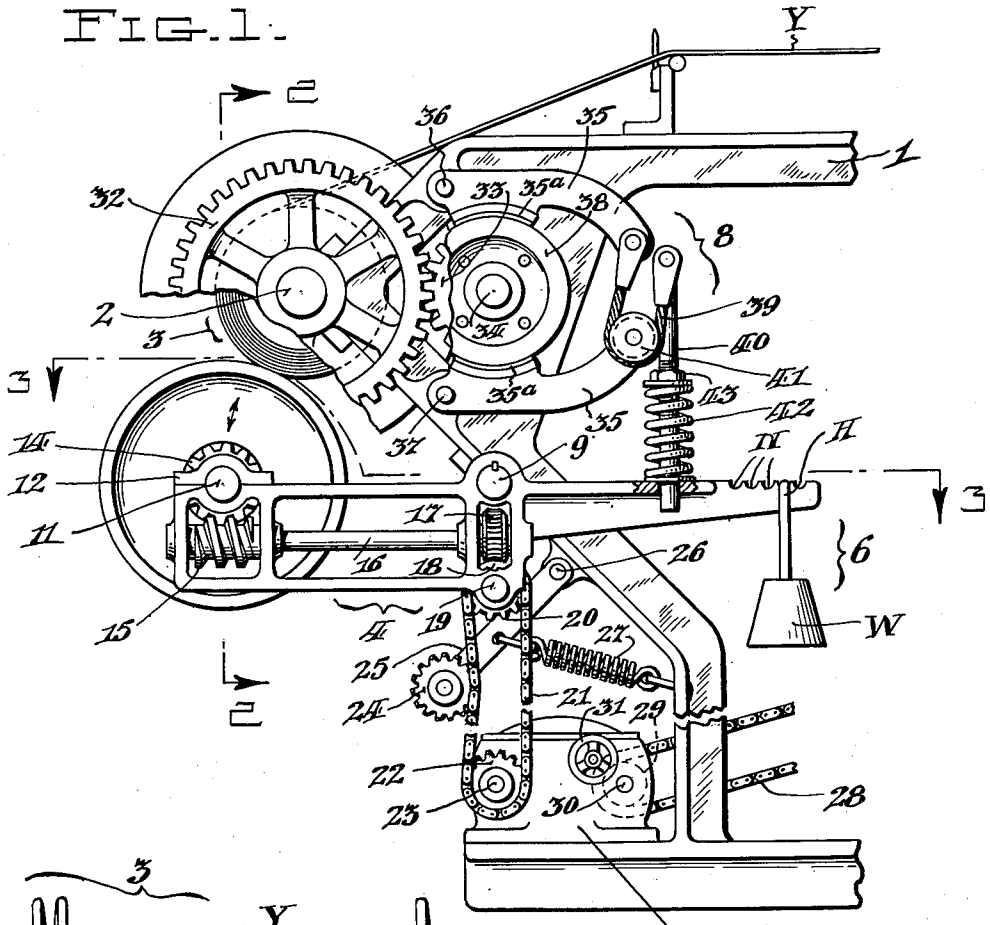
Nov. 25, 1952 E. BELLINI 2,618,945

WARP YARN FEED DEVICE

Filed July 27, 1951 2 SHEETS—SHEET 1

FIG. 1.



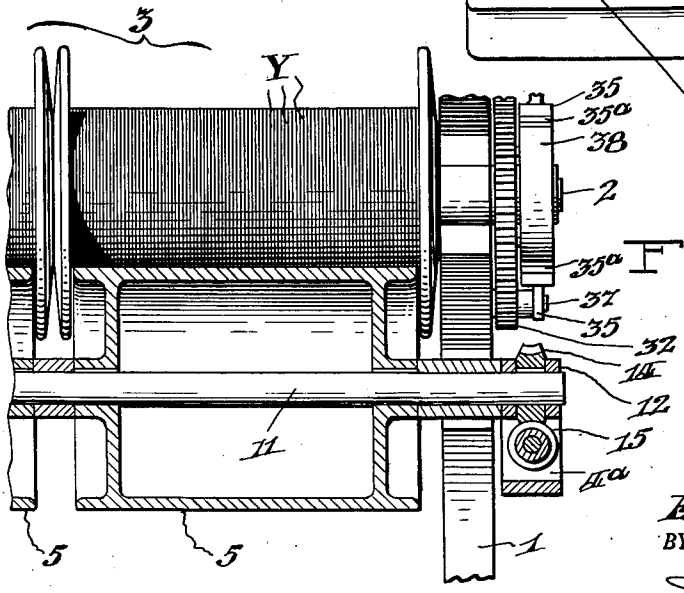


FIG. 2.

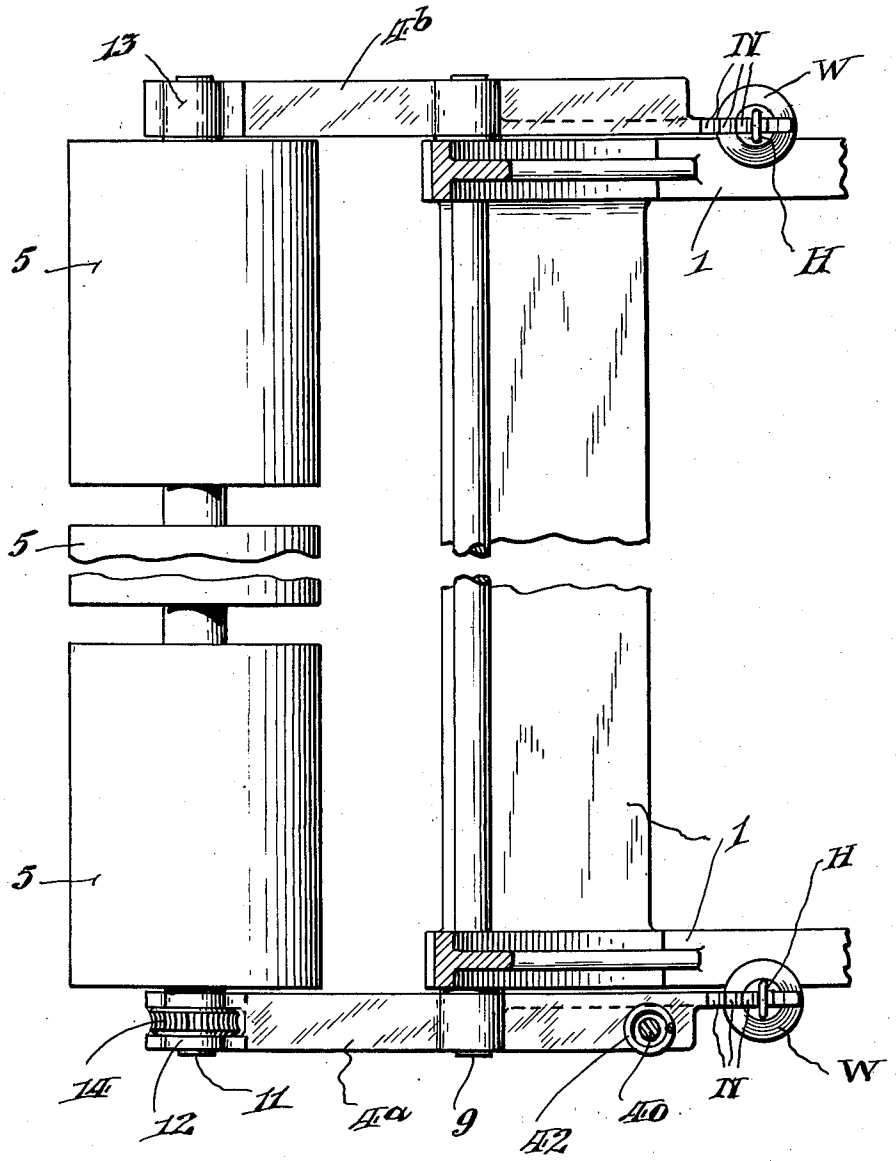
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WARP YARN FEED DEVICE

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FIG. 3.



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UNITED STATES PATENT OFFICE

2,618,945

WARP YARN FEED DEVICE

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11 Claims. (Cl. 66—86)

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This invention relates to the mechanism for feeding or delivering thread, or yarn, from warp beam spools, bobbins, etc., of knitting, weaving, or other machines, during the yarn feeding process, and more particularly concerns a mechanism of the general type exemplified by the disclosure of U. S. Patent No. 2,489,609, issued in the name of R. C. Amidon, on November 29, 1949.

In the production of fabrics made upon tricot or so-called "fast warp knitting machines," or in any process of using the warp principle, the density of the fabric or tightness of the stitches is largely determined by the feeding action, i. e., the portion of thread or yarn allotted to each knitting cycle. In order to prevent the formation of so-called "shadow marks" or "chatter marks," frequently found in fabrics when the beam let-off is uneven or irregular, it has been deemed desirable to provide some means of effecting a continuous rotation of the beam in a manner to let-off exactly the amount of thread, or yarn, that is required by the needles.

In tricot or warp knitting machines in which the let-off of the yarn is effected by the pull of the needles for starting the rotation of the beam, the movement of the beam is not continuous but is intermittent, and brake devices have heretofore been provided to operate on the beam to prevent its overrunning.

Various methods have been proposed, with more or less success, to drive the beam through suitable speed adjusting devices so as to deliver the thread, or yarn, at a fixed linear speed. All such devices heretofore devised, are more or less objectionable for one reason or another. For example, they may be too complicated, or too expensive, or due to their design they have structural or functional limitations which prevent them from effectively, or efficiently, carrying out their intended purpose.

One object of my invention is to provide a novel mechanism of the type indicated, which overcomes the mentioned and other detrimental features of the similar prior art mechanisms.

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

A further object is to provide such a mechanism in which the thread or yarn let-off is controlled by variable speed beam driving means, arranged to effect feeding of the yarn at a uniform linear speed regardless of the decreasing diameter of the beam from maximum to minimum.

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Another object is to provide such a mechanism having highly sensitive and automatically adjustable means for applying a braking or restraining action in connection with the forward movement of the beam, so as to effect precise control of the yarn let-off tension at all times during feeding of the yarn.

It is also an object to provide such a mechanism in which the said variable speed beam driving means and means for applying a braking or restraining action are arranged to cooperate in novel manner so as to effect a complementary or compensating functional relationship between them.

Another object is to provide a yarn-feeding mechanism for letting-off yarn from a beam continuously at a predetermined linear speed, which comprises certain structural and functional features in combination with a rotatably mounted beam, such as a centrally pivoted supporting member having a beam driving element rotatably mounted at one end thereof and adjustable means at the opposite end thereof adapted to maintain the beam driving element in selectively determined pressure contact with the surface of the beam; driving means on said member for effecting rotation of said beam driving element; a variable speed drive unit fixedly mounted in spaced relation to said supporting member; flexible motion transmitting means connecting said driving means and variable drive unit; a slack take-up member connected with said flexible motion transmitting means; automatically adjustable brake means cooperatively connected with the yarn beam; connecting means between said brake means and pivotally mounted support for automatically regulating the brake action applied to the yarn beam during its yarn feeding movements in accordance with the movement of the pivotally mounted support; and a variable tension device associated with said connecting means for selectively adjusting the action of the brake means.

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

In the accompanying drawings:

Figure 1 is a side elevational view of a portion

of a warp knitting machine having one form of my invention embodied therein.

Fig. 2 is a vertical sectional view through certain parts shown in Figure 1, taken substantially as indicated by the arrows 2—2 on the latter.

Fig. 3 is a plan sectional view taken substantially as indicated by the arrows 3—3 in Figure 1.

It will facilitate an understanding of my invention to first briefly direct attention to the broader aspects and phases thereof, so that these may be kept in mind when later reading the detailed description of one practical and illustrative embodiment of my novel improvements.

Accordingly, it is noted that the yarn feeding mechanism of my invention is provided with means for letting-off yarn from a beam continuously at a predetermined linear speed, in conjunction with means for selectively controlling and maintaining the let-off tension precisely as required for best knitting, or yarn feeding results, regardless of the decreasing diameter of the beam from maximum to minimum. To this end, the improvements here involved combine, in novel manner, variable speed beam driving means and selectively regulatable beam braking or restraining means, in such manner as to automatically compensate for any variations in linear yarn feeding speed, or let-off tension, resulting from the decreasing diameter of the beam, as the yarn is being withdrawn from the latter. These features will become more apparent from the following description in which like reference numerals and letters indicate like parts.

Considering first the usual and well-known parts of a warp knitting machine shown in the drawings, 1 indicates a portion of the machine frame having at both sides thereof suitable bearings for a shaft 2, on which is mounted for rotation therewith a conventional yarn or thread beam 3 of the sectional type commonly provided in such machines and arranged to feed to the knitting elements of the machine individual threads or yarns indicated by the letter Y.

In accordance with my invention there is provided with such an arrangement a mechanism which generally comprises two supporting members, or lever units 4, beam driving rollers or drums 5, a selectively adjustable device 6, the movement of which in one direction may be biased by suitable means, such as by springs, or by weights as shown, a variable speed driving unit 7, and a selectively and automatically adjustable beam braking or restraining unit 8.

The supporting member or lever unit 4 comprises two lever frames 4^a and 4^b of the type shown in Figs. 1 and 3, that are respectively positioned at each side of the machine and centrally keyed or otherwise fixed to a rocking shaft 9, mounted in suitable bearings fixed to the frame 1, as indicated. The levers 4^a and 4^b move in unison with the shaft 9.

The beam driving rollers 5 are of a lesser length than the yarn surface portions of the individual beam sections (see Fig. 2), and are keyed or otherwise secured in practical manner to a shaft 11 mounted for free rotation in suitable bearings 12 and 13 fixed, respectively, on the levers 4^a and 4^b.

Secured to the shaft 11 is a worm wheel 14 that is driven by a worm 15, fixed on a shaft 16, having secured to its opposite end a worm wheel 17 that is in mesh with a worm 18 fixed on a shaft 19, to which is also secured a chain sprocket wheel 20, connected by a chain 21 with a sprocket wheel 22, secured on a shaft 23 extending from the variable speed drive unit 7. The parts just described are mounted in suitable bearings on the lever 4^a, as indicated in Fig. 1. To take up any slack in the chain 21 during turning movement of the lever 4^a about its pivot point represented by the shaft 9, there is provided an idler sprocket 24 mounted at one end of an arm 25, pivotally secured to the machine frame 1 at 26. A tension spring 27 has its ends secured respectively to the arm 25 and frame 1, so that the sprocket 24 will be maintained in tensioned engagement with the chain 21 at all times. It will be understood that the idler sprocket 24 and chain 21 are so related and arranged as to provide the required chain slack for proper adjustment of the chain so as to permit the entire arcuate movement of the drums 5 as the yarn mass on the beam 3 changes in diameter from maximum to minimum.

The rearward ends of the supporting members or levers 4^a and 4^b are each provided with a series of spaced notches N arranged to have separably suspended therefrom in selective manner, weight elements W. The latter are provided at their upper ends with hooks or loops H to facilitate suspension of the weights from the respective notches N. The extent of the downward pull of the weights W, exerted on the rearward ends of the lever arms 4^a and 4^b of the supporting member 4, can be varied within a certain range, so that the rollers or drums 5, positioned transversely at the forward ends of the lever arms 4^a and 4^b, will be brought into proper and selective driving pressure engagement with the yarn surfaces of the individual sections of the beam 3. As previously mentioned, other suitable means, such as springs, can be substituted for the weight elements W, or the movement of the levers 4^a and 4^b can be otherwise biased to attain the desired pressure contact of the rollers 5 with the yarn surfaces of the beam 3.

The variable speed drive unit 7 is operated from the main power shaft or other suitable shaft of the machine (not shown) through a suitable connection, such as a chain 28, that operates a sprocket wheel 29 on a shaft 30 of the unit 7. The variable speed drive unit 7 may be of the type sold by Link Belt Company. Such a unit is provided with a speed regulating wheel 31 for selectively setting the ratio of speed change between the driven sprocket 29 and the drive sprocket 22, and provides a speed variation range suitable for the present purpose of selective establishment of the proper operating speed of the rollers or drums 5, through intermediate motion transmitting means, substantially as previously described. By suitably adjusting the unit 7, the thread, or yarn, may be fed to the needles at predetermined speed to produce a variety of patterns and effects in a manner well understood in this art.

The beam braking or restraining unit 8 generally comprises, a gear 32 fixed on beam shaft 2, which meshes with a gear 33 mounted for free rotation on a fixed shaft 34 that is secured to the frame 1, a pair of similar brake shoe levers 35, each of which is pivotally mounted on frame 1 at 36 and 37 and has secured thereto brake shoes 35^a arranged to cooperate with a brake drum 38 attached to the gear 33, a flexible connector or cable 39, and a connecting link 40. The gear 33 and brake drum 38 are suitably attached to each other so that they will rotate in unison on the shaft 34. As indicated in Fig. 1, the cable 39 is pivotally secured to one end of a brake shoe lever 35, is trained about a grooved roller 41 mounted for free rotation on the end of

the other brake shoe lever **35**, and the other end of cable **39** is pivotally secured to the upper end of the connecting link **40**. The lower end of the link **40** projects through, and has free movement in, an aperture in a flange portion of the supporting member **4a**, as indicated in Fig. 1. A spiral compression spring **42** surrounds a portion of the link **40** and the ends of said spring are confined between a pair of washers, one of which rests against the said flange of supporting member **4a** and the other against a spring tension adjusting nut **43** that is selectively movable along a threaded portion of the connecting link **40**.

By initially setting the tension of the spring **42**, effected by selective positioning of the nut **43** along the threaded portion of the link **40**, in conjunction with selective initial adjustment of the weights W in relation to the notches N on lever arms **4a** and **4b**, both the brake action on the beam **3** and the driving pressure exerted by the drums **5** on the beam **3**, may be set for best operating, or yarn feeding results. As the diameter of the yarn windings on the beam decreases, the beam driving drums **5** will gradually move in an upward direction, closer to the longitudinal axis of the beam **3**, and this will cause the rearward end of the supporting members **4a** and **4b** to correspondingly move downward, thereby gradually decreasing the tension of the compression spring **42**, with the result that the pressure of brake shoes **35a** against the brake drum **38** will be likewise gradually reduced. In other words, the tension of the spring **42** is gradually automatically reduced, or adjusted, as the diameter of the beam **3** decreases and this will bring about a corresponding automatic reduction, or adjustment, of the brake action on the beam **3**, so that the restraining action on the latter will be gradually reduced to the proper degree for best yarn feeding results, as the diameter of the beam **3** gradually changes from maximum to minimum.

It will be apparent that the rollers **5** and their drive mechanism will not interfere with the travel of the thread or yarn from the beam to the needles.

Since the shaft **11** is driven at a constant selected or predetermined speed, the rollers or drums **5** will likewise be turned at a constant speed and as they are held in pressure contact with the yarn Y on the beam **3**, they will effect feeding of the yarn and rotation of the beam, or beam sections as the case may be, so that the yarn leaves the beam at the same linear speed all the time the machine is in operation, or until all the yarn has been let-off the beam. The beam **3** is operated to let-off yarn at one preselected linear speed during the entire yarn feeding operation of the machine.

While my invention has been devised primarily for use on knitting machines, it can also be adapted for other uses as well, for example, weaving machines.

Of course, the novel improvements specifically shown and described can be changed and modified in various ways without departing from the invention herein disclosed and more particularly defined by the hereto appended claims.

I claim:

1. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, adjustable means at the opposite end of said member for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, and variable speed drive means connected with said beam driving element.

2. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, adjustable biasing means at the opposite end of said member for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, and variable speed drive means connected with said beam driving element.

3. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, operative means on said member for effecting rotation of said beam driving element, means for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, a variable speed drive unit mounted in spaced relation to said member, and flexible motion transmitting means connecting said operative means and variable drive unit.

4. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, operative means on said member for effecting rotation of said beam driving element, means for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, a variable speed drive unit mounted in spaced relation to said member, flexible motion transmitting means connecting said operative means and variable drive unit, and a slack take-up member connected with said flexible motion transmitting means.

5. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a fixed frame, a yarn beam rotatably mounted on said frame, a supporting member pivotally mounted on said frame, a beam driving drum rotatably mounted at one end of said member, adjustable means at the opposite end of said member arranged to maintain the drum in selectively determined pressure contact with the yarn surface of the beam, operative means on said member for effecting rotation of said drum, a variable speed drive unit fixedly mounted in spaced relation to said member, and flexible motion transmitting means connecting said operative means and variable drive unit.

6. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, adjustable means at the opposite end of said member for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, and automatically adjustable brake means connected with said yarn beam.

7. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatively mounted at one end of said member, adjustable means at the opposite end of said member for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, automatically adjustable brake means connected with said yarn beam, and means connecting said brake means and supporting member for varying the action of the brake means in accordance with the movement of the supporting member.

8. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a rotatably mounted yarn beam, a centrally pivoted supporting member, a beam driving element rotatably mounted at one end of said member, adjustable means at the opposite end of said member for maintaining the beam driving element in selectively determined pressure contact with the yarn surface of the beam, automatically adjustable brake means connected with said yarn beam, and an adjustable tension device connecting said brake means and supporting member.

9. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a fixed frame, a yarn beam rotatably mounted on said frame, a supporting member pivotally mounted on said frame, a beam driving drum rotatably mounted at one end of said member, adjustable means at the opposite end of said member arranged to maintain the drum in selectively determined pressure contact with the yarn surface of the beam, operative means on said member for effecting rotation of said drum, a variable speed drive unit fixedly mounted in spaced relation to said member, flexible motion transmitting means connecting said operative means and variable drive unit; and automatically adjustable brake means connected with said yarn beam.

10. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a fixed frame, a yarn beam rotatably mounted on

said frame, a supporting member pivotally mounted on said frame, a beam driving drum rotatably mounted at one end of said member, adjustable means at the opposite end of said member arranged to maintain the drum in selectively determined pressure contact with the yarn surface of the beam, operative means on said member for effecting rotation of said drum, a variable speed drive unit fixedly mounted in spaced relation to said member, flexible motion transmitting means connecting said operative means and variable drive unit, automatically adjustable brake means connected with said yarn beam, and means connecting said brake means and supporting member for varying the action of the brake means in accordance with the movement of the supporting member.

11. In a yarn-feeding mechanism, means for letting-off yarn from a beam continuously at a predetermined linear speed: said means including a fixed frame, a yarn beam rotatably mounted on said frame, a supporting member pivotally mounted on said frame, a beam driving drum rotatably mounted at one end of said member, adjustable means at the opposite end of said member arranged to maintain the drum in selectively determined pressure contact with the yarn surface of the beam, operative means on said member for effecting rotation of said drum, a variable speed drive unit fixedly mounted in spaced relation to said member, flexible motion transmitting means connecting said operative means and variable drive unit, automatically adjustable brake means connected with said yarn beam, and an adjustable tension device connecting said brake means and supporting member.

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