

Sept. 8, 1931.

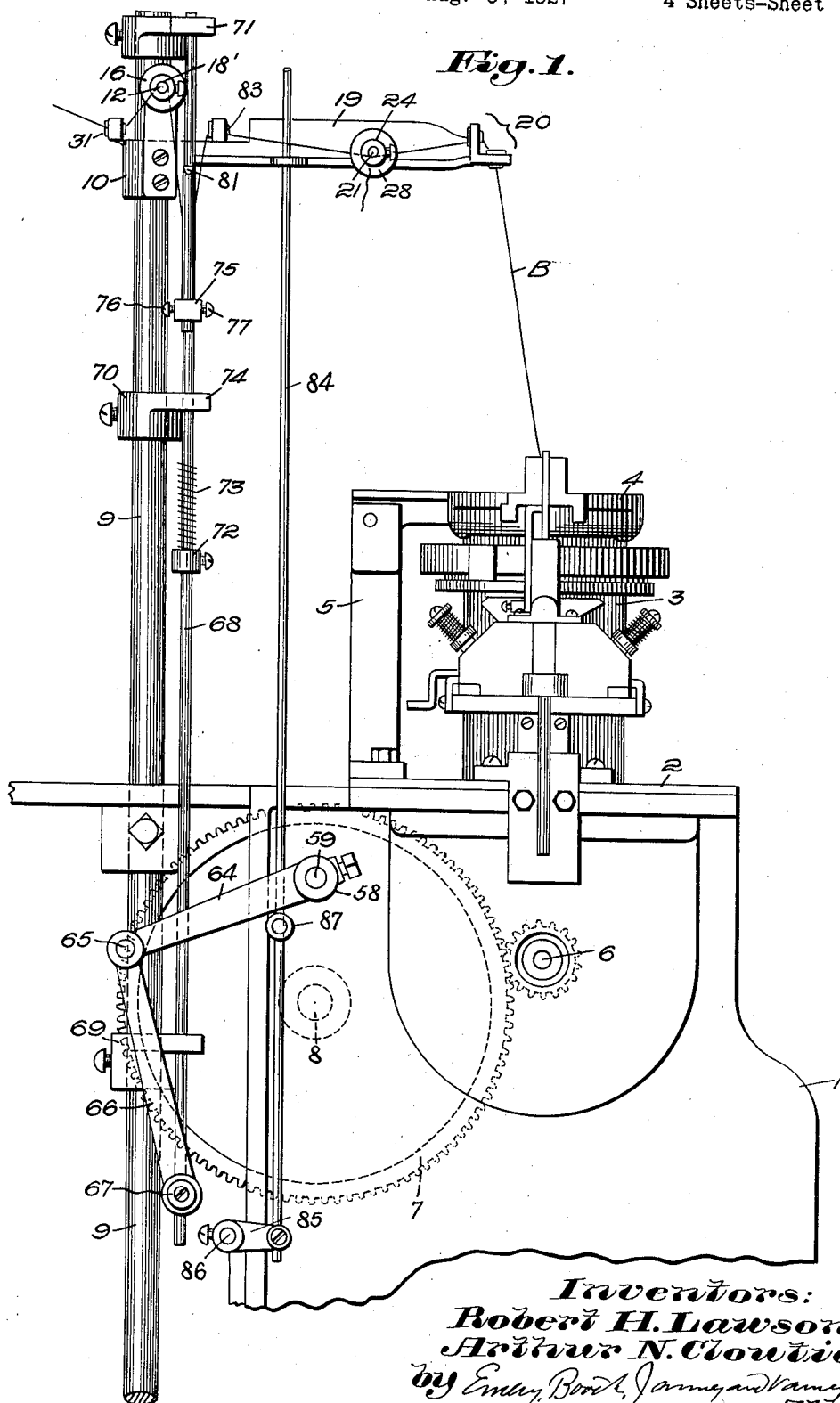
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1,822,870

TENSION CONTROLLING DEVICE FOR KNITTING MACHINES

Filed Aug. 9, 1927

4 Sheets-Sheet 1



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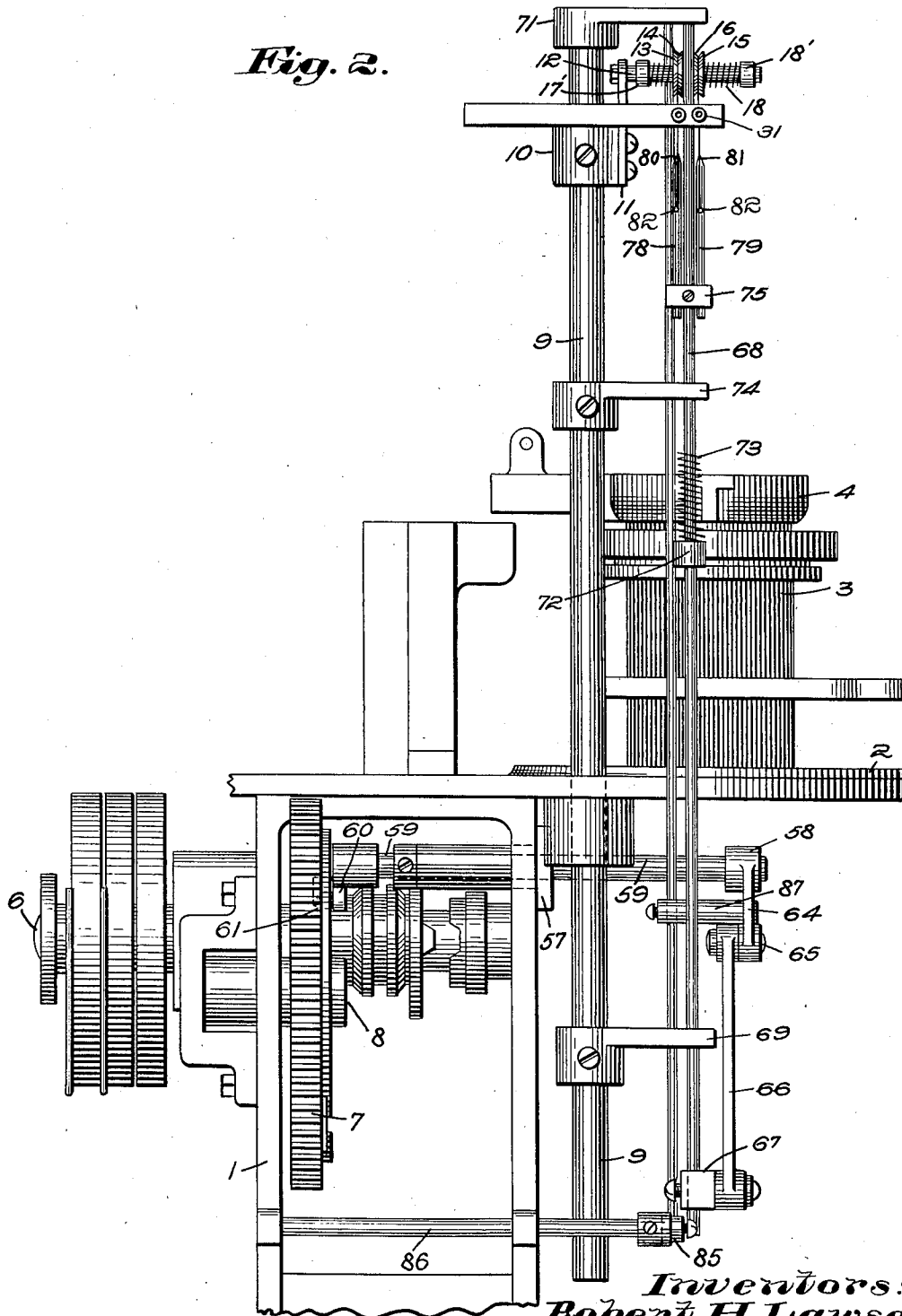
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4 Sheets-Sheet 2

Fig. 2.



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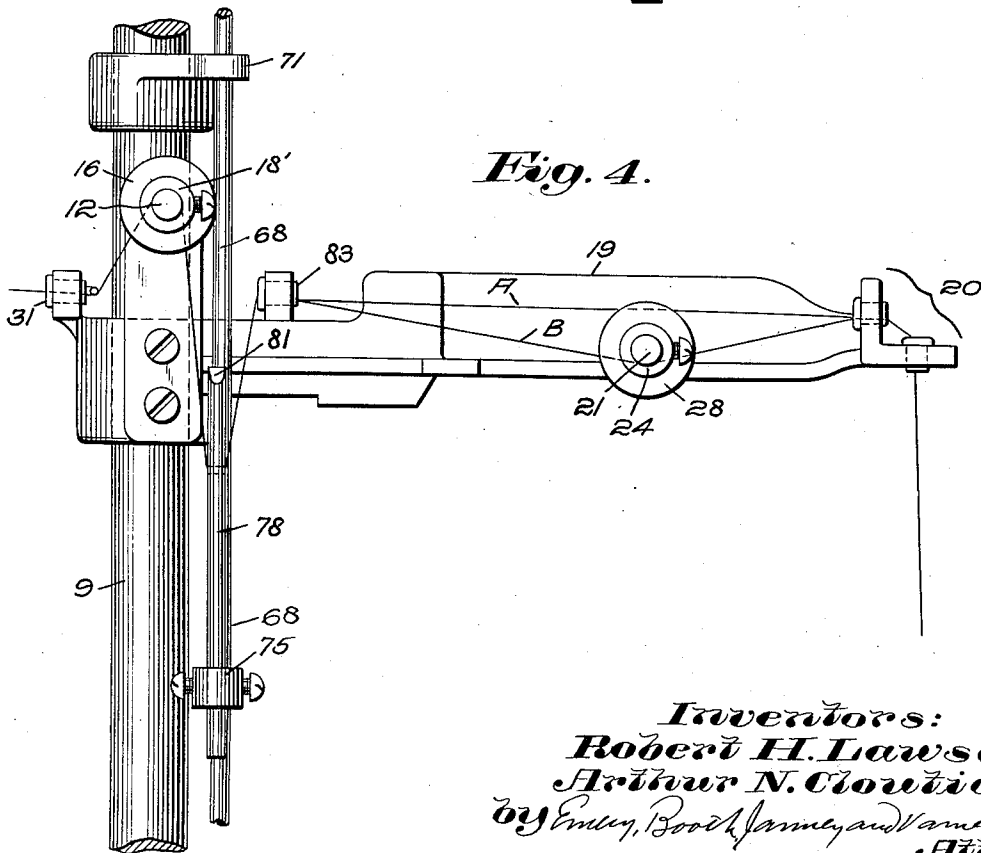
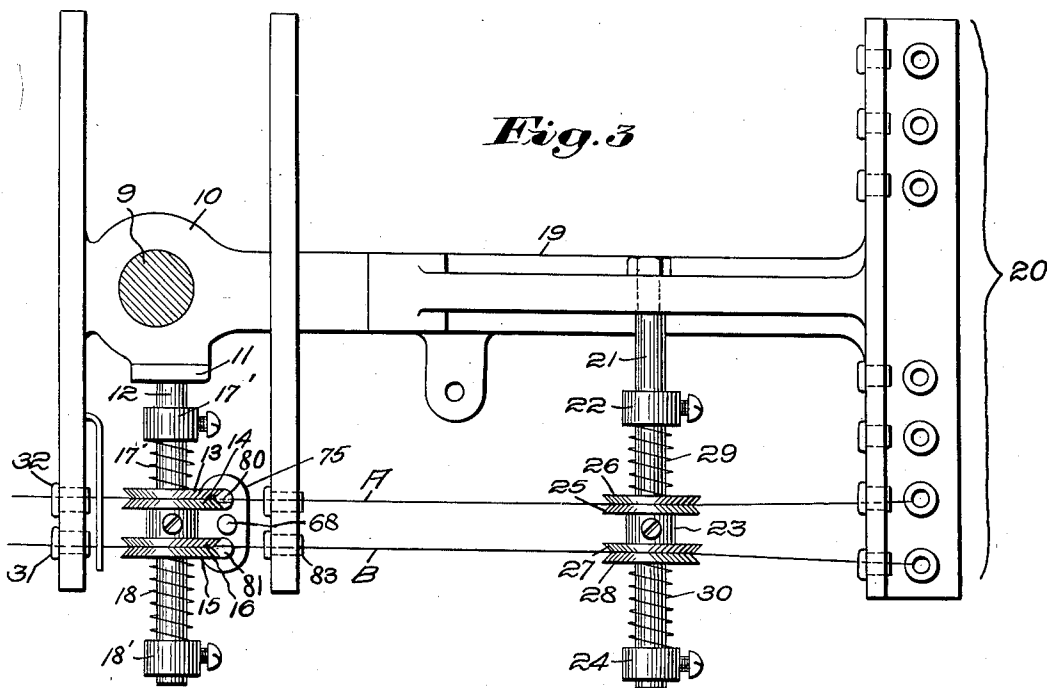
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TENSION CONTROLLING DEVICE FOR KNITTING MACHINES

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4 Sheets-Sheet 3



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TENSION CONTROLLING DEVICE FOR KNITTING MACHINES

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4 Sheets-Sheet 4

Fig. 5.

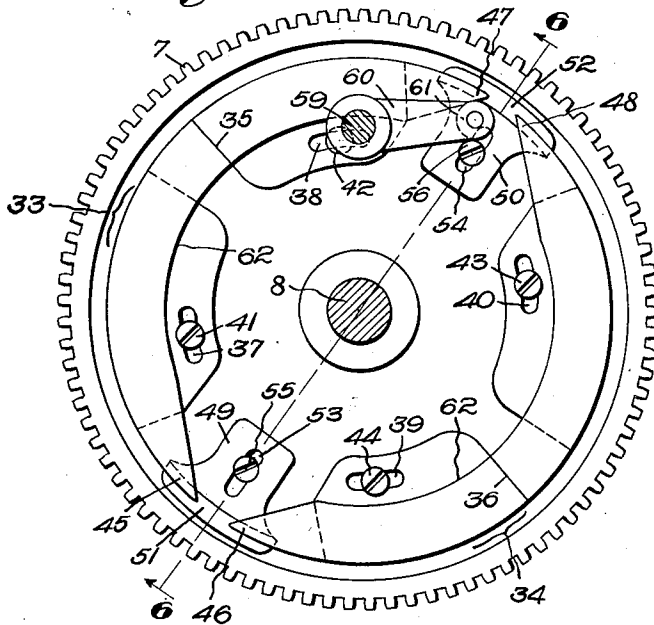


Fig. 6.

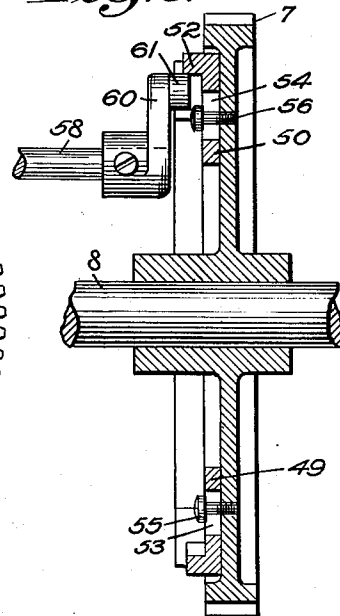


Fig. 7.

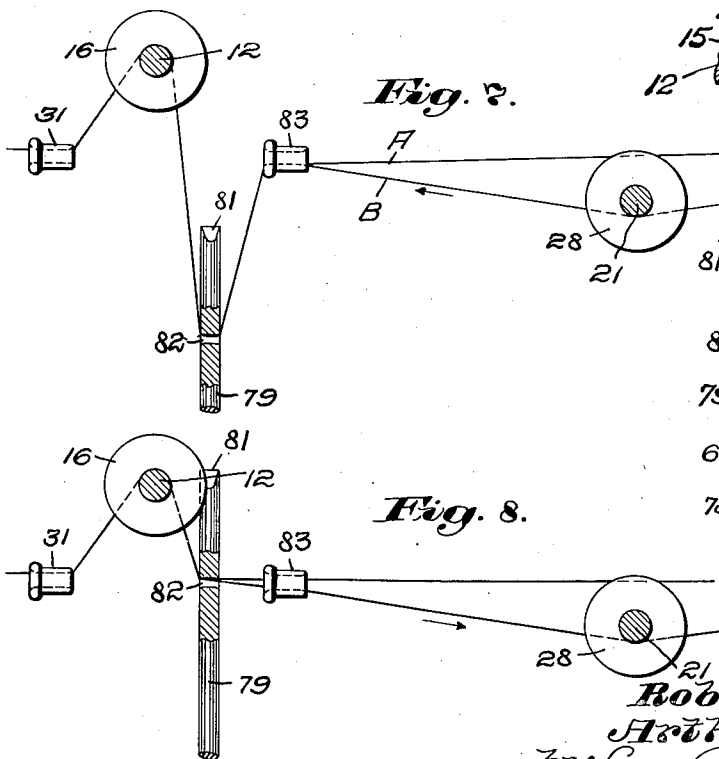
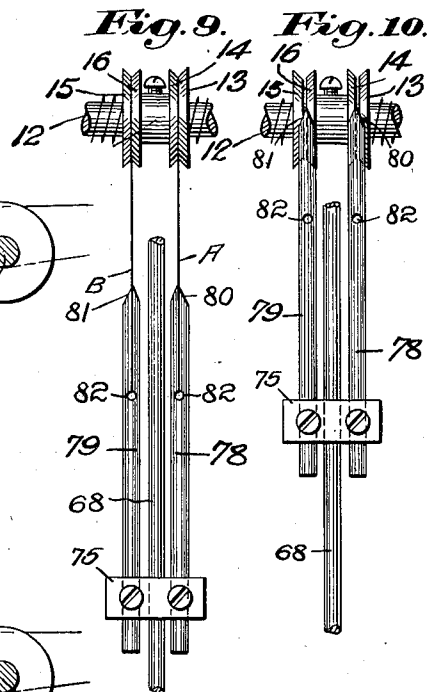


Fig. 8.



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TENSION CONTROLLING DEVICE FOR KNITTING MACHINES

Application filed August 9, 1927. Serial No. 211,734.

This invention relates to thread tension devices, particularly for knitting machines, and more especially to devices for controlling the tension of yarn or thread in plating.

5 In order that the principle of the invention may be readily understood, we will disclose a single embodiment thereof in the accompanying drawings, wherein

10 Fig. 1 is a left hand end elevation of a circular knitting machine having our invention applied thereto;

Fig. 2 is a rear elevation of the mechanism shown in Fig. 1;

15 Fig. 3 is a plan view showing the tension disks and associated parts, the supporting rod or post being in horizontal section;

Fig. 4 is a side elevation of the parts shown in Fig. 3;

20 Fig. 5 is a side elevation of the so-called "104" gear of a Banner knitting machine having cams applied thereto for controlling certain parts in accordance with our invention;

Fig. 6 is a vertical section on the line 6—6 of Fig. 5;

25 Figs. 7 and 8 are somewhat diagrammatic views showing the course of certain of the threads in different positions of the tension controlling devices; and

30 Figs. 9 and 10 are details in front elevation of certain of the parts shown in Figs. 7 and 8.

The purpose of this invention is to provide means for controlling the tension upon a thread or threads, yarn or yarns, particularly in the knitting operation, and in the ensuing description the words "thread" and "yarn" will be used interchangeably. The invention may be applied to various types of knitting machines and under various conditions of knitting. While we have chosen to illustrate the invention as employed in association with means for plating, it is to be understood that the invention is not restricted thereto and may be used in many different relations, although peculiarly applicable to the control of yarn or thread in or in association with plating.

45 Although the invention may be employed with various types of knitting machines, we have chosen to represent the same as employed

upon a so-called Banner machine having means for producing split work; that is to say, having at one side thereof a plurality of yarn or thread fingers located over or in operative relation to the main set of knitting 55 cams and diametrically opposite one or more yarn or thread fingers above or in operative relation to the auxiliary set of cams. The needles may be either latch or spring beard needles as employed in the different types of Banner machines. It is unnecessary to describe at length the type of knitting machine chosen for illustration of the application of the invention.

The framing of the machine is indicated at 65 1, the bed plate thereof at 2, the needle cylinder at 3, the latch ring at 4, the supporting post therefor at 5, the main drive shaft at 6 and the so-called "104" gear at 7 upon the shaft 8. The machine is provided with the usual upright post 9 upon which the yarn or thread tension devices are supported. Upon the rod or post 9 near its upper end is secured a bracket 10, 11, from the upper end whereof 75 horizontally extends a short stud 12. Supported thereon are a suitable number of yarn or thread tensioning disks or tensioning members, here shown as two pairs at 13, 14 and 15, 16, associated with which are coiled springs 17, 18 adapted to press the two movable disks 13, 16, into thread tensioning relation to the disks 13, 15. Said springs 17, 18 are subjected to suitable tension by means of the adjustable collars 17', 18'. In Fig. 7 the rods 78, 79 have moved down to take up the slack while changing from circular to reciprocating knitting. The yarns A, B are being held by disks 13, 16, and slack will be taken up in the direction of the arrow in Fig. 7. The upward movement of rods 68 will allow this slack to be knit in without breakage of the yarns, and when rods 78, 79 have completed their upward movement all slack will have been knit in without a break of the 90 yarns. Referring to Fig. 7, A is the slack yarn, and B is the tensioned yarn passing through the tension wheel 28. In Fig. 3, the springs 17, 18 are set so that tension wheels 13, 16 hold the yarns while the rods 78, 79 are 100

being moved downward to take up the slack yarn when changing.

The bracket 10, 11 is laterally prolonged as indicated at 19 in Figs. 1, 3 and elsewhere, so as to constitute a support for additional yarn or thread tensioning devices and also for thread guides, the latter being generally indicated at 20. Laterally extending from the part 19 is a rod or stud 21 having thereon collars 22, 23 and 24, between which are respectively positioned the tension disks 25, 26 and 27, 28 held in yarn or thread tensioning relation by the light coil springs 29, 30, the collars 22, 24 being adjustable to vary the tension of the springs 29, 30.

The course of two yarns or threads is indicated in Figs. 3, 4, 7 and 8. As shown in Fig. 3, two threads A, B pass respectively between the pairs of tension disks 13, 14 and 15, 16. They then pass to the tension disks 25, 26, 27, 28, respectively, but in the application of our invention here illustrated, the thread A, which for purposes of description we shall refer to as the back yarn or inside yarn in plating, is not tensioned at or by the disks 25, 26, but merely passes along the groove or trough formed by the flaring edges of the said disks 25, 26. This is best illustrated in Figs. 4, 7 and 8. The yarn B, which may be assumed to be the front yarn in plating, and hence in the knitted article appears at the face of the fabric, receives additional tension at the disks 27, 28, being engaged by the flat contacting faces of said disks, as indicated most clearly in Figs. 4, 7 and 8. The two yarns or threads A, B, are, of course, delivered from separate bobbins or other packages and pass through separate yarn guides 31, 32, shown most clearly in Fig. 3. In accordance with our invention we provide means whereby the tensioning of the threads A and B at or by the tension disks 13, 14, 15, 16 may be periodically interrupted and whereby the slack of the yarns or threads may be periodically taken up, as, for example, when the motion of the needle cylinder is reversed in split work. While for this purpose any suitable means may be provided we preferably employ the means shown in the drawings and now particularly to be described.

Upon the "104" gear 7 we position two arc shaped cams 33, 34 at one face of said gear. Each of said cams 33, 34 is in reality a two part cam having overlapping narrower or reduced ends indicated at the radial lines 35, 36 in Fig. 5, so as to present an uninterrupted surface for a part to be described. The two parts of each of the cams 33, 34 are provided with circumferentially extending slots 37, 38, 39, 40 to receive screws 41, 42, 43, 44, thereby permitting the desired circumferential adjustment. The adjacent ends of said cams 33, 34 are tapered as indicated at 45, 46, 47, 48 and between the pairs of tapered ends are positioned two blocks or

brackets 49, 50, each provided with an arc shaped flange 51, 52, and a radially extending slot 53, 54 for the reception of screws 55, 56, by means of which the radial position of said blocks or brackets may be varied. The flanges 51, 52 prevent the undue outward movement of the part to be described that contacts with the inner edges of the cams 33, 34.

As shown most clearly in Fig. 2 there are provided brackets 57, 58, wherein is supported for to and fro movement a rock shaft 59 having laterally extending therefrom an arm 60 provided at its outer end with a roll 61 adapted to contact or bear against the inner edges 62, 62 of the two duplex cams 33, 34 as previously referred to.

In the customary operation of a Banner split work machine, the needle cylinder is reciprocated during the formation of split work, such, for example, as the ankle and the foot. The "104" gear is, however, constantly rotated at a predetermined ratio with respect to the usual rotation of the needle cylinder, as, for example, four revolutions of the needle cylinder to one revolution of the "104" gear. When, however, the needle cylinder is reciprocated as in the formation of split work, the yarn or yarns which are in action become momentarily slack when the direction of movement of the needle cylinder is changed. One of the purposes of our invention is to take up the yarn or yarns upon change of direction of rotation of the needle cylinder (or relative direction of rotation of the needle cylinder and cam support or carrier), so that no slack occurs in the yarn or yarns.

The function of the cams 33, 34 is to rock the shaft 59 at such times as to operate other members or devices whereby the results referred to are secured. As shown most clearly in Fig. 1 the rock shaft 59 has fast thereon an arm 64 pivotally secured at its outer end at 65 to a link 66 which at its other end is pivotally secured at 67 to an upright rod 68.

The said rod extends through suitable openings in brackets or collars 69, 70 and 71 upon the post or upright 9.

The said rod 68 is, through the described connections, reciprocated at the proper times by reason of the cams 33, 34 upon the "104" gear 7. Upon said rod 68 is adjustably secured a collar 72 above which is a light coiled spring 73 that in the upward movement of the rod 68 contacts with the arm or extension 74 of the collar 70, thereby preventing jar and also acting to assist in effecting the downward movement of said rod 68.

Above the bracket 70 there is adjustably secured to the rod 68 a collar or bracket 75 which as shown most clearly in Fig. 2 has adjustably secured therein by the screws 76, 77 two upright short rods 78, 79, pointed or

tapered at their upper ends as indicated at 80, 81.

In the upward movement of the rod 68 the tapered ends 80, 81 of the short or extension rods 78, 79 enter between the disks 13, 14 and 15, 16 respectively, as indicated in Figs. 3 and 8, so as to move the disks 13 and 16 away from the disks 14, 15, thereby permitting the two yarns A and B to pass freely or without tension between said pairs of disks, respectively. Each of the short rods 78, 79 is provided with an opening, one of which is shown at 82 in Figs. 7 and 8, and through which the threads A and B respectively pass. When the rod 68 with its extension rods 78, 79 are elevated to separate the pairs of disks as shown in Fig. 8, the two threads A, B pass, as shown, from between the separated disks to the next guide eye at 83. This is the position when the needle cylinder is turning in one direction or the other. At or about the instant when the needle cylinder changes its direction of movement in split work the rod 68 has descended or is so positioned that the extension rods 78, 79 are not functioning to separate the pairs of disks and therefore the two yarns take the looped course indicated in Fig. 7, thus taking up what would otherwise be the slack portions of the two yarns resulting from the momentary change in direction of movement of the needle cylinder. When the parts are in the position shown in Fig. 7 (that is, when the two pairs of disks 13, 14 and 15, 16 are in contacting or closed position) the two threads A, B cannot readily pull through said tension-functioning pairs of disks, and therefore at such time no additional extent of yarn will in practice be drawn from the bobbins or packages thereof. The result is that in the continued knitting operation the needles knit from that portion of the two yarns A, B extending from the needles up to said pairs of disks 13, 14, 15, 16. This insures that the slack yarn is properly knitted and prevents the yarns being drawn unnecessarily or at improper times from the yarn packages.

It is to be understood that the springs 29, 30 are so constructed or so controlled that they impose less tension upon the disks 26, 28 than do the springs 17, 18 upon the disks 13, 16. This is indicated by the positions of the collars 17', 18' as compared with the collars 22, 24.

Our invention, while useful in various relations, has been particularly described with reference to the formation of split work, but it is also to be understood that it may be employed in heel and toe work, where the parts are reciprocated or in connection with those types of knitting machines which constantly are reciprocated, as, for example, in independent needle machines of the so-called Lamb or Burson types.

If desired, the tension controlling means may be associated with the regular take-up

locking means whereby the latter may be employed to hold the tension controlling means from operation at times. For this purpose we have, in Fig. 1, represented the vertical rod 84 extending to the tension lock (not shown). At its lower end said rod is pivotally connected to a link 85 pivoted at 86 upon a rock shaft adapted to be operated by cam or other means (not shown) in usual manner. Upon said rod 84 is a roll or other lateral projection 87, the purpose whereof is in the upward movement of the tension lock rod 84 to engage the arm 64, and therefore to prevent such turning movement of the rock shaft 59 as would permit the roll 61 to come in contact with the inner edges 62 of the cams 33, 34. In other words, the tension lock rod 84 is provided with means to prevent temporarily the functioning of the rod 68.

Having thus described one illustrative embodiment of our invention, it is to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

We claim:

1. Thread tension controlling means including two thread tensioning devices one of which acts also as yarn holding means and means for intermittently relieving the thread from tension by one of said devices while permitting it to continue at the other of said devices.
2. In a knitting machine, means to subject a thread or threads to tension at two spaced points and also to hold the thread at one of said points, and means intermittently to relieve the tension at one of said points only.
3. In connection with a knitting organization having a relative to and fro movement of the needles, means for subjecting the thread or threads to a constant tension at one point and to intermittent tension and clamping at another point.
4. In connection with a knitting organization having a relative to and fro movement of the needles, means for subjecting the thread or threads to a constant tension at one point and to intermittent tension and clamping at a point between the first point of tension and the thread supply.
5. In connection with a knitting organization having a relative to and fro movement of the needles, means for subjecting the thread or threads to a constant tension at one point and to intermittent tension and clamping at a point between the first point of tension and the thread supply, together with means whereby slack is taken up in the thread or threads when said second tension is released.
6. In a knitting organization having means for imparting relative to and fro movement to the needles, means whereby upon change of

relative direction of movement of the needles, the withdrawal of additional thread from the packages is momentarily prevented, said means including one or more pairs of tension and thread clamping disks, one or more rods adapted to have portions thereof entered between the respective disks to separate the same, and means controlled from the knitting head of the machine for operating said rod or rods.

7. In a knitting organization having means for imparting relative to and fro movement to the needles, means including thread clamping means whereby upon change of relative direction of movement of the needles, the withdrawal of additional thread from the packages is momentarily prevented, and whereby the slack that would occur upon change of relative direction of movement is taken up.

8. In a knitting organization having means for imparting relative to and fro movement to the needles, means including thread clamping means whereby upon change of relative direction of movement of the needles, a thread is relieved from tension at one point while remaining under clamping tension at another point, said means including one or more pairs of tension and thread clamping disks, one or more rods adapted to have portions thereof entered between the respective disks to separate the same, and means controlled from the knitting head of the machine for operating said rod or rods.

9. In a knitting organization having means for imparting relative to and fro movement to the needles, means including thread clamping means whereby upon change of relative direction of movement of the needles, a thread is relieved from tension at one point while remaining under clamping tension at another point, and whereby intermediate said two points of tension the slack in the thread is taken up.

10. In a knitting organization wherein the needles are relatively reciprocated as for split work, a pair of thread tensioning and clamping disks and a member adapted periodically to be inserted between said disks to relieve the thread of tension and means for operating said member including the "104" gear, cam means carried thereby, and connections from said cam means to said member.

11. In a knitting organization wherein the needles are relatively reciprocated as for split work, a pair of thread tensioning and clamping disks and a member adapted periodically to be inserted between said disks to relieve the thread of tension, said member having a thread guide or eye through which the yarn passes and by which slack in said thread is periodically taken up and means for operating said member including a part moving with the needle cylinder, and connections from said part to said member.

12. In a knitting organization, means to feed a thread or threads to the needles and including one or more pairs of thread tension disks of which one pair constitutes also thread clamping disks, a reciprocable member having a part adapted to enter between said clamping disks so as to relieve the thread of tension, and means automatically to move said member into and out of engagement with said disks said means including the "104" gear and cams carried thereby and the parts moved by said cams and having operative connection to said reciprocable member.

13. In a knitting organization, means to feed a thread or threads to the needles and including one or more pairs of thread tension disks of which one pair constitutes also thread clamping disks, a reciprocable member having a part adapted to enter between said clamping disks so as to relieve the thread of tension, and means for reciprocating said member in predetermined relation to the times of change of direction of travel of the needles said means including the "104" gear and cams carried thereby and the parts moved by said cams and having operative connection to said reciprocable member.

14. In a circular knitting machine a pair of tension and thread clamping disks 13, 14, a rod 68 having means adapted to be inserted between said tension disks to relieve the tension upon the thread, a part rotated in fixed relation to the needle cylinder, and connections from said part to said rod 68 thereby to operate the latter.

15. In a circular knitting machine, pairs of tension and thread clamping disks 13, 14, 15, 16, pairs of tension disks 25, 26, 27, 28, whereby two threads may be subjected to tension respectively at two spaced points, and means including a rod 68 with extension rods 78, 79 having tapered parts adapted upon lengthwise elevation of the rod 68 to relieve said threads of clamping tension at the disks 13, 14, 15, 16.

16. In a circular knitting machine, pairs of tension and thread clamping disks 13, 14, 15, 16, pairs of tension disks 25, 26, 27, 28, whereby two threads may be subjected to tension respectively at two spaced points, and means including a rod 68 with extension rods 78, 79 having tapered parts adapted upon lengthwise elevation of the rod 68 to relieve said threads of clamping tension at the disks 13, 14, 15, 16, said rod having yarn guiding means for taking up slack.

17. In a knitting organization, means to feed a pair of threads to the needles in a plating relation and including spaced means to impart tension at two points to one of said threads and at one point to the other of said threads and including thread clamping means, and means periodically to relieve the tension upon both of said threads, while per-

mitting it to remain upon one of said threads at the other mentioned point.

5 18. In a knitting organization, means to feed a pair of threads to the needles in a plat-
ing relation and including spaced means to
impart tension at two points to one of said
threads and at one point to the other of said
threads and including thread clamping
means, and means connected to the driving
10 part of the knitting machine for relieving
both of said threads periodically of tension
at one point together with means for taking
up the slack in the threads when so relieved of
tension.

15 19. In a knitting organization, means to feed a pair of threads to the needles in a plat-
ing relation and including spaced means to
impart tension at two points to one of said
threads and at one point to the other of said
20 threads and including thread clamping
means, a reciprocable rod adapted to act
upon the tension means for both of said
threads and to relieve the same periodically
from tension at one point and to take up slack
25 in the threads when so relieved of tension.

In testimony whereof, we have signed our
names to this specification.

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