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WIRE PAY-OFF REEL
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Fig. 1.

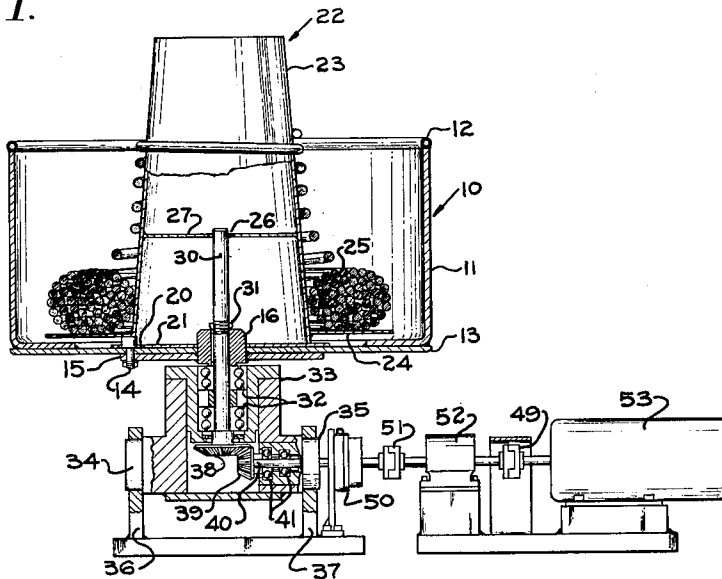
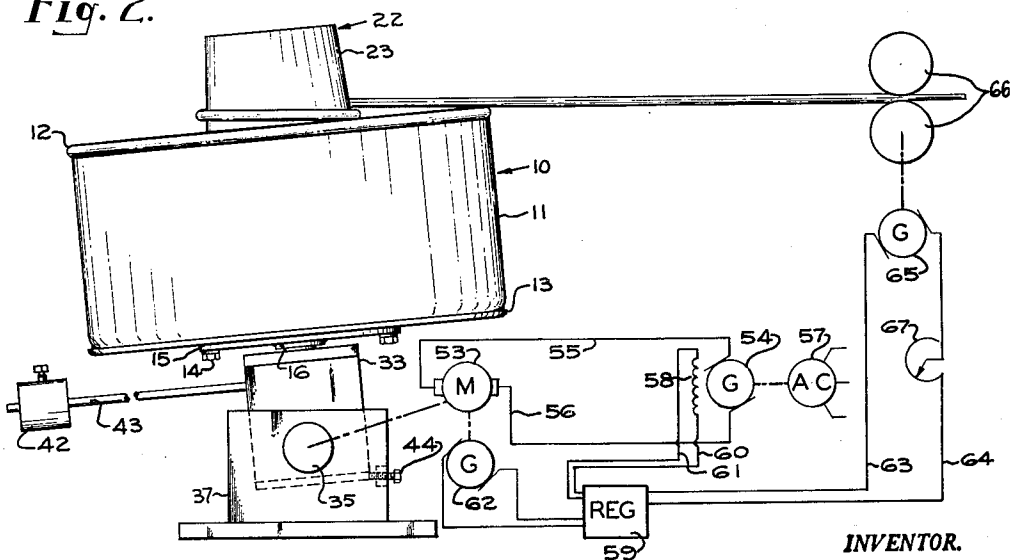


Fig. 2.



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WIRE PAY-OFF REEL

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The present invention relates to reels and is concerned more particularly with a pay-off reel adapted to be loaded with wire in bundle form as available commercially and which will pay off the wire in an improved manner to an associated mechanism such as a rolling mill or the like.

Commercially available round wire in various diameters as taken from a wire drawing block is usually supplied to the trade in the form of a loose doughnut-shaped coil referred to as a bundle. In the forming process, the wire is given a permanent set such that each loop or convolution of the coil has the same diameter. During normal handling, the loops of the coil, which are not rigidly supported, do not remain concentric but shift relative to each other in overlapping relationship such that some entanglement of the loops takes place. As a consequence, it is exceedingly difficult to feed the wire in a satisfactory manner to a rolling mill or similar apparatus at high speeds unless the wire is first wound on a spool. Furthermore, it is exceedingly difficult to feed such wire when the more economical heavier bundles are used because of the increased inertia of the bundle which causes excessive tension in the wire.

A principal aim of the present invention is to provide a wire pay-off reel for receiving a bundle of wire of the type referred to in the normal condition in which it is available commercially and without any need for a rewinding operation or the like, and which will pay off the wire to an associated mechanism such as a rolling mill, at high speeds with substantial elimination of snagging and without twisting, and which will avoid the undesirable effects of inertia or drag on the wire so that tension on the wire may be maintained at a desired minimum or, if desired, may be eliminated entirely.

A further aim of the invention is to provide such a pay-off reel which is motor driven and wherein means is provided to control the speed of operation thereof in accordance with the speed of operation of the associated mechanism to which the wire is being fed. Included in this aim is the provision of control means which can be adjusted during start-up of the machine to overcome starting inertia and provide the required acceleration to prevent excessive tensioning of the wire while normal operating speed is being attained.

Another aim of the invention is to provide a pay-off reel of the type referred to which is of simple and economical construction and yet rugged and versatile in operation so that it may be used with a minimum of skill and instruction and will be substantially fool-proof and free of malfunctions during normal conditions of operation.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawings:

FIG. 1 is an end elevational view partly broken away and partly in section of a pay-off reel constructed in accordance with the invention and loaded with a bundle of round wire; and

FIG. 2 is a side elevational view thereof together with a

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diagrammatic showing of the driving and control mechanism for the reel.

Referring to the drawing in detail, the embodiment of a pay-off reel constructed in accordance with the invention comprises an outer substantially upright basket generally denoted by the reference numeral 10 which includes a cylindrical wall 11 preferably formed of sheet metal provided with an annular top rim 12 in the form of a rail or tubular rod secured thereto such as by welding and preferably formed of hardened steel. The lower end of wall 11 is inwardly turned or flanged and secured as by welding to a bottom plate 13. The bottom plate 13 is fastened by bolts 14 to a reinforcing plate 15 which is secured to a center hub 16.

The bolts 14 are formed with enlarged heads as shown which are received in apertures 20 formed in the bottom plate 21 of the inner unit generally denoted by the reference numeral 22. The inner unit 22 comprising a tapered or frustoconical drum 23 secured to the bottom plate 21 and has an annular platform 24 fixed thereto and spaced slightly above the bottom plate 21 so as to clear the heads of the bolts 14. As will be described more fully hereinafter, the bundle or coil of wire denoted at 25 to be fed to an associated mechanism is merely placed on the platform 24 and the wire is drawn upwardly around the drum 23 and then fed outwardly over the rail 12. The inner unit 22 is not fastened to the basket 10 except for the driving connection provided by the heads of the bolts 14 received in the apertures 20 and thus the inner unit 22 can be readily separated from the basket and removed through the open top thereof.

The sub 16 is splined to a spindle 30 and retained thereon by a retaining nut 31. The spindle 30 extends upwardly into the drum 23 with its upper end received in an aperture 26 in a centering and reinforcing plate 27 extending across the interior of the drum. The spindle 30 is journaled in antifriction bearings 32 mounted in a mounting block 33 which is pivotally supported by the trunnions 34, 35 thereon which are journaled in the side plates 36 in the base or frame 37.

The lower end of the spindle 30 has fixed thereto a beveled gear 38 meshing with a beveled gear 39 on a drive shaft 40 extending through antifriction bearings 41 in the trunnion 35. As a result of the location of the parts just described, the reel can readily pivot on the trunnions 34, 35 without interfering with the driving connection between the spindle 30 and drive shaft 40. As shown in FIG. 2, the reel is counterbalanced by means of an adjustable weight 42 supported on a rod 43 secured to the block 33 so that the basket 10 normally tilts to the left as viewed in FIG. 2 with the bottom of the block 33 resting against an adjustable stop 44.

The outer end of the drive shaft 40 is connected to a brake 50 which is utilized when the mechanism is being stopped, and thence is connected by a coupling 51 to a speed-change mechanism shown diagrammatically at 52. The speed-change mechanism 52 is connected by coupling 49 to the drive motor 53.

Turning now more particularly to the control system shown diagrammatically in FIG. 2, the drive motor 53 is energized by a D.C. generator 54 connected thereto by leads 55, 56, the generator being driven by an electric motor 57 connected to any convenient source of electric power. The field 58 of generator 54 is controlled by a voltage regulator 59 connected thereto by lines 60, 61. The regulator is electrically connected to a tachometer generator 62 driven by the drive motor 53 and by lines 63, 64 to a tachometer generator 65 operatively connected to the rolling mill or other apparatus indicated diagrammatically by the rolls 66 to which the wire is being fed. As will be readily understood, the voltage regulator 59 will energize the field 58 and thus control the

output of generator 54 in accordance with the relative outputs of the tachometer generators 62 and 65 thus maintaining the speed of drive motor 53 in predetermined relationship to the speed of the rolling mill 66. A potentiometer 67 in the line 64 permits the operator to manually vary the effective output of the tachometer generator 65 and thus adjust the relative speeds of the drive motor 53 and rolling mill 66.

It is believed that the operation of the wire pay-off reel will be apparent from the foregoing description of the mechanism together with the following description. As previously stated, the bundle of wire 25 in the usual form and without any especial pretreatment is merely placed on the platform 24 around the tapered drum 23 and one end of the wire is drawn upwardly along the drum 23 and then fed outwardly over the rail 12 to the rolling mill 66 which is located so that the wire will travel in a direction at right angles to the axis of the trunnions 34, 35. The weight 42 is adjusted if necessary so that the basket 10 will tilt slightly backwardly away from the direction of wire feed as shown in FIG. 2. The rolling mill 66 is then started in operation which will automatically cause the drive motor 53 to be energized by means of the circuitry described. Initially, during start-up of the mechanism, it is preferred that the operator set the potentiometer 67 so as to increase the effective output of the tachometer generator 65 thus increasing the power output of drive motor 53 to the point that the inertia of the bundle 25 and pay-off reel is overcome and acceleration thereof corresponds to the acceleration of the rolling mill. After operating speed is attained, however, the potentiometer 67 is adjusted so that the wire will pay off at the desired speed and with the minimum tension desired.

The wire being released over the upper rail 12 is thus drawn upwardly and inwardly from the bundle 25 along the tapering drum 23 to cause it to feed from the bundle without tangling or snarling and due to the rotation of the basket without any twisting. Because the drum 23 is of smaller diameter than although in contiguous relationship with the bundle 25, its peripheral or linear speed is less than that of the bundle so that the wire will normally be drawn tightly into a helical coil in engagement with the drum insuring that the wire will feed properly from the bundle. Some slippage of the wire on the upper end of the drum will occur because of this difference in speed and for this reason, lubricant may be applied to the surface of the drum if desired.

While the pay-off reel of the invention will normally feed the wire without any tangling or snarling; nonetheless, if such snarling should occur as a result of kinks or for other reasons, no breakage of the apparatus or wire will normally occur because of the tiltable mounting of the basket 10 and the releasable connection between the inner drum unit 22 and the basket. In the event a snarl occurs such that excessive tension on the wire occurs, the basket 10 will merely tilt on the trunnions 34, 35 and spill out the inner drum unit 22 and bundle 25.

The pay-off reel of the present invention has been found to be particularly useful for paying out wire at high speeds in the range as high as 1,000 feet per minute and operates effectively with bundle loads as heavy as half a ton. This is accomplished without any pretreatment of the wire such as expensive rewinding, and the apparatus operates effectively over long periods of time without undue wear or breakdown. As a result, rolling mill operations and the like are rendered more efficient and economical.

Although the invention has been described in connection with a specific preferred embodiment, it will be understood that variations and modifications will be apparent to one skilled in the art and all such variations and modifications are intended to be included within the scope of the invention.

I claim:

1. A wire pay-off reel comprising a base, a supporting member mounted on the base for pivoting movement

about a horizontal axis, a spindle rotatably mounted in the supporting member about an axis extending outwardly from the axis of pivoting movement, means biasing the supporting member to a pivoted position with the spindle extending in an upward direction, an open-ended basket mounted on the spindle for rotation therewith, an upwardly tapered drum seated coaxially in the basket having its upper end extending upwardly above the open end of the basket, a guide rail on the upper edge of the basket, and means for driving the spindle.

2. A wire pay-off reel as set forth in claim 1 wherein the means biasing the supporting member is an adjustable weight slidably mounted on the supporting member.

3. A wire pay-off reel comprising a base, a supporting member mounted on the base for pivoting movement about a horizontal axis, a rotatable spindle mounted in the supporting member about an axis extending outwardly from the axis of pivoting movement, means biasing the supporting member to a pivoted position with the spindle extending in an upward direction, an open-ended basket mounted on the spindle for rotation therewith, an upwardly tapered drum removably seated in the basket having its smaller end extending upwardly from the open end of the basket and having means at its lower end for supporting a bundle of wire, means interengaging the drum with the basket for rotation therewith, and means for driving the spindle.

4. A wire pay-off reel for paying off wire from a bundle of wire to an associated apparatus comprising an open-ended basket, means mounting the basket for rotation with its axis extending in an upward direction, an upwardly tapered drum having a substantially continuous circumferential surface mounted coaxially within the basket for rotation therewith having its smaller end extending beyond the open end of the basket, said drum defining with the basket an annular chamber for receiving the bundle of wire, a guide rail extending about the open end of the basket, and means for rotating the basket at a speed proportional to that of an associated apparatus, said drum having its larger end dimensioned for substantial engagement with the bundle of wire whereby the wire being paid off from the reel is fed from the bundle into a helical coil in engagement with the tapered drum.

5. In combination, a wire treating apparatus, a wire pay-off reel for paying off wire to said apparatus from a bundle of wire comprising an open-ended basket, means mounting the basket for rotation with its axis extending in an upward direction, a tapered drum having a substantially continuous circumferential surface mounted coaxially within the basket for rotation therewith having its smaller end extending beyond the open end of the basket, a guide rail extending about the open end of the basket, and driving means for rotating the basket, said reel being adapted to support a bundle of wire within the basket with the bundle extending about the lower end of the drum and to feed the wire upwardly around the drum and then outwardly over the guide rail to the wire treating apparatus; said drum having its larger end dimensioned for substantial engagement with the bundle of wire whereby the wire being paid off from the reel is fed from the bundle into a helical coil in engagement with the tapered drum, and means for controlling the speed of said driving means in relationship to the speed of the wire treating apparatus.

6. In combination, a wire treating apparatus, a wire pay-off reel for paying off wire to said apparatus from a bundle of wire comprising an open-ended basket, means mounting the basket for rotation with its axis extending in an upward direction, a tapered drum having a substantially continuous circumferential surface mounted coaxially within the basket for rotation therewith having its smaller end extending beyond the upper end of the basket, a guide rail extending about the open end of the basket, and driving means for rotating the basket including an electric motor, said reel being adapted to receive a bun-

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dle of wire within the basket with the bundle encircling the lower end of the drum and to feed the wire upwardly around the drum and then outwardly over the guide rail to the wire treating apparatus, said drum having its larger end dimensioned for substantial engagement with the bundle of wire whereby the wire being paid off from the reel is fed from the bundle into a helical coil in engagement with the tapered drum, and means for controlling the speed of the electric motor to maintain the speed of rotation of the drum in selected relationship to the speed of the wire treating apparatus.

7. In combination, a wire treating apparatus, a wire pay-off reel for paying off wire to said apparatus from a bundle of wire comprising an open-ended basket, means mounting the basket for rotation with its axis extending in an upward direction, a tapered drum mounted coaxially within the basket for rotation therewith having its smaller end extending beyond the upper end of the basket, a guide rail extending about the open end of the basket, and driving means for rotating the basket including an electric motor, said reel being adapted to receive a bundle of wire within the basket with the bundle encircling the lower end of the drum and to feed the wire upwardly around the drum and then outwardly over the guide rail to the wire treating apparatus, said drum being dimensioned for contiguous relationship with the bundle of wire whereby the wire being paid off from the reel is fed from the bundle into a helical coil in engagement with the tapered drum, and means for controlling the speed of the electric motor to maintain the speed of rotation of the drum in selected relationship to the speed of the wire treating apparatus comprising a direct current generator for energizing the electric motor, a first tachometer generator driven by the electric motor, a second tachometer generator driven by the wire treating apparatus, and a voltage regulator connected to said tachometer generators and to the field of said direct current generator for energizing said field in proportion to the difference of outputs of said tachometer generators.

8. In combination, a wire treating apparatus, a wire pay-off reel for paying off wire to said apparatus from a bundle of wire comprising an open-ended basket, means

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mounting the basket for rotation with its axis extending in an upward direction, a tapered drum mounted coaxially within the basket for rotation therewith having its smaller end extending beyond the upper end of the basket, a guide rail extending about the open end of the basket, and driving means for rotating the basket including an electric motor, said reel being adapted to receive a bundle of wire within the basket with the bundle encircling the lower end of the drum and to feed the wire upwardly around the drum and then outwardly over the guide rail to the wire treating apparatus, said drum being dimensioned for contiguous relationship with the bundle of wire whereby the wire being paid off from the reel is fed from the bundle into a helical coil in engagement with the tapered drum, and means for controlling the speed of the electric motor to maintain the speed of rotation of the drum in selected relationship to the speed of the wire treating apparatus comprising a direct current generator for energizing the electric motor, a first tachometer generator driven by the electric motor, a second tachometer generator driven by the wire treating apparatus, a voltage regulator connected to said tachometer generators and to the field of said direct current generator for energizing said field in proportion to the difference of outputs of said tachometer generators, and manually adjustable means for varying the effective output of said second tachometer generator.

9. The wire pay-off reel of claim 4 further comprising means providing a driving connection between the basket and drum to ensure common rotation thereof, said means allowing axial separation of the drum from the basket.

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