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WARPING MACHINE

Filed Nov. 15, 1961

FIG. 1

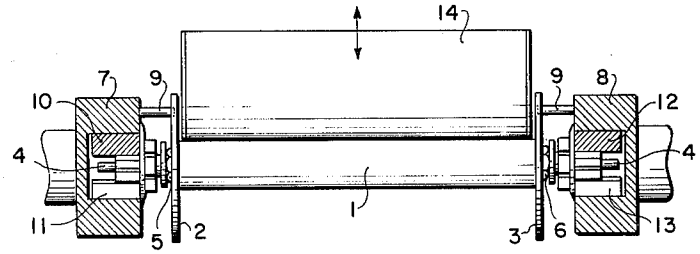



FIG. 2

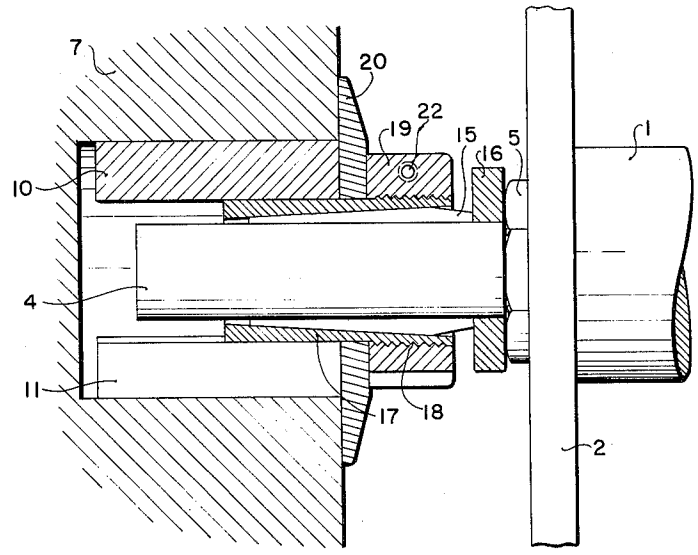



FIG. 3

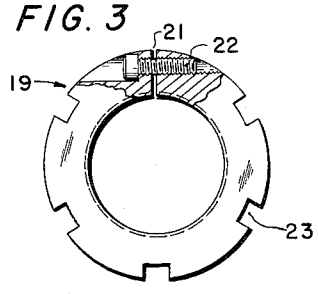
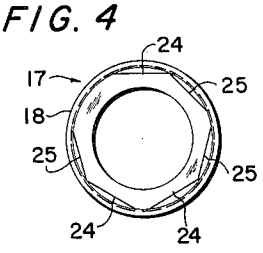



FIG. 4

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# WARPING MACHINE

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5 Claims. (Cl. 242—129.6)

This invention relates to textile apparatus and relates more particularly to improvement in a machine for warping yarn beams wherein said beams are mounted on a shaft, and wherein the machine is provided with a pair of rotatable chuck jaws for holding the two shaft journals which project at both ends of the beam. More specifically the instant invention is directed to a novel clamping device for holding the shaft journals within the rotatable chuck jaws.

In the conventional warping machine, the warp beams are mounted on a shaft and are secured thereon by means of nuts or other fastening means. In other prior warping machines, the beams are formed as an integral part with the projecting shaft journals. Such shaft journals function to position the beams in the jaws of two support chucks, said chucks serving to hold the beams in the machine and support them in operation. In many warping machines, such chucks also provide a direct contact between the beam and the driving system or the braking system. In systems embodying driven chucks, the driving force may be applied to the warp beam through the clamping action of the chuck jaws. Generally, however, a separate driving connection is employed. For example, use may be made of a driving pin which is attached to the chuck jaw and engage with a suitable recess or notch in the warp beam.

Another well known driving system in the art makes use of a pressure roller which is in frictional contact with the cylindrical surface of the warp beam and the roll of threads being formed thereon. The action of this pressure roller also presses the yarn being uniformly wound onto the beam. It is essential that the pressure roller by placed truly parallel to the axis of the beam and accurately between the flanges at either end thereof.

In order to insure that the warp beam is accurately mounted, the shaft journals must be positioned truly concentric with the axis of the beam and must be so machined that they are accurate in size and have good surface smoothness. It is essential, moreover, that shaft journals retain their concentric positioning and surface smoothness throughout the life of the beam so as to insure continued winding accuracy and a consequent high quality product.

In practice, however, it is difficult to retain the journal surface smoothness and concentricity due to ordinary textile operating conditions. That is, warp beams must be wound and unwound at great speed from an economic standpoint. For economic operation also, the beams must carry a large quantity of yarn and this yarn must be of high quality. Therefore, during the winding of a warp beam, such beam must be stopped quickly if it is necessary to remove any knops, slubs, broken threads, shining ends, rolled ends and the like, which have been detected. A great braking force must be employed to counteract the great kinetic energy of the heavily laden and rapidly rotating beam. As is well known in the art, chuck jaws are commonly employed to transmit the braking force to the journals of the rotating warp beam.

However, even in cases a where a separate driving unit is employed, it has been found that the braking must be effected with such force that it will very often cause the shaft journals to turn slightly, relative to the chuck jaws.



As a result of such movement the chuck jaws will bite into or gouge the smooth surface of the shaft journals, so that after the brake has been applied a few times, the journals will no longer be sufficiently smooth or concentric enough to maintain the winding accuracy of the beam. Due to this slippage and gouging, a looseness or "play" will arise between the several warping machine parts. Moreover, since warp beam parts are very often produced from a light-weight metal, this "play" will increase and consequently the risk of further damage to the shaft journals will arise.

It is therefore an object of this invention to provide a warp beam support and clamping device that will eliminate the inherent disadvantages of prior art devices.

Another object of this invention is to provide a clamping device for beam supporting shafts that will hold the journals thereof more securely than has been known heretofore.

Still another object of this invention is to provide a warp beam support that will not damage the journals thereof in the event of any slippage of said beam.

It is another object of this invention to provide a warp beam support that will prevent the occurrence of slippage or play between the several elements of a warping machine.

A further object of this invention is to provide a warp beam clamping device that will insure winding accuracy and precision of operation.

Still a further object of this invention is to provide a warp beam clamping device that may be substituted into existing warping machines to provide improved, damage free beam winding and stopping.

It has been found that the warping machine play and slippage inherent to prior art devices can be substantially eliminated by employing the clamping device of the present invention.

In accordance with this invention, a warping machine is provided with a clamping system comprising expansible clamping bushings which may be placed between the jaws of the journal supporting chucks and around the supporting shaft journals. By using these clamping bushings, damage to the shaft journals can be prevented entirely. Furthermore, the shaft journals will be held more tightly by the chuck jaws, and even if the shaft journals should turn slightly with respect to said jaws, the shaft journals will not be damaged.

In a preferred embodiment of the instant invention, the external surface of the expansible clamping bushings are tapered and are fitted with sleeves provided with a tapered internal bore and at least a partial external screw thread. A mating nut is provided to mesh with the screw threads. This embodiment is particularly suitable for clamping a warp beam in a warping machine in a simple manner without any risk of damage to the shaft journals. After a warp beam is mounted in position, the nuts will be tightened over the screw threads. The nuts will press against the external surfaces of the chuck jaws and cause the sleeves which are provided with tapered bores to slide over the tapered clamping bushings in such a manner that the sleeves, clamping bushings and shaft journals will all be clamped tightly together. At the same time, the beam will be fixed in position between the chuck jaws. By subsequently tightening the jaws of the chuck around the sleeves, the warp beam will be completely fixed in winding position.

The above embodiment of the device of this invention permits the warp beam to be located very accurately in its position opposite a conventional pressure roller. Further, if the clearance spaces on either side of the beam and the head surfaces of the pressure roller are not truly equal, such may be remedied by a simple adjustment. That is,

the two nuts on the sleeves may be simultaneously loosened and tightened before the sleeves ore clamped between the jaws of the chucks. This will cause the warp beam to be displaced somewhat in its axial direction over a distance that is proportional to the degree to which the nuts have been turned. Obviously, this distance may be arbitrarily selected so that it will correspond to the desired adjustment.

In order to prevent the adjustment nuts from loosening under ordinary operating vibration, it is preferred that they be provided with a detachable locking means.

Other objects and advantages of this invention, together with certain details of construction and combinations will appear from the following detailed description and will be pointed out in the appended claims.

In the drawings wherein a preferred embodiment of the instant invention is shown,

FIGURE 1 is a front elevational view, partly in section, of a warp beam mounted in a warping machine;

FIGURE 2 is an enlarged view of the left-hand shaft journal mounting shown in FIGURE 1;

FIGURE 3 is a front view of a portion of the clamping device of the instant invention partially in section; and

FIGURE 4 is a front view of a different portion of the clamping device.

Like reference numerals indicate like parts throughout the several views of the drawings.

Referring now to the drawings for a detailed description of this invention and particularly to FIGURE 1 the numeral **1** designates the winding surface of a warp beam which is provided at its ends with flanges **2** and **3**.

Passing through the warp beam in a supporting relationship thereto is a shaft **4**, said shaft being held against lateral and rotational movement by means of nuts **5** and **6** acting against the flanges **2** and **3**. In this manner, only the two shaft journals will project from either side of the flanges **2** and **3** as clearly shown in FIGURE 2. In order for the warping machine to function properly the journals must be machined with truly cylindrical precision, and also must be arranged in a truly concentrical relationship with respect to the winding surface **1**.

The two shaft journals serve to mount the beam at its opposite ends in the chucks **7** and **8**. The chucks, which are shown diagrammatically, form a part of a conventional warping machine (not shown). If desired, the chuck **7** may provide the driving action for the warp beam. In any event, the chuck **7** is provided at its face (FIGURE 1) with a driving pin **9** engageable with a recess (not shown) provided in the flange **2**. Preferably, the driving pin is provided on the chuck face so that the pin will exert a greater torque on the warp beam due to the distance between pin **9** and shaft **4**. Although the chuck **7** can operate in a driving manner without pin **9**, it is preferable to provide the pin to aid both the stopping and the driving action of the chuck. On the other hand, the chuck **8** can freely rotate along with the beam. The chuck **8** may be provided with a similar pin **9** (as clearly shown in FIGURE 1) to provide for positive rotation which is simultaneous with the movement of chuck **7**. Alternatively, the chuck **8** may also be driven.

In order to frictionally clamp the shaft journal in the chucks **7** and **8**, the latter are each provided with three adjustable jaws, of which only jaws **10** and **11** are shown in chuck **7** and only jaws **12** and **13** are shown in chuck **8**, respectively. Jaws **10** and **12** are shown in cross section and jaws **11** and **13** are shown in front elevation in both FIGURES 1 and 2.

As shown in FIGURE 1, pressure roller **14** is preferably movable in a vertical direction as shown by the arrow, while in contact with the winding surface **1** of the warp beam in order to provide for yarn build-up. The roller presses against the layers of yarn in a manner well known in the art to permit uniform build-up. If desired, however, the pressure roller may provide the driving action by frictional contact with the surface of the warp beam.

Referring now to FIGURE 2, jaws **10** and **11** of the chuck **7** are shown in closed position. An expansible bushing type clamp **15**, **16** is fitted over the journal of the shaft **4** and in abutting relationship to the locking nut **5**. The clamp consists of a solid ring **16** (shown in section) and an expansible cylindrical bushing **15**, the outer surface of which is tapered. Ring **16** abuts against nut **5** and restricts the lateral movement of the whole bushing. The bushing **15** is made expansible by being provided with four longitudinal slits (not shown) that extend to the outer surface of ring **16**. As clearly shown, the ring **16** is integrally connected to bushing **15**. Sleeve **17** (shown in section) is then placed over bushing **15** in a sliding relationship thereto. In accordance with this invention, the inner surface of sleeve **17** is provided with a tapered bore to correspond with the outer tapered surface of the clamping bushing **15**. At its wider (right-hand) end, sleeve **17** is provided with an external screw thread **18**. Nut **19** (shown partially in section) contacts thread **18** in mating relationship. Between nut **19** and the jaws **10** and **11**, there is provided a pressure receiving ring **20** which fits over the sleeve **17** and abuts against the outer face of chuck **7** in a restraining relationship.

In operation, the jaws **10** and **11** are first placed in an open position. The nut **19** is then tightened, and in so doing, presses against ring **20** and thereby forces the sleeve **17** to slide over the clamping bushing **15**. This operation is then repeated at the right-hand (flange **3**) of the warp beam by a similar clamping device to maintain the beam in position. In this manner, clamping bushing **15** will contract and tightly embrace the journals of shaft **4** since the bushing **15** is restrained from any lateral movement by the simultaneous tightening action occurring at both ends of shaft **4**. The clamping operation is then completed by tightening the jaws **10** and **11**.

In spite of the aforementioned tightening, the position of the beam may still be adjusted in an axial direction relative to the position of chucks **7** and **8**. This may successively be accomplished by slightly loosening the jaws **10**, **11**, **12** and **13** and also by loosening and tightening the nuts **19** at both ends of shaft **4**, respectively. The jaws **10**, **11**, **12** and **13** are then tightened again to hold sleeve **17** in clamping relationship.

Referring now to FIGURE 3, a front view of tighening nut **19** is shown. The nut is longitudinally cut to form a slit **21**. The opening of the slit **21** may be regulated by tightening socket-head screw **22** by means of a conventional socket wrench. By adjusting screw **22**, the nut **19** will be tightened around screw **18**, thus preventing the nut from loosening under normal operational vibration.

Five recesses or notches **23** are provided in the outer surface of nut **19** to enable the gripping of the nut with a wrench or "spanner" (not shown) to tighten the same.

Referring now to FIGURE 4, a front view of sleeve **17** is shown. The outer surface of the sleeve adjacent screw thread **18**, is provided with six flat faces and a plurality of arcuate faces. As is readily apparent, the flat faces are arranged in two series, **24** and **25**, of three flat faces each. Each series of flat faces are clamped between the three jaws of chucks **7** or **8** for holding the warp beam in position on the machine. The three jaws are not arranged at equal angles with each other, as clearly shown in FIG. 4. However, it has been found that this arrangement is satisfactory since the jaws need not be fully opened before the beam is mounted therebetween.

It has been found that the clamping device of this invention will hold the supporting shaft journals of the warp beam supporting shaft more tightly than has been known heretofore. It has also been found, that by employing the clamping device of the instant invention, damage to the shaft journals will be entirely eliminated if any chuck jaw-shaft journal slippage should occur in

either driving or braking due to the sleeve-like nature of the novel clamping bushing.

More important, it has been found that improved winding accuracy, economy and precision of operation will result when the clamping system of this invention is employed. For example, the clamping system of this invention provides for prompt and exact braking or stopping so that yarn defects may be removed before they are incorporated in the warp beam. This clamping system also provides the strength necessary to support large warp beams, while providing the great braking power necessary to accurately resist the great kinetic energy of a rapidly rotating warp beam.

Attendant with all the above advantages, the clamping device of this invention will provide smooth, damage free, warp beam operation in such a manner that the driving pin or other driving means will tightly engage the warp beam flange, leaving no play or slippage and assuring winding accuracy.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations and changes may be made therein without departing from the spirit or scope of this invention.

What is claimed is:

1. In a yarn warping machine including a warp beam mounted on a supporting shaft, two rotatable chucks adapted to support said beam and supporting shaft, jaws within said chucks for holding the journals of said shaft, the improvement comprising a clamping system for retaining the shaft journals within each of said jaws, said clamping system including expansible clamping bushings and mating threaded elements, said threaded elements radially compressing the respective expansible clamping bushings and thereby axially adjusting and fixing said expansible bushings to the surfaces of the respective chucks, one of said threaded elements being held by each of said jaws by frictional contact.



2. A yarn warping machine in accordance with claim 1 wherein the expansible clamping bushings have a tapered outer surface.

3. A yarn warping machine in accordance with claim 1 wherein one of the threaded elements is a sleeve adapted to fit over the expansible clamping bushings.

4. A yarn warping machine in accordance with claim 3 wherein the sleeve is provided with an inner tapered bore.

5. A yarn warping machine having improved winding accuracy comprising a warp beam mounted on a supporting shaft, a plurality of rotatable chucks adapted to support the beam and the shaft at its end journals, jaws within said chucks for respectively holding the journals of said shaft, and a clamping system for securing the shaft journals within each of said jaws including expansible clamping bushings and sleeves adapted to fit thereover, said sleeves being provided with external screw threads and engaging mate threaded nuts, said threaded sleeves and nuts radially compressing the expansible clamping bushings and also axially adjusting and fixing said expansible clamping bushings to the respective surfaces of said chucks, said sleeves being held by the jaws by means of frictional contact.

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