July 29, 1958 E. M. AYARS ET AL 2,844,860

WARPING MACHINE STOP MOTION

Filed Feb. 14, 1955 2 Sheets-Sheet 1

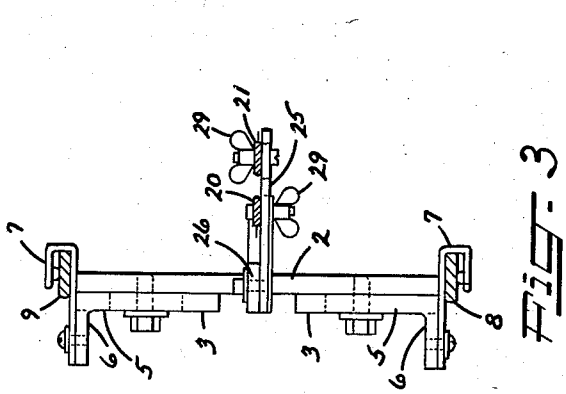


Fig. 3

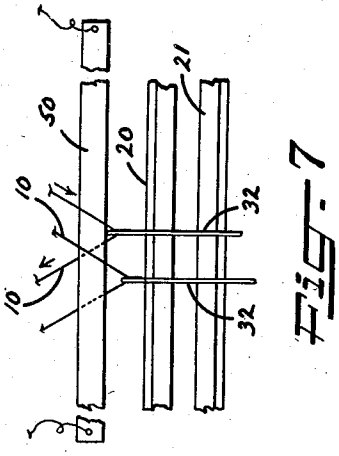


Fig. 7

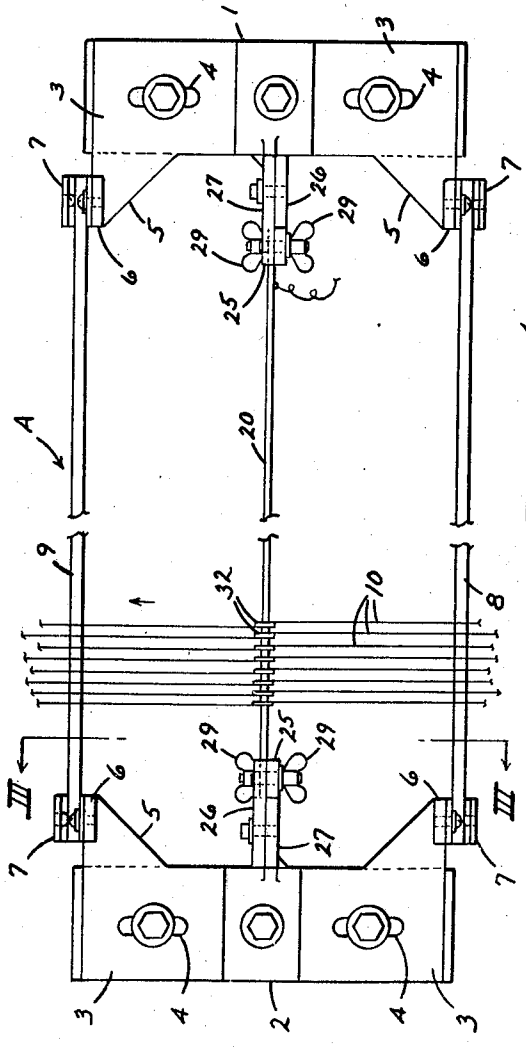


Fig. 1

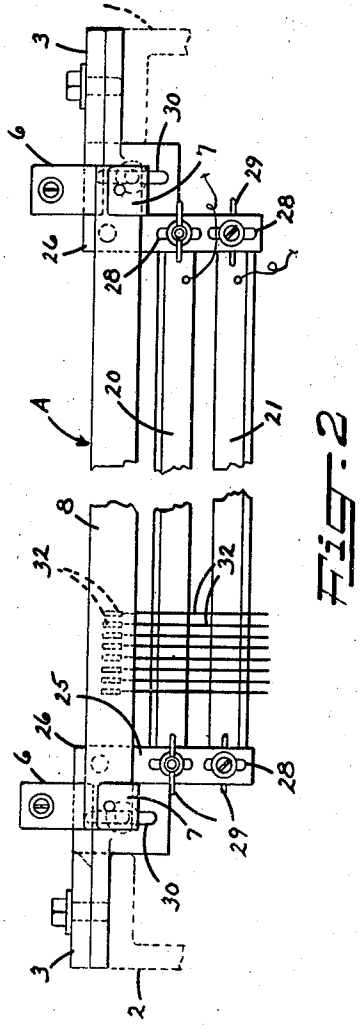


Fig. 2

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WARPING MACHINE STOP MOTION

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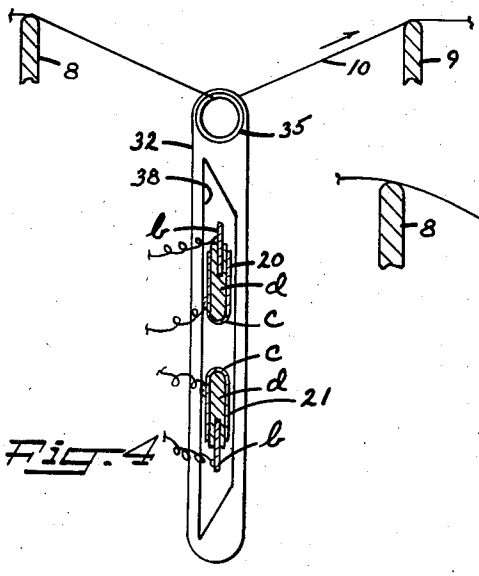


Fig. 4

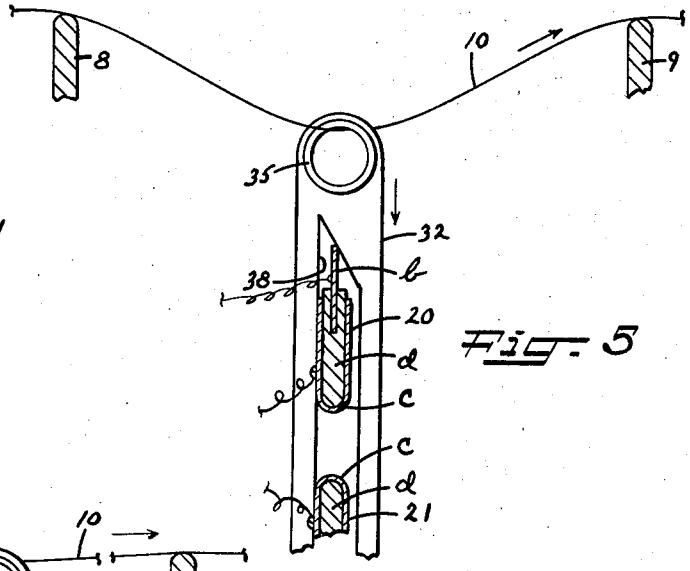


Fig. 5

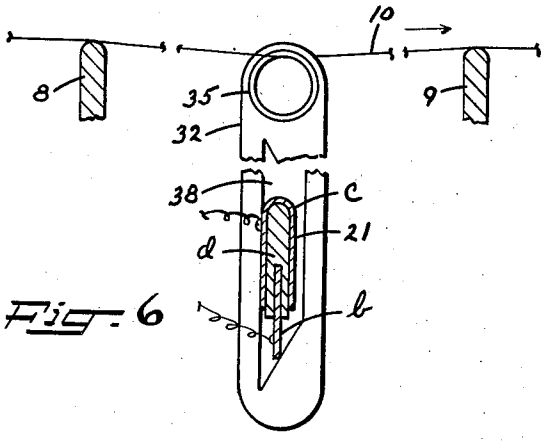


Fig. 6

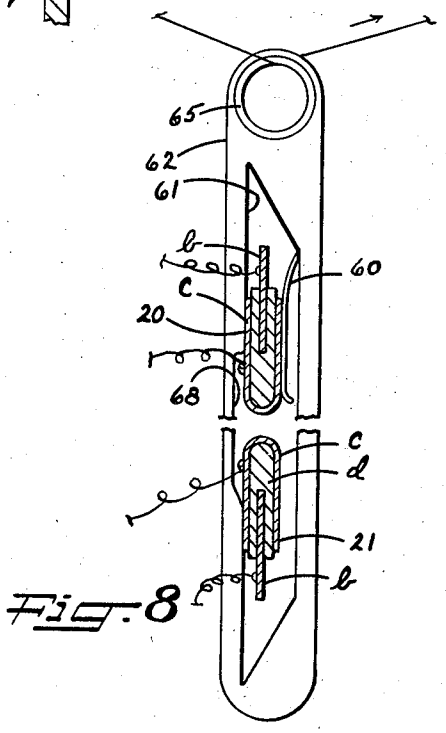


Fig. 8

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WARPING MACHINE STOP MOTION

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Application February 14, 1955, Serial No. 488,033

4 Claims. (Cl. 28—51)

The present invention relates to a device for improving yarn warping efficiency and fabric quality. In particular, the invention relates to a double acting stop motion device or assembly for use with yarn warping or beaming operations.

In yarn producing plants, especially rayon filament plants, the yarn must be transferred from the individual small yarn packages to large section beams or large reels for shipment to customers. The small yarn packages are mounted on yarn creels and the yarn ends from each cake are threaded through a warper frame in a side by side relation. Each yarn end is then attached to the large section beam which is then rotated to collect thereupon the yarn ends in even layers. The section beams are then shipped to customers who feed the yarn ends directly from the beam into a warp sizing machine, winding, knitting, weaving, or other process or fabricating apparatus. A great deal of trouble has been encountered in effecting this yarn end transfer from the cakes to the section beams because of frequent yarn end breakage as the yarn is wound up upon the beamer. When a yarn end breaks, a suitable stop motion device is activated whereby the transferring or warping operation is automatically terminated. The warper is then rethreaded and the transferring operation is resumed.

A related problem, and the one with which our invention is concerned, is that certain of the yarn ends being collected will invariably run under excess or non-sufficient tension. If certain of the yarns on the beamer have been collected under excessive or insufficient tension, cloths or fabrics produced therefrom will be of poor quality because of "tight ends" or "loose ends" running through the warp of the fabric.

There is a great need for a satisfactory yarn warping apparatus which will take into account and correct for both excessive and insufficient tension within the individual traveling yarn ends. Such abnormal tension may result from the following sources:

1. Damp or wet yarn.
2. A poorly formed yarn cake or other yarn package.
3. Momentary interference with the yarn end, for example, being caught under the bottom edge of the yarn package.
4. Improperly adjusted creel tension device.
5. Improper threading at the creel tension device.
6. A cracked or rough yarn eye or guide.

The stop motion devices which have been used heretofore to terminate certain yarn feeding operations because of excessive or insufficient tension in certain of the yarn ends have proved to be highly impractical when used with warping apparatus because of the excessive amount of bulky and space consuming apparatus required to effectively accomplish the signaling and terminating action. The average warping apparatus accommodates from 800 to 1200 yarn ends. This means that 800–1200 tension signaling devices are required, one for each yarn end. Any satisfactory signaling device must, therefore, be

extremely simple and must consume only a minimum of space so that the operator is not hindered from gaining access to the primary portion of the apparatus for examination or for the threading and rethreading of any of the 800–1200 yarn ends within the warping frame.

It is therefore an object of our invention to provide an inexpensive and simple stop motion device for warping apparatus wherein the warping operation is interrupted whenever the tension build up or drop within any individual yarn end exceeds a predetermined tension tolerance previously set up in the warping frame and which leaves ample room for the operator to examine or thread or rethread any of the 800–1200 yarn ends through the warp frame.

It is another object of our invention to provide in a warping apparatus a double acting actuating member or drop wire for each individual yarn end which wire reacts to excess or insufficient tension in the yarn to close an electrical circuit which automatically terminates the warping operation whenever predetermined permissible high or low tension limits are exceeded.

A further object of our invention is to provide in a yarn warping apparatus, indicating means which cooperate with the individual drop wires or actuating members for indicating, after the warping operation has been terminated, which of the yarn ends have exceeded the permissible high tension limits.

It is still another object of our invention to provide in a yarn warping apparatus a drop wire or actuating member which, because of its specific structure, is capable of indicating after the warping operation has been terminated, which yarn end or ends have exceeded the predetermined permissible high or low tension limits.

Still another object of the present invention is to provide in a yarn warping apparatus, a pair of electrode bars or signalling units which cooperate with a single drop wire unit to actuate a circuit which terminates the warping operation when a yarn end has insufficient or excessive tension therein as measured against predetermined tension tolerances set up in the warping frame.

Another object of our invention is to provide a warping apparatus having an automatic stop tension device wherein the apparatus may be adjusted to provide a variety of permissible high and low tension tolerances.

Other objects and advantages of our invention will become apparent from a further study of the following description and drawings in which:

Figure 1 is a top view of the yarn warping apparatus;

Figure 2 is a front view of the yarn warping apparatus of Figure 1;

Figure 3 is a section taken along line III—III of Figure 1;

Figure 4 is a view on an enlarged scale of a drop wire in normal operating position;

Figure 5 is a view of the drop wire in the down or insufficient yarn tension position;

Figure 6 is a view of the drop wire in the raised or excessive yarn tension position;

Figure 7 is a view of the means for retaining the drop wire in the raised or excessive yarn tension position after the warping operation is terminated; and

Figure 8 is a view of a modified drop wire.

Briefly, the invention consists of a frame having end supports, a pair of yarn guide bars connected at their ends to the end frames over which the yarn ends travel, and a pair of signalling units affixed to the end supports which units extend the full length of the frame. The signalling units which may be electrode bars are set one above the other and are positioned at a point intermediate of and lower than the guide bars. A plurality of double acting drop wires for actuators through which

the yarn ends are threaded are mounted over the electrode bars. Means are provided for adjusting the vertical position of the electrode bars and for adjusting the horizontal spacing of the guide bars with respect to one another whereby a variety of predetermined tension tolerances may be set up within the warp frame. Means may also be provided either externally of the frame or in the drop wire structure itself for retaining the drop wire in the raised or excessive tension positioning after the warping operation has been terminated whereby the operator may determine which yarn end or ends were under excessive tension.

Referring now to the drawings, especially Figures 1 to 2, the warping apparatus A comprises end supports **1** and **2** with horizontally adjustable plates **3**, **3** secured to the opposite ends of the top surface of each support. The adjustable plates **3**, **3** have center slots **4**, **4** through which are inserted bolts or other suitable connectors to secure the plates **3**, **3** to the end supports. The plates **3**, **3** terminate in triangular corner extensions **5**, **5** which extend inwardly from the end supports **1** and **2**. The extensions **5**, **5** have vertically extending plate sections **6**, **6** to which hanger brackets **7**, **7** are affixed. Yarn guide bars **8** and **9** are supported by the brackets **7**, **7** and extend the full width of the frame. As seen in Figure 1, the yarn ends **10**, **10** are fed to the warper over guide bar **8** and are discharged therefrom over guide bar **9**. By loosening the bolts which secure the plates **3**, **3** to the supports **1** and **2**, the adjustable plates **3**, **3** may be moved backward or forward with respect to each other to bring the guide bars **8** and **9** closer together or further apart for a purpose which will be hereinafter explained.

An upper electrode bar or electrical signalling unit **20** and a lower electrode bar or signalling unit **21** (Figs. 1 to 3) which may be of the type produced by the Steel Heddle Mfg. Co., Philadelphia, Pa. extend the width of the frame A and are positioned intermediate and somewhat below guide bars **8** and **9**. Each electrode bar consists of a first contact point *b* (Figure 4), and a second contact point *c* which points are separated by suitable insulation *d*. The electrode bars **20** and **21** are secured to hanger extensions **25**, **25** which are in turn secured to plates **26**, **26** which in turn are adjustably secured to fixed extensions **27**, **27** of end supports **1** and **2**. The hanger bars **25**, **25** have slots **28**, **28** therein by which the electrode bars may be attached thereto with thumb screw assemblies **29**, **29**. With this arrangement, it is seen that the electrode bars may be separately raised or lowered as desired for a purpose to be later described. The plates **26**, **26** have slots **30**, **30** therein whereby they may be secured to members **27**, **27** in vertical adjustment and may be raised or lowered to in turn raise or lower the hanger bars **25**, **25** and the electrode bars **20** and **21** as a single unit.

Drop wires or actuators **32**, **32** for the signalling units or electrode bars **20**, **21** (see Figure 4) are mounted over the electrode bars **20**, **21**. The drop wires **32**, **32** which carry the running yarn ends **10**, **10** are made of small light weight thin metal pieces. As seen in Figure 4, the upper portion of the drop wire **32** is drilled to form an eye **35** through which the yarn end is threaded. The remaining portion of the drop wire **32** is cut out to form a longitudinal slot **38** by which it is positioned over the electrode bars **20**, **21**.

As seen in Figure 4, the drop wire **32** is in normal operating condition with the upper and lower ends of the slot **38** equally spaced from the upper and lower electrode bars **20**, **21**, neither of the bars touching the ends of slot **38**.

Figure 5 shows the drop wire in the down position to which it descended as a result of non-sufficient tension in the yarn end passing through eye **35**. Here it is seen that the first contact *b* and the second contact *c* of the upper electrode bar **20** are in contact with the upper end and the left hand side respectively of the longitudinal slot **38** of drop wire **32**. Such double contact closes a circuit which interrupts the main feed circuit leading to the beamer drive motor to stop the motor and the warping operation. Since the drive system for the yarn collection beam and the circuits mentioned above do not constitute a part of the present invention they are neither shown or described in the present application.

Figure 6 shows the drop wire **32** in the raised or excessive tension position wherein the contacts *b* and *c* of the lower electrode bar **21** contact the bottom edge and the left hand side respectively of slot **38** of drop wire **32**. The warping operation is interrupted and terminated in the same manner as described above with reference to Figure 5.

As mentioned above, the positioning of the guide bars **8** and **9** may be varied to move the bars further apart or to bring them closer together; in addition, the electrode bars are vertically adjustable either separately or as a unit. By virtue of this adjustability, the permissible low and high tension limits may be changed in accordance with the particular denier yarn passing through the warper. The lowest possible gram tension limits are set up within the warper when the guide bars **8** and **9** are as close together as possible and the electrode bars **20** and **21** are in their uppermost and lowest possible position respectively. The greatest possible gram tension limits are set up within the warper when the guide bars **8** and **9** are as far apart as possible and the electrode bars **20** and **21** are in their lower and uppermost position respectively. Tension tolerances between these two extremes may be set up within the warper as desired merely by positioning the guide bars and the electrode bars at suitable points between the extreme limits mentioned above.

The drop wire or wires may or may not return to their normal operating position from their raised or excessive tension position depending on the cause for the excessive tension. In some instances, the interruption of the warping operation will correct the situation of excessive tension and upon resumption of the warping operation, the yarn ends which were previously over-tensioned will run at normal tension. In other instances, however, the over-tensioning cause will not be corrected by the mere interruption of the warping operation. In these instances, the warping operation will immediately be terminated again as soon as the warping is resumed since the cause for the over-tensioning has not been eliminated. I have, therefore, found it desirable to include in the apparatus described above an indicating means whereby the operator may tell at a glance which of the yarn ends were over-tensioned after the warping operation has been interrupted. It is, of course, a simple matter for the operator to pick out the yarn ends which were running under insufficient tension after the warping operation has been terminated as the drop wire for those yarn ends would fall to the down or lowermost position on the electrode bars **20** and **21** and naturally remain there until the operation is resumed.

The apparatus shown in Figure 7 includes such an indicating means. An electromagnet bar **50** is positioned above the drop wires **32**, **32** running parallel with the electrode bars whereby when the wire or wires **32**, **32** are moved to the raised position on the electrode bars **20** and **21** because of excessive tension within the yarn end or ends passing through the wire, the wires will contact the electromagnet **50** and will be retained in the raised position by the magnet force of the electromagnet after the warping operation has ceased. The magnet carries just enough charge to hold the drop wires in place when the contact is made and do not influence the wires otherwise. When lacing the yarn ends through the eyes **35**, **35** of drop wires **32**, **32** the electromagnet **50** is demagnetized and removed from its position above the drop

wires. To resume the warping operation after it has once been terminated it will first be necessary to pull the drop wire 32, 32 off the electromagnet 50 or to de-energize the electromagnet so that the drop wires will return to normal operating positions. An ordinary bar magnet may be used instead of the electromagnet but the latter is preferred because its degree of magnetism can be accurately controlled and in addition, it can be demagnetized and magnetized easily.

In Figure 8 there is shown a different type drop wire which cooperates with the electrode bar 20 to act as an indicator for indicating, after termination of the warping operation, which of the yarn ends were under excessive tension. A small spring wire 60 is affixed by a small spot weld to the upper right hand edge of the slot 61 in drop wire 62 which wire presses against the side off the upper electrode bar 20. A notch 63 is cut into the left hand edge of slot 61, the upper shoulder of which lies adjacent the opposite side of electrode bar 20. When excessive tension is present in the yarn end passing through eye 65 of the wire 62, the wire will be raised to contact the lower electrode bar 21, which, as described above, will terminate the warping operation. When the wire is raised to this position, the upper shoulder of notch 60 will be raised above the top edge of contact *c* of bar 20 and will slide thereover since the wire spring 60, pressing against the right hand side of electrode bar 20, will move the drop wire 62 in a right hand direction. The drop wire 62 will, of course, remain in this position until the operator resets the drop wire or wires 62, 62 into normal operating position.

The use of the warping apparatus described above is not limited to the collection of yarn ends on a beamer or roller but may also be used for controlling the warp tension of yarn ends being fed to any type of fabricating apparatus such as knitting and weaving machines.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the present invention as defined in the appended claims.

We claim:

1. A yarn warping frame comprising end supports, a first yarn introduction guide bar extending between and secured to the end supports, a second yarn discharge guide bar extending between and secured to the end supports which bar lies opposite to and is spaced apart from the first guide bar, an upper electrode bar positioned intermediate of the guide bars and extending between and secured to the end supports, a second electrode bar positioned immediately below the upper electrode bar, a double acting drop wire positioned over the upper and lower electrode bars through which drop wire is threaded a yarn end, said drop wire being capable of being raised or lowered in accordance with the degree of tension within the yarn end when traveling, whereby when the tension within the traveling yarn end exceeds predetermined high or low limits the drop wire will contact and actuate either the lower or the upper electrode bar to initiate the immediate termination of the yarn warping apparatus, and means for retaining the drop wire in the upward or excess tension position after the warping operation has been terminated because of excess tension in the yarn.

2. A yarn warping frame according to claim 1 wherein the drop wire retaining means comprises a magnet positioned above the electrode bars and extending the width of the warp frame to retain the drop wire in an upward or excess tension position after the warping operation has been terminated.

3. A yarn warping frame according to claim 1 wherein the means for retaining the drop wire in the upward or excess tension position comprises an elongated slot in the drop wire, a notch in one side of the slot, and a spring wire affixed to the opposite side of the elongated slot which spring rests upon one side of the upper electrode bar whereby when the drop wire is raised to its uppermost position because of excess tension in the yarn traveling through the wire, the upper shoulder of the notch will slide over the outer contact of the upper electrode bar whereby the wire will be retained in the raised or excessive tension position after the winding operation has been terminated.

4. A stop motion assembly for use in terminating yarn beaming or warping operations when a yarn is running under excess or insufficient tension comprising a first mounted signalling unit which is responsive to an insufficient tension condition in a running yarn to terminate the warping or beaming operation, a second signalling unit responsive to an excess tension condition in the running yarn to terminate the yarn beaming operation, said second signalling unit being positioned below the first signalling unit, a yarn carrying actuating member for both the signalling units which member is loosely positioned over the signalling units, said actuating member being responsive to the tension condition in the carried yarn whereby it is raised or lowered with respect to the signalling units to contact and actuate one or the other signalling unit when excess or insufficient tension respectively is present in the yarn, and means for retaining the actuating unit in the raised or excess tension position after the beaming or warping operation has been terminated.

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