Dec. 26, 1950 J. E. REPASS 2,535,515

WHIP ROLL MECHANISM FOR LOOMS

Filed June 7, 1949 2 Sheets-Sheet 1

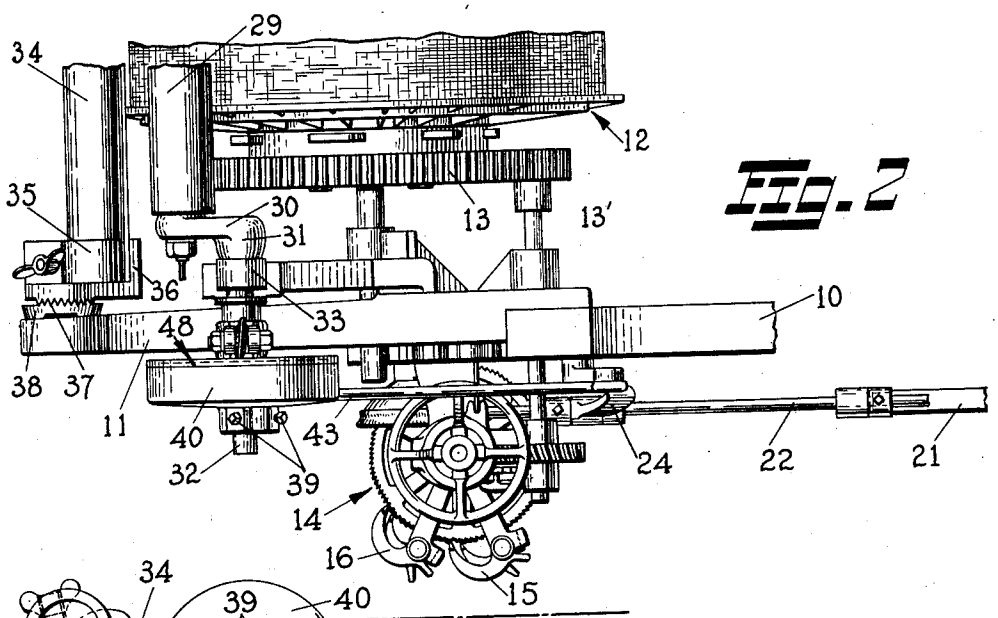


Fig. 2

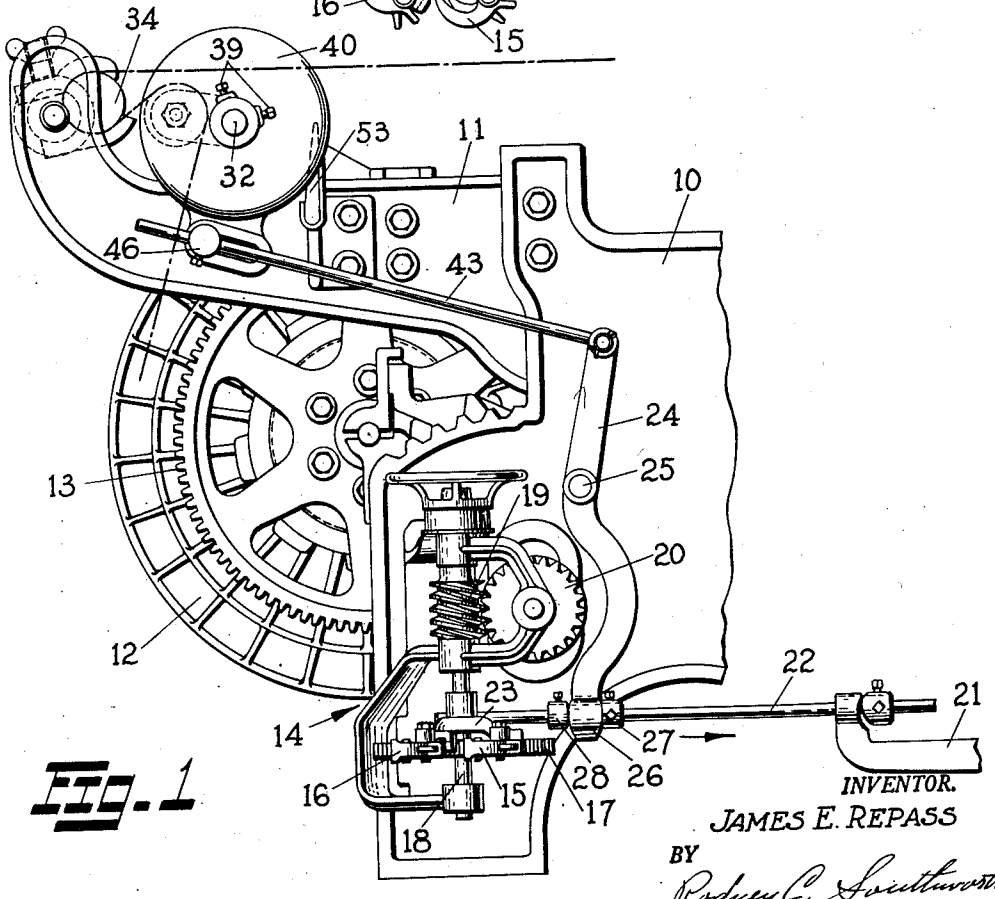


Fig. 1

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Fig. 3

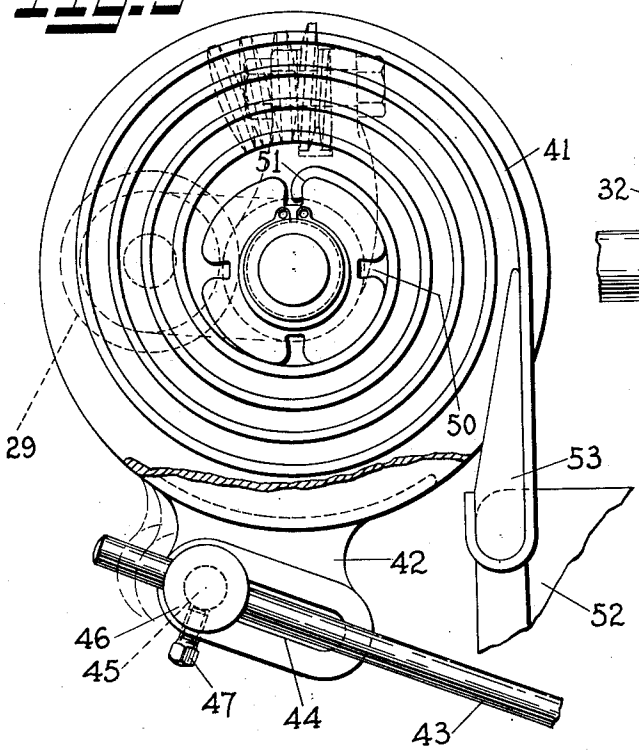
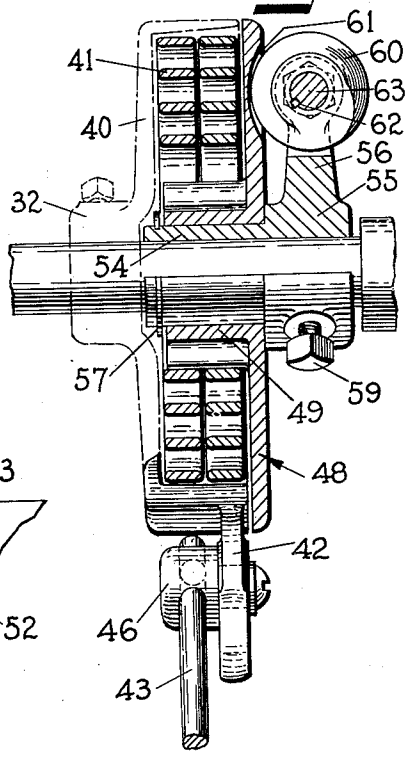


Fig. 4



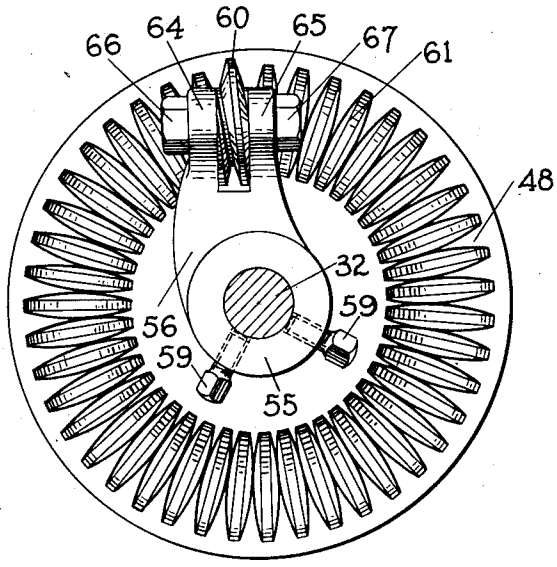


Fig. 5

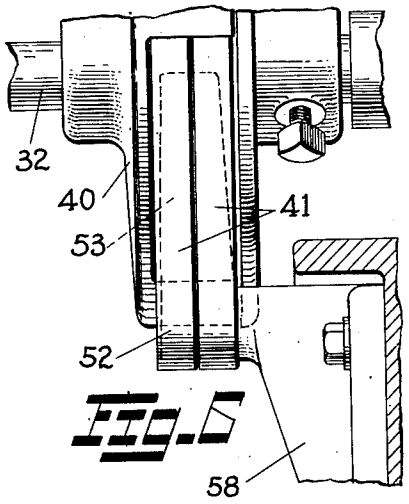


Fig. 6

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WHIP ROLL MECHANISM FOR LOOMS

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Application June 7, 1949, Serial No. 97,523

9 Claims. (Cl. 139—114)

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This invention pertains to improvements in looms, and more specifically, to improvements in biasing means as applied to the whip roll of a loom of the type in which the warp threads are let off from a beam and passed over a whip roll by which tension in said warp threads is caused to govern the let-off mechanism and to regulate the rate at which it functions to permit the warp threads to be drawn from the beam.

It is a general object of the invention to devise an improved means by which a whip roll of more or less conventional type may be biased and its effect upon the warp sheet passing over it carefully controlled and adjusted.

It is a more specific object of the invention to provide a more or less unitary, self-contained, biasing means including springs enclosed within a casing the parts of which serve in adjusting the tension in the springs and in conveying the governing effect of the angularly moved whip roll to the control mechanism for the let-off.

It is a further object of the invention to devise whip roll biasing means which may employ clock type springs and to confine the mechanism within a re atively small space so that it does not conflict with functioning of other parts of the loom, nor will it stand in the way of or limit access to the functional parts of the loom or the ready accessibility of the warp beam, particularly the introduction or removal of the beam from the loom.

It is a further object to devise mechanism of this type which shall decrease and practically minimize the possibility of injury to personnel in the event of spring breakage or for any other reason, e. g., during the making of adjustments.

Furthermore, it is an object of the invention to provide a spring or springs of the type described which sha l be capable of being subjected to relatively great tension forces, but which shall offer no particular hazard to those effecting adjustments or in the vicinity of the loom since the spring or springs are substantially enclosed and the adjusting means is always in full engagement.

Other objects of the invention will become apparent from the following more detailed description of the invention and the manner in which it is employed.

In looms of the general character herein described, a warp beam is mounted in bearings or gudgeons at the rear portion of the loom framework and the warp threads, collectively referred to as a warp sheet, are drawn therefrom and over a whip roll the general function of

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which is well understood by those conversant with this art, then from the whip roll on to the fell of the fabric having been passed through the heddles and other weaving instrumentalities of conventional nature and which need not be described here. A let-off mechanism, of which there are several well known types, is intergeared or otherwise connected to rotate the warp beam as permitted so to do under the influence of control mechanism, the regulation of which is most frequently derived from tension influences within the warp sheet. Since the warp sheet is trained over the whip roll these tension influences are most conveniently conveyed through the whip roll mechanism and certain interconnecting linkage to the said let-off. The warp beam is permitted to rotate under the tension influence of the warp thread being drawn therefrom at a rate substantially that required for maintaining the desired tension condition in the warp threads, it being understood that tension therein may vary for different looms, for different types of fabrics being woven, with different materials, and other factors.

The whip roll device itself commonly comprising spindle or shaft means mounted in bearings at the top rear portion of the loomsides or extensions thereof, and to which are fixed short arms carrying a freely rotatable roll, must be biased or urged in a direction such that it normally tends to exert a tensioning influence on the warp sheet. This biasing movement is conveniently produced by some type of spring and lever mechanism, those springs heretofore employed in most instances being of the helical or coil type and being attached to an arm or lever fixed to the whip roll pivot spindles themselves or to some convenient part of the whip roll structure so as to be elongated (or compressed) in accordance with the details of design to be found in any particular installation. The other ends of these springs are conveniently attached to suitable fixed elements.

These helical springs are generally of considerable length and must be attached in exposed positions or at some particular location with respect to other parts so that they interfere with ready accessibility of other parts at that portion of the loom. Again, in the event one of these springs breaks or becomes detached, the fact that it is exposed and completely unguarded renders it something of a hazard to those working on the machine or in the close vicinity thereof, that being something which is not easily overcome so long as the helical type spring is utilized.

In constant tension let-offs it is desirable that considerable adjustment be provided and therefore these springs previously employed have had to be connected to some part of the loom structure or some projection therefrom which may be moved throughout a considerable range for that purpose. That has likewise complicated the mechanism, has rendered it more costly than desired and also made it necessary for the loom operator, when effecting adjustments, to work in a position not conducive to comfort nor to effecting relatively fine adjustments of the parts.

The invention herein described and claimed is directed toward improvements in the resilient biasing means for such whip roll devices and briefly, comprises an application of a clock type or spiral spring or springs directly to or concentric with the pivot spindles on which the whip roll is adapted to swing, and which are also readily and easily adjustable for varying in a precise manner the tension to be applied by the whip roll to the warp sheet trained thereover. Springs applied at one side of the whip roll device are enclosed within a casing with the exception of one end of each spring which may project through an opening in the casing to be connected to anchor means for that end of the spring. One portion of the casing is adapted to convey the angular movement imparted by the tensioned warp sheet to the whip roll mechanism through connecting linkage of more or less conventional nature by which the warp beam advancing motion imparted through the left-off is carefully regulated. The other portion of the casing is preferably freely mounted on the whip roll pivot and is adjustably interconnected to the said pivot means for the whip roll through a peculiar type of worm and worm wheel device hereinafter to be described in greater detail. The adjustment effected by the above mentioned means is one conveniently made and also is effected without any possibility of injury in the event of the spring or springs breaking or other unforseen difficulties arising due to displacement of a spring or other releasing thereof as might sometimes occur with springs fully exposed and which have no guiding or restraining parts constantly associated therewith.

The let-off action as controlled by the whip roll under the influence of biasing means herein described and claimed is one found to be very effective when employed as a constant tension let-off not requiring any follower mechanism for compensating for differences in beam diameter, and is also capable of taking care of let-back of the warp up to a relatively great number of picks without noticeably disturbing the quality of material being woven and without requiring any manual attention at the let-off portion of the loom.

The invention is hereinafter to be described by reference to one preferred embodiment thereof as evidenced in th attached figures of drawing wherein:

Fig. 1 is a side elevation of that portion of a loom to which the invention has been applied and includes enough of the loom parts which cooperate with the whip roll and are controlled thereby to show the mode of operation thereof.

Fig. 2 is a plan view of that side of the loom illustrated in Fig. 1 and further illustrating the parts shown therein.

Fig. 3 is a detail view taken from the end of the whip roll pivot shaft or spindle and having a part of the spring enclosing means broken away.

Fig. 4 is a partial section taken vertically along the center line of Fig. 3 and further showing details of the mechanism.

Fig. 5 is a detail view in which certain of the parts incidental to effecting adjustment are more fully illustrated.

Fig. 6 is a fragmentary view showing the anchoring means for the outer spring ends.

Now referring to Figs. 1 and 2, the rear left hand portion of a loom is shown and comprises loomside 10, extension 11, a warp beam generally indicated by numeral 12 and having a gear 13 with which meshes a pinion 13' which forms the terminal drive element of a let-off generally indicated by numeral 14 and, as herein shown, of Bartlett type, although it is to be understood that the invention is not at all dependent upon the type of let-off employed, but may be used with any let-off controlled by tension of the warp sheet as it affects the position of a whip roll or similar mechanism.

The let-off is ratcheted by pawls 15 and 16 which make engagement with the teeth of a ratchet wheel 17 thereby to drive shaft 18, worm 19, gear 20, etc. Motion for this let-off ratcheting means is derived from the lay structure of the loom, or may be taken from a crank or other operative part thereof, and includes a driving rod 21, a connecting rod 22 attached at one end to a spider 23 rotatable on shaft 18 and which has mounted thereon the spring pressed pawls 15 and 16. The amount of movement which is permitted the pawls themselves is controlled by a lever 24 pivoted at 25 and having its lower, forked end 26 engageable about the connecting rod 22 between collars 27 and 28, adjustably secured to the rod by set screws. Depending upon the angular position of the lever 24, the active or effective movement of rod 22 is governed to impart to the ratchet wheel any desired movement from one by which a relatively great number of teeth are affected to a condition in which no ratcheting movement at all is imparted. It is this lever 24 which is directly acted upon by the angularly movable whip roll in a manner as will hereinafter be described.

The warp threads are drawn from the beam 12 and pass upwardly about the freely rotatable whip roll itself which is designated by numeral 29. This whip roll is carried at the outer or free ends of a pair of arms 30, it being understood that the structure at the opposite side of the loom (not shown) is substantially the same, except for the fact that there need be no let-off mechanism at that side and therefore the control for the let-off is taken at this left hand side of the loom as herein described, although it is quite evident that the let-off, if at the opposite side of the loom, would be controlled from the unit adjacent thereto.

These arms 30 have hub portions 31 from which extend and within which are fixed the shafts or spindles 32, one at either end of the machine, and which are freely pivoted in bearings 33 so that the whip roll 29 under the influence of the tensioned warp sheet may move angularly about an axis defined by these spindles 32.

As herein illustrated, the warp sheet, after passing about the whip roll 29, is trained around a drag roll 34 clamped between members 35 and 36 and held in a properly disposed position after adjustment which may be effected through swinging the drag roll about a pivot point at which it is locked and maintained in a

definite position by the serrations or teeth 37, one set of which is formed in the lower clamping member 36, the other or complementary teeth being formed as a part of a collar 38 at the outer, upper end of the loom-side extension 11. It is to be understood that this drag roll may or may not be used and that the actual construction thereof is not important, several types being available, it also being well known that the actual threading or manner of passing the warp sheet about the whip roll and drag roll is also capable of being varied in accordance with the particular design of the parts and other considerations.

It is to be understood that in certain instances a single unit only may be employed at that side of the machine at which the control for the let-off itself is taken. However, it is preferred that more or less identical units be employed at each side of the machine, that is, at each spindle 32 upon which the whip roll is pivoted, since in that way the balance of the parts is more precisely regulated. While there may be some differences in the units, they are preferably substantially the same and a description of one as hereinafter given should suffice for an understanding of both.

Now referring to Figs. 3, 4, 5 and 6, a more complete description of the whip roll biasing mechanism will be given. The spindle 32 which projects at the left hand end of the loom has fixedly attached thereto by means of set screws 39 a casing member 48 which is adapted to cover or enclose substantially all of a pair of clock type springs one of which is indicated by numeral 41, and which are maintained under a suitable tension such as is required for urging the whip roll 29 upwardly against the pull of the warp sheet in a manner understood by those conversant with this art. While two springs are housed within each casing as herein shown, and according to a preferred form which the invention may take, a single spring or a greater plurality may be used depending upon circumstances. It is preferred that two springs be employed since each spring may be of less strength and therefore more easily handled and assembled and, in the event of spring breakage, all tension at one side of the whip roll is not lost.

The casing member 40 has integrally or otherwise formed as a part thereof a depending arm 42 which serves to impart the angular movements of the whip roll mechanism through a link 43 to the lever 24, Fig. 1, the function of which was mentioned above. This depending arm 42 has a slot or elongated opening 44 within which is slidably retained a stud or pin 45 extending from or threaded into a collar 46 which is adjustable along the length of the link or rod 43 and fixed in position thereon by means of a set screw 47. In actual operation the whip roll may vibrate as is common in such devices due to the effect of the harness motion and to the beat-up, but that has no primary effect upon the take-up control as it is only by abnormal positioning and upon greater angular movements of the whip roll about its pivot 32 and corresponding movement of the casing 40 and its depending arm 42 that the link 43 is actually pushed to the right, Figs. 1 and 3, to permit engagement of a greater number of teeth in the ratchet wheel 17, or else is permitted to move in the opposite direction thereby to prevent a full number, or perhaps any, teeth being engaged, all in a manner commonly understood by those familiar with

let-offs of the type herein shown. The slot 44 permits considerable movement of the whip roll and of the arm 42 without an immediate change in position of the link 43 or lever 24, etc., such as occurs when the fabric is "let back," that sometimes being necessary in repairing damaged filling, and such movement may be carried to the extent of five or more picks without loss of tension and without it being necessary to effect any manual adjustments at the let-off. In other words, the let-off as controlled by the whip roll biasing means of this case takes care of letting back the fabric throughout almost any extent which may normally be required without attention upon the part of the loom operator.

The enclosure of the springs 41 is completed by a second casing member 48 which is comprised as a disk or plate having a hub 49 slotted or grooved at four positions, more or less, these grooves indicated by numeral 50 being deep enough and so shaped as to receive the bent or curved end 51 of the spring 41. The spring end 51 may be hooked into an appropriate one of the slots or grooves 50 and then when the outer end 52 of that spring is attached at an anchor 53 and the casing member 48 rotated in a counterclockwise direction, Fig. 3, the coils of the spring will be tightened thereby tensioning it as is necessary for biasing the whip roll 29 against the pull of the warp sheet with whatever degree of force is appropriate under the circumstances.

The hub 49 of the second casing member 48 is freely rotatable upon a sleeve 54 which projects along the spindle 32 as it extends from a hub 55 which also has extending therefrom an arm 56. The hub is maintained in axial position on the sleeve 54 since it engages against a shoulder terminating the hub 55 at one end and by a spring fastening 57, or by any other convenient retaining means at the opposite end.

The anchor 53 is an integral part of a bracket 58, Figs. 3 and 6, the latter being bolted or otherwise more or less permanently attached to the extension 11 at the rear portion of loomside 10. In actual practice it is convenient to mount the bracket 58 and anchor 53 on or about a dowel or pivot (not shown) and to allow enough play at the bolt holes for the attaching means so that the anchor may be aligned with the outer ends of the springs 41 as they extend through an opening at that particular part of the casing member 40, all as illustrated at Fig. 3. That permits the springs to bear against the anchor member without subjecting them to any unnecessary bending or imposing thereon unnecessary strain.

For adjustably fixing the position of the second mentioned casing member 48 and therewith, the inner hooked end 51 of the springs 41, the arm 56 is interconnected to the disk portion of the casing member and the hub 55 fixed to the spindle 32. The latter connection may be effected by a key or by set screws such as those indicated here at 59, Figs. 4 and 5. The means for interconnecting the arm 56 and the disk portion of the casing member 48 and for permitting adjustment between the two comprises a worm 60 which engages within toothlike elements 61 cast or otherwise formed in the adjacent surface of the casing member 48. Acording to a simple and preferred embodiment which this part of the invention takes, these indentations or toothlike depressions are radially disposed and the worm 60 merely comprises a single thread or turn which extends at a proper angle to engage the teeth 61 in the disk since the arm 56 is slightly curved or other-

wise offset as illustrated in Fig. 5 so that the angle made by the helix of the worm substantially approximates the angle then made by that toothlike depression 61 within which the worm convolution is meshed.

The hub of worm 60 is fixed as by means of a key 62, or in any other satisfactory manner, and is compelled to rotate with a bolt 63 or other spindle means which extends through bearings in the forked ends 64 and 65 of the arm 56. A head 66 of the bolt 63 permits the worm to be turned therewith by a suitable wrench or other convenient means and the nut 67 applied to the threaded end of the bolt is used to lock the parts in an adjusted position. Other equivalent constructions may be used at this point, but that herein described has been found to be effective and comprises a relatively inexpensive construction entirely adequate for its intended purpose.

The worm 60 and the toothlike identations 61 may, if desired, be machined for greater accuracy or better conditions of interengagement, but in actual practice it has been found that cast parts serve quite well and therefore the cost may be reduced to a minimum by employing parts formed in that manner. A single threaded worm is effective, but double or other types of thread may be used if it is desired to speed up the rate at which an adjustment may be effected. In actual practice, adjustment is not frequently made except at the assembly of the mechanism and thereafter at rare intervals, and thus a socket or other wrench may be applied to the bolt head 66 and tightening of the spring or releasing of a slight amount of tension therein is effected without consuming very much time since it is never necessary to rotate the casing member 48 relatively to the arm 56 more than a few degrees. Adjustment is easily effected while the loom is running.

Some variations in the actual details of construction are contemplated, but it is preferred that there be a plural number of springs in each casing thereby to use smaller springs and to facilitate assembly since heavier springs naturally are somewhat harder to handle. The whip roll, either one having separate pivot spindles such as that herein illustrated, or one having a shaft extending completely across the loom as is sometimes the case, should preferably have one of the biasing units at each end. One of these units may be provided with an arm such as the arm 42 by which linkage extending to the let-off mechanism is controlled. The actual means by which the worm is rotated may vary, for example, it is not essential that the bolt be of a type having a hexagonal head and nut and, in fact, various interconnecting means may be devised to which a wrench or crank or like instrumentality may be applied for effecting the adjustment by turning the worm on its axis thereby to rotate the disk and to tension or relax the spring or springs.

In actual operation it is to be assumed that the various adjustments have been effected so that the whip roll is biased against the warp sheet with the requisite amount of pressure for ordinary operating conditions. In most instances the collars 27 and 28, Fig. 1, are so adjusted and locked on the rod 22 that there is merely a working clearance between their inner surfaces and the adjacent portions of the forked end 26 of the lower part of lever 24. The collar 28 should be positioned in that manner although it is not quite so essential that collar 27 be closely positioned since the device will operate with that collar spaced away from the end 26 of the lever, if desired. The normal operation of the loom merely causes the whip roll to assume a more or less neutral or running position in which it is effective for maintaining the casing member 40 against the tension of the clock type springs so that arm 42 maintains the link 43 and lever 24 in a position such that the pawls 15 and 16 engage the ratchet teeth on the wheel 17 and rotate the take-up mechanism throughout a slight extent for every beat of the lay or in synchronism with the weaving cycle. This actual rotation may vary from pick to pick, but the sum total of the ratcheting movements will be effective over a period of time to rotate the beam at a rate just fast enough to let off a sufficient length of warp threads as required in the weaving of the particular fabric being produced.

For weaving some fabrics, the forward movements of the link 22 move lever 24 through the collar 28, and thus link 43 in a direction to press the whip roll upwardly against the warp sheet every time the lay beats up. That assures that the fabric produced is tightly woven since each pick of filling will be beaten into a tightly held warp, and by suitable adjustment, this action may be varied as desired.

Whenever it is desired to let back fabric, the whip roll is permitted to rise since the warp is slackened an amount corresponding to the number of picks let back, and the slot 44 in the arm 42 permits angular displacement of the whip roll mechanism and of the casing members 40 without corresponding movement on the part of the link 43, lever 24, etc. The slot makes it possible for the whip roll under the influence of the springs 41 to maintain sufficient tension in the warp without any further let-off motion until the warp has been taken up after resumption of weaving and the whip roll is again drawn down to its normal running position.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

I claim:

1. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of the thread from the beam, an improved whip roll biasing means comprising a clock type spring, a casing means substantially enclosing said spring, means forming a part of one casing member to which one end of the spring is attached, an anchor for the other end of said spring, and an adjusting means effective for altering the relative position of said casing member to which the spring is connected thereby to adjust the tension therein and thus, its biasing effect upon the whip roll.

2. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of the thread from the beam, an improved whip roll biasing means comprising a clock type spring, a casing means substantially enclosing said spring,

means forming a part of one casing member to which one end of the spring is attached, an anchor for the other end of said spring, and an adjusting means effective for altering the relative position of said casing member to which the spring is connected which comprises an arm fixed for swinging movement with said whip roll, a worm member carried by said arm and means by which said worm member may be rotated and held in a set position, and cooperating toothlike elements formed in said casing member and being complementary to said worm member and engaged thereby, said worm member being effective when rotated to adjust the position of the casing member angularly with respect to the said arm and whip roll thereby to tension the spring and to alter its biasing effect upon the whip roll.

3. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of the thread from the beam by said let-off, an improved whip roll biasing means comprising a clock type spring, a casing means substantially enclosing said spring, one part of said casing means having a hub portion to which the inner end of said spring is connected, the other portion of said casing being fixed to the whip roll pivot member and having means projecting therefrom to which may be connected a link for conveying movement of the whip roll to the said let-off, an adjusting means effective for altering the relative position of said casing member to which the spring is connected thereby to adjust the tension in the spring and to alter its biasing effect upon the whip roll, said means comprising an arm fixed for angular movement with the whip roll, a worm member carried by said arm and means by which said worm member may be rotated and held in a set position, and complementary toothlike indentations in that casing member to which the inner end of the spring is attached, said indentations being positioned for interengagement with the said worm member.

4. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of the thread from the beam by said let-off, an improved whip roll biasing means comprising a clock type spring, a disklike member freely rotatable on said whip roll pivot, said disk-like member having means forming a part thereof to which the inner end of said spring is attached, an anchor for the outer end of said spring, and means for adjusting the tension in said spring by rotating the said disklike member about its pivot which comprises a plurality of toothlike indentations in said disk, an arm fixed to said whip roll pivot and a worm member rotatably carried by said arm, means by which said worm member may be rotated and locked in a set position, said worm member being positioned for interengagement in said toothlike indentations in the disk member to which the inner end of the spring is attached.

5. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect the let-off to control the unwinding of the thread from the beam by said let-off, an improved biasing means comprising a unitary

and self-contained structure mounted upon the pivot means upon which the said whip roll is angularly movable, said structure comprising a clock type spring, a casing formed of two parts, one said casing part being rotatably mounted upon the said whip roll pivot means and the other said casing part being fixed to said pivot means and having an arm projecting therefrom to which is attached link means for imparting the angular movement of the whip roll to the said let-off means, a hub portion extending inwardly of the casing from the first mentioned part thereof and to which the inner end of said spring is connected, an anchor means for the outer end of said spring, and means for adjustably tensioning said spring which comprises an arm fixedly attached to the said whip roll pivot means and a worm rotatably mounted at the free end of said arm, a plurality of toothlike indentations in the said casing member to which the end of the spring is attached and within which said worm is operatively engaged.

6. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of the thread from the beam, an improved whip roll biasing means comprising a clock type spring, a casing means for said spring, and means forming a part of said casing to which one end of the spring is attached, an anchor for the other end of said spring, and an adjusting means effective for altering the relative position of said casing with respect to the said anchor, thereby to adjust the tension in the spring and its biasing effect upon the whip roll.

7. For a loom of the type having a warp beam, a let-off mechanism and a whip roll through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of thread from the beam, improved whip roll biasing means comprising a clock type spring, one at each end of said whip roll pivot means, a casing for each clock type spring, and means forming a part of each casing to which one end of the spring is attached, anchors, one for each spring, to which that end of the spring opposite the end connected to the casing is attached, an adjusting means effective upon each of the casings for altering the relative position of the casing to which the spring is connected thereby to adjust the tension in the spring and its biasing effect upon the whip roll.

8. For a loom of the type having a warp beam, a let-off mechanism and a whip roll the ends of which are retained in crank means swingable upon pivot spindles fixed in said crank means, said whip roll comprising a means through which changes in tension of the warp threads drawn from said beam and passing over the whip roll affect said let-off to control the unwinding of thread from the beam, improved whip roll biasing means at each end of said whip roll and connected for functioning upon the spindles upon which the whip roll is pivoted, said means comprising a clock type spring, casing means for each spring, means forming a part of each casing to which one end of the spring individual thereto is attached, anchor means for the other ends of each of said springs and an adjusting means effective upon each casing for altering the relative position thereof for adjusting the

tension in the spring and thus, its biasing effect upon the whip roll.

9. Improved whip roll biasing means for looms of the type described which comprises a clock type spring, a two part casing means substantially enclosing said spring, inwardly projecting means forming a part of one casing member to which one end of the spring is attached, an anchor externally of the casing for the other end of said spring and an adjusting means effective for altering the relative position of said casing member to which the spring is connected which comprises an arm fixed for swinging movement with said whip roll, a worm carried by said arm and means by which said worm member may be rotated and held in a set position, and cooperating toothlike elements formed in said casing member to which the said spring

is attached, said elements being complementary to said worm and engaged thereby, said worm being effective when rotated to adjust the position of the casing member angularly with respect to the said whip roll thereby to tension the spring and to alter its biasing effect on the whip roll.

JAMES E. REPASS.

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