Oct. 7, 1947. A. L. EWING 2,428,703

YARN ADVANCING REEL

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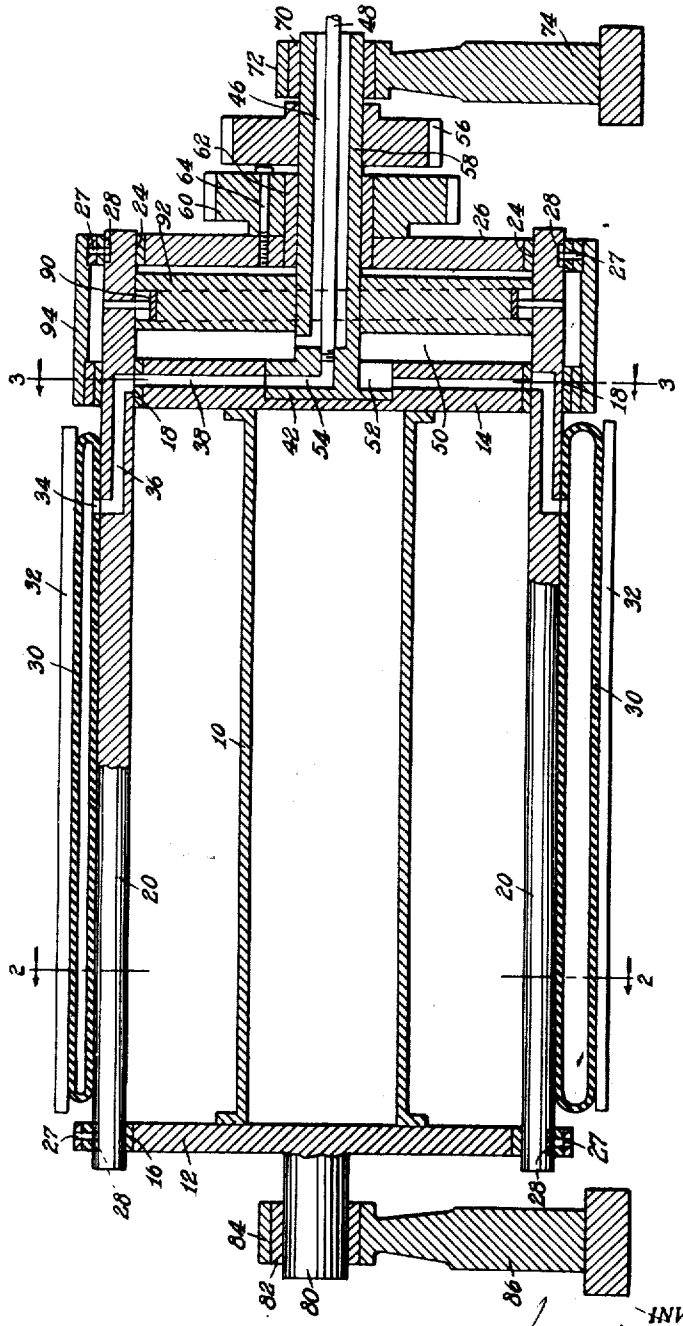


Fig. 1.

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Fig. 2.

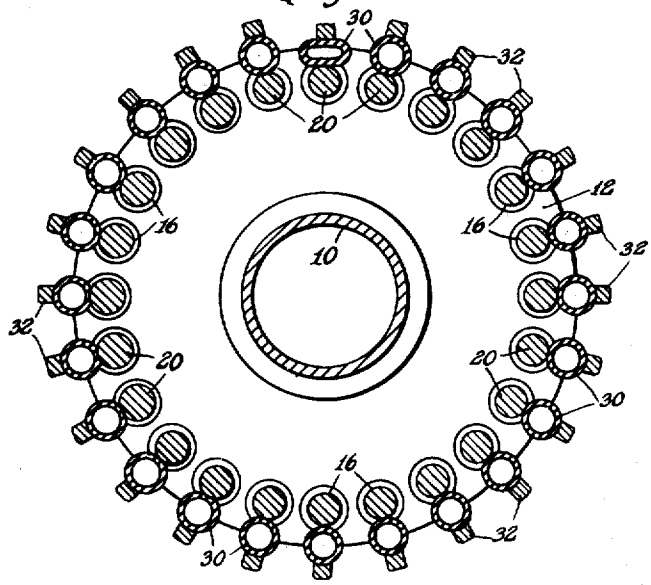
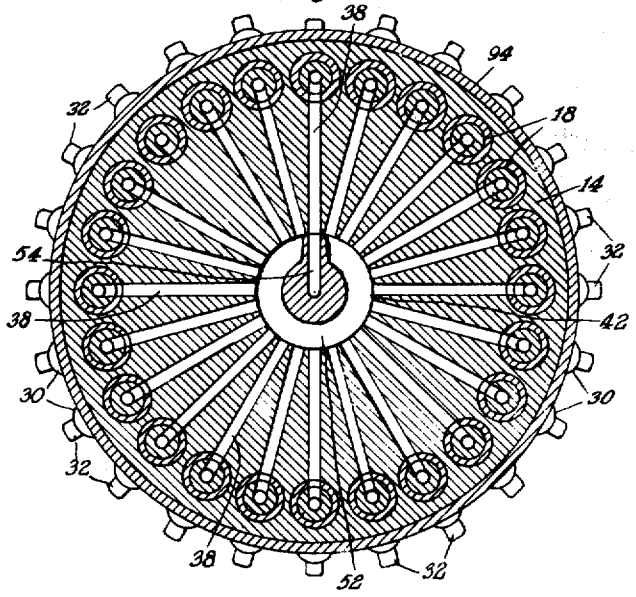


Fig. 3.



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YARN-ADVANCING REEL

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Application February 1, 1946, Serial No. 644,940

4 Claims. (Cl. 28—71.6)

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This invention relates to an apparatus for advancing yarns. More particularly, it relates to a yarn-advancing reel for continuously and progressively advancing a yarn in the form of a helix.

Copending application, Serial No. 633,339, filed December 7, 1945, for Yarn-advancing reel, discloses a rotary reel having a plurality of yarn-supporting bars, each of which bars is moved axially in the direction of the yarn travel over the reel whereby the yarn carried thereby is progressively and continuously advanced over the reel and, when each bar reaches the limit of its axial movement in the direction of the yarn travel, it is retracted (moved radially inwardly) from the yarn and moved axially in a direction opposite to the yarn travel and radially outwardly to bring it into yarn-supporting position. The axial (longitudinal) movement is imparted directly to the yarn-supporting bars by a cam mechanism and the radial movement of the bars is obtained by fluid actuated pistons to which the yarn-carrying bars are connected.

An object of this invention is to provide a new and improved yarn-advancing reel which effectively and continuously advances a yarn along the length thereof.

Another object of this invention is to provide a pneumatic advancing reel having a minimum number of working parts.

An additional object of this invention is to provide a yarn-advancing reel wherein the radial movement of the yarn-supporting bars is obtained by pneumatic actuated means which do not include pistons.

Other and additional objects of this invention will appear hereinafter.

The objects of the invention are accomplished, in general, by winding yarn in the form of a helix onto a rotary reel having a plurality of yarn-supporting bars, each of which bars is moved axially in the direction of the yarn travel over the reel, whereby the yarn carried thereby is progressively and continuously advanced over the reel and, when each bar reaches the limit of its axial movement in the direction of the yarn travel, it is retracted (moved radially inwardly) from the yarn and moved axially in a direction opposite to the yarn travel and radially outwardly to bring it into yarn-supporting position.

Each yarn-supporting bar is secured to a slide rod and axial (longitudinal) movement is imparted to the yarn-supporting bar by a cam mechanism cooperating with the respective slide rod. Each yarn-supporting bar is rigidly secured to an inflatable tube which is also rigidly secured

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to the slide rod. A rotary valve controls the inflation and deflation of each of the tubes at predetermined times. The mechanisms of the reel are so interrelated that, when a tube is in deflated or collapsed state, the thread-supporting bar carried thereby is out of yarn-contacting position and, when a tube is in the inflated state, the respective yarn-supporting bar will be in yarn-contacting position.

The inflation and deflation of the tube, the rotation of the reel, and the axial movements of the bars are operated in timed relationship to effect the operations in the desired sequence.

The details and manner of practicing the invention will become clear from the following detailed description when taken in connection with the accompanying drawings forming a part of this specification, and wherein:

Figure 1 is a longitudinal section of a yarn-advancing reel embodying the principles of this invention;

Figure 2 is a section taken on lines 2—2 of Figure 1; and

Figure 3 is a section taken on lines 3—3 of Figure 1.

Referring now to the drawings wherein like reference numerals designate like parts, the reference numeral 10 designates the main supporting axle of the reel which, in the form illustrated, is horizontally disposed. One end of the axle 10 is appropriately secured to an end plate 12 and the other end is secured to a guide plate 14. The end plate 12 is provided with a plurality of bushed holes 16 arranged in spaced relationship adjacent the circumference thereof. The guide plate 14 is also provided with bushed holes 18 arranged in spaced relationship adjacent the circumference of the guide plate 14. The holes 16 and 18 are in aligned relationship and a slide rod 20 is slidably positioned in each pair of aligned holes 16 and 18.

As shown in Figure 1, each slide rod 20 extends beyond the guide plate 14 and is positioned in a bushed hole 24, a plurality of such holes 24 being arranged in spaced relationship adjacent the circumference of an end plate 26. Each hole 24 in the end plate 26 is in alignment with corresponding holes 16 and 18 in end plate 12 and guide plate 14 respectively.

As will hereafter appear, each slide rod 20 is moved axially of the reel and, accordingly, each series of the respective holes 16, 18 and 24, in addition to supporting the rod 20 positioned therein, also permit sliding movement therein. It is to be noted that a pin 21 in each end plate

cooperates with a slot 28 in the respective bars 20 to prevent said bars from turning about their horizontal axes.

On the outer peripheral edge of each slide rod 20 there is secured, as by vulcanization, a collapsible rubber tube 30. A yarn-supporting bar 32 is secured, as by vulcanization, to the opposite side of the tube 30. Each tube 30 and the yarn-supporting bar 32 secured thereto are approximately of the same length and extend longitudinally of the reel with their respective ends in spaced relationship to the end plate 12 and the guide plate 14 to permit the radial movement of the bar 32 hereinafter described. Each tube 30 is at times in the collapsed or deflated state and, when in such condition, the yarn-supporting bar 32 secured thereto is out of yarn-contacting position. However, when a tube 30 is in the inflated state, the yarn-contacting bar 32 secured thereto will be in yarn-contacting position. The means whereby each tube 30 is inflated and deflated at predetermined times will now be described.

Each tube 30 is provided with an opening 34 which communicates with one end of a passage 36 in the respective slide rod 20. The other end of the slide bar passage 36 communicates with a passage 38 in the guide plate 14. A rotary valve 42 is appropriately mounted in the guide plate 14. The rotary valve 42 is provided with concentric supply and exhaust passages which are designated by the reference numerals 46 and 48 respectively. Compressed air is supplied to the outer end of the supply passage 46 from any suitable source (not shown). The supply passage 46 communicates with an air chamber 50.

The rotary valve 42 has a port 52 which can be brought, upon rotation of the valve 42, into position to establish communication between the air chamber 50 and the passage 38, and, when the port 52 is so positioned, the compressed air will inflate the tubes 30 which are in communication with the air chamber and move them radially outwardly into yarn-contacting position. The rotary valve also has a port 54 which can be brought into position upon rotation of the valve 42 to establish communication between the passage 38 and the exhaust 48 whereby the air will pass from the tube 30, the tube will deflate or collapse, and the yarn-supporting bar carried thereby will be moved radially inwardly out of yarn-contacting position. In the form shown in the drawings, the rotary valve 42 and the ports 52 and 54 thereof are so designed that the bar in the uppermost position will be out of yarn-contacting position while all the other bars will be in yarn-contacting position.

The rotary valve 42 is rotated by a gear 56, which is secured to a housing 58 of the rotary valve and is in cooperative relationship with a driven gear (not shown).

A gear 60 is rotatably mounted on a sleeve 62 disposed on the valve housing 58. The gear 60 is secured by a lag bolt 64 to the end plate 26, and is in cooperative relationship with a driven gear (not shown).

The housing 58 is mounted in a sleeve 70 carried by a pillow block 72 which, in turn, is carried on a support 74 of the machine. The end plate 12 is secured at one end of a shaft 80 which is rotatably mounted in a sleeve 82 carried by a pillow block 84 which, in turn, is mounted on a support 86 of the machine.

From the foregoing description, it is apparent that, upon rotation of the gear 60, rotation will be imparted to the end plate 26, which movement will be transferred through the slide bars 20 to the end plate 12 and the guide plate 14. Rotation of the gear 56 will impart rotation to the rotary valve 42.

In order to impart axial movement to each of the bars 20, and hence the yarn-supporting bars 32, each bar 20 is provided with a cam follower 90 which cooperates with a cam 92 mounted on the rotating housing 58, the cam being of such a shape and design that it will impart axial movement to the rods 20 in the direction of the yarn travel when the yarn-supporting bars 32 are in yarn-contacting position and in the opposite direction when the yarn-supporting bars 32 are out of yarn-contacting position. A housing 94 encloses the cam mechanism.

In operation, compressed air is introduced through the supply 46 into the air chamber 50 whereby all of the tubes 30, except that one at the uppermost position in the reel, are connected through the passages 36, 38 and 52 to the pressure chamber 50, with the result that each of such tubes 30 will be inflated and the yarn-supporting bars carried thereby will be in radially expanded position so that they will be in yarn-supporting position with the yarn which is wound in a helix on the reel to a point where it is drawn off the reel. The reel drive gear 60 and the valve drive gear 56 are actuated to rotate the parts of the reel respectively driven thereby. During rotation of the reel, due to the cooperation of the cam follower 90 and the rotating cam 92, each rod 20 carrying a yarn-supporting bar 32 in yarn-contacting position is moved axially in the direction of the yarn travel over the reel, whereby the yarn carried thereby is advanced over the reel. When a bar 20 reaches the limit of its axial movement in the direction of yarn travel over the reel, the rotary valve has been rotated to a position so that the port 54 will connect the tube 30 with the exhaust 48 and the tube will collapse or deflate, whereby the yarn-supporting bar will be moved radially inwardly and out of yarn-contacting position. When the yarn-supporting bar 32 is out of yarn-contacting position, the slide rod 20 will be, due to the shape of the cam 92, moved axially in a direction opposite to the direction of travel of the yarn over the reel, and at the limit of this movement, due to the rotation of the parts previously mentioned, the tube will again be inflated. This cycle is repeated and the yarn is continuously and progressively advanced over the reel.

The gears 56 and 60 are of such diameters and driven at such rates that the parts operated thereby will be moved in timed relationship and at the required speeds to perform the respective functions in the sequence described.

In the embodiment herein specifically described, only one bar is returned at a time. Such construction is particularly suitable in a reel where the yarn-carrying surface of the bars is straight, since it reduces wear of the parts but makes each advancing cycle long and extend over one or more revolutions of the reel. However, if the reel is of a type which is designed to stretch the yarns or relax their tension at desired points by means of tapered bars, it is desirable to have more than one bar returning from the yarn sheet so as to reduce the advancing cycle to very short intervals, or, in other words, increase the frequency to several advancing cycles per revolution of the reel in order to minimize sudden tension variations at a tapered part of the reel. Thus, in gen-

eral, the invention is not restricted as to the number of bars returned at one time and the times therefor.

The exhaust port **54** can be made of such width that it will extend over a portion of two or more passages **38**. In such a construction, the high pressure in a tube is reduced in advance of complete exhaustion so that complete exhaustion of the tube is effected in the short interval elapsing on high speed operation of the reel.

Though it is preferred to rotate the cam **92** so that its peripheral speed is different from that of the reel, this is not necessary since the cam **92** can be stationary.

The tube can be made of any suitable flexible and inflatable material. Neoprene, rubber, etc., are illustrative examples of materials of which the tubes can be made.

Normally, the tube will deflate or collapse when it is connected to the exhaust. In order to definitely assure collapsing, the exhaust can be connected to an appropriate exhausting mechanism, such as suction, vacuum pump, etc. The inflating medium can be any appropriate fluid, either gaseous such as air, etc., or liquid such as water, oil, etc.

Though the reel has been described as operating in a horizontal position and supported at both ends, it can be of a cantilever design.

The invention is applicable to yarn composed of continuous filaments, staple fibers, rope, ribbons, and other similar articles of continuous length.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. In an apparatus for advancing yarn and the like in the form of a helix, a reel, means to rotate said reel, a plurality of yarn-supporting bars arranged circumferentially of the reel, an inflatable tube cooperating with each of said yarn-supporting bars whereby upon inflation and deflation of said tube the respective yarn-supporting bar will be moved into and out of yarn-contacting position, means to inflate and deflate each of said tubes at predetermined times, and means to move each of said yarn-supporting bars axially in the direction of the yarn travel when the yarn-supporting bars are in yarn-contacting position and in the opposite direction when out of yarn-contacting position.

2. In an apparatus for advancing yarn and the like in the form of a helix, a reel, means to rotate said reel, a plurality of yarn-supporting bars arranged circumferentially of the reel, an inflatable tube cooperating with each of said yarn-supporting bars whereby upon inflation and deflation of said tube the respective yarn-supporting bar will be moved into and out of yarn-contacting position, means to inflate and deflate each of said tubes, a rotary valve to control the inflation and deflation at predetermined times, means to rotate said valve and means to move each of said yarn-supporting bars axially in the direction of the yarn travel when the yarn-supporting bars are in yarn-contacting position and in the opposite direction when out of yarn-contacting position.

3. In an apparatus for advancing yarn and the like in the form of a helix, a reel, means to rotate said reel, a plurality of yarn-supporting bars arranged circumferentially of the reel, each of the respective yarn-supporting bars being secured to a flexible tube which is in turn secured to a slide rod, means to inflate and deflate each of said tubes at predetermined times whereby the yarn-supporting bars secured to said tubes will be moved into and out of yarn-contacting positions respectively, means to move each of said slide rods axially in the direction of the yarn travel when the yarn-supporting bars are in yarn-contacting position and in the opposite direction when out of yarn-contacting position.

4. In an apparatus for advancing yarn and the like in the form of a helix, a reel, means to rotate said reel, a plurality of yarn-supporting bars arranged circumferentially of the reel, each of the respective yarn-supporting bars being secured to a flexible tube which is in turn secured to a slide rod, means to inflate and deflate each of said tubes whereby the yarn-supporting bars secured to said tubes will be moved into and out of yarn-contacting positions respectively, a rotary valve to control the inflation and deflation at predetermined times, means to rotate said valve and means to move each of said slide rods axially in the direction of the yarn travel when the yarn-supporting bars are in yarn-contacting position and in the opposite direction when out of yarn-contacting position.

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