May 13, 1958 S. FÜRST 2,834,091

BEAM WARPING MACHINE

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Fig. 1.

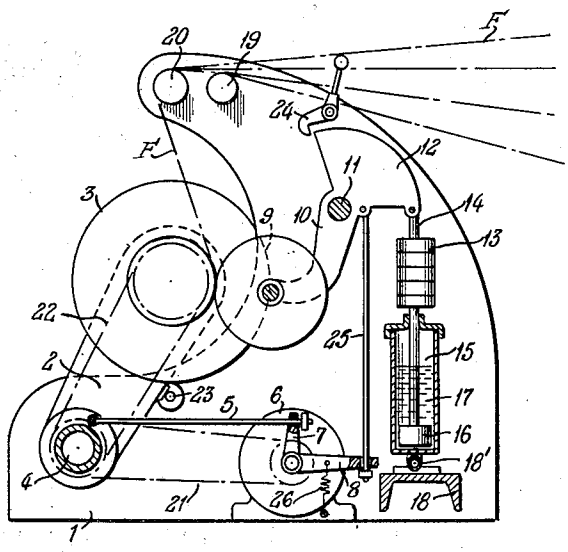


Fig. 2.

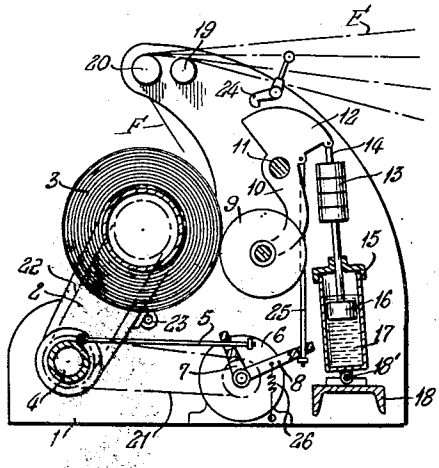
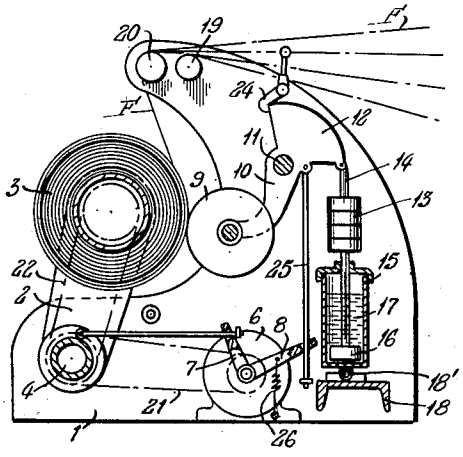


Fig. 3.



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BEAM WARPING MACHINE

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12 Claims. (Cl. 28—38)

My invention relates to a beam warper for the beaming of arrays of yarn in the manufacture of fabrics.

The beaming of threads for use in the manufacture of textiles must be effected under a thread tension adapted to the requirements of the particular fabricating operation. If the warp beam, prior to further fabrication of the material, is to be subjected to liquid processing, for instance dyeing or bleaching, then the array of threads beamed upon the warp beam must form a very soft winding so that the beam, during liquid processing, is not damaged by shrinking of the yarn and the beamed-up yarn is not impaired or irregularly processed due to non-uniform effects of the processing liquid. On the other hand, if the beamed amount of yarn is to be directly passed from the warp beam to a sizing machine or to a loom, then a hard winding of warp is preferable.

Therefore, the known warpers have been provided with mechanical and hydraulic devices which vary the winding hardness by changing the pressure exerted upon the beam. These devices are intricate and are not controllable to the desired extent.

It is an object of my invention to provide warper control means of improved simplicity and reliability that permit a control of the winding hardness within a wider range than heretofore practicable.

To this end, and in accordance with a feature of my invention, the warp beam and the pressure roller cooperating therewith are individually displaceable toward and away from each other, preferably by swinging motion about respective pivot axes, and are also individually arrestable in respective predetermined limit positions. This permits the selective use of either the warp beam or the pressure roller for determining the pressure imposed upon the warp winding during beaming operation and thus affords a much greater range of pressure adjustment than heretofore available.

When the winding pressure is produced by the warp beam leaning against the pressure roller, such pressure is comparatively great because it is caused by the weight of the heavy beam and of the warp material wound upon it. Hence, the winding is apt to be rather hard. According to another feature of my invention, therefore, I place the movable pressure-roller assembly under the effect of a biasing force that, when effective, exerts a much smaller pressure upon the warp material so that a soft warp winding is produced. That is, in such a machine the pressure roller is arrested in a fixed position of its rotation axis and the warp beam is released for yielding displacement relative to the roller if a hard winding is to be produced, whereas the position of the beam is arrested and the roller is released for yielding motion if a soft winding is desirable.

According to another feature of the invention, either one or both of the warp-beam assembly and pressure-roller assembly are provided with a damping or dash-pot device to reduce oscillations that may occur during beaming operation. Preferably only the pressure-roller assembly is equipped in this manner.

For securing the proper amount of pressure, it is further preferable to completely or nearly completely balance the weight of the pressure roller by means of a counter poise and to use selectively adjustable force means, such as weights or sets of weights, for producing the warp-beam engaging pressure of the roller.

It is known to vary the speed of the beam drive in accordance with the amount of warp material being built up on the beam, so that the angular speed of the beam is automatically reduced with increasing diameter of the warp winding to maintain a substantially constant peripheral speed. In the known warping machines, this speed control is derived either from the operation of a feeler not responsive to the winding hardness, or by the warp beam itself. It is also known to control the drive from a movable driving roller frictionally acting upon the beam. These types of motor control, however, are not adequate for a warping machine according to the invention. According to another feature of the invention, therefore, the control of the drive is effected in selective dependence upon yielding motion of the warp beam as well as upon yielding motion of the pressure roller. In any one condition of operation, the one machine component that then controls the winding pressure and hence the winding hardness is thus also active to effect speed control of the beam drive. That is, either the pressure roller or the warp beam, as the case may be, is operative to effect the speed control.

For obtaining a soft warp winding, it is of advantage to arrest the position of the beam already in the empty condition of the beam and to release the pressure roller for yielding motion. In this case the beam is placed upon or against a stationary stop. Since the beam as such has considerable weight and increases its weight to a further extent as the warp winding builds up its diameter, the beam weight is sufficient to make it rest upon the stationary stop. Such a stop is preferably located on the side of the warp beam facing the pressure roller so that the beam journaling or supporting means will abut against the stop when in the extreme position. If desired, the beam can be fixed in this position by means of a latching device. On the other hand, if a hard warp winding is desired, it is of advantage to arrest the position of the much lighter pressure roller by means of a positively acting latch preferably in the extreme position of the pressure roller toward the warp beam.

An embodiment of a beam warper according to the invention is illustrated on the drawing by way of example.

Fig. 1 shows a warping machine in part-sectional side elevation.

Fig. 2 shows the same machine set for producing a soft warp winding.

Fig. 3 shows the same machine set for producing a hard winding.

The machine frame 1 carries a swing-arm structure 2 pivotally mounted on a shaft 4. The warp beam 3 is journaled on the arm structure. Connected with the swing arm 2 is a control rod 5 which acts upon a speed control mechanism 6 of the beam drive by entraining a crank arm 7. A second crank arm 8 is firmly connected with crank arm 7 in angular relation thereto. A pressure roller 9 is revolvably mounted on another swing-arm carrier structure 10 which is pivotally movable on a shaft 11 mounted on the machine frame 1. The pressure roller 9 is balanced by a counter poise 12. The pressure roller 9, when moving about the axis of pivot shaft 11, can be subjected to the effect of a set of selected weights 13 placed on a rod 14. A piston 16, secured to the rod 14,

cooperates with a cylinder 15 and the liquid 17 therein to form an hydraulic damping device. The damping device is pivotally mounted at 18' to a cross rail 18 firmly secured to the machine frame 1. While only one swing arm 2 and only one swing arm 10 are visible on the drawing, it will be understood that two arms 2 and also two arms 10 are preferably provided, each two arms being located on opposite axial sides of the warp beam and pressure roller respectively.

The array of threads F to be beamed passes through a comb 19 and a measuring roller 20 onto the beam 3 where it forms the warp winding. The beam 3 is directly driven by chains 21 and 22. The pivotal movement of the swing arm 2, of the warp beam 3, toward the right is limited by a stationary stop 23 mounted on the machine frame. The extreme left-hand position of the pressure roller 9 is determined by a latch pawl 24.

If the beam is to wind a hard winding of warp, the pawl 24 is placed into latching engagement. Then the rotating warp beam 3, due to the increasing diameter of the warp winding, swings gradually toward the left, thus moving away from the stop 23 as the warp winding is being built up. This is apparent from the stage of operation illustrated in Fig. 3. The weight component of warp beam plus warp winding, acting toward the pressure roller 9, produces the required pressure engagement between warp winding and pressure roller and thus determines the hardness of the warp winding.

If desired, a control or regulation for uniformity of pressure can be secured with conventional means which are not illustrated because they are not part of, or essential to, the invention. If a soft beam is to be wound, the pawl 24 is released. The swing arm 2 now rests against the stop 23 as shown in Fig. 2, and the pressure roller can yield backwards. During yielding movement, caused by the increasing diameter of the warp winding being built up, the pressure roller 9 exerts upon the winding a pressing force corresponding to the particular set of weights 13 mounted on the rod 14. Preferably, the pressure thus produced is considerably lower than the pressure produced when the warp beam 3 provides the pressure force as a proportion of its total weight.

During winding of the warp beam, the speed of the electric beam drive is also automatically controlled in accordance with the particular amount of warp material wound up on the beam at any time so as to maintain constant peripheral speed of the winding. This automatic control is effected by displacement of the drive control mechanism 6 through the control rod 5. The rod 5 entrains the crank arm 7 so that this arm is moved in proportion to the displacement of the beam. However, if for producing a soft warp winding the latch pawl 24 is released so that the pressure roller 9 can yield toward the right, then the rod 25 is entrained by the movement of swing arm 10 and counter poise 12. This movement is proportionately transmitted to the crank arm 8 so that now the control of the drive mechanism is effected through crank arm 8 instead of through arms 7 (Fig. 2). A spring 26 always takes care of returning the drive control mechanism to the initial setting as soon as the beam 3 is in the position determined by the stop 23 and the pressure roller 9 is in the left-hand extreme position.

By virtue of the fact that in a machine according to the invention the pressure controls for hard and soft winding operations are assigned to two different and selectively operable machine components, namely the warp beam and the pressure roller, these two machine components can be better adapted to the particular requirements than has heretofore been possible. Also due to the fact that either the warp beam or the pressure roller can be set to be individually yieldable, the obtainable pressure range is greatly increased so that the conditions best suited for a particular kind of warp winding can be more fully satisfied. It is also an advantage that the pressure roller, when in movable condition, can be made to produce a considerably smaller pressure than heretofore available which, besides, can also be varied to suit any particular requirements.

It will be obvious to those skilled in the art that my invention permits of various modifications as regards the design and arrangement of the machine components and hence can be embodied by machines other than the one particularly illustrated and described, without departing from the essential features of the invention as set forth in the claims annexed hereto.

I claim:

1. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam, an arm structure on which said beam is journaled, a pivot located beneath the axis of said beam, said arm structure being pivotally movable about said pivot so that the beam weight has a pressure component directed toward said roller when said beam axis is horizontally displaced toward said roller relative to said pivot, arresting means for said beam comprising a fixed stop enagageable with said arm structure on the side facing said roller so as to define the extreme beam position on said side, a carrier structure on which said pressure roller is journaled, said carrier structure being displaceable in a direction transverse to the beam axis, biasing means connected with said carrier structure for urging it toward said beam, and latch means to delimit the extent of displacement of the carrier structure in a direction transverse to and away from the beam axis.

2. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam, an arm structure on which said beam is journaled, a pivot located beneath the axis of said beam, said arm structure being pivotally movable about said pivot so that the beam weight has a pressure component directed toward said roller when said beam axis is horizontally displaced toward said roller relative to said pivot, arresting means for said beam comprising a fixed stop engageable with said arm structure on the side facing said roller so as to define the extreme beam position on said side, another arm structure on which said pressure roller is journaled, said latter arm structure having a pivot axis above the roller axis and having a counter poise approximately balancing said roller about said pivot, adjustable force means connected with said latter arm structure for biasing said roller toward said beam, and arresting means engageable with said latter arm structure for selectively setting it to a fixed position.

3. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable in a direction transverse to the beam axis, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam axis being non-arrested and that of the pressure roller axis away from the beam axis being arrested to produce a hard winding.

4. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable in a direction transverse to the beam axis, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam axis

being non-arrested and that of the pressure roller axis away from the beam axis being arrested to produce a hard winding, a drive connected with said beam for imparting revolution thereto and having speed regulator means, and several control means operatively connecting said regulator means with said beam and said roller and independently operative to control said regulator means in response to the yielding movement effective at a given time.

5. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable in a direction transverse to the beam axis, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam axis being non-arrested and that of the pressure roller axis away from the beam axis being arrested to produce a hard winding, said roller having biasing force means of a force direction toward said beam, said force means applying to the warp on said beam a pressure force smaller than the pressure caused by said beam when said beam is not arrested by said arresting means.

6. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable transverse to the beam axis, said pressure roller being journalled on an arm structure, a pivot about which said arm structure is rotatable and from which it is suspended, said pivot having an axis parallel to the axis of said beam, a counterpoise joined with said arm structure and substantially balancing said roller about said pivot, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam axis toward the roller axis being non-arrested and the pressure roller axis being arrested to produce a hard winding, and said roller having biasing force means of a force direction toward said beam, said biasing force means applying to the warp on said beam a pressure force smaller than the pressure caused by said beam when said beam is not arrested by said arresting means, said biasing force means being connected with said arm structure and being adjustable for varying said biasing force.

7. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable transverse to the beam axis, said pressure roller being journalled on an arm structure, a pivot about which said arm structure is rotatable, said pivot having an axis parallel to the axis of said beam, a counterpoise joined with said arm structure and substantially balancing said roller about said pivot, said beam and roller having individual arresting means which delimit the extent of movement of the beam axis toward the roller axis and of the roller axis away from the beam axis, the beam axis being thus arrested and the pressure roller axis non-arrested to produce a soft winding, the beam axis being non-arrested and the pressure roller axis being thus arrested to produce a hard winding, said roller having biasing force means of a force direction toward said beam, said biasing force means applying to the warp on said beam, by means of said roller, a pressure force smaller than the pressure caused by said beam when said beam is not arrested by said arresting means, said biasing force means comprising a carrier connected with said arm structure, a set of selective weight members mounted on said carrier for imposing said biasing force upon said roller, and a damping device operatively connected to the pressure roller to damp the yielding movement of the roller.

8. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable transverse to the beam axis, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam axis being non-arrested and that of the pressure roller axis away from the beam axis being arrested to produce a hard winding, said roller having biasing force means of a force direction toward said beam, said force means applying to the warp on said beam a pressure force smaller than the pressure caused by said beam when said beam is not arrested by said arresting means, a drive connected with said beam for imparting revolution thereto and having speed regulator means, and separate control means operatively connecting said speed regulator means with said beam and said roller for controlling said regulator means in response to the yielding movement effective at a given time.

9. A beam-warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam, an arm structure on which said beam is journalled, a pivot for said arm structure, the beam weight having a pressure component directed toward said roller when the axis of said beam is displaced toward said roller on said pivot, stop means defining the extreme beam position on the side facing said roller, another arm structure on which said pressure roller is journalled, a second pivot for said latter arm structure, adjustable force means connected with said latter arm structure for biasing said roller toward said beam, and arresting means settable to delimit the extent of movement of the pressure roller about said second pivot in the direction away from the beam.

10. A beam-warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam, an arm structure on which said beam is journalled, a pivot for said arm structure, the beam weight having a pressure component directed toward said roller when the axis of said beam is displaced toward said roller on said pivot, stop means defining the extreme beam position on the side facing said roller, another arm structure on which said pressure roller is journalled, a second pivot for said latter arm structure, adjustable force means connected with said latter arm structure for biasing said roller toward said beam, and arresting means settable to delimit the extent of movement of the pressure roller about said second pivot in the direction away from the beam, a drive connected with said beam for imparting revolution thereto and having speed regulator means, and separate control means operatively connecting said speed regulator means with said beam and said roller for controlling said regulator means in response to the yielding movement effective at a given time.

11. A beam-warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable wtih the warp on said beam, an arm structure on which said beam is journalled, a pivot for said arm structure, the beam weight having a pressure component directed toward said roller when the axis of said beam is displaced toward said roller on said pivot, stop means defining the extreme beam position on the side facing said roller, another arm structure on which

said pressure roller is journalled, a second pivot for said latter arm structure, the second pivot being offset laterally from the first pivot, the weight of the pressure roller turning the pressure roller on the second pivot away from said beam, adjustable force means connected with said latter arm structure for biasing said roller toward said beam, and arresting means settable to delimit the extent of movement of the pressure roller about said second pivot in the direction away from the beam.

12. A beam warping machine, comprising a revolvable warp beam, a revolvable pressure roller parallel to said beam and engageable with the warp on said beam to impose winding pressure thereupon, said beam and roller having rotational axes which are yieldingly movable in a direction transverse to the beam axis, said beam and roller having individual arresting means which delimit the extent of movement of beam and roller axes, the movement of the beam axis toward the roller axis being arrested and the pressure roller axis non-arrested to produce a soft winding, the said movement of the beam

axis being non-arrested and that of the pressure roller axis away from the beam axis being arrested to produce a hard winding, said roller having biasing force means of a force direction toward said beam, said force means applying to the warp on said beam a pressure force smaller than the pressure caused by said beam when said beam is not arrested by said arresting means, and a damping device operatively connected to the pressure roller to damp the transverse yielding movement of the said roller.

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