METHOD AND APPARATUS FOR WINDING LOOM BEAMS
10 Claims, 6 Drawing Figs.

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ABSTRACT: A combined support and drive assembly and method for winding loom beams with warp threads in uniform fashion. The drive includes a pair of dogs which engage ears on the loom beam and which equalize the driving pressure between them so that a purely torsional force is imparted to the loom beam. The drive assembly also includes a guide which positively locates the driven end of the loom beam so as to assure symmetrical engagement between the dogs and the loom beam ears.
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METHOD AND APPARATUS FOR WINDING LOOM BEAMS

BACKGROUND OF THE INVENTION

In the manufacture of cloth, the warp threads for a loom are first wound upon a spool commonly referred to as a beam and the beam with its supply of warp threads is then operatively associated with the loom during the weaving operation. During weaving, the warp threads are maintained under tension by braking the loom beam and it is important and desirable that the tension as between the individual warp threads across the width of the fabric being woven be kept as uniform as possible. This uniformity of tension depends in part upon the uniformity with which the warp threads have been wound upon the beam in the first place and it is this particular area with which the present invention is concerned.

Conventional mechanism for winding the warp threads upon the beam do not obtain a uniform winding action of the warp threads along the length of the beam, with the result that disparity in tension is manifest as between, in particular, the warp threads at one extreme end of the beam and the warp threads wound upon the other extreme end of the beam.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to the discovery that the aforesaid nonuniformity of tension during weaving is directly traceable to bending moments imparted to the beam during the winding thereon of the supply of warp threads and that this, in turn, is due to asymmetrical application of the winding force. For example, conventional winding mechanism for a loom beam employs a single dog displaced radially from the axis of winding rotation and engaging an ear or flange on the beam to impart the requisite winding rotation thereto as the individual warp threads, distributed along the length of the beam, are wound thereon. The resultant reaction force acting on that end of the loom beam to which the winding force is applied and which imparts a bending moment to the loom beam continuously varies not only as to magnitude but as to direction as the dog is rotated angularly through 360° of arc. The bending moment produced by this reaction force causes deflection of the beam such that the warp threads are not uniformly wound along the length of the beam.

The present invention overcomes this problem by utilizing a combined support and drive assembly for the loom beam in which the beam is supported or guided at its driven end so that a pair of drive dogs are assured of symmetrical disposition with respect thereto and wherein means is provided assuring equal distribution of the winding torque between the two dogs.

A piston is provided for each dog and each piston is capable of limited free axial movement, with there being an incompressible fluid system acting between the pistons causing them to share equally in the driving force imparted to the loom beam.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a perspective view illustrating a loom beam and a portion of the drive mechanism according to the present invention in exploded relation;

FIG. 2 is a view showing an end portion of a wound loom beam according to methods employed by the prior art;

FIG. 3 is an enlarged view, partly in section, illustrating the interengagement between the loom beam and the driving assembly;

FIG. 4 is a transverse view taken substantially along the plane of section line 4—4 in FIG. 3;

FIG. 5 is a transverse section taken substantially along the plane of section line 5—5 in FIG. 3; and

FIG. 6 is an enlarged sectional view of one of the drive dog assemblies as indicated by section line 6—6 in FIG. 5.

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DETAILED DESCRIPTION OF THE INVENTION

With reference now more particularly to FIG. 1, a loom beam is indicated generally therein by the reference character 10 and which will be seen to include an elongate spool portion 12 and opposite end plates 14 and 16. The end plate 14 is provided with a projecting stub shaft 18, not shown, and a similar stub shaft 18 is provided on the end plate 16, the end plate 16 also being provided with a hub portion 20 from which there are provided a pair of diametrically opposed and radially extending flanges 22 and 24. This is a normal construction for the loom beam assembly, it being appreciated when the warp threads are wound upon the loom beam, same is disposed in association with a loom so that the individual warp threads unfold therefrom as the weaving process progresses. As would be expected, the uniformity with which the warp threads are wound upon the spool portion 12 in longitudinally side-by-side relation therealong controls the uniformity of tension in the warp threads as they are unrolled from the beam.

When winding a fresh supply of warp threads on the beam 10, the beam assembly is supported by the stub shafts at its opposite ends in association with a winding assembly indicated generally by the reference character 26 and which will include a drive shaft 28 and an associated faceplate 30 having a drive dog thereon for engaging one of the flanges 22 or 24 to impart rotary motion to the beam 10 to which the free ends of individual warp threads are secured in longitudinally spaced relationship along the length of the spool portion 12. The use of a single driving dog, or for that matter a pair of dogs which do not equally distribute the driving force between the two flanges 22 and 24, will produce a reaction force acting against the stub shaft 18 tending to deform and bend the beam assembly 10 tending to unevenly wind certain of the warp threads, and more notably those disposed adjacent the driven end of the beam assembly 10. This is illustrated in FIG. 2 wherein it will be seen that the several warp threads region 32 will display a high point H and a low point L, as compared with the remaining warp threads as indicated in the region 34. Thus, when the individual warp threads are unrolled during the weaving operation, the high and low points will cause uneven tension in the associated warp threads so that the tension in all of the warp threads longitudinally along the spool portion 12 of the beam assembly 10 will not be uniform.

According to the present invention, as may be seen from FIG. 3, the present invention utilizes two driving dogs indicated by the reference characters 36 and 38 which are disposed at radially equidistantly spaced positions with respect to the recess 40 in the driving assembly which guides and receives the stub shaft portion 18 of the loom beam 10. Thus, the assembly positively assures symmetrical disposition of the dogs 36 and 38 and 38 radially with respect to the axis of the drive shaft 28 and of the axis of the loom beam assembly 10.

As may be seen in FIGS. 5 and 6, the faceplate 30 is provided with a pair of guide blocks 42 and 44 which may be secured thereto by a pair of fasteners 46 and 48, as shown in FIG. 6, and which guide blocks each include a pair of outstanding bushing stands 50 and 52 having aligned bores therethrough, each of which is provided with a suitable bushing such as those indicated by the reference characters 54 and 56. A piston 58 is slidably received in the aligned bushings 54 and 56 and each is provided with a reduced diameter portion 60 receiving its associated dog 36 or 38. The bushing stands 50 and 52 define a gap therebetween which is wider than the width of the dogs 36 or 38 so as to allow the piston a limited amount of free play between the bushing stands 50 and 52, the purpose of which will be presently apparent.

One of the bushing stands receives a retainer plate 62 held in place by suitable circlet 64 and which acts as a seat for a reaction member 66. The reaction member includes a head portion which is slidably received in a fluid recess 68 in each piston as may be seen in FIG. 6 and may be provided with a circumferential groove receiving a suitable O-ring 70 to provide a good sealing engagement with the piston and whereby
to define, therewith, a fluid chamber 72. The reaction member 66 is provided, in each case, with an axial bore 74 communicating with its fluid chamber 72 and the two bores 74 are interconnected by a suitable conduit 76 so that the two fluid chambers 72 are in intercommunication.

The reduced end portion 78 of each reaction member 66 projects through a suitable opening in the plate 62 and may be provided with a circlet 80 to retain it in place. Additionally, the plate 62 may be provided with a notch 82 receiving a pin 84 carried by the reaction member 66 in each case so as to prevent rotation between the reaction member 66 and the plate 62.

Each piston is provided with an axial bore 86 communicating its outer end with the fluid chamber 72 and provided, at such outer end with a suitable grease nipple or similar one-way check device 88. A relatively high-viscosity incompressible fluid, such as axle grease, is introduced into the system through the nipples 88, the air being bled from the system so that the incompressible fluid completely fills the chamber and conduit system. The amount of incompressible fluid introduced is such as will not force both pistons to their extreme positions and, to this end, one piston may be held in its fully retracted position as is shown in dash-dot line in FIG. 6 while the other piston is allowed to extend to an intermediate position toward the full line position of the dog 36 as shown in FIG. 6.

With this condition prevailing, and as is shown in FIG. 5, the dogs are disposed on opposite sides of the respective flanges 22 and 24 and the driving force imparted to the faceplate 30 will permit the dogs 36 and 38 to seek positions in which the driving torque is equally divided therebetween as effected by the intervening, incompressible fluid system.

The floor portion 90 formed in each guide block between the outstanding bushing stands 50 and 52 thereof is flat and the corresponding inner end 92 of each dog is similarly flat and disposed in close adjacency thereto so as to stabilize the dogs and maintain them in outstanding positions as is shown for example in FIG. 3.

**OPERATION**

In operation, the stub shaft 18 of an empty loom beam 10 is positioned in faceplate 30 and the stub shaft of the end plate 14 is positioned in another plain faceplate, (not shown). Since the driving flanges 22 and 24 are offset as seen in FIG. 5 so that their driving surfaces D lie along a diameter of the end plate 16, the dog 36 engages the driving surface S of flange 22 and the dog 38 engages surface S of flange 24. The faceplate 30 is driven so that the beam 10 is rotated clockwise in FIG. 5 as shown by arrow M.

When the warp threads are attached to the beam 10 and the winding operation starts, wherever dog 36 or 38 that first engages a driving surface S forces the other dog 36 or 38 into contact with the other driving surface S by forcing the fluid through conduit 76. This causes equal loading on the flanges 22 and 24 so that the movement of the beam 10 as experienced by the prior art is eliminated even though there may be variations formed in flanges 22 and 24 during casting.

Further, if the viscosity of the fluid is not such that the dogs 36 and 38 move slowly back and forth in their stands 50 and 52, a flow-control valve V (shown in FIG. 5) may be inserted in conduit 76 to restrict the fluid flow and retard the speed of movement of dogs 36 and 38. This prevents chatter between dogs 36 and 38 and flanges 22 and 24 while the equal loading adjustment is taking place.

While specific embodiments of the invention have been disclosed herein, it is to be understood that modifications, equivalents, and substitutions may be used without departing from the scope of the inventive concept.

What is claimed is:

1. In combination with a loom beam having an end flange with a projecting stub shaft and outstanding ears on either side of said stub shaft, a combined support and drive assembly for said loom beam, said assembly comprising a drive shaft, a faceplate at one end of said drive shaft, said assembly having a recess concentric with the axis of said drive shaft guiding said stub shaft to align said loom beam with said drive shaft, a pair of floating drive dogs carried by said faceplate and engaging said ears symmetrically with respect to the axis of said drive shaft and of said loom beam, and means for interconnecting said drive dogs to equalize the driving pressure exerted thereby against said ears.

2. The combination as defined in claim 1 wherein said faceplate is provided with a piston for each drive dog, the last-mentioned means comprising an incompressible fluid system interconnecting said pistons.

3. The combination as defined in claim 2 wherein said faceplate is provided with a pair of guide blocks, each guide block including a pair of bushing stands defining a gap therebetween, each piston having opposite end portions received in an associated pair of said bushing stands, said dogs being carried by intermediate portions of said pistons for limited movement within said gaps.

4. The combination as defined in claim 3 wherein each guide block is provided with a flat floor portion between its bushing stands, each drive dog having a flat base portion adjacent its associated floor portion so as to be stabilized thereby.

5. The combination as defined in claim 1 wherein said faceplate is provided with a pair of guide blocks, each guide block including a pair of bushing stands defining a gap therebetween, a piston having opposite end portions received in said bushing stands and having one end portion provided with a fluid recess, a reaction member fixed to one of said bushing stands and projecting into said fluid recess to define a fluid chamber therewith adapted to be filled with an incompressible fluid, said dogs being carried by intermediate portions of said pistons for limited movement within said gaps.

6. The combination as defined in claim 5 wherein each guide block is provided with a flat floor portion between its bushing stands, each drive dog having a flat base portion adjacent its associated floor portion so as to be stabilized thereby.

7. The combination as defined in claim 6 wherein each reaction member is provided with a bore therethrough, said means for interconnecting comprising a fluid conduit intercommunicating said bores.

8. A method for winding warp threads on a loom beam having a support shaft and diametrically extending driving flanges comprising the steps of: rotatably supporting the loom beam by its support shaft; applying a first force to one of the driving flanges of the beam through an element engaging said flange for rotating the beam in a given direction; applying a second force to the other flange of the beam through an element engaging said other flange for rotating the beam in said given direction; and equalizing the torque applied to the loom beam by said first and second driving forces, by transmitting an equalizing force from one of said flange engaging elements to the other.

9. A method as in claim 8 wherein the force is transmitted from one flange engaging element to the other through a fluid medium.

10. A method as in claim 8 wherein said first and second forces are each applied at a predetermined distance from the axis of rotation of the beam on diametrically opposite sides of said axis.