a slight angle to the axis of said spindle and drum, means interengaging said upper drum and associated apron for rotation together, whereby a relative rocking action of said latter apron is afforded effective to push up wire wound on said upper drum, an arm mounted on said tubular spindle and projecting laterally between the upper end of said lower drum and said push-up apron, and a pulley carried by said arm, the periphery of said pulley being generally tangential to the work-engaging surfaces of said respective drums.

3. Continuous take-up mechanism for wire and the like comprising a rotatably mounted drum, drive means for said drum, a tubular spindle journaled for rotation within said drum coaxially therewith, separate reversible drive means for said spindle, brake means operative to hold said spindle against rotation, a second spindle journaled for rotation within said tubular spindle, a second drum mounted on said second spindle for rotation therewith slightly spaced axially from said first drum and of substantially the same diameter but greater longitudinal extent than said first drum, a bevel gear mounted for rotation with said first drum coaxially therewith, a similar bevel gear on said second spindle opposed thereto but spaced therefrom, a bevel gear carried by said tubular spindle and mounted for rotation about an axis normal to that of said spindles interposed between and engaging said opposed bevel gears to form a universal drive unit, an arm mounted on said tubular spindle and projecting laterally between said two drums, and wire guiding means carried by said arm adapted to conduct a wire unwound from said first drum for winding in the opposite direction about said second drum.

4. Continuous take-up mechanism for wire and the like comprising a rotatably mounted drum, drive means for said drum, a tubular spindle journaled for rotation within said drum coaxially therewith, separate reversible drive means for said spindle, a second spindle journaled for rotation within said tubular spindle, a second drum mounted on said second spindle for rotation therewith, a bevel gear mounted for rotation with said first drum coaxially therewith, a similar bevel gear on said second spindle opposed thereto but spaced therefrom, a bevel gear carried by said tubular spindle and mounted for rotation about an axis normal to that of said spindles interposed between and engaging said opposed bevel gears to form a universal drive unit, and wire guiding means carried by said tubular spindle intermediate said two drums adapted to conduct a wire unwound from said first drum for winding in the opposite direction upon said second drum.

5. Continuous take-up mechanism for wire and the like comprising a rotatably mounted drum, drive means for said drum, a tubular spindle journaled for rotation within said drum coaxially therewith, separate drive means for said spindle, a second spindle journaled for rotation within said tubular spindle, a second drum mounted on said second spindle for rotation therewith slightly spaced axially from said first drum, a bevel gear mounted for rotation with said first drum coaxially therewith, a similar bevel gear on said second spindle opposed thereto

but spaced therefrom, a bevel gear carried by said tubular spindle and mounted for rotation about an axis normal to that of said spindles interposed between and engaging said opposed bevel gears to form a universal drive unit, and wire guiding means carried by said tubular spindle intermediate said two drums adapted to conduct a wire unwound from said first drum for winding in the opposite direction upon said second drum.

6. Continuous take-up mechanism for wire and the like comprising two axially spaced rotatably mounted drums, drive means for one of said drums, wire guiding means adapted to conduct wire from one drum to the other and mounted for rotation about the axis of said drums, separate drive means operative to rotate said wire guiding means, and differential drive means driven by said drive means for said first drum adapted to drive said second drum in the opposite direction, an element of said differential means being rotatable with said wire guiding means about the axis of said drums to vary the speed of rotation of said second drum relative to that of said first drum.

7. Continuous take-up mechanism for wire and the like comprising two spaced coaxial drums of equal diameter mounted for rotation about such axis, drive means for one of said drums, wire guiding means adapted to conduct wire from said last-named drum to the second said drum and mounted for rotation about such axis, separate reversible drive means operative thus to rotate said guiding means in a selected direction, and differential drive means driven by said first-named drive means operative to drive said second drum in a direction opposite to said other drum and at the same rate of speed, an element of said differential means being rotatable with said wire guiding means about the axis of said drums to vary the speed of rotation of said second drum relative to that of the other said drum, whereby said wire guiding means may be driven at the same speed as said last-named drum and thereby stop rotation of said second drum for removal of accumulated wire therefrom while turns of wire instead temporarily accumulate on the other said drum.

8. Continuous take-up mechanism for wire and the like comprising two coaxial rotatably mounted drums, drive means for the first said drum, differential gearing driven by said drive means operative to drive the second said drum in a direction opposite to that of said first drum, wire guiding means adapted to conduct wire from said first drum to said second drum and mounted for rotation about the axis of said drums, an intermediate gear of said differential gearing being mounted for orbital movement with said rotatable wire guiding means to vary the speed of rotation of said second drum, and means operative to control rotation of said wire guiding means.

9. Continuous take-up mechanism for wire and the like comprising two coaxial rotatably mounted drums, drive means for the first said drum, differential gearing driven by said drive means operative to drive the second said drum in a direction opposite to that of said first drum, a push-up apron encircling said second drum and rotatable therewith, said apron being mounted for rotation about an axis slightly inclined to that of said second drum with resultant relative rocking movement as said second drum turns, wire guiding means adapted to conduct wire

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from said first drum to said second drum and mounted for rotation about the axis of said drums, an intermediate gear of said differential gearing being mounted for orbital movement with said rotatable wire guiding means to vary the speed of rotation of said second drum, and means operative to control rotation of said wire guiding means.

10. Continuous take-up mechanism for wire and the like comprising two coaxial rotatably mounted drums, drive means for the first said drum, differential gearing driven by said drive means operative to drive the second said drum in a direction opposite to that of said first drum, wire guiding means adapted to conduct wire from said first drum to said second drum and mounted for rotation about the axis of said drums, an intermediate gear of said differential gearing being mounted for orbital movement with said rotatable wire guiding means to vary the speed of rotation of said second drum, reversible drive means for rotating said wire guiding means, and releasable brake means operative to hold said last-named drive means stationary.

11. Continuous take-up mechanism for wire and the like comprising two axially spaced rotatably mounted drums, drive means for each said drum, wire guiding means adapted to con-

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duct wire from one drum to the other and mounted for rotation generally coaxially of said drums, drive means for rotating said wire guiding means, and differential means interconnecting the said drive means for said drums.

12. Continuous take-up mechanism for wire and the like comprising two axially spaced rotatably mounted drums, positive drive means for each said drum, wire guiding means adapted to conduct wire from one drum to the other and mounted for rotation generally coaxially of said drums, positive drive means for rotating said wire guiding means, and control means operative positively to regulate the rotation of said wire guiding means relative to that of said drums to cause additional turns of wire to be wound on or unwound from the first said drum or to maintain the number of such turns constant as may be desired.

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