SELF-ADVANCING WINDING REEL

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2 Claims. (Cl. 28—71.7)

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This application is made under the act of March 3, 1833, 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 application is a continuation-in-part of my copending application for patent, Serial No. 684,910, filed July 19, 1946.

This invention relates to a self-advancing winding reel for use in the processing of artificial threads, filaments, or the like. It is employed to treat the filaments in a chemical solution or in a current of gas to impart strength and firm texture, for example.

The threads or filaments to be treated are spread or wound on the outside surface of the reel, or, of several reels in series, while being kept separate from each other on the reel, or reels. As the reels rotate they may dip into a chemical solution.

The treatment solution may be caused to fall in a stream onto the reel. The filaments on the reel may be subjected to the action of a current of gas, or they may be washed and dried on the reel.

The reel may be tapered. The threads, or filaments, would then be started at the smaller end, and as they advance to the larger end, they would be gradually stretched. From experience, it can be shown that the threads, filaments or the like, have superior properties, such as greater strength, when so treated.

In operation the threadlike material is brought to the starting point on the reel. The rotating reel then carries the material around on its outer surface in separate turns, while advancing the threadlike material until the opposite end is reached. This is accomplished by sliding or moving bars, located in slots or between the fixed bars forming the main body of the reel. The bars are moved lengthwise of the reel by a cam. A pair of cams, each of which is located near an end of the reel, move the sliding bars radially inwardly and outwardly at the proper stage of each revolution. Spiral springs keep the sliding or movable bars in a continuous contact with the cams to secure the proper sequence of motions.

In my co-pending application for patent, Serial No. 684,910, I have described a self-advancing reel which is supported in two bearings and mounted on a base as a separate unit to be incorporated into a spinning or extruding assembly. In the present application is described a reel which is supported at one end only and may be incorporated directly into a spinning or extruding assembly which will be referred to as panel mounting. Under certain conditions it may be necessary to keep the material being treated in continuous contact with the chemical treatment for a considerable length of time. This would require a large reel which could be best mounted rotatably in more than one bearing. In panel mounting the reel is supported at one end only. This permits it to be incorporated into an assembly by means of which consecutive treatments may be applied by carrying the treated filament from one reel to another until the process is completed.

The reel shown in attached drawings consists of an 8-sided cylindrical prism, but I do not wish to limit myself to any particular number of sides or faces, as these can vary with the size of reel desired for necessary treatment of threadlike filaments.

The shape of the reel may be cylindrical, or conical.

The faces or sides of the cylindrical prism comprising the main body of the reel, and which have no lateral or radial movement, need not have a solid surface. These faces or sides may be provided with grooves or slots, and with openings of any desired shape or size. This may be desirable to obtain a more thorough treatment of the threadlike filament, under certain conditions.

The accompanying drawing illustrates one embodiment of the reel.

Figure 1 is an end view.

Figure 2 is a longitudinal view, partly in section.

Figure 3 is a modified form of the sliding bar.

Figure 4 is another form of the sliding bar.

In Figure 2 the stationary parts, that is, the parts which are to be fixedly attached to the panel, constitute panel plate 10, yoke 2 fastened to plate 10 by screws 13, stationary shaft 1 rigidly attached to and supported by the yoke at the left end only, annular cam 7 attached to panel plate 10 by means of screws 14, and cam disc 8 rigidly attached on the right end of shaft 1.

The moving parts in Figures 1 and 2 are the cylindrical sleeve 3 rotatably mounted on stationary shaft 1 by means of annular bearings at 4 and 16. An additional support bearing is provided by the yoke at 17. Sprocket gear 5 is fixedly mounted upon and turns sleeve 3. The sprocket is actuated by any convenient source of power. The rotating reel comprises fixed bars having outer faces 8', forming the thread sup-
porting surface of the reel, and radially inwardly projecting portions 18 which provide axially and longitudinally extending slots 11. In each slot 14 is located a sliding bar 15. Each sliding bar is supported at an end by fixed cam plate 2 and at the other end by fixed cam 8. Springs 9, attached at one end to the bars and at the other to the sleeve 3, keep the bars in contact with the cam surfaces. Rollers are provided at 12 to reduce friction. The fixed bars 6 and their projecting portions 18 are rigidly attached to and supported by plate 20. The plate 20 is mounted on, and rotated by sleeve 3, being attached thereto by screws 21.

Cam 7 is provided with an annular cam surface 17 which moves the bars longitudinally in the slots. The cam 7 is also provided with a cam surface 17' which is preferably identical with the cam surface 17 of disc 8. Consequently, as the reel rotates, the bars 15 are moved parallel to the axis of the reel and also radially outwardly or inwardly in a predetermined sequence.

In operation, the threadlike filament is brought to a starting point on the reel, for example, at the top in the end view (Fig. 1). In the following description, the filament is wound in the direction indicated by the arrow. Obviously, an opposite winding may be obtained by re-arrangement of the cams 7 and 8.

Referring to Figure 1, at point a the sliding bar is at the top, in starting position, and rotates with the reel. At point b the bar has been moved lengthwise by cam 7 toward cam 6, and it also has been moved radially toward the axis of the reel by the combined action of cams 7 and 8, and the spiral spring. The same motion is continued as the reel rotates through point c. At point d the outer face of the movable bar is flush with the surface of the main body of the reel, which now supports and carries the threadlike filaments. At this point d, the bar is stationary insofar as lengthwise motion is concerned, but continues to recede into the slot.

At point e, the bar has receded into the slot and its outer face is below the surface of the main body of the reel and thus out of contact with the threadlike filament. While in this position the bar is moved axially or lengthwise toward cam 7 by the combined action of the spring and the cam 7. The bar having reached its lowest position continues to move in the same lengthwise direction, but not radially, and this motion continues up to point f. At point f the bar still continues to move lengthwise toward cam 7 but at the same time is moved radially, away from the axis of the reel, by the combined action of cams 7 and 8 and spring 6. At point g the bar has moved to its lengthwise starting position, and at this point the lengthwise motion ceases. The bar continues, however, to move radially away from the axis of the reel, and its outer face is now flush with the surface of the main body of the reel and in contact with the filaments. At point h the bar is still stationary as far as the lengthwise motion is concerned, and continues its radial motion away from the axis of the reel and this motion continues until the bar assumes the starting position a, thus completing the operation cycle.

The same sequence of movements is repeated in each revolution of the reel. The sequence of movements and their relative duration may be altered to adapt the reel for use in any particular process.

In the foregoing description the sequence of movements imparted to the bars, which take place at least once for each revolution of the drum, is as follows:

1. Forward lengthwise (toward cam 6) and simultaneously inwardly.
2. Toward radially only.
3. Backward lengthwise (toward cam 7) only.
4. Backward lengthwise and simultaneously outwardly.

This sequence of movements will advance the thread in one direction on the reel. By a proper arrangement and design of the cam surfaces it is possible to advance the thread in the opposite direction. When a larger reel is used the design of the cams may be modified in such a manner as to impart to the bars the sequence of movements shown in my co-pending application Serial 684,910, wherein the bars do not move lengthwise while they are being moved radially and do not move radially while they are being moved lengthwise. The designating of the cam surfaces to accomplish this is obvious.

The double cam 7 may be replaced by two separate cams one providing cam surface 17, and the other cam surface 17'.

To assist in advancing the thread on the reel, the outer edges or working faces of the sliding bars 15 may be provided with a number of equidistant, longitudinally aligned and radially directed pins 22, as taught in my application Serial No. 684,910 and shown in Figure 3. Or, the edges of the bars may be roughened to aid in advancing the thread. Longitudinally and equidistantly spaced grooves 13 may be cut in the working faces of the bars 15 for the same purpose, as shown in Figure 4. However, by making the working faces of sufficient width, a smooth surface may be employed.

The cams described may be replaced by other types of cams and cam tracks. For example, the lengthwise motion of the sliding or moving bars may be obtained by means of a pin or roller attached to each bar and travelling in a groove of proper design cut in the periphery of a cylindrical cam. The radial movement may also be obtained by the proper shape of the inner bottom face of the groove.

Having thus described my invention, I claim:
1. A cantilever reel supported at one end only, comprising: a panel plate; a supporting stationary shaft fixedly mounted, adjacent one end thereof, by the plate and extending through said plate; a stationary cam disc attached to the shaft adjacent the other end of the latter, said disc providing a first cam surface; stationary means mounted by said panel plate providing a second and a third cam surface, the third cam surface being an annular surface transverse to the axis of the shaft; a rotating driven sleeve mounted about said shaft and extending through said panel; a first set of spaced longitudinally extending bars fixed in position on and mounted upon and rotating with said sleeve, a second set of spaced, longitudinally extending individually movable bars interdigitating with the first set, the latter bars each resting adjacent one end upon the first cam surface and adjacent the other end upon the second cam surface, an end of each bar being adjacent the third cam surface, the said second set of bars being thereby mounted for individual movement longitudinally to the axis of rotation of the first set by the action of the third cam surface and for individual movement radially toward and away from the said axis by the action of the first and second cam surfaces, said bars of the second set having por-
tions which are projected radially at least once during each revolution of the first set of bars, outside the latter, and in which the first set of bars is supported adjacent one end only by a plate secured for rotation with the sleeve, spring means for pressing each of the second set of bars against all three cam surfaces, comprising a spring for each bar of the second set attached at one end to a bar of said set and at the other end to said sleeve.

2. A cantilever reel supported at one end only, comprising: a panel plate; a supporting stationary shaft fixedly mounted, adjacent one end thereof, by the plate, and extending through said plate; a stationary cam disc attached to the shaft adjacent the other and inner end of the latter; said disc providing a cam surface; stationary means mounted upon said panel plate providing a second and a third cam surface, the third cam surface being an annular surface transverse to the axis of the shaft; a rotating driven sleeve mounted about said shaft and extending through said panel; a thread supporting drum comprising a first set of spaced longitudinally extending bars fixed in position on and mounted upon and rotating with said sleeve; a second set of spaced, longitudinally extending individually movable bars interdigitating with the first set; the set of movable bars being carried by and rotating with said drum, the rotary movement of said second set being actuated solely by the rotating of the drum; the movable bars each resting, adjacent one end, upon the first cam surface and adjacent the other end upon the second cam surface, an end of each bar being adjacent the third cam surface; means attached to the sleeve to urge the movable bars against all three cam surfaces; the second set of bars being thereby mounted for individual movement longitudinally to the axis of rotation of the first set by the action of the third cam surface and for individual movement radially toward and away from the said axis by the action of the first and second cam surfaces; said bars of the second set having portions which are projected radially at least once during each revolution of the first set of bars, outside the latter; at any one instant some of the movable bars being retracted below the surface of the drum and others being projected beyond the outer surface of the drum.

RUDOLPH HELLBACH.

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