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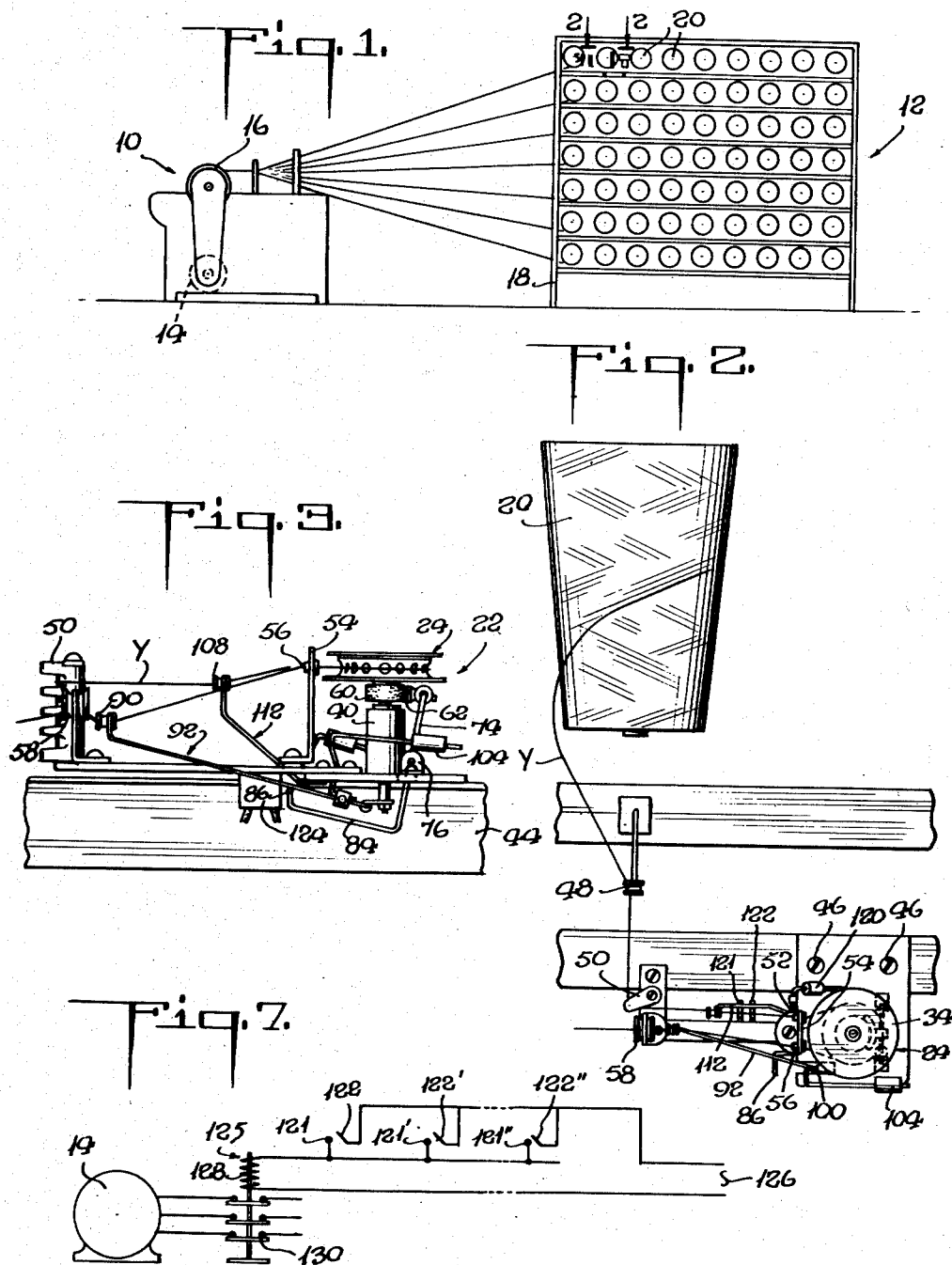
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2,689,393

YARN HANDLING EQUIPMENT

Filed Nov. 30, 1951

2 Sheets-Sheet 1



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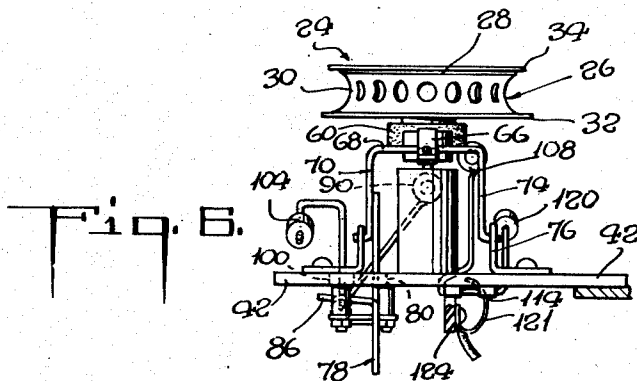
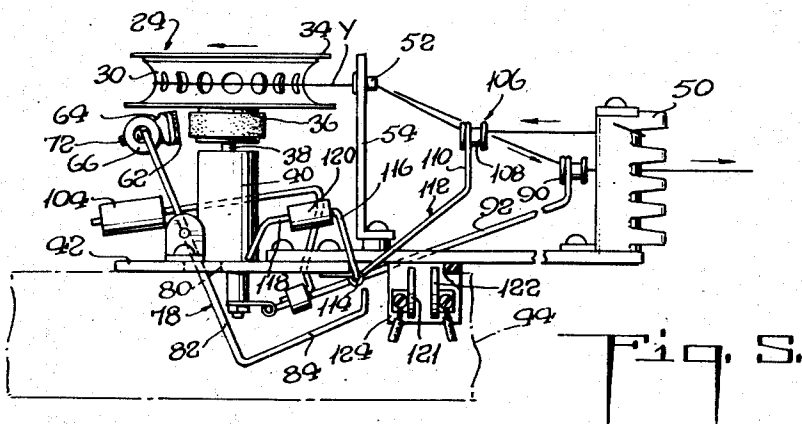
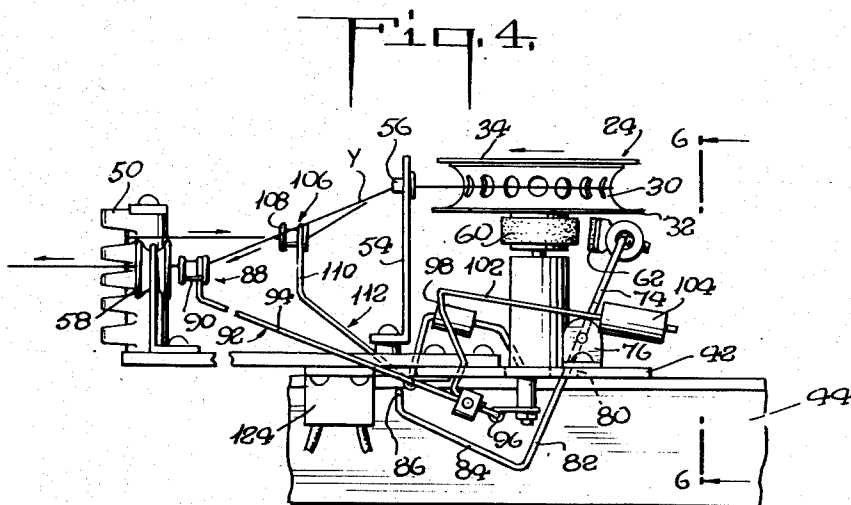
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2,689,393

YARN HANDLING EQUIPMENT

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Application November 30, 1951, Serial No. 259,219

11 Claims. (Cl. 28—51)

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This invention relates to yarn handling equipment.

By way of example the invention will be described herein as it is used in connection with a magazine creel. However, it is to be understood that this specific form of the invention is to be considered as illustrative only and the invention is not to be deemed as limited thereby except to the extent to which certain features of such embodiment are pointed out below and are incorporated in the appended claims.

In present-day flat-bed knitting machines, such for example as conventional high speed tricoat machines, thousands of yarns are knit simultaneously. If these yarns were drawn from individual cones or bobbins, they would take up too much space at the knitting machine. Accordingly, it is the practice to wind up a large number of yarns on a section warp spool and to use a few of these spools on each machine. Yarns are warped on the spools in a beaming machine in which several hundred threads are wound on the spool side by side. It will be appreciated that unless the tension of all the threads in each spool is maintained substantially uniform, the knitted fabric will be noticeably uneven, since yarns which are more tensed tend to depress the fabric locally and resemble a run or ripple. Moreover, when the tensions of the yarns in a spool are not uniform, the looser threads pile up and overlap the tighter threads causing occasional snapping of the yarns during knitting.

In a standard magazine creel from which threads are drawn to a beaming machine, tension is regulated by a plurality of tension units of which one is provided for each yarn. Unless all of these units impart substantially identical tensions, the aforementioned defects will arise.

Differences in tension are due to various causes. For example, in squeeze type tension units, consisting of two independently rotatable hardened metal discs between which yarn runs and which are supported to be turned by the passage of yarn, dirt, lint, size or other foreign matter upon becoming lodged between the discs markedly reduces the yarn tension. Moreover, when the beaming machine stops, e. g. when a thread breaks, the tension unit continues to rotate and thereby induces slack in the yarn. A further difficulty with the squeeze type tension unit is that drag is not uniform in different units because foreign matter becomes lodged between the discs. To remove this foreign matter the units must be cleaned daily, and it now is customary to stop warping operations for about one and one-half hours each shift to permit indi-

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vidual cleaning of the several hundred tension units of a magazine creel.

Another type of tension unit that currently is employed is the interlocking finger type. In this unit two relatively movable comb-like members have their teeth interleaved. The thread runs between the teeth and urges the same apart against a restoring force. This kind of unit likewise is affected by the accumulation of foreign matter and needs daily cleaning, an operation which consumes about as much time as is consumed with the squeeze type units. Additionally, the yarn wears scores (grooves) in the teeth, and if a creel is allowed to run with a badly scored tension unit, the yarn passing through such unit will be scraped and seriously weakened. Also, interleaved teeth units impose a momentarily abnormally high tension each time the beaming machine is started.

A third type of tension unit is the twirler which consists of a wheel around whose periphery the thread passes and which imparts tension by drag of the wheel. Twirlers are not favored because they are subject to a marked overrun, i. e., they continue to spin for some time after the beaming machine is stopped. The overrun very appreciably slackens the threads and oftentimes disengages the thread, necessitating rethreading. Furthermore, twirlers are subject to scoring and consequent abrasion of the yarn, although not to as marked an extent as the interleaved teeth type of tension unit.

In co-pending application Serial No. 157,238, filed April 21, 1950, for Yarn Handling Equipment, assigned to the assignee of the instant application, there is shown, described and claimed an improved tension unit which overcomes the foregoing difficulties. However, said improved unit, although it has been found to be highly efficient in operation, is subject to the drawback that it involves considerable wiring and auxiliary electrical equipment. Furthermore the stop motion device which forms part of said tension unit has been found to be somewhat expensive to manufacture.

It is an object of the present invention to provide an improved tension unit of the type described in said co-pending application but which is not subject to the aforementioned drawbacks.

It is a more specific object of the present invention to provide a tension unit of the character described wherein braking of the twirler, when the yarn stops traveling, is achieved without the aid of electric braking equipment.

It is another specific object of the present in-

vention to provide a tension unit of the character described wherein a mechanical brake is under the control of a moving strand of thread but in which, although the brake is quick and positive in action, only a negligible drag is imparted to the thread when the beaming machine is operating.

It is another specific object of the present invention to provide a tension unit of the character described which constitutes relatively few and simple parts and is rugged, durable and fool-proof in operation.

It is another specific object of the present invention to provide a tension unit of the character described which can be threaded rapidly and with ease.

It is another specific object of the present invention to provide a combined tension unit and stop motion device which is particularly sensitive to the breakage of the thread and yet which is inexpensive and simple in construction.

Other objects of the invention will in part be obvious and in part will be pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the device hereinafter described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of the invention,

Fig. 1 is a schematic front view of a yarn handling apparatus comprising a beaming machine and a magazine creel, the latter including tension units embodying the present invention;

Fig. 2 is an enlarged sectional view taken substantially along the line 2—2 of Fig. 1, the same illustrating one of said tension units in plan;

Fig. 3 is a side view of said tension unit, the same being shown as it appears with the brake effective;

Fig. 4 is a view similar to Fig. 3 but to a larger scale and with the brake in ineffective position;

Fig. 5 is a view similar to Fig. 4 but of the opposite side of the tension unit;

Fig. 6 is a front view of the tension unit, the same being taken substantially along the line 6—6 of Fig. 4; and

Fig. 7 is a wiring diagram of the electric circuit of a group of stop motion devices.

Referring now in detail to the drawings, the reference numeral 10 denotes a conventional beaming machine which draws several yarns from a magazine creel 12. The beaming machine 10 includes a motor 14 which rotates a section warp spool 16 through a suitable power train including, for example, a belt and pulleys.

The magazine creel has a conventional frame 18 which forms the support for a large number of bobbins or cones 20 whose yarns are to be wound side by side on the spool 16. Associated with each cone is a tension unit 22 embodying the present invention. A thread runs from each cone to the associated tension unit and then through suitable guides (not shown) to the beaming machine 10.

The tension unit is of the twirler type and, except for the specific brake and stop motion device, is the same as that illustrated, described and claimed in said copending application, Serial No. 157,238.

More specifically said unit includes a light,

squat gyratory member 24 and suitable means mounting the same for rotation about a vertical axis. The gyratory member has the form and appearance of a small sheave. It constitutes a sheet metal section 26 which is formed from one piece of lightweight metal, e. g. aluminum, into the indicated shape which includes a flat top 28 from whose periphery there depends a downwardly extending annular externally concave narrow side wall 30 which forms a circular track for yarn Y. A horizontal flange 32 integral with the wall 30 extends outwardly from the bottom edge of said wall.

The top 28 has seated thereon a flat disc 34 of electrically non-conductive material forming a top flange.

Also secured to the top 28 is a central depending cylindrical plug 36 from which a downwardly extending spindle 38 protrudes. The spindle is received in a vertical journal 40 which is suitably mounted on a support, for example, a plate 42. It will be understood that the type of specific construction of the support will depend upon the kind of magazine creel 12 with which the tension unit is used. The creel here shown includes angle irons 44 which run in front of the cones 20. Hence the plate is fastened to said angle irons as by nuts and bolts 46. The plate 42 is so oriented that the spindle 38 is vertically disposed whereby the gyratory member 24 rotates about a vertical axis.

The concave annular narrow side wall 30 (yarn track) is provided with an outer traction surface, for example a uniform series of through openings.

Yarn Y drawn off the cone 20 is guided through a thread eye 48 and then around a thread comb 50 to another thread eye 52 which is mounted on a plate 54 in front of the gyratory member. The yarn travels from the thread eye 52 around the gyratory member, thereupon passing through a thread eye 56 likewise mounted on the plate 54. From the thread eye 56 yarn travels to a thread eye 58 alongside the comb 50 and in front of the plate 54.

When yarn is being drawn from a cone and on to the warp spool 16 it always will be under at least a slight tension which tends to maintain in straight lines short sections of the yarn between fixed points of support. Thus during a beaming operation yarn will tend to maintain a straight line position between the comb 50 and the thread eye 52 and between the thread eyes 56 and 58.

Pursuant to the present invention, advantage is taken of this tendency to initiate braking of the gyratory member each time that a beaming operation is stopped. In other words the condition to which the braking operation is responsive is slackening of the thread from its straight line condition which is inherent to the normal operation of the beaming machine. This is in contrast to said co-pending application in which the operation of the brake is responsive to the opening of the electric energizing circuit for the motor 14.

More particularly the braking means of the present tension unit comprises a sleeve 60 supported by the plug 36. Said sleeve preferably is made of a material having a relatively high coefficient of friction, an example thereof being rubber.

The sleeve is disposed below the lower flange 32 so as to be readily accessible to the action of a brake shoe 62. This shoe, like the sleeve, prefer-

ably is made from a good braking material such as rubber. Said shoe is mounted on a back 64 that is carried by a mounting collar 66. The collar is located on a shank 68 of a yoke 70, being secured thereto in some suitable fashion, for instance by a screw 72. The tips of the arms 74 of the yoke are out-turned and journaled for horizontal rotation in upstanding ears 76 carried by the plate 42.

Fixedly secured to one of the arms of the yoke, as by welding, is a light wire 78. Said wire extends from the yoke through a generous opening 80 in the plate, the portion of the wire beneath the plate including a downwardly and forwardly extending reach 82 which terminates in a forwardly and upwardly sloping leg 84 at whose tip the wire 78 is provided with an upwardly extending toe 86. The exact conformation and disposition of the wire is not important save for the fact that the toe 86 preferably is forward of the spindle 38 and between said spindle and the comb 50. The shoe 62, back 64, collar 66, yoke 70 and wire 78 which are fixedly joined to one another to turn as a unit about a horizontal axis with respect to the ears 76 have their joint center of gravity located above said horizontal axis and slightly to the rear of the same when the brake is in idle position, this condition being shown in Fig. 5. In other words, said combined elements are so mutually shaped, arranged and journaled that the brake will barely maintain itself in its idle position.

The braking mechanism further includes a sensing element 88 comprising a thread eye 90 carried at one end of a wire 92. The wire 92 has a reach 94 extending downwardly and rearwardly from the thread eye to a horizontal pivot 96 supported beneath the plate 42. Said reach is located immediately above and just out of contact with the toe 86 when the beaming machine is in operation. The wire has a branch 98 which extends upwardly from the pivot through a generous hole 100 in said plate, the upper end of said branch terminating in a rearwardly extending leg 102 on which a weight 104 is supported.

The yarn traveling from the thread eye 56 to the thread eye 58 is passed through the thread eye 90 so that when the beaming machine is in operation the thread eye 90 will be urged upwardly as shown in Fig. 4. The wire 92, thread eye 90 and weight 104 which are fixedly connected for joint rotation about the pivot 96 are so shaped and are of such relative weights and dimensions that when said thread eye is held in its upper position by the yarn passing under tension through the thread eye 90 the center of gravity of said wire, thread eye and weight are above and just slightly forward of the pivot 96. Hence when the yarn slacks upon deenergizing of the motor 14 the thread eye 90 will drop immediately, causing the reach 94 to strike the toe 86 and depress the same. Since the center of gravity of the brake, brake support, yoke and wire 78 is only slightly to the rear of the horizontal axis of rotation of said elements, when the toe 86 is depressed the center of gravity of the brake will be moved forwardly of its axis of rotation and the brake will fall against the sleeve 60.

It will be observed that, due to the counterbalancing effect of the weight 104, the thread eye 90 rests very lightly on yarn passing there-through so that the tension of said yarn is increased but slightly by this thread eye. However, as soon as the yarn becomes slack and the thread eye starts to drop, the center of gravity of said

thread eye and associated elements rotatable about the pivot 96 moves further forwardly of said pivot so as to increase their torque about said pivot, whereby the weight of the thread eye and associated elements increases the force with which the reach 94 depresses the toe 86 and thus increases the force urging the brake against the sleeve 60. In this manner the overall effect of the brake and sensing element for actuating the brake is to impart a minimum drag on the thread during beaming, to act speedily in rendering the brake effective when the thread slackens upon halting of a beaming operation, and to brake with a sufficient force to decelerate the whirling gyrotory member rapidly.

It also will be observed that the rapid and positive braking action is attained without the use of any electrical adjuncts whatsoever.

Associated with the tension unit is a stop motion device 106 whose construction constitutes an ancillary feature of the invention. Said device comprises a thread eye 108 through which thread passes on its way from the comb 50 to the thread eye 52. The thread eye 108 is carried on a reach 110 of a wire 112 which is horizontally pivoted at 114 adjacent the lower surface of the plate 42. Said wire has an upwardly extending reach 116 terminating in a rearwardly extending leg 118 on which a weight 120 is supported. The thread eye 108, wire 112 and weight 120 are so shaped and are of such relative weights and dimensions that when the thread eye is held in its upper position by yarn running under tension therethrough, the center of gravity of the thread eye, weight and wire is above and slightly forward of the horizontal pivot 114. Thus, if the thread breaks, the wire 112 will fall forwardly although as long as the thread eye is held up it will impart only a slight drag to yarn passing therethrough.

A pair of resilient contact strips 121, 122, e. g. thin narrow strips of phosphor bronze, are supported on a block 124 of electrical insulation, the tips of the strips being laterally offset to lie beneath the wire 112. Said wire is electrically conductive so that when the thread eye drops upon breakage of the yarn, the wire will bridge the two strips 121, 122 and conduct current therebetween.

Strips 121, 122; 121', 122', 121'', 122'', etc. of all the stop motion devices on the creel are connected in parallel in a circuit, as shown in Fig. 7, for a relay 125 for the motor 14. Closure of any one of said pairs of strips in the magazine creel will complete a circuit from a source 126 of electric energy to the actuating coil 128 of the relay 124. Relay contacts 130 in the power supply to the motor 14 are normally closed. When the actuating coil is energized, these contacts will be opened to stop the motor.

It thus will be seen that there is provided a device which achieves all the objects of the invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, there is claimed as new and desired to be secured by Letters Patent:

1. For use in a yarn handling apparatus comprising a large number of sources of yarn which

are drawn into a machine, a combined tension unit and stop motion device, said tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to mount said brake for movement into and out of engagement with said gyratory member, said brake normally being out of contact with the gyratory member, and means to move said brake into contact with the gyratory member, said last-named means including a thread guide, means to mount said thread guide for movement laterally of the path of travel of a yarn, said thread guide being biased in a direction away from said path, yarn biasing the thread guide in an opposite direction when under tension, a member movable with said thread guide, and a member movable with the brake, said last-named member being engaged by the member movable with the thread guide when a yarn slackens, said stop motion device being mounted adjacent the tension unit and including a thread guide, means mounting the thread guide for movement laterally of a path of travel of a yarn, said last-named thread guide being biased in a direction away from said last-named path, a pair of contacts and a reciprocal conductive member carried by the second thread guide and engaging said contact members when a yarn passing through the second thread guide breaks.

2. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a combined tension unit and stop motion device, said tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with the gyratory member and the other of which engages the gyratory member, said brake in its first-named position being biased away from the gyratory member and in its second-named position being biased toward the gyratory member, and means rendered effective by slackening of a thread for moving the brake from its first-named position towards its second-named position, said stop motion device being mounted adjacent the tension unit and including a thread guide, means mounting the thread guide for movement laterally of a path of travel of a yarn, said last-named thread guide being biased in a direction away from said last-named path, a pair of contacts and a reciprocal conductive member carried by the second thread guide and engaging said contact members when a yarn passing through the second thread guide breaks.

3. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a combined tension unit and stop motion device, said tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with said gyratory member and the other of which it is in contact with said gyratory member, said brake in its first-named position being biased away from

the gyratory member and in its second-named position being biased toward the gyratory member, a thread guide, means mounting the thread guide for vertical movement in a path of travel intersecting the path of travel of the yarn whereby said thread guide is raised when yarn is traveling therethrough under tension and will drop when the yarn slackens, and means actuable upon such movement of the thread guide from raised to lowered position for moving the brake from its first-named to its second-named position, said stop motion device being mounted adjacent the tension unit and including a thread guide, means mounting the thread guide for movement laterally of a path of travel of a yarn, said last-named thread guide being biased in a direction away from said last-named path, a pair of contacts and a reciprocal conductive member carried by the second thread guide and engaging said contact members when a yarn passing through the second thread guide breaks.

4. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a combined tension unit and stop motion device, said tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with said gyratory member and in the other of which it is in contact with said gyratory member, said brake in its first-named position being biased away from its gyratory member by gravity and in its second-named position being biased toward its gyratory member by gravity, a thread guide, means mounting the thread guide for movement about a horizontal axis in a path of travel intersecting the path of travel of the yarn whereby said thread guide is raised when yarn is traveling therethrough under tension and will drop when the yarn slackens, a member mounted to move with said thread guide, the thread guide, the mounting means for the thread guide and the member movable with the thread guide having their joint center of gravity almost above the axis of rotation of the mounting means for the thread guide on the side thereof to bias the thread guide downwardly, and a member movable with the brake, said member when the brake is in its first-named position being disposed immediately below the member movable with the thread guide whereby when the thread guide drops it will urge the brake to its second-named position, said stop motion device being mounted adjacent the tension unit and including a thread guide, means mounting the thread guide for movement laterally of a path of travel of a yarn, said last-named thread guide being biased in a direction away from said last-named path, a pair of contacts and a reciprocal conductive member carried by the second thread guide and engaging said contact members when a yarn passing through the second thread guide breaks.

5. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to mount said brake for movement into and out of engage-

ment with said gyratory member, said brake normally being out of contact with the gyratory member, and means to move said brake into contact with the gyratory member, said last-named means including a thread guide, means to mount said thread guide for movement laterally of the path of travel of a yarn, said thread guide being biased in a direction away from said path, yarn biasing the thread guide in an opposite direction when under tension, a member movable with said thread guide, and a member movable with the brake, said last-named member being engaged by the member movable with the thread guide when a yarn slackens.

6. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with the gyratory member and the other of which engages the gyratory member, said brake in its first-named position being biased away from the gyratory member and in its second-named position being biased toward the gyratory member, and means rendered effective by slackening of a thread for moving the brake from its first-named position towards its second-named position.

7. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with said gyratory member and the other of which it is in contact with said gyratory member, said brake in its first-named position being biased away from the gyratory member and in its second-named position being biased toward the gyratory member, a thread guide, means mounting the thread guide for vertical movement in a path of travel intersecting the path of travel of the yarn whereby said thread guide is raised when yarn is traveling therethrough under tension and will drop when the yarn slackens, and means actuatable upon such movement of the thread guide from raised to lowered position for moving the brake from its first-named to its second-named position.

8. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member having a narrow circular yarn track whose traction surface is irregular in the direction of the yarn travel, means to mount said gyratory member for rotation about a vertical axis, a brake, means to pivotally mount said brake for movement between two positions in one of which it is out of contact with said gyratory member and in the other of which it is in contact with said gyratory member, said brake in its first-named position being biased away from its gyratory member by gravity and in its second-named position being biased toward its gyratory member by gravity, a thread guide, means mounting the thread guide for movement about a horizontal axis in a path of travel intersecting the path of travel of the yarn whereby said thread guide is

raised when yarn is traveling therethrough under tension and will drop when the yarn slackens, a member mounted to move with said thread guide, the thread guide, the mounting means for the thread guide and the member movable with the thread guide having their joint center of gravity almost above the axis of rotation of the mounting means for the thread guide on the side thereof to bias the thread guide downwardly, and a member movable with the brake, said member when the brake is in its first-named position being disposed immediately below the member movable with the thread guide whereby when the thread guide drops it will urge the brake to its second-named position.

9. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member having means to mount said gyratory member for rotation about a vertical axis, a brake, means to mount said brake for movement into and out of engagement with said gyratory member, said brake normally being out of contact with the gyratory member, and means to move said brake into contact with the gyratory member, said last-named means including a thread guide, means to mount said thread guide for movement laterally of the path of travel of a yarn, said thread guide being biased in a direction away from said path, yarn biasing the thread guide in an opposite direction when under tension, a member movable with said thread guide, and a member movable with the brake, said last-named member being engaged by the member movable with the thread guide when a yarn slackens.

10. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit including a gyratory member, a brake, means to mount said brake for movement into and out of engagement with said gyratory member, means to bias said brake out of engagement with said gyratory member, a thread guide through which yarn passing around the gyratory member is threaded, means to mount said thread guide for movement laterally of the path of travel of a yarn, means to bias said thread guide away from said path, said thread guide acting against said biasing means when yarn passes therethrough under tension, and means operable upon movement of said thread guide, under the sole influence of the biasing means when the yarn slackens, to move the brake into engagement with the gyratory member.

11. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a tension unit comprising a gyratory member, means to mount said gyratory member for rotation about a vertical axis, a brake, means to mount said brake for rotation about a horizontal axis into and out of engagement with said gyratory member, said brake being located between said horizontal axis and said gyratory member when it is in engagement with said gyratory member and said horizontal axis being located between said gyratory member and said brake when said brake is out of engagement with said gyratory member, whereby said brake is biased toward said gyratory member when it is in contact therewith and is biased away from said gyratory member when it is out of contact therewith, a member mounted for movement with said brake, a thread guide, means to mount said thread guide for movement about a horizontal axis, a member mounted to move

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with said thread guide, said thread guide, mounting means for the thread guide and member movable with the thread guide having a joint center of gravity almost directly above the horizontal axis of rotation for the thread guide mounting member when a yarn is passing under tension around the gyratory member and through the thread guide whereby when the yarn slackens the thread guide will drop, the member mounted for movement with the thread guide being disposed when thread is passing under tension through the thread guide slightly above the member mounted for movement with the brake whereby when the thread slackens and the thread guide drops the brake will be thrown into contact with the gyratory member.

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