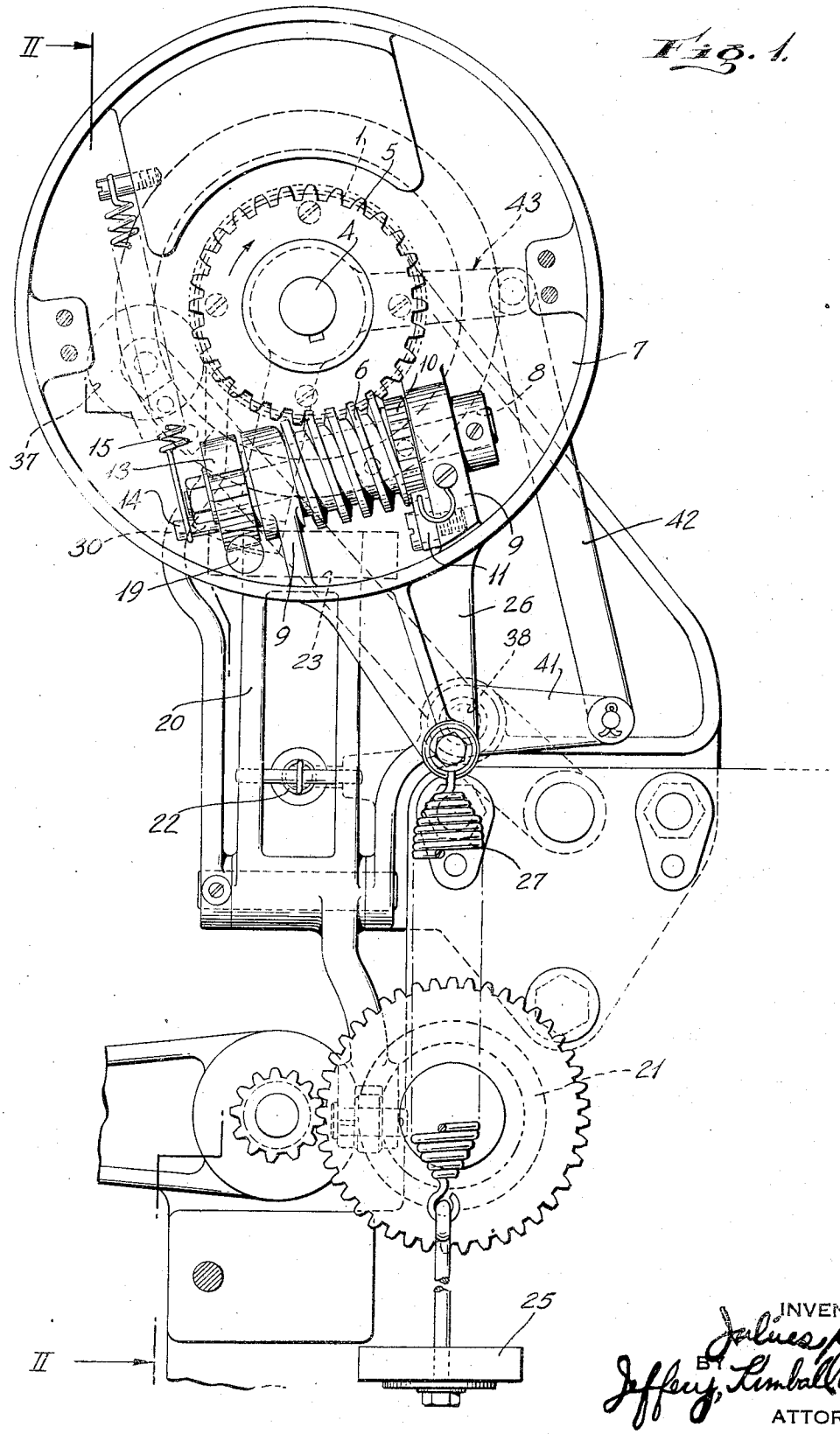
Jan. 2, 1945. J. SIRMAY 2,366,462

CLOTH TAKE-UP

Filed Aug. 2, 1940 3 Sheets-Sheet 1

Fig. 1.



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Filed Aug. 2, 1940 3 Sheets-Sheet 2

Fig. 2.

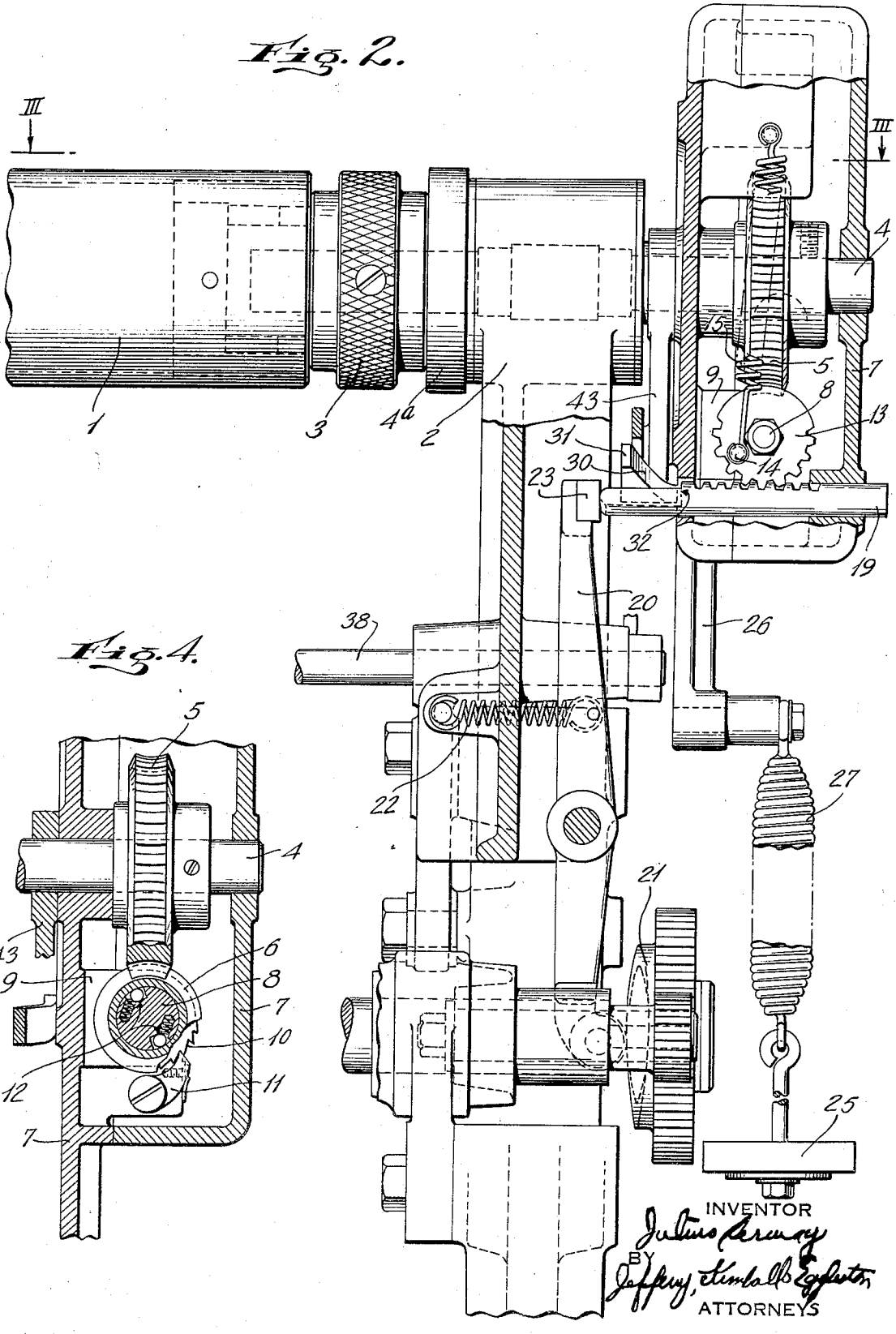


Fig. 4.

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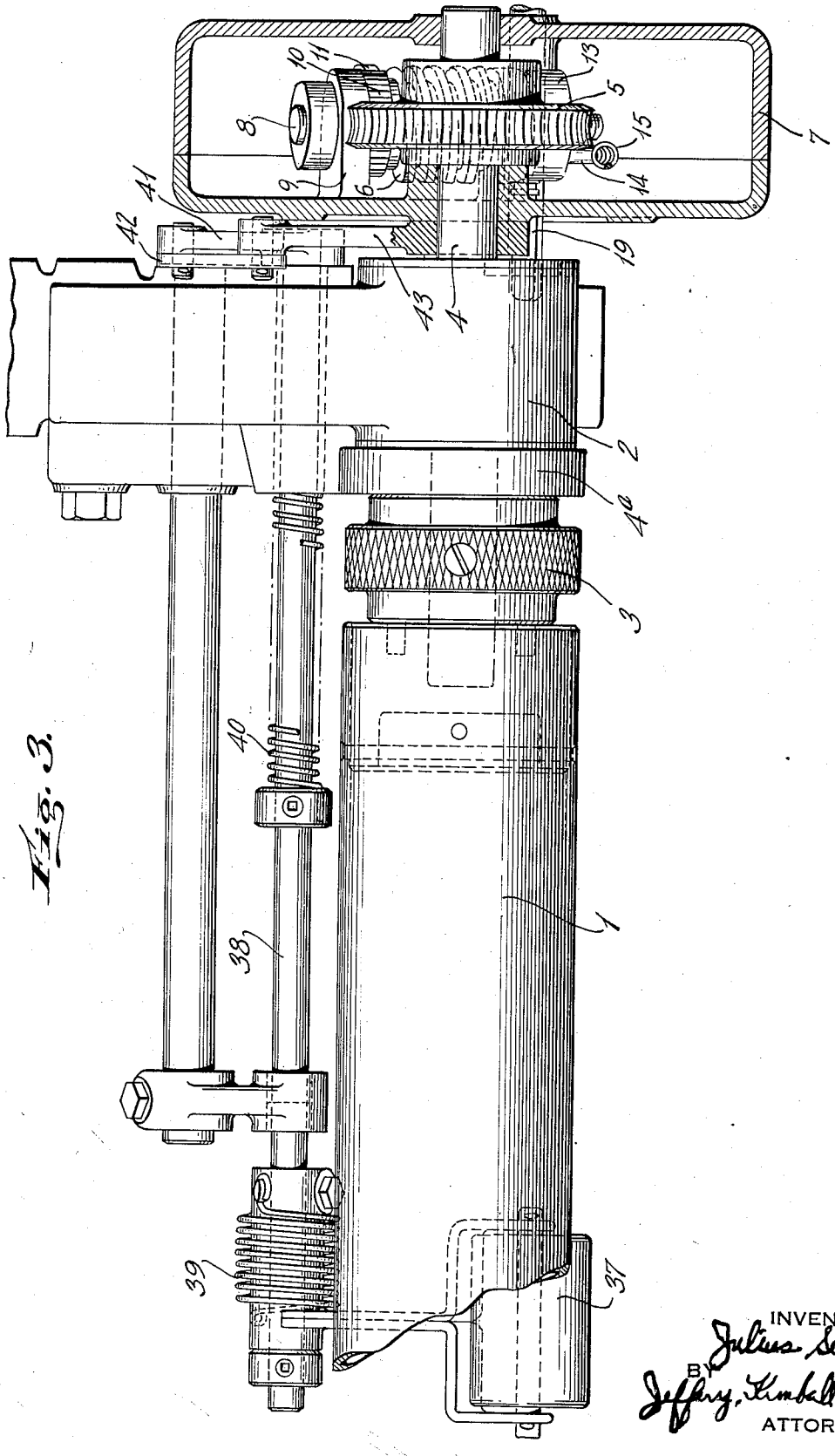


Fig. 3.

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Patented Jan. 2, 1945

2,366,462

UNITED STATES PATENT OFFICE

2,366,462

CLOTH TAKE-UP

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Application August 2, 1940, Serial No. 349,583

9 Claims. (Cl. 66—149)

My invention relates to the driving of cloth beams and other forms of cloth take-ups. The word "take-up" is here used as including all the various forms of such devices.

Cloth take-ups are used to draw the newly-made cloth from its point of fabrication and serve to maintain the cloth under tension at the point of fabrication. As is well known, uniformity in structure of the cloth throughout its length is dependent in part on the maintenance of a uniform cloth tension, and certain types of textile machines, such as warp knitting machines knitting fine yarn in many stitches per inch, require a quite substantially uniform tension. My invention provides a take-up driving mechanism well suited to meet the exacting demands of warp knitting machines and which can be used with other types of textile machinery also.

From one aspect my invention contemplates turning the cloth take-up by definite increments or steps which initially are excessive and accordingly would produce an excessive tension on the cloth if continued, but which decrease in length or frequency as the tension increases and vice versa. The tendency therefore is toward a stable condition in which the tension desired is maintained. Additionally the take-up can be provided with a brake or clutch to prevent the reverse movement of the take-up under the tension on the cloth during those intervals in which the driving is discontinued, in those situations where this is necessary or desirable. From this aspect, my invention can be embodied in various forms of device as will be evident.

From another aspect of my invention, it contemplates driving the cloth take-up through gearing of the epicyclic or planetary type, and using the movement against its restraint of whichever gear must be restrained to cause the transmission of power to the take-up, to reduce the rate of rotation of the take-up, and vice versa. From this aspect, my invention can be embodied in the various forms of epicyclic gearings.

Preferably I employ an epicyclic or planetary type of gearing to turn the take-up by steps of varying lengths tending toward the discontinuance of the drive on the attainment of the cloth tension desired, and a preferred example of this applied to the driving of a cloth beam is illustrated in the accompanying drawings in which:

Fig. 1 is an end view of the take-up mechanism;

Fig. 2 is a sectional view of the same, partly in elevation, substantially on the line II—II of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a sectional plan view of the same mechanisms substantially on the line III—III of Fig. 2;

Fig. 4 is a sectional view through the worm of the mechanism.

One end of the cloth beam or take-up roll 1 is carried in a bracket 2 of the machine through a device 3 of some convenient form whereby the beam can be removed and replaced conveniently; its opposite end can be assumed to be supported similarly. At its driving end, an extension 4 of its supporting shaft is used for driving the beam which, in the present instance, is rotated in the direction of the arrow in Fig. 1. If and as necessary, a friction clutch 4a, say of the cam and roller type, may be provided to prevent the beam 1 turning under the tension of the cloth being wound on it when the driving force is relieved at any moment, or any other appropriate device for securing this function may be used for this purpose.

To rotate the beam, it is provided with a worm gear 5 keyed to the shaft extension 4 and a worm 6 meshed with the worm gear 5 is mounted in a casing or bracket 7 which is free to turn on the shaft 4. This worm 6 is mounted loosely on a short shaft 8 which is carried in brackets 9 within the larger bracket 7; also the worm 6 has attached to it a ratchet wheel 10 cooperating with a spring-pressed pawl 11 to assure the worm 6 not being turned under the thrust of the worm gear 5; in lieu of the ratchet and pawl 10 and 11, a friction clutch (e. g., of the cam and roller type) may be employed to assure that the worm 6 does not rotate in the reverse direction. The internal short shaft 8 is provided with means whereby rotation of this shaft in the driving direction will lock this shaft to the worm 6 and thereby turn the worm with it; preferably to this end, I provide the shaft with one or more cams and roller connections 12 for frictional engagement with the worm 6 (Fig. 4). The short shaft 8 in turn is driven by a circular rack or spur gear 13 fixed to it and carrying a pin 14 having a spring 15 which tends to rock the short shaft 8 in its non-driving direction. The short shaft 8 is driven in its driving direction by a reciprocating rack 19 sliding in the bracket 7 and which is moved to its outer position (to the left in Figs. 2 and 3) by the spring 15 and its cooperating gear 13, as will be evident from Fig. 2. A swinging lever 20 oscillated by a cam 21 on or driven by a power shaft of the machine, and a spring 22

which returns the lever in opposition to the cam 21, is provided to thrust the reciprocating rack 19 to turn the cooperating spur gear 13 and thereby, through the mechanism already described, rotate the cloth beam 1 to wind up finished cloth on it. It will be seen of course that the beam 1 rotates intermittently, generally one step each time the power lever 20 oscillates. The power lever 20 is provided with a rather long face member 23 to engage with the reciprocating rack 19 so that this rack may be struck by the lever despite considerable displacement of the bracket 7 from its initial position in Fig. 1 (namely, counterclockwise as viewed in Fig. 1). Rotation of the worm 6 by the cooperation of the oscillating lever 20 and the spur gear spring 15 tends to move this worm 6 in such counterclockwise direction of course and this motion is restrained, for example, by a weight 25 hung on an arm 26 of bracket 7; usually I interpose a spring 27 between the arm 26 and weight 25 simply to counteract the inertia effect of the weight 25.

Repeated oscillation of the lever 20 therefore (its power shaft rotates continuously) will rotate the worm gear 6 intermittently and thereby rotate the cloth beam 1 intermittently as before indicated but gradually applying greater and greater tension to the cloth being wound on the cloth beam because of the displacement of the weight arm 26 toward the horizontal, which accompanies the counterclockwise movement of the worm 6 and its carrying bracket 7. However I provide for varying the effective stroke or increment of turning of the worm gear 6 and this is done most conveniently by providing for limiting the return or left hand movements of the reciprocating rack 19, and limiting them in such a way that, while this rack 19 is moved to a certain position to the right by each stroke of the oscillating lever 20, the rack 19 returns to the left shorter and shorter distances as the worm wheel 6 with its carrying bracket 7 moves greater and greater distances counterclockwise from its initial Fig. 1 position. This I do preferably by a wedge or inclined-faced member 30 placed in the path of a shoulder 32 on the reciprocating rack 19. This wedge or inclined-faced member 30 extends a little distance circumferentially as shown in Fig. 1 and is so shaped that when the rack 19 is adjacent the narrow end 31 of the wedge, the return stroke of the reciprocating rack 19 is equal to, say, its power stroke under the action of the oscillating lever 20, but when the reciprocating rack 19 is adjacent the opposite end of the incline it can make substantially no movement to the left whatsoever, and hence the oscillating lever 20 is unable to deliver driving power to the rack and therethrough to the cloth beam 1. Beginning with the worm 6 in its initial Fig. 1 position therefore, the beam 1 is advanced or rotated by increments or steps which initially rotate the beam 1 at such a rate as tends to increase the tension on the cloth but these steps progressively become shorter and shorter as the worm 6 is carried counterclockwise and in each position the tension on the cloth is fixed by the weight 25 (which may be increased or diminished at will) and the angular position of the weight-carrying arm 26. Usually I apply such weight at 25 as will give me the desired tension on the cloth when the reciprocating rack 19 is at such a position, or substantially at such a position, that the oscillating lever 20 can no longer reciprocate it. When the desired tension on the cloth is reached accordingly, all further driving of the beam 1 tends to be discontinued as it were. Ultimately of course the production of further cloth will relieve this tension somewhat, and thereupon the weight 25 will start the worm 6 back toward its initial position, but as soon as this occurs the oscillations of the lever 20 will become effective to again step the cloth beam 1 around to restore the tension on the cloth. It follows accordingly that the cloth tension will remain substantially constant at its desired value as determined by the amount of weight applied at 25.

As cloth is wound on the beam 1 however and the layer of cloth on this beam increases in thickness the tension of the cloth, as determined by the driving mechanism so far described, will decrease of course. To compensate for this, I mount the wedge or inclined-face member 30 in such a way that it is displaced counterclockwise (Fig. 1) from its initial position in accordance with the increase in the thickness of the cloth wound on the cloth beam 1, so that the turning-effort exerted on the take-up is controlled directly in accordance with the length of the radius of the cloth accumulated on the cloth beam. Such displacement of the wedge member 30 permits lengthy advancing steps at the cloth beam 1 until the worm 6 has proceeded further around the axis of its sun gear 5 as may now be seen. This in turn permits the weight arm 26 of the casing or bracket 7 to approach more nearly to a horizontal position before driving of the worm is discontinued by the wedge member 30, and this approach more nearly toward a horizontal position produces a greater restraint on the counterclockwise movement of the worm 6, and accordingly increased torque on the cloth beam to compensate for the thickness of the cloth wound on the yarn beam. It will be seen that by properly proportioning the parts, such increased torque can be made to correspond to the increased thickness of the cloth on the cloth beam 1 with the result that the tension on the cloth will be maintained constant regardless of the amount of cloth previously wound on the cloth beam 1, providing the wedge or inclined-faced member 30 is positioned at all times in accordance with the thickness of the layer of cloth on the cloth beam. This last I secure by providing a follower roll 37 to bear on the cloth wound on the cloth beam 1 and place the wedge or inclined-faced member 30 correspondingly. To this end, the follower roll 37 may be carried by a rock shaft 38 (usually I attach the bracket of the follower roll 37 to the shaft 38 through a spring 39 although this is not necessary; a spring 40 serves to turn the shaft 38 in a direction to press the follower roll 37 against the cloth. The opposite end of the rock shaft 38 operates through an arm 41 and link 42 to position a bracket 43, loose on the cloth beam shaft 4, which carries the wedge or inclined-faced member 30. As cloth accumulates on the cloth beam 1 therefore, the wedge member 30 is positioned accordingly, and accordingly the tension on the cloth is maintained substantially constant regardless of whether there is little or a considerable quantity of cloth on the beam. As a matter of convenience in design, I usually position the weight arm 26 so that when the driving worm 6 and accordingly the casing or bracket 7 is in its initial position, the end of the arm 26 to which the weight is connected is directly in a vertical tangent of the cloth beam 1 (see Fig. 1), and so proportion the various arms

which shift the wedge or inclined-faced member **30** that this end of the weight arm **26** always stands in the line of a vertical tangent to the roll of cloth accumulated on the cloth beam at any moment. It is sufficient however if the arms which shift the wedge (e. g., arms **41** and **42** and the arms of bracket **43**) are so proportioned that, when the device is in operation, the ratio between the radius of the roll of cloth accumulated on the beam and the distance from the center line of the cloth beam to a vertical line through the end of the arm **26** to which the weight is connected, tends to remain constant. The result of this of course is that the increase in the effective length of the weight arm **26** compensates directly for the increase in the thickness of the accumulated cloth.

The operation of my driving mechanism can be seen from the foregoing; briefly it is as follows: Assuming that the cloth is being started on the cloth beam (which is to rotate in the direction of the arrow in Fig. 1), the parts are substantially in the positions illustrated in Fig. 1. As the power shaft oscillates the power lever **20**, the rack **19** reciprocates and, acting through the worm **6** rotates the cloth roll **1** intermittently by steps which diminish in length as the worm **6** moves bodily counterclockwise (Fig. 1) along with its casing or bracket **7** until the desired tension on the cloth is reached, at which time the wedge or inclined-faced member **30** prevents further driving except as such driving may be just sufficient to maintain the desired tension on the cloth. As the cloth accumulates on the cloth beam **1**, the follower roll **37** shifts the wedge **30** counterclockwise corresponding to the increase in thickness of the cloth on cloth beam **1**, thereby permitting the worm **6** to move still further counterclockwise so that the increase in the effective restraint to such counterclockwise movement of the worm **6** imposed by the weight **25** results in the greater torque needed to compensate for the increased thickness in the cloth on the cloth roll to the end that the tension on the cloth may remain constant.

As before indicated, the details of construction and operation illustrated in the drawings and described above are subject to considerable modification and my invention may be embodied in other forms of apparatus of the type here employed. It will be understood accordingly that my invention is not limited to those details of construction and operation except as appears hereafter in the claims.

I claim:

1. The method of rotating a cloth take-up which consists in rotating the same intermittently by steps, and, as the cloth tension increases, varying the step motion in a manner to impose less tension on the cloth and also, as the tension on the cloth decreases, varying the step motion in a manner to impose greater tension on the cloth, and simultaneously controlling the turning effort exerted on the take-up directly in accordance with the length of the radius of the cloth accumulated on the cloth beam, to counteract the tendency of such accumulations to reduce the tension.

2. The combination with a cloth take-up, of means to rotate the take-up step by step, means to shorten the amplitude of the steps as the momentary cloth tension increases and to lengthen the amplitude of the steps as the momentary cloth tension decreases, and a follower to bear on the cloth wound on the cloth beam and operatively connected to the second-mentioned means tending to lengthen the amplitude of the steps as cloth accumulates on the beam.

3. The combination with a cloth take-up, of two gears disposed in a planetary type of arrangement and one of which is connected to the take-up to rotate the latter, means to drive the other of said two gears, means to restrain planetary movement of that one of said gears which has planetary motion to cause said gears to transmit power to the take-up, said means imposing greater restraint on said planetary movement the farther said gear moves from an initial position, and means to cause said driving means to respond to said planetary movement, to control the tension on the cloth.

4. The combination with a cloth take-up, of a planetary type of gearing including means connected to the take-up to rotate the latter and a gear which needs to be restrained in position to cause transmission of power through the planetary gearing to rotate the take-up, means to restrain movement of said gear in that direction from an initial position which would prevent the transmission of power, a member to apply power to the planetary gearing intermittently to rotate the take-up step by step, a second member to control the duration of the power applications, said second member being so related to said restrained gear that movement of the restrained gear in a direction against its restraint causes the duration of the power applications to be shortened and vice versa, and means responsive to the diameter of the cloth accumulation on the take-up to change said relation between said second member and the restrained gear.

5. The subject matter of claim 4, characterized by the fact that said gear restraining means imposes restraint on the restrained gear proportional to the diameter of the cloth accumulation, and said means responsive to the diameter of the cloth accumulation is a member arranged to bear on said accumulation.

6. The combination with a cloth take-up roll, of a gear connected to the take-up roll to rotate the latter, a second gear meshed with said first gear and mounted to oscillate about the axis of the first gear, means to rotate said second gear intermittently by steps of shortening amplitude as resulting movement of said second gear about said axis carries said second gear farther from an initial position, said means rotating the second gear in a direction to drive the first-mentioned gear in a direction to apply tension to the cloth, and means opposing the movement of said second gear about the axis of said first gear and increasing its opposition the farther the said gear is displaced from its said initial position and tending to restore said second gear to said initial position about said axis.

7. The subject matter of claim 6, characterized by the fact that said second-gear rotating means includes a reciprocating plunger, carried with said second gear, and also includes a power-driven member to actuate said plunger in the gear-rotating direction and an inclined-faced member to limit the return of the plunger in the opposite direction.

8. The subject matter of claim 6, said means to rotate said second gear comprising a driving portion and an amplitude-varying portion, in combination with a follower to bear against cloth wound on the take-up roll and, as cloth accumulates on the roll, to displace said amplitude-vary-

ing portion of said second gear rotating means in the direction said second gear tends to move when rotated.

9. The subject matter of claim 6, characterized by the fact that said means to rotate the second-gear includes a member to rotate the gear step by step and a member to determine the amplitudes of the steps, and a follower arranged to bear on the cloth on the take-up roll and, as cloth accumulates on the take-up roll, to displace said amplitude-determining member in a direction to enlarge the amplitude of the steps.

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