

March 17, 1964

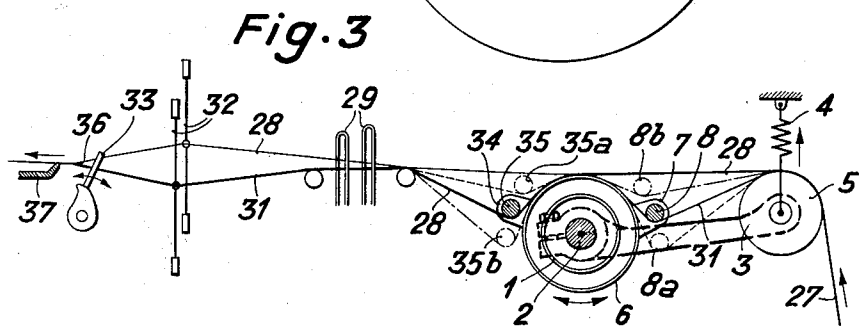
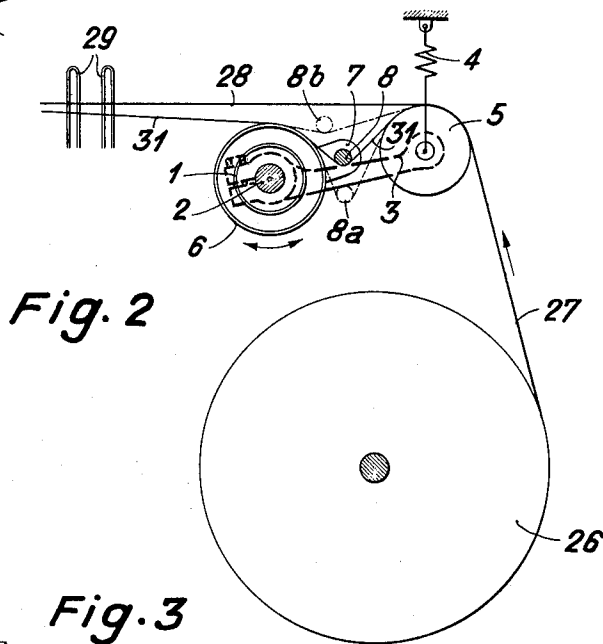
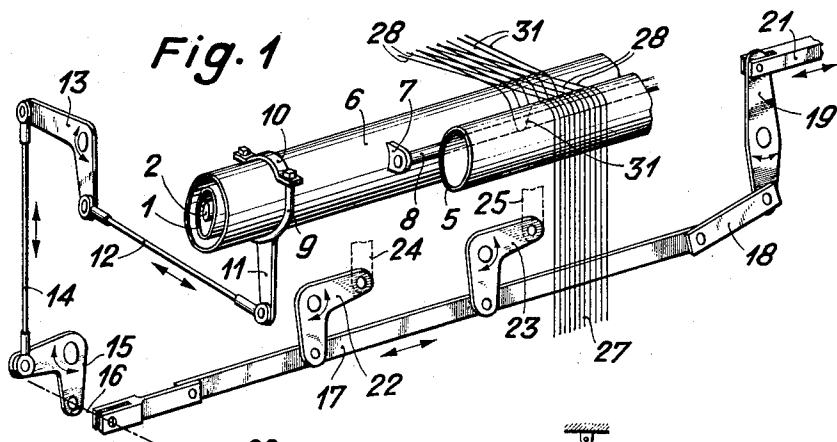
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WARP TENSION CONTROL IN WEAVING MACHINES

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2 Sheets-Sheet 1



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Fig. 4.

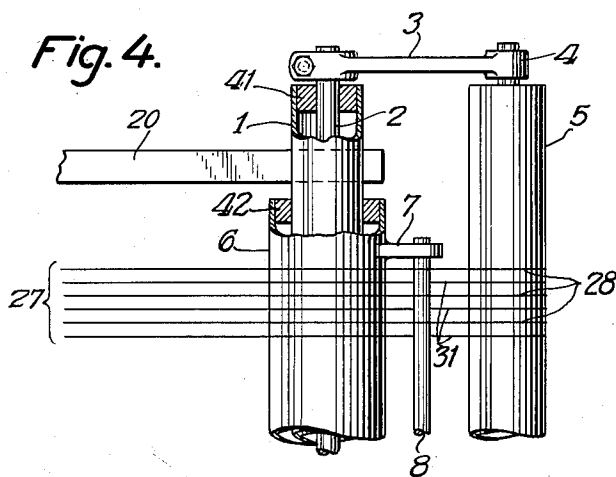


Fig. 5.

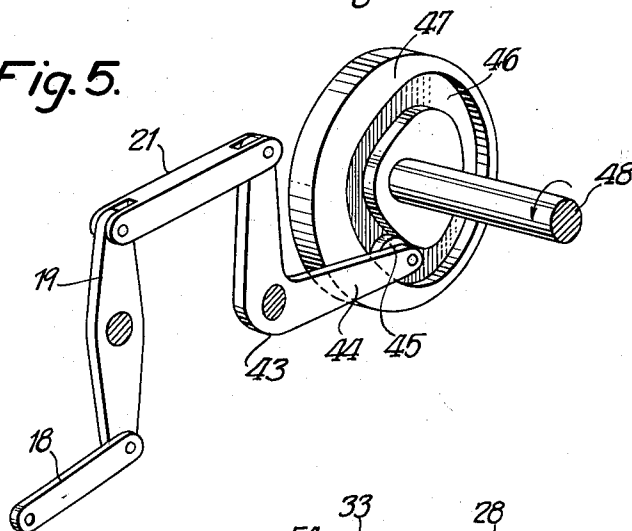
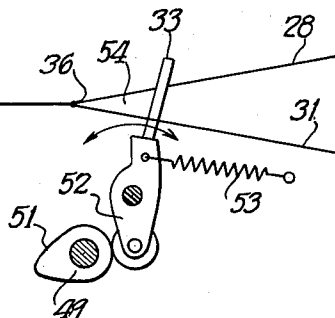


Fig. 6.



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WARP TENSION CONTROL IN WEAVING MACHINES

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4 Claims. (Cl. 139—115)

The present invention relates to a method and means for controlling the tension of warp threads in a weaving machine and more particularly to a method and means for periodically tensioning and slackening at least a portion of the warp threads.

The tensioning and slackening method and means according to the invention are used for what is known as rocking of the cloth, but may also be used for compensating the different lengths of the warp threads as occur during open shed and cross shed when weaving fabrics including leno or gauze weave. Rocking is a conventional weaving method when producing fabrics having many crossings of warp threads and weft threads, particularly when weaving according to the pattern 1:1. In this method, for example, the tension of the warp threads in the upper shed position is less than the tension of the warp threads in the lower shed position so that each weft thread, after it is beaten up, moves alternately several times into a position slightly above and slightly below the plane of symmetry of the shed. The purpose of this rocking movement of the last inserted weft thread is to increase the angle at which the warp threads extend around the weft threads for producing a close weave wherein the weft threads and the warp threads are equally spaced in the screen formed by the threads.

In conventional weaving machines wherein the warp threads are periodically stretched and released for rocking the cloth, the warp tension beam is placed somewhat above or below the plane of symmetry of the shed and the warp threads which are in upper shed position are less tensioned than the warp threads which are in lower shed position, because the path of the warp threads which are in upper shed position between the tensioning beam and the beat-up location is shorter than the path of the warp threads which are in lower shed position.

Another conventional mechanism for periodically stretching and releasing warp threads includes two rods which are parallel to the warp tensioning beam and arranged between the latter and the heddle frames. A portion of the warp threads is placed above one of the rods and below the second rod and the balance of the warp threads is passed below the first rod and above the second rod. Both rods are rocked when the weaving machine is in operation in synchronism with the beat-up operation so that the first rod is, for example, below its mid-position and the second rod is above its mid-position whereupon both rods are returned to mid-position and thereupon the first rod is moved above and the second rod below the mid-position, and so on.

The warp stretching and releasing mechanism according to the invention includes an oscillatable carrier beam and at least one rodlike element mounted thereon in parallel relation to the rocking axis of the carrier beam, a portion of the warp threads being guided by said rodlike element. The latter is rocked around the axis of the carrier beam in a rhythm corresponding to the rhythm in which the weft threads are beaten up. In contradistinction to the conventional arrangement first described above wherein the rotation axis of the warp tensioning beam is not within the plane of symmetry of the shed, in the mechanism according to the invention the warp threads are

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not continuously subjected to variable tension but are tensioned or released only if the rodlike element is moved from an idle mid-position to an active position above or below the mid-position. This permits actuation of the stretching and releasing mechanism only momentarily. In the cloth rocking method and apparatus according to the invention the rocking mechanism is moved from an idle position to an active position only at the moments when a weft thread is beaten up. Therefore, the warp threads are additionally tensioned or released, as is required for producing the rocking movement of the cloth, only during very short periods of time.

The mechanism according to the invention requires less space than the second conventional arrangement described above which has two rocked rods. In the mechanism according to the invention a warp carrier beam which is usually provided anyway in the weaving machine forms part of the rocking mechanism so that no additional elements need be placed between the existing warp carrying beam and the heddles.

Corresponding rhythm or synchronism between the rocking movement and the beating up of weft threads referred to in this specification means that there is a rational ratio between the number of beat-ups of weft threads and the number of active positions or the number of complete movements from one active position to the opposite active position per time unit of the rocking mechanism. This ratio amounts, for example, to 1:1, 2:1, 3:1, 3:2, 4:1. There is, for example, movement of the rocking mechanism into a first active position at the first beat-up, movement of the rocking mechanism to the second active position at the second beat-up, return of the rocking mechanism to the first active position at the third beat-up, and so forth, or movement of the rocking mechanism to a first active position at the first beat-up, movement of the rocking mechanism to the idle mid-position at the subsequent beat-up, movement of the rocking mechanism to the second active position at the third beat-up, and so on. The once adjusted rhythm is maintained as long as the weaving machine is in operation by suitable operative connection of the actuating mechanism for the reed and the rocking mechanism.

In a preferred embodiment of the invention the rodlike element is mounted on a tube oscillatable around its axis and forming a warp carrier beam, the tube being oscillated when the weaving machine is in operation in order to move the rodlike element from an idle mid-position to active positions below and above the mid-position. Oscillation of said tube and the rod-like element connected thereto is preferably effected by the shedding mechanism. If the weaving machine is stopped, for example, due to breakage of a weft thread and the shedding mechanism is manually operated in reverse, the rhythm of actuation of the rocking mechanism relative to the rhythm of actuation of the shedding mechanism remains unchanged so that it is not necessary to readjust the rocking mechanism when operation of the loom is resumed after the thread breakage is corrected.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing wherein:

FIG. 1 is a diagrammatic perspective illustration of a portion of a weaving machine according to the invention.

FIG. 2 is a diagrammatic elevation of the mechanism illustrated in FIG. 1 the figure also showing a warp beam.

FIG. 3 is a diagrammatic elevation of a loom including a modified mechanism according to the invention.

FIG. 4 is a plan view of the mechanism shown in FIG. 3.

FIG. 5 is a perspective illustration of a detail of the mechanism according to the invention.

FIG. 6 is a diagrammatic elevation of another detail of the mechanism.

Referring more particularly to the drawing, numeral 1 designates a stationary tube rigidly connected to a frame part 20 of a weaving machine and forming a carrier beam rotatably supporting a shaft 2 by means of bearings 41. Arms 3 are connected to the shaft 2 and rotatably support a warp tensioning beam 5 which is also supported by one or more springs 4.

The carrier beam 1 also rotatably supports, by means of bearings 42, a tube 6 to which two brackets 7 are connected for supporting a rodlike element 8. A lever 11 having prongs 9 at one end straddling the tube 6 is made fast on the tube 6 by means of a strap 10. The free end of the lever 11 is connected by means of a link 12 to one arm of an angle lever 13, the other arm of the latter being connected to one arm of a second angle lever 15 by means of a link 14. The second arm of the lever 15 is connected by a link 16 to a rod 17 which is connected by a link 18 to one arm of a two-arm lever 19, the second arm of the lever 19 being connected to a rod 21.

As seen in FIG. 5, the rod 21 is pivotally connected to one arm of an angle lever 43 whose second arm 44 is provided with a cam follower roller 45 guided in a groove 46 of a driving disc 47 mounted on a shaft 48. The shaft 48 is driven by a shaft 49, for example, through gears, not shown. Shaft 49 carries a cam 51 reciprocatingly actuating a lay 52 against the action of a spring 53. The lay supports a reed 33 for beating weft thread into the apex 36 of a shed 54 formed by warp threads 28, 31. The ratio of the speeds of rotation of the shafts 48 and 49 is rational, for example 2:1. One arm of angle levers 22 and 23 is connected to the rod 17, the other arms of the levers 22 and 23 being connected through links 24 and 25 to heddle frames for actuating the latter.

In the illustrated example, the cam groove 46 is so shaped that the rocking mechanism 6, 8 is moved into one or the opposite actuating position only at the moment a weft thread is beaten up. If a heddle frame is actuated by levers 22, 23 actuated by the rod 17, the groove 46 would have to be so shaped that the rocking mechanism 6, 8 is actuated during longer periods of time.

The shedding mechanism driven by the shaft 48 drives two heddle frames or two groups of heddle frames in the conventional manner. One of the heddle frames or one group thereof is moved to upper shed position while the second heddle frame or group of heddle frames is moved into lower shed position. Each group of heddle frames may comprise, for example, four or five parallel heddle frames.

The warp 27 unwound from a warp beam 26 (FIG. 2) runs over a warp tension beam 5. A portion 28 of the warp threads passes through detectors 29 of a stop motion mechanism, not shown, to heddle frames, not shown in FIG. 2, and therefrom through a reed, not shown in FIG. 2, to the beat-up location, the resulting fabric being wound onto a cloth beam, not shown. The balance 31 of the warp threads passes beneath the rod 8 between the warp tensioning beam 5 and the tube 6 whereupon this portion of the warp threads is guided in the same manner as the warp portion 28.

When the loom is in operation the rod 8 is alternately moved from the mid-position shown in solid lines in FIG. 2 downward into the position 8a shown in dotted lines and upward into the position 8b shown in dash-dot lines. When the rod 8 is in mid-position the tension of the warp threads 31 is the same as the tension of the warp threads 28. Movement of the rod 8 is effected simultaneously with the movement of the reed and the heddle frame

actuated by the levers 22 and 23. The distances between the positions 8a and 8b from the mid-position are exaggerated in FIG. 2. If the portion 31 of the warp threads is in upper shed position and the portion 28 is in lower shed position and the reed moves toward beat-up position, the rocking tube 6 and the rod 8 are moved only during the beat-up moment, for example, counterclockwise so that the rod 8 is temporarily in the position 8b and the tension of the warp threads 31 is reduced relative to the tension of the warp threads 28. Thereupon the rod is returned to the mid-position whereupon the shed is changed and the warp threads 31 move to the lower shed position while the warp threads 28 move to the upper shed position. At the subsequent beat-up the elements 6, 8 are momentarily rocked clockwise around the shaft 2 to the position 8a so that the threads 31 are subjected to a greater tension than the threads 28. At the subsequent thread change the threads 31 are once more in upper shed position and the threads 28 are in lower shed position. Since the tension of the warp portions 28 and 31 is simultaneously affected by the action of the spring 4 and the tensioning beam 5, the total tension of the warp 27 is constant. For example, if the rod 8 is in the position 8a, the tension of the threads 31 is so much greater than the tension of the threads 28, that the sum of both tensions is equal to said constant tension. If the rod 8 is in the position 8b the tension of the threads 31 is less and that of the threads 28 is so much greater than the sum of the tension amounts to the constant tension.

In the embodiment of the invention shown in FIG. 3 showing the heddle frames 32, the reed 33 and the beat-up location 36, two additional brackets 34 are mounted on the rocking tube 6 which carry an additional rocking rod 35 parallel to the shaft 2. The warp threads 28 pass below the rod 35, the warp threads 31 passing below the rod 8 as in the mechanism shown in FIG. 2.

It is assumed that the reed 33 shown in FIG. 3 moves counterclockwise and is on its way to the beat-up position. Shortly before the beat-up the rocking tube 6 is moved clockwise so that the rocking rod 8 is in its lower position 8a at the beat-up and the rod 35 is at the same time in the upper position 35a and the warp threads 28 which are in upper shed position are under less tension than the normal tension and the warp threads 31 which are in lower shed position are under a tension which is greater than the normal tension. When the beat-up is completed the reed 33 is moved in clockwise direction as seen in FIG. 3, and the rods 8 and 35 return to the mid-position which is shown in solid lines whereby the tension of the warp threads in the upper shed position is the same as the tension of the warp threads which are in the lower shed position. At the subsequent change of shed the threads 28 are moved into the lower shed position and the threads 31 are moved in the upper shed position. The tube 6 is temporarily moved counterclockwise at the subsequent beat-up whereby the rod 8 moves into the upper position 8b and the rod 35 moves to the lower position 35b. The threads 28 which are now in the lower shed position are subjected to above normal tension and the threads 31 which are now in the upper shed position are subjected to subnormal tension.

Although, theoretically, it does not matter whether the threads which are in upper shed position or the threads which are in lower shed position are momentarily subjected to a reduced tension, it is advisable to reduce the tension of the warp threads which are in upper shed position, because this produces a tension component of the entire warp at the beat-up location 36 which is downwardly directed so that the cloth and the warp are automatically held to a support 37.

Since the drive of the rocking mechanism 6, 8, 35 is derived from the shedding mechanism, the rhythm of the rocking movements is always in a fixed relation to the rhythm of the movement of the heddles, also during

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periods when the heddles are operated in reverse, for example, after a weft thread breakage. There is no such advantage if the drive of the reed 33 is operatively connected to the drive of the rocking mechanism 6, 8, 35, because a manual reverse operation of the weaving machine usually does not include operation of the reed but includes only reverse operation of the shedding mechanism.

The described examples of the mechanism according to the invention can also be used when producing leno or gauze weave, whereby the different lengths of the weft threads at open shed and cross shed must be compensated, i.e., the effective length of a weft thread must be increased or decreased at substantially constant weft thread tension.

I claim:

1. In a weaving machine having a warp beam, a warp tensioning beam for all warp threads, a carrier beam supporting said tensioning beam, the axes of rotation of said beams being parallel, and warp threads running off said warp beam and over said tensioning beam: a rodlike element placed in parallel relation and adjacent to said carrier beam, and means for oscillating said rodlike element around the longitudinal axis of said carrier beam, at

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least a portion of said warp threads passing from said tensioning beam to engagement with said rodlike element and with said carrier beam for periodic stretching and slackening of said portion of said warp threads.

2. In a weaving machine as defined in claim 1, means coaxially rotatably supported by said carrier beam, said rodlike element being rigidly connected to said last mentioned means.

3. In a weaving machine according to claim 2 and wherein said means coaxially rotatably supported by said carrier beam is in the form of a tube surrounding said carrier beam.

4. In a weaving machine as defined in claim 1, a shedding mechanism, said means for oscillating said rod-like element being operatively connected to said shedding mechanism for actuation thereby.

References Cited in the file of this patent

UNITED STATES PATENTS

667,527	Hutchins	Feb. 5, 1901
2,125,339	Grimm	Aug. 2, 1938
2,966,930	Pfarrwaller	Jan. 3, 1961