Sept. 5, 1939. F. TAIT, JR 2,172,114

MULTIPLE THREAD BACK-WINDING MACHINE

Filed July 12, 1938 2 Sheets-Sheet 1

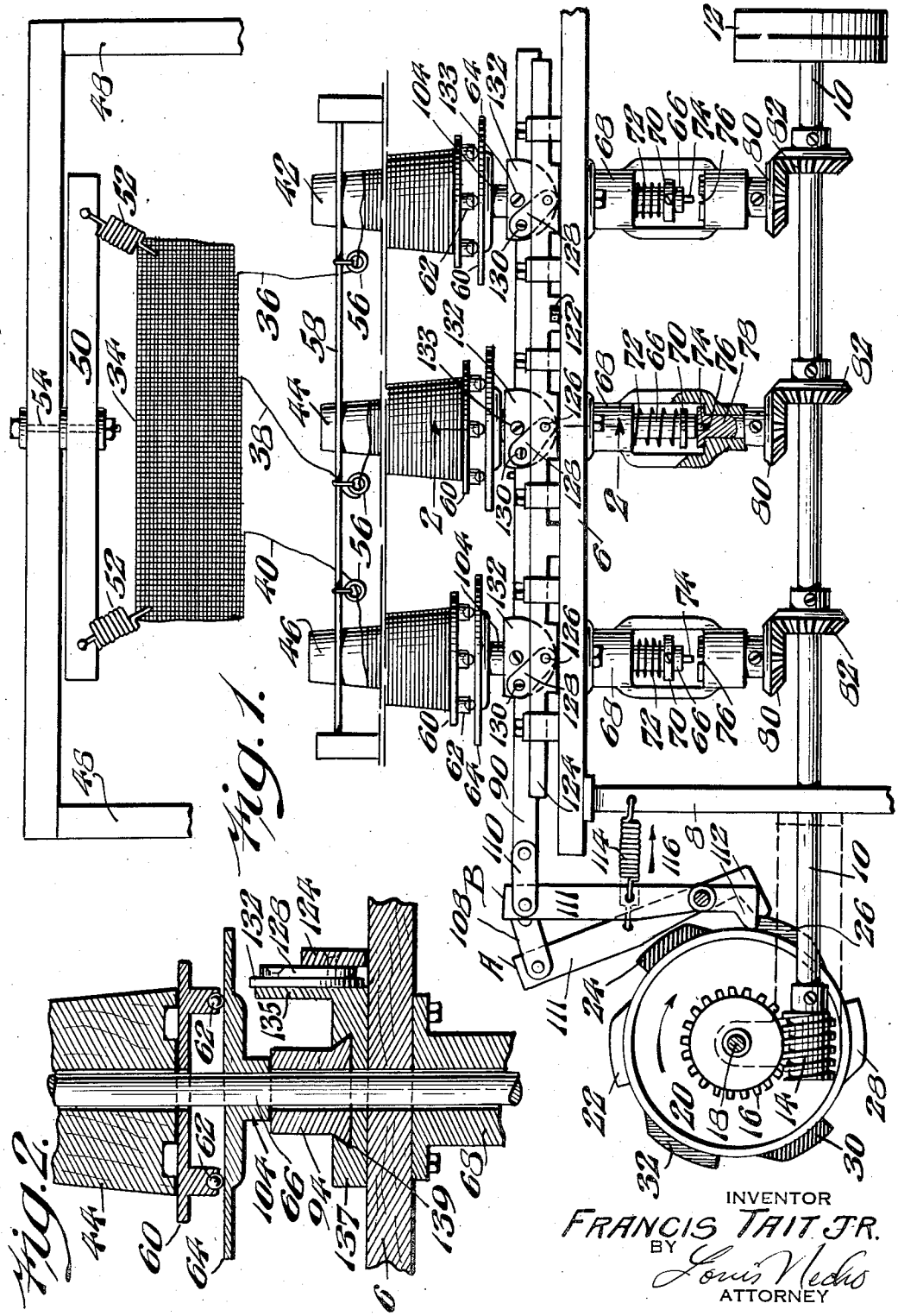


Fig. 1.

Fig. 2.

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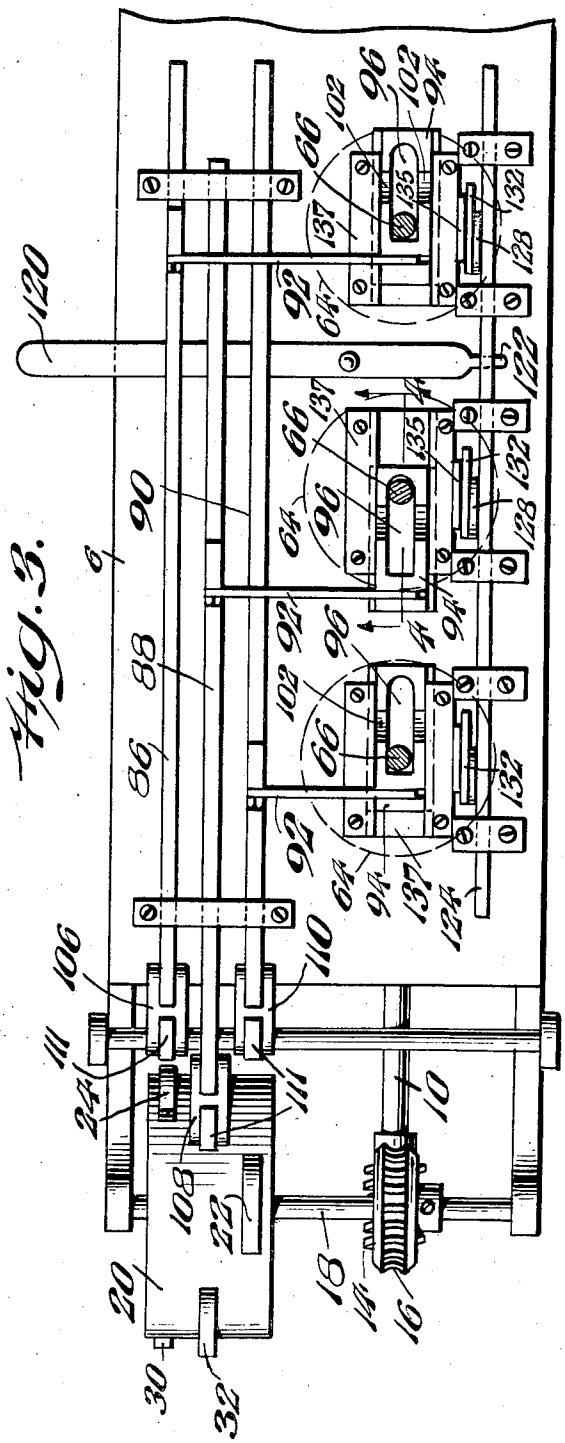


Fig. 3.

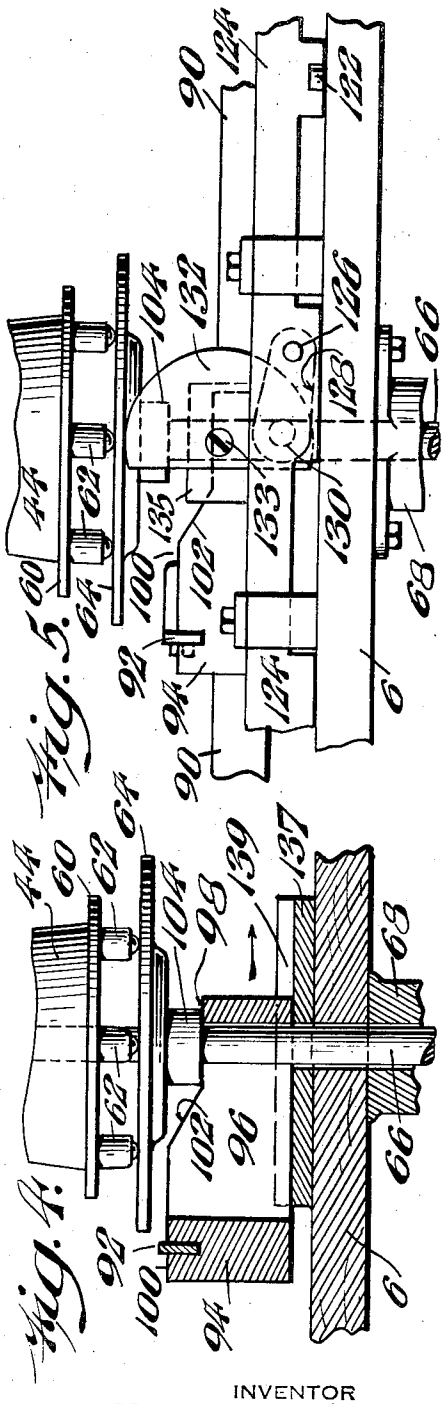


Fig. 5.

Fig. 4.

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MULTIPLE THREAD BACK-WINDING MACHINE

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Application July 12, 1938, Serial No. 218,741

4 Claims. (Cl. 28—17)

In the manufacture of hosiery and more particularly ladies' full-fashioned hosiery, a certain number of stockings are so damaged as to be unsaleable even as seconds, and, unless the thread used in the manufacture of such stockings is reclaimed, the fabric has to be sold or used as "waste". In the case of stockings knit of a single thread the problem of reclaiming the thread by the process known as "back-winding" is not serious, but in the case of stockings made of two or more threads by the multiple carrier process now almost universally used, and in which the various threads used serve to knit single, separate courses respectively, the reclamation of the plurality of threads used in the knitting of the stocking, if done in the conventional manner, would involve attaching all three ends and back-winding them on a single cone. It is then necessary to separate the threads and rewind each of them on a separate cone. The time and labor involved all but rendered the reclamation of such threads unprofitable.

It is therefore the object of my invention to overcome these difficulties and produce a back-winding machine by means of which the multiple threads used in the knitting of a stocking or other fabric may be unraveled and back-wound onto separate cones automatically and by a single operation.

My invention further relates to a machine of this character which is provided with means which insure against the breaking of the threads which, as is well known, are very frail, and which sometimes may not unravel with perfect precision, thus avoiding waste and greatly minimizing the necessity of an attendant, as well as the duties to be performed by such attendant, if any.

My invention further relates to a back-winding machine of this character which is provided with means for disengaging the rotating cones from the actuating mechanism without the necessity of shutting off the power while the material being handled is being renewed or while any break in the threads is being repaired.

Other novel features of construction will be more clearly understood from the following specification and the accompanying drawings in which;

Fig. 1 represents a front elevation of a machine embodying my invention, certain parts being shown only diagrammatically.

Fig. 2 represents a section, on an enlarged scale, on line 2—2 of Fig. 1.

Fig. 3 represents a top plan view of Fig. 1, certain parts being omitted.

Fig. 4 represents on an enlarged scale a section on line 4—4 of Fig. 3.

Fig. 5 represents a view on an enlarged scale showing the manner in which the back winding cone is disengaged from the actuating parts.

Referring to the drawings in which like reference characters indicate like parts, and more particularly to Fig. 1, 6 designates a bed plate or platform suitably supported by the legs or other framework 8. 10 designates a shaft which is driven from the pulley 12 or any other source of power and which is provided with the worm 14 meshing with the gear 16 on the shaft 18 which also carries the drum 20 provided with the cams 22, 24, 28, 30 and 32, and rotated in the direction of the arrow in Fig. 1. 34 designates a stocking the threads 36, 38 and 40 of which are to be back-wound onto the cones 42, 44, and 46 respectively. 48 designates a suitable support from which is suspended the bar 50 to which the end of the stocking is suitably secured as at 52, it being understood that the bar 50 and the stocking 34 carried thereby are capable of turning or rotating about the vertical axis of the pivot 54 so that, when the thread 36 or the thread 40 are being back-wound onto their respective cones 42 and 46, the entire stocking 34 can swing about the pivot 54 in the corresponding direction, as will hereinafter be more fully explained. The threads 36, 38 and 40 pass through eyelets 56 which are carried by any suitable frame 58 which is reciprocated vertically during the back-winding of the threads by any conventional means (not shown) for the purpose of distributing the threads lengthwise of the cone in the usual manner known in the trade as "shaping" of the cone. Since the reciprocation of the frame 58, so as to guide the threads to the bottom of the cones and up to the upper predetermined limit and down again and so forth, is now in use on conventional back winders, it is believed that any further illustration or description thereof is unnecessary. As the mounting and structure of the cones 42, 44 and 46 are identical, I have shown on an enlarged scale in Fig. 2 the mounting of the cone 44, which as will be seen, is carried by the supporting disc 60 which is provided with the ball bearings 62, which rest upon the actuating disc 64 which is turned by the spindle 66. The spindle 66 extends downwardly through the bed plate 6 and the bushing 68 and is provided with the stop plate 70 which serves as a seat for the spring 72, it being understood that the function of the spring is to exert a constant downward pull on the spindle 66. The lower end 74 of the spindle 66 is

adapted to engage a key-way 76 in the bushing 78 which carries at its lower end the bevelled gear 80 adapted to mesh with the bevelled gear 82 on the shaft 10 so that, when the shaft 10 is rotated, rotation is imparted to the spindle 66 and the plate 64 which supports the disc 60 and the cone 44. It will be understood that when the end 74 of the spindle 66 is out of engagement with the key-way 76, as shown to the right and to the left of Fig. 1, the corresponding spindles 66 are stationary, and that when the lower end 74 of the spindle 66 is engaged in the key-way 76, as shown in the center of Fig. 1, the particular spindle 66 is rotated by the shaft 10.

As illustrated in Fig. 1, I have shown a back-winding machine constructed for unraveling and back-winding the blank of a "three-thread" stocking, but it is obvious that the number of cones used will correspond to the number of threads knit in the blank so that my invention is not limited to the disclosure of three cones or a greater or lesser number. In order to be able to back-wind each of the three threads 36, 38 and 40 on a separate cone 42, 44 and 46 respectively, I have provided means for automatically actuating one of the cones 42, 44 or 46 at a time and only during a number of revolutions corresponding to the length of the course knit of the particular thread being back wound. Since in the knitting of a stocking there is no variation in this respect, I make the movements of the various cones identical, it being understood that where variation exists each of the various cones can be made to travel through a greater or lesser number of revolutions as desired, or as the case may be. The mechanism for actuating the various cones separately, as best seen in Fig. 3, consists of the rods 86, 88 and 90 which are connected through the links 92 to the cam brackets 94. The cam brackets 94 are provided with slots 96 and their upper surface is divided into the lower level 98, the upper level 100 and the interconnecting portion 102. Thus when the cam brackets 94 are moved in the direction of the arrow in Fig. 4, the hub 104 on the spindle 66 rides over the slanted portion 102 and rests upon the upper level 100 thus disconnecting the pin 74 at the bottom of the spindle 66 from the key-way 76 in the bushing 78. On the other hand, when the cam brackets 94 are moved in a direction opposite to that of the arrow in Fig. 4, the hub 104, under tension of the spring 72, rides down the inclined portion 102 and rests on the lower level 98 in which the pin 74 engages the key-way 76 and the spindle 66 is rotated. The rods 86, 88 and 90 are provided with the links 106, 108 and 110, which are pivoted to the arms 111, the lower ends 112 of which are adapted to ride on the cams 22, 24, 26, 28, 30 and 32 successively and respectively. The cams referred to are arranged in three separate rows, two to a row, so that each pair of cams would actuate one of the rods 86, 88 or 90 twice for each rotation of the drum 20. While in this particular illustration I have shown two cams for actuating each of the rods 86, 88 and 90, I do not want to limit myself to this arrangement since, without further invention, the timing of the operation, the length of the cams and the diameter of the drum 20 can all be varied, so that, with a smaller drum 20 one cam will be used for operating each of the rods instead of two as shown, and with a very large drum 20, other things being equal, there will be a correspondingly greater number of cams for intermittently operating each of the rods 86, 88 and 90.

When the hooked end 112 of one of the arms 111 rides upon one of the cams on the drum 20, the particular arm is deflected against the tension of the spring 114 into the position A in Fig. 1 thus moving the cam bracket 94 so as to bring the low level portion 98 thereof under the hub 104 of the corresponding spindle. When the hooked end 112 of the particular arm 111 has dropped off the cam upon which it has been riding, the spring 114 actuates the particular arm in question back to the position marked B which results in pushing the cam bracket 94 to bring the high level portion 100 thereof under the hub 104 thus rendering the cone carried by the particular spindle inoperative.

In order manually to disengage all of the cones 42, 44 and 46 and render them inoperative without cutting the power from the shaft 10, I provide the lever 120, one end of which is connected at 122 to the rod 124. The rod 124 has pivoted thereto at 126 the link 128, the other end of which is pivoted at 130 to the cam 132. The cam 132 is pivoted at 133 to the flange 135 of the stationary plate 137 which is suitably secured to the bed plate 6 and which is provided with a dove-tailed slot or recess 139 which forms a guide for the movement of the cam bracket 94. The cam 132 normally assumes the position shown in Fig. 1 with the straight edge thereof below the actuating disc 64 and is hence inoperative. When the lever 120 is moved to the left as shown in Fig. 3, it moves the rod 124 to the right of Fig. 3 and thus turns the cam 132 into the position shown in Fig. 5 in which position it raises the spindle 66 into an inoperative position with respect to the cam bracket 94 as well as with regard to the gears 80 and 82.

In Fig. 1 the cone 44 is shown engaged in back-winding the thread 38. When the end 112 of the particular arm 111, which actuates the rod 88 drops off the cam 26, the cone 44 will be raised into disengaging position and the particular arm 111, actuating the rod 90 will ride on the cam 22 to engage the next cone 46 which back-winds the thread 40. When the particular course of the thread 40 is completely unravelled, the cone 46 will be disengaged and the end 112 of the particular arm 111 which actuates the rod 86 will ride on the cam 30 or 24, whichever happens to be next in line and engage the cone 42. If, during the back-winding of the thread 36 or 40 there is any binding or snag, or if either of the threads fails to unravel with complete freedom, the bar 50, carrying the stocking 34, will turn about the pivot 54 so as to "give" in the direction of either the cone 42 or 46 thus easing the tension for preventing breakage while the thread disentangles itself or is disentangled.

In order further to guard against breakage, I have established a "slip clutch" arrangement between the cones and the actuating plates 64, by means of the ball bearings 62 which, by lessening the friction enables the actuating plates 64 to turn without necessarily turning the supporting plates 60. At the same time the friction between the ball bearings 62 and the actuating plate 64 is enough to cause the cone 44 to turn as long as the thread is unravelling freely and the tension on the thread being wound is less than the tensile strength of such thread. In other words, if, while any particular thread is being back-wound on one of the cones the movement of such thread is arrested, the actuating plate 64 keeps on rotating but the particular cone will remain stationary and the pull on that

thread will cease until, by itself or with the aid of the operator, the thread is again unravelling freely.

In the drawings I have shown an arrangement for back-winding one three-thread stocking, but it is obvious that by lengthening the rods **86**, **88** and **90** and duplicating the mechanism actuated by said rods any number of stockings of any number of threads may be back-wound simultaneously within the limits of practicability.

While I have shown the drum **20** carrying the respective cams for operating the rods 86, 88 and **90**, I want it understood that my invention contemplates and includes the use of other arrangements of cams or of any other conventional selective mechanism for separately and successively turning the cones **42**, **44** and **46**. Also, while I have illustrated one particular form of engaging the spindle **66** by means of the pin **74** and key-way **76** to transmit the rotary movement of the shaft **10** to the cones, it is to be understood that any other desired construction can be substituted for the parts mentioned since the essence of the invention resides in permitting a number of cones corresponding to the number of threads to be back-wound to be successively rotated during a period of time sufficient to enable each cone completely to back-wind the length of thread used in a given course. Also, I claim broadly the reduced friction arrangement between the supporting plate **60** and the actuating plate **64** which serves as a slip clutch to permit the actuating plate **64** to keep on turning without necessarily turning the plate **60** and the cone supported thereby, thus guarding against the breaking of the thread in the event if fails to unravel freely.

While in practice I have found the cam bracket **94** to be a convenient means for actuating the cone into disengaged position against the tension of the spring **72**, and while I have also found it convenient to guide the cam bracket **94** in the dove-tailed recess **139** in the plate **137**, it is to be understood that other structures for intermittently disengaging any one of the cones can be employed without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for unravelling and back-winding a fabric knit of two or more threads comprising a plurality of cones each of which is adapted to receive and wind one of said threads, an actuating mechanism for rotating said cones, and means for pivotally supporting said fabric in cooperative relation to said cones.

2. A machine for unravelling and back-winding a fabric knit of two or more threads comprising a plurality of cones each of which is adapted to receive and wind one of said threads, means for supporting said fabric in cooperative relation to said cones, an actuating mechanism for rotating said cones comprising a rotating shaft, means for normally retaining said cones out of engagement with said shaft, and cam-actuated devices for selectively and successively bringing said cones into engagement with said shaft in timed relation to the length of the course knit in the fabric of the separate threads being wound upon the respective cones.

3. A machine for unraveling and back-winding a knit fabric comprising a frame, a driving mechanism mounted therein, a cone, means for normally retaining said cone in engagement with said driving mechanism, and means for disconnecting such cone from said driving mechanism comprising a cam element having a low portion and a high portion, said low portion being normally under said cone when the latter is in engagement with said driving mechanism, and means for moving said cam element to bring the high portion thereof under said cone and disengage said cone from said driving mechanism.

4. A machine for unraveling and back-winding a knit fabric comprising a frame, a driving mechanism mounted therein, a cone, means for normally retaining said cone in engagement with said driving mechanism, means for disconnecting such cone from said driving mechanism comprising a cam element having a low portion and a high portion, said low portion being normally under said cone when the latter is in engagement with said driving mechanism, means for moving said cam element to bring the high portion thereof under said cone and disengage said cone from said driving mechanism, and auxiliary means for detaching said cone from said driving mechanism comprising an arcuate cam, a link for pivotally connecting said arcuate cam to the stem of said cone and actuating means for turning said cam about its horizontal axis to elevate or depress said cone from or into engagement with said driving mechanism.

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