May 26, 1953 H. J. McDERMOTT 2,639,486

ADJUSTABLE THREAD ADVANCING ROLL

Filed March 17, 1948 2 Sheets-Sheet 1

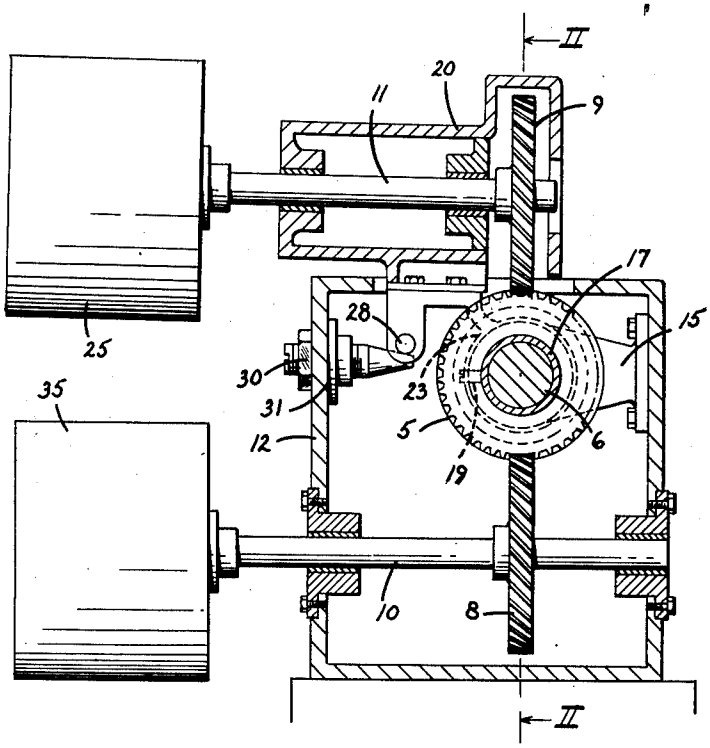



Fig. 1

Fig. 3

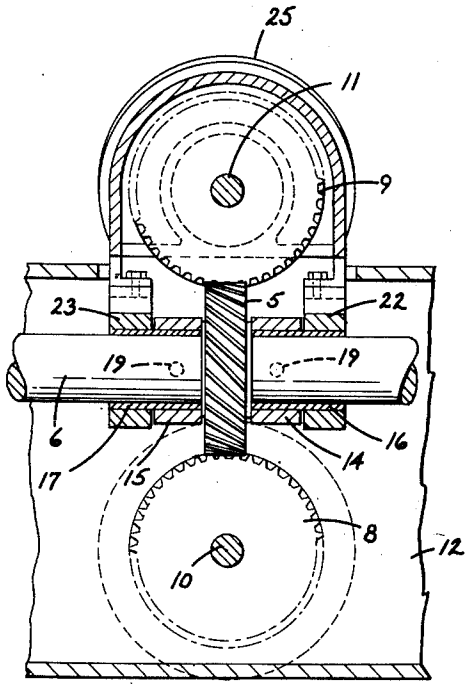
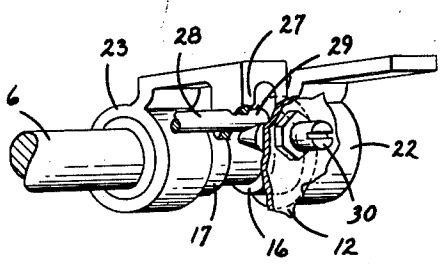



Fig. 2

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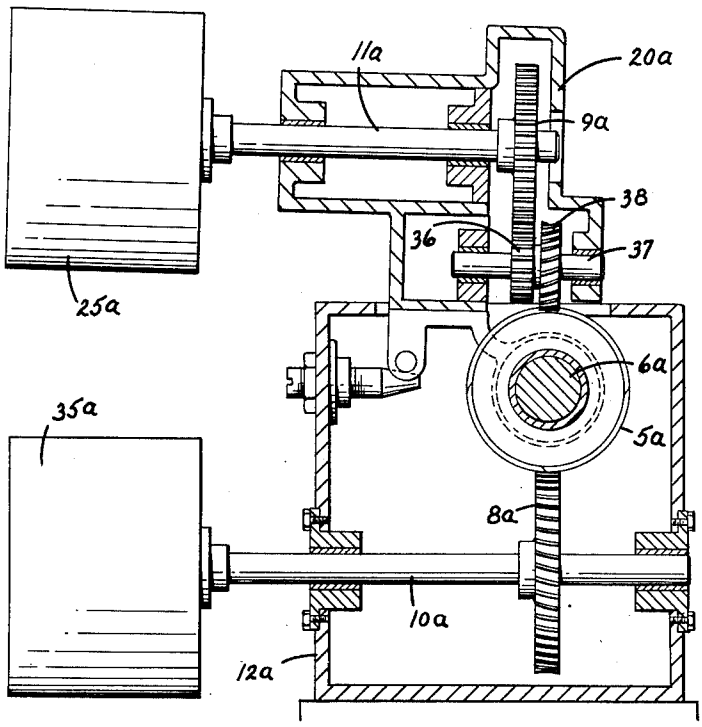


Fig. 4

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# UNITED STATES PATENT OFFICE

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## ADJUSTABLE THREAD ADVANCING ROLL

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7 Claims. (Cl. 28—71.5)

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This invention relates to a thread advancing apparatus and particularly to the type on which thread is advanced on inclined rolls.

It is well known that strands may be passed around a pair of rolls or drums having axes canted or set askew to one another in order to obtain a helical strand path. In this manner, a running strand material may be caused to travel about the rolls for a number of convolutions depending on the length of the rolls and/or the cant or askewness between their axes. The rolls may be used to merely advance the strand or they may be used for strand storage while subjecting the strand to drying, dyeing, washing or various other fluid treatments. The length and completeness of a treatment will vary for a given linear strand speed according to the number of convolutions traversed in the treatment zone.

Recently in patent applications Ser. Nos. 750,456 and 750,457 (both applications filed May 26, 1947, and now abandoned) methods and apparatus have been disclosed in which a strand is passed continuously through "figure 8" convalutions about rotors to accomplish chemical treatment or drying. Convolutions of the "figure 8" type are advantageous in a drying operation because the strand is in contact with a greater portion of the circumference of the drum surface of each rotor and also because the surface of the strand which bears on one rotor is not the same surface presented to the other rotor. To obtain strand-advancing on rotors wound in "figure 8" fashion, the rotors are turned in opposite directions and the axes thereof are canted with respect to one another. The greater the degree of canting, the greater is the spacing between separate convolutions of strand. When rotors are operated in connection with a treating process such as drying, the time required by the process may be regulated by the number of convolutions. This may be done by either changing the length of the rotors or the degree of canting. Since having long rotors introduces complication and difficulties into machinery design such as that of continuous rayon yarn machinery, it is desirable to adjust the degree of canting of the axes of the drums or rotors which support the strand material.

It is a principal object of this invention to provide thread-advancing rolls, the axis of one of the rolls adjustably cantable with respect to the other. It is also an object to provide continuous strand-processing equipment readily adjustable to variable processing periods. Other objects, advantages and features of the invention will be apparent as the invention is described.

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In the drawing illustrative of the invention,

Fig. 1 is an elevation view of a section taken along the axes of rotor shafts;

Fig. 2 is a side view partially in section of apparatus in Fig. 1;

Fig. 3 is a fragmentary cutaway view showing supporting brackets for a portion of the apparatus in Fig. 1 and a setscrew for applying lifting force to one of the brackets; and

Fig. 4 illustrates diagrammatically an important modification of the embodiment shown in Fig. 1.

An apparatus according to the invention is shown in Fig. 1 of the drawing which comprises a worm or spiral gear drive for two thread advancing rotors wherein the axis of the shaft for one rotor is fixed with respect to a driving shaft, and the shaft axis of the other rotor is tiltable. Tilting of the latter shaft is limited to tangential displacement of its axis along an arc about the axis of the driving shaft, the radius of the arc being the distance between the axis of the adjustable rotor shaft and the axis of the drive shaft. The axes of the rotor shafts remain at all times substantially in the same plane.

Referring specifically to Fig. 1, a gear 5 secured on the driving shaft 6 meshes with gears 8 and 9 mounted on rotor shafts 10 and 11 respectively on opposite sides of the gear 5. The gears 8 and 9 are turned in opposite directions. Shafts 6 and 10 are rotatably supported within the case 12 with axes fixed with respect to each other. Support for the shaft 6 is obtained through two bearing brackets 14 and 15 attached to the wall of casing 12. Bearing sleeves 16 and 17 extend through the brackets 14 and 15 respectively and along the shaft 6 toward opposite sides of the casing 12. Set screws 19 prevent the sleeves from turning in the bearing brackets 14 and 15. The portions of the sleeves extending beyond the bearing brackets 14 and 15 provide exterior surfaces on which support brackets 22 and 23 (best shown in Figs. 3 and 4) may be pivoted. Brackets 22 and 23 are attachable to and provide right and left support of a tiltable casing 20 (as viewed in Fig. 2) which houses the rotor shaft 11 and the gear 9.

In order to carry out a principal feature of the invention, that is, to adjustably cant the shaft 11 with relation to shaft 10 while the axes of both shafts lie in substantially the same plane, an adjusting means is provided to obtain tilting motion between case 12 and the assembly comprising case 20, shaft 11, gear 9, and a rotor 25. For this purpose, bracket 23 termintes in a clevis-like structure 27 at the end most removed from

the shaft 6. Pin 28 extends through the clevis structure 27 to provide a lifting surface on the exposed portion 29 of the pin against which a lifting force may be exerted to produce tilting or rotation of the casing 20 about the axis of shaft 6. To supply a lifting force upwards on pin 28, a set-screw 30 having a tapered end portion projects through the wall of casing 12. Set screw 30 extends in threaded engagement through a sleeve 31 which is fixed to the wall. Movement of the set-screw 30 inwardly of the case 12 produces clock-wise motion (as viewed in Fig. 1) of the case 20 about the axis of driving shaft 6 and change in the axial alignment of shaft 11 with respect to shaft 10. As the two shafts 10 and 11 are moved farther from parallel alignment, greater advancing of the strand is obtained and separate convolutions of the strand are spaced farther apart longitudinally along the rotors 25 and 35; obviously, less convolutions will then be supported on the rotors. Consequently by adjustment of the set screw 30 great variation may be obtained in the number of strand convolutions supported on the rotors. At a given linear strand speed, the number of convolutions governs the time expended by the strands in passing over the rotors. When such canted rotors are used in strand-treating processes, such as drying or dyeing, periods of treatment may be conveniently regulated by the tilting arrangement just described.

Rotor 25 may be tilted with respect to rotor 35 while the rotors are rotating. However, during such adjustment stretching must occur in the strand as the convolutions about the rotors are lengthened simultaneously with the canting of the axes thereof. If the adjustment is made slowly, the stretching of the strand which occurs during the adjustment period will be distributed over a considerable length of strand without damage thereto. If preferred, however, the strand may be removed from the rotors, the rotor 25 tilted, and the strand thereafter laced about the rotors.

As another embodiment in the invention, apparatus is shown in Fig. 4 wherein the rotors turn in the same direction and the axes thereof may be inclined in a common plane. The arrangement shown in Fig. 4 is similar to that shown in Fig. 1 except that an intermediate gear means, comprising a gear 38 and a gear 36 both fixed to the shaft 37, is rotatably supported within case 20*a* on an axis fixed and parallel with relation to the axis of shaft 11*a*. On account of the shape of the teeth of gear 38, it is preferable instead of meshing gear 38 with gear 9*a*, to provide an extra gear 36 to drive the gear 9*a*, these gears being of a standard type used to carry power from one shaft to a parallel shaft. As the case 20*a* is tilted about the axis of shaft 6*a*, gear 9*a* and the assembly comprising gears 38 and 36 always remain in the same alignment with each other. By this arrangement, the rotors 25*a* and 35*a* always turn in the same direction whereas the rotors of Fig. 1 turn in opposite directions. The letter "*a*" has been added to numerals used in Fig. 1 to designate parts of similar function in Figs. 1 and 4. However, as a further embodiment (not illustrated), an intermediate gear assembly such as the coaxial gears 38 and 36 may be used to transmit power between the gears 6*a* and 8*a*, with proper offsetting of gear 8*a* along shaft 10*a*, in lieu of its position between gears 6*a* and 9*a* as illustrated in Figure 4.

The apparatus of the invention may be readily adapted to processes where stretching or shrinking is desired by providing rolls or rotors of suitable contour; for example, stretching rolls would have conicity and increase in diameter longitudinally of the rolls in the direction in which the strand is advancing whereas shrinking rolls would have conicity in the opposite direction.

The adjustable rotor system described above may be used in treating filamentary bundles or strands of any desired material in any treating process which may be conducted while the strand is passing over a roll. The apparatus comprising oppositely turning rolls, as a result of advantages inherent in the "figure 8" convolutions formed, is especially useful in drying strand materials of natural and/or artificial filaments. The invention is intended for use in treating such natural filaments as cotton, wool, and silk and artificial filaments such as those from regenerated cellulose as from viscose or from cuprammonium cellulose, cellulose acetate, vinyl-resin filaments such as those of polyvinyl chloride, copolymers of vinyl chloride with vinyl acetate or with acrylonitrile, and those from polyvinylidene chloride.

The rolls used in the invention may be interiorly heated as by steam, hot water or other hot fluids conducted thereto by a device such as a hollow rotor shaft or the cylindrical surfaces thereof drilled for carrying treating fluids such as dyeing or conditioning solutions to the convoluted strand, or the rolls may be partly or wholly immersed in treating liquids. The rolls may also be used as electrodes for electrically treating the strand, such as in a high frequency electrostatic and electromagnetic field.

By this invention, a two roll thread-advancing apparatus is provided on which a strand may be advanced on rolls rotating in the same direction or in opposite directions. A principal advantage of the invention over prior devices is the ease with which the inclination of the axes of the rolls or rotors may be varied while the rolls are driven from a single power supply element. While a setscrew extending through the wall of one casing acting on a tiltable casing comprises the means described for obtaining inclination of the axes of the rotor shafts, this device is illustrative only and other adjustable arrangements for tilting such a tiltable shaft or casing may be provided. In addition to manual tilting control, means may be provided for automatically controlling the inclination of the axes of the rotor shafts in order to vary the length of time during which a strand is traversing the rolls, which are responsive to changes in pH, temperatures, tension, or solution concentration.

It is understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. An apparatus for handling filamentary materials comprising two substantially similar rotors and supporting shafts therefor having axes substantially within a plane, a power shaft perpendicularly intersecting the plane midway between the two rotor shafts, a gear fixed on the power shaft, gears fixed on each of the rotor shafts meshing with the gear on the power shaft, a casing for rotatably supporting the power shaft and one of the rotor shafts, another

casing for supporting the other rotor shaft pivotably supported within the first-named casing and pivotable about the power shaft axis, an adjustable means mounted on the first-named casing for rotating the other casing about its pivot.

2. An apparatus for handling filamentary materials comprising two substantially similar rotors and supporting shafts therefor having axes substantially within a plane, a power shaft perpendicularly intersecting the plane midway between the two rotor shafts, a gear fixed on the power shaft, gears fixed on each of the rotor shafts meshing with the gear on the power shaft, a stationary casing for rotatably supporting the power shaft and one of the rotor shafts, a second casing pivotably supported within the stationary casing and pivotable about the power shaft axis and supporting the other rotor shaft, a setscrew in threaded relationship with the stationary casing and extending inwardly of the casing to engage a surface of the second casing to cause pivoting movement thereof.

3. An apparatus for handling filamentary materials comprising two rotors and shafts therefor having axes substantially within a plane, a power shaft which extends perpendicular to the plane at a point between the rotor shafts, a housing for rotatably supporting one of the rotor shafts, said housing being supported pivotally with respect to the drive shaft axis, gear means for communicating power from the power shaft to the rotor shafts comprising a gear on the drive shaft and a gear on each of the rotor shafts in mesh with the drive shaft gear, and adjustable means for tilting the housing on its pivotal axis.

4. An apparatus for processing filamentary materials comprising two rotors and shafts therefor having axes substantially within a plane, a drive shaft extending perpendicularly to the plane at a point midway between the rotor shafts when said shafts are parallel to each other, a gear drive for communicating power from the drive shaft to both rotor shafts, a housing for supporting one of the shafts at a fixed radius from the drive shaft axis, said housing being supported pivotally with respect to the drive shaft axis, and adjustable means for tilting the housing about its axis.



5. An apparatus for handling filamentary strands comprising two strand-carrying rolls, shafts for the rolls lying substantially in a common plane, a common drive shaft mounted perpendicular to the plane with its axis intersecting the plane at a point intermediate adjacent ends of the roll shafts, gear means comprising a gear on the drive shaft for driving the roll shafts, bearing means for one of the roll shafts, a support for said bearing means, said support being mounted pivotally on the axis of the drive shaft, and adjustable means for tilting the support on its axis whereby the inclination between the axes of the rolls may be varied.

6. An apparatus for handling filamentary materials comprising two rotors and shafts therefor having axes substantially within a plane, a power shaft intersecting the plane at a point between the rotor shafts, a gear on the power shaft, a gear on one rotor shaft in mesh with the power shaft gear, a gear on the second rotor shaft, an intermediate gear supported in mesh with the gear of the second rotor shaft, a second intermediate gear coaxially mounted for rotation with the first intermediate gear, said second intermediate gear being supported in mesh with the power shaft gear, and adjustable means for varying the inclination of one of the rotor shafts within the plane while maintaining its axis tangential to an arc of a circle whose radius is the distance between the axes of the rotor shaft with which the adjustable means is associated and the power shaft.

7. An apparatus for handling filamentary material as in claim 6 wherein the intermediate gears and adjacent rotor gear are supported in a casing tiltable with respect to the power shaft axis.

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