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R. A. O'CONNELL, JR

2,439,903

THREAD ADVANCING, STORAGE, AND STRETCHING REEL

Filed Dec. 6, 1946

4 Sheets-Sheet 1

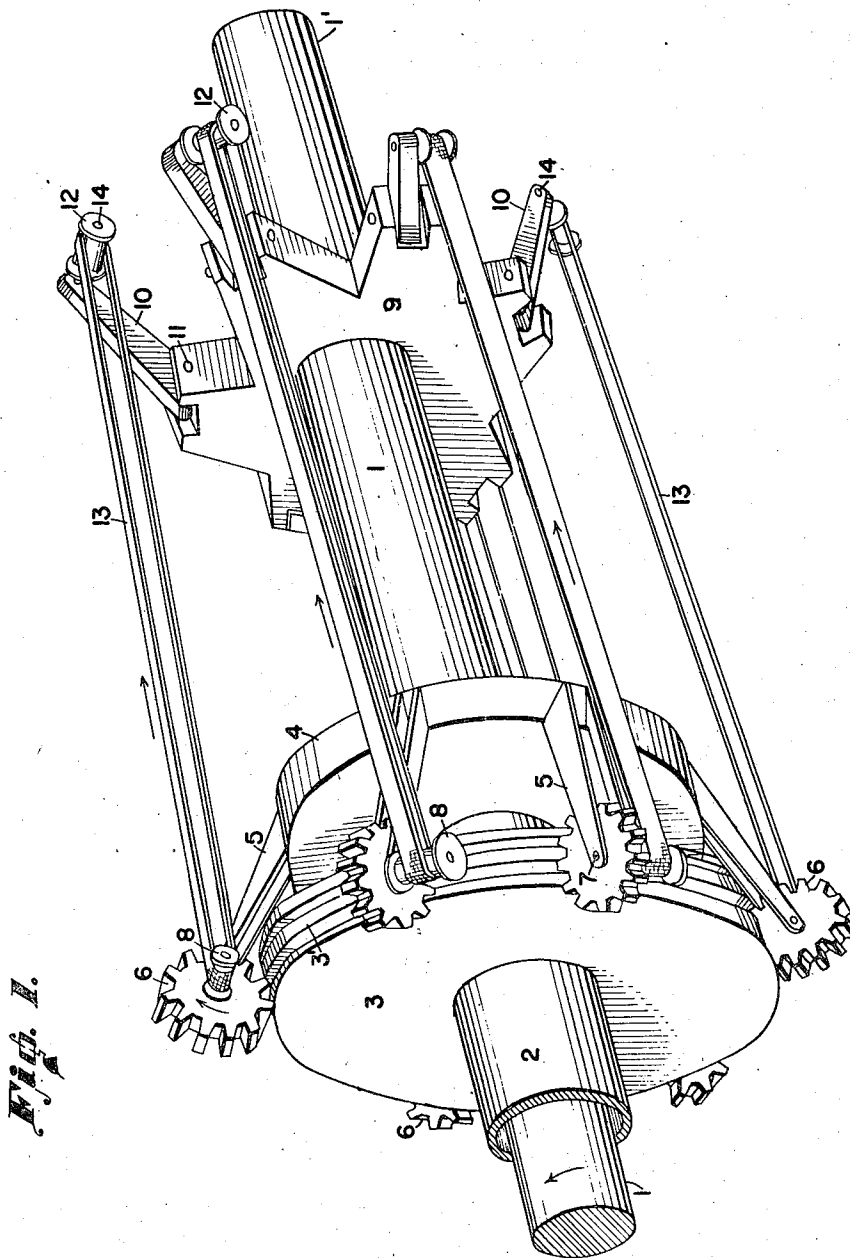


Fig. 1.

INVENTOR
R.A.O'CONNELL

H. N. Foss
L. M. Mantel
ATTORNEY

BY

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R. A. O'CONNELL, JR

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Fig. 2.

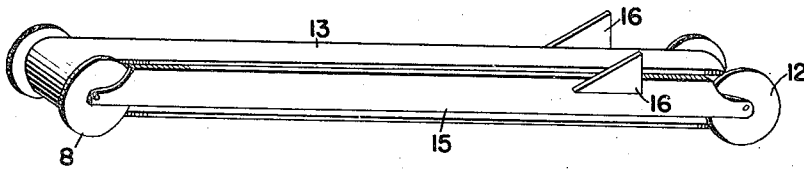
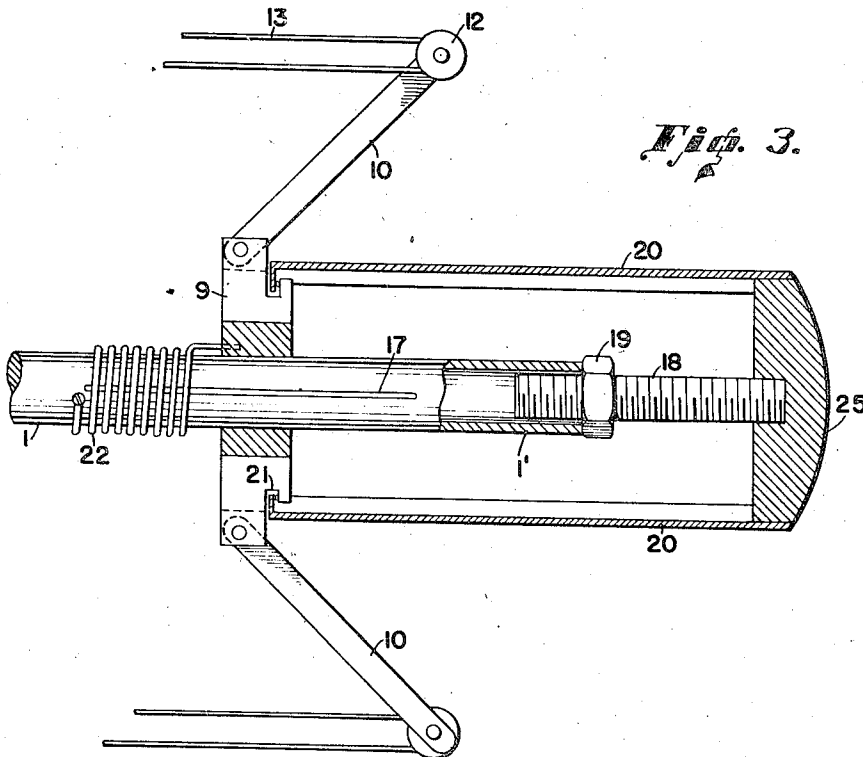


Fig. 3.



INVENTOR
R.A. O'CONNELL

H. N. Foss
L. M. Mantel
ATTORNEY

BY

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Fig. 4.

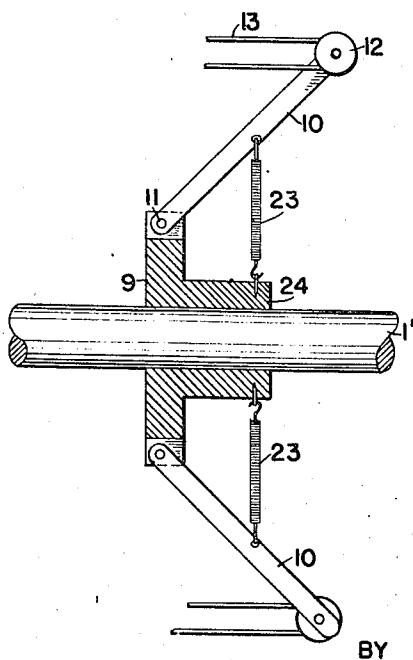
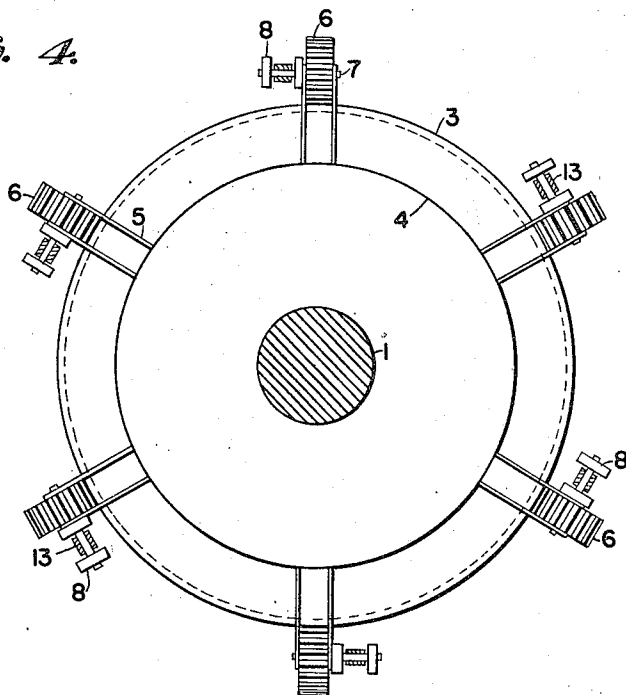


Fig. 5.

INVENTOR
R.A. O'CONNELL

H. R. Foss
L. M. Mantell
ATTORNEY

April 20, 1948.

R. A. O'CONNELL, JR.

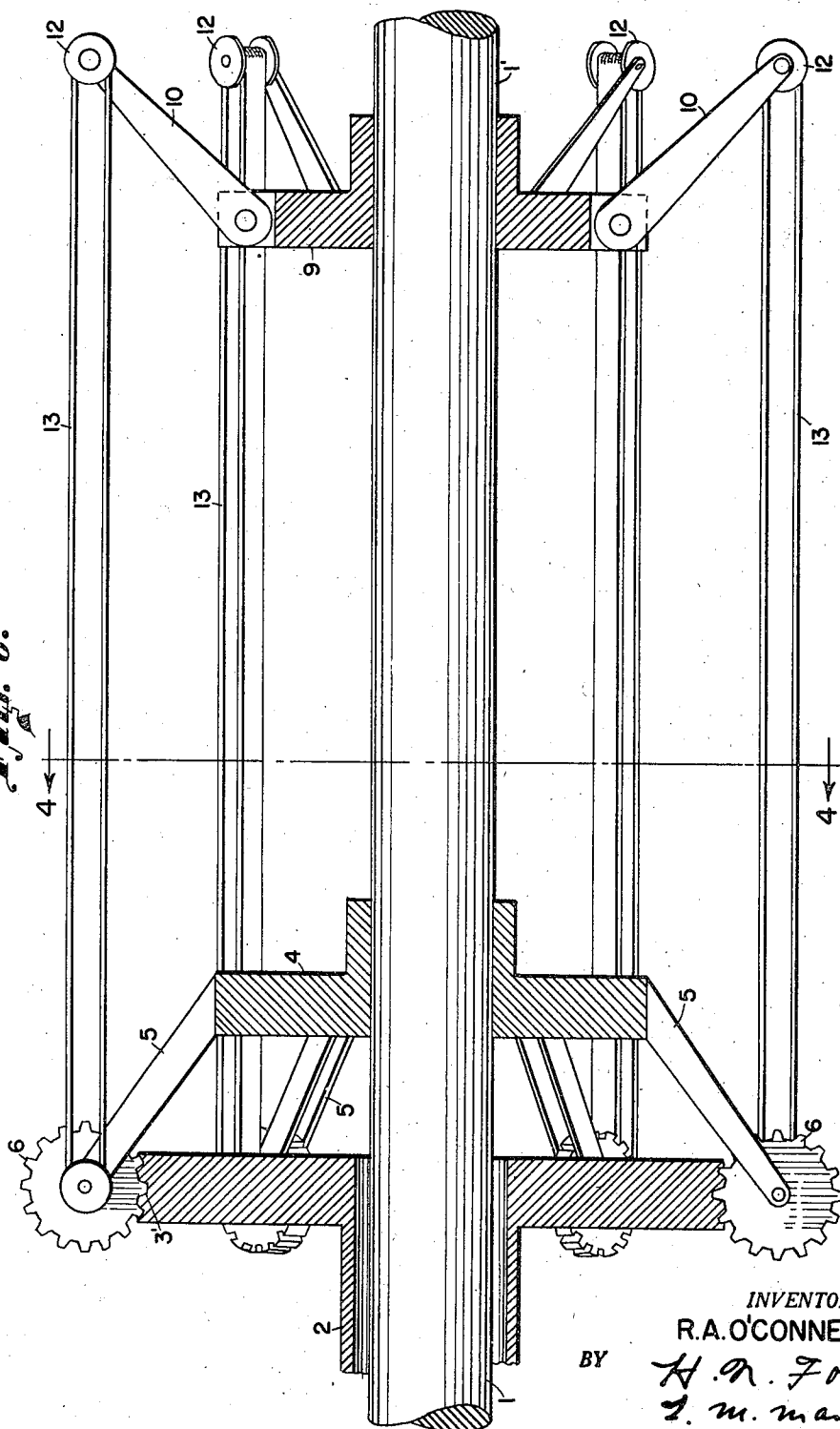
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Fig. 6.



INVENTOR.

R.A. O'CONNELL

BY

H. N. Foss

J. M. Mantel

ATTORNEY

UNITED STATES PATENT OFFICE

2,439,903

THREAD ADVANCING, STORAGE, AND
STRETCHING REELRichard A. O'Connell, Jr., Berkeley, Calif., as-
signor to United States of America as repre-
sented by the Secretary of Agriculture

Application December 6, 1946, Serial No. 714,597

5 Claims. (Cl. 28—71.6)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

1 This application is made under the act of March 3, 1883, as amended by the act of April 30, 1928, and the invention herein described, if patented, may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to an improved self-advancing, winding, and storage reel for threads, yarns, or other continuous filaments. Such reels are customarily used in the chemical or physical treatment of filaments, the latter being treated while continuously wound on and travelling along the axis of the reel.

In the manufacture of some synthetic filaments it is common practice to subject the filament to a stretching operation, whereby the orientation of the chains is affected and the strength of the filament greatly increased. This stretching is generally carried out while the continuous filament is passed from one reel or spool to a second. It is usually a separate operation from treatments such as washing, bleaching, drying, viscose desulphurization, acetylation and tanning of protein fibers, and saponification of cellulose acetate filaments.

One object of this invention is to provide a reel which imparts the desired degree of stretch to the filament wound thereon.

A further object is a reel which continuously imparts the stretch while the continuous filament is being subjected to other physical or chemical treatment.

Some filaments when stretched develop tension, which should be removed before the thread is collected. Otherwise the tension developed on the spool or collecting device may cause damage to the latter and to the filament. This residual tension in the filament may be removed by allowing the thread to contract before collection. The contraction may be allowed to take place continuously, and even simultaneously with other operations, such as drying or oiling, by the use of my reel.

The reel comprises a rotary shaft which carries a number of endless belts which are arranged longitudinally of the shaft and which rotate with and about the axes of the shaft. The filament is wound upon and carried by the outer surfaces of the belts, and is caused to advance by moving

2 the belts longitudinally. By mounting one end of the belt on an adjustable frame which can be moved toward or away from the axis of the shaft, the thread can be stretched or contracted while on the reel, and also while the reel is in motion.

The invention will now be described with reference to the drawings, in which

Figure 1 is a three-dimensional view of the reel;

10 Figure 2 is a view of a modified arrangement for maintaining the belts taut;

Figure 3 is a view, partly in section, of a device for adjusting the support for the belts axially along the reel;

15 Figure 4 is a vertical section along the line 4—4 of Figure 6;

Figure 5 is a view of spring means to maintain the belts taut;

20 Figure 6 is a vertical longitudinal view, partly in section, of the reel of Figure 1.

In Figures 1 and 6, shaft 1—1', fixed belt support 4, axially adjustable belt support 9, worm gears 6, and belts 13 rotate together about the axis of shaft 1—1'. Disc 3 carrying the worm gear track 3' is fixed on bearing 2, which is supported and maintained stationary in any suitable manner. Rotatable shaft 1—1' is supported in fixed bearing 2 and is rotated by power supplied in any conventional way.

30 Rigidly fixed on shaft 1—1' is the supporting disc 4 carrying arms or brackets 5 which extend out over the worm gear track 3'. Each bracket 5 rotatably supports an axle 7 which is fixed to a worm gear 6. Six such gears are shown, each of which meshes with the worm gear track 3'. Attached to each axle 7 is a pulley 8. Each of the pulleys 8 supports and rotates an endless belt 13.

35 The other end of each belt is supported by a freely rotating pulley 12 mounted by axle 14 on an arm 10. Each arm 10 is pivoted at 11 in a slot in support 9 which constrains the motion of each arm in a plane parallel to the axis of the shaft 1—1'.

45 Support 9 rotates with shaft 1—1', being attached thereto by a set screw (not shown) or by a conventional key and slot. Support 9 is movable longitudinally along shaft 1—1'. Upon so moving the support, the ends of arms 10 carrying pulleys 12 are moved toward or away from the shaft 1—1'.

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In Figure 2 is shown a bar 15 in the ends of which the axles of pulleys 8 and 12 rotate. Two bars 15 are employed for each belt, one on each side. These bars serve to keep the belts taut. They also serve as support for guides 16. When the thread reaches the guides 16 it climbs up the guides and off the belts. Alternatively, guides 16 may be attached to the shaft 1-1' or support 9. Bars 15 are preferably placed so that their upper edges support the belts, the belts being in sliding contact therewith. When bars 15 are employed it is not necessary to use tensioning springs to keep the belts taut.

In Figure 5 is illustrated a tensioning spring means to be employed on the device of Figures 1 and 6. It may also be used, if desired, in conjunction with the belt tautening bar 15 of Figure 2. A spring 23 is attached at one end to an arm 10 and at the other to a flange 24 on the support 9. A spring 23 is provided for each arm 10.

As mentioned above, support 9 is fastened to shaft 1-1' in such manner that it can be moved along the shaft, thereby changing the angle which the belts make with the shaft. One apparatus which may be employed to move the support 9 is shown in Figure 3. A key (not shown) on support 9 rides in a slot 17 in the shaft 1-1'. Shaft 1-1' is hollow at 1' to receive, loosely, the end of threaded rod 18. By turning nut 19, which rests against the end of the shaft, the position of the rod 18 is determined. Attached to rod 18 is a plate 25 which carries arms 20. Arms 20 are provided with flanges that hook into groove 21 on the support 9, riding freely therein on ball bearings. When rod 18 is moved to the right or left by turning nut 19, the support 9 is moved to any desired position. While shaft 1-1' and support 9 rotate, the unit comprising 18-25-20 may be held stationary and nut 19 turned. Adjustment can thus be obtained without interrupting the operation of the reel. Spring 22, attached at one end to shaft 1 and at the other end to support 9, forces rod 18 into the hollow end 1' of shaft 1.

Another adjusting means that may be used is to thread the end 1' of shaft 1 and mount a nut on it that may be brought to bear against support 9. Spring 22 would then be replaced by a compression spring that forces support 9 to the right.

In operation, upon rotating shaft 1-1' worm gears 6 whirl around the worm 3', the teeth of the former riding in the grooves of the latter so that rotary motion is applied to the gears. As the gears 6 revolve the pulleys 8 also revolve, moving the belts longitudinally and in unison. If a thread be led onto the revolving and axially moving belts, it will be wound thereon with no overlapping, each turn being separated from the next by the distance the belts move for each revolution. The degree of stretch or contraction is governed by the distance of spools 12 from the shaft 1-1'.

In another embodiment of my invention, not shown in the drawings, the travelling belts are replaced by longitudinally disposed parallel rotating shafts each of which has an external helical groove or screw thread in the grooves of which screw thread the filament seats. The filament thus rides along the reel, axially, in the said grooves. One end of each rotating shaft is supported by an arm 10, on support 9. On the other end of each rotating shaft is fixed a pinion gear the axis of revolution of which gear is the axis of revolution of the shaft. The pinion gears mesh with a stationary gear mounted on bearing 2.

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Each pinion gear is rotatably supported by a bracket 5 attached to support 4. As the pinion gears are rotated by 4 over the stationary gear the teeth of the latter rotate the pinion gears, thus rotating each of said grooved shafts about its longitudinal axis. All of the grooved shafts rotate together about the shaft 1-1', forming in effect a rotating cage-like cylinder or frustum of a cone.

Having thus described my invention, I claim:

1. A thread-storage, thread-advancing device comprising a rotary shaft, a number of endless driven belts mounted longitudinally to the shaft, and rotating with said shaft, and providing a plurality of longitudinally extending circumferentially spaced strands moving longitudinally in unison and constituting the thread-supporting surface, a support mounted to rotate with the shaft, said support carrying a number of worm gears whose axes of rotation are transverse to that of the shaft, a worm wheel the axis of which is that of the shaft, said worm wheel meshing with said worm gears, whereby upon rotating said shaft, support, and worm gears about the axis of said shaft, the worm gears are caused to rotate about their individual axes, each of said worm gears having means for mounting and driving an end of one of said belts, a second support mounted to rotate with said shaft and carrying means for rotatably supporting the other ends of said belts and in which the second support is adjustable longitudinally of said shaft, and in which the said means carried by the second support comprises, for each belt, an arm pivoted at one end upon the second support, and having, adjacent the other end of the arm, means for supporting an end of a belt, whereby upon adjusting the second support longitudinally of the said shaft the arms pivot in unison to adjust the angle between the belts and the shaft, and having means for adjusting the second support longitudinally of said shaft, said means comprising a bracket rotatably supported on a screw mounted on one end of the shaft, one end of said bracket being operatively connected to the second support to adjust the latter longitudinally as aforesaid.

2. In an apparatus for laying up thread in the form of a continuously advancing helix, a rotating cage-like cylinder comprising a plurality of longitudinally extending circumferentially spaced endless belts having outer strands constituting the thread supporting surface and inner strands closer to the axis of the cage, a rotating shaft, first support means attached adjacent one end of the shaft, a first set of belt-supporting, belt-turning, rollers carried by the first support means, second support means adjacent the other end of, and rotated by, said shaft, and movable longitudinally of the axis of the shaft, a support arm for each belt pivotally mounted upon said second support means to turn about an axis transverse to the said shaft, a second set of belt-supporting rollers each roller of which set is supported by one of said support arms, means for rotating the shaft, and for rotating the first set of rollers.

3. The apparatus described in claim 2, individual means for maintaining the belts taut, comprising a rigid member mounted between the two opposite rollers of each belt.

4. The apparatus described in claim 2, means for maintaining the belts taut, comprising a spring attached at one end to one of said support arms and at the other to the second support means.

5. The apparatus described in claim 2, the sec-

ond support means having a circumferential flange, an arm extending longitudinally of the shaft having one end adjacent said flange in position to move said flange, and thereby said second support means, longitudinally, means for mounting the other end of the arm, comprising a plate to which the arm is attached, means for moving the plate longitudinally of the shaft.

RICHARD A. O'CONNELL, JR. 10

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