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 tricot 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 snagging 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 squeegee type tension units, consisting of two independently rotatable hardened metal discs between which yarn runs and which are supposed 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 squeegee 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 individual 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 squeegee 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 abnormal 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 impacts tension by drag of the wheel. Twirlers are not favored because they are subject to 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 retreading. 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.

Depending upon the yarn, the knitting machine and the type of knitting (variations in patterns, inlays and stitches) it sometimes is desirable to change the tensions of all the yarns on a section warp spool. To vary the tension of the tension units presently used, each of the several hundred units of a magazine creel must be individually adjusted. Such operation involves so much time in making the changeover and in regulating the different units so as to obtain some degree of uniformity that currently there is a great reluctance to change operating tensions.

It is a general object of the invention to provide an improved tension unit which overcomes all the aforesaid difficulties.

It is another object of the invention to provide a tension unit of the character described which comprises relatively few and simple parts, is inexpensive to manufacture, and can be threaded rapidly.

It is a more specific object of the invention...
to provide a tension unit of the character described which will keep tension substantially constant when the beaming machine is stopped or started.

It is another specific object of the invention to provide a tension unit of the character described which is so constructed that it will accumulate no foreign matter and will not score, even after long periods of time, and will maintain yarn in operative position on the unit when the beaming machine is running or when the latter stops.

It is an ancillary object of the invention to provide a tension unit of the character described whose tension is capable of being adjusted from a remote point.

It is another ancillary object of the invention to provide a creeling machine having a plurality of tension units of the character described which can jointly be adjusted so as to vary simultaneously the tension of all the units.

It is another ancillary object of the invention to provide a tension unit of the character described which is capable of having the tension imposed thereby adjusted finely and adjusted while the creeling machine is in operation.

It is another object of the invention to provide a tension unit which has the foregoing characteristics and which can be operated continuously for long periods of time without replacement or repair.

It is another object of my invention to provide an improved twirler type tension unit.

When warping from wooden bobbins, rather than cones, there sometimes are very marked variations in tension in the yarns entering the divers tension units.

It is an ancillary object of the invention to provide a twirler type tension unit having a simple manually operable adjustment for changing the tension applied by the unit, so as to offset the variation in the tension of the yarn entering the unit whereby the tensions of yarns leaving the group of such units readily can be made substantially uniform.

It is another ancillary object of the invention to provide a twirler type tension unit which is of such construction that the tension applied by the unit is inversely proportional to the tension of the yarn entering the unit whereby the tensions of yarns leaving a group of such units automatically can be rendered substantially uniform.

A difficulty often experienced in connection with tension units used in conjunction with magazine creels and beaming machines is that broken yarns twist about adjacent unbroken yarns so that for an appreciable time after breakage, the tension of the broken yarn is maintained in its associated stop-motion device. Thereafter, the yarn tension slackens at the stop-motion device and the beaming machine is stopped. This necessitates the time-consuming operation of backing off all the threads from the section warp spool until the broken end is reached.

It is another object of the invention to provide a magazine creel wherein the stop-motion devices and tension units are so mutually arranged as to avoid the foregoing difficulty.

More specifically, it is an object of the present invention to provide a combined tension unit and stop-motion device which, under all circumstances, will stop warping action of the beaming machine at substantially the same time that a yarn breaks.

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

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

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

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

Fig. 2 is a plan view of a section warp spool such as is wound in the beaming machine shown in Fig. 1;

Fig. 3 is an enlarged sectional view taken substantially along the line 3—3 of Fig. 1, the same illustrating one of said tension units in plan;

Fig. 4 is a side view of the tension unit shown in Fig. 3;

Fig. 5 is a front view of the tension unit, the same being taken substantially along the line 5—5 of Fig. 3;

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

Fig. 7 is a view of the tension unit seen from the line 7—7 of Fig. 3;

Fig. 8 is a horizontal sectional view through the tension unit, the same being taken substantially along the line 8—8 of Fig. 6;

Fig. 9 is an enlarged vertical section through the tension unit, the same being taken substantially along the line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 6 but including the wiring diagram of an electric control for the tension unit;

Fig. 11 is a top view of a tension unit embodying a modified form of the invention, the same being shown in connection with an electric drag adjusting circuit;

Fig. 12 is a side view of the tension unit shown in Fig. 11;

Fig. 13 is an enlarged sectional view taken substantially along the line 13—13 of Fig. 11;

Fig. 14 is a top view of a tension unit embodying another modified form of my invention; and

Fig. 15 is a sectional view taken substantially along the line 15—15 of Fig. 14.

Referring now in detail to the drawings, and more particularly to Figs. 1–10, the reference numeral 40 denotes a conventional beaming machine which draws several yarns from a magazine creel 22. The beaming machine 20 includes a motor 24 which rotates a section warp spool 26 through a suitable power train including, for example, a belt and pulleys.

The magazine creel has a conventional frame 28 which forms a support for a large number of bobbins or cones 29 whose yarns are to be wound side by side on the spool 26. Associated with each cone is a tension unit 32 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 20.

The tension unit is of the twirler type, constituting a light squat gyration member 34 and suitable means for mounting the same for rotation about a vertical axis. More specifically, the gyra-
tory member has the form and appearance of a small sheave. It includes a sheet metal section \(36\) which is formed from one piece of lightweight metal, e.g., aluminum, into the indicated shape which includes a flat top \(38\) from whose periphery there depends a downwardly extending annular externally concave side wall \(40\) which forms a circular track for yarn \(Y\). A horizontal flange \(42\) integral with the wall \(40\) extends outwardly from the bottom edge of said wall.

The top \(38\) is fashioned with a central opening \(44\) and is seated on a shoulder \(46\) formed at the top of a cylindrical plug \(48\) which preferably is of lightweight metal, e.g., aluminum. An erect stub projection \(50\) which extends through the opening \(44\) is peened over firmly and permanently to secure the section \(36\) to the plug.

The plug \(48\) includes a central bore \(52\) disposed concentrically with respect to the axis of gyration of the combined section \(36\) and plug \(48\). Said bore receives a spindle \(54\) which protrudes downwardly from the plug and is held in place, as by a set screw \(56\).

The flange \(42\) functions in a conventional manner to serve by its mere physical presence to prevent the yarn \(Y\) from riding off the member \(34\) as long as some tension is present. It is desirable to provide a similar horizontal flange at the top of the member. Accordingly, a flat disc \(58\) is secured as by a film \(59\) of adhesive to the upper surface of the top \(38\).

There is a tendency for yarn to be caught in the crack \(60\) whereas the disc \(58\) is adjacent the periphery of the top \(38\). According to an ancillary feature of the invention, this is prevented by fabricating said disc \(58\) from an electrically non-conductive material. Typical materials which have been found satisfactory for this component of the tension unit are synthetic plastics, such as cellulose acetate, cellulose butyrate, acrylic resins and phenol-formaldehyde condensation products. These materials are available in sheet form and can be cut to the desired washer-like shape. It is believed that when the gyratory member \(34\) rotates at a high speed, an electrostatic charge is formed on the disc \(58\) which is of the same sign as the charge on the yarn \(Y\) running through the tension unit. This causes the yarn to be repelled by the disc so that, in effect, said disc functions as an electrostatic guard to keep the yarn out of the crack \(60\).

The spindle \(54\) is received in a vertical journal constituting, for example, a pair of bushings \(62, 64\) of the type known as "Ollite" bushings, these being metal bushings which are formed with minute cavities in which oil or some other suitable lubricant has been trapped. The bushings are force-fitted in the opposite ends of a sleeve \(66\). The lower bushing has its bottom end closed by a hardened press-fitted steel ball \(68\). The sleeve is suitably mounted in a support which in the present embodiment of the invention comprises a plate \(70\). It will be understood that the type and specific construction of the support may depend upon the kind of magazine creel \(22\) with which the tension unit is to be used. The creel shown here includes angle irons \(71\) which run in front of the cones \(30\). Hence, the support \(70\) for the tension unit \(32\) comprises a plate which is fastened in any suitable manner, for instance by nuts and bolts \(75, 77\) to said angle irons. The spindle is long enough for its lower end to be seated on the ball \(68\) which thus acts as a thrust bearing. The plate \(70\) is so oriented that said spindle is vertically disposed. Thus the gyratory member \(34\) rotates about a vertical axis.

The concave annular side wall \(40\) (yarn track) is provided with an outer traction surface in order that the yarn may obtain a good purchase thereon and thereby cause the twirler to rotate fast enough for the peripheral speed of the track substantially to match the speed of the yarn, and in this fashion to reduce to a negligible minimum the slip between the yarn and twirler. This very substantially reduces wear on the yarn track and prevents scoring. In the operation of tension units such as described, gyratory members have been running for many more times the period than normally would have caused scores to be formed in conventional tension units, and no indication whatever of a score has appeared upon said members.

The desired traction surface may be obtained by forming markings which make said surface irregular in the direction of yarn travel. For example, such marks may comprise depressions or ridges extending across the yarn track. A simple and economical manner in which to provide the desired traction surface is to form a uniform series of through openings \(72\) in the yarn track.

Twirlers constructed as aforesaid have run for several months with two shifts a work day without any cleaning; this in contrast with the one and one-half hour cleaning period required after each shift when present day conventional tension units are employed.

The tension unit also includes a brake \(74\). Said brake may be of any desired construction but preferably is lightweight so that it lends itself to very rapid movement. As shown herein the brake includes a yoke \(76\) of inverted U-shape whose legs are pivotally mounted on a pair of angle brackets \(78\) carried by the plate \(70\). The base of the U is covered by a sleeve \(79\) of an elastomeric material, e.g., rubber or synthetic rubber, to obtain a good braking action. Other suitable materials are those conventionally used for drum brakes. The yoke is of such length and is so mounted that the sleeve \(79\) swings in an arc which is intercepted by a portion of the gyromatic member. In order to minimize distortion of said member upon application of the brake, said brake is arranged to engage the plug \(48\) beneath the section \(58\), a short distance above the upper bearing \(62\).

Means also is included to actuate the brake, said means desirably being extremely fast in operation. One such means which has been found to operate in a very satisfactory manner is a solenoid \(80\). Said solenoid has a plunger \(82\) which is connected to the yoke \(76\) by a link \(84\) so that when the solenoid is energized it will retract its plunger and pull the yoke to the operative position indicated by the dot-and-dash lines in Fig. 9.

Pursuant to the invention, the brake actuating means has its energization controlled by the state of the mechanism which draws yarn from the magazine creel. As long as such mechanism is drawing yarn from the creel, the control for the brake actuating means remains ineffective. As soon as this mechanism stops, and substantially instantaneously therewith, the control means renders the brake actuating means effective so that the brake functions to stop the gyratory member at practically the same instant that the mechanism which draws yarn from the magazine creel is stopped for any reason whatsoever.

The means for controlling energization of the
brake actuating means—preferably is electrical in nature, comprising for example a circuit such as is shown in Fig. 10. Said circuit includes a source of energy for the solenoid, this optionally being a six volt storage battery. The circuit from the storage battery to the solenoid is interrupted by the contacts 92 of a relay 90. The operating coil 94 of this relay is powered from a suitable source, e. g., a single phase supply 96 of alternating current, whose circuit to said coil is interrupted by the normally open contacts 98 of a relay 100, having normally closed contacts 104 in the power circuit of the beamng machine motor 24. The operating coil 102 of the relay 100 is in a suitable circuit (not shown) which is energized upon the occurrence of any condition desired to cause the motor 24 to stop.

From the foregoing, it will be understood that when the relay coil 102 is energized the motor will be stopped. At the same time the relay contacts 98 will close to energize the relay 90 and close its contacts 92. This latter action energizes the solenoid 80 and causes the brake to be rendered effective. It has been observed that although the gyration member spins at a high speed during operation of the beamng machine, for instance at around 3000 R. P. M., said member is stopped so rapidly by the means described above that the yarn in the tension unit remains in engagement with the yarn track 40, so that there is no appreciable slackening of the yarn either between the cone and tension unit or between the tension unit and beamng machine. For the same reason the yarn does not tend to overrun and thereafter drop off the tension unit due to residual motion of the twirler when the beamng machine is stopped.

It may be pointed out that the intermediate circuit from the relay contacts 93 to the operating coil 94 does not noticeably slow down the almost instantaneous action of the solenoid 80 on stopping of the motor 24, and such intermediate circuit avoids the necessity of running low volt age lines from the main magazine creel to the beamng machine. It also permits a low voltage circuit to be used for energization of the solenoid.

All of the solenoids in the magazine creel or a substantial section thereof are controlled by a single relay 90, the feed line for the additional solenoids being the buses 105, 108.

In accordance with an ancillary feature of the invention, a stop-motion device 110 is disposed adjacent the tension unit. Said device comprises a snap-acting momentary electric switch 112 having a pair of normally open contacts and a rotary actuating member 114 which when turned in a clockwise direction will cause the switch contacts to close. Since the switch is of the momentary type, as soon as clockwise torque on the actuating member 114 is released, the switch will reopen these contacts. The actuating member carries an operating arm 116 on which a thread eye 118 is mounted. The yarn after leaving the tension unit passes through this thread eye and thereafter through the conventional threading guides which lead yarn to the beamng machine.

While the moving yarn is unbroken the tension, slight as it may be, will keep the thread eye 118 raised; but as soon as the yarn breaks, the eye will drop and the contacts of the switch 112 will close. These contacts are in a conventional circuit for operating the relay 100 which stops the motor. It will be observed, with the stop-motion device located adjacent the tension unit, that it is not possible for a broken thread to twist around an unbroken thread and thus keep the eye raised for any appreciable period of time, so that an effective and dependable response to breaking of the yarn is accomplished.

The switch 112 is secured to a plate 120 mounted on, or in one piece with, the mounting for the tension unit, i.e. the plate 78. The plate 120 also may serve as a support for a pair of thread eyes 122, 124 which guide the yarn on to and off the gyration member. Additionally, the plate 120 can carry a standard yarn guiding comb 126 through which thread travels as it passes from the cone 90 to the guiding-eye mechanism.

In Figs. 11-13 there is shown a tension unit 130 embodying a modified form of the invention. Said unit includes a gyration member 132 whose construction and mounting is substantially the same as that shown in the first described form of the invention. A brake 136 for the gyration member includes a shoe 138 carried by a wire 140 which is fixed to a post 141 that is pivoted in a journal 142 so as to rotate about a vertical axis.

The gyration member 132 has a lower flange 144 which, for a reason that soon will be apparent, extends further away from the yarn track than does the flange 42 shown in the first form of the invention. Said flange 144 turns between a pair of soft iron pole pieces 145, 146 which form part of the magnetic circuit for a coil 150 of an electromagnet. Said pole pieces are located very close to the top and bottom surfaces of the flange 144. The flange is fashioned from an electrically conductive non-magnetic metal, a satisfactory metal being aluminum.

When the coil 150 is energized it produces a strong magnetic field between the pole pieces and through the flange 144. This field reacts with the magnetic flux produced by the eddy currents generated in the flange by the field, thereby producing a drag torque.

The coil 150 is supplied with power from a pair of bus lines 152, 154 energized from a battery 156 through a variable resistance 158. Thus, by moving the resistance control, the value of the drag torque may be varied from a remote point without physically touching or adjusting any part of the tension unit. All the tension units in a given magazine creel are similarly equipped, and thus are controlled by varying a single resistance 158.

It is within the scope of the invention to provide gyration members having different inherent drags. This may be most simply accomplished by providing a rotating portion thereof with one or more projections that resist motion through air. For instance, the disc 160, which constitutes the top flange of the gyration member 132 and is made from synthetic plastic, can, at the time it is blanked out, be fashioned with projections such as small radial vanes 162 protruding from its upper surface out of the way of the thread. By changing the gyration members on all the tension units of the magazine creel to include gyration members having like vanes of a certain selected size and position, drag on the magazine creel can be adjusted to any desired value of tension. This method of varying the tension is slower than the remote control adjustment above described, but is satisfactory in cases where changes in tension are not required frequently. Figs. 14 and 15 illustrate a tension unit 170 which embodies another modified form of the invention wherein there is provided a mechanism for individually varying the tension applied by the unit so as to compensate for variation in
tension of yarn entering the unit. Except for the omission of the eddy current drag means and the inclusion of the mechanism for individually changing applied tension, the unit is identical with the unit 130 shown in Figs. 11-13 and described above.

The aforesaid mechanism includes a pole piece 171 carried by an arm 174 fixed on a post 178 of magnetic material, e.g. steel. The pole piece is located immediately above the horizontal flange 175 of the gyrationary member 170. Said pole piece and arm preferably constitute a single permanently magnetized member which desirably is fashioned from a substance capable of creating a strong magnetic field, such as an alloy of aluminum, nickel and copper, known to the trade as “Alnico V.”

A second pole piece 182 is located immediately beneath the flange 175. This latter pole piece is carried by an arm 184 rotatable on a wide diameter portion of the post 178. The pole piece 182 and arm 184 likewise constitute a permanently magnetized single member of a strong magnetic substance like Alnico V.

Desirably, the two pole pieces have the same plan configuration. The pole 174, 184 are of such length that the pole pieces can be moved into vertical registry on opposite sides of the flange 178. The two pole pieces are of opposite polarity and thereby create a magnetic field between them which extends through the flange 178. This field will produce a drag torque due to the eddy currents generated in the flange as the gyrationary member rotates. The value of the torque thus evolved will be a function of the strength of the magnetic field and this latter can be varied by changing the angular position of the arm 184 so as to shift the movable pole piece 182 more or less out of registry with the stationary pole piece 172.

If desired, such shifting can be accomplished manually and to this end there is provided a tab 186 integral with the arm 184 which is journaled on the post 176 and carries the arm 184.

An operator when he observes, for example, that the yarn leaving the bobbin B and entering the tension unit is running under too great a tension, i.e., a value higher than that desired, due to the tightness of the yarn on the bobbin, or for any other reason, will manipulate the tab 186 to somewhat disalign the two pole pieces. This will lessen the intensity of the magnetic field between the pole pieces and reduce the drag torque, and consequently the tension imposed.

The amplitude of movement of the tab will be determined by the value of the tension in the thread leaving the bobbin. Conversely, if the yarn is running too loosely off the bobbin, the pole pieces can be brought closer to registry thereby to increase the tension applied by the unit.

Instead of manipulating the tab 186 manually, the control thereof may be accomplished automatically as a function of the tension of the yarn running from the bobbin to the tension unit. The reference numeral 180 denotes a means for accomplishing the foregoing. Said means includes an eyelet 192 through which the yarn leaving the bobbin is threaded. This eyelet is carried on one end of a thin spindle 194 which is reciprocably mounted in a bearing 196. The spindle is non-circular in profile to match the corresponding bore in the bearing, or a key or other suitable means is provided, to prevent rotation of said spindle in order that the opening through the eyelet may be maintained in a direction extending substantially parallel to the axis of symmetry of the bobbin. The end of the spindle opposite to that on which the eyelet is mounted is operably connected, e.g. by a pivot pin 198, to the tip of the tab 186, said pin riding in a radial slot 200 in the tab in order to prevent binding.

Means is included to bias the tab 186 to a position in which the two pole pieces are in registry. Such means comprises a tension spring 202 anchored at one end to the pin 198 and at the other end to a bar 204 fixed to the post 176. Said spring pulls the eyelet 192 toward the bearing 196, movement in this direction being limited by abutment of a stop collar 206 against said bearing. In such position, the eyelet 192 is radially spaced from the axis of symmetry of the bobbin, this being the axis about which the bobbin rotates when yarn is wound thereon. The spindle 194 is so disposed that as the eyelet 192 is moved away from the bearing 196, it will approach the axis of symmetry of the bobbin. This may be accomplished by disposing said spindle 194 radially with respect to said axis of symmetry. Yarn leaving the bobbin passes through the eyelet 182 and then is led around a comb 208 to the inlet eyelet 210 which directs the yarn to the track of the gyrationary member 170. Said comb is disposed on or near the axis of symmetry of the bobbin.

In the operation of the device, yarn traveling from the bobbin to the comb follows a broken mean path. The term “mean path,” as used herein, denotes the average path of the yarn and is employed particularly because the yarn running from the bobbin to the eyelet 192 traces out a roughly conical envelope whose apex is said eyelet and whose base is the cylindrical surface of the yarn on the bobbin. The mean path of the yarn from the bobbin to the eyelet is at an angle to the path of the yarn from the eyelet to the comb. Hence, the yarn which is running under some tension will exert a force tending to urge the eyelet in a direction to straighten the broken mean path. This force is opposed by the spring 202. Such force increases or decreases with an increase or decrease in the tension of the yarn running from the bobbin to the gyrationary member so that the greater the tension, the greater will be the deflection from idle position of the eyelet 192.

Deflection of the eyelet from idle position rotates the pole piece 182 in a direction out of registry with the pole piece 172 and the greater the deflection, the greater will be the extent of non-registry of said pole pieces. Moreover, the greater the non-registry of the pole pieces, the less will be the drag applied thereby so that, upon an increase of tension in the yarn leaving the bobbin, the tension applied to the yarn by the tension unit will decrease.

It thus will be seen that there have been provided devices which achieve all the objects of the invention and are well adapted to meet the conditions of practical use. As various possible embodiments might be made in the above invention, and as various changes might be made in the embodiment hereinafter 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 wherein yarn is drawn into a machine, a combined tension unit and stop-motion device, said tension unit including a gyratory member having a 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, said gyratory member including a pair of upper and lower horizontal flanges one of which is fabricated from an electrically non-conductive material, said tension unit further including a brake, means to mount said brake for movement into and out of engagement with said gyratory member, actuating means to move said brake into engagement with said gyratory member, said brake normally being out of contact with the gyratory member, and means to energize said actuating means, said energizing means being responsive to the condition of the machine and being effective when the machine stops drawing yarn, and an electromagnetic drag constituting an electromagnet having pole pieces disposed adjacent the metallic flange.

5. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a plurality of tension units, one for each of the sources of yarn, each tension unit including a gyratory member having a circular yarn track, 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 the gyratory member, and electric actuating means to move said brake into engagement with said gyratory member, said brake normally being out of contact with the gyratory member, and means to energize jointly all of said actuating means, said energizing means including a circuit adapted to be fed by a source of electric energy, a pair of normally open contacts in said circuit, said circuit being connected to all said actuating means, and means responsive to the condition of said machine for closing said contacts, said last-named means being effective when said machine stops drawing yarn from said sources.

6. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a plurality of tension units, one for each of the sources of yarn, each tension unit including a gyratory member, and a solenoid to move said brake into engagement with said gyratory member, said brake normally being out of contact with the gyratory member; and means to energize jointly all of said solenoids, said energizing means including a circuit adapted to be fed by a source of electric energy, a plurality of normally open contacts in said circuit, said circuit being connected to all said solenoids, and means responsive to the condition of said machine for closing said contacts, said last-named means being effective when said machine stops drawing yarn from said sources.

7. For use in a yarn handling apparatus comprising a machine driven by an electric motor having a switch in its feed lines, a plurality of tension units, one for each of the sources of yarn, each tension unit including a gyratory member having a circular yarn track, means to mount said gyratory member for rotation about a vertical axis, said gyratory member including a pair of upper and lower horizontal flanges one of which is fabricated from an electrically non-conductive material and the other from an electrically conductive non-magnetic metal, said tension unit further including a brake, means to mount said brake for movement into and out of engagement with said gyratory member, actuating means to move said brake into engagement with said gyratory member, said brake normally being out of contact with the gyratory member, and means to energize said actuating means, said energizing means being responsive to the condition of the machine and being effective when the machine stops drawing yarn, and a brake, means to mount said brake for movement into and out of engagement with said brake, and including a switch which controls the stopping of a motor which actuates said machine.
for movement into and out of engagement with the gyratory member, and a solenoid to move said brake into engagement with said gyratory member, said brake normally being out of contact with the gyratory member; and means to energize jointly all of said solenoids, said energizing means including a circuit adapted to be fed by a source of electric energy, a pair of normally open contacts in said circuit, said circuit being connected to all said solenoids, and means responsive to the condition of said machine for closing said contacts, said last-named means being effective when the motor switch disconnects the feed lines from the motor.

8. A tension unit including a gyratory member comprising a section made from a piece of sheet metal and constituting a top, a concave side wall serving as a yarn track and a lower outwardly extending flange, a disc of electrically non-conductive material, and means to secure said disc to the top of said section in position to constitute a second flange.

9. A tension unit including a gyratory member having a circular yarn track, a spindle depending from said member, a vertical bushing in which said spindle is journaled, and a ball disposed in the lower end of said bushing, the bottom of said spindle resting on said ball to take up the vertical thrust of said gyratory member.

10. For use in a yarn handling apparatus comprising a large number of sources of yarn, a tension unit including a gyratory member including a circular portion of an electrically conductive non-magnetic metal, said member having a circular yarn track concentric with said metallic portion, and an electromagnetic drag means constituting an electromagnet having pole pieces disposed adjacent the metallic portion.

11. For use in a yarn handling apparatus comprising a large number of sources of yarn which are drawn into a machine, a plurality of tension units, one for each of the sources of yarn, each tension unit including a gyratory member having a circular portion of an electrically conductive non-magnetic metal and a circular yarn track concentric with said metallic portion, and electromagnetic drag means constituting an electromagnet having pole pieces disposed adjacent the metallic portion, and circuit means for supplying electric energy jointly to all of said electromagnets, said circuit means including means to vary the potential applied to said electromagnets.

12. For use in a yarn handling apparatus wherein a large number of sources of yarn are drawn into a machine: a plurality of tension units one for each of the sources of yarn, each tension unit including a squa, light, yarn-driven gyroratory member having a narrow, annular, peripheral yarn receiving surface about which the yarn passes in its path from a source of yarn to the machine, means to mount said gyroratory member for rotation about a vertical axis, a brake, means to mount said brake for movement into and out of engagement with said gyroratory member, a brake actuating means for causing said brake to operate on the gyroratory member, said brake normally being idle, and means to jointly energize all of said actuating means, said energizing means including a circuit adapted to be fed by a source of electric energy, a pair of normally open contacts in said circuit, said circuit being connected to all said actuating means, and means responsive to the condition of said machine for closing said contacts, said last-named means being effective when said machine stops drawing yarn from said sources.

13. A tension unit as set forth in claim 12 wherein the last-named means includes a permanent magnet.

14. A tension unit as set forth in claim 13 wherein the last-named means includes a movably permanent magnet.

15. A tension unit as set forth in claim 14 wherein said last-named means includes a permanent magnet automatically movable responsive to the tension of yarn entering the tension unit.

16. For use with a bobbin having yarn wound about an axis of symmetry, a tension unit including a gyroratory member having a circular yarn track and an annular portion concentric with said track and fabricated from electrically conductive non-magnetic material, means to mount said gyroratory member for rotation, a pair of yarn guiding elements, means to mount one of said elements adjacent said axis of symmetry, means to mount the other of said elements remote from said axis of symmetry, said other element being adapted to be disposed closer to the bobbin than said one element, means to stationary support said one element, means to support said other element subject to movement in a direction toward and away from said axis of symmetry, means to bias said other element in the direction away from said axis of symmetry, means to pass a magnetic field through said annular portion, said last-named means including a pair of permanent magnets including a stationary magnet and one movable magnet, and means responsive to movement of said other member for moving the movable magnet, said movable magnet being in substantial registry with said stationary magnet when the unit is idle.

17. For use in a yarn handling apparatus wherein a large number of sources of yarn are drawn into a machine: a plurality of tension units one for each of the sources of yarn, each tension unit including a squa, light, yarn-driven gyroratory member having a narrow, annular, peripheral yarn receiving surface about which the yarn passes in its path from a source of yarn to the machine, means to mount said gyroratory member for rotation about a vertical axis, a brake, means to mount said brake for movement into and out of engagement with said gyroratory member, a brake actuating means for causing said brake to operate on the gyroratory member, said brake normally being idle, and means to jointly energize all of said actuating means, said energizing means including a circuit adapted to be fed by a source of electric energy, a pair of normally open contacts in said circuit, said circuit being connected to all said actuating means, and means responsive to the condition of said machine for closing said contacts, said last-named means being effective when said machine stops drawing yarn from said sources.

18. For use in a yarn handling apparatus wherein a large number of sources of yarn are drawn into a machine: a plurality of tension units; each of said units including a squa, light, yarn-driven gyroratory member having a narrow, annular, peripheral yarn receiving surface about which the yarn passes in its path from a source of yarn to the machine, means to mount said member for rotation about a vertical axis, a metallic member rotatable with said gyroratory member, and an electro-magnet having pole-
pieces spaced from but adjacent the metallic
member; and variable means to supply current
to the electro-magnets of all the tension units
simultaneously whereby the tension applied by
all of said units may be altered by means of a
single adjustment.

19. In a warping apparatus having a yarn
package and a warp beam upon which the yarn
from said package is wound; a yarn tensioning
means comprising a squat, light, yarn-driven
gyratory member having a narrow, annular,
peripheral yarn-engaging surface about which
the yarn passes in its path from the yarn pack-
age to the warp beam, a slender, vertical spindle
supporting said member, a vertical bushing
through which the spindle extends, a hardened
steel surface, and means locating said steel sur-
fice beneath and in contact with the lower end
of the spindle whereby the spindle rests and
turns on said surface.

20. A tension unit including a light yarn-
driven gyratory member having a narrow, ann-
ular, concave, metal yarn traction surface with
horizontal flanges above and below said traction
surface at least one of which is of synthetic
plastic material capable of generating a charge
of the same sign as that carried by the yarn
which engages said traction surface whereby
the yarn is repelled by said flange.