Nov. 24, 1942. G. B. NUTTING 2,303,172

SPINNING FRAME

Filed Feb. 27, 1937 4 Sheets-Sheet 1

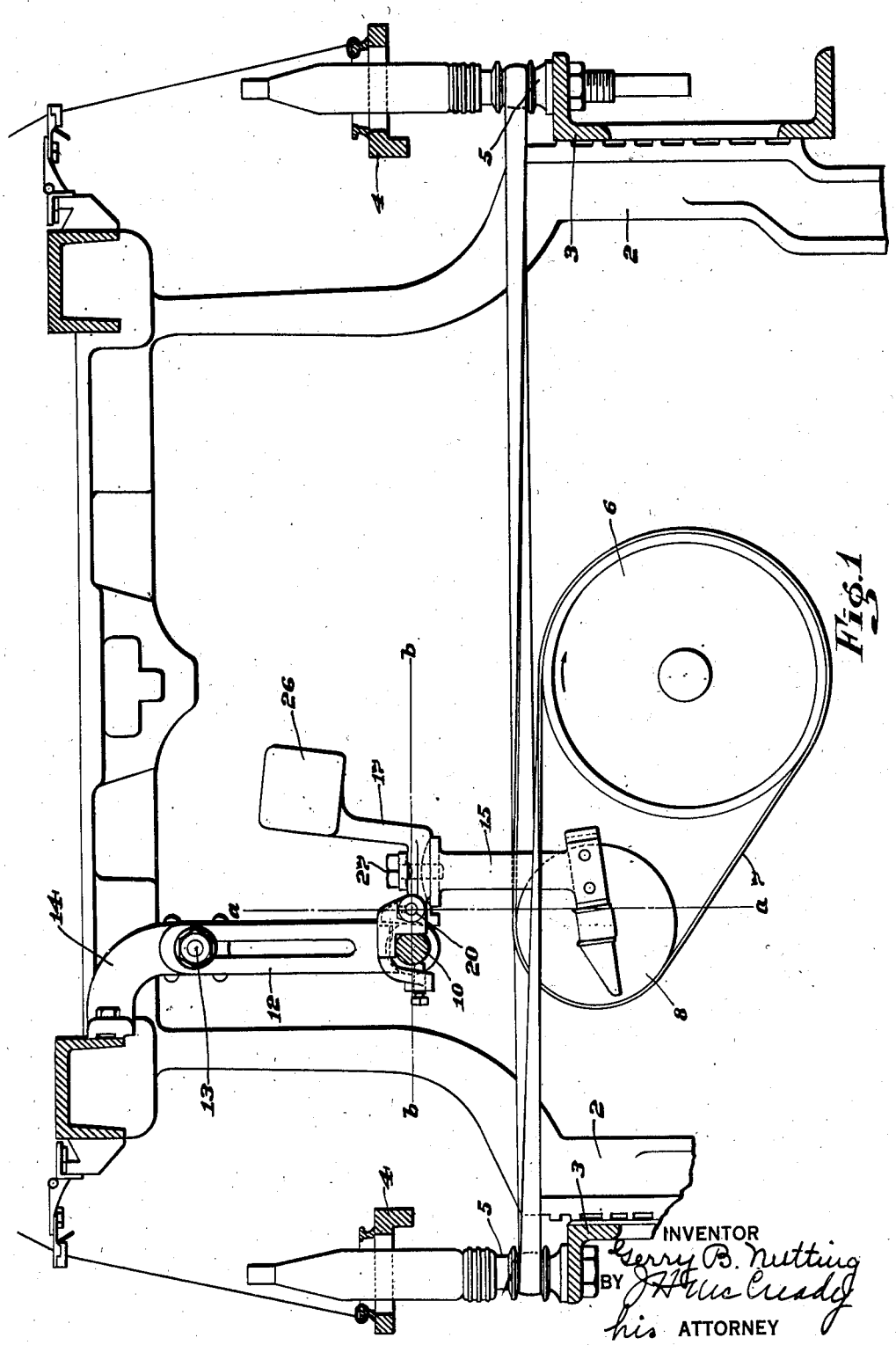


Fig. 1

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SPINNING FRAME

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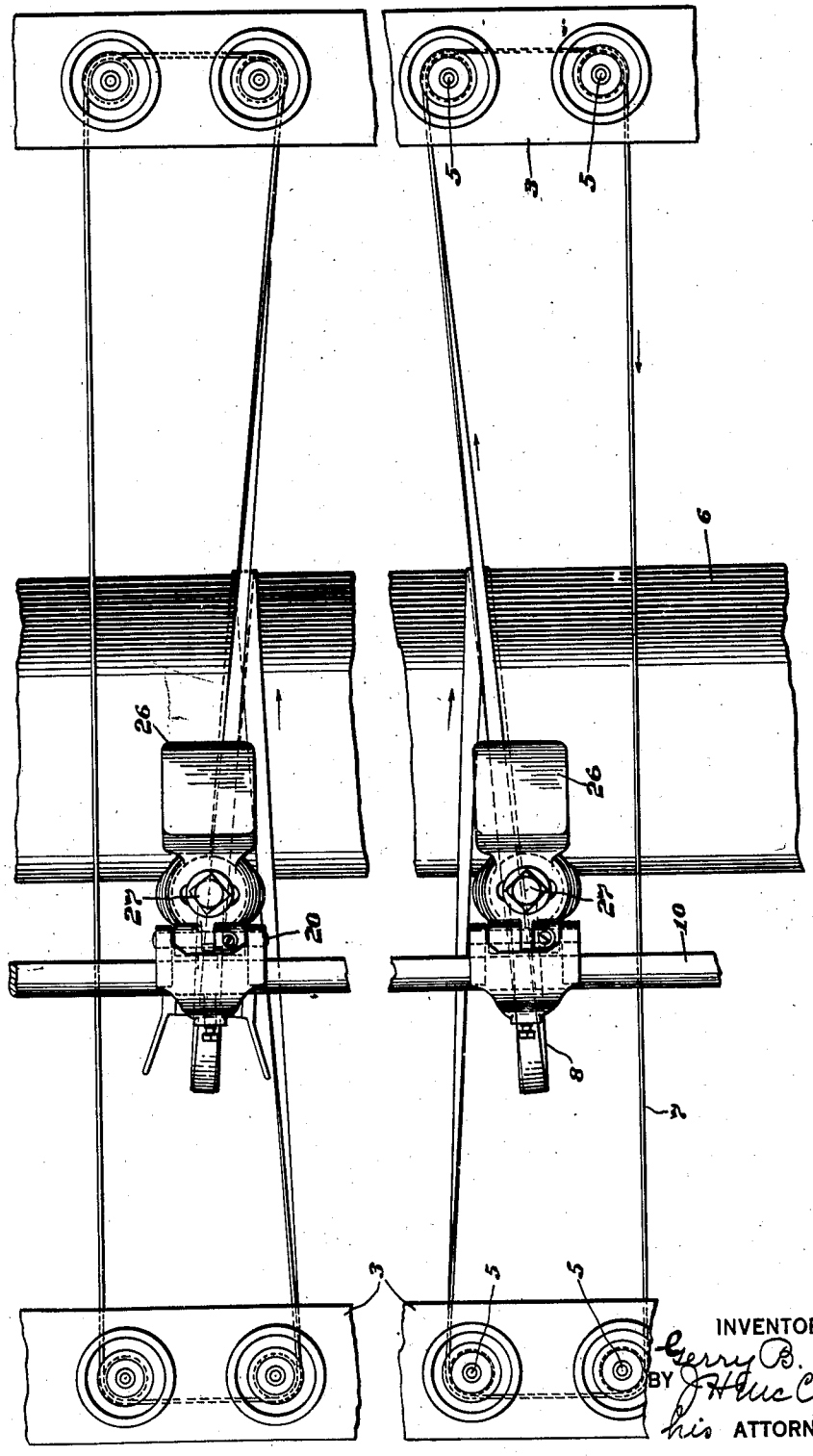


Fig. 2

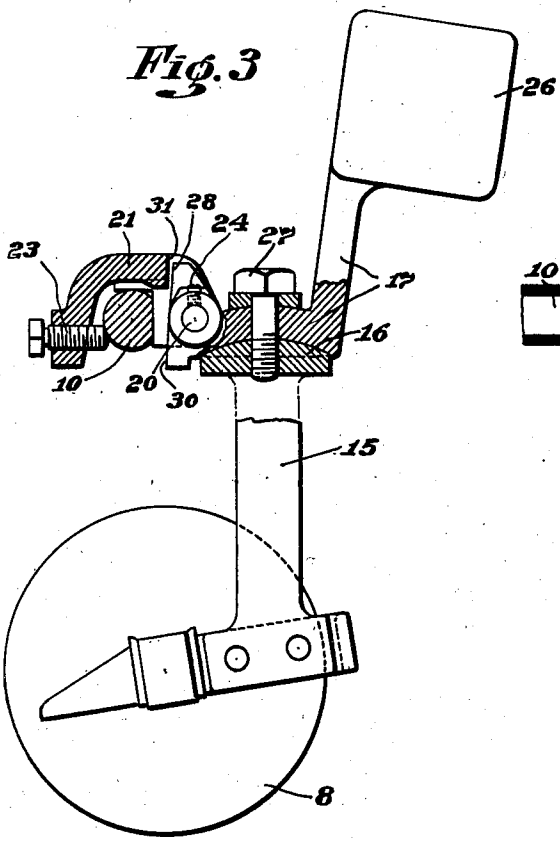
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SPINNING FRAME

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Fig. 3



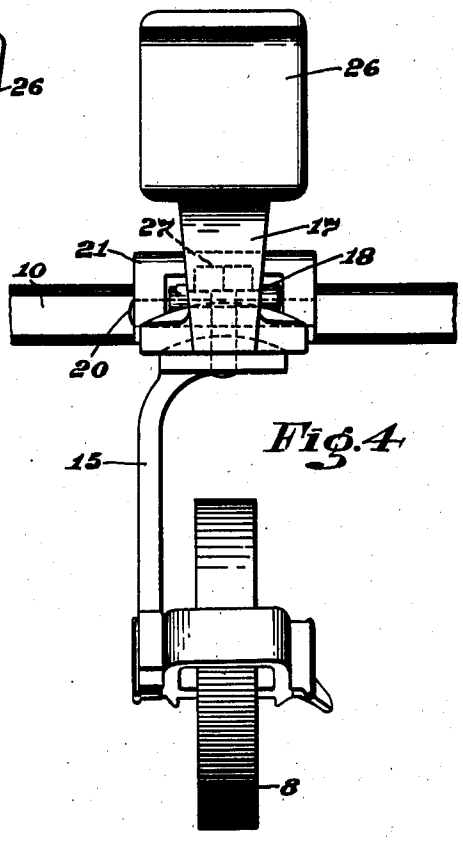


Fig. 4

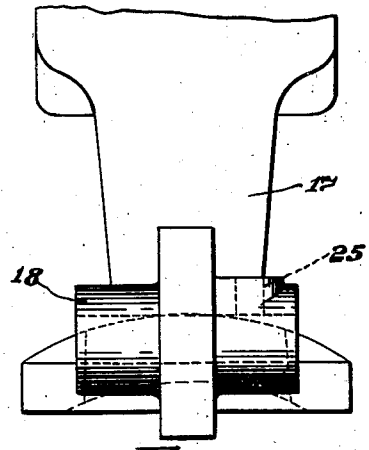


Fig. 5

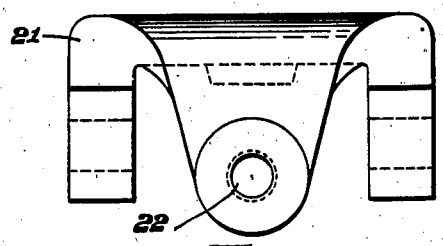


Fig. 6

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SPINNING FRAME

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Fig. 7

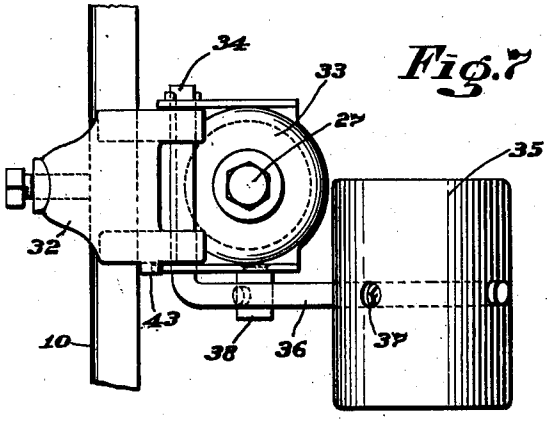


Fig. 8

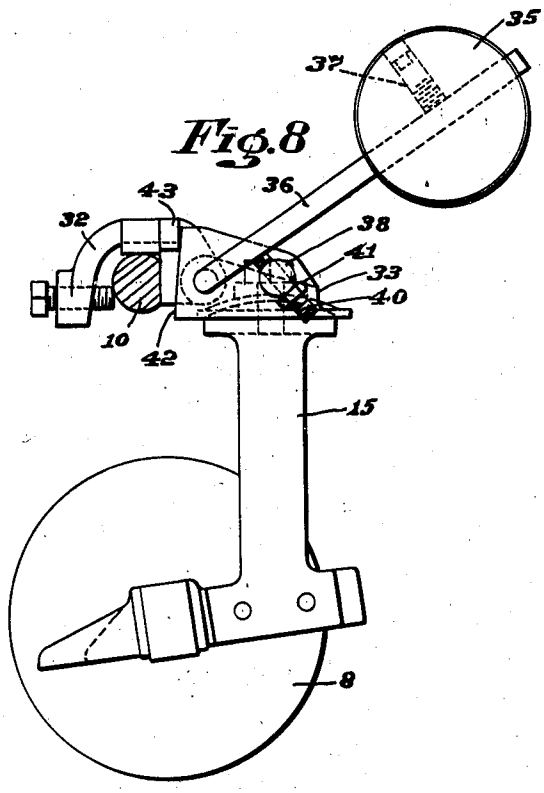
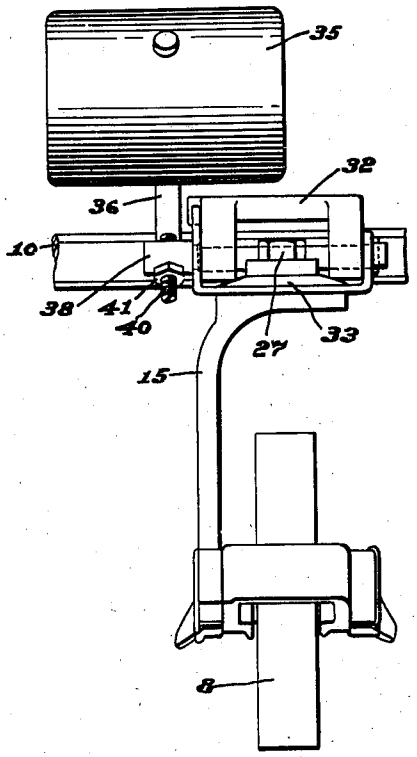


Fig. 9



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Patented Nov. 24, 1942 2,303,172

UNITED STATES PATENT OFFICE

2,303,172

SPINNING FRAME

Gerry Bradley Nutting, Saco, Maine, assignor, by mesne assignments, to Saco-Lowell Shops, Biddeford, Maine, a corporation of Maine

Application February 27, 1937, Serial No. 128,062

7 Claims. (Cl. 57—105)

This invention relates to spinning and twister frames (hereinafter included generically in the term "spinning frames") and it is more especially concerned with the spindle driving mechanisms for machines of this type.

It is the usual practice in these machines to mount the spindles in two parallel rows at opposite sides of the frame and to drive the spindles from a common drum or cylinder which extends longitudinally of the frame and is located approximately midway between the rows of spindles. In a common arrangement an endless belt or tape partly encircles the drum and is driven by it, this tape running from the cylinder around two adjacent spindles at one side of the frame, then across the frame to the opposite side, around two spindles at the latter side, and thence back to the cylinder. These tapes or belts customarily are made of textile fabric, leather, or other suitable materials, a textile tape being most commonly used, and they always stretch more or less, depending upon the running conditions, variations in atmospheric humidity, and the like. It is, therefore, necessary to employ some kind of a takeup or tension mechanism on each tape to maintain it continuously under tension notwithstanding variations in the degree of stretch of the tape.

The action of a takeup device is such that it necessarily moves through some appreciable range of operation depending upon the degree of stretch of the belt. It is highly desirable to the maintenance of uniform spinning conditions throughout the frame to maintain a constant degree of tension on each tape throughout the entire range of movement of the tape tensioning roll, and in addition, to maintain the same degree of tension on all of the tapes in the frame. However, the tape tensioning devices available heretofore do not produce these results. The construction most commonly used comprises a support somewhat like a bell crank lever pivoted to swing through an arc and carrying a tape tensioning roll on one arm and a weight on the other. The arrangement is such that in some positions of the roll its moment and that of its supporting arm cooperate with the moment of the weight and its arm to apply tension to the tape, while at other points in its swing these two moments oppose each other. Thus the tension on the tape varies materially at different points within the range of swing of the roll.

The present invention deals especially with this problem, and it aims to devise a thoroughly practical solution for it.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a vertical, transverse, sectional view through a portion of a spinning frame equipped with a tape tensioning mechanism constructed in accordance with this invention;

Fig. 2 is a plan view of a portion of such a frame as that illustrated in Fig. 1, showing the arrangement for both right and left-hand drives;

Fig. 3 is a side view of applicant's tensioning device, certain parts being shown in section;

Fig. 4 is an edge view of the device shown in Fig. 3;

Fig. 5 is a front view of the main arm of the takeup;

Fig. 6 is a front view of the supporting bracket for the takeup device;

Fig. 7 is a plan view of a modified construction in which the weight is adjustable;

Fig. 8 is a side view of the takeup mechanism shown in Fig. 7; and

Fig. 9 is a rear view of said mechanism.

Referring first to Fig. 1, the invention is there shown as applied to a spinning frame of a common type including samsons 2—2, spindle rails 3—3, ring rails 4—4, and spindles 5 mounted in the spindle rails, all of these parts being constructed, arranged and organized in the usual manner. Midway between the spindle rail is the usual horizontal driving cylinder 6. As shown in both Figs. 1 and 2, the driving band or tape 7 extends partly around this cylinder and runs from the top of the cylinder around two of the whirls of the spindles 5 at the left-hand side of the machine, thence across the machine to the right-hand side, around the whirls of two spindles mounted in the right-hand spindle rail, next back around a takeup roll 8, and finally to the cylinder 6 again. This general arrangement is like that used heretofore. Also, as in prior constructions, the takeup mechanisms for the entire series of tapes are mounted on a horizontal bar 10 supported in the lower ends of a series of links, one of which is shown at 12, the upper end of the link being adjustably secured by a bolt 13 to a bracket 14 bolted to the roll beam of the machine.

As above pointed out, the position of the roll 8 will vary considerably with the stretching and shrinking of the tape 7, and it is desirable to maintain the tension on the belt substantially

constant regardless of these variations in the position of the takeup roll. In Fig. 1 the roll 8 is shown at approximately the limit of its range of swing toward the cylinder, but it may swing away from the cylinder as the tape stretches through an arc of perhaps 15° or 20° and sometimes more. The extreme angle of swing, however, need not be greater than 30°, and the tapes can initially be cut of such a length that this entire angle will be at the left-hand side, Fig. 1, of the vertical plane through the axis on which the roll swings.

As shown in Figs. 1 to 4, the roll 8 is mounted in an arm 15, the lower end of which carries self-lubricating bearing boxes to receive the ends of the roll axle or shaft. This construction may be like those used in prior forms of takeups. At its upper end 16 the arm 15 is provided with a convex or ball surface to fit into a concave socket of a weight arm 17, this arm being provided with an integral bearing section 18, Fig. 5, to receive a pivot pin 20 by means of which it is secured to a bracket 21. The bracket is shaped, as shown in Figs. 3 and 6, to slip over the supporting rod 10, above referred to, and it is provided with a tapped hole 22, Fig. 6, to receive a screw 23, Fig. 3, by means of which it is secured on said rod. A set screw 24, Fig. 3, threaded into a hole 25, Fig. 5, secures the pivot pin 20 against working endwise out of the bearing. The arm 17 has a weight 26 secured to it, or made integral therewith, as desired, and the hanger arm 15 is secured to it by a bolt 27, this arrangement providing for the angular adjustment of the roll 8 in both horizontal and vertical planes, as shown in Fig. 2, for the purpose of producing either a right or left-hand drive for the spindles, as desired. It should be observed that in this construction the roll 8 and its arm 15 are suspended on the pivot 20, which is a part of the takeup mechanism, instead of being mounted to rock on the rod 10, as in prior constructions.

It will be evident from an inspection of Fig. 1 that the weight 26 is so disposed with reference to the pivot 20 and the takeup roll 8, that it causes the roll to hold the tape tensioned at all times. In order to produce the same degree of pull or tensioning effort on the tape as it stretches, and the position of the roll consequently changes, the weight 26, roll 8, and their supporting elements which move with them, are so related to each other and are made of such mass that the tape tensioning effort applied through the roll is maintained substantially constant throughout its working range. To state the matter somewhat differently, the effective moments of the weight plus its arm and that of the roll plus its supporting arm are made such that the clockwise moments of the former, in any working position of the roll, equals the net counter-clockwise moment of the latter plus that of a predetermined reactive pull of the tape, this pull remaining at a fixed value, say for example, one and a half pounds, as the roll swings throughout its entire working range. As above stated, it must be expected that this range will be at least 20°.

A satisfactory method of calculating the values and essential dimensions required in the production of an actual takeup mechanism of the character above described is as follows:

The roll 8, its arm 15, and the necessary bearings and other connections between these two members may be of the form heretofore used so that their combined mass may readily be found. To this may be added the horizontal portion of the arm 17 and the bolt 27. Also, the center of gravity of this assembly may easily be found. The desired degree of tension to be maintained on the tape may be assumed as, say, 1.5 pounds, or any other desired value. With these known factors the net counterclockwise moments exerted on the roll in three different positions in its working range may readily be calculated by methods familiar to any designer. These three positions may, for example, be its two extreme positions and an intermediate position midway between said extremes. In the arrangement shown one position may be that in which the roll 8 is illustrated in Fig. 1, a second position 15° to the left and a third position 30° to the left of that illustrated.

The net sum of the moments of the weights of these parts about the axis of the pivot 20 in any one of said positions, plus that due to the pull of the tape (which is to remain the same in all three positions) gives the effective moment for that particular position which must be counter-balanced by a positive or clockwise moment to be produced by the weight 26 in order to put the assembly in equilibrium for the particular conditions assumed. Thus the three moments which the weight must produce in the three positions above referred to, can readily be calculated and laid out.

Assuming that the mass of the weight and the vertical portion of its arm 17 (which may be considered a part of the weight) is to be constant and predetermined, the effective moment arms of the weight in all three positions can readily be calculated since these moment arms will be proportional to the respective counterclockwise moments which have been determined in the manner above described. Next, the initial angle which a radial line from the axis of the pivot 20 through the center of gravity of the weight makes with the vertical plane *a*—*a* through said axis, should be determined since this angle defines the position which the center of gravity of the weight will take when the roll 8 is in its first position, as shown in Fig. 1. This may be done by laying out points on the horizontal line *b*—*b* spaced at the right from said axis by distances of, or proportional to, the counter-clockwise moments, and erecting vertical lines from these three points. It should be observed that the distances so measured off are equal, or proportional, to the various effective moment arms required for the weight 26 in the three angular positions above mentioned. An angle of 30° and its bisector next should be laid out on tracing paper or tracing cloth, and the apex of this angle registered with the center of said axis 20 by a compass point, needle, or the like, so that it can be swung across the vertical lines above mentioned until some arc drawn about the axis of the pivot will pass through the intersections of the angle lines with the respective vertical lines. A number of trial arcs may have to be drawn before finding one that will pass through these three intersections, and it may not be possible to make any arc pass exactly through all three of them, but the errors may be divided about equally between the three points and with a little trial some arc can be found which will be entirely satisfactory. If the above mentioned distances are the actual effective moment arms, then the radius on which this arc is drawn about the axis of the pivot will be the radius on which

the center of gravity of the weight 26 will swing and the intersection of this radius with the first of the vertical lines above mentioned determines the initial angle of the center of gravity of said weight from the axis *a—a*. Of course, any radius may be used, the greater the radius the less the weight required, but the initial angle of the center of gravity of the weight will remain constant. Thus the essential dimensions which must be found in order to satisfy the required conditions can be determined and the parts constructed accordingly.

If desired, the range of swing of the roll 8 may be limited by providing the hinged portion of the member 17 with upper and lower shoulders 28 and 30, respectively, the upper shoulder being arranged to engage a corresponding shoulder 31 on the member 21, while the lower shoulder will engage the rod 10 at the forward limit of the swing of the roll.

Figs. 7, 8 and 9 show another embodiment of the invention in which provision is made for adjusting the weight toward and from the axis about which it swings and thus making it possible to adjust the intensity of the belt tensioning force while still maintaining that force substantially constant throughout the entire range of operation of the device. In this construction the roll 8 and arm 15 may be duplicates of those shown in the other figures. Also, the bracket 32 is substantially like the bracket 21 and is mounted in the same manner. The arm 17 of the construction previously described, however, is replaced by a hinge piece 33 having a socket to receive the ball-shaped end of the arm 15 and provided, also, with arms to straddle the bracket 32 and to engage the pivot pin 34. The bolt 27 secures the parts 33 and 15 together and holds them in their adjusted relationship. The weight 35 is slidably mounted on a rod 36 which, in the particular construction shown, is made integral with the pivot pin 34. A screw 37 secures the weight in various positions of adjustment on the rod or arm 36 so that by means of this adjustment the length of the moment arm through which the weight 35 acts can be adjusted, as desired.

The initial angle of the center of gravity of the weight should be adjusted with a change in the degree of tension, and for this purpose a lug 38 is secured rigidly to the member 33 and projects laterally from one side thereof where it serves to support a screw 40 against which the arm 36 bears. The screw is threaded through the lug and is secured in its adjusted position by a check nut 41. In this arrangement, also, the extreme range of angular movement of the roll may be limited by the engagement of the front face 42 of one of the arms of the hinge member 33 with the rod 10 at one end of the swing and with a stop 43 at the opposite end.

While I have herein shown and described typical embodiments of my invention, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope of the invention. For example, an arc may be struck through three points representing the center of gravity for three desired tape tensions, say one and three-eighths pounds; one and seven-eighths pounds, and two and three-eighths pounds, and the arm formed to this arc so that the weight, slidably mounted thereon, can be clamped on the rod in any one of the three positions corresponding to the said three points. This does away with any necessity for an adjustment of the angle of the rod, and, to simplify placement and adjustment of the weights on different types for the same corresponding position, the rods may have indentations to receive the set screws.

Having thus described my invention, what I desire to claim as new is:

1. In a spinning frame, the combination of a plurality of spindles mounted therein, a driving cylinder, a tape driven by said cylinder and driving one or more of said spindles, a take-up roll over which said tape runs, a pivoted arm supporting said roll for swinging movement in a path spaced vertically from the horizontal plane through the pivotal axis of said arm, a weight acting on said arm to apply a tape tensioning effort to said roll, said weight being located at the opposite side of said plane from said roll, and the effective moments of said roll, plus its arm and that of said weight and its arm; being so related that they act through said roll to maintain a substantially uniform tension on the tape in its various working positions.

2. In a spinning frame, the combination of a plurality of spindles mounted therein, a driving cylinder, a tape driven by said cylinder and driving one or more of said spindles, a take-up roll over which said tape runs, a rod extending parallel to said cylinder for supporting the take-up mechanisms in said frame, a bracket mounted on said rod, an arm pivotally connected to said bracket and supporting said roll for swinging movement in a vertical plane, a weight swinging with said arm and acting on it to apply a tape tensioning movement to said roll, and the effective moments of said roll plus its arm and that of said weight being so related that they act through the roll to maintain a substantially uniform tension on the tape as the roll swings through a normal working angle.

3. In a spinning frame, the combination of a plurality of spindles mounted therein, a driving cylinder, a tape driven by said cylinder and driving one or more of said spindles, a take-up roll over which said tape runs, a rod extending parallel to said cylinder for supporting the take-up mechanisms in said frame, a bracket mounted on said rod, two arms pivotally connected to said bracket to swing about a common axis, one of said arms extending upwardly and the other downwardly, said roll being mounted on one of said arms, and a weight mounted on the other arm, said arms being connected together for swinging movement in unison about said axis, whereby said weight serves to apply a tape tensioning movement to said roll, the effective moments of said roll plus its arm and that of said weight and its arm being so related that they act through the roll to maintain a substantially uniform tension on the tape as the roll swings through its working angle, and means adjustable to change the vertical angular relationship of one of said arms to the other.

4. In a spinning frame, the combination of a plurality of spindles mounted therein, a driving cylinder, a tape driven by said cylinder and driving one or more of said spindles, a take-up roll over which said tape runs, a rod extending parallel to said cylinder for supporting the take-up mechanisms in said frame, a bracket mounted on said rod, a hinge piece pivoted to said bracket for swinging movement in a vertical plane, an arm supporting said roll and connected to said bracket for angular adjustment relatively thereto

in a horizontal plane, a weight, a second arm supporting said weight and connected with the first arm to swing therewith whereby it serves to apply a tape tensioning movement to said roll, one of said arms extending upwardly from said hinge piece and the other downwardly therefrom, and the effective moments of said roll plus its arm and that of said weight and its arm being so related that they act through the roll to maintain a substantially uniform tension on the tape as the roll swings through its working angle.

5. In a spinning frame, the combination of a plurality of spindles mounted therein, a driving cylinder, a tape driven by said cylinder and driving one or more of said spindles, a take-up roll over which said tape runs, a pivoted arm supporting said roll for swinging movement in a path spaced vertically from the horizontal plane through the pivotal axis of said arm, a second arm mounted to swing about said axis, a weight mounted on said second arm, said weight being located at the opposite side of said plane from said roll, the effective moments of said roll plus its arm and that of said weight and its arm being so related that they act through the roll to maintain a substantially uniform tension on said tape in various working positions of said roll.

6. A tension apparatus comprising a take-up roll, a tape positioned around said roll and adapted for lengthwise movement thereover, a pivoted arm supporting said roll for swinging movement in a path spaced vertically from the horizontal plane through the pivotal axis of said arm, a second arm mounted to swing about said axis, a weight mounted on said second arm, said weight being located at the opposite side of said plane from said roll, said tension apparatus being characterized by such distribution of the mass of said roll, said weight and said arms relative to said axis that the tensioning effort of said roll on said tape remains substantially constant as the roll swings about its axis through a normal working angle with elongation and contraction of said tape.

7. A tension apparatus comprising a take-up roll, a tape positioned around said roll and adapted for lengthwise movement thereover, a pivoted arm supporting said roll for swinging movement in a path spaced vertically from the horizontal plane through the pivotal axis of said arm, a second arm mounted to swing about said axis, a weight mounted on said second arm, said weight being located at the opposite side of said plane from said roll, the mass of said weight, said roll and said arms being so positioned and proportioned that the summation of the effective moments of the weight and its arm and the takeup roll and its arm operating to produce the tensioning effort on said tape is substantially constant within the normal working range of the device.

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