Dec. 5, 1950 R. F. BERNDT 2,532,987

BELT GUIDE AND TENSIONING DEVICE

Filed April 19, 1947

Fig. 1.

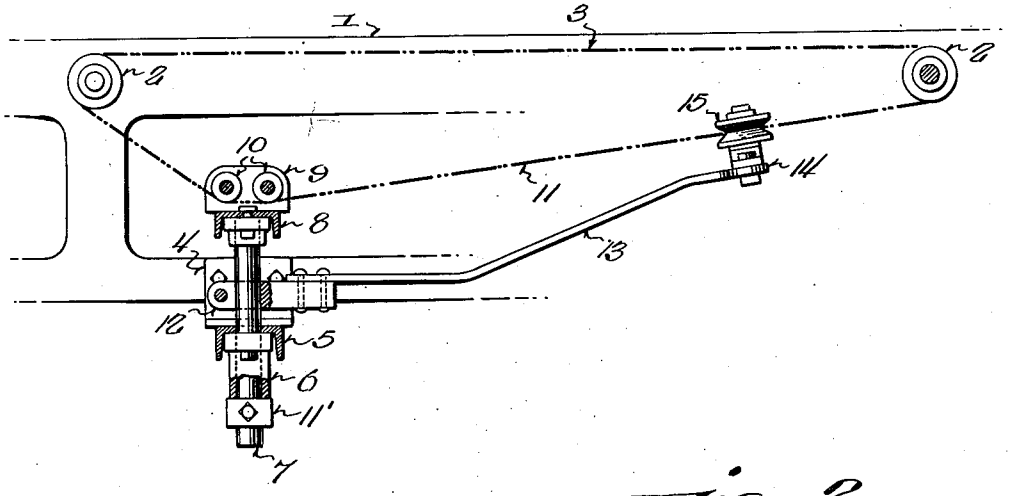
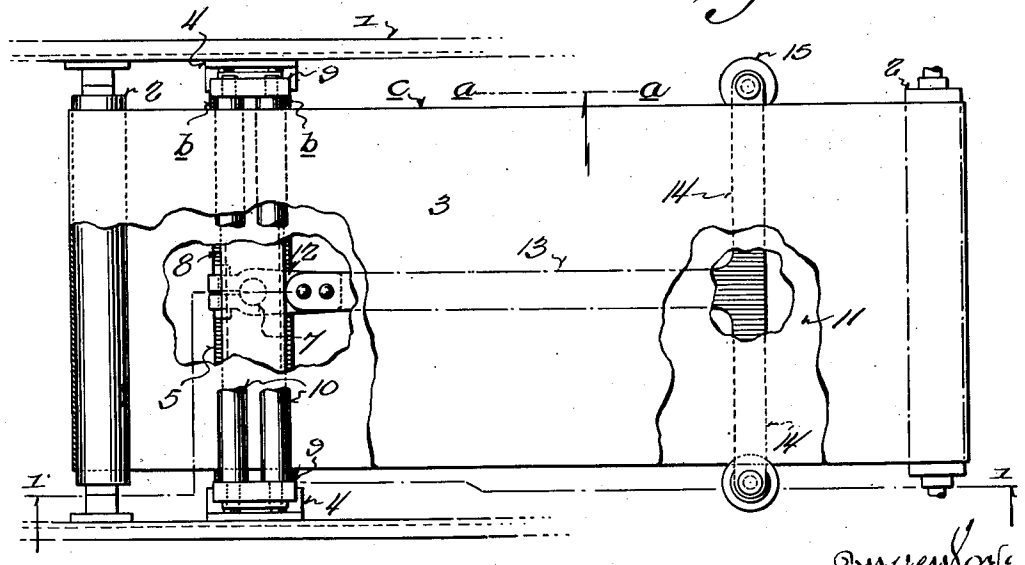


Fig. 2.



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BELT GUIDE AND TENSIONING DEVICE

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7 Claims. (Cl. 74—241)

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The present invention relates generally to belt guides for centering a belt or traveling web upon a pulley or carrier roll.

The invention has primarily for its object to provide a comparatively simple and highly sensitive device, actuated upon transverse shifting of a belt or web to cause the same to center itself upon a pulley or carrier roll.

Incidental to the foregoing, a more specific object of the invention resides in the provision of a device of the foregoing character for varying the tension upon opposite sides of a belt upon transverse shifting of the same, causing the belt to center itself.

Another object is to accomplish the foregoing by means of a transverse tension roller engaging a stretch of belt and pivotly mounted about an axis at a right angle to the plane of the belt surface and the longitudinal axis of said roller, to increase tension upon one side of the belt and relieve the same upon the opposite side upon oscillation about its pivotal axis in synchonism with lateral shifting of said belt.

Still another object is to automatically determine the angular position of the tension roller with relation to the belt, by means effected by either one or both edges of the belt.

A further object of the invention resides in the provision of a combination tensioning and belt guide.

In addition to the foregoing, other objects will appear as the description proceeds, and while the accompanying drawing illustrates one complete physical form of the invention in accordance with the best mode so far devised, it is to be understood that changes in the precise embodiment of the invention are contemplated within the scope of the appended claims.

In the drawing:

Fig. 1 is a longitudinal sectional view of a belt guide and tensioning device incorporating the principles of the present invention, the same being taken substantially on the line 1—1 of Fig. 2; and

Fig. 2 is a plan view with parts broken away to more clearly illustrate structural detail.

For the purpose of explanation the present invention has been illustrated, and will be described, in connection with a continuous belt or conveyor. However, it is to be understood that the same is equally applicable to a web traveling over a carrier roll, such as in rewinding apparatus, paper making machines, and the like. Therefore, in referring to a pulley and belt throughout the specifications and claims, it is to be understood that the terms also include traveling webs of any character and carrier rolls.

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Referring now more particularly to the accompanying drawing, the numeral 1 designates a frame in which a pair of spaced rolls 2 are journaled to carry a continuous belt or conveyor 3.

A pair of brackets 4 secured to opposite sides of the frame 1, support a channel cross-beam 5 to which a depending bearing 6 is secured intermediate its ends and centrally of the belt 3.

Journaled within the bearing 6 is a pintle 7 that carries a cross-arm 8 secured to its upper end for oscillatory movement about the vertical axis of the pintle.

A pair of brackets 9 secured to the opposite ends of the cross-arm 8 have journaled therein a pair of spaced tension rollers 10, transversely engaging the upper face of the lower stretch 11 of the belt 3. By the foregoing arrangement it will be apparent that the weight of the roller assembly, include the pintle 7 and cross-arm 8, creates a tightening tension on the belt, which in addition to the weight of the assembly can be regulated through adjustment of a set collar 11' secured to the lower end of the pintle 7 to determine the upper position of the tension rollers.

Adjustably secured upon the pintle 7 intermediate the cross-beam 5 and cross-arm 8 is a split clamp 12, to which a lever 13 is attached and provided at its free end with oppositely extending arms 14, upon which grooved rollers 15 are mounted for engaging opposite edges of the lower belt stretch 11.

In operation, with the belt normally centralized on the carrier rolls 2, the lever 13 is adjusted on the pintle 7 to accurately position the tension rolls 10 at an exact right angle to the longitudinal axis of the belt 3, thus creating a uniform tension upon the belt across its entire width.

In the event the belt should shift laterally in either direction, its edges engaging the pulleys 15 will cause the lever 13 to shift and oscillate the tension rollers on the vertical axis of the pintle 7, those ends of the rollers which shift towards the adjacent carrier roll 2, serving to increase tension on that side of the belt, while the opposite ends of the rollers moving away from the carrier roll relieve the tension upon that side. Upon the crown pulley principle, the traveling belt naturally has a tendency to shift in a direction to equalize the tension across the belt, which would be towards the center of the carrier rolls, inasmuch as the increased tension upon the belt is created on the side toward

which the belt shifts. For example, should the belt shift toward the dotted line *a* in Fig. 1, the lever 13 would also be rotated in the same direction by the rollers 15 engaging the edges of the belt. In turn the tension rollers 10 would be oscillated about the axis of the pintle 7 to shift the ends *b* toward the adjacent carrier 2 to increase tension upon the edge *c* of the belt, and at the same time relieve tension upon the opposite side. As explained the belt then has a tendency to shift towards the center of the roll to relieve the increased tension upon the side *c* of the belt, and in doing so causes the lever 13 to shift and return the rollers 10 to their normal position at right angles to the longitudinal axis of the belt.

Another occurrence in the operation of the present guide resides in the fact that when the tension rollers assume an oblique angle with relation to the direction of travel of the belt, the belt naturally has a tendency to avoid friction necessarily resulting from slippage between the rollers and belt because of relative different directions of travel, and to accomplish this the belt has a tendency to follow the direction of rotation of the rollers, which is at a right angle to their longitudinal axes, and that would be toward the normal centralized position of the belt on the carrier rolls.

Another highly important feature of the invention resides in positioning the tension rollers closer to one of the carrier rolls than the other, which materially increases the sensitiveness of the device for several reasons.

For instance, if the tension rollers 10 were positioned to engage the belt 3 centrally of the carrier rolls, oscillation of the tension rolls would not effect a variation of tension upon opposite sides of the belt, as the opposite ends of the rolls would then merely equalize each other, leaving only the tendency of the belt to follow the direction of rotation of the tension rolls to return the belt to a centralized position on the carrier rolls.

By positioning the tension rollers closer to one of the carrier rolls than to the other, the angle of the stretch of belt between the tension rollers and the closest carrier roll is materially greater than the angle of the belt between the tension rolls and the other carrier roll. Therefore, oscillation of the tension rolls effects a greater ratio of variation in the respective angles of the engaged stretch of the belt, variation in the angle of the shorter stretch being materially greater than variation of the angle in the longer stretch. Also, the greater the angle of the belt between the tension rolls and one of the carrier rolls, the greater the resulting variation in tension upon opposite sides of the belt upon oscillation of the tension rolls.

From the foregoing, considered in connection with the accompanying drawing, it will be apparent that an exceedingly simple, effective and highly sensitive guide has been devised for centralizing and tensioning traveling belts or webs.

In the mechanical form of the invention illustrated and described, because of the leverage provided for oscillating the tension rolls, the device is extremely sensitive and accurate in operation even in the absence of close workmanship and small tolerances. Further, inasmuch as minimum pressure against the anti-friction rollers 15 is required to oscillate the tension rolls through the leverage of the lever 13, and the fact that centralizing of the belt is accomplished by rollers traveling in substantially the same direction as the belt, friction and wear upon the belt is reduced to a minimum.

Also, by increasing the angle of the belt between the tension rollers and the adjacent carrier roll over which the belt travels from the tension rolls in the direction indicated by the arrow in Fig. 2, the contact between the belt and said carrier roll is reduced to a minimum, and consequently less action is required upon the belt by the tension rolls in returning the belt to a central position.

While two tension rollers have been illustrated and described it is to be understood that the invention contemplates the use of a single roller. However, two parallel tension rolls having their longitudinal axes equally spaced from their axes of oscillation are preferred, in that the resulting plurality of spaced contacts with the belt, increases frictional action of the guide upon oscillation, over that of a single roller the longitudinal axis of which intersects its axis of oscillation, all of which adds to the sensitiveness of the device. A single roller whose longitudinal axis is offset from its axis of oscillation, preferably on the side of the axis of oscillation opposite the belt or web-engaging rollers 15, may also be employed to advantage.

While a positive mechanical structure has been illustrated for effecting oscillation of the tension rollers, it is to be understood that any means for accomplishing this result, are contemplated with the scope of the invention. For instance, various conventional electronic devices effected by the position of the belt on the carrier rolls may be employed for oscillating the pintle 7 in synchronism with shifting of the belt.

I claim:

1. A guide for a continuous belt or web traveling over spaced carrier rolls comprising, a tension roller transversely engaging a stretch of said belt or web intermediate the carrier rolls and maintaining it under substantal tension, said tension roller being pivotally mounted for oscillation in a plane parallel to the plane of the engaged stretch to vary tension upon opposite sides of said belt and having its longitudinal axis offset from its axis of oscillation, and means effected by the position of said belt for oscillating said roller.

2. A guide for a belt or web traveling over spaced carrier rolls comprising, a tension roller transversely engaging a stretch of said belt or web intermediate said carrier rolls and maintaining it under substantial tension, said tension roller being pivotally mounted for oscillation in a plane parallel to the plane of the engaged stretch and about an axis perpendicular thereto and positioned centrally of the longitudinal edges of said belt to vary tension upon opposite sides of said belt, the longitudinal axis of the tension roller being offset from its axis of oscillation, and means effected by the position of said belt for oscillating said roller about said perpendicular axis.

3. A guide for a belt or web traveling over spaced carrier rolls comprising, a tension roller transversely engaging a stretch of said belt or web intermediate said carrier rolls and maintaining it under substantial tension, said tension roller being pivotally mounted for oscillation in a plane parallel to the plane of the engaged stretch and about an axis perpendicular thereto and positioned centrally of the longitudinal edges

of said belt to vary tension upon opposite sides of said belt, said tension roller being positioned at a point closer to one of said carrier rolls than to the other and having its longitudinal axis offset from its axis of oscillation, and means effected by the position of said belt for oscillating said roller.

4. A guide for a continuous belt or web traveling over spaced carrier rollers comprising, a tension roller transversely engaging a stretch of said belt or web intermediate said carrier rolls and maintaining it under substantial tension, said tension roller being pivotally mounted for oscillation in a plane parallel to the plane of the engaged stretch to vary tension upon opposite sides of said belt, and a lever assembly engaged by the edges of said belt and connected with said tension roller for oscillating the same upon lateral shifting of the belt, the longitudinal axis of the tension roller being offset from its axis of oscillation on the side thereof opposite the lever assembly.

5. A guide for a continuous belt or web traveling over spaced carrier rollers comprising, a tension roller transversely engaging a stretch of said belt or web intermediate said carrier rolls said tension roller being pivotally mounted for oscillation in a plane parallel to the plane of the engaged stretch to vary tension upon opposite sides of said belt, and a lever assembly engaged by the edges of said belt and connected with said tension roller for oscillating the same upon lateral shifting of the belt, the longitudinal axis of the tension roller being offset from its axis of oscillation on the side thereof opposite the lever assembly, said tension roller further being movable in a direction perpendicular to the engaged stretch of the belt, thereby to maintain the belt or web under substantial longitudinal tension.

6. A guide for a belt or web traveling over spaced carrier rolls comprising, a horizontal tension roller transversely engaging a stretch

of said belt or web intermediate the carrier rolls said tension roller being pivotally mounted for oscillation in a horizontal plane and about a perpendicular axis positioned centrally of the longitudinal edges of said belt and at a point closer to one of said carrier rolls than the other to vary tension upon opposite sides of said belt, and a lever assembly engaged by the edges of the belt and connected with the tension roller for oscillating said roller upon lateral shifting of the belt, said tension roller further being movable vertically, thereby to maintain the belt or web under substantial longitudinal tension, and the longitudinal axis of the tension roller being offset from its axis of oscillation on the side thereof opposite the lever assembly.

7. A belt guide comprising a bearing, a pintle journalled in the bearing and adapted to be oscillated about its longitudinal axis, a tension roller supported for oscillation at one end of the pintle and having its longitudinal axis lying in a plane perpendicular to the longitudinal axis of the pintle, the longitudinal axis of the tension roller being off-set from the axis of oscillation of the pintle, a lever assembly connected to the pintle for oscillating the same, said lever assembly extending from the pintle in a direction opposite to that in which the longitudinal axis of the tension roller is off-set.

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