J. H. ZENS.

YARN TAKE-UP MECHANISM FOR KNITTING MACHINES.

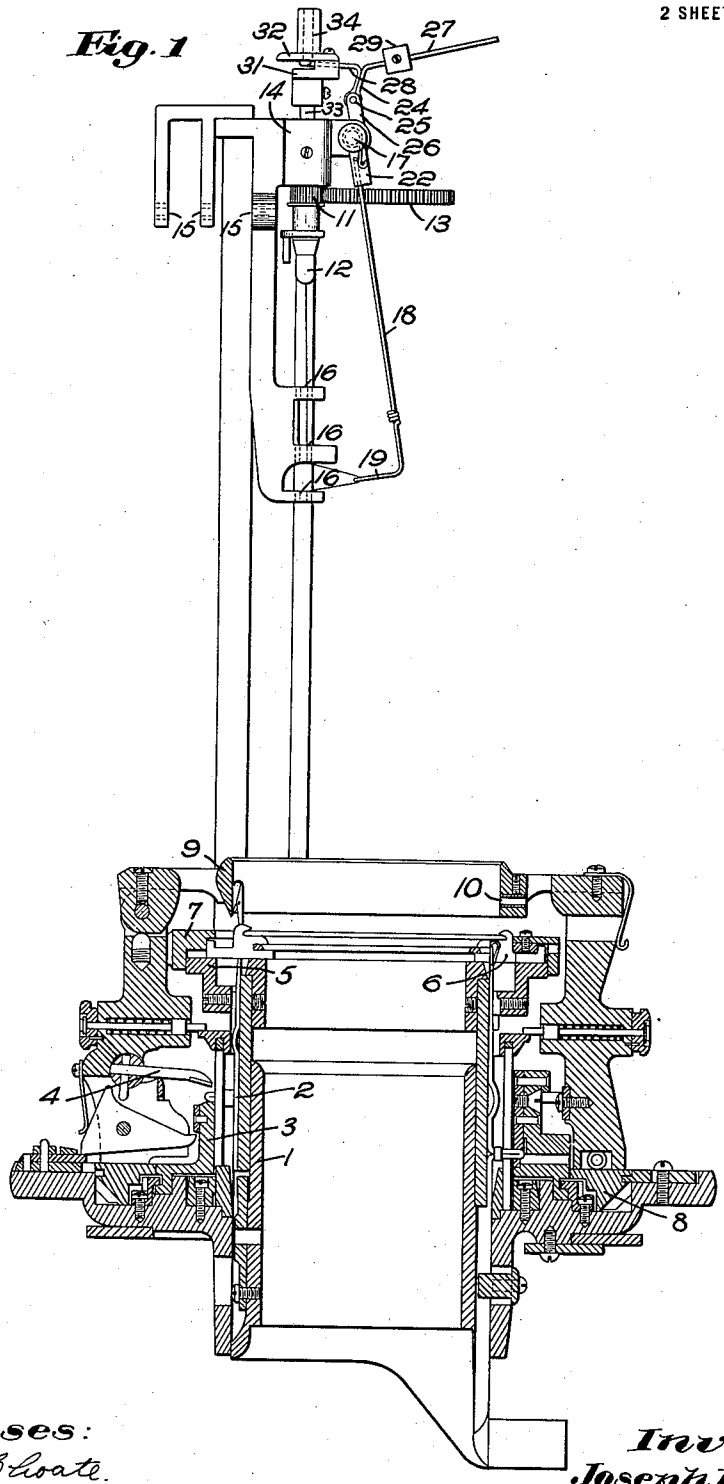
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1,138,717.

Patented May 11, 1915.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2

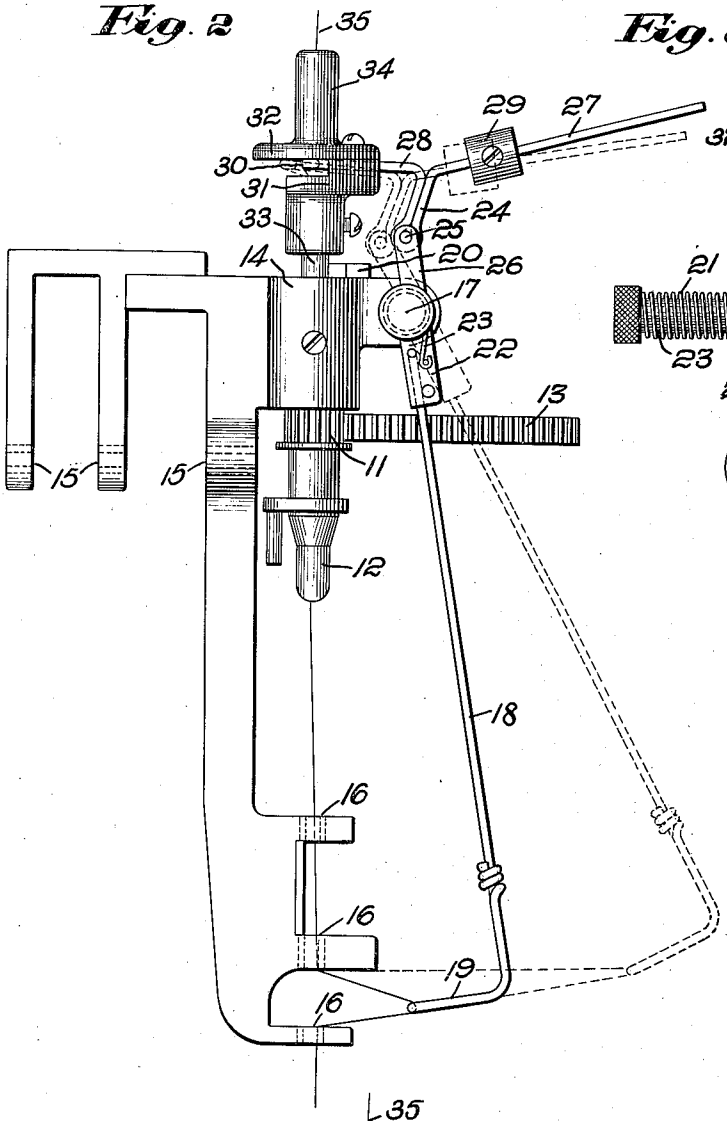


Fig. 3

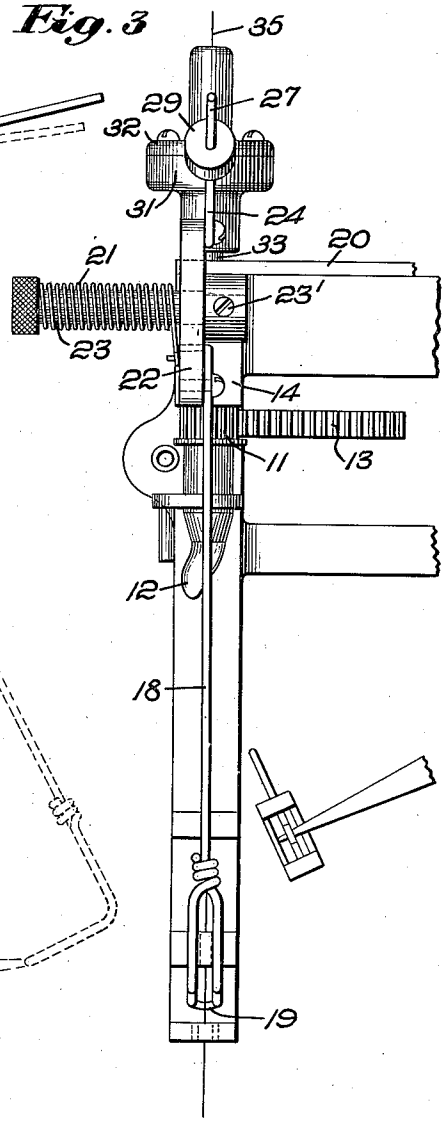
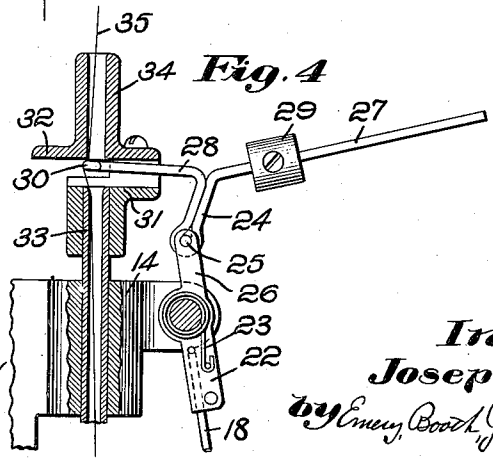


Fig. 4



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UNITED STATES PATENT OFFICE.

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YARN-TAKE-UP MECHANISM FOR KNITTING-MACHINES.

1,138,717. Specification of Letters Patent. Patented May 11, 1915.

Application filed June 30, 1911. Serial No. 636,303.

To all whom it may concern:

Be it known that I, JOSEPH H. ZENS, a citizen of the United States, and a resident of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented an Improvement in Yarn-Take-Up Mechanism for Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to yarn take-up mechanism particularly applicable for use in connection with knitting machines.

In order that the principle of the invention may readily be understood, I have disclosed a single embodiment thereof in the accompanying drawings, wherein:

Figure 1 is a view showing in vertical central section the cam and needle cylinders of a circular knitting machine and parts directly associated therewith and in side elevation the yarn take-up mechanism coöperating therewith. Fig. 2 is a side elevation on an enlarged scale of the yarn take-up mechanism, two positions thereof being indicated in full and dotted lines respectively. Fig. 3 is a front elevation of the mechanism shown in Fig. 2; and Fig. 4 is a vertical central section of a portion of the mechanism shown in Figs. 2 and 3.

The yarn take-up mechanism herein disclosed is peculiarly adapted for taking up slack yarn normally formed upon a change in relative movement of the needle and cam carriers. I have herein shown said carriers as of a cylindrical type employed in circular knitting machines having movable needles. Obviously, however, my invention may be embodied or utilized in knitting machines of the straight type such as Lamb machines, or others wherein the needle and cam carriers are relatively reciprocated in the production of knitted web. My invention is also applicable to circular machines used wholly or mainly for circular work and is not restricted to knitting machines wherein the direction of relative movement of the needle and cam carriers is changed, although it is peculiarly adapted thereto.

The yarn take-up mechanism embodying my invention is especially designed to take up slack yarn formed at the periods of change in relative movement of the needle and cam cylinders. These changes in relative movement may occur during narrowing and widening or in the formation of a split foot stocking. Therefore, obviously, my invention is peculiarly adapted for use with circular knitting machines wherein the needle cylinder or the cam cylinder is either periodically reciprocated in forming the heel and toe of the stocking or is continuously reciprocated as in forming a split foot stocking. Herein, however, I have shown the take-up mechanism as used in connection with a rotary knitting machine of the type disclosed in the patent to George D. Mayo No. 726,178, April 21, 1903, the needle cylinder being continuously rotated excepting during the formation of the heel and toe.

Great difficulty has heretofore been experienced in obtaining a yarn take-up that will take up the normal slack yarn at the changes in relative rotation of the needle and cam cylinders and yet, at the same time, will not rob the needles of yarn by improperly taking up more or less yarn during the intervals between the normal formation of slack yarn when the changes in the direction of movement of the needle or cam cylinder occur. Yarn take-up devices heretofore employed have commonly been provided with spring actuated arms acting at all times to take up yarn, that is, not only at the periods of normal slack formation, but during the intervals between the periods of normal slack formation. In order to overcome this defect, I have provided means to restrain the yarn take-up so as to prevent excess take-up of yarn during the interval between the changes in direction of relative reciprocation of the needle and cam cylinders. In other words, I have provided means coöperating with the yarn take-up mechanism to preserve substantially uniform action of the yarn take-up mechanism upon the yarn during the intervals between the normal formation of slack yarn in changing the relative direction of movement of the cylinders.

Referring more particularly to the drawings, I have in Fig. 1 represented sufficient portions of a circular knitting machine of the type shown in said Mayo patent to make clear the application of my invention. Therein the needle cylinder of any suitable type is indicated at 1 and the needles here shown as of the latch type, are indicated at

2. Surrounding the needle cylinder and needles is a cam cylinder 3 here shown as of the type disclosed in said Mayo patent. Co-operating with the needles is suitable narrowing and widening mechanism, a portion of which is indicated at 4 and which may be of the type shown in said patent. Surmounting the needle cylinder is a suitable sinker-ring 5 having sinkers 6 and a rotatable sinker cam ring 7 of the general type shown in said patent. While rotation may be imparted to either cylinder, I have herein shown the cam cylinder as rotated by means of a gear 8 formed thereon or operatively connected thereto and meshing with the gear wheel, not shown, which may be upon the main drive shaft of the machine. Suitably supported upon the cam cylinder is a latch ring 9 having a yarn guide 10, these parts being similar, it may be, to those shown in said Mayo patent.

While the parts thus far referred to are shown as of the type disclosed in said Mayo patent, it is obvious that they may be of any other suitable type.

In Figs. 1 to 4 inclusive, I have represented one form of the yarn take-up mechanism proper and in Fig. 1 have shown it as somewhat angularly displaced with respect to the knitting mechanism, in order that the construction thereof may be more clearly apparent. Said yarn take-up mechanism may obviously be employed with a single knitting yarn or in conjunction with a main yarn and a supplemental yarn or yarns introduced to reinforce the stocking at the heel or toe or elsewhere. Herein I have represented the yarn take-up mechanism as used in conjunction with mechanism for introducing a supplemental yarn which may be presented to the needles in any suitable manner and united to the main thread if desired; and as here represented the said take-up mechanism is employed in conjunction with means for introducing a supplemental yarn and tying the same to the main yarn in any desired manner as, for example, by the mechanism shown in the patent to George D. Mayo, No. 726,229, April 22, 1903.

The yarn take-up mechanism may be supported in any suitable manner from the bed of the machine or otherwise in suitable position to supply the yarns to the needles. In the form of the mechanism here shown I provide a hollow pinion 11 through which the yarn is delivered and which terminates in a hollow nose 12 through which the thread or threads issue to the knitting mechanism. Rotary movement is imparted to the pinion 11 and nose 12 in any suitable manner as by means of the curved rack 13 similar, it may be, to that shown in said Mayo Patent No. 726,229. The said hollow pinion 11 is suitably mounted for rotation in the frame or bracket 14 which is provided with guides 15 for the introduction of a supplemental yarn and with guides 16 through which the yarns pass on their way from the nose 12 to the knitting needles.

Pivoted at 17 upon the bracket 14 is a yarn guide arm 18 having its lower portion formed of spring wire or other suitable material and here shown as having its lower end twisted at 19 to form an eye through which the threads pass to the needles. Suitably mounted at the upper face of the bracket 14 is a lever 20 generally similar, it may be, to the corresponding part in said Mayo Patent No. 726,229, and adapted to be moved automatically or otherwise into engagement with a part of or projection from the yarn guide arm 18, thereby to lock the latter in a substantially vertical position with its eye 19 in substantially vertical alinement with the yarn guides 16 so that the yarn may be fed directly to the needles without being acted upon by said take-up arm. In other words, said take-up arm may be locked or held in inoperative position as during circular work. At the commencement of narrowing or widening, or in the formation of a split foot stocking, the said lever or other member 20 is automatically or otherwise withdrawn from engagement with the arm 18, thereby to permit said arm to become effective upon the yarn or yarns and to take up slack normally formed therein at each change in direction of relative rotation of the needle and cam cylinders.

The yarn guide arm 18 is normally outwardly actuated as by means of a coiled spring 21, one end whereof engages the upper end of said yarn arm or its support as indicated at 22, said spring being coiled upon a suitable stud 23 and having its opposite end secured thereto. The stud is held in position in its bearing by a screw 23′. By adjustment of the screw 23′, the tension of said spring may, obviously, be adjusted, thereby to vary the tendency of said yarn arm 18 to move outwardly from the guide 16.

The tendency of the yarn guide arm 18, as thus far described, is to move outwardly or toward the dotted line position indicated in Fig. 2, at all times when not locked in inoperative position by the lever 20. Obviously, therefore, said yarn guide arm 18 not only will move into extreme outward position to take up the normal slack formed in the yarn when the relative direction of movement of the needle and cam cylinders is changed, but during the intervals between consecutive changes the said arm tends constantly to assume said outward position. This results in "robbing" the yarn or drawing off more of it from the bobbins than is needed for knitting and frequently the said arm moves so far outward during the movement of the cam or needle cylinder in one direction, that when the relative movement of

said cylinders is changed the arm cannot move farther outward and therefore cannot take up the slack normally formed at such period.

In order to overcome this defect I have provided means having the function of the well-known clamp devices usually employed with spring take-ups, and also so arranged as to preserve substantially uniform action of the take-up upon the yarn during the intervals between the normal formation of slack yarn as described, or, in other words, to prevent excess take-up of the yarn during the intervals between the normal formation of slack yarn. I secure these functions by the provision of a system constituting as a whole a yarn take-up lever pivoted between its ends, and having a bearing upon a guided run of the yarn at each end of the system formed by the take-up arm proper and an attachment of said arm, the points of contact of the system with the yarn both being so arranged as to return the lever toward its normal position upon an increase of tension upon the run of yarn 35 between the guide 34 and the knitting head, one end of the system comprising means to apply restraint to the yarn between the bobbin and the knitting head.

Referring now to the drawings, a wire lever 24 is pivoted at 25 to an upward projection 26 of the support for the yarn guide arm 18. Said lever 24 is provided with two arms 27 and 28 the former of which has adjustably mounted thereon the weight 29 and the latter of which is provided with a head 30 adapted to play between the surfaces 31, 32 of guides 33, 34, suitably supported above the bracket 14.

The weight of the arm 27 may be, and preferably is, such as to hold the head 30 of the arm 28 in contact with the surface 32 of the guide 34 and by adjustment of the weight 29 the pressure of said head 30 against the surface 32 may, obviously, be varied as occasion may require.

In the normal operation of my device the head 30 will play along the surface 32 and in light contact therewith to a degree dependent upon the adjustment of the weight 29, which rocks the lever 24 upon the point 25 as a center. The location of the surface 32 and of the pivot 17 is as shown, such as to prevent the pivot 25 in any position from passing the line joining the head 30 and the pivot 17, one purpose of the pivoted attachment to the upper end of the lever 18 being to provide a device to move along the surface 32 and at right angles to the guide 34 and the yarn in response to the position of the take-up arm. Frictional contact of the head 30 with the surface 32 is of aid in damping the vibration of the arm 18 when said arm is suddenly placed under stress or released.

The yarn 35 passing downwardly through the guides 33, 34 is engaged by the head 30 of the lever 24 as indicated in Fig. 4.

When the yarn is running through the guides 34, 33 and the guides 16 under a normal tension the position of the take-up lever will be that shown in Figs. 2 and 4, unless the take-up lever is locked out of operation by the lever 20 above described. Whenever from any cause there is a decrease in the normal running tension of the yarn, such as may occur when there is decrease in the strain or pull on the yarn running into the machine, a first effect of this decrease is to cause the arm 18 and the head 24 under the influence of spring 21 to pass toward the position shown in dotted lines in Fig. 2. The effect of even a short movement in this direction of the arm 18, its attachment 24 and the head 30 is to greatly increase the friction upon the yarn between the surfaces 32 and 31 by reason of the bight of the yarn held against the surface 32 by the movement of the head 30 out of line with the yarn guide bore in guide 34. The automatic increase of the tension thus occasioned after a slackening of the running yarn is effective not only at the lower end 19 of the take-up arm 18, but is transmitted from the yarn through the lower run of the bight formed about the head 30 to the upper end of the lever comprising the arm 18 and the attachment 24 as well.

The normal position of the elements when the yarn is running into the machine, when the tension on the yarn is constant, may be that shown in Figs. 2 and 4, the tension on the yarn acting on the end 19 of the take-up arm and the head 30 setting up forces both tending to rotate the lever comprised of the arm 18 and its attachment 24, 28, etc. about the pivot 17 in a clockwise direction as viewed in Fig. 2, in opposition to the spring 21. This normal position is therefore one in which the take-up spring and the running tension on the yarn are in a state of balance.

As above explained, when for any reason the running tension decreases, the action of the head 30 and the surface 32 to place restraint upon the yarn will cause the rapid increase of tension at all points between the guide 34 and the machine, which will immediately result in bringing the take-up arm back to its normal position, and the relief of the restraint upon the yarn, when the tension upon it is again normal. I find this arrangement to be effective to avoid too great outward movement of the take-up during the running movement of the yarn, without interfering with activity of the take-up for its proper purpose, to take up the slack occurring at the machine and beyond the guide 16, especially at the ends of the reciprocatory strokes of the machine.

The arrangement of the head 30, the surface 32, etc. permits the head 30 readily to move, when the yarn slackens without being drawn off, the additional distance required by the amount of slack to be taken up, the cessation of all endwise strain upon the yarn permitting the head 30 to move to the left beyond the line of the normal position of the yarn, without altering the function of the head 30 to prevent yarn being drawn from the bobbin.

It will be observed that my new construction avoids positively clamping the yarn, and permits the force exerted upon the yarn to restrain it from running from the bobbin to be utilized to limit the take-up arm to a narrow arc of motion during use of the yarn by the machine.

Having thus described one illustrative embodiment of my invention, I desire it 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.

Claims.

1. A machine having yarn supply means, means for continuous operation and means for discontinuous operation, whereby yarn supplied thereto is at times constantly taken into the machine and at times taken intermittently with formation of slack, in combination with yarn take-up means having a take-up arm, and means reacting with the constantly moving yarn and said arm to restrain said arm from excessive movement during said continuous operation.

2. A knitting machine having yarn feeding means, means for continuous rotary knitting and means for reciprocatory knitting, whereby yarn supplied thereto is at times constantly taken into the machine and at times taken intermittently with formation of slack, in combination with yarn take-up means having a take-up arm, and a restraining arm reacting with the yarn when constantly moved to restrain said take-up arm from excessive movement, said restraining arm being free to move with the yarn in contact therewith when said yarn is slack.

3. A knitting machine having yarn feeding means, means for continuous rotary knitting and means for reciprocatory knitting respectively taking yarn constantly, and intermittently with the formation of slack, in combination with yarn take-up means having a take-up arm, means reacting with the constantly moving yarn to restrain said arm from excessive movement during rotary knitting, and means to lock said take-up arm out of action.

4. Yarn take-up means comprising an arm and an attachment of said arm mounted to contact with a guided run of yarn, means tending to displace said arm and said attachment and the yarn laterally upon the occurrence of slack in the yarn, a fixed surface and means to hold said attachment in sliding contact with said surface to restrain endwise movement of yarn laterally deflected into contact therewith on the occurrence of slack.

5. A knitting machine having in combination yarn guiding means, a yarn take-up arm and means for deflecting the yarn and placing it under frictional restraint when so deflected connected to said take-up arm to control its position by the resistance of normally tense yarn during the operation of the machine to deflection by said deflecting means.

6. Yarn feeding mechanism for knitting machines comprising yarn take up means having a spring guide arm and a co-acting yarn restraining arm operatively connected to and controlling the action of said spring guide arm by the resistance of normally tense yarn to deflection by said restraining arm.

7. Yarn feeding mechanism for knitting machines comprising in combination yarn take up means including a take up arm having a guide, a restraining arm operatively connected with said take-up arm, and means coöperating with the latter to form a bight in the yarn in frictional contact with said means on one side of said bight.

8. Yarn feeding mechanism for knitting machines comprising in combination a pivoted guide-arm for take-up of slack in the yarn, a restraining arm connected to said guide-arm to move therewith, a fixed guide for the yarn having a surface near the path of said restraining arm, and variable means to cause said restraining arm to bear constantly against said surface during movement thereupon.

9. Yarn feeding mechanism for knitting machines comprising in combination a yarn take up pivoted guide arm, a restraining arm pivoted thereto, an abutment with which the restraining arm frictionally cooperates and means to vary the action of said restraining arm.

10. Yarn feeding mechanism for knitting machines comprising in combination a yarn take up pivoted, spring, guide arm, a restraining arm pivoted thereto, and a yarn guide having a surface with which said restraining arm is adapted frictionally to engage, thereby to govern the action of said guide arm.

11. Yarn feeding mechanism for knitting machines comprising in combination a pivotally mounted spring take-up arm, a restraining arm pivoted thereto, a pair of yarn guides having surfaces between which said restraining arm is adapted to play and with one of which said arm may friction-

ally engage, thereby to govern the action of said guide arm, and adjustable means to vary the action of said restraining arm.

12. Yarn feeding mechanism for knitting machines comprising yarn take-up means having a spring guide arm and a coöperating yarn restraining arm carried by said spring guide arm and controlling the action of the latter by contact with the yarn.

13. In a knitting machine a source of yarn supply, a pivoted take-up tending to displace the yarn between said supply and the machine to take up slack, in combination with means moving with said take-up in contact with and over a fixed surface and laterally against the yarn to displace it laterally and to restrain the yarn between the take-up and the supply, whereby increased tension upon the yarn due to its restraint and use by the machine re-acts upon the take-up at two points on either side of its pivot to restore it to a normal position.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOSEPH H. ZENS.

Witnesses:
E. W. BRICKELL,
EMIL QUADE.