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WARP TENSION COMPENSATOR

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Fig. 1

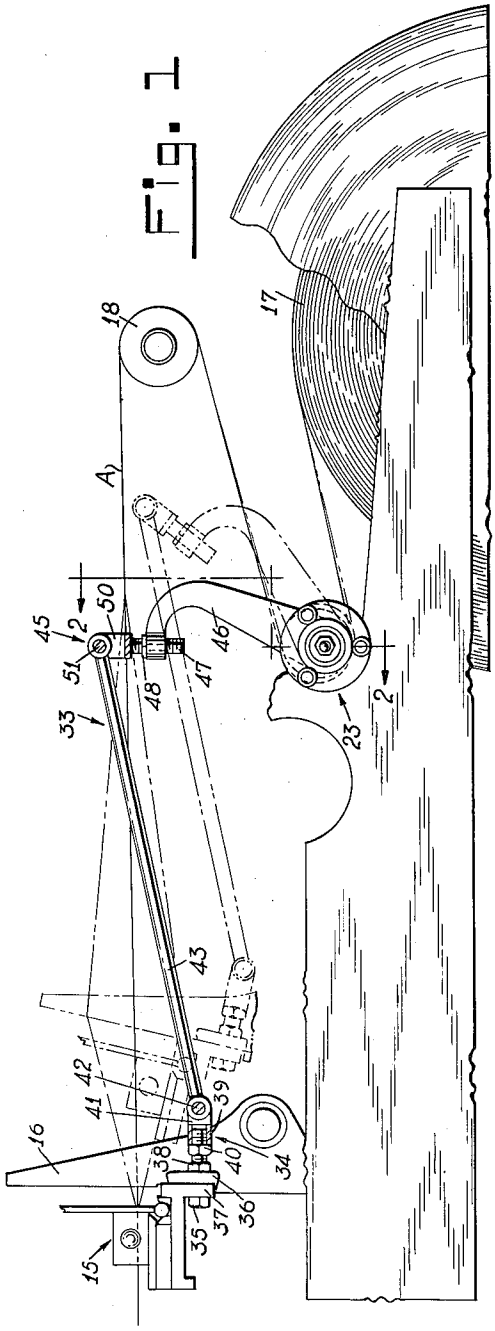


Fig. 3

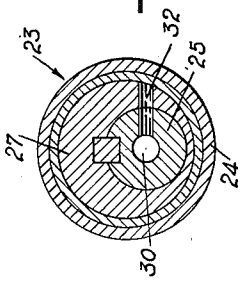


Fig. 2

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WARP TENSION COMPENSATOR

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The present invention relates generally to looms and more particularly to a shed tension compensating device for neutralizing variations in warp tension due to shedding action.

In a conventional loom, the length of yarn between the warp beam and the fell of the cloth is greater in an open shed than it is in a closed shed. The warp tension therefore would increase during the shed opening phases of the weaving cycle, if some arrangement were not provided to prevent it. This condition is avoided in some cases by making the whip-roll over which the warp passes oscillate, so that when the warp is slack, the whip-roll moves upward to take up the slack, and when the warp is tight, the whip-roll moves downward to relieve the tension therein.

In certain types of looms, such as those with automatic let-offs controlled by the oscillating action of the whip-roll, and those for the weaving of heavy fabrics, it is desirable to compensate for the variations in tension resulting from shedding to obtain thereby proper warp tension with much less strain on the let-off motion. Moreover, the automatic let-off motion may be such as not to permit wide oscillations in the whip-roll coextensive with differences in warp lengths between the open and closed sheds. In that case, a warp tension compensating device is provided separate from the whip-roll for guiding the warp in its passage from the warp beam to the fell of the cloth, and for alternately taking up the slack and relieveing the tightness in the warp resulting from shedding operations. This device usually takes the form of a lever carrying a roll over which the warp passes and cam operated according to the shedding cycle to take up the slack during shed closing and to relieve the yarn tension during shed opening. This type of device is subject to play, lost motion, vibration, and other disadvantages inherent in cam-controlled operations, especially at high speed.

One object of the present invention is to provide a new and improved warp tension compensating device which guides the warp in its passage from the warp beam to the fell of the woven cloth, which is automatically and positively operatable in accordance with the shedding cycle to regulate the tension of the warp and to maintain thereby said warp taut but not too tight, and which is free from the defects inherent in cam operations.

In accordance with certain features of the present invention, there is provided a tension compensating roll over which the warp passes, moved from the lay motion through a positive transmission in the form of a linkage, to relieve tenseness in the warp during shed opening and to maintain the warp taut during shed closing.

As a further feature, the tension compensating roll is mounted eccentrically on an axis and

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is rotated thereabout in accordance with the shedding cycle, to cause said roll to oscillate laterally and to effect thereby the necessary tension regulating function on the warp, as described.

As another feature, the device of the present invention is adjustable to regulate the amplitude of lateral movement of the tension compensating roll.

Various other objects, features and advantages of the invention are apparent from the following particular description and from an inspection of the accompanying drawings, in which:

Fig. 1 is a fragmentary side elevation of a loom looking from the right hand side thereof and showing a tension compensating device embodying the present invention;

Fig. 2 is a section of the tension compensating device taken along the lines 2—2 of Fig. 1, but showing said device on a larger scale; and

Fig. 3 is a section of the tension compensating roll taken on the lines 3—3 of Fig. 2.

Referring to the drawings, there is shown a loom comprising a pair of loomsides 10 and 11, each desirably of the double plate or web type. Only one web 12 of the right hand loomside 10 is shown. The two webs 13 and 14 of the left hand loomside 11 are shown. These webs are rigidly held in parallel relationship by cross-braces and the like (not shown).

The loom has the usual lay 15 operated from lay swords 16. Each of the lay swords 16 is connected to the lay 15 near one corresponding end thereof, and is located between the webs of the corresponding loomside. The loom is also provided with a warp beam 17 carrying the warp supply and with a whip-roll 18 which is located above said warp beam and which oscillates up and down to control automatically a suitable let-off motion (not shown) and to cause thereby the rotation of the warp beam and the unwinding of the necessary amount of warp yarn from said beam.

The loom is also provided with a tension compensating device 23, comprising a roll 24 disposed in front of the warp beam 17 and the whip-roll 18 between the loomside plates 12 and 13, and located below the level of said whip roll. The yarn A from the warp beam 17 passes around the compensating roll 24 on one side and around the whip roll 18 on the opposite side in serpentined fashion, passes through the heddles of the harness motion (not shown) for shedding operations and extends towards the cloth being woven.

The tension compensating device 23 comprises a rocker shaft 25 journalled in bearings 26 in the loomside webs 10, 11 and 12. Eccentrically supported on this rocker shaft is the roll 24 of cylindrical hollow construction, supported at each end on an eccentric 27 keyed or otherwise affixed

to said rocker shaft. The roll 24 is freely rotated about the eccentrics 27 by the tractive action of the yarn A passing thereover, and is internally lined for that purpose with bearing bushings 28, embracing said eccentrics respectively with free rotative fits. For lubrication purposes, the rocker shaft 25 has a center lubrication bore 30 closed at each end by a fitting 31 and communicating with the inner peripheral surface of each of the bearing bushings 28 by means of a transverse conduit 32 extending through said rocker shaft and through the corresponding eccentric 27.

The rocker shaft 25 is positively oscillated in synchronism with the lay motion and therefore, in phase with the shedding cycle by means of a linkage 33. For that purpose, one end of this linkage 33 is connected to one of the lay swords 16 by means of an adjustable pivotal connection 34 comprising a bolt screw 35 passing through a flange 36 on said lay sword and through a flange 37 on the lay 15 and affixed to said flanges by a nut 38, so that the screw serves not only as part of this pivotal connection but also as part of the means for connecting the lay to the lay sword. Threaded on to the projecting end of the screw 35 is a sleeve 39 locked in adjusted position on to said screw by a nut 40 and having a clevis extension or head 41 supporting a pivot pin 42 for one end of a link 43 constituting part of the linkage 33. The other end of the link 43 is secured by means of an adjustable pivotal connection 45 to the outer end of a crank 46 keyed or otherwise affixed at its inner end to the rocker shaft 25 between the loomside webs 13 and 14. The pivotal connection 45 comprises a screw 47 threaded into the outer end of the crank 46 and locked in adjusted position therein by means of a nut 48. The screw 47 has a clevis extension or head 50 carrying a pivot pin 51 for one end of the link 43.

The crank 46 has its outer end section 52 offset from the main body of said crank to cause the screw 47 to extend substantially radially with respect to the rocker shaft 25, and to permit thereby the effective length of said crank to be varied.

In the operation of the tension compensating device described, as the lay 15 is oscillated through the angular oscillation of the sword 16, the rocker shaft 25 is rotatively oscillated. This gives the encircling roll 24 a lateral movement or crank motion to an extent limited by the deviation of the center of said roll from the center of the rocker shaft 25. The lateral movement of the roll 23 is effected in synchronism with the movement of the lay 15 and therefore in synchronism with the movement of the harness motion and serves to take up the slack in the warp yarn when the shed is closing and to relieve the tension in the yarn when the shed is opening. In Fig. 1, the yarn A is shown in full lines during the weaving cycle, when said yarn is straight and in the cross-over phase, so that the shed is fully closed and is beginning to open. At this phase, the lay sword 16 is in front center position shown in full lines, and the crank 46 is in its forwardmost position, causing the roll 24 to be thrown forwardly in its limiting position. In this limiting position of the roll 24, the full slack of the yarn A is taken up. As the lay sword 16 begins to move rearwardly, the shed begins to open, and the tension on the yarn begins to increase. At the same time, the crank 46 moves clockwise (Fig. 1), causing the roll 24 to be thrown about the center of the rocker shaft 25

in a corresponding direction and the tension of the yarn to be released thereby. In the extreme rearward center position of the lay sword 16, shown in dot and dash lines in Fig. 1, the shed will be fully opened and the roll 23 will be in limiting thrown position, so that the yarn A will be in the dot and dash lines shown in Fig. 1, and the increased tension engendered by the opening of the shed will be relieved. In this manner, the roll 24 in its movement follows the tension of the yarn in accordance with the shedding operations, and thereby serves to maintain said yarn taut and not too tight.

The extent of crank throw of the roll 23 can be varied by varying the effective length of the crank 46. This crank length variation can be achieved by adjusting the extent to which the screw 47 is threaded into the outer end of the crank 46. The sleeve 39 can be adjusted on the screw 35 to bring the pivot pin 42 in proper relationship according to the effective length of the crank 46.

While the invention has been described with particular reference to a specific embodiment, it is to be understood that it is not to be limited thereto, but is to be construed broadly and restricted solely by the scope of the appended claims.

What is claimed is:

1. In a loom having a warp beam, a tension compensating mechanism for the warp comprising a roll over which the warp is adapted to pass in its passage from the warp beam towards the cloth being woven, an eccentric device mounted for eccentric movement about an axis, said eccentric device mounting said roll for movement therewith about said axis, and means for imparting a crank motion to said roll through said eccentric device in phase with the shed cycle to take up the slack in the warp while the shed is closing and to relieve the tension in the warp while the shed is opening.

2. In a loom having a warp beam, a tension compensating device for the warp comprising a rocker shaft mounted for rotation about a fixed axis, eccentric means secured to said shaft for rotation therewith, a roll embracing said eccentric means with a rotative fit and adapted to tractively engage the warp in its passage from the warp beam towards the cloth being woven, and means for rocking said shaft in phase with the shed cycle and for reciprocating thereby said roll laterally.

3. In a loom having a warp beam, a tension compensating device for the warp comprising a roll over which the warp is adapted to pass in its passage from the warp beam towards the cloth being woven, an eccentric device mounted for eccentric movement about an axis, said eccentric device mounting said roll for movement therewith about said axis, and means including a linkage for operating said eccentric device and for imparting thereby a reciprocating crank motion to said roll in phase with the shed cycle.

4. In a loom having a warp beam and a reciprocable lay, a tension compensating device for the warp comprising a rocker shaft mounted for rotation about a fixed axis, eccentric means secured to said shaft for rotation therewith, a roll embracing said eccentric means with a rotative fit and adapted to tractively engage the warp in its passage from the warp beam towards the cloth being woven, and a linkage between said reciprocable lay and said rocker shaft for rock-

ing said shaft in phase with the shed cycle and for reciprocating thereby said roll laterally.

5. In a loom having a warp beam, a tension compensating device for the warp comprising a roll over which the warp is adapted to pass in its passage from the warp beam towards the cloth being woven, and a linkage for positively reciprocating said roll laterally in phase with the shed cycle to take up the slack in the warp while the shed is closing and to relieve the tension in the warp while the shed is opening, and including a crank, a support for one end of said crank, a link for oscillating said crank about the axis of said support, an eccentric connection between said crank and said roll for reciprocating said roll laterally as said crank is oscillated about said axis, and a pivot connection between one end of said link and the other end of said crank including a screw threaded into said crank and carrying a pivot pin for said link, said screw being adjustable in said crank to adjust the effective length of said crank and thereby to adjust the amplitude of lateral movement of said roll.

6. In a loom having a warp beam and an oscillatory lay sword, a tension compensating device for the warp comprising a roll over which the warp is adapted to pass in its passage from the warp beam towards the cloth being woven, and a linkage between said lay sword and said roll for positively reciprocating said roll laterally in phase with the shed cycle to take up the slack in the warp while the shed is closing and to relieve the tension in the warp while the shed is opening, and including a crank, a support for one end of said crank, a link between said lay sword and said crank for oscillating said crank about the axis of said support, an eccentric connection between said crank and said roll for reciprocating said roll laterally as said crank is oscillated about said axis, a pivot connection between one end of said link and the other end of said crank adjustable to adjust the effective length of said crank and thereby to adjust the amplitude of lateral movement of said roll, and a pivot connection between the other end of said link and said lay sword adjustable to locate the pivot axis of said last-mentioned pivot connection in proper position to conform with adjustments in said first-mentioned pivot connection.

7. In a loom, a tension compensating device for the warp as described in claim 6, each of said pivot connections comprising a screw, a clevis adapted to pivotally receive one end of said link between the arms thereof and secured to said screw, and a pivot pin passing through said clevis and the end of said link, said clevis being adjustably movable to permit adjustments in the position of said pivot pin.

8. In a loom having a warp beam, a tension compensating device for the warp comprising a roll over which the warp is adapted to pass in its passage from the warp beam towards the cloth being woven, and a linkage for positively reciprocating said roll laterally in phase with the shed cycle to take up the slack in the warp while the shed is closing and to relieve the tension in the warp while the shed is opening, and including a crank, a support for the inner end of said crank, a link for oscillating said crank about the axis of said support, an eccentric connection between said crank and said roll for reciprocating said roll laterally as said crank is oscillated about said axis, and a pivot connection between one end of said link and the outer end of said crank including a screw threaded into said crank and carrying a pivot pin for said link, said screw extending substantially radially with respect to said axis, the outer end of said crank having an offset to permit the radial location of said screw with respect to said axis, said screw being axially adjustable in said crank to adjust the effective length of said crank and thereby to adjust the amplitude of lateral movement of said roll.

9. In a loom having a warp beam and a reciprocable lay sword, a tension compensating device for the warp comprising a rocker shaft mounted for rotation about a fixed axis, eccentrics secured to said shaft for rotation therewith, an idler roll embracing said eccentrics with a rotative fit and adapted to tractively engage the warp in its passage from the warp beam towards the cloth being woven, a crank connected to said rocker shaft, and a link pivotally connected at one end to said crank and pivotally connected at its other end to said lay sword to reciprocate said roll laterally in phase with the shed cycle.

10. In a loom, the combination as described in claim 9, comprising means for adjusting the effective length of said crank, and means for correspondingly adjusting the position of the pivot axis between said link and said lay sword.

11. In a loom, the combination of a reciprocable lay sword, a warp beam, a whip-roll above said warp beam, a hollow tension compensating roll forwardly of said warp beam and said whip-roll, the warp being adapted to extend forwardly from said warp beam, around one side of said tension compensating roll, rearwardly towards the whip-roll, around one side of said whip-roll, and forwardly towards the cloth being woven, a rocker shaft passing through and extending along said tension compensating roll eccentrically thereof, and mounted for rotation about a fixed axis, a pair of eccentrics affixed to said shaft near the ends respectively of said tension compensating roll and embraced by said tension compensating roll with a rotative fit, a crank affixed to said shaft, and a link pivotally connected at one end to said crank and pivotally connected at the other end to said lay sword, to reciprocate said tension regulating roll laterally in phase with the shed cycle forwardly and rearwardly of the loom.

12. In a loom, the combination comprising a pair of loomsides, at least one of the loomsides having double webs, a reciprocable lay sword between the double webs, a hollow tension compensating roll for the warp extending between said loomsides, a rocker shaft passing through and extending along said roll eccentrically thereof, and projecting from one end of said roll into the space between said double webs, a pair of eccentrics affixed to said shaft near the end respectively of said roll and embraced by said roll with a rotative fit, a crank affixed to the portion of said shaft projecting into said loomside space, and a link between said lay sword and said crank to reciprocate said roll laterally in phase with the shed cycle.

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