

April 30, 1963

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3,087,516

LOOM BEAM LET-OFF

Filed June 13, 1961

2 Sheets-Sheet 1

Fig. 1.

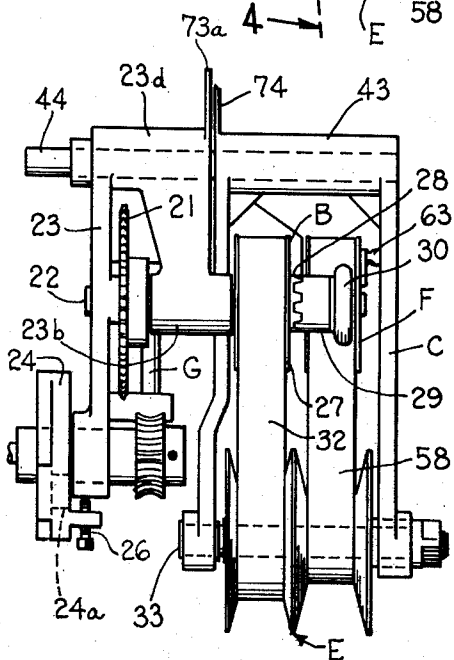
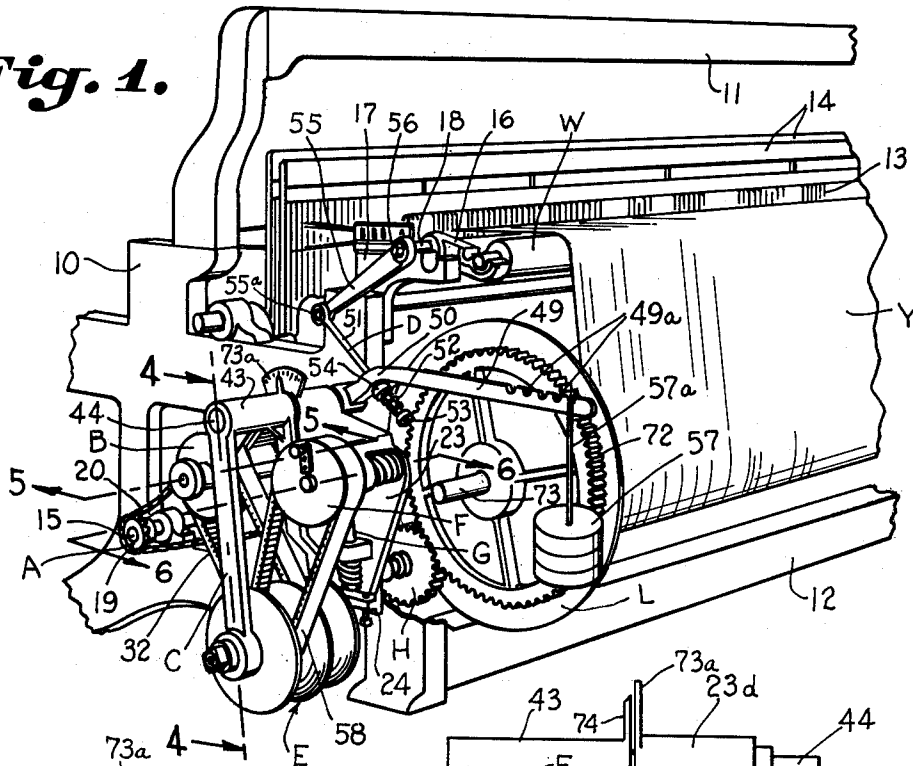


Fig. 2.

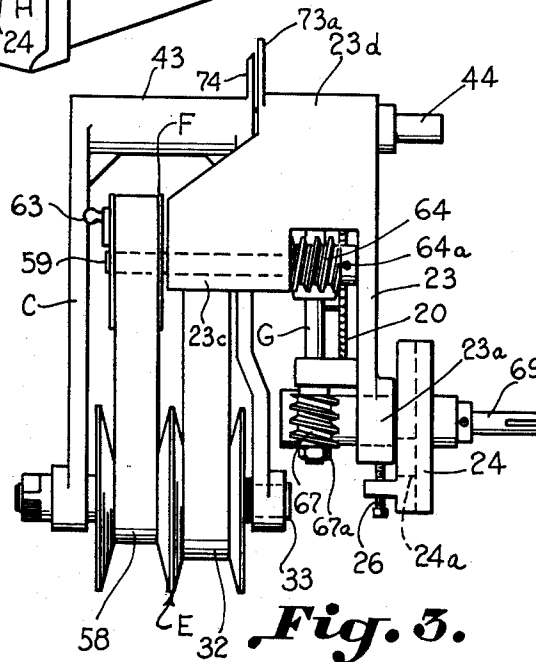


Fig. 3.

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2 Sheets-Sheet 2

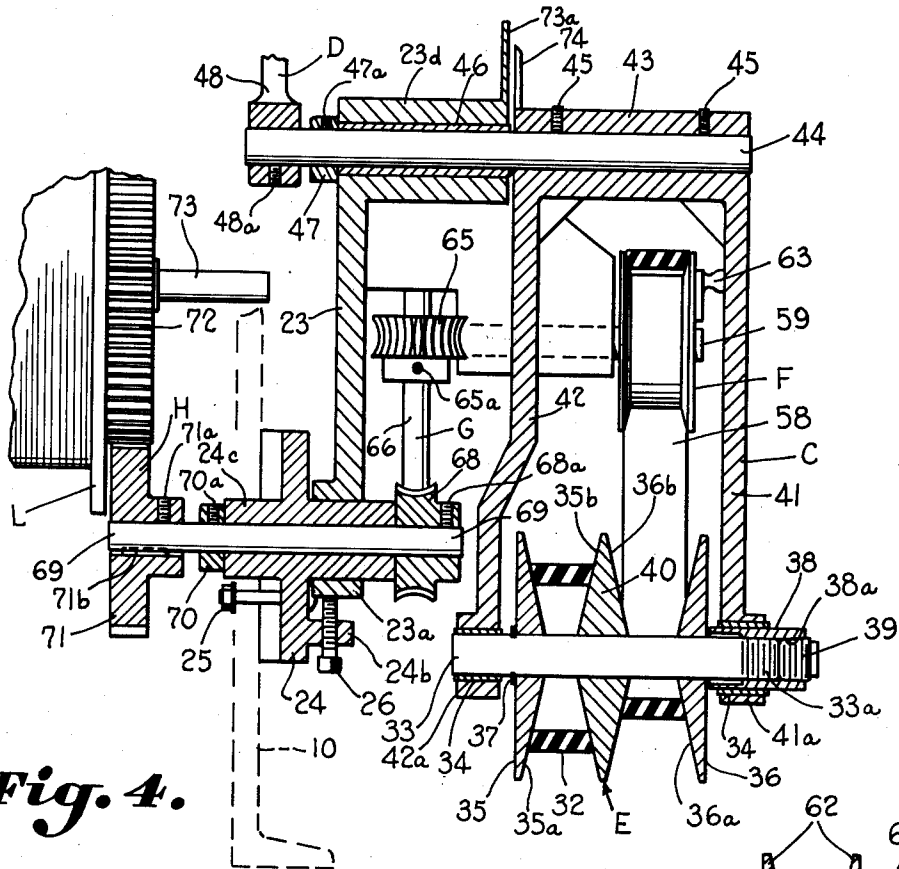


Fig. 4.

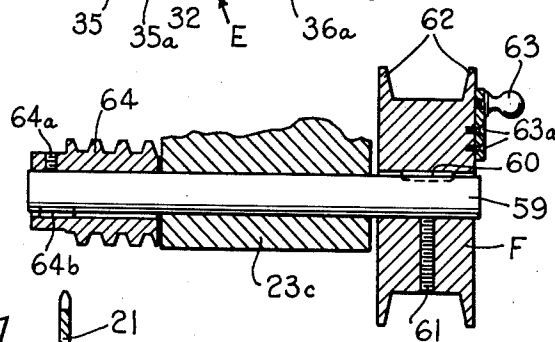


Fig. 6.

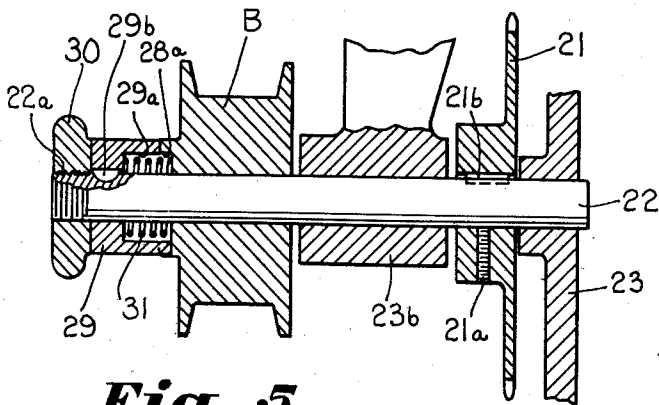



Fig. 5.

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3,087,516

LOOM BEAM LET-OFF

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12 Claims. (Cl. 139—110)

This invention relates to loom beam let-offs of the positive type which control the peripheral speed of the loom beam to maintain the tension on the warp as nearly uniform as possible.

Loom let-offs have been in use in which the tension on the whip roll has been transmitted through various systems including pivoted linkage, weights and the like to adjust disc assemblies to vary their output to the loom beam drive responsive to changes in tension on the whip roll. Difficulty has been experienced in the operation of such devices because the arcuate movements of such pivoted links do not transmit a straight line adjustment to the expansible pulleys. The present invention overcomes this difficulty by providing a dual sheave or pulley means for driving the loom beam which is mounted on a pivoted frame which is moved responsive to variations in tensions of the warp yarn to automatically vary the speed of the loom beam to maintain the tension of the warp yarn as nearly uniform as possible. By mounting the dual sheave assembly upon a pivoted frame so as to move same in an arcuate path, it is possible to maintain the tension of the driving belts to and from the dual sheave arrangement substantially constant.

An important object of the invention, therefore, is to provide a loom beam let-off including a pair of variable speed pulleys moved through a particular arcuate path responsive to variations in warp tension so that input and output belt tension is maintained more nearly constant throughout the range of the drive.

Another important object of the invention is the provision of a positive type loom beam let-off; requiring no pivoted linkage, spring loaded pulleys having slidable mountings, and the like; which will produce more nearly responsive action to variations in the tension of the warp yarns upon the whip roll because the distorted variations in pitch diameter produced by the action of the pivoted linkage upon slidable disc mountings have been eliminated.

It is another important object of the present invention to provide an improved loom let-off requiring reduced maintenance by providing a uniform tension on the driving belts of the let-off sheave arrangement.

Another object of the invention is to provide a let-off which quickly adjusts the peripheral speed of the loom beam to compensate for variations and tension of the warp yarn in which there is a positive arrangement with no belt slippage.

Another object of the invention is to provide a loom beam let-off arrangement, which automatically controls the peripheral speed of the warp beam to maintain the tension on the warp beam as nearly uniform as possible responsive to variations in tension of the warp yarn, having fewer parts and which will be inexpensive and reduce maintenance.

Another object of the invention is to provide a loom beam let-off which, through more responsive, closer control upon the warp tension permits a loom to be operated with a tighter warp without danger of a breakout which might be caused if the warp was running on the verge of breaking and the let-off failed to respond sufficiently quickly to tension variations thus producing more yards per pound of raw material. Tight warps also avoid slack ends which get in the way of the shuttle and are broken.

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A further object of the invention is to provide a loom beam let-off which may be easily set to provide proper tension especially when beginning weaving with a full warp beam.

Another object of the invention is to provide a let-off which may be easily disengaged from its driving mechanism permitting manual release of the warp tension when such is desirable as in case of ends down.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

FIGURE 1 is a perspective view illustrating a loom let-off constructed in accordance with the present invention mounted in operative position upon a loom,

FIGURE 2 is an enlarged side elevation looking from the left-hand side of FIGURE 1,

FIGURE 3 is an enlarged side elevation looking from the right-hand side of FIGURE 1,

FIGURE 4 is an enlarged transverse sectional elevation taken on the line 4—4 in FIGURE 1,

FIGURE 5 is an enlarged transverse sectional view taken on the line 5—5 in FIGURE 1, and

FIGURE 6 is an enlarged transverse sectional view taken on the line 6—6 in FIGURE 1.

Referring more particularly to the drawings, a loom let-off constructed in accordance with the present invention is illustrated in FIGURE 1 as being driven by suitable means such as the cam shaft of a loom through suitable driving means A. A pulley or sheave B is driven by the driving means A and drives a driving belt which, in turn, drives a dual variable pulley assembly E. The pulley assembly E is mounted upon a pivoted frame C mounted upon a suitable support fixed to the loom. The frame C is swung in an arcuate path responsive to tension upon the whip roll W through the linkage D which includes a weighted arm. The sheave assembly E includes a pair of spaced elements each having a like inwardly facing cone surface as well as an intermediate element having like outwardly facing cone surfaces. The second pulley formed by the sheave assembly drives a sheave F, which through suitable driving means G, drives the loom beam L. The driving and the driven pulley belt means are so mounted on opposite sides of the assembly E that swinging movement responsive to variations of tension in the warp yarns move the slidable element to speed up or slow down the driven pulley belt and the means driven by the driven pulley belt driving the loom beam drive. The arc traversed by the dual variable pulley assembly E is such that it will vary its pitch diameters to accommodate fixed belt lengths.

A preferred embodiment of the loom beam let-off is illustrated in FIGURE 1 as being mounted in operative position upon a loom having side frames 10, the usual arch 11 and front girt 12. The warp yarn Y is illustrated as coming off the loom beam L and passing over the whip roll W, through the drop wires 13 and the harnesses 14 which form the shed for weaving. In the weaving operation it is important that uniform tension be exerted upon the warp yarn so as to avoid ends coming down, bad work and otherwise interfering with the operation of the loom parts.

The loom beam L is driven by a suitable drive mechanism H which is driven from a loom cam shaft 15 through the let-off mechanism which forms the subject matter of this invention. The mechanism of the let-off is automatically adjusted responsive to variations in the

tension upon the whip roll W exerted thereon by the warp yarn. The whip roll is illustrated as being mounted in the usual rocker arm 16 carried by the bearing stand 17. The rocker arm 16 has a stub shaft 18 which has fixed connection to the linkage mechanism D for adjusting the let-off mechanism as will be described below.

The cam shaft 15 carries a sprocket 19 for driving the chain 20 which, in turn, drives a larger sprocket 21. The sprocket 21 has a fixed mounting as by set screw 21a and key 21b upon a shaft 22 journaled within a support 23. It should be noted at this point that the support 23 has adjustable mounting upon the side frame 10 of the loom. A base in the form of a suitable casting 24 is fixed to the loom frame 10 as by bolts 25 carried within vertical slots 24a adjacent each side of the casting 24. A pair of threaded members 26 are threaded into an inward projection 24b and bear against the base 23a of the support 23. By adjusting the threaded members 26, the support 23 may be turned about the hub 24c which forms a part of the casting 24.

Referring again to the shaft 22, it will be noted that the shaft also has support from the arm 23b into which it is also journaled. The shaft 22 carries a sheave or pulley B which is mounted for free rotation thereon. The sheave B has flanges 27 and carries a toothed segment 28 which, together with a corresponding toothed segment 29, forms a dog clutch. An internally threaded operating member 30 is carried adjacent the threaded end 22a of the shaft 22. The segments 28 and 29 have corresponding bores 28a and 29a, respectively, for housing a spring 31. The segment 29 is keyed to the shaft as at 29b so that by turning the internally threaded member 30 the clutch segments 28 and 29 may be engaged or disengaged to correspondingly fix or disengage the sheave B from the shaft 22.

The sheave B drives a belt 32 which, in turn, drives an assembly E which is oscillatably mounted adjacent one end of a depending frame C. The frame C has a shaft 33 mounted thereon to slide and turn within the bushings 34. A pair of spaced elements 35 and 36 are carried upon the shaft 33 and have inwardly facing cone surfaces 35a and 36a, respectively. The spacing of the elements 35 and 36 are determined outwardly by a retaining ring 37 on one end and an internally threaded housing 38 on the other which forms part of an adjustable assembly for determining the spacing. The internally threaded housing 38 is carried upon a threaded portion 33a of the shaft 33 and a threaded socket 39 is threaded in the threaded bore 38a into tight engagement with the adjacent end of the shaft 33 to form a locking arrangement. An intermediate element 40 is carried upon the shaft 33 for sliding movement thereon. The intermediate element 40 has outwardly projecting cone surfaces 35b and 36b carried thereby so that the surfaces 35a and 35b form a sheave while the cone surfaces 36a and 36b form another sheave. By varying the position of the pivoted frame C, as will be described below, the position of the belt 32 upon the sheave formed by the surfaces 35a and 35b will be varied accordingly, varying the speed of the entire assembly E. Thus, both pitch diameters of the assembly E will be varied.

The assembly E is mounted between a pair of arms 41 and 42 which are included in the pivoted depending frame C. The arms at their lower ends have hubs 41a and 42a, respectively, each carrying a bushing 34 for accommodating the assembly E. The arms 41 and 42 are joined at the top by a housing 43 which is fixed upon the shaft 44 by set screws 45. The shaft 44 is journaled in the upper bearing support 23d of the support 23 within a suitable bearing 46. A sleeve 47 confines the shaft 44 within the bearing 46 and is fixed to the shaft 44 by the set screw 47a.

It is desired that the variable sheave assembly E traverse an arc formed by the intersections of radii which are the center to center distances from the fixed sheaves

to respective variable sheaves wherein said radii correspond to each other in that as one of the pulleys of the assembly increases its pitch diameter the opposite pulley decreases its pitch diameter in a straight line proportion so that, due to the fact that a single member is common to both variable pulleys and the pinch diameters of the fixed pulleys are equal, belts of equal length may be accommodated by the assembly. The pivoted depending frame C has a pivot located medially between the fixed pulleys and is of such length that the variable sheave assembly carried by the lower portion thereof substantially traverses the arc described above. Thus, the arc for its operative range in the embodiment of the invention illustrated is a true circle and corresponds within mechanical tolerances applicable here to the desired arc.

Having determined the desired characteristics of the variable speed drive, such as ratio range, physical dimensions of total unit, type and length of belt which will satisfy these conditions, the following computations may be used to develop the required design dimensions. It has been found that a ratio range of the input pulley B to the output pulley F of from 1:3½ to 3½:1 is suitable although other ranges may be used to satisfy required conditions.

The center to center distance between the fixed pulleys to suit the overall dimensions of the unit is determined. Then using the pinch diameters of the fixed pulleys and various pitch diameters of the variable assembly, noting that as the pitch diameters of the variable assembly depart from the mean or center pitch line (occurring when the two belts are equidistant from the center of the variable assembly) one pitch diameter increases proportionately to the decrease of the other pitch diameter, a number of corresponding center to center distances between the fixed and variable assembly are calculated using the following equations.

$$L = 2C + 1.57(D+d) + \frac{(D-d)^2}{4c}$$

or

$$C = \frac{b + \sqrt{b^2 - 32(D-d)^2}}{16}$$

Where

$$b = 4L - 628(D+d)$$

D = pitch diameter of large pulley

d = pitch diameter of small pulley

L = pitch length of belt

C = center to center distance between pulleys

The first of the above equations is normally used to calculate the belt length when the pitch diameters and center to center distances are known and is transposed in the form of the second equation since the center to center distance is to be calculated from the other known values.

The determination of position of pivot and length of control arm can now be determined graphically by scribing arcs of lengths determined above using the center of the fixed pulleys as locii. A line passing through the points of intersection of arcs of lengths corresponding to the center distances between fixed and variable pulley assembly may be constructed. Perpendicular bisectors to this line will converge at one point (within the range of the unit). This point will be the position of the pivot of the control arm and the distance from this point to the curved line will be the length of the control arm. It will be apparent that the curved line (passing through the intersections of the corresponding arcs) will be the only path of the variable assembly that will maintain proper tension on the belts as the control arm moves to change the ratio of the drive unit.

The proper pivot point and control arm can also be determined algebraically. For ease of computation the

use of Segmental Functions, by C. K. Smoley is suggested. ("Smoley's New Combined Tables," Segmental Functions, First Edition, published by C. K. Smoley & Sons, Scranton, Pennsylvania.)

Using the distance between the center of the fixed pulleys as the base of a triangle and the corresponding center to center distances between the fixed pulley and the variable assembly as the other two sides for a number of positions of the variable assembly, a number of triangles may be formed.

Determine the altitudes of these triangles by using:

$$\sin \frac{A}{2} = \sqrt{(s-b)(s-c)}$$

$$\sin A \times c = \text{altitude}$$

where

A = angle between the base and one side of triangle

a = one side of triangle

b = base of triangle

c = other side of triangle

$S = \frac{1}{2}(a+b+c)$

These altitudes and their position between the fixed pulleys are ordinates of the curve that is the path of the variable assembly. The Locus and the radius of curvature can now be determined using Segmental Functions:

$$\log \beta = \log M - \log C$$

and

$$\log A = \log C + \log \alpha$$

and

$$\log R = 2 \log A + \log s - \log M$$

where

A = Abscissa = difference between an ordinate on perpendicular bisector of the base and ordinate perpendicular to the base at its extremities

C = Chord = base of triangle

R = Radius

The radius will be the length of the control arm. The locus for this radius is calculated by subtracting the ordinate coinciding with one fixed pulley position, resulting in a position below the base of the triangle on the perpendicular bisector.

The linkage D includes a link 48 which is fixed upon the shaft 44 by a set screw 48a on one end thereof while the other end is joined to a weighted arm 49 by a hub 50. The hub 50 has a rod 51 slidable therein adjacent one end thereof and a compression spring 52 is confined upon the rod 51 by a bolt 53 on its free end and bears against an abutment 54 adjacent the hub 50. The abutment 54 has an arcuate surface to conform to the inner surface of the hub 50. The link 51 is pivotally connected at its other end to a link 55 by a pin 55a. The other end of the link 55 has fixed connection with the stub shaft 18 as by the bolt 56.

It is evident that the oscillations of the whip roll produced by varying tension exerted upon it by the warp yarn Y are transmitted through the biased linkage D to the shaft 44 so that the frame C is swung into proper position to insure proper compensation of the speed of the loom beam to provide as uniform tension as possible. The tension upon the warp yarn Y is regulated by the weights 57 which are suspended in chosen position upon the lever 49 within one of the grooves 49a for accommodating a hanger 57a for suspending the weights. Bias could be provided for the shaft 44 by any other suitable means such as a spring (not shown) in lieu of the weights 57.

The sheave formed by the cone surfaces 36a and 36b drives a belt 58 to, in turn, drive the sheave F. The sheave F is fixed to a shaft 59 as by the key 60 and the set screw 61 and has flanges 62 with a handle 63 secured as by screws 63a to manually turn the shaft 59 when the dog clutch is disengaged. The shaft 59 is journaled within

an arm 23c of the support 23 and carries a worm gear 64 adjacent its end remote from the sheave F. The worm gear 64 is fixed to the shaft as by the set screw 64a and key 64b.

The worm gear 64 drives a pinion 65 which is included in the driving means G. The pinion 65 is fixed to the shaft 66 by a set screw 65a. The shaft 66 carries a worm 67 fixed adjacent its other end as by the nut 67a. The worm 67 drives a pinion 68 which, in turn, drives a shaft 69 and is fixed thereto by a set screw 68a. The shaft 69 is journaled within the hub 24c and is confined therein by the sleeve 70 fixed to the shaft 69 by the set screw 70a. The shaft 69 is fixed to a pinion 71 as by set screw 71a and a key 71b. The pinion 71 forms a part of a gear drive serving as the drive H for the loom beam L. The pinion 71 drives a ring gear 72 which, in turn, drives the loom beam L. The shaft 73 of the loom beam is mounted in suitable trunnions (not shown) for supporting same upon the loom.

In operation, for example, in a condition where the tension on the warp yarn Y is increasing due to the loom beam L revolving too slowly, such tension causes the whip roll W to be displaced downwardly rotating the arm 16 about its pivot point 18. This causes the arm 55 through rod 51 and spring 52, to raise arm 49 which rotates the shaft 44. The shaft 44 rotates the arm C so that the shaft 33 is moved closer to the fixed pulley F and further away from the fixed pulley B, thus, increasing tension on the belt 32 and decreasing tension on the belt 58. The belt 32 forces the intermediate slidable element 40 to move outwardly allowing the belt 32 to seek a smaller pitch diameter and causing the belt 58 to seek a larger pitch diameter on the adjustable sheave assembly E. Since the fixed pulley B now drives a pulley formed by the surface 35a and 35b at a smaller diameter, the speed of rotation of the shaft 33 is now increased. Also, since the belt 58 is now at a larger diameter on the pulley formed by the surfaces 36a and 36b, driving the fixed pulley F, the rotational speed of the shaft 59 is now increased by the combination of the increased speed of the adjustable assembly F and the change in pitch diameter of pulley formed by the surfaces 36a and 36b. This increase in speed is transmitted through gears 64 and 65, shaft G, and gears 67 and 68, through the shaft 69, to the pinion 71 and beam gear 72. The gear 72 is attached to the loom beam L which, due to its increase in rotational speed supplies more yarn to relieve the excess tension on warp yarn Y.

In a condition where the tension on the warp yarn Y is less than required due to the loom beam L rotating too fast, delivering more yarn than required, the correct decrease in speed of warp beam L is achieved by reversal of the sequence of operation described above. Thus, the assembly E is moved toward the front of the loom and the belt 58 forces the slidable element 40 to move inwardly toward the loom allowing the belt 58 to seek a smaller pitch diameter and causing the belt 32 to seek a larger pitch diameter. The rotational speed of the shaft 59 is now decreased as is the rotational speed of the loom beam L so that less yarn is delivered at greater tension.

It should be noted that if for any reason it is desirable to let off the tension on the warp yarns Y such as for the purpose of a drawing-in operation in the event of ends down and the like, that this may be accomplished manually by disengaging the dog clutch formed by the segments 28 and 29 so as to disengage the let-off from the loom drive and by turning the handle 63 carried by the sheave F.

During a weaving operation as the warp yarns Y are expended from the loom beam L, the frame C traverses an arc so that depending upon a given warp diameter and picks per inch of cloth construction, the arm C will traverse a given arc. It is, therefore, desirable to have a calibrated dial 73a carried by the upper bearing support 23d while an indicator 74 is carried by the housing to 43

to facilitate resetting to the proper position. By disengaging the dog clutch as described above, the dual pulley assembly E may be moved to reset the let-off for the proper tension to begin a weaving operation with a full loom beam. The let-off should be reset prior to placing the new full beam upon the loom but, if desired, an additional dog clutch arrangement may be provided to disengage the pulley F from the beam drive.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

What is claimed is:

1. A let-off for a loom having a loom beam and a whip roll moved responsive to tension on the warp yarn including, a first sheave driven by the loom, a second sheave driving said loom beam mounted in a plane parallel to the plane of the first sheave, a shaft disposed between said first sheave and said second sheave in a plane parallel to the axis of rotation of said sheaves, a pair of spaced inwardly facing cone elements carried by the shaft, an element carried by the shaft carrying outwardly facing cone elements intermediate said inwardly facing cone elements, a first belt driven by said first sheave positioned between one of the pair of adjacent inwardly and outwardly facing cone elements, a second belt driving said second sheave positioned on the other of the pair of adjacent inwardly and outwardly facing cone elements, and means moving said shaft in an arcuate path responsive to movement of the whip roll to vary the spacing between each of the pair of adjacent inwardly and outwardly facing cone elements, whereby the speed of the second belt is varied to maintain uniform tension on the warp yarn.

2. A let-off for a loom having a loom beam and a whip roll moved responsive to tension on the warp yarn including, a first shaft disposed horizontally longitudinally of the loom and driven thereby, a first sheave carried by said first shaft and driven thereby, a second shaft disposed horizontally longitudinally of the loom, a second sheave driving said loom beam carried by said second shaft, a depending pivoted frame carried between said first and second sheaves, a third shaft carried by the lower end of said frame disposed between said first sheave and said second sheave in a plane parallel to the first and second shafts, a pair of spaced inwardly facing cone elements carried by the third shaft, an element carried by the third shaft carrying outwardly facing cone elements intermediate said inwardly facing cone elements, a first belt driven by said first sheave positioned between one of the pair of adjacent inwardly and outwardly facing cone elements, a second belt driving said second sheave positioned on the other of the pair of adjacent inwardly and outwardly facing cone elements, and means operated responsive to movements of the whip roll moving said shaft in an arcuate path to vary the spacing between each of the pair of adjacent inwardly and outwardly facing cone elements, whereby the speed of the second belt is varied to maintain uniform tension on the warp yarn.

3. The structure set forth in claim 2 including, a clutch engaging and disengaging said first sheave with respect to the first shaft thus engaging and disengaging the let-off with respect to the loom.

4. A let-off for a loom beam drive and the like operated responsive to the tension of the warp yarn including, a pivotally mounted frame, means transmitting variations in tension of the warp yarn to oscillate said frame, an assembly carried by said frame including, a pair of aligned spaced elements each having an inwardly facing cone surface, an element having corresponding outwardly facing cone surface intermediate said spaced elements so that a pair of pulleys are formed by adjacent facing cone surfaces, pulley belt means driving said assembly carried by one of said pair of pulleys, and pulley belt means driven by said assembly carried by the other of said pulleys, said

driving and said driven pulley belt means being so mounted on opposite sides of said assembly that oscillations of the frame responsive to variations of tension in the warp yarn vary the distance between the inwardly facing cone surfaces with respect to the outwardly facing cone surfaces to vary the effective diameters of the pulleys formed by adjacent facing cone surfaces to speed up or slow down said driven pulley belt.

5. A let-off control for a loom beam drive operated responsive to the force exerted upon the whip roll by the tension of the warp yarn including, a support, a pivoted depending frame mounted upon said support for oscillation thereon, means connecting the frame with the whip roll transmitting variations in tension on the warp yarn to oscillate said frame, an assembly carried by said frame including, a pair of aligned spaced elements each having an inwardly facing cone surface, an element having corresponding outwardly facing cone surfaces intermediate said spaced elements so that a pair of pulleys are formed by adjacent facing cone surfaces, driving pulley belt means driving said assembly carried by one of said pair of pulleys, driven pulley belt means driven by said assembly carried by the other of said pulleys, said driving and said driven pulley belt means being so mounted on opposite sides of said assembly that oscillations of the frame responsive to variations of tension in the warp yarn vary the distance between the inwardly facing cone surfaces with respect to the outwardly facing cone surfaces to vary the effective diameters of the pulleys formed by adjacent facing cone surfaces to speed up or slow down said driven pulley belt.

6. In a loom beam let-off and the like having input and output pulleys and means transmitting variations in tension of the warp yarn to vary the speed of the output pulley responsive to such variations to control such tension, the improvement including, a variable pulley assembly intermediate the input and output pulleys, said variable pulley assembly including a pair of spaced opposed cone surfaces and an element intermediate said cone surfaces having cone surfaces opposed to said first mentioned cone surfaces, and means mounting said variable pulley assembly substantially to traverse an arc formed by the intersections of radii which are the center to center distances from the input pulley and the output pulley to said variable pulley assembly wherein said radii correspond to each other in that as one of the pulleys of the assembly increases its pitch diameter the opposite pulley decreases its pitch diameter in a straight line proportion.

7. In a loom beam let-off having means transmitting variations in tension of the warp yarn to vary the output of the let-off responsive to such variations to control such tension, the improvement including, an input pulley, an output pulley, a variable pulley assembly intermediate the input and output pulleys, said variable pulley assembly including a pair of spaced opposed cone surfaces cone surfaces opposed to said first mentioned cone surface and an element intermediate said cone surfaces having cone surfaces opposed to said first mentioned cone surfaces forming a pair of variable pulleys, a first pulley belt connecting said input pulley with said variable pulley assembly, a second pulley belt connecting said variable pulley assembly with the output pulley, and means mounting said variable pulley assembly substantially to traverse an arc formed by the intersections of radii which are the center to center distances from the input pulley and the output pulley to said variable pulley assembly wherein said radii correspond to each other in that as one of the variable pulleys increases its pitch diameter the other variable pulley decreases its pitch diameter in a straight line proportion.

8. A let-off control for a loom beam drive operated responsive to the pressure exerted upon the whip roll by the tension of the warp yarn including, a support, a frame mounted upon said support for oscillation thereon, means

through which said support has connection with the whip roll through which variations in tension on the warp yarn are transmitted to oscillate said frame, an assembly shaft carried by said frame, a pair of spaced elements each having an inwardly facing cone surface fixed upon said assembly shaft, an element having corresponding outwardly facing cone surfaces carried by the assembly shaft intermediate said spaced elements, said inwardly facing cone surfaces and outwardly facing cone surfaces being axially movable with respect to each other, pulley belt means driving said assembly, pulley belt means driven by said assembly, said driving and said driven pulley belt means being so mounted on opposite sides of said assembly that oscillations responsive to variations of tension in the warp yarn move the inwardly facing cone surfaces and the outwardly facing cone surfaces to vary the effective diameters of the pulleys formed by adjacent cone surfaces to speed up or slow down said driven pulley belt, and means driven by said driven pulley belt driving the loom beam drive.

9. A let-off control for a loom beam drive operated responsive to the pressure exerted upon the whip roll by the tension of the warp yarn including, a support, a pivoted depending frame mounted upon said support for oscillation thereon, linkage means through which said support has connection with the whip roll through which variations in tension on the warp yarn are transmitted to oscillate said frame, means exerting a bias upon said frame exerting tension upon said warp yarn, an assembly shaft carried by said frame, a pair of spaced elements each having an inwardly facing cone surface fixed upon said assembly shaft, an element having corresponding outwardly facing cone surfaces carried by the assembly shaft intermediate said spaced elements, said inwardly facing cone surfaces and outwardly facing cone surfaces being axially movable with respect to each other, pulley belt means driving said assembly, pulley belt means driven by said assembly, said driving and said driven pulley belt means being so mounted on opposite sides of said assembly that oscillations responsive to variations of tension in the warp yarn move the inwardly facing cone surfaces and the outwardly facing cone surfaces to vary the effective diameters of the pulleys formed by adjacent cone surfaces to speed up or slow down said driven pulley belt, and means driven by said driven pulley belt driving the loom beam drive.

10. A let-off for a loom having a loom beam and a whip roll moved responsive to tension on the warp yarn including, a first sheave driven by the loom, a second sheave driving said loom beam mounted in a plane parallel to the plane of the first sheave, a shaft disposed between said first sheave and said second sheave in a plane parallel to the axis of rotation of said sheaves, a pair of spaced inwardly facing cone elements carried by the shaft, an element carried by the shaft carrying outwardly facing cone elements intermediate said inwardly facing cone elements, a first belt driven by said first sheave positioned between one of the pair of adjacent inwardly and outwardly facing cone elements, a second belt driving said second sheave positioned on the other of the pair of adjacent inwardly and outwardly facing cone elements, and means moving said shaft responsive to movement of the whip roll to vary the spacing between each of

the pair of adjacent inwardly and outwardly facing cone elements, whereby the speed of the second belt is varied to maintain uniform tension on the warp yarn.

11. A let-off for a loom having a loom beam carrying warp yarn including, a first driven sheave, a second sheave driving said beam mounted in a plane parallel to the plane of the first sheave, a shaft disposed between said first sheave and said second sheave in a plane parallel to the axis of rotation of said sheaves, a pair of spaced inwardly facing cone elements carried by the shaft, an element carried by the shaft carrying outwardly facing cone elements intermediate said inwardly facing cone elements, a first belt driven by said first sheave positioned between one of the pair of adjacent inwardly and outwardly facing cone elements, a second belt driving said second sheave positioned on the other of the pair of adjacent inwardly and outwardly facing cone elements, and means moving said shaft responsive to variations in tension on the warp yarn to vary the spacing between each of the pair of adjacent inwardly and outwardly facing cone elements, whereby the speed of the second belt is varied to maintain uniform tension on the warp yarn.

12. A let-off control for a loom beam operated responsive to the tension upon the warp yarn including, a support, a frame mounted upon said support for oscillation thereon, means oscillating said frame responsive to variations in tension upon the warp yarn, an assembly shaft carried by said frame, a pair of spaced elements each having an inwardly facing cone surface fixed upon said assembly shaft, an element having corresponding outwardly facing cone surfaces carried by the assembly shaft intermediate said spaced elements, said inwardly facing cone surfaces and outwardly facing cone surfaces being axially movable with respect to each other, pulley belt means driving said assembly, pulley belt means driven by said assembly, said driving and said driven pulley belt means being so mounted on opposite sides of said assembly that oscillation responsive to variations of tension in the warp yarn move the inwardly facing cone surfaces and the outwardly facing cone surfaces to vary the effective diameters of the pulleys formed by adjacent cone surfaces to speed up or slow down said driven pulley belt, and means driven by said driven pulley belt driving the loom beam drive.

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