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2,153,996

STRAND HANDLING APPARATUS

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2 Sheets-Sheet 1

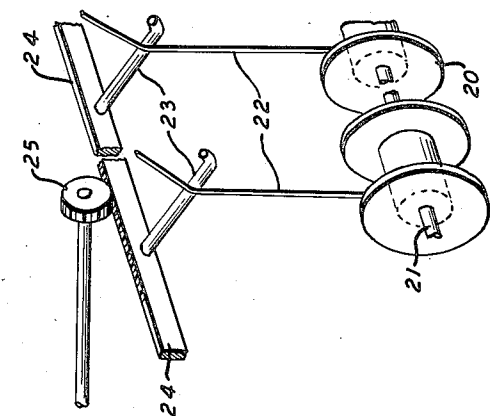
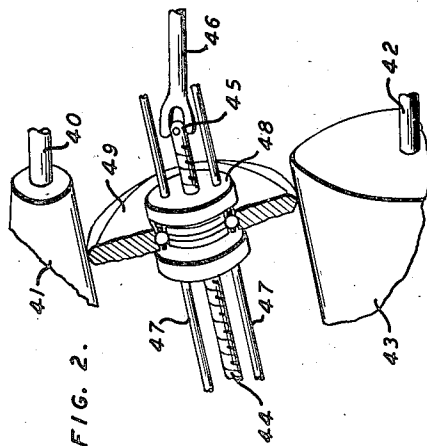
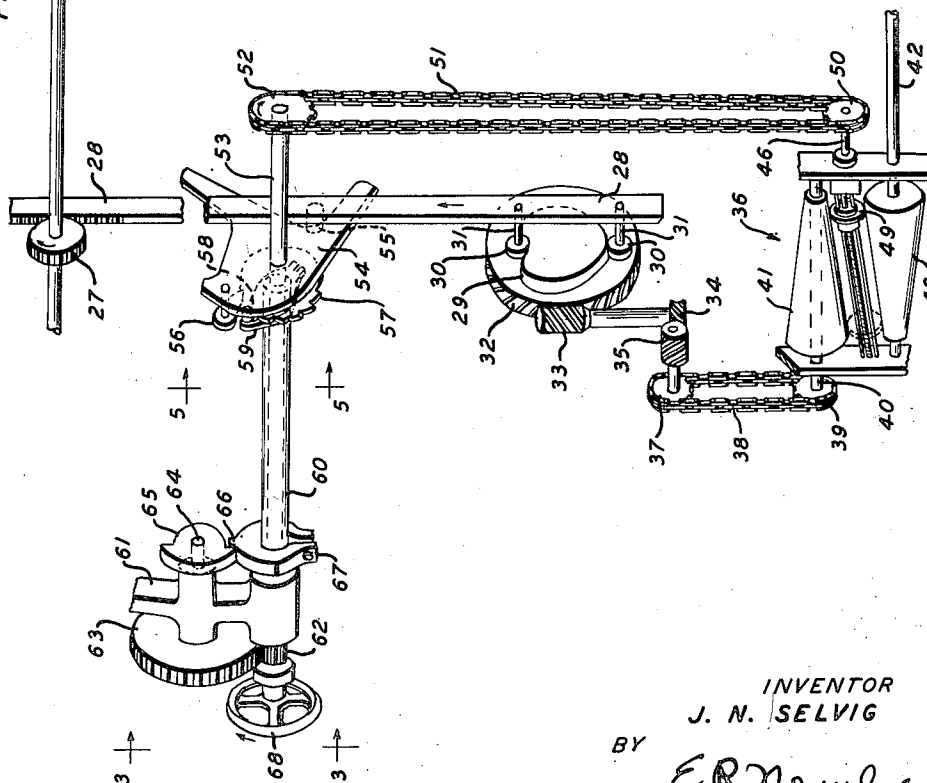


FIG. 1.



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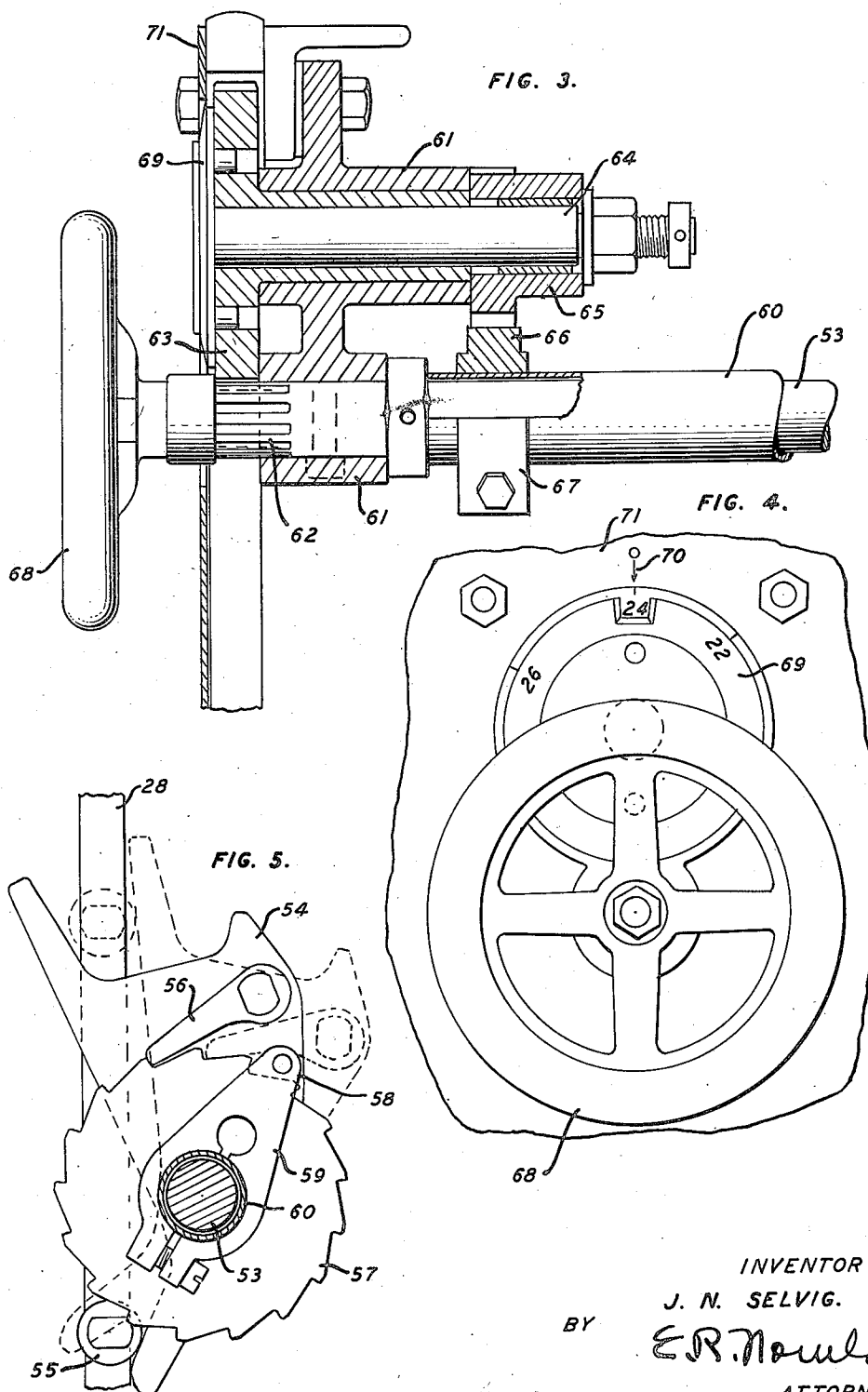
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2 Sheets-Sheet 2



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STRAND HANDLING APPARATUS

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Application October 10, 1935, Serial No. 44,314

2 Claims. (Cl. 242—25)

This invention relates to strand handling apparatus and more particularly to strand control apparatus for distributing or guiding a strand being wound or taken up on a driven rotatable spool, reel or the like.

It is sometimes necessary that a strand being taken up on a rotating reel be guided thereto in a continuously cyclically varying manner so that successive coils of the strand on the reel will lie regularly beside each other in smooth layers smoothly disposed one on another. There are many types of apparatus for operating on strands in which one or more strands pass from the apparatus, after being operated on simultaneously, in mutually parallel relationship and are wound simultaneously although independently of each other upon a corresponding plurality of take-up reels. In such instances it is desirable that each strand be guided to or distributed on its reel in a manner adapted to allow for the fact that ordinarily such reels are so driven as to maintain a constant pull on the strand and to wind the strand at constant linear speed thereof. Hence the rotary speed of the reel decreases as the body of wound strand on the reel increases in circumference. Hence, the lateral speed of the distributing means along the reel from head to head thereof must also decrease in corresponding fashion.

An object of the present invention is to provide a distributing apparatus for use in connection with strand take-up reels which shall be entirely automatic in action during the filling of a reel and shall adapt its own pace to the decelerative variation in reel speed required by the layers of wound strand being each of successively increasing diameter although the strand is being wound on the reel at a substantially constant linear velocity.

One embodiment of the invention contemplates a distributor guide member driven in to and fro reciprocation from a speed changing device or transmission whose speed changing power in turn is varied by means actuated by the reciprocation of a member connected to the guide.

The above and other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawings in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a diagrammatic view of a strand distributing apparatus constructed in accordance with the invention;

Fig. 2 is an enlarged view in perspective and partly in section of the speed changing device;

Fig. 3 is an enlarged fragmentary view in section on the line 3—3 of Fig. 1;

Fig. 4 is a front elevation of Fig. 3, and

Fig. 5 is an enlarged section on the line 5—5 of Fig. 1.

In the embodiment of the invention herein disclosed, one or more take-up reels 20 are driven through a shaft 21 by means not shown to wind on the reels one or more strands 22 at constant linear speed of the strands. The reel driving means is not a part of the present invention and therefore is not shown, but one such means is disclosed in detail in U. S. Patent 1,598,937 issued September 7, 1926, upon an application filed by the present inventor, to which reference may be had if desired. Each strand is guided to and distributed on its reel by a strand guide 23 of any suitable nature and construction but here shown as a simple finger over which the strand passes at an angle under its own tension. The guides 23 are rigidly mounted in and carried by a common rack 24 supported by means not shown, and oriented parallel to the axes of the reels 20 and to be reciprocable longitudinally of itself. The rack 24 is driven through a gear 25, a shaft 26, a gear 27 and a second rack 28 from a rotary cam 29 by means of cam rollers 30 carried on pins 31 mounted in the rack 28. The cam 29 is secured to and driven by a gear 32, which in turn is driven by speed reducing mechanism 33, 34, 35, from a variable speed transmission device generally indicated at 36, through a sprocket and chain drive 37, 38, 39.

The sprocket 39 is mounted on the output shaft 40 of the variable speed device 36, on which is also rigidly mounted a friction cone 41. The input shaft 42 is parallel to the shaft 40 and carries rigidly thereon a friction cone 43, and is driven at constant speed by means not shown. The two cones 41 and 43 are oriented with their axes parallel but pointed in opposite directions so that the linear surface element in each nearest to the other is parallel to the nearest linear surface element of the other.

A screw threaded shaft 44 lies midway between the two cones and parallel to their respective nearest linear surface elements and is journaled at its left end in any suitable stationary support, while its right end is connected through a universal joint 45 to a shaft 46 mounted to be parallel to the shafts 40 and 42. A pair of rigid and unmovable guide rods 47, 47 are mounted parallel to the shaft 44 and a nut 48 is mounted on the shaft 44 to be moved along the same by rotation thereof, being held against rotation by

the guide rods 47 passing through apertures in the nut.

A friction wheel 49 is rotatably carried on the nut, preferably on antifriction bearings as shown in Fig. 2, and is so dimensioned as to make suitable driving contact at opposite ends of a diameter of the wheel 49 with the two cones 41 and 43. Thus the input shaft 42 running at constant speed will drive the output shaft 40 at a speed dependent upon the position of the nut 48 and wheel 49 on the shaft 44.

A sprocket 50 rigidly secured on the shaft 46 may be driven through a chain 51 from a sprocket 52 rigidly mounted on a shaft 53. A rocker plate 54 is positioned on the shaft 53 with freedom to rock thereon under the reciprocating drive of a pin 55 carried by the rack 28. A pawl 56 is pivotally mounted on the rocker plate 54 and takes into the teeth of a ratchet wheel 57 rigidly secured to the shaft 53. The pawl 56 may be lifted out of contact with the ratchet wheel as hereinafter described by a pin 58 extending laterally over the ratchet from a lever arm 59 rigidly secured on a hollow shaft or sleeve 60 coaxial with and rotatable on the shaft 53. The shaft 53 is journaled in and supported by a stationary member 61 which may be a part of or secured to the principal machine frame. Lateral dimensions have been exaggerated in this part of diagrammatic Fig. 1 to spread the parts for clarity.

A spur gear 62 rigid on the shaft 53 meshes with another gear 63 secured on a shaft 64 also journaled in the member 61. A cam 65 also is secured on the shaft 64 and coacts with a lug 66 integral with a member 67 secured on the sleeve 60. There is also a hand wheel 68 rigidly mounted on the end of the shaft 53.

In operation, the shafts 21 and 42 are driven at appropriate speeds by means not shown from the drive of the principal machine. The shaft 21 drives the spool or reel 20 to wind up the strand 22 thereon at substantially constant linear speed of the strand. The shaft 42 running at substantially constant speed drives the sprocket 40, through the device 36, at a speed dependent upon the position of the nut 48 and friction wheel 49 on the threaded shaft 44. The sprocket 40 in turn rotates the cam 29 through the elements 38, 37, 35, 34, 33 and 32; and the cam 29 reciprocates the rack 28 and thereby the rack 24 to cause the strand guide 23 to move back and forth along the reel 20 and thus distribute the strand thereon.

Meantime the reciprocation of the rack 28 and with it of the pin 55 causes the rocker plate 54 to swing to and fro which causes the pawl 56 to advance the ratchet wheel 57 and thus turn the shaft 53 step by step and with it the sprocket 52 in the direction of the arrow. The sprocket 52 drives the chain 51 and sprocket 50 to rotate the shaft 46 and thereby the threaded shaft 44, thus causing the friction wheel 49 to move to the left (Figs. 1 and 2) and gradually slow down the motion of the entire train of mechanism from the cone 41 on. At the same time the shaft 53, through the gears 62, 63 drives the cam 65 slowly around until, when the reel 20 is full and ready to be removed, the forward end of the high part of the cam strikes and drives the lug 66 and therewith the sleeve 60 and the arm 59 until the pin 58 lifts and holds the pawl 56 out of coaction with the ratchet wheel 57, which can then no longer drive the shaft 53.

After the full reel 20 has been interchanged

for an empty one, it is necessary to return the friction wheel 49 to the right hand portion of the shaft 44. To this end, the shaft 53 may be reversely rotated by the hand wheel 68, the ratchet 57 moving idly under the lifted pawl and the sprocket 52 driving the shaft 44 to draw the nut 48 and therewith the wheel 49 to the right. The sleeve 60 and arm 59 with the pin 58 remain stationary while the low part of the cam 65 rides idly over the lug 66 until the other end of the high part of the cam strikes the lug 66 and moves it back. This draws the pin 58 out from under the pawl 56 and the latter once more engages the ratchet 57, thus beginning the cycle of operation over again.

Thus at each complete reciprocation to and fro of the strand guide 23 along the reel, during which two consecutive layers of strand, the speed of the guide is diminished. This diminution is accomplished during the last fractional part of the return motion of the guide, for during the left to right motion of the guide the rack 28 is moving up and the pawl 56 is moving idly backward over the ratchet, while on the return of the guide from right to left, the pin 55 does not rock the plate 54 until near the end of the down stroke of the rack 28 owing to the peculiar shape of the rocker plate (best shown in Fig. 5).

In practice it is found that, with ordinary sizes of wire or strand, alteration of the guide speed at the end of each two layers of winding is sufficient to give satisfactory distribution of the strand on the reel. At the same time by this procedure the strand is laid uniformly over substantially the whole of each layer, the deceleration of motion of the guide being limited to a relatively small fractional part of every other layer only, which fractional part may in some instances even be confined to the last turn only of the layer.

Means may also be further provided as shown in Figs. 3 and 4, to allow of predetermining the setting of the friction wheel 49 for use with any one of several slightly differing sizes of wire or strand. To this end a dial 69 bearing appropriate markings may be secured to the shaft 64 to cooperate with a zero mark or the like 70 carried by an appropriate fixed member 71.

The embodiment of the invention herein disclosed is illustrative only and may be widely departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. The combination with a strand winding apparatus having a reel driven to take up a strand at constant linear speed, of a reciprocable strand guide and means to reciprocate the guide at an intermittently variable speed, said means comprising a reciprocating element, means operatively connecting the element to the guide to transfer to the guide like movements of the element, a cam operatively connected to the element and conditioned to reciprocate the element when rotated, variable speed means for rotating the cam, a rocking member, means connecting the rocking member to the element to cause movement of the member by the element, and means actuated by movements of the rocking member to change the speed of the variable speed means to vary the reciprocatory speed of the element and guide.

2. The combination with a strand winding apparatus having a reel driven to take up a

strand at a constant linear speed, of a reciprocable strand guide and means to reciprocate the guide at a variable speed adjacent the termination of reciprocal movements of the guide, said means comprising a reciprocable element, means operatively connecting the element to the guide to transfer to the guide like movements of the element, variable speed means for reciprocating the element, a rocking member, means operatively connecting the rocking member to the element to cause reverse directional movements of the rocking member, and means actuated adjacent the termination of movements of the rocking member to vary the variable speed means. 5

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