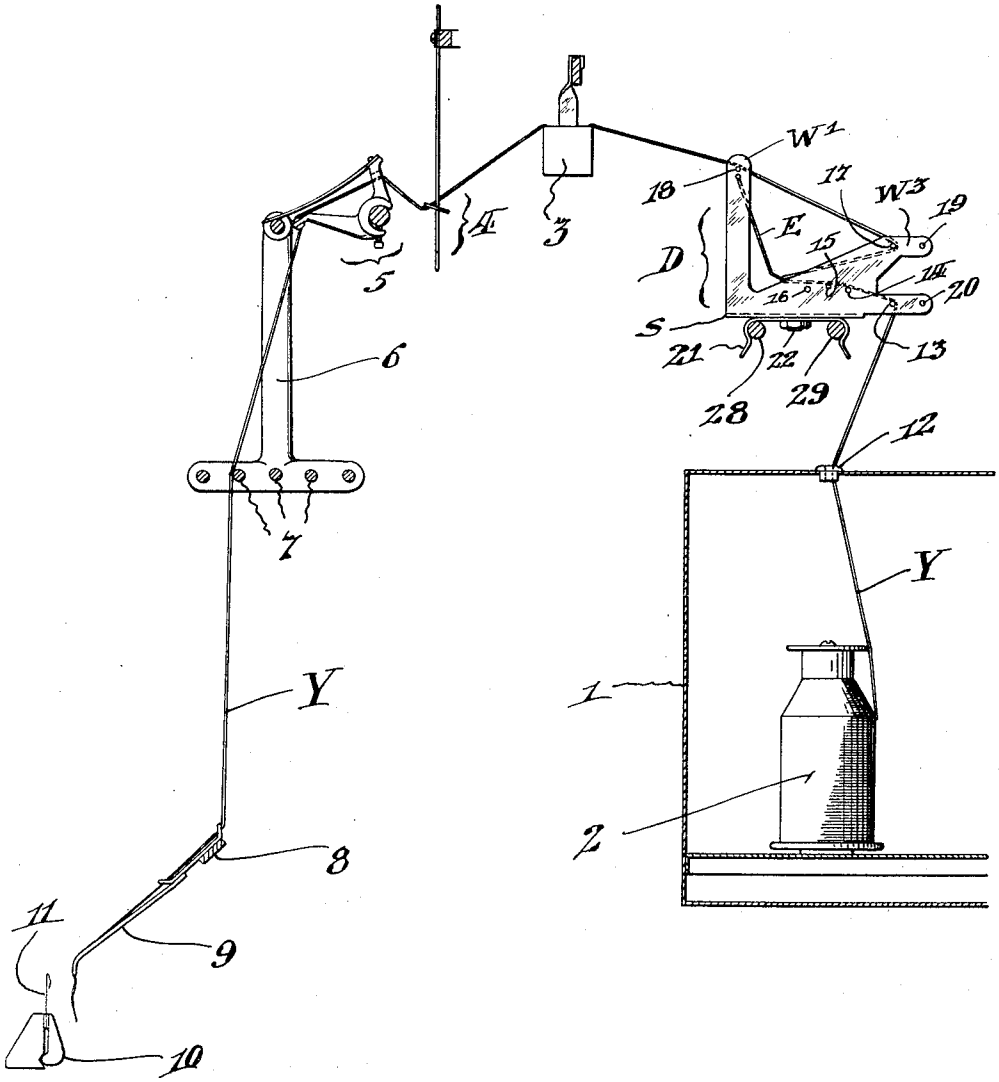
July 11, 1950 R. H. JOHNSON 2,514,582

YARN TENSION EQUALIZING MEANS

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Fig. 1.



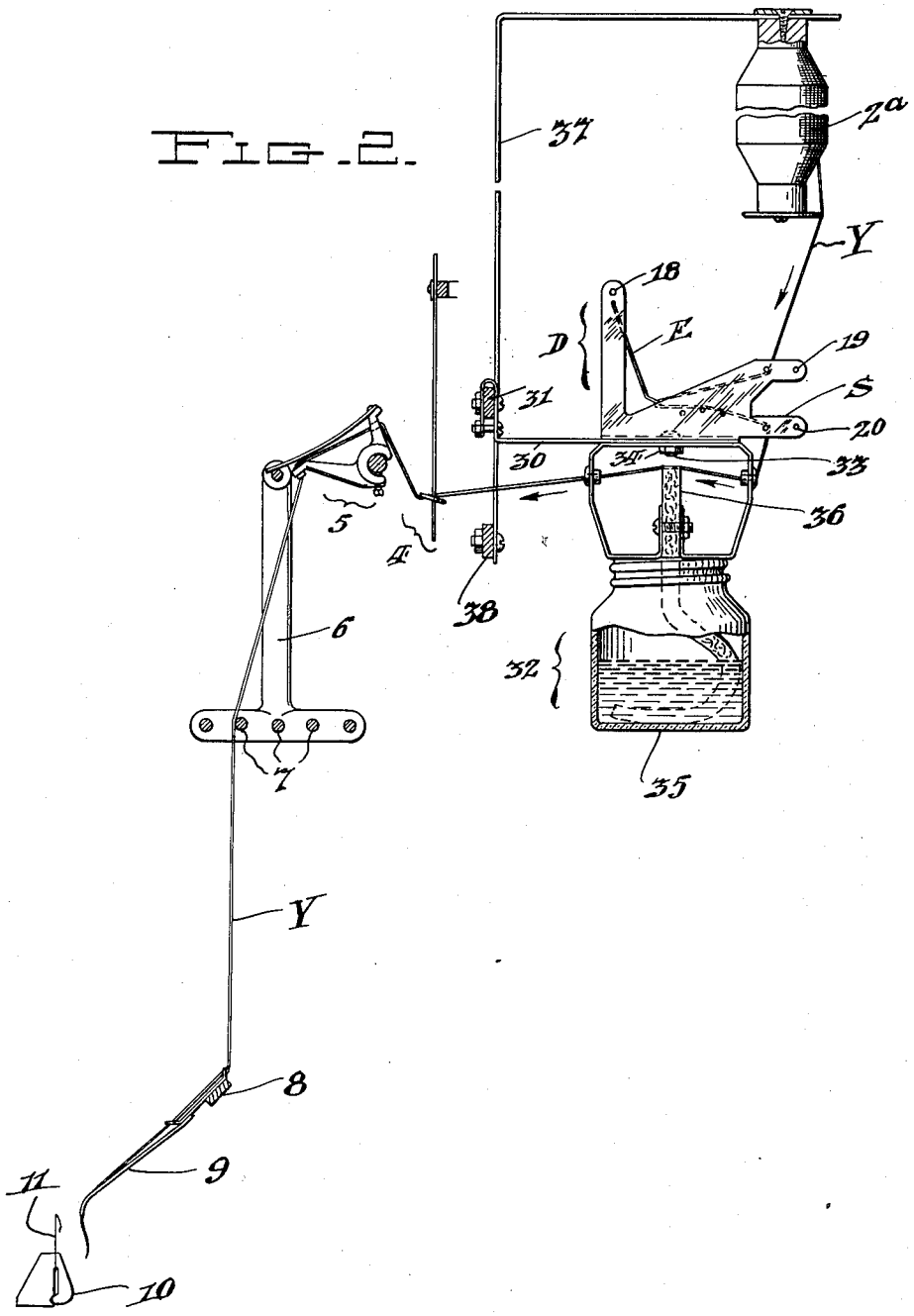
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YARN TENSION EQUALIZING MEANS

Filed Jan. 25, 1950 3 Sheets-Sheet 2

FIG. 2.



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YARN TENSION EQUALIZING MEANS

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Fig. 3.

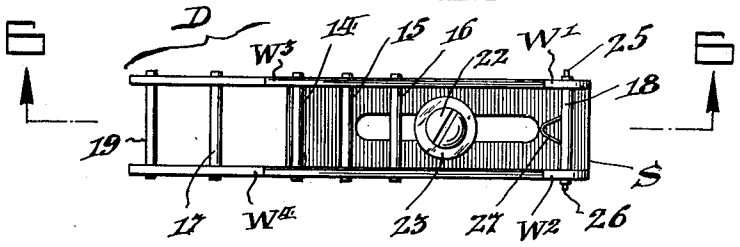


Fig. 4.

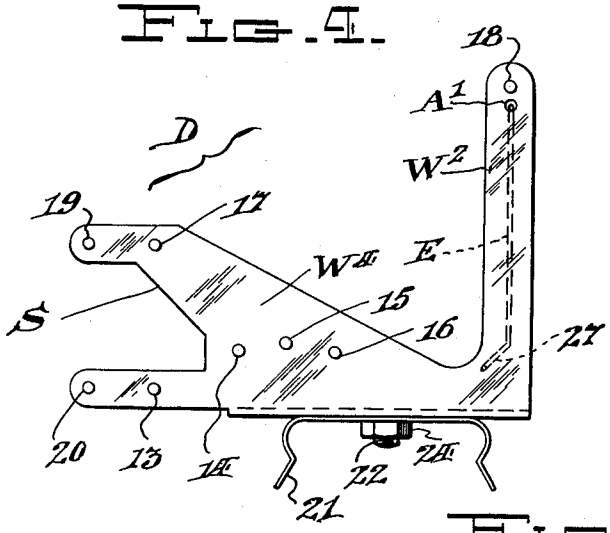


Fig. 5.

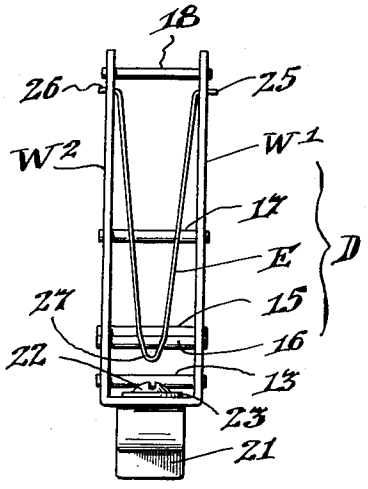


Fig. 7. Fig. 8.

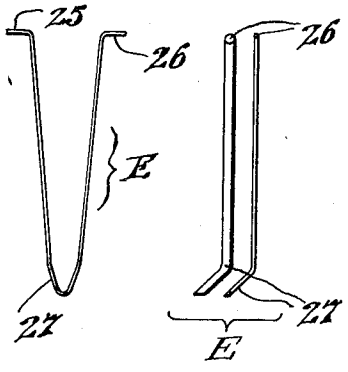
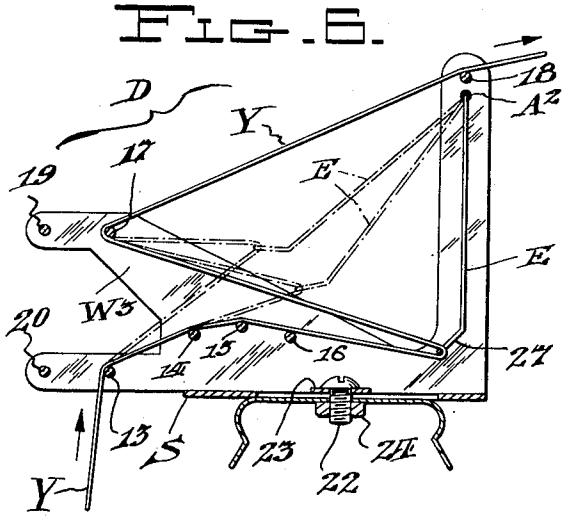


Fig. 6.



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Patented July 11, 1950 2,514,582

UNITED STATES PATENT OFFICE

2,514,582

YARN TENSION EQUALIZING MEANS

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Application January 25, 1950, Serial No. 140,420

11 Claims. (Cl. 66—146)

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This invention relates generally to devices for equalizing the tension of yarns during feeding movement thereof from one point to another in a textile machine, and more particularly concerns a device for equalizing the feeding tension of nylon yarn during its travel from a source of supply to a point of demand in a hosiery fabric knitting machine, or the like.

It has been found in practice that variation in the feeding tension of nylon yarn in hosiery fabric knitting machines will cause such detrimental results as irregular and unsightly selvedge edges in the fabric, as well as considerable variation in the lengths of the hosiery fabrics produced. To overcome such detrimental results, various expedients have been employed, such as rewinding of the yarn pirns, cones, or packages, to effect a more uniform tension condition of the yarn at its source of supply, and installation in the knitting machine of various means intended to equalize the yarn feeding tension at some point between the yarn supply and the yarn demand. However, none of these expedients have so far accomplished their intended purpose in a manner considered by the trade to be economical, or satisfactory from a practical or commercial standpoint.

One object of my invention is to provide a novel yarn tension equalizing device for textile machines, which overcomes the indicated and other difficulties and detrimental results.

Another object is to provide such a device which has certain structural and functional features of advantage over the similar devices of the prior art.

A further object is to provide such a device which is simple in construction and operation and which performs its intended purpose in an effective, efficient and practical manner.

An additional object is to provide such a device which can be variously installed in a knitting, or other textile machine, between the yarn source and point of yarn demand, so as to cooperate with, or to eliminate, certain standard yarn tensioning elements of such machines.

It is also an object to provide such a device having a novel yarn tension equalizing element which is pivotally suspended on a support so that a portion, or means, at the free end thereof may be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element means, or portion.

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Another object is to provide such a device in which the said pivotally suspended yarn tension equalizing element cooperates with one or more yarn contacting members the action of which is made effective, or ineffective, by the positional location of the element during its swinging movement from a perpendicular position to a yarn tension equalizing position.

A further object is to provide such a device comprising a support having mounting means thereon adapted to suspendedly receive in interchangeable manner, different yarn tension equalizing elements.

Another object is to provide such a device comprising a support having vertically opposed wall sections through which extend apertures arranged to form pivot bearings for different interchangeable yarn tension equalizing elements.

An additional object is to provide such a device comprising a novel substantially V-shaped yarn tension equalizing element formed of resilient wire and having extensions at its upper end that project outwardly in opposed relation and which projections are relatively movable toward and from each other so that they can be readily inserted and withdrawn from bearing apertures provided therefor in the supporting structure of the device.

With these and other objects in view, which will become more apparent from the following detailed description of one practical and illustrative form of my improvements shown in the accompanying drawings, the invention comprises the novel device, elements, features of construction and arrangement of parts in cooperative relationship, as more particularly indicated by the hereto appended claims.

In the accompanying drawings—

Figure 1 is a partial vertical cross-sectional view through the upper section of a conventional full-fashioned hosiery knitting machine and shows one form of my novel yarn tension equalizing device applied thereto.

Fig. 2 is a partial vertical cross-sectional view through the upper section of a conventional full-fashioned hosiery knitting machine, similar to Fig. 1, and shows my novel yarn tension equalizing device applied thereto in a different manner than illustrated in Fig. 1.

Fig. 3 is a top plan view of a preferred embodiment of my novel yarn tension equalizing device.

Fig. 4 is a side elevational view of the device shown in Fig. 3.

Fig. 5 is an end elevational view of the device

shown in Figs. 3 and 4, as seen by looking at Fig. 4 from the right hand end thereof.

Fig. 6 is a central vertical cross-sectional view through the device shown in Fig. 3, as indicated by the arrows 3—3 on the latter, and

Fig. 7 is a front elevational view of one type wire-formed yarn tension equalizing element constituting a part of my novel device.

Fig. 8 is a side elevational view of two elements like the element shown in Fig. 7, but each being of a different weight, or wire gauge.

It will be helpful to an understanding of my invention to first briefly consider some of the more important aspects and features thereof, so that these may be kept in mind during the subsequent reading of the detailed description of the practical and illustrative embodiment of my improvements as shown in the accompanying drawings. Accordingly, it is noted that the production of hosiery from yarn, such as nylon yarn, which has an elastic quality or characteristic, has heretofore posed the problem of providing knitting machines with means to overcome the difficulties resulting from variation in the yarn feeding tension, caused by the said elastic quality, or characteristic, of nylon yarn. This problem has not been satisfactorily solved prior to my invention.

As previously mentioned, the difficulties resulting from the indicated variation in yarn feeding tension, manifest themselves in the formation of irregular, or unsightly, selvedge edges in the flat knitted fabrics produced on straight, or full-fashioned knitting machines, and more seriously, in considerable variation in the overall lengths of the individual hosiery fabrics that are produced by the different knitting sections of such machines.

It has been found in practice that ladies' nylon stockings made from such fabrics may vary in overall length from 1½ to 3 inches, or even more in some instances, and since the full length of such finished stockings ordinarily varies in lengths from 29 to 35 inches, it will be appreciated that the said undesirable variation in fabric lengths, entails length matching labor and other costs which considerably increase the production cost of the hosiery.

It has also been found in practice that when the nylon pirns, cones, or packages of a knitting machine are wound relatively tight, the resultant yarn tension causes the stocking, or hosiery fabrics, to be shorter, whereas a relatively loosely wound nylon pirn, or cone, will cause the hosiery fabrics to be longer. Also, that a large pirn or cone has a tendency to have less drag on the yarn, than one from which about one-half or perhaps three-fourths of the yarn has been removed, or withdrawn. This has led to the practice of rewinding the yarn cones to thereby effect a more uniform yarn tension condition at the yarn source, with consequent additional production cost.

The novel yarn tension equalizing device of my invention is designed so that it may be mounted at a convenient location in the path of travel of the yarn moving from a yarn supply, to a point of yarn demand, in such manner that it may either cooperate with the usual yarn tension devices of the particular knitting, or other textile machine, with which it is associated, or in such manner as to eliminate the said usual yarn tension devices.

When properly mounted and located, my device will function to substantially overcome, or minimize, the said difficulties heretofore experienced and resulting from the elastic quality or characteristic of nylon yarn. In practice, I have found that the utilization of my device in a textile machine, for example in straight or full-fashioned knitting machines, will reduce by at least one-half and in most instances considerably more, the variation in overall length of the hosiery fabrics knitted in accordance with the prior art practice. Furthermore, my yarn tension equalizing device may be selectively adjusted by insertion therein of a certain swingable yarn tension equalizing element of the proper weight, for a nylon yarn of a particular denier, to thereby maintain the yarn tension constant, so that the use of the usual yarn tension devices of the machine becomes unnecessary, or optional.

The foregoing phases and features of my invention will become more apparent from the following detailed description thereof:

Referring to the drawings, and more particularly to Fig. 1 thereof, my novel yarn tension equalizing device is there generally identified by the letter D and shown applied to a conventional straight, or full-fashioned hosiery knitting machine, which comprises such well-known parts as a yarn supply box 1 containing as usual a plurality of yarn pirns, cones, or packages 2, a yarn moistening trough 3, a ring tension unit 4, a snapper yarn tension unit 5, a bracket member 6 adapted to support a plurality of yarn guide rods 7, a reciprocatively operated yarn carrier bar or rod 8, on which are fixedly mounted a plurality of yarn feeding fingers or carriers 9, one for each knitting section of the machine, and a needle bar 10, having secured thereto for united action a series of spring beard needles 11.

The yarn pirn, cone, or package 2, is of the usual and well-known type utilized in such knitting machines, and is provided with a supply of nylon yarn Y that is fed to the needles 11 by the reciprocating movement of a respective yarn feeding finger or carrier 9, of the particular knitting section served by said carrier.

In the present instance, the nylon yarn Y is shown as traveling from its source of supply, represented by the cone 2, to its point of demand, represented by the lower feeding end of the yarn carrier finger 9 adjacent the needles 11, by moving upwardly from the cone 2, through a yarn guide eyelet 12 in the top section of the yarn box 1, then through my yarn tension equalizing device D, from whence it follows its usual course through the yarn moistening trough 3, the ring element of the unit 4, the snapper of the unit 5, along a guide bar 7 to the yarn carrier finger 9.

The yarn tension equalizing device D of my invention, is more particularly shown in Figs. 3 to 8 inclusive of the drawings, and generally comprises a support S, a swingably mounted, or suspended, yarn tension equalizing element E, a plurality of yarn guide pins, or rods 13, 14, 15, 16, 17, 18, 19 and 20, and a spring clamp member 21 which is attached to the bottom of the device D by suitable means, such as a screw bolt 22, washer 23 and internally threaded nut 24.

The support S may be stamped out of sheet metal, moulded of plastic material, or otherwise formed of suitable material, and provided with a shape, or configuration, substantially as shown, so as to include a pair of opposed upstanding wall members, comprising sections W^1 and W^2, provided with aligned apertures A^1 and A^2, and arranged to support the ends of the yarn guide pin 18, and sections W^3 and W^4 arranged to support the ends of yarn guide pins 13, 14, 15, 16, 17, 19 and 20.

The yarn tension equalizing element E, more particularly shown in Figs 7 and 8, is substantially V-shaped in configuration and may be formed of spring wire, or other resilient material. At its upper end the element E is provided with outwardly bent extensions, or projections, 25 and 26, and at its lower end the element E is provided with an integral inclined, or angular shaped section 27. Since the element E is formed of resilient material, it will be understood that the alignedly arranged legs thereof may be grasped at the sides thereof between the fingers of a hand, and lightly compressed, or moved toward each other, so as to similarly move the projections 25 and 26, until the outer ends of the latter clear the inner surfaces of the wall sections W^1 and W^2, to effect easy insertion thereof in the apertures A^1 and A^2, arranged to form bearing apertures for suspendedly mounting the element E, as clearly shown in Figs. 4, 5 and 6. Removal of the element E, from the support S, is similarly effected.

Each of the yarn guide pins 13, 14, 15, 16, 17, 18, 19 and 20, is preferably, but not necessarily, formed of metal, such as hardened steel, and provided with a polished external surface to effect smooth sliding action of the nylon yarn along the point of contact therewith, and the outer ends of these pins are frictionally, or otherwise secured, in suitable apertures provided therefor in the respective opposed wall sections of the support S, as shown.

The spring clamp member 21 is formed of suitable resilient material, such as spring metal, and shaped as shown in Figs. 4, 5 and 6, so that the outer ends thereof may be spread apart and sprung over a pair of yarn guide rods 28 and 29, ordinarily located above the yarn box 1 of a full-fashioned knitting machine, as indicated in Fig. 1. The spring clamp member 21 constitutes simple separable fastening means for attaching the device D in proper location on the textile machine with which it is associated. It will be understood, however, that when the device D is to be located at some other point in a straight knitting machine, or some other textile machine, other suitable separable attaching means may be connected with the device D to serve a similar purpose at said different location.

Figure 6 more particularly illustrates one way in which the nylon yarn Y may be directed to travel through the device D, so as to effect equalization of the yarn tension during feeding movement of the yarn in a textile machine, or apparatus, from a yarn source to a point of yarn demand. As there shown, the nylon yarn Y coming from the yarn bobbin 2, passes around the pin 13, then contacts, or slides along the upper surfaces of the three pins 14, 15 and 16, then is trained about the lower free inclined bight portion of the yarn tension equalizing element E, from which it extends to the pin 17, and after passing the latter the yarn Y slides over the pin 18, from whence it travels to its point of demand, as previously indicated.

In this arrangement of parts comprising the device D, the weight of the element E, functions to counteract the extent of variation in yarn tension, or pull, due to, or resulting from, the previously indicated conditions caused by the elastic quality, or characteristics, of the nylon yarn Y. As long as the tension of the yarn traveling through the device D remains constant, or uniform, and flows freely through the device D, the element E, will remain in its perpendicular position, or substantially so. However, as soon as there is a drag on the yarn coming from the yarn bobbin 2, the resultant pull exerted by the yarn on the element E, will cause the latter to swing to the left, as seen in Fig. 6, until the weight action caused by such movement substantially balances, or equalizes, the variation in yarn tension which has been initiated by said drag on the yarn coming from the bobbin 2. This yarn tension equalizing action by the element E, is enhanced, as the swinging movement of the latter increases, or advances, since such advancement will cause the yarn which slides along the pins 14, 15, and 16, to be lifted in accordance with the swinging movement of the element E, as indicated by the dot-and-dash positions of the element E in Fig. 6. As the yarn portion in contact with the pins 14, 15 and 16 is lifted in this manner, it will be successively moved out of contact with these pins, i. e., the yarn will first be lifted out of contact with pin 16, then out of contact with pin 15, and finally out of contact with pin 14. Such successive removal of the yarn from contacting relation with the pins 16, 15 and 14, will have the effect of reducing the frictional drag created when the yarn moves over, or along, the contact surfaces of these pins, thereby reducing, or eliminating this drag, as the case may be, in cooperation, or supplementation, with the yarn tension equalizing action of the element E, as the yarn Y travels through the device D.

In order that my device D may be properly adjusted for best yarn tension equalizing results with nylon yarns of different denier, several interchangeable elements E are provided for selective association with the support S, each of which is exactly like the element E shown in Figs. 7 and 8, in construction, size and configuration, but different in weight, or wire gauge. This makes it possible to select an element E of the required weight best adapted to perform the described yarn tension equalizing action, with nylon knitting yarn of a certain denier, and to mount the same on the support S, as shown and described.

It will be realized that the nylon yarn Y may be directed through the device D in a manner which differs somewhat from the yarn travel shown and described. For example, instead of the yarn Y first moving along the pin 13, it may be caused to contactingly move along the pin 20. Likewise, instead of the yarn moving along the pin 17, it may be caused to contactingly move along the pin 19. Such and other changes in travel of the yarn Y, through the device D, may be effected to slightly increase, or decrease, the frictional drag on the yarn, as desired, or required, under certain conditions, or to otherwise vary the yarn travel conditions for the purpose of attaining best operating results.

It is also to be understood that my novel yarn tension equalizing device can be utilized in a textile machine, such as a straight, or full-fashioned knitting machine, with or without, the usual, or standard, yarn tensioning means of such machines, and that the use of such yarn tensioning means, in conjunction with my device, is optional and depends on the machine operating conditions prevailing, or the operating policy adopted in any particular instance. For example, in the arrangement shown in Fig. 1, the ring tension unit 4 and the snapper tension unit 5, may be entirely eliminated, if desired, without in any

way changing, or affecting the functioning of my device D, as described.

Likewise, it is to be understood that the yarn tension equalizing device D of my invention may be otherwise mounted, or supported, in a textile machine, than as shown in Fig. 1, and combined with other parts, so as to provide an arrangement of cooperating yarn feeding parts which meet conditions as desired, or required, for best results, in any particular instance. For example, as shown in Fig. 2, my device D may be mounted on a bracket 30, which is fixed to a usual frame member 31 located at the front of a straight or full-fashioned knitting machine, and a yarn moistening device 32 may also be secured to the bracket 30 by suitable means, such as a bolt 33 and nut 34, provided to simultaneously secure the device D to the bracket 30. The yarn moistening device 32 may include a liquid jar 35 adapted to contain a suitable liquid for moistening the nylon yarn Y, and a wick 36 arranged to extend from said liquid upwardly through the top of the jar 35 to a point of contact with the yarn Y. With such an arrangement, the yarn pirn, cone, or package indicated by the reference character 2^a in Fig. 2, may be invertedly mounted, as shown, on a bracket 37, which is secured to the knitting machine frame member 31 and a second similar knitting machine frame member 38. In Fig. 2 certain of the standard or conventional parts of a straight or full-fashioned knitting machine are shown which are also illustrated in Fig. 1. Since such conventional knitting machine parts have already been identified and described, corresponding reference characters have been applied thereto in Fig. 2, so as to avoid redundancy in the description thereof. As indicated by short arrows in Fig. 2, the nylon yarn Y in this instance travels from the bobbin 2^a, downwardly, so that the movement of the yarn Y travels through the device D in reverse direction to that previously described. Such reversal of the yarn travel does not, however, affect the functioning of the device D in any manner whatsoever, and the device D as shown in Fig. 2, carries out the same yarn tension equalizing operation, in the same manner as previously described.

Of course, the improvements herein specifically shown and described can be further changed and modified in various ways, without departing from the invention disclosed, the scope of which is more particularly indicated by the hereto appended claims.

I claim:

1. In a textile apparatus a yarn tension equalizing device located in the path of travel of a yarn moving from a supply and comprising, a support, and a plurality of yarn tension equalizing elements of different weights a selected one of which is pivotally suspended on said support and has a portion at the free end thereof arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element portion.

2. In a textile apparatus a yarn tension equalizing device located in the path of travel of the yarn moving from said supply and comprising, a support, a yarn tension equalizing element freely pivotally suspended on said support in gravity determined perpendicular position and having a portion at the free end thereof arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from its perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element portion, and two stationary yarn guide members on said support one of which is located above and one below said element portion when the element is in its perpendicular position so that the element portion moves between said guide members.

3. A yarn tension equalizing device comprising a support, a plurality of yarn tension equalizing elements of different weights a selected one of which is pivotally suspended on said support, and means at the free end of each of said elements arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element means.

4. A yarn tension equalizing device comprising, a support, and a plurality of wire-formed yarn tension equalizing elements of different weights a selected one of which is pivotally suspended on said support which element has a portion at the free end thereof arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element portion.

5. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a yarn tension equalizing element provided with projections adapted to extend through said apertures to effect pivotal suspension of the element between said wall sections, and means at the free end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said means.

6. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a yarn tension equalizing element provided with projections adapted to extend through said apertures to effect pivotal suspension of the element between said wall sections, resilient means arranged to maintain said projections in pivotal relation with said apertures and in relatively movable relation with respect to each other, and means at the free end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said means.

7. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a substantially V-shaped yarn tension element formed of resilient wire and provided at its upper end with outwardly bent projections that are relatively movable with respect to each other and adapted to extend through said apertures to effect pivotal suspension of the element

between said wall sections, and a portion at the lower end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the pulling action exerted by the yarn during its feeding travel along said element portion.

8. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a substantially V-shaped yarn tension element formed of resilient wire and provided at its upper end with outwardly bent projections that are relatively movable with respect to each other and adapted to extend through said apertures to effect pivotal suspension of the element between said wall sections, a portion at the lower end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the yarn during its feeding travel along said element portion, and a plurality of yarn guide pins fixedly supported in said opposed wall sections at least one of which is located above said element portion when the element is in its perpendicular position.

9. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a substantially V-shaped yarn tension element formed of resilient wire and provided at its upper end with outwardly bent projections that are relatively movable with respect to each other and adapted to extend through said apertures to effect pivotal suspension of the element between said wall sections, a portion at the lower end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the yarn during its feeding travel along said element portion, and a plurality of yarn guide pins fixedly supported in said opposed wall sections at least one of which is located above said element portion and one below said element portion when the element is in its perpendicular position.

10. A yarn tension equalizing device comprising, a support having vertically extending opposed wall sections each of which is provided with an aperture, a substantially V-shaped yarn tension element formed of resilient wire and provided at its upper end with outwardly bent projections that are relatively movable with respect to each other and adapted to extend through said apertures to effect pivotal suspension of the element between said wall sections, a portion at the lower end of said element arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to a yarn tension equalizing position as determined by the yarn during its feeding travel along said element portion, and a plurality of yarn guide pins fixedly supported in said opposed wall sections all of which are arranged to be contacted by the yarn when said element is in its perpendicular position and from which the yarn will be successively lifted out of contact during said swinging movement of the element from its perpendicular position to different yarn tension equalizing positions.

11. In a textile apparatus a yarn tension equalizing device located in a path of travel of the yarn moving from a supply and comprising, a support, a yarn tension equalizing element pivotally suspended on said support and having a portion at the free end thereof arranged to be engaged by the yarn during its feeding travel in such manner as to effect swinging movement of the element from a perpendicular position to different yarn tension equalizing positions as determined by the pulling action exerted by the yarn during its feeding travel along said element portion, and means on said support provided with a plurality of relatively spaced surfaces all of which are arranged to be contacted by the yarn when said element is in its perpendicular position and from which the yarn will be successively lifted out of contact during said swinging movement of the element from its perpendicular position to different yarn tension equalizing positions.

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