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TERRY WARP FEEDING METHOD AND APPARATUS

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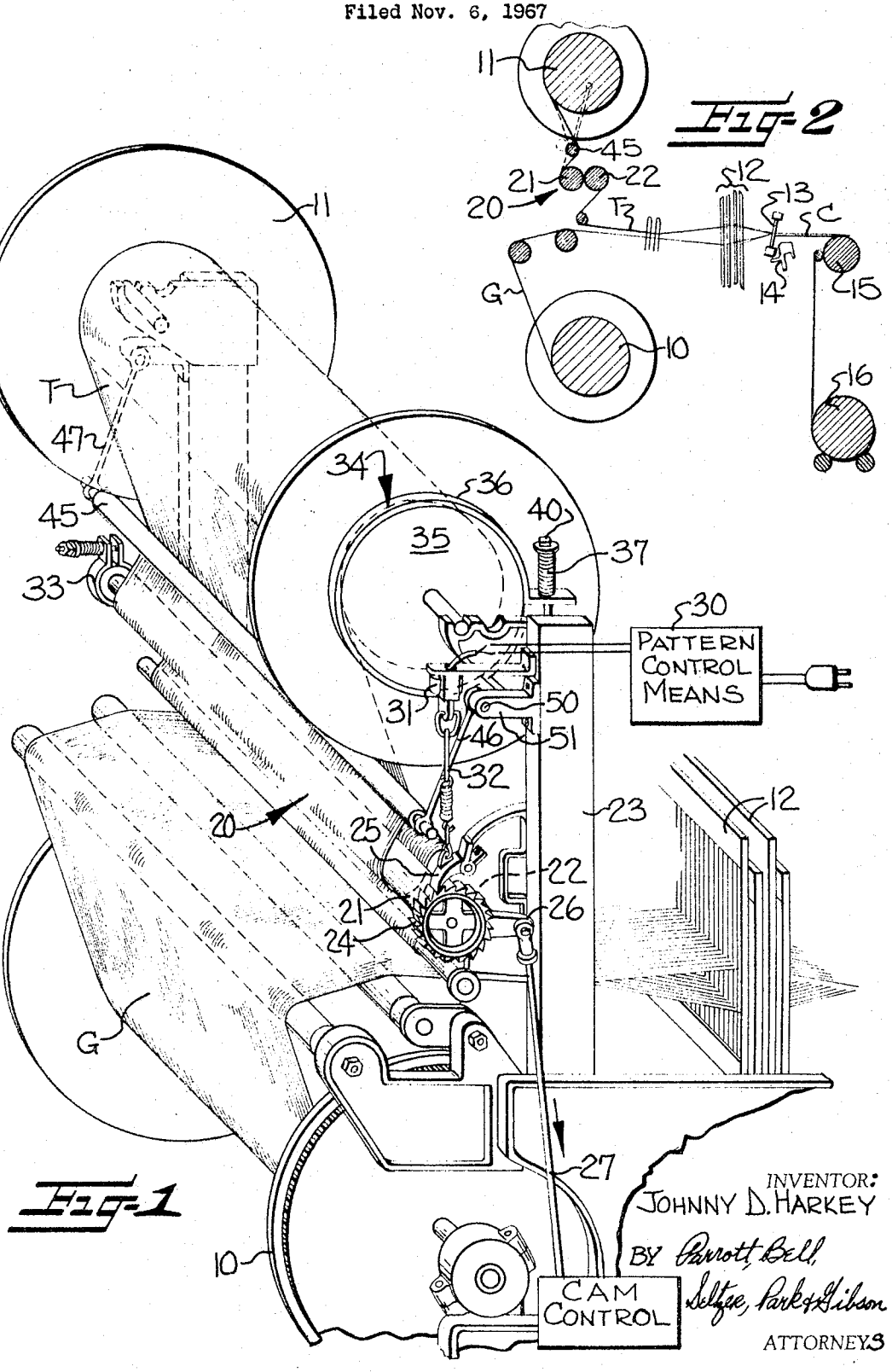


Fig-2

Fig-1

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TERRY WARP FEEDING METHOD AND APPARATUS

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ABSTRACT OF THE DISCLOSURE

To aid in feeding terry warps during each fast pick of a terry loom, predetermined lengths of terry warps are withdrawn from a terry warp beam during intervals between spaced feeding intervals of a positive terry warp feeding device, and in the course of the terry warps to the feeding device, so as to avoid breakage of the terry warps in this area. Such withdrawal of terry warps is effected by continuously applying a lateral yielding force to the terry warps through the medium of a pendulous bar engaging the terry warps between the beam and the feeding device.

This invention relates to terry looms, and more particularly to improvements in the feeding of terry warps from a warp beam to the weaving instrumentalities of such looms.

Generally, terry looms are equipped with a positive feeding device, known as a terry warp let-off, which is intermittently driven by a pattern controlled ratchet mechanism for quickly withdrawing and delivering terry warps from a warp beam thereabove to the weaving instrumentalities at spaced intervals coinciding with respective fast picks incident to successive terry-loop-forming cycles of a terry loom. Terry warp let-offs of this type are disclosed in U.S. Patent No. 3,130,756 dated Apr. 28, 1964 and in British Patent No. 547,864 dated Sept. 15, 1942, for example.

In the interests of production economy, it is desirable to utilize substantially larger terry warp spools or beams than were used for many years. Also, some form of braking device is used to prevent overrunning of terry warp beams upon each positive feeding interval of the positive feeding device. As is well known, the larger the diameter of the warp package on the terry warp beam, the greater is the pulling force which must be applied to the terry warps to overcome the inertia of the warp beam and its braking device. Since the positive terry let-off must function very quickly in order to feed the desired length of terry warps to the weaving instrumentalities during a single pick of the loom, this has necessitated the application of an abrupt and strong, short-term pulling force to the terry warps in order to overcome the inertia of, and to rotate, the warp beam; especially where the warp beam was very large, thus unduly stretching and causing breakage of the terry warps.

The primary object of this invention is to reduce the shock of the withdrawal of terry warps from the warp beam by effecting a relatively long-term withdrawal which may extend throughout the entire interval of each terry-loop-forming cycle (three or more picks), instead of a short-term withdrawal of the terry warps from the beam which extends through the time interval of only a single pick of the loom. Such long-term withdrawal provides for a gradual reaction of the terry warps and the beam to the force being applied to the terry warps, thereby avoiding abrupt applications of high tension to the terry warps, and substantially reducing or eliminating breakage of terry warps during positive feeding intervals thereof.

Another object is to provide a method and apparatus

for feeding terry warps to weaving instrumentalities of a loom, wherein a substantially continuous lateral yielding force is applied to the terry warps; preferably by means of a pendulous bar or roll, between the terry warp beam and an intermittently operable positive feeding device, and wherein the yielding force is sufficient to withdraw from the terry warp beam predetermined lengths of the terry warps during intervals between successive positive feeding intervals of the feeding device, and also wherein the yielding force maintains the terry warps under tension as the predetermined lengths are taken up and fed to the weaving instrumentalities by the positive feeding device during the positive feeding intervals.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a perspective view of the rear portion of a terry loom equipped with the means according to the present invention for applying lateral yielding force to the terry warps at an area between the terry warp beam and the positive feeding device; and

FIGURE 2 is a schematic longitudinal sectional view through the terry loom of FIGURE 1.

Referring more specifically to the drawing, the terry loom generally is of the type having weaving instrumentalities tor weaving terry cloth from ground warps G and terry warps T taken from respective warp spools or beams **10, 11**. The weaving instrumentalities include the usual vertically movable harnesses or heddles **12**, and a reed **13** which cooperates with the usual filling inserting means, not shown, to weave the terry cloth C. Cloth C may be taken up by a driven take-up roll **15** and a driven cloth roll **16**.

As is well known, in weaving terry cloth, reed **13** may be shifted rearwardly to a partial beat-up position relative to lay **14** during loose pick operations of the loom and reed **13** may be shifted forwardly to a full beat-up position relative to lay **14** drawing fast pick operations of the loom. In weaving a three-pick terry cloth, for example, reed **13** occupies the partial beat-up position during two of every three picks of the loom and reed **13** occupies full beat-up position during the other of said three picks of the loom to effect each terry-loop-forming cycle. Typical reed shifting means of this type is disclosed in U.S. Patent No. 1,901,769, issued Mar. 14, 1933, for example, and a detailed illustration and description thereof is thus deemed unncessary. Alternatively, the terry-loop-forming cycles may be effected by shifting the cloth and the warps relative to the beat-up point of reed **13** as disclosed in said U.S. Patent No. 3,130,756, if desired.

The loom is equipped with a ratchet-operated positive feeding device **20** for positively feeding a predetermined length of terry warps T from terry warp beam **11** to the weaving instrumentalities during each fast pick of the loom; i.e., during each full beat-up stroke of reed **13** in the weaving of terry cloth, and in accordance with the length of terry loops to be formed in the cloth. Feeding device **20** may be of conventional or other construction, an example of which is disclosed in said U.S. Patent No. 1,901,769. As shown, positive feeding device **20** comprises a pair of feed rolls **21, 22** which are spaced below terry warp beam **11**. Normally, terry warps T extend downwardly from warp beam **11** in a substantially straight path of travel to feed roll **21** and then pass partially around feed roll **21**, between rolls **21, 22**, and partially around roll **22** in their course to the weaving instrumentalities **12** and **13**.

Feed rolls **21, 22** are suitably journaled in the loom frame **23** and roll **21** has a ratchet wheel **24** fixed on one reduced end thereof which is normally engaged by

a ratchet pawl **25** during terry weaving. Ratchet pawl **25** is pivotally mounted on one arm of a bell crank **26** oscillatably mounted on the corresponding reduced end of feed roll **21** and to which a pattern controlled rod **27** is connected for imparting a rapid active stroke to pawl **25** during a single pick of the loom in the course of each terry-loop-forming cycle, thus imparting corresponding rotational movement to feed rolls **21, 22** in effecting a positive feeding interval thereof in feeding the terry warps T to the weaving instrumentalities. As indicated schematically in FIGURE 1, connecting rod **27** may be operatively connected to a suitable control cam. From the foregoing description, it is apparent that in the weaving of a three-pick terry cloth an active stroke is imparted to ratchet pawl **25** during one out of every three picks of the loom and the ratchet pawl **25** remains stationary during the other picks of the loom incident to each terry-loop-forming cycle.

If it is desired to weave plain cloth on the loom, or to weave non-loop pile areas in the cloth C to form so-called borders therein, pawl **25** may be connected to a suitable pattern control means **30** for lifting pawl **25** out of engagement with ratchet wheel **24** during plain weaving operation of the loom. In this instance, pattern control means **30** is electrically connected to a solenoid **31** whose plunger is connected, as by a link **32**, to pawl **25** for lifting the same out of engagement with ratchet wheel **24** whenever the pattern control means **30** effects energization of solenoid **31**. Positive feeding device **20** includes a suitable brake means **33** for restraining feed rolls **21, 22** from unintentional excessive rotation and for maintaining the terry warps T under tension between feeding device **20** and the weaving instrumentalities during intervals between positive feeding intervals of feeding device and also during non-terry weaving operation of the loom.

In order to prevent overrunning of the terry warp beam **11** upon each feeding interval of the positive feeding device **20**, a braking device **34** is provided and comprises a brake drum **35** on at least one end of terry warp beam **11** which is engaged by a brake band **36**. One end of band **36** is suitably attached to the frame **23** and the other end thereof is engaged by a spring **37** mounted on a stud or screw **40** for applying sufficient pressure to the brake band **36** to prevent overrunning of terry warp beam **11**.

The parts of the loom heretofore described may be conventional and it is with such or similar parts that the present invention is particularly adapted to be associated.

There are obvious advantages in utilizing as large diameter warp beams as is practicable on terry looms. However, as stated earlier herein, this necessitates the application of such large pulling force on the terry warps by the positive feeding device **20**, and within such a very short period of time, in order to overcome the inertia of the warp beam and its braking device **34**, that substantial stretching and weakening of the terry warps, and considerable breakage of the terry warps, occur between the package on the terry warp beam **11** and the feed rolls **21, 22** during positive feeding intervals of the positive terry warp feeding device **20**.

According to the method of this invention, in order to avoid the sudden pull on the terry warps by the positive feeding device **20** in the course of each terry-loop-forming cycle of the loom, a substantially continuous lateral yielding force is applied to the terry warps at an area between the positive feeding device **20** and the terry warp beam **11** such as to withdraw a predetermined length of the terry warps T from the terry warp beam by deflecting the same out of their normal path of travel between the terry warp beam and the feed rolls **21, 22** during those intervals between positive feeding intervals of the feeding device **20**. It is apparent that the braking device **33** associated with positive feeding device **20** and/or the engagement of ratchet wheel **24** by ratchet pawl **25** will prevent reverse turning movement of feed rolls **21, 22** under impetus of the lateral yielding force being applied to the terry warps.

In its preferred embodiment, the means for applying a continuous lateral yielding force to the terry warps comprises an elongate bar **45**, which may be termed as a "terry warp pull-off bar", and which engages the outer or rear surface of the sheet of terry warps T along an area spaced below terry warp beam **11** and also spaced above terry warp feed rolls **21, 22** of positive feeding device **20**. Opposite ends of pull-off bar **45** extend outwardly beyond the flanges of terry warp beam **11** and are pendulously suspended from an upper portion of the loom frame **23** by means of a pair of suspension arms or links **46,47**.

The upper end of each suspension arm **46, 47** is pivotally connected, as at **50**, to a corresponding bracket **51** extending rearwardly from the upper portion of loom frame **23**. The lower ends of suspension arms **46, 47** are suitably connected to opposite ends of pull-off bar **45** and, if desired, opposite ends of pull-off bar **45** may be rotatably supported in the lower portions of suspension arms **46, 47**.

The axis of the pivot points **50** of suspension arms **46, 47** is preferably located substantially in the vertical plane of terry warp feed rolls **21, 22** or, at least, the axis of pivot points **50** is spaced sufficiently forwardly of the normal path of travel of the terry warps from warp beam **11** to feed roll **21** so that the pull-off bar **45** applies a forward lateral yielding force to the corresponding portions of the terry warps T being engaged thereby. Also, the weight of bar **45** coupled with the mechanical advantage afforded by suspension arms **46, 47** should be such as to deflect the terry warps forwardly and ut of their normal path of travel between terry warp beam **11** and feed roll **21** by withdrawing corresponding predetermined lengths of terry warps T from terry warp beam **11**. In so doing, it is apparent that pull-off bar **45** must exert a sufficient force on the terry warps T to overcome the inertia of the terry warp beam **11** and its braking device **34**.

It should be noted, however, that the axis of the suspension arm pivot points **50** is positioned so that the force being applied to the terry warps T gradually diminishes as deflection of the terry warps T increases; i.e., the further the pull-off bar **45** moves forwardly with respect to the normal path of travel of the terry warps T between warp beam **11** and feed roll **21**, the lesser becomes the amount of force being applied to the terry warps T by pull-off bar **45**.

It follows that, as bar **45** moves forwardly in engagement with terry warps T, the more closely the bar **45** approaches the vertical plane of pivot points **50**, the lesser is the amount of tension applied to the terry warps by bar **45** so the bar then becomes ineffective to withdraw terry warps from warp beam **11**. It is thus seen that bar **45** is effective to withdraw predetermined lengths of terry warps T from warp beam **11** during those intervals between the feeding intervals of the positive feeding device **20**. Also, since bar **45** may occupy a forward position only slightly rearwardly of the vertical plane of pivot points **50**, it is apparent that, upon the next succeeding active stroke of pawl **25** and the resultant rotation of feed rolls **21, 22** of positive feeding device **20**, only a relatively small amount of force need be imparted to the terry warps in order to overcome the inertia of bar **45** and swing the same rearwardly to the extent necessary to feed positively the short lengths of terry warps of from about $\frac{3}{16}$ inch to about ½ inch to the weaving instrumentalities during a corresponding fast pick of the loom in accordance with the length of terry loops to be formed in the cloth. It is further noted that the inertia of bar **45** is sufficiently low relative to the inertia of the terry warp beam **11** and the braking force being applied to the terry warp

beam such that the bar **45** will swing from the forward solid-line position of FIGURE 2 to the rearward dotted-line position of FIGURE 2 before the terry warp beam **11** can be placed in rotation.

Although bars have been employed heretofore for applying tension to terry warps in their course from a terry warp beam to a positive feeding device, as disclosed in said British Patent No. 547,864 and U.S. Patent No. 3,130,756, it can be seen that I have arranged bar **45** in a novel manner so as to apply a lateral yielding force to the terry warps sufficient to withdraw and unwind predetermined lengths of terry warps from warp beam **11** in cooperation with the positive terry warp feeding device **20** and wherein, at the instant at which each positive feeding of the terry warps occurs, only a very small amount of force must be applied to the terry warps to effect the feeding thereof as compared to the amount of force which would have to be applied to the terry warps in the absence of applicant's bar **45** in order to overcome the inertia of terry warp beam **11** and its braking means **34** and to rotate the terry warp beam **11** in effecting the withdrawal of the terry warps T therefrom.

In the drawing and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. In a method of feeding terry warps from a terry warp beam to weaving instrumentalities of a terry loom wherein the terry warps are positively fed at spaced apart feeding intervals of relatively short duration at a point spaced from the terry warp beam, and wherein a braking force is applied to the terry warp beam sufficient to prevent overrunning thereof; the improvement comprising withdrawing from the terry warp beam predetermined lengths of the terry warps by causing the beam to rotate during intervals between successive positive feeding intervals.

2. The method of claim **1**, in which the step of withdrawing predetermined lengths of the terry warps from the warp beam comprises laterally deflecting the terry warps at an area spaced from and located between the warp beam and the point at which the positive feeding of the terry warps is effected.

3. The method of claim **2**, in which the lateral deflecting of the terry warps includes applying a laterally yielding force of gradually diminishing magnitude to the terry warps during each interval between successive positive feeding intervals.

4. The method of claim **1**, in which the step of withdrawing predetermined lengths of the terry warps from the warp beam includes laterally deflecting the warp yarns from their normal path of travel between the warp beam and the positive feeding point by applying a sufficient lateral yielding force to the terry warps at an area spaced from and located between the warp beam and the positive feeding point to cause the beam to rotate and to withdraw the terry warps from the warp beam.

5. In a terry loom having weaving instrumentalities for weaving terry cloth from ground warps and terry warps, wherein the terry warps are taken from a terry warp beam, said loom including positive terry warp feeding means spaced from the warp beam and operable to positively feed the terry warps from the terry warp beam to the weaving instrumentalities at spaced apart feeding intervals of relatively short duration, and braking means applying a braking force to the terry warp beam sufficient to prevent overrunning thereof; the improvement comprising means engaging and withdrawing from the terry warp beam predetermined lengths of the terry warps during intervals between successive positive feeding intervals of said positive feeding means, and said engaging means being operable to cause the beam to rotate during said withdrawal of the terry warps therefrom.

6. A structure according to claim **5**, wherein said engaging means is operable to laterally deflect the terry warps to withdraw the predetermined lengths of terry warps from the warp beam.

7. A structure according to claim **5**, wherein said warp beam is located above said positive feeding means, and wherein said engaging means comprises an elongate bar contacting the terry warps at an area spaced from and located between the warp beam and the positive feeding means, suspension means connected to opposite ends of said bar and being pivotally supported for movement about an axis spaced substantially above said bar, the weight of said bar being such and the axis of said suspension means being so located with respect to the warp beam and the positive feeding means that said bar applies a yielding force to and thereby deflects the terry warps during intervals between successive positive feeding intervals of said positive feeding means.

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HENRY S. JAUDON, Primary Examiner