# United States Patent

**Miller et al.**

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[54] **TAKE-UP MECHANISMS**


[72] Inventors: **Jarrell Miller,** Denver; **Jimmy Talmage Whiteside,** both of Greeneville, Tenn.

[73] Assignee: **Huyck Corporation,** Stamford, Conn.



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[51] **Int. Cl.** ..... **D03d 49/20**

[58] **Field of Search** ..... 139/307, 308, 304; 242/66, 242/65; 66/86 A



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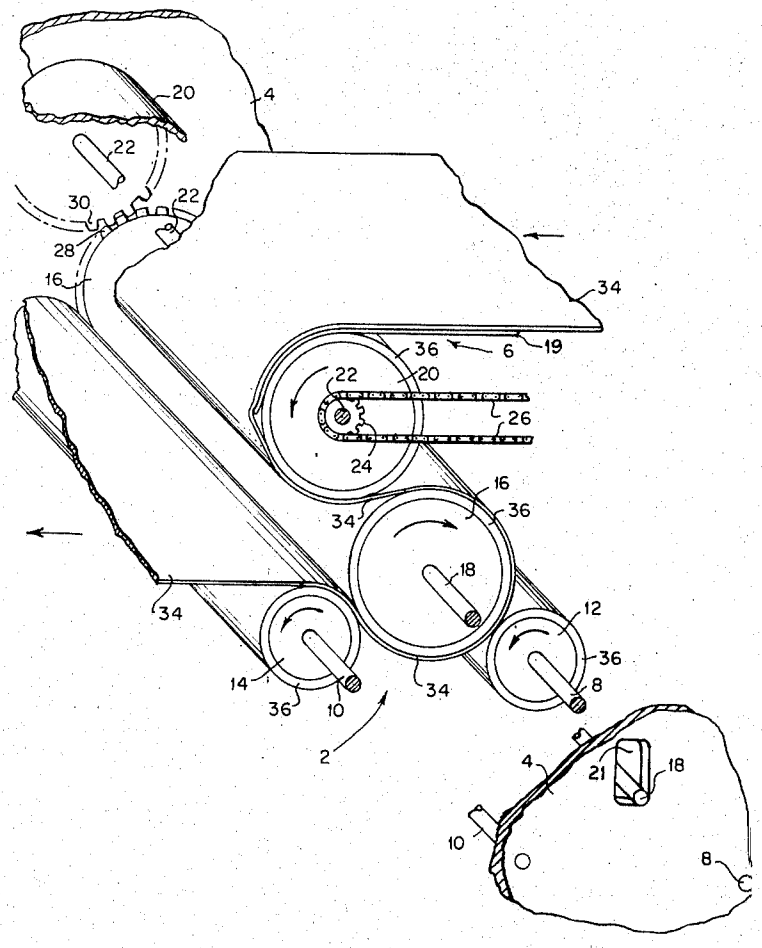
*Primary Examiner*—James Kee Chi
*Attorney*—William G. Rhines

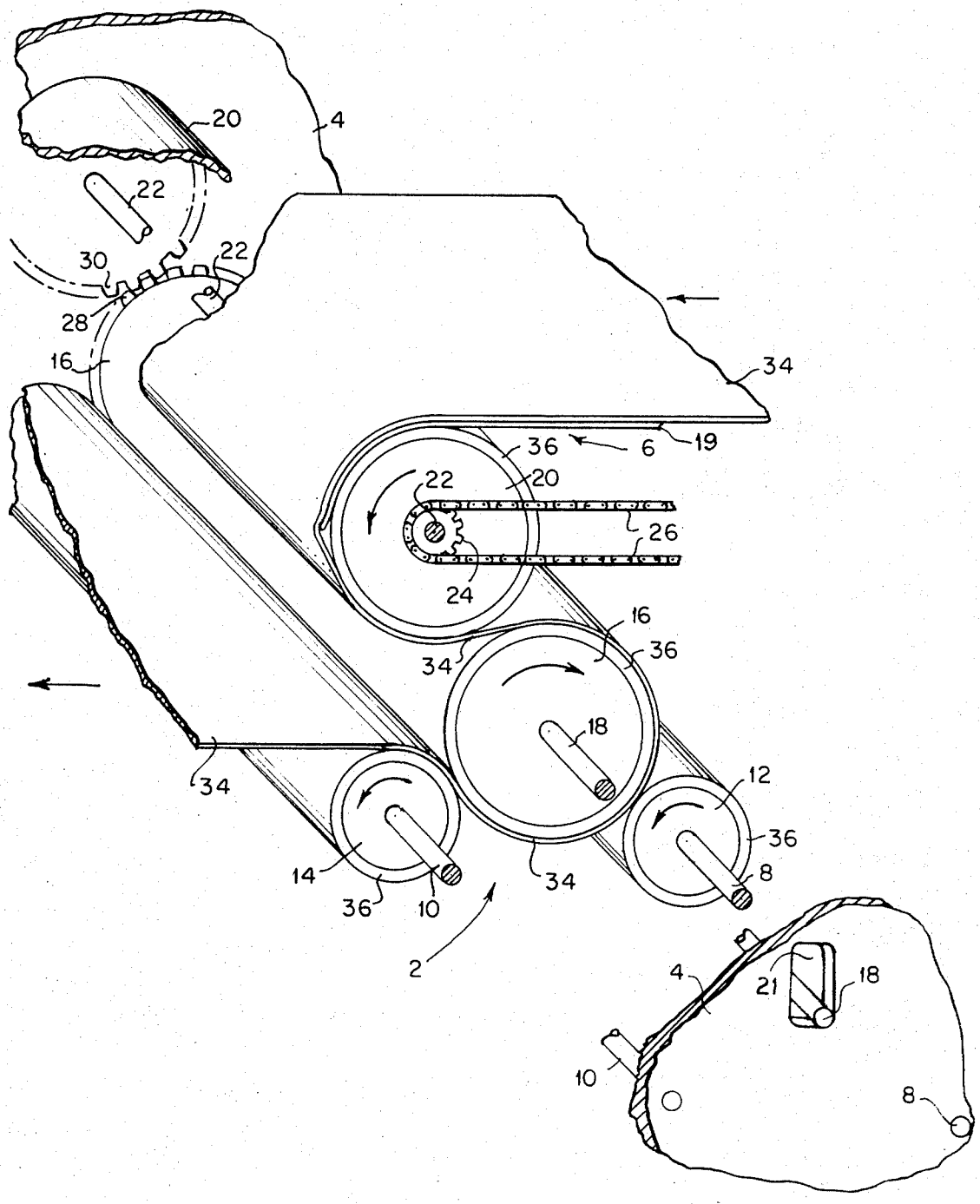


[57] **ABSTRACT**

This invention relates to new and useful improvements in loom take-up mechanisms. More particularly, this invention relates to a take-up mechanism for a loom for weaving fabric comprising a positively driven take-up roll and at least one support roll which together cooperatively form at least one press nip and exert a positive resultant force on the fabric as it passes through the press nip.


**11 Claims, 1 Drawing Figure**






JIMMY T. WHITESIDE
JERALD D. MILLER
INVENTORS
BY William J. Adams
ATTORNEY

# TAKE-UP MECHANISMS

## BACKGROUND OF THE INVENTION

During the weaving of certain fabrics, it is often desirable that the tension applied to the fabric in the warp direction ("warp tension" hereinafter) be very high. For example, in weaving a fabric endless for use in the forming section of a papermaking machine, it is often desirable to subject the fabric to warp tensions of about 40 pounds per lineal inch of width in order to assure that the weave pattern is uniform throughout the woven fabric.

High tension weaving, for example, weaving at warp tensions of about 30 to 60 pounds per lineal inch of width, is of particular concern to manufacturers of papermakers fabrics in that due to the high degree of uniformity in weave pattern which is required by papermakers in order to be assured of the production of an acceptable paper or similar products, the high warp tension in the fabric must be maintained substantially uniform during the entire weaving process since, if it is not, some of the warp yarns may be more slack than the others, thereby causing pick variations. Looms heretofore used for high tension weaving are not readily adapted for maintaining the predetermined warp tension substantially uniform. For example, in endless weaving of forming fabrics from synthetic yarns at warp tensions of about 40 pounds per lineal inch of width there has been a tendency for the take-up mechanism to "slip"; that is, momentarily to allow the woven portions of the fabric to cease moving through the take-up mechanism. This has the effect of causing the pick count to increase and of allowing some of the warp yarns to become more slack than others thereby causing pick variations as noted above.

Even when weaving at low warp tensions, for example, warp tensions of about 15 pounds per lineal inch of width, it is often desirable to maintain the predetermined warp tension substantially uniform. Heretofore, means for maintaining warp tension substantially uniform even during low tension weaving have involved complicated apparatus not readily adapted to existing equipment. The present invention provides an uncomplicated apparatus for maintaining even low warp tensions substantially uniform.

Accordingly, it is an object of this invention to provide a loom take-up mechanism which will prevent the take-up mechanism from slipping, particularly at high warp tensions.

It is a further object of this invention to provide a loom take-up mechanism which will maintain the predetermined warp tension substantially uniform.

Another object of this invention is to provide a loom take-up mechanism which will maintain the warp tension substantially uniform during high tension weaving.

Still another object of this invention is to provide a loom take-up mechanism which does not require the use of complicated apparatus.

A further object of the present invention is to provide a take-up mechanism which requires relatively simple modifications of existing looms.

## SUMMARY OF THE INVENTION

Many desired objectives, including those listed above, are achieved through practice of the present invention in which the fabric woven on a loom is passed through a take-up mechanism which comprises a positively driven take-up roll and at least one support roll, the axes of said rolls being substantially parallel to each other and extending substantially at right angles to the path traveled by the fabric as it is woven in the loom. The rolls cooperatively form at least one press nip and exert a positive resultant force on the fabric as it passes through the nip.



## BRIEF DESCRIPTION OF DRAWINGS

This invention may be more clearly understood by reference to the specification which follows and to the attached drawing in which, FIG. 1 is a perspective view of the preferred embodiment of the present invention.

## DESCRIPTION OF THE EMBODIMENTS OF THE INVENTION

Referring to FIG. 1, there is depicted a take-up mechanism 2 which comprises a support means 4, for example, the frame of the loom, having affixed thereto a fabric support member 6, and having rotatably mounted thereto by means of axles 8, 10, rearward cradle roll 12 and forward cradle roll 14. Cradle rolls 12, 14 are in supporting relationship to solid lower take-up roll 16. Axle 18 extends into an opening 21 in support means 4 such that roll 16 can move vertically and/or horizontally, as described in more detail hereinafter, but cannot roll out of the cradle. Fabric support member 6 comprises a fabric guiding member 19, which is affixed to support means 4, and upper take-up roll 20, which is rotatably mounted to support means 4 by means of axle 22. Upper take-up roll 20 is caused to rotate by means of sprocket 24, which is affixed to axle 22, and chain 26 which engages sprocket 24 and the driving mechanism of the loom (not shown). Lower take-up roll 16 is caused to rotate at the same speed as upper take-up roll 20, by means of an interconnecting linkage comprising, for example, gear 28, which is affixed to axle 18, and gear 30, which is affixed to axle 22.

In operation, the woven fabric 34 passes over the fabric guiding member 19, partially wraps around upper take-up roll 20, engages lower take-up roll 16 and passes through the press nips which are formed by lower take-up roll 16, and cradle rolls 12 and 14, respectively. The fabric 34 is subsequently wound for storage. In the preferred embodiment of the present invention, the cradle rolls 12, 14 are disposed relative to one another so as to impede any tendency for the lower take-up roll 16 to fall from the "cradle." For example, as depicted in FIG. 1, the axle 10 of cradle roll 14 is disposed higher than the axle 8 of cradle roll 12 in order to prevent the lower take-up roll 16 from being pulled out of the "cradle" by the fabric 34 as a result of the force the fabric exerts on the take-up roll 16 during the weaving operation.

The diameter of the take-up rolls 16, 20 and cradle rolls 12, 14 relative to each other is not critical, except that the outer diameter of the take-up roll 16 should be greater than the distance between the closest part of the cylindrical surfaces of cradle rolls 12, 14 so that the latter will support the former.

All of the rolls extend horizontally in the transverse direction: that is, their axes extend in a longitudinal plane disposed in a direction substantially at right an-

gles to the direction in which the woven fabric is moving. Generally, the rolls will be placed near the front of the loom.

Slippage of the take-up mechanism **2** may be substantially eliminated, and the warp tension in the fabric **34** may be maintained substantially uniform, as a result of the "positive resultant force" by which is meant the effective force exerted on the fabric **34** as it passes through the press nips formed by lower take-up roll **16**, and cradle rolls **12, 14**. This force may be made to increase as the warp tension in fabric **34** is increased, so that the pressure exerted on the fabric by the press nips formed by take-up roll **16**, and cradle rolls **12, 14** will be increased, such that the increased warp tension will be maintained substantially uniform and the lower take-up roll will continuously drive the fabric through the take-up mechanism **2** during the weaving process. This is because the positive resultant force has two vector components; that is, the force resulting from the weight of the lower take-up roll bearing against at least one support or cradle roll, and the force resulting from the lateral moment of force produced by the lateral movement of roll **16** induced by tension on the fabric **34**. Thus, the positive resultant force may be varied by varying either or both of these vector components. By way of example only, and referring to the drawing, the nip pressure may be increased as warp tension increases; that is, the positive resultant force may be increased on fabric **34** during the weaving process, by warp tension increases causing the lateral moment of force to increase. For example, in FIG. **1**, this is achieved by causing fabric **34** to wrap around more than 180° of roll **16**. For example, it has been found that warp tensions of about 45 pounds per lineal inch of width may be maintained substantially uniform by using a solid steel lower take-up roll having a diameter of 8 inches, the weight being distributed throughout the roll at about 14 pounds per lineal inch of width, and causing the fabric to wrap around the lower take-up roll more than 180°. Fabric **34** may be guided in such a manner as to wrap lower take-up roll **16** the desired amount, by means of a breast beam which extends in the transverse direction and is affixed to support means **4**. In such an embodiment, the woven fabric passes over and partially wraps around the breast beam, engages the lower take-up roll, passes through the press nips formed by the lower take-up roll and cradle rolls, and is subsequently wound up. As depicted in FIG. **1**, however, in the preferred embodiment a fabric guiding member **19** and upper take-up roll **20** are used in place of a breast beam. In this manner, fabric abrasion is substantially reduced.

It should be noted that it is not meant to limit the present invention to a lower take-up roll supported by two cradle rolls. For example, the lower take-up roll may cooperatively form press nips with any number of support rolls, the cooperative relationship being perfected by a lower take-up roll and one support roll.

Although not necessary, in most applications it is desirable that the speed of the two take-up rolls **16, 20** be identical. This may be achieved by causing lower take-up roll **16** to be driven by upper take-up roll **20** by means of gears **28, 30**. It should be noted, however, that the exact means for maintaining the speeds of the take-up rolls **16, 20** identical is not limited to such a construction and any well-known means may be used. For example, take-up rolls **16, 20** may be independently driven by the loom and/or some auxiliary driving means.

Although cradle rolls **12, 14** may be driven by some driving means, in the preferred embodiment they are caused to rotate by the movement of the fabric **34** through the press nips formed by the lower take-up roll **16** and cradle rolls **12, 14**, and by the driving motion of lower take-up roll **16**.

Although not necessary, the gripping action of the rolls upon the fabric may be increased by providing all or some of them with a surface having a high coefficient of friction. For example, in the preferred embodiment depicted in FIG. **1**, all of the rolls have a rubber covering **36** adhesively bonded thereto.

It is to be understood that in the foregoing specification and the attached drawing, the specific embodiments and components thereof which have been illustrated and discussed are by way of illustration and not of limitation and that this invention may be practiced by those skilled in the art utilizing a wide variety of materials and configurations without department from the true spirit and scope of this invention.

We claim:

**1.** A take-up mechanism for a loom for weaving fabric comprising

a take-up roll,

at least one support roll,

and driving means for causing said take-up roll to rotate in at least one direction,

the axes of said rolls being substantially parallel to each other and extending substantially at right angles to the path traveled by said fabric as it is woven in said loom, said rolls cooperatively forming at least one press nip, said take-up roll being free to move vertically and/or horizontally relative to the axis of said support roll so that when said fabric so traverses the surface of said take-up roll that increasing tension on said fabric will impel the axis of said take-up roll closer to the axis of said support roll, the force exerted on said fabric passing through said nip will be increased.

**2.** The apparatus described in claim **1** wherein said take-up roll is cradled by at least two support rolls.

**3.** The apparatus described in claim **2** wherein said fabric wraps about said take-up roll by more than 180°.

**4.** The apparatus described in claim **3** wherein said axis of said support roll forming the first press nip said fabric passes through is positioned lower than at least one other axis of at least one other support roll.

**5.** The apparatus described in claim **4** wherein the surface of at least one of said rolls has a high coefficient of friction.

**6.** The apparatus described in claim **5** wherein said take-up roll is solid.

**7.** The apparatus described in claim **6** wherein said surface is rubber.

**8.** The apparatus described in claim **7** wherein said driving means is also the power source for said loom.

**9.** A take-up mechanism for a loom for weaving fabric comprising

a take-up roll,

a first and second support roll spaced apart by a distance between the closest part of their cylindri-

cal surfaces which is less than the outer diameter of said take-up roll,

and means for imparting torque motion to said take-up roll in at least one direction,

the axes of all of said rolls being substantially parallel to each other and at right angles to the path traveled by said fabric as it is woven in said loom,

said take-up roll and said first and second support rolls cooperatively forming a first and second press nip, respectively,

means for guiding said fabric such that said fabric wraps about said take-up roll by more than 180°, a portion of said fabric passing sequentially through said first press nip and then through said second press nip,

whereby said rolls will exert a positive resultant force on said fabric passing through said nips.

**10**. The apparatus described in claim **9** wherein said rolls have surfaces which have a high coefficient of friction.

**11**. The apparatus described in claim **10** wherein the axis of said second support roll is positioned higher than the axis of said first support roll.

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