

May 12, 1942.

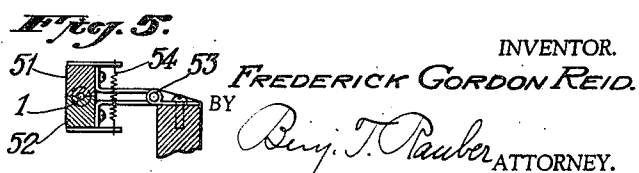
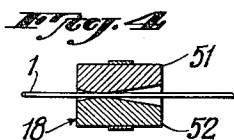
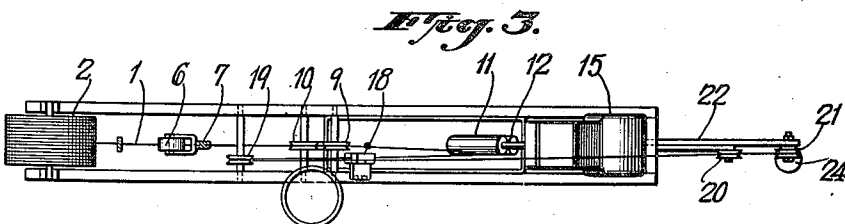
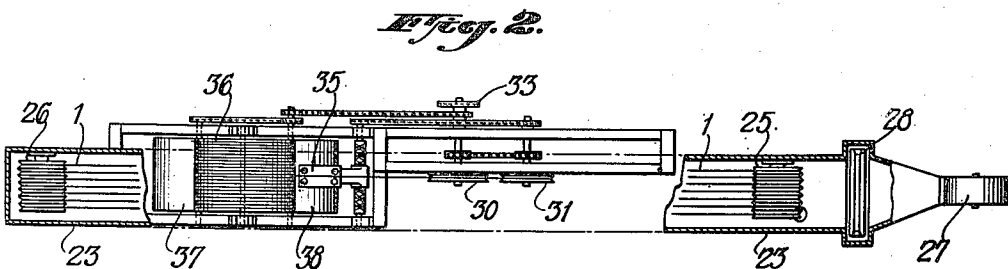
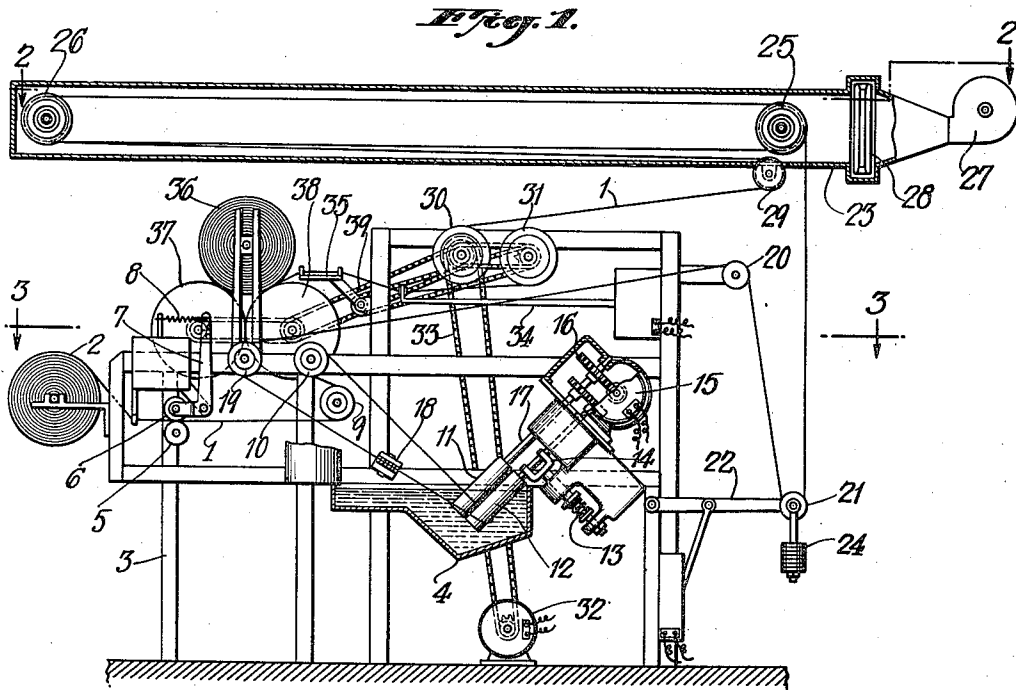
F. G. REID

2,283,014

APPARATUS FOR TENSIONING CORD

Filed May 16, 1939

2 Sheets-Sheet 1



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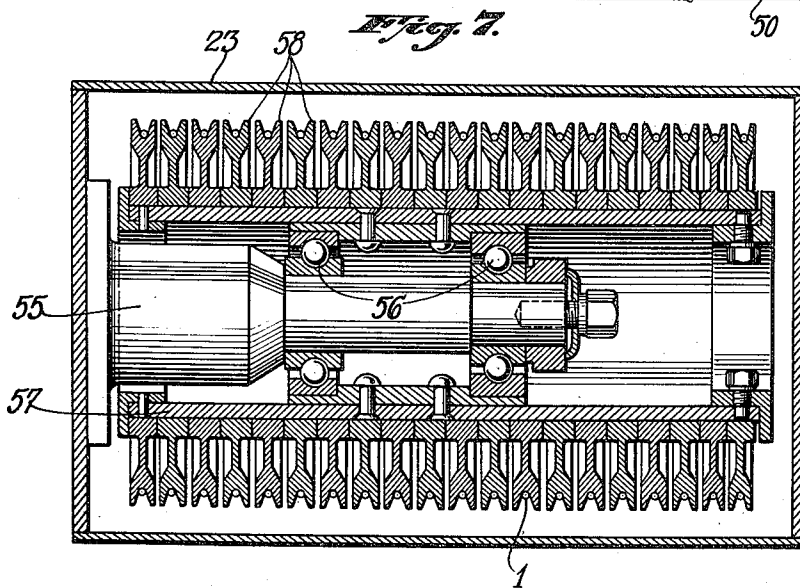
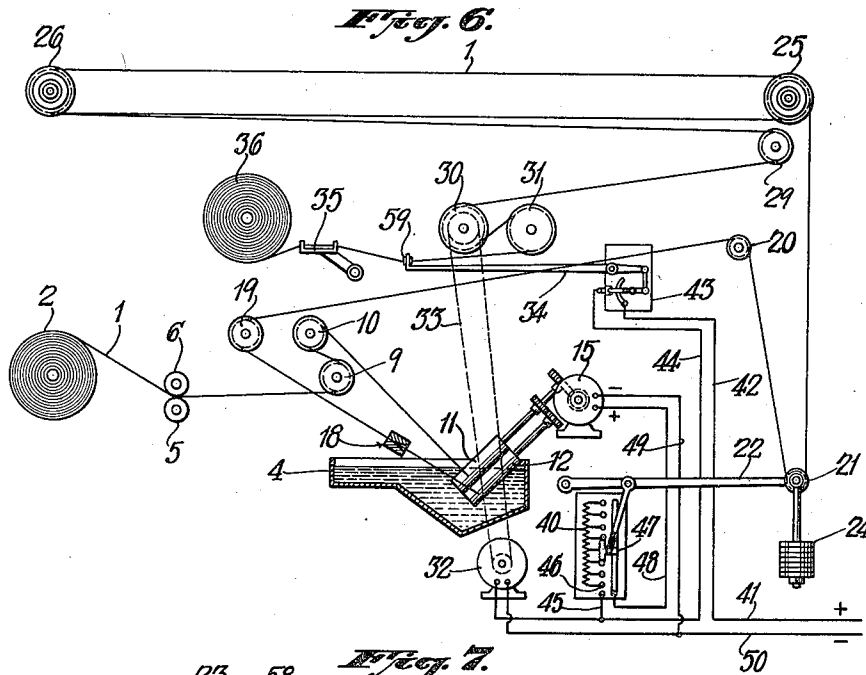
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APPARATUS FOR TENSIONING CORD

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2 Sheets-Sheet 2



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2,283,014

APPARATUS FOR TENSIONING CORD

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9 Claims. (Cl. 91—55)

My invention relates to an apparatus for tensioning cord such as that used in belt and tire constructions, and more particularly to tensioning the cord uniformly throughout its entire length and while it is being impregnated with an impregnating bath such as rubber latex or other aqueous dispersions of rubber material or rubber compounds, and dried. The invention also provides tensioning apparatus that automatically maintains a uniform degree of tension throughout the length of the cord.

In my invention the cord to be tensioned passes through suitable tensioning means into a bath of material such as compounded latex in which it is impregnated with the liquid material and thence to a drying chamber where the water of the latex is evaporated, and is then wound onto a spool. While passing through the liquid bath the cord is squeezed, or otherwise worked, by passing between a pair of rollers to thereby improve or facilitate the penetration of the liquid into the fibrous structure of the cord. Excess liquid is then wiped free from the cord before it passes to the drying chamber.

The cord may be drawn through the impregnating bath and the drying chamber by means of a constant speed drawing means which draws the cord at a constant linear speed, and to impose a constant tension to the cord passing to and through the drying chamber, its passage is retarded by a variable speed means rotated at such a speed as automatically to impart the desired tension. Conversely, the tensioning means may be run at a constant speed and the winding or drawing rollers or means be run at a variable speed to maintain a constant tension.

For the purpose of applying constant tension the cord may be gripped between a pair of rollers dipping into the impregnating bath and run by a variable speed motor. The cord then passes about idler pulleys, one of which is mounted upon a lever arm to operate and control means for the variable speed motor, and then passes into the drying chamber. In the drying chamber the cord passes in successive passes about a number of spaced pulleys, the number of pulleys and the number of passes being so chosen as to obtain the required drying of the cord. Thence the cord passes about drawing rolls which serve to impart a constant speed to it and thence to the wind-up spool. The control lever and, accordingly, the idler pulley carried by it are weighted with a predetermined weight sufficient to impart the desired tension to the cord, and the cord is trained below and about the pulley so as to support this

weight with a proportionate tension on the cord. If the cord stretches, the pulley and lever fall and operate a control mechanism to decrease the speed of the tension rolls.

Conversely, if the cord shortens sufficiently to lift the weight, the lever moves the control mechanism to increase the speed of the rolls and thus to maintain a constant tension on the cord. Suitable means are also provided to stop the mechanism in case of breakage of the cord.

The various features of the invention are illustrated by way of example in the accompanying drawings, in which—

Fig. 1 is a side elevation, partly in section, of apparatus embodying a preferred form of the invention.

Fig. 2 is a horizontal section of the apparatus taken on the line 2—2 of Fig. 1, certain parts being broken away to show the mechanism therebelow.

Fig. 3 is a horizontal section of the apparatus of Fig. 1 taken on the line 3—3 of Fig. 1.

Fig. 4 is a longitudinal section, and Fig. 5 a transverse section of a wiping die to remove excess impregnating liquid from the cord.

Fig. 6 is a diagrammatic sketch showing the path of travel of the cord and the wiring mechanism for controlling the motors, and

Fig. 7 is a detail of a number of pulleys for the cord during drying.

Referring more particularly to the accompanying drawings, the cord 1 is drawn from a supply spool 2 mounted on the frame 3 of the apparatus which also carries a tank or bath 4 of latex or other suitable treating medium. As the cord is drawn from the supply spool 2 it passes between a pair of rollers 5 and 6, the latter of which is carried on a bell crank lever 7 and impelled downwardly by the action of a spring 8 to grip the cord and hold it from sagging. Thence the cord passes about a pair of guide pulleys 9 and 10 and thence into the bath 4. Upon entering the bath 4, the cord passes between a pair of squeeze pulleys 11 and 12 which are pressed toward each other by means of a spring 13 acting through a rod and yoke 14 on the shaft of the pulley 12. The pulleys are driven from a variable speed motor 15, preferably an electric motor, although fluid or other types of motors may be employed. The motor 15 drives the pulley 11 through a worm and gear 16, or other non-reversible gearing, and a drive shaft 17. After passing between the pulleys 11 and 12, the cord leaves the bath 4 and passes through a wiping die 18. Thence it passes over a pair of guide pulleys 19 and 20 and below a

pulley 21 mounted on a horizontal lever 22. After passing beneath and about the pulley 21, the cord passes upwardly into a drying chamber 23. The weight of the lever 22 and pulley 21 is supported in the bight of the cord between the pulley 20 and the drying chamber 23. To obtain any desired tension, additional weights 24 may be suspended from the lever arm 22. Accordingly, the cord is placed under a tension determined by the weights 24 before passing into the drying chamber 23.

After entering the drying chamber 23 under the tension imparted by the weight 24, the cord passes first over a pulley of a group of pulleys 25 near one end of the drying chamber, thence to the opposite end over and about a pulley of a group 26 at the opposite end. Each group of pulleys 25 and 26 consists of a number of closely spaced co-axial pulleys and the cord passes successively about the successive pulleys of alternate groups 25 and 26 so as to provide a sufficient length of cord in the drying chamber 23 to thoroughly dry the cord, or to dry it to the desired extent. Air for drying may be supplied by a steam coil or other heating element 28. After passing over the final pulley of the groups 25 or 26, the cord passes out of the drying chamber 23 over an idler pulley 29. Thence it passes in succession about a pair of drawing pulleys 30 and 31 which may be mounted on the frame 3. The pulleys 30 and 31 are driven at a constant speed from a constant speed motor 32 through the chain 33. After passing about the pulley 31 the cord is drawn through a stopping device 34 and over a guide 35 onto the spool 36. The spool 36 may be driven at a constant linear speed by means of a pair of contact rolls 37 and 38 driven from the pulley 30 by means of the chain 39. The rolls 37, 38 are, however, solely for the purpose of winding the thread on the pulley, and not to draw it through the apparatus, the rolls or pulleys 30 and 31 serving to draw the cord. Should the cord sag too much, or be tightened, between the rolls 30 and 31 and the spool 36, the lever arm 34 would drop or rise and stop the mechanism.

The stretchability of the cord as it is drawn from the spool 2 may vary and it is necessary in order to obtain the desired tension between the rolls 12 and the pulleys 30 and 31, to vary the speed of one or the other in accordance with the stretchability of the cord so as to maintain the cord under a constant or uniform predetermined tension. Where the spool 36 is driven from the motor 32 it is desirable to have the pulleys 30 and 31 driven at a constant speed, and to vary the speed of the rolls 11 and 12 in accordance with the stretchability of the cord, although it will be understood that this arrangement might be reversed.

To vary the speed of the motor 15 and the rolls 11 and 12 in accordance with the stretchability of the cord and to obtain the desired tension, the speed of the motor is controlled by the position of the lever 22 through a speed control rheostat 40. Accordingly, current is supplied from a main 41 through a branch wire 42, a stopping switch or cut-out 43, a return branch wire 44 and side branch 45 to one terminal 46 of the rheostat 40. Thence it passes through the resistance and through a sliding contact 47 to a wire 48 leading to the motor 15. From the motor 15 the circuit returns through a branch 49 to the opposite main 50. The branch 49 and main 50 also supply the constant speed motor 32. Accordingly, when the

weight 24 drops, the rheostat moves to decrease the speed of the motor 15 until the weight 24 is lifted or, conversely, the speed of the motor 15 is increased. Accordingly, the tension of the cord is always maintained at a value determined by the weight 24 and this tension is maintained from the impregnation of the cord until after it has dried, so that the cord is dried under uniform tension.

The wiping die 18 prevents excess of impregnating liquid to be drawn onto the cord and maintains the cord at a uniform smooth diameter. Preferably, the die 18 is made in two parts 51 and 52 supported on arms hinged at 53 and normally held closed by a spring 54. To thread a cord through the die 18 it is, therefore, only necessary to separate the two halves, position the cord between them and release them.

In Fig. 7 there is shown a detail of the mounting of the pulley groups 25 and 26. In this mounting the pulleys are supported by a stud 55 extending from one side of the drying chamber and supporting a pair of anti-friction or ball bearings 56 which, in turn, rotatably support a rotatable sleeve or shell 57 on which are mounted side by side a number of grooved pulleys 58. When the cord is trained over one of these pulleys under a given tension, it tends to maintain the same uniform tension in its passage over successive pulleys. In the event that the cord should break, or should sag or tighten beyond a predetermined limit in passing through an agate or guiding eye 59 on the lever arm 34, it would swing the latter in one direction or the other to break the circuit through the switch 43 and, therefore, stop both the motor 15 and the motor 32.

Through the above invention I have provided an apparatus whereby cord may be impregnated with any desired impregnating liquid, then drawn at a constant predetermined tension into and through a drying chamber and maintained under tension until it is dried completely or to the desired extent. Thereupon it passes to a receiving spool at a constant linear tension, but changes in the stretchability of the cord are automatically compensated by the weight 24 and lever 22 to maintain a constant tension regardless of the stretchability of the cord.

What I claim is:

1. Apparatus for uniformly tensioning and drying a cord which comprises a treatment tank and a drying chamber for cord to be treated, two rotary feeding devices engaging the cord at spaced linear intervals to pass said cord in succession into and out of said tank and through said chamber, one of said feeding devices engaging said cord before it passes into said chamber, and the other engaging said cord after it leaves said chamber, movable means to apply constant tension to said cord between said rotary feeding devices, and means to vary the speed of one of said rotary feeding devices in accordance with the movement of said tensioning means due to variable stretchability of said cord.

2. Apparatus for treating cord under tension which comprises a treating tank, a drying oven, a pair of rotary feeding devices engaging the cord at points spaced linearly thereof to pass said cord from said tank through said oven, one of said feeding devices engaging said cord before it enters said drying oven and the other engaging said cord after it leaves said drying oven, means to apply a tension to said cord between said rotary feeding devices, and means to vary the speed of one of said rotary feeding devices

to counteract variations in the stretchability of said cord under said tensioning means.

3. Apparatus for uniformly tensioning a cord which comprises a rotatable pull roll for drawing the cord at a substantially constant speed, a treating tank, a pair of rotatable squeeze rolls in said tank to engage and squeeze cord drawn through said tank, variable speed means for driving said squeeze rolls, means positioned between said squeeze rolls and said pull roll for applying a predetermined tension to cord passing from said squeeze rolls to said pull roll, and means controlled by the movement of the tension applying means for regulating the speed of the variable speed means.

4. Apparatus for uniformly tensioning and stretching a cord which comprises a treating tank, a pull roll for drawing cord from the tank at a substantially constant speed, a die for removing surplus treating material from the cord as said cord leaves the tank, drying means comprising spaced idler pulleys about which the cord is passed after leaving said die squeeze rolls in said tank for controlling the resistance to the movement of the cord as it is being drawn by said pull roll, means bearing against the cord for applying a predetermined tension thereto between said pull roll and said squeeze rolls, variable speed means for driving said squeeze rolls, and means controlled by the tension applying means for regulating the speed of the variable speed means.

5. Apparatus for uniformly tensioning a cord which comprises a supply means, a treating tank into and from which said cord is drawn, a die for removing surplus treating material from said cord drawn from said tank, a drying chamber to receive cord after passing through said die and having a plurality of idler pulleys spaced to carry the cord back and forth through the chamber, the adjacent idler pulleys being journaled for rotation independently of one another, a pull roll for drawing cord from said tank through said die and around said idler pulleys, squeeze rolls in said tank for controlling the resistance to the movement of the cord as it is being drawn by said pull roll, tensioning means engaging the cord between said squeeze rolls and said pull roll for applying a predetermined tension thereto, driving means for said pull roll and said squeeze rolls, and means controlled by the tension applying means for varying the relative speeds of said squeeze rolls and said pull roll.

6. Apparatus for uniformly tensioning a cord which comprises a supply means, a treating tank into and from which said cord is drawn, a die for removing surplus treating material from cord drawn from said tank, a drying chamber to receive said cord after passing said die and having a plurality of idler pulleys spaced to carry the cord back and forth through the chamber, the adjacent idlers being journaled for rotation independently of one another, a pull roll for drawing cord from said tank through said die and around said idler pulleys, squeeze rolls in

said tank for controlling the resistance to the movement of the cord as it is being drawn by said pull roll, tensioning means engaging the cord between said squeeze rolls and said pull roll for applying a predetermined tension thereto, driving means for said pull roll and said squeeze rolls, means controlled by the tension applying means for varying the relative speeds of said squeeze rolls and said pull roll, a spooling mechanism including a rotating spool for winding the cord as it leaves the pull roll, and a means controlled by the tension of the cord between said pull roll and said spooling mechanism to stop said mechanism when said cord breaks between said pull roll and said spooling mechanism.

7. Apparatus for uniformly tensioning a cord comprising a power driven device for pulling the cord at a substantially constant speed from a treating tank, a variable resistance device in said tank for controlling the resistance to movement of the cord as it is pulled by said pulling means, means for drying the cord after leaving said tank comprising spaced apart idler pulleys on which the cord is strung and around which the cord is pulled by said pulling means, means positioned between said pulling means and the resistance controlling means to apply a predetermined tension to the cord, and means controlled by the tension applying means for varying the speed of passage of said cord through said tensioning means.

8. Apparatus for uniformly tensioning a cord which comprises a treating tank, a power driven pull roll for drawing the cord at a substantially constant speed from said tank, a pair of squeeze rolls in said tank between which said cord passes for controlling the resistance to the movement of the cord as it is being pulled by the pull roll, resiliently actuated mechanism for forcing the squeeze rolls toward one another, gearing between said squeeze rolls for rotating them in opposite directions, a worm wheel secured to one of said squeeze rolls, a variable speed electric motor, a worm driven by said motor and meshing with said worm wheel, a movable weighted arm engaging the cord at a point between the pull roll and the squeeze rolls for applying a predetermined tension to the cord, a rheostat for controlling the speed of said motor, and means actuated by said weighted arm to operate said rheostat to vary the speed of the motor and squeeze rolls.

9. Apparatus for uniformly treating and tensioning a cord which comprises a liquid treating bath, a pair of rotary feeding devices, the first of said rotary feeding devices being in said bath and the second of said rotary feeding means being spaced beyond said bath to permit the drying of said cord, movable means for imposing a predetermined tension on said cord between said first and said second rotary feeding device, and means for varying the speed of one of said rotary feeding devices in accordance with the stretchability of said cord under said tensioning means.

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