

July 16, 1957

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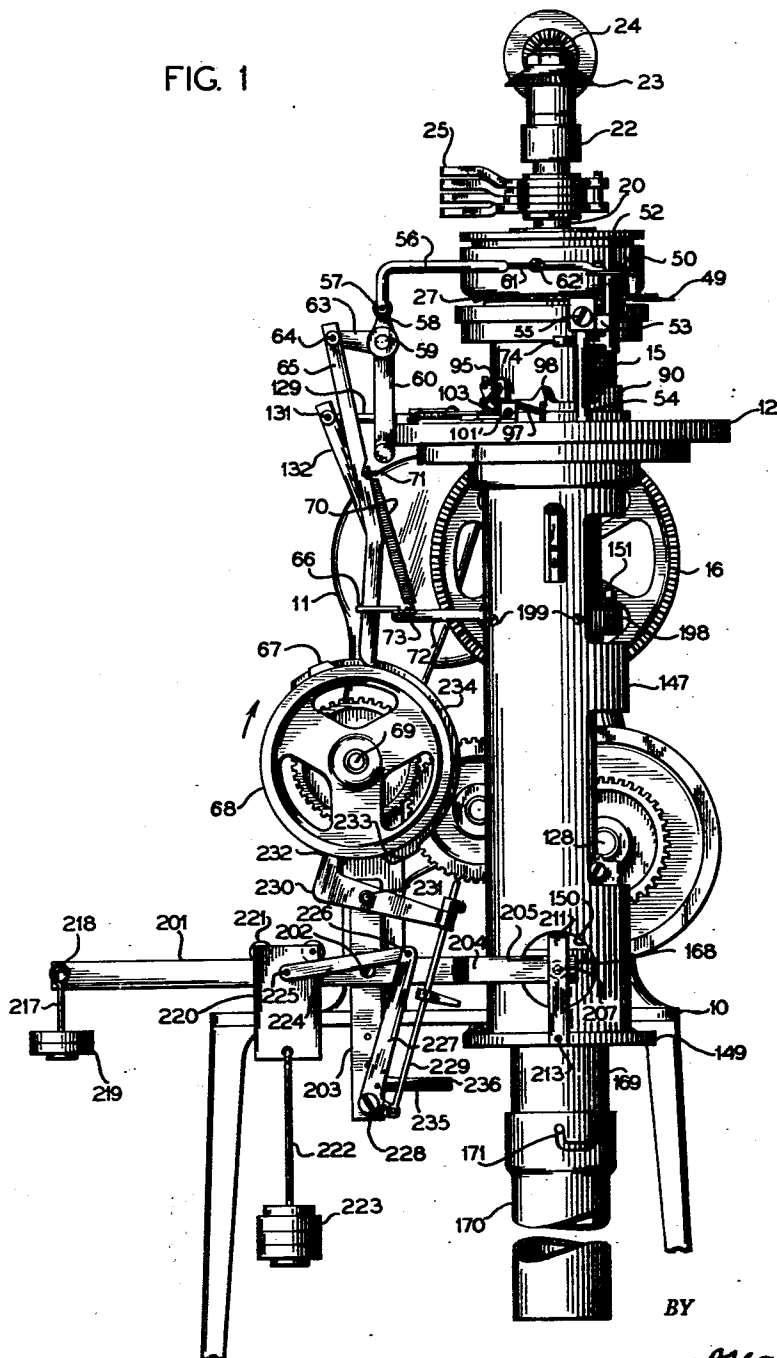
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AUTOMATIC TRANSFER KNITTING MACHINE AND METHOD

Filed Oct. 3, 1952

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FIG. 1



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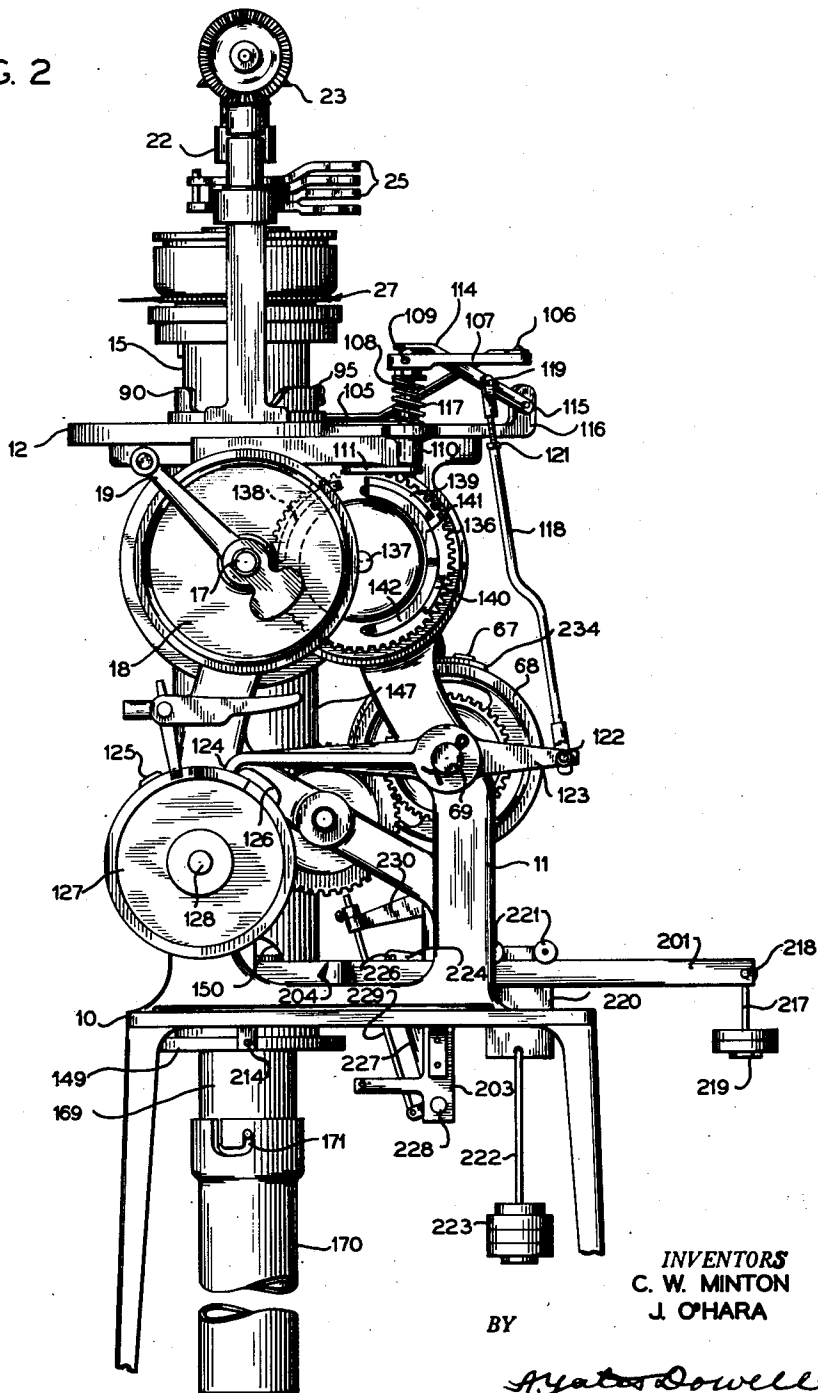
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AUTOMATIC TRANSFER KNITTING MACHINE AND METHOD

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FIG. 2



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FIG. 3

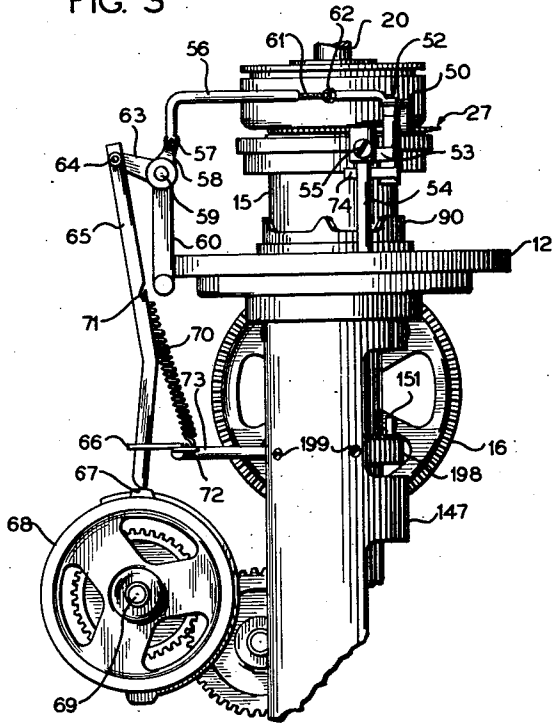


FIG. 4

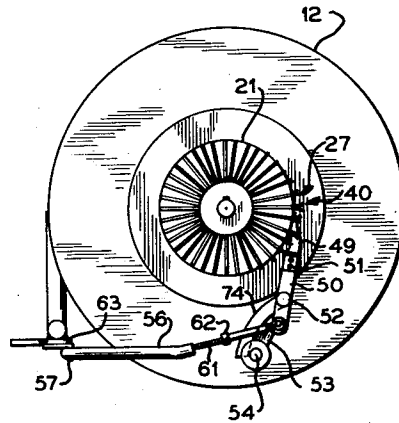


FIG. 5

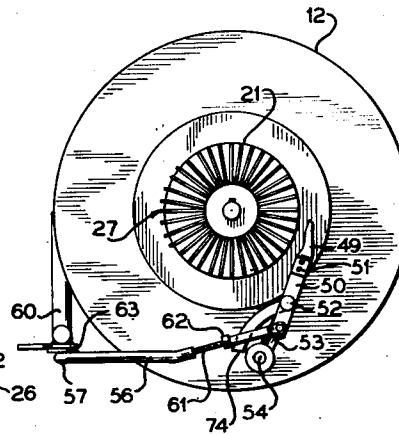
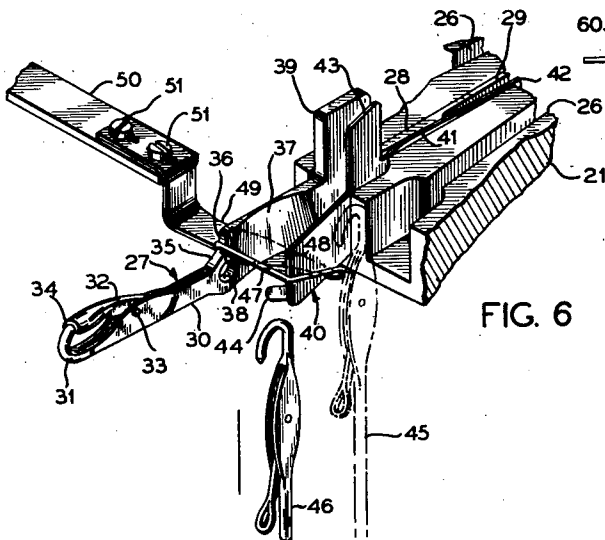


FIG. 6

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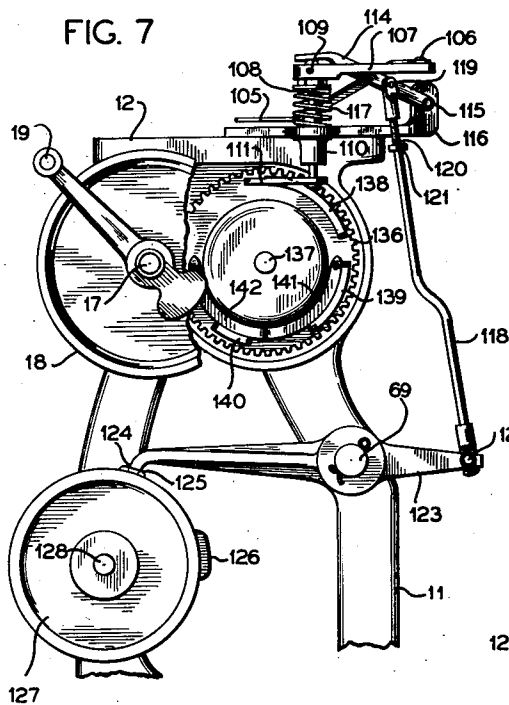
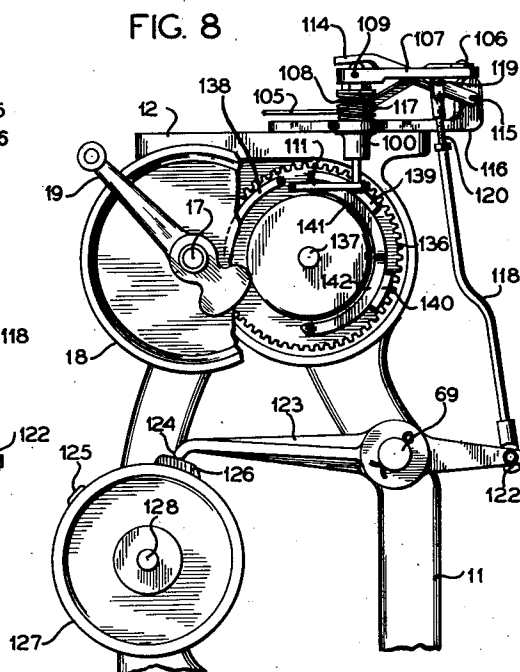
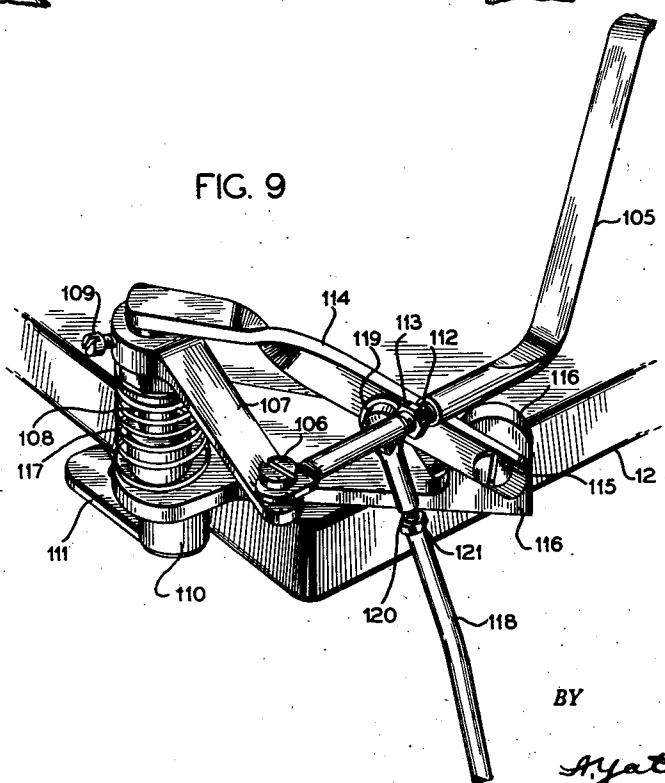
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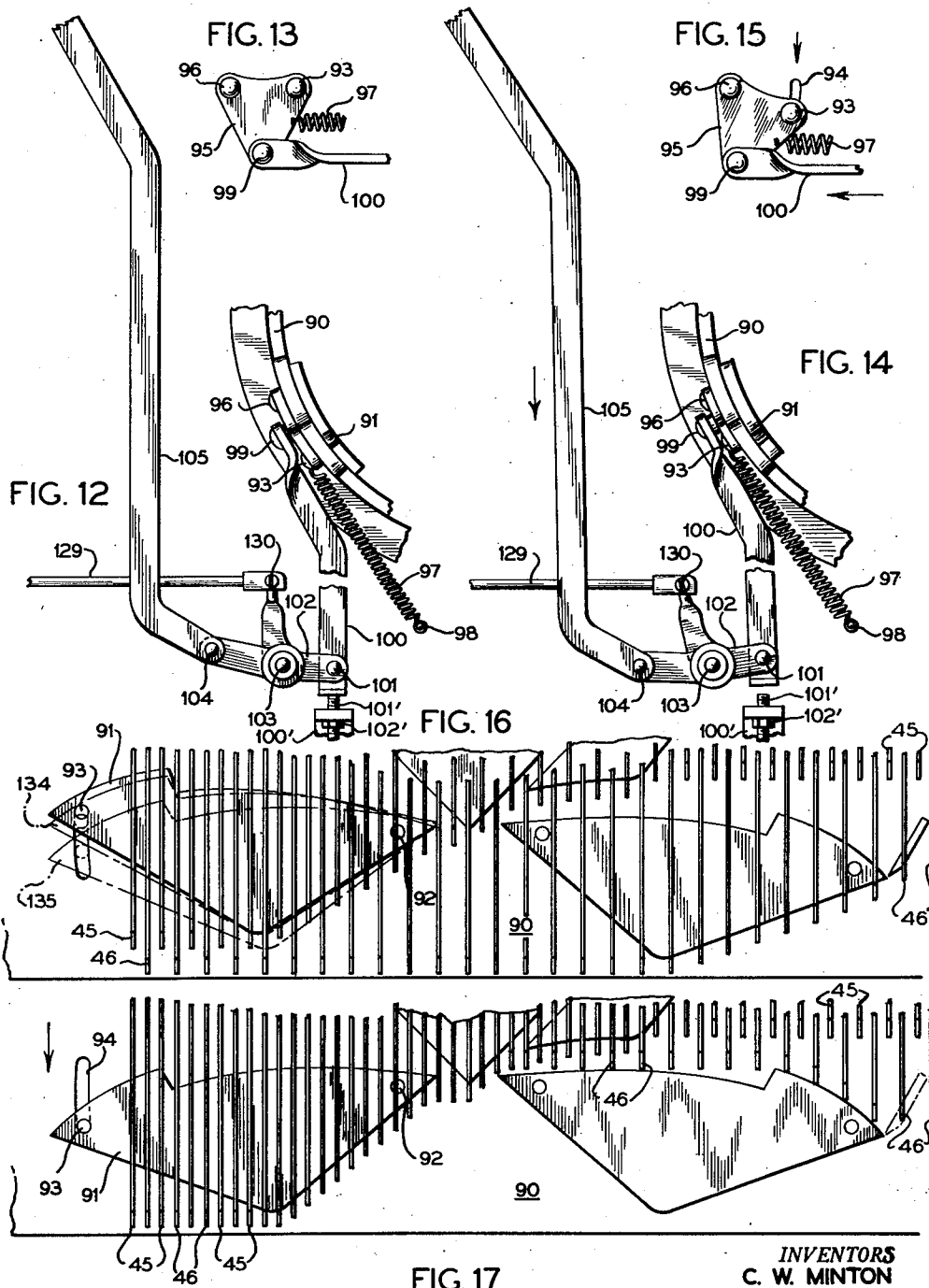
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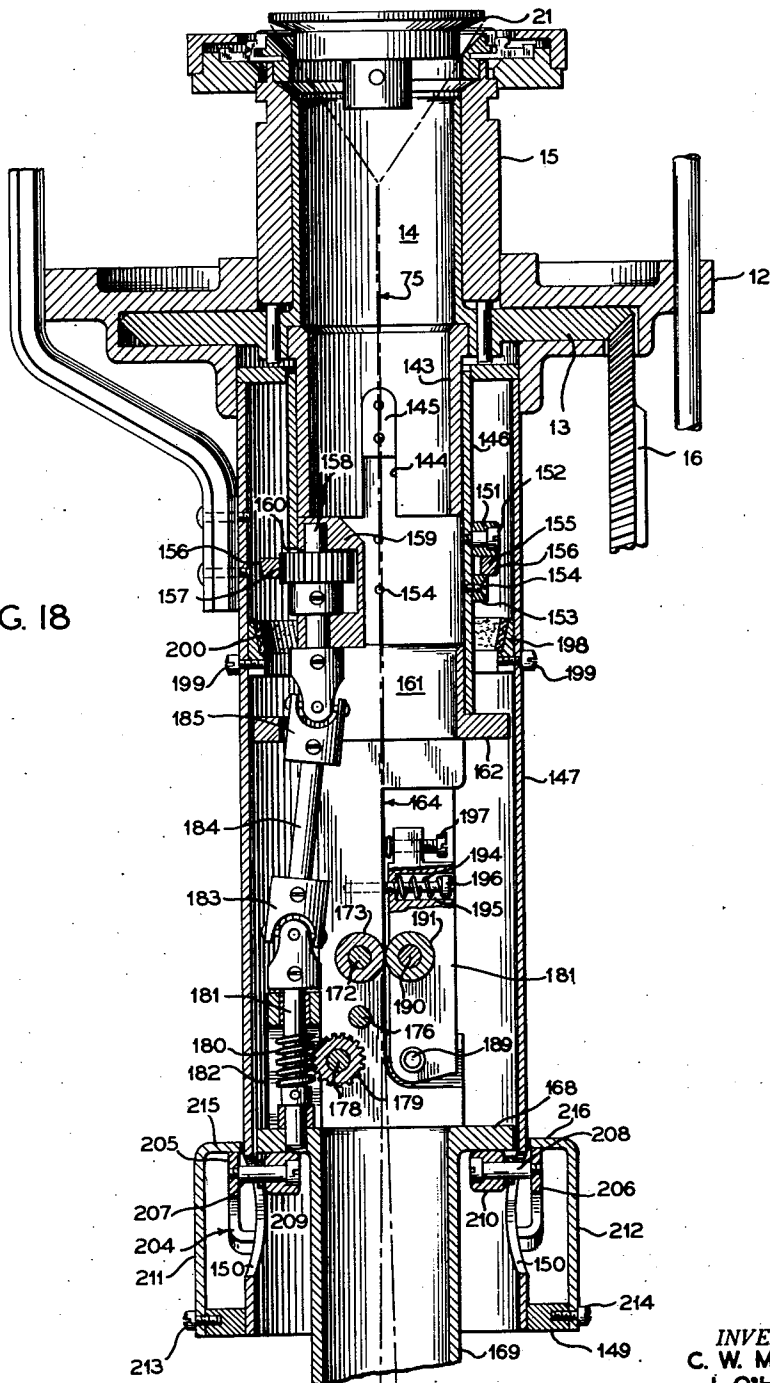
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FIG. 18



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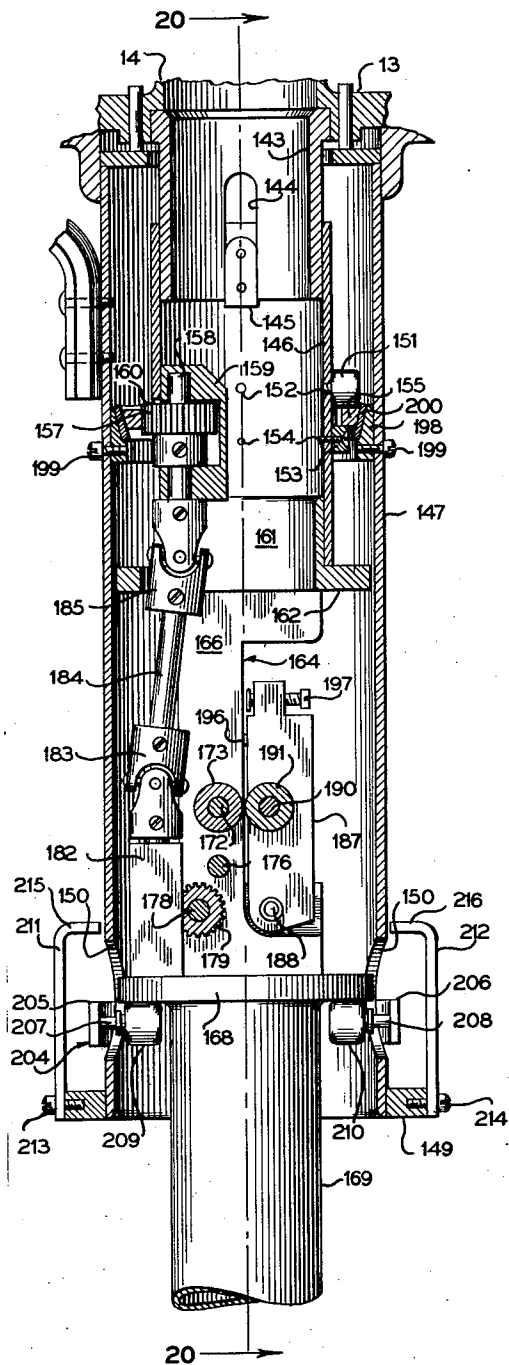
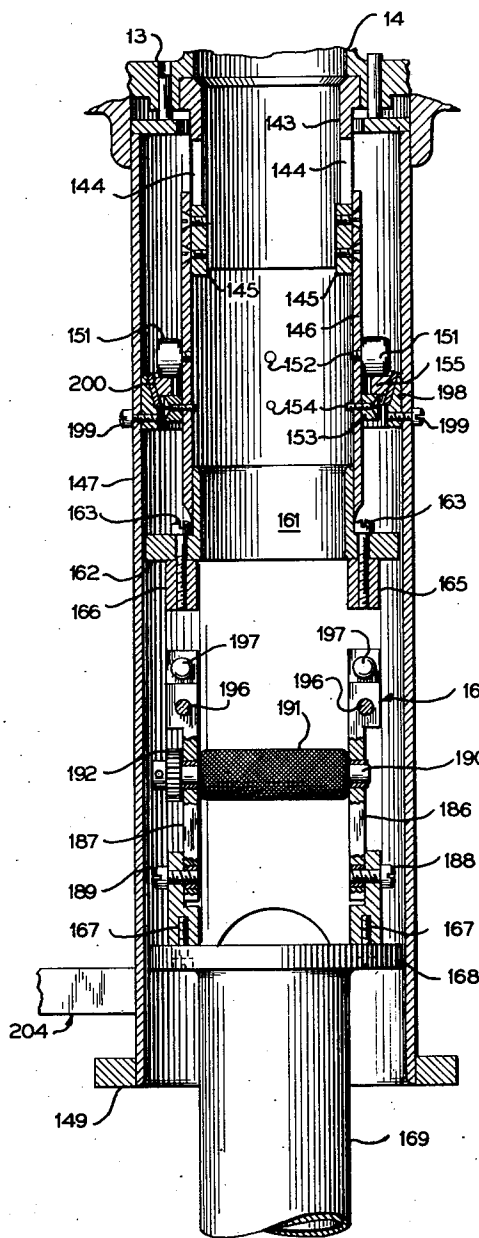
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FIG. 19

FIG. 20



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FIG. 21

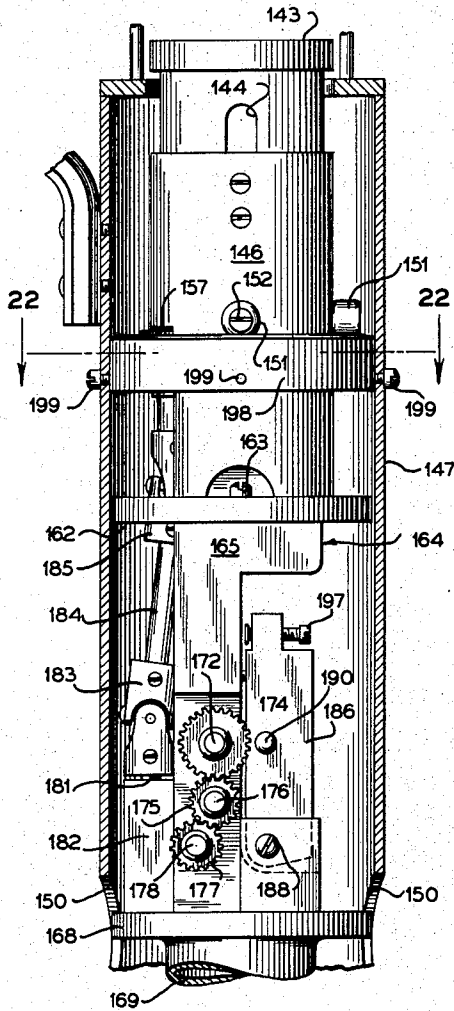


FIG. 22

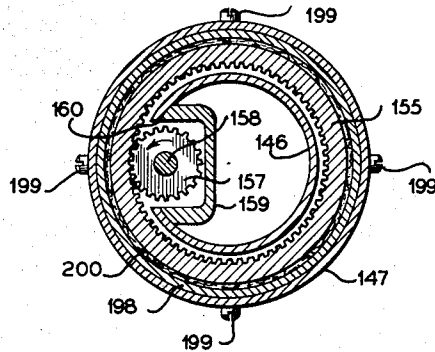


FIG. 24

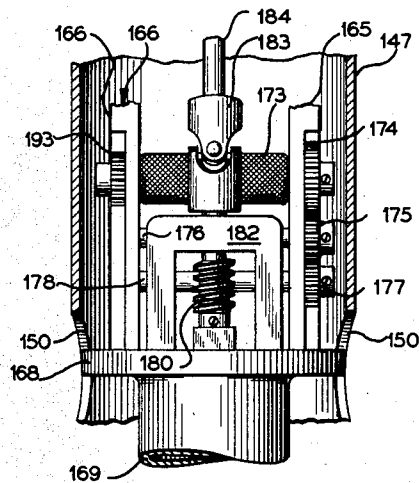
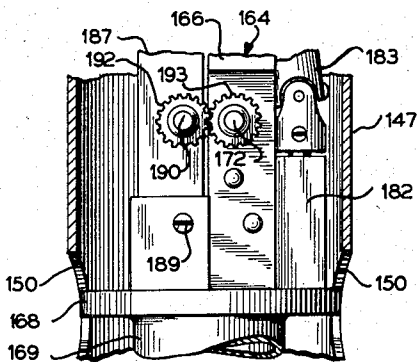


FIG. 23



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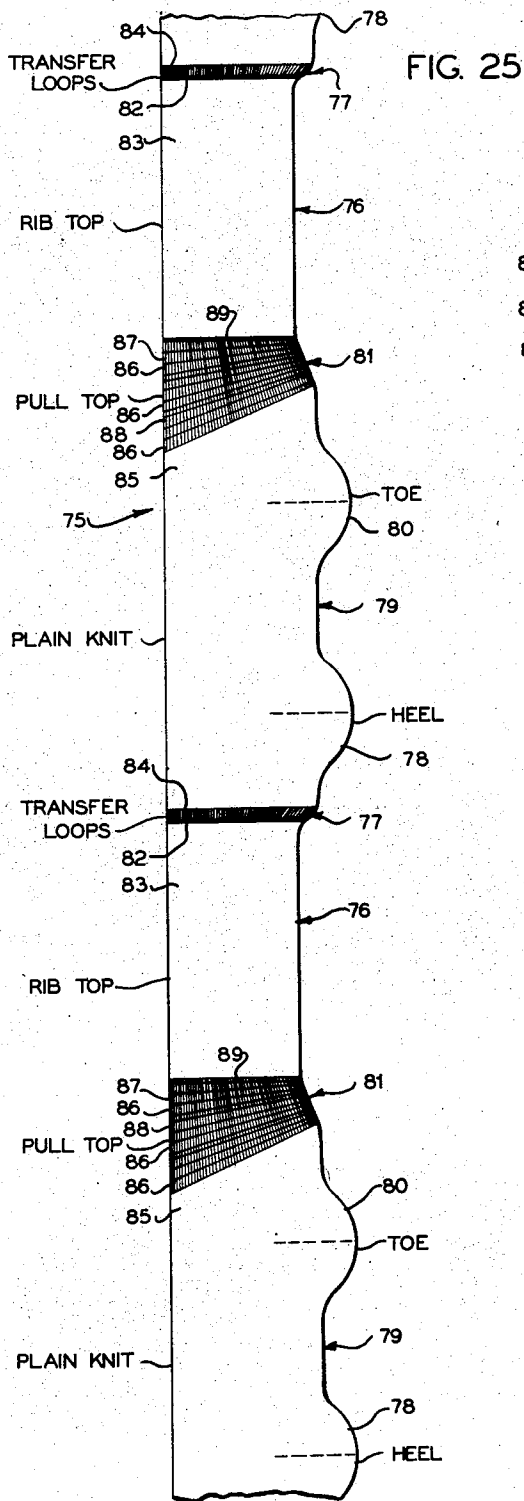
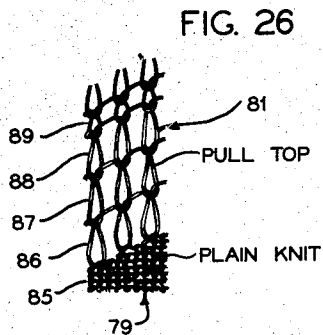
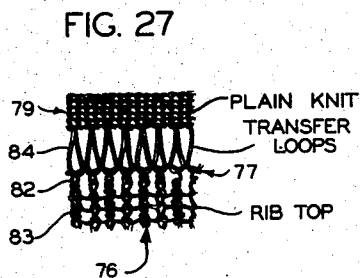
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AUTOMATIC TRANSFER KNITTING MACHINE AND METHOD

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10 Sheets-Sheet 10



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AUTOMATIC TRANSFER KNITTING MACHINE AND METHOD

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Application October 3, 1952, Serial No. 312,894

73 Claims. (Cl. 66—24)

This invention relates to textiles and more particularly to a method and apparatus for knitting hosiery.

In the knitting industry particularly in the knitting of hosiery it has been common practice to use rib knitting for the leg and plain knitting for the foot portion. These operations have commonly been performed on two separate machines, one for the rib knitting which is termed "a ribber" and one for the plain knitting which is termed "a footer" with the knitted fabric being manually transferred from one machine to the other.

As is well known in the art the rib knitting of hose may be performed on a machine utilizing a plurality of vertically reciprocable needles slidably mounted in grooves in the outer surface of a cylinder. These needles may be termed "cylinder needles" and cooperate with a plurality of horizontal or dial needles which reciprocate radially in grooves in the upper surface of a dial or plate disposed above the upper end of the cylinder. In the simplest form of rib knitting the cylinder and dial needles are arranged alternately but any desired combination of cylinder and dial needles may be utilized in order to provide different rib patterns. Plain knitting is performed by the use only of the cylinder needles.

There are many disadvantages in this prior method of making hosiery, among them being the fact that it is necessary to maintain a relatively large supply of ribbed tops in order that the plain knitting machines will always be kept busy. Also there are numerous problems connected with the shades or colors of the yarn utilized since it is almost impossible to knit the tops and foot portions of the hose from the same dye lot of yarn where this is done on different machines and it is likely that the tops will be knitted at one time and the foot portion at another time as much as several weeks or months later. Obviously it would not be practical to attempt to make all of these top portions and foot portions from the same dye lot of yarn, consequently many problems having to do with shading are presented which contribute materially to the relatively high cost of production. By production in the prior manner much yarn is wasted since it is necessary for the ribbed top to have extra or excessive length to make it possible for the operator to transfer the same to the plain knitting machine. Such extra or excessive length is unraveled or "raveled off" after the transfer operation is finished and such unraveled yarn is discarded or wasted.

One of the important objections to the present method of manually transferring from the rib knitting machine to the plain knitting machine is that a high degree of skill is required of the operator. Such skilled operators are relatively scarce and many persons do not have the necessary aptitude to permit their being trained as transfer operators. Consequently the cost of such operation is materially increased and there is always the problem of obtaining sufficient trained operators to maintain production.

Heretofore numerous attempts have been made to

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eliminate the manual transfer operation including a machine which knits the stocking backwards or in other words from the toe to the top. Also relatively expensive special needles have been used which are designed to permit the cylinder needle to engage the loop carried on the dial needle and most of these required that very close tolerances in manufacturing be maintained and also as soon as a relatively small degree of wear had taken place in the parts breakage of needles occurred, stitches were dropped and the resulting product was definitely inferior. These prior art machines present a very real problem of maintenance and much time has been lost due to frequent breakdowns.

Obviously the main reason for developing an automatic transfer knitting machine is to produce perfect knitted fabric in less time and at less cost than is possible with the present hand transferring operations. Unfortunately, however, prior art machines which theoretically would appear to produce such results have been subject to various difficulties such as transferring more than one loop at a time from the dial needles to the cylinder needles resulting in bunches or knots in the fabric which prevented the continuous production of first class fabric. This resulted in a material loss since many of the articles produced thereby must of necessity be sold as seconds whereas if the machine had produced perfect fabric at a relatively rapid rate, profits would have been materially increased.

While basically an automatic transfer knitting machine produces knitted fabric in exactly the same manner as has been practiced for many years, nevertheless the design of a successful automatic transfer knitting machine is dependent on several factors, among which are the provision of a stitch loop sufficiently large to insure that the cylinder needle will pass therethrough without engaging another loop of the stitch and furthermore, it is imperative that previous stitch loops be held in a position whereby it will be impossible for the same to be engaged by a cylinder needle being projected upwardly during the transfer operation. Furthermore, it has been found that the transfer operation may be materially improved by providing means for lengthening the stitch during the transfer operation which further ensures that only one stitch will be transferred from the dial needles to the cylinder needles and it has further been found that this transfer operation may be materially improved by the provision of an automatically adjustable tension mechanism which releases the tension on the knitted fabric during the transfer operation.

As is well known a knitting machine is a relatively complex piece of apparatus and while the particular mechanisms above discussed which improve on automatic transfer operation may seem in and of themselves relatively simple, nevertheless, the problem of incorporating these mechanisms into the complex structure of the modern knitting machine presents a very real problem in engineering and design. Since it is obvious that all of the operations accomplished during a transfer operation must be coordinated the problem of including these mechanisms in the conventional knitting machine is further complicated by the necessity of providing adequate control means including cams and linkages in an apparatus which is already replete with such mechanisms.

An added problem occasioned by the production of knitted fabric, particularly hosiery, is occasioned by the fact that the toe and heel of a sock are formed in the nature of a pouch and these portions provide an added length of fabric on one side thereof which must be compensated for in some manner if adequate uniform tension is to be applied to the knitted fabric and furthermore this additional length must be compensated for if the transfer from rib to plain knitting and from one sock to the next is to be accomplished while producing a sub-

stantially straight tubular fabric. It will be readily appreciated that if the additional length occasioned by the heel and toe pouches is not compensated for that there would be a possibility of the fabric being knitted at an angle which would result in an inferior product and soon would result in the necessity for shutting down the machine and starting the same from the beginning.

In overcoming these various problems it has been found that it is only necessary to provide mechanism for spreading the stitch loop retained on the dial needles and for pushing the loop of the previous stitch inwardly in order to provide a sufficient opening for the cylinder needle to pass through during the transfer operation, to provide mechanism for permitting a larger loop than is normally used during the knitting operation and further in providing mechanism for adjusting the tension on the knitted fabric whereby such tension may be varied during the various knitting operations and during the transfer operation, all of these mechanisms being operated in timed relation to the knitting machine itself whereby a series of knitted articles such as hosiery may be produced one after the other in a continuous piece of fabric which results in the production of a materially increased number of such knitted articles and at a cost materially lower than that resulting from a hand transferring operation. Such an apparatus also precludes the necessity for recruiting and training hand transfer operators which as mentioned above are exceedingly hard to find.

It is therefore an object of this invention to provide a method and apparatus for automatically performing a transfer knitting operation.

Another object of this invention is to provide an automatic transfer knitting apparatus utilizing relatively inexpensive needles and in which it is not necessary to maintain extremely close tolerances, normal wear having no effect on the efficiency of the apparatus.

Another object of the invention is to provide an automatic transfer knitting apparatus in which the loop carried by the dial needles is spread or enlarged to permit the cylinder needles to pass through and receive the loop from the dial needles in order to complete the transfer operation.

A further object of the invention is to provide an automatic transfer knitting apparatus in which the loop prior to the one carried by the dial needles is moved inwardly during the transfer operation in order to preclude interference thereof with the engagement of the cylinder needles with the loop carried by the dial needles.

A still further object of the invention is the provision of an automatic transfer knitting apparatus in which means is provided to push the loop preceding the loop carried by the dial needles inwardly during the transfer operation and in which such means is retracted out of the way during normal operations.

Another object of the invention is the provision of an automatic transfer knitting machine in which loop pushing means is provided and further in which means is provided for preventing cutting of the yarn or mutilation of the fabric by such loop pushing means.

Another object of the invention is the provision of an automatic transfer knitting apparatus incorporating loop pushing means which assists in providing an enlarged stitch loop carried by the dial needles in order to facilitate the transfer of such loop from the dial needles to the cylinder needles.

A still further object of the invention is the provision of an automatic transfer knitting machine incorporating means for lengthening the stitch loop during the transfer operation, such means also operating to provide an elongated stitch loop in the pull top section between the adjacent socks and the knitted fabric.

Another object of the invention is the provision of an automatic transfer knitting apparatus incorporating means for varying the length of the stitch loop during the transfer operation and also for facilitating the provision of a

pull top section between adjacent socks which will compensate for the added length on one side of the fabric occasioned by the heel and toe pouches.

A still further object of the invention is the provision of an automatic transfer knitting apparatus in which the means for pushing a stitch loop inwardly and the means for controlling the length of a stitch loop are controlled by cams or other suitable mechanism on the knitting apparatus and in timed relation to the remainder of the knitting operation.

A further object of the invention is the provision of an automatic transfer knitting apparatus in which means is provided for varying the tension on the knitted fabric in accordance with the type of knitting and further to vary such tension at the time of the transfer operation and during the knitting of a pull top section between adjacent socks.

A still further object of the invention is the provision of an automatic transfer knitting apparatus in which means is provided for imparting tension to the knitted fabric, such tensioning means being operated in timed relation to the knitting operation.

Another object of the invention is the provision of an automatic transfer knitting apparatus in which means is provided to knit a tapered pull top section between adjacent socks in order to compensate for the difference in length occasioned by the heel and toe pouches of the sock.

A still further object of the invention is to provide an automatic transfer knitting apparatus which will produce knitted hosiery of high quality and with no apparent change in the knitting when compared with present commonly used manual methods.

A further object of the invention is to provide an automatic transfer knitting apparatus which may be economically constructed at a cost only slightly higher than the cost of conventional knitting machines.

A further object of the invention is to provide a method of automatically transferring the stitches from the dial needles in the knitting machine to the cylinder needles thereof in order to produce completely knitted hose in one automatic operation and on one single machine.

A still further object of the invention is to provide a method of automatically knitting hose in one continuous piece of fabric with the section between such hose tapered to compensate for the heel and toe pouches of the socks.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

Fig. 1 is an elevational view of one side of a knitting apparatus of this invention;

Fig. 2, an elevational view of the opposite side of the knitting apparatus shown in Fig. 1;

Fig. 3, a fragmentary elevational view of the loop pusher mechanism and showing the operating linkage therefor;

Fig. 4, a top plan view of the loop pusher mechanism in operative position;

Fig. 5, a top plan view similar to Fig. 4 and showing the loop pusher mechanism in inoperative position;

Fig. 6, a fragmentary perspective view showing the loop pusher mechanism in operative position with the stitch loop in position on the dial needle;

Fig. 7, a fragmentary elevational view showing a portion of the stitch length control mechanism;

Fig. 8, a fragmentary elevational view similar to Fig. 7 and showing the stitch length control in a different operative position;

Fig. 9, a fragmentary perspective view showing a portion of the stitch length control mechanism;

Fig. 10, a fragmentary rear elevational view showing the loop pusher mechanism and stitch length control mechanism and the operating linkages therefor;

Fig. 11, a sectional view on the line 11-11 of Fig. 10.

Fig. 12, a top plan view of a portion of the stitch length control mechanism in inoperative position;

Fig. 13, a fragmentary elevational view of a portion of the stitch length control mechanism in inoperative position;

Fig. 14, a top plan view of the stitch length control mechanism similar to Fig. 12 and showing such mechanism in operative position;

Fig. 15, an elevational view similar to Fig. 13 and showing a portion of a stitch length control mechanism in operative position;

Fig. 16, a development showing the stitch length control cam in the three operative positions utilized during the knitting operation;

Fig. 17, a development similar to Fig. 16 and showing the control cam in one extreme operative position;

Fig. 18, a vertical sectional view showing the tensioning apparatus incorporated in the automatic transfer knitting machine of this invention;

Fig. 19, a fragmentary sectional view similar to Fig. 18 but showing the drive clutch for the tensioning means in engaged position;

Fig. 20, a sectional view on the line 20—20 of Fig. 19;

Fig. 21, an elevational view with parts in section for greater clarity and showing the gear drive arrangement for the tensioning rollers;

Fig. 22, a sectional view on the line 22—22 of Fig. 21;

Fig. 23, a fragmentary elevational view with parts in section for greater clarity and showing the gear drive arrangement on the opposite side from that shown in Fig. 21;

Fig. 24, a fragmentary elevational view with parts in section for greater clarity and further showing the drive mechanism for the tensioning rollers;

Fig. 25, a diagrammatic view showing the successive socks produced as a continuous piece of fabric in the automatic transfer knitting apparatus of this invention and further showing the details of the transfer between the rib knitting and plain knitting and the details of the pull top section between adjacent socks;

Fig. 26, a fragmentary detail view to an enlarged scale of the pull top section between adjacent socks; and

Fig. 27, a detailed view to an enlarged scale of the transfer portion between the rib knitting and the plain knitting.

With continued reference to the drawing the automatic transfer knitting machine of this invention comprises a base 10 carrying a base frame 11 which serves to support a bed plate 12. As best shown in Fig. 18 a ring gear 13 is mounted for rotation in the bed plate 12 and ring gear 13 is provided with an upwardly extending sleeve 14 which serves to receive and drive a cylinder 15. Ring gear 13 and cylinder 15 are conventional in every respect and cylinder 15 rotates during the knitting operation with the cylinder needles carried thereby reciprocating in a vertical direction.

Ring gear 13 is driven by a bevel gear 16 meshing therewith, gear 16 being mounted on a drive shaft 17 which receives a plurality of drive pulleys 18 and on the other end of shaft 17 there is mounted a crank 19 which may be utilized for hand operation of the machine while making adjustments thereon.

Mounted above the upper end of cylinder 15 on a shaft 20 is a dial 21 which serves to receive dial needles for radial reciprocation, these dial needles being utilized during the rib knitting operation in a manner well known in the art. Shaft 20 is journaled in a bearing 22 and receives a bevel gear 23 which meshes with a bevel gear 24, the latter gear being driven by shafting not shown in timed relation to the rotation of cylinder 15. Control levers 25 are provided and these serve to control the operation of cams which in turn actuate the dial needles in accordance with the desired knitting pattern. These control levers 25 are also conventional and operate in a manner well known in the art. Since the specific structure of the dial mechanism and the control means there-

fore forms no part of this invention, further detailed description thereof is considered unnecessary.

As is well known in the art during the operation of a knitting machine of this type the cylinder 15 and the dial 21 rotate in the same direction and at the same speed and in the simplest arrangement there are twice as many cylinder needles as dial needles. During the rib knitting operation every other cylinder needle is utilized and every dial needle is utilized, alternate stitches being received over these needles. After a sufficient length of rib knitting has been completed the stitches on the dial needles are transferred to the previously inoperative cylinder needles and thereafter the dial needles cease to operate during the plain knitting operation. The mechanism for facilitating the transfer of the stitches from the dial needles to the cylinder needles is an important part of this invention and such specific mechanism will be presently described.

With particular reference to Fig. 6 the dial 21 is provided with a plurality of radial grooves 26 in which dial needles 27 are slidably disposed. Each dial needle 27 comprises an elongated flat body portion 28 which is constructed preferably of metal but other suitable material may be employed if desired. One end of body 28 terminates in a tail or tang 29 which prior to positioning of needle 27 within the groove 26 is bent at an angle to the body 28, the purpose and utility of this bent tang presently becoming obvious. Extending from the opposite end of the body 28 is a reduced shank portion 30 terminating in a hook 31. Hook 31 may be closed to permit a stitch loop to pass from the shank 30 over the hook without being received within the same by a latch 32 pivotally mounted at 33 on the shank 30. Latch 32 is provided with a hood 34 which partially embraces the end of hook 31 in order to provide a smooth surface and prevent catching of the yarn thereon. At the inner end of shank 30 there is provided an inclined surface 35 which extends upwardly and terminates in a shoulder 36 at the point of juncture with the body 28. Body 28 is provided in one face thereof with a tapered concave groove 37 and adjacent this groove is an aperture 38 the purpose of which will be presently described. Body 28 is also provided with a cam engaging butt 39 projecting from one edge thereof and this butt may be either of the low variety or may be made longer depending on the disposition of the cams with which such butt is to be engaged.

Slidably disposed in the groove 26 of the dial 21 in juxtaposition to the needle 27 is a transfer finger 40 having somewhat the same configuration as the body 28 of the needle 27. Transfer finger 40 comprises a body portion 41 and a tang or tail portion 42 there being a cam engaging butt 43 projecting from one edge of the body 41. Butt 43 is similar in every respect to the butt 39 of the needle 27. The body 41 of the transfer finger 40 is provided at the forward end thereof with a bit 44 which extends at an angle to the body portion 41 as clearly shown in Fig. 6. The formation of the transfer finger 40 forms in effect a leaf spring, the purpose of which will be later described.

As shown in Fig. 6 the dial needles 27 and transfer fingers 40 are disposed in side by side relation in grooves 26 of dial 21 and the resiliency of these needles and fingers result in the exertion of sufficient pressure against the walls of the grooves 26 to prevent vibration or undesired movement of the needles and fingers. In operation it is to be assumed that stitch loops are received on each dial needle 27 and that stitch loops are received on every other cylinder needle 45. The cylinder needle 46 located directly below the dial needle 27 is in lowered or inoperative position during the rib knitting operation. When it is desired to change from rib knitting to plain knitting it is necessary to transfer the stitch loop 47 carried by the dial needle 27 to the previously inoperative cylinder needle 46. This operation is accomplished by projecting the dial needle 27 and the transfer finger 40 to the position shown

in Fig. 6. In this position the outer end of the transfer finger 40 carrying the bit 44, springs or moves outwardly away from the adjacent surface of the needle 27 to form a diverging support for the stitch loop 47. In this period of the operation the stitch loop 47 is moved up the inclined surface 35 and into engagement with the shoulder 36 on the outer end of the body 28 of needle 27. Likewise, the stitch loop 47 is engaged by the upper surface of the bit 44 and by the outer end 48 of the transfer finger 40. As is clearly shown in Fig. 6 this diverging relationship between the outer end of the transfer finger 40 and the needle 27 spreads the stitch loop 47 an appreciable amount and materially facilitates passage of the cylinder needle 46 through the loop 47 during the transfer operation.

While the dial needle and transfer finger above described will normally operate to spread the loop 47 sufficiently to permit passage of the cylinder needle 46 therethrough without engaging loops previous to the loops carried by the dial needles, nevertheless it has been found in practice that frequently loops previous to the loops carried by the dial needles 27 will be engaged by the cylinder needles 46 resulting in bunching and consequent inferior fabric. It has therefore been found necessary to provide what may be termed a loop pushing means for pushing the stitch loop previous to the one carried by needles 47 inwardly to prevent any possibility of engagement of the cylinder needles 46 with such previous loops. The structure for accomplishing this purpose is shown in detail in Figs. 1, 3, 4, 5, 6 and 10.

As shown in the above mentioned figures a loop pusher finger 49 is adjustably secured on a lever 50 by screw threaded fastening means or the like 51. Lever 50 is pivotally mounted at 52 on a bracket 53 carried by an upstanding pin 54 secured to the bed plate 12. Bracket 53 is held in an adjusted position on a pin 54 by a set screw or other suitable fastening means 55.

As best shown in Figs. 1, 3, 4 and 5 lever 50 is connected at the opposite end from that carrying the transfer finger 49 with an adjustable link 56 which is pivotally connected at 57 to a bell crank lever 58 pivotally mounted at 59 on a bracket 60 supported from the bed plate 12. Link 56 may be adjusted lengthwise by means of a threaded connection 61 and locked in an adjusted position by a lock nut 62. Bell crank lever 58 is provided with an arm 63 to which is pivotally connected at 64 a push rod 65 which extends through a guide 66 carried by the frame of the machine, the lower end of push rod 65 cooperating with a cam 67 disposed on the pattern drum 68 of the knitting machine. Pattern drum 68 is mounted on a shaft 69 and is operated in timed relation to the operation of the remainder of the knitting machine. Push rod 65 is normally urged in a downward direction into engagement with the cam 67 and surface of the pattern drum 68 by a tension spring 70 connected to the push rod 65 at 71, the opposite end of the tension spring being connected at 72 to the bracket 73 which serves to support the guide 66 from the frame of the machine.

During the rib knitting operation the loop pusher finger 49 occupies the position shown in Fig. 5 of the drawing and when it is desired to transfer the stitches from the dial needles 27 to the alternate cylinder needles 46 the cam 67 on the pattern drum 68 engages the lower end of the push rod 65 moving this rod upwardly and oscillating the bell crank lever 58 in a clockwise direction as viewed in Fig. 3 about the pivot 59 this oscillation of the bell crank lever 58 serving to move the link 56 and lever 50 carrying transfer finger 49 in such a manner that this finger will be moved inwardly toward the dial 21 to the position shown in Fig. 4. In this position since the dial 21 and cylinder 15 are rotating in a counter-clockwise direction as viewed in Fig. 4, the end of loop pusher finger 49 will act as a cam and engage the stitch loops previous to the loops 47 carried by the needles 27

and transfer fingers 40 and move these loops inwardly toward the dial 21 thus providing a clear path for the upward passage of the alternate cylinder needles 46. The engagement of cam 67 with push rod 65 is of sufficient duration to hold the stitch pusher finger 49 inwardly throughout one revolution of the dial 21 and cylinder 15 thus accomplishing the entire transfer operation. The provision of loop pusher finger 49 overcomes the tendency of loops previous to those carried by the dial needles to occupy positions a sufficient distance outwardly of the dial 21 to cause engagement of the cylinder needles 46 therewith during the transfer operation thus resulting in transfer of more than one stitch at a time and causing bunching of the fabric and consequent inferior quality thereof.

Since it is imperative that the loop pusher finger 49 be moved inwardly toward the dial 21 only a certain distance in order to preclude breakage or cutting of the yarn stop means is provided in the form of a finger 74 which is mounted for movement with the lever 50 carrying finger 49, stop finger 74 as shown in Fig. 4 engaging the upstanding pin 54 when the pusher finger 49 is in operative position and moving out of engagement with pin 54 as shown in Fig. 5 when pusher finger 49 is in inoperative position. As clearly shown in Fig. 6 the pusher finger 49 operates slightly in advance of the upward movement of cylinder needles 46 and consequently does not in any way interfere with the upward movement of such needles during the transfer operation.

It will thus be seen that by the above described portion of the invention there has been provided a particular structure of dial needle and transfer finger whereby due to the operation thereof the stitches carried by the dial needles are spread during the transfer operation in order to facilitate the passage of the dial needles therethrough when transferring a stitch from the dial needles to the cylinder needles and furthermore there has been provided a means whereby the loops previous to those carried by the dial needles are pushed or moved inwardly a sufficient distance to prevent any possibility of the cylinder needles engaging any of these previous loops during the transfer operation. This latter operation is necessitated by reason of the fact that frequently the previous loops to those carried by the dial needles do not move inwardly a sufficient distance to insure clearing the cylinder needles during the transfer operation and consequently in order to preclude any possibility of engagement with these previous loops the pusher mechanism is provided and operates to move these previous loops inwardly which position they occupy until the transfer operation is completed. This mechanism insures a perfect transfer operation and in practice has proven effective in producing perfect fabric knitted in sequence from rib to plain knitting as is common in the knitting of hosiery such as socks.

The loop pusher mechanism above described as will also be obvious has been incorporated in the conventional knitting machine with little material change therein it only being necessary to mount the pusher finger on the knitting machine, to provide an additional cam on the pattern drum and to provide the necessary mechanism and linkages for actuating the pusher finger from such cam. Obviously this mechanism does not materially complicate the apparatus and clearly does not necessitate a complete redesign thereof.

Before proceeding with a detailed description of the remaining mechanism comprising the automatic transfer knitting machine of this invention it is considered advisable to describe the fabric produced by this machine in order to facilitate a more complete understanding of the results produced by the mechanism later described. Attention is particularly directed to Fig. 25 which diagrammatically illustrates the fabric produced in the machine of this invention and Figs. 26 and 27 which show enlarged details of certain sections of the fabric.

In operation the apparatus of this invention produces

a continuous fabric 75 made up of successive socks. Each sock comprises a rib top portion 76, a toe pouch 80 and a pull top section 81 connecting one sock to the next sock in order to form the continuous piece of fabric. The rib top portion 76 is knit by both the cylinder and dial needles while the plain knit foot portion 79 is knit only on the cylinder needles. The transfer section 77 is formed during the transfer operation and the loop pusher above described facilitates the formation of this transfer section and likewise the stitch length control to be presently described also facilitates this transfer operation. The pull top section 81 is formed by means of the stitch length control to be presently described and this section is formed in such a manner as to compensate for the excess fabric caused by formation of the heel pouch 78 and the toe pouch 80. Likewise the pull top section 81 provides a connection between adjacent socks which may be cut without affecting these socks the remaining portion thereof being raveled off and discarded when completing the socks by closing the toe portion thereof.

The transfer section 77 is shown in detail to an enlarged scale in Fig. 27 and comprises one course of knitting 82 which is slightly longer than the preceding courses 83 of rib knitting. Immediately subsequent to the formation of the slightly elongated course 82 a much longer course of stitches 84 is formed and it is these elongated stitches which are actually transferred from the dial needles to the cylinder needles during the transfer operation. The provision of these elongated loops materially facilitates the transfer operation since in conjunction with the loop pusher above described these enlarged loops insure that the cylinder needles to which the loops are to be transferred pass upwardly through only a single loop and this elongated loop together with the loop pusher precludes the possibility of the cylinder needles engaging more than one loop and transferring a plurality thereof to the cylinder needles thereby producing a bunched appearance and consequent inferior fabric. Upon completion of the transfer of the elongated or enlarged loops 84 the plain knitting of the foot portion 79 is commenced by the cylinder needles only and as shown in Fig. 27 the stitches forming this plain knitting are relatively short and close together.

As shown in detail to an enlarged scale in Fig. 26 there is a section of plain knitting 85 following the completed toe pouch 80 and upon completion of this section of plain knitting the pull top section 81 is started. As shown in Fig. 25 the pull top section 81 comprises three groups of stitches and each group comprises a tapered course of elongated stitches 86 of varying length, a second tapered course of elongated stitches 87 of varying length, a third tapered course of elongated stitches 88 of varying length and a fourth straight course of relatively shorter stitches 89. As shown in Fig. 25 the courses of stitches 86, 87 and 88 are tapered or in other words these courses do not consist of the longer elongated stitches for the entire circumference of the fabric. The course of stitches 89 extends completely around the circumference of the fabric and the stitches thereof are of the same length throughout. These groups of stitches as shown in Fig. 25 are repeated three times while obviously any desired number of groups may be employed depending upon the particular fabric being produced. The effect of these tapered courses of stitches as shown in Fig. 25 is to compensate for the additional fabric provided by the heel and toe pouches 78 and 80 respectively and consequently a substantially straight piece of fabric is produced which permits the application of a substantially even tension to the fabric during the knitting process thus precluding dropped stitches and other imperfections in the fabric. The use of this tapered pull top section to compensate for the additional fabric requires the use of little additional yarn since in a transfer knitting operation it is necessary to provide a pull top section between ad-

jacent socks in order to permit separation of the same during the finishing operations and therefore merely providing the tapered courses of stitches in this pull top only requires the use of a relatively few additional courses of yarn, consequently this represents a very simple and economical solution to the problem of compensating for the additional fabric on one side of the socks occasioned by the heel and toe pouches whereby substantially even tension may be applied throughout the circumference of the fabric.

The stitch length control mechanism which enables the production of the fabric above described is best shown in Figs. 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17. A cam ring 90 is supported by the bed plate 12 and surrounds the cylinder 15 adjacent the lower end thereof and this cam ring serves to actuate the cylinder needles 45 and 46 during normal knitting operations. For the purpose of providing a control for the stitch length during the transfer operation and in the pull top section of the fabric there has been provided a stitch length control cam 91 which as shown in Figs. 16 and 17 is pivotally mounted at 92 on the inner surface of cam ring 90. Stitch length control cam 91 is provided with a pin 93 projecting through an arcuate slot 94 in the cam ring 90 the purpose of which will be presently described. Pin 93 which projects through the arcuate slot 94 is fixed to a triangular plate 95 pivotally mounted at 96 on the external surface of the cam ring 90. Plate 95 is normally urged in a counterclockwise direction as viewed in Figs. 13 and 14 by a tension spring 97 one end of which is connected to the plate 95 the opposite end being connected to an upstanding pin 98 secured to the bed plate 12. Pivotally connected to the triangular plate 95 at 99 is a link 100 which is pivotally connected at 101 to a bell crank lever 102 rotatably mounted upon a stud 103 extending upwardly from the base plate 12. Bell crank lever 102 is also pivotally connected at 104 to a link 105 which in turn is pivotally connected at 106 to a lever 107 which is secured to a rock shaft 108 by a set screw or the like 109. Rock shaft 108 is slidably and rotatably mounted in a bearing 110 secured to the bed plate 12 and the lower end of rock shaft 108 is connected to a cam follower 111 the purpose and operation of which will be presently described. Link 105 is provided with a length adjusting means in the form of a screw threaded connection 112 and a lock nut 113 for locking the same in adjusted position. The uppermost position of cam 91 is determined by a stop comprising a bracket 100' secured to the bed plate 12 and threadedly receiving a screw 101' fixed in adjusted position by a lock nut 102'. Screw 101' serves to engage the end of link 100 and prevent further upward movement of cam 91 under the action of tension spring 97.

The vertical position of rock shaft 108 and cam follower 111 carried thereby is controlled by a rocker arm 114 pivotally mounted at 115 on an ear 116 extending upwardly from the bed plate 12. The end of rocker arm 114 opposite the pivotal connection 115 bears on the upper end of rock shaft 108 and this rock shaft is normally urged to an upward position by a compression spring 117 disposed between the bearing 110 and the lever 107.

A link 118 is pivotally connected to rocker arm 114 at 119 and link 118 may be adjusted as to length by a threaded connection 120 and locked in this adjusted position by a lock nut 121. The opposite end of link 118 is pivotally connected at 122 to a rocker arm 123 which is pivotally mounted on shaft 69 carried by frame 11 the opposite end 124 of rocker arm 123 comprising a cam follower disposed in position to engage cams 125 and 126 positioned on the circumference of belt shipper drum 127 carried by shaft 128 which is rotatably mounted on frame 11.

Stitch length control cam 91 is also provided with an auxiliary control mechanism in the form of a link 129

which is pivotally connected at 130 to the bell crank lever 102, the opposite end of link 129 being pivotally connected at 131 to a rocker arm 132. The opposite end of rocker arm 132 is disposed in position to engage a cam 133 positioned on the outer circumference of the pattern drum 68. Engagement of rocker arm 132 with the cam 133 serves to move the stitch length control cam 91 downwardly to its lower extreme position as shown in Fig. 17 in which position the plain knit leg, heel, foot and toe portions are formed. After completion of these portions and prior to beginning the pull top the rocker arm 132 is disengaged from the cam 133 and the stitch length control cam 91 moves upwardly to the full line position shown in Fig. 16.

A gear 136 is mounted on a shaft 137 journaled in the frame 11 and the outer face of gear 136 is provided with two rings of cams the outer ring comprising elongated cams 138, 139 and 140 while the inner cam row comprises a relatively low cam 141 and a high cam 142. The face of gear 136 between the cams 140 and 138 is somewhat higher than the face between cams 142 and 141 and the purpose of this raised surface will be presently described.

Cam follower 111 serves to engage either the series of cams 138, 139 and 140 or the series of cams 141 and 142 and the position of cam follower 111 is controlled by the rocker arm 114, the link 118 and the rocker arm 123 which engages either the low cam 125 or the high cam 126. As shown in Fig. 7 the end 124 of rocker arm 123 is in engagement with the low cam 125 on the belt shipper drum 127 and in this position the cam follower 111 is moved downwardly a sufficient distance to be in the path of movement of the cams 138, 139 and 140. As shown in Fig. 8 the end 124 of the rocker arm 123 is in engagement with the high cam 126 on the belt shipper drum 127 and in this position the cam follower 111 is moved downwardly into the path of movement of the cams 141 and 142.

Obviously the gear 136 and belt shipper drum 127 rotate in timed relation to the operation of the remainder of the apparatus and when the rib top section 76 is completed and it is desired to transfer the stitches from the dial needles to the cylinder needles the end 124 of rock shaft 123 engages the cam 126 on belt shipper drum 127 thus moving the cam follower 111 downwardly into the path of movement of cams 141 and 142. As shown in Fig. 8 cam follower 111 first engages the lower cam 141 and this moves the stitch length control cam 91 downwardly to the intermediate position 134 shown in Fig. 16. In this position the butts on the cylinder needles are engaged by the cam 91 and pulled downwardly to form the slightly elongated course of stitches shown at 82 in Fig. 27. Upon completion of this course of stitches the cam follower 111 engages the high cam 142 which moves the stitch length control cam 91 downwardly to the full line position shown in Fig. 17 at which point the cylinder needles are moved downwardly to the full extent of their travel thus forming the elongated course of stitches 84 which facilitates the transfer of the stitch loops from the dial needles to the cylinder needles. Thereafter the plain knitting operation is carried out solely on the cylinder needles and this continues until the pull top section 81 is reached.

When the pull top section is reached the end 124 of the rocker arm 123 as shown in Fig. 7 engages the lower cam 124 on the belt shipper drum 127 and moves the cam follower 111 into position to be engaged by the cams 138, 139 and 140. It will be noted that cam 138 is relatively long while cams 139 and 140 are progressively shorter. The length of these cams control the length of the tapered courses of stitches 86, 87 and 88 in the pull top section 81 and engagement of cam follower 111 with cam 138 results in moving the stitch length control cam 91 downwardly to the position shown in Fig. 17 at which time the first tapered course of stitches

86 is formed. As the gear 136 rotates in timed relation to the rest of the machine the cam follower 111 passes onto the shorter cam 139 which still retains the stitch length control cam 91 in the position shown in Fig. 17 and forms the relatively shorter tapered course of stitches 87. Likewise the cam follower 111 passes onto the shorter cam 140 and in this position forms the shorter tapered course of stitches 88. Between cams 138 and 139 and between cams 139 and 140 the follower 111 moves toward the gear 136 and permits upward movement of the stitch length control cam 91 to the full line position shown in Fig. 16. This results in the formation of shorter stitches which in conjunction with the longer stitches 86, 87 and 88 form the tapered courses. After leaving the shorter cam 140 the cam follower 111 engages the raised surface of gear 136 between cams 140 and 138 until reengagement with the cam 138. In this position the stitch length control cam 91 is in the intermediate position 135 shown in Fig. 16 and the straight elongated course of stitches 89 in the pull top section 81 is formed. After completion of this course the cam follower 111 again engages the cam 138 and the cycle of operation described above is repeated. This cycle may be repeated as many times as necessary but as shown in Fig. 25 there are three groups of tapered courses which are normally sufficient to compensate for the excess material provided in the fabric by the heel and toe pouches 78 and 80 respectively.

It will be seen that by provision of the above described mechanism that the stitch length may be conveniently controlled both in transferring from the rib top section to the plain knit section and in forming the pull top section. As mentioned above the provision of an elongated stitch in the transfer section is extremely important and contributes materially to the production of a perfect transfer and likewise it is necessary to provide the elongated stitches in the pull top section in order to compensate for the excessive length produced by the formation of the heel and toe pouches. As stated above this compensation is accomplished by providing the tapered courses of elongated stitches and separating groups of these courses by a straight course of relatively shorter elongated stitches. All of the mechanism described above operates in timed relation to the remainder of the machine and when considering the complexity of the apparatus in general is relatively simple and efficiently operates to produce the desired result.

Since it is necessary that a downward tension be applied to the fabric as it presses downwardly through the knitting apparatus in order to avoid dropping stitches and the like and further since it is necessary to vary this tension in accordance with the particular type of knitting being performed, means has been provided in this apparatus to apply such tension and to automatically vary the same in accordance with whether a rib knitting operation is being performed or whether a plain knitting operation is being performed and to remove substantially all of the tension from the fabric during the transfer operation. It has been found that if the tension on the fabric is too great that frequent breakage of needles will occur and likewise if the tension is too small dropped stitches will result which frequently causes imperfect fabric to be produced by the apparatus. Obviously any automatic tensioning means must also compensate for the fact that the fabric is being continually knitted and moves downwardly and consequently any gripping means which engages the fabric must automatically move upwardly thereon as the length of the fabric increases.

As best shown in Fig. 18 the knitted fabric 75 passes downwardly through the sleeve 14 attached to the ring gear 13 and driven by the ring gear 13 is a downwardly extending sleeve 143 provided with diametrically opposed slots 144. Slidably disposed in slots 144 are keys 145 carried by a downwardly depending sleeve 146 which serves to support a portion of the operating mechanism

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for the automatic tensioning device. This mechanism is enclosed within a tubular housing 147 mounted in the bed plate 12, housing 147 engaging at its lower end in a collar 149. The housing 147 is also provided with diametrically disposed apertures 150 adjacent the lower end thereof the purpose of which will presently appear.

Sleeve 146 is provided on the circumference thereof with a series of rollers 151 rotatably carried by studs 152 and spaced below these rollers is a bearing ring 153 secured to the outer surface of the sleeve 146 by screw threaded fastening means or the like 154. Rotatably disposed between the rollers 151 and bearing ring 153 is an internal ring gear 155 the outer surface 156 of which forms the driven member of a cone clutch. The inner surface of ring gear 155 is provided with gear teeth which mesh with a pinion gear 157 mounted on a shaft 158 journaled in a block 159 secured to the inner surface of sleeve 146. Pinion gear 157 extends through an aperture 160 in the side of sleeve 146 and into engagement with the teeth of ring gear 155.

A sleeve 161 is fixed in the lower end of sleeve 146 and sleeve 161 is provided with an outwardly extending annular flange 162 to which is secured by screw threaded fastening means 163 or the like a depending frame 164 having side members 165 and 166. Side members 165 and 166 extend downwardly and are attached by screw threaded fastening means or the like 167 to a flange 168 of a fabric receiving tube 169. As shown in Fig. 1 a fabric receiving the cup 170 is attached by means of a bayonet joint 171 to the lower end of tube 169. As fabric is formed by the knitting apparatus of this invention the same collects in the cup 170 and at intervals the same may be removed by disengaging the bayonet joint 171 and a length of the knitted fabric may be cut off at the pull top section and removed for further finishing operations. The cup 170 is then returned to position and locked in place by the bayonet joint at which time the knitting operations continues the knitted fabric collecting in this cup.

Journalled in the side bars 165 and 166 and extending transversely thereof is a shaft 172 which serves to carry a fabric engaging tensioning roller 173. Roller 173 may be provided with a knurled surface or any other surface which provides sufficient friction between this roller and the fabric may be utilized. On one end of the shaft 172 there is mounted a spur gear 174 which engages an idler gear 175 journaled on a shaft 176, idler gear 175 in turn meshing with a drive gear 177 carried by a cross shaft 178 journaled in the side bar members 165 and 166. Shaft 178 carries a worm wheel 179 which is engaged by a worm 180 carried by a shaft 181 journaled in a yoke 182 secured to the flange 168 of tube 169. Shaft 181 is coupled through a universal joint 183 with a shaft 184 which in turn is coupled through a universal joint 185 with the shaft 158 driven by pinion gear 157.

A movable frame comprising side bars 186 and 187 is pivotally mounted by studs 188 and 189 on the frame 164 and side bars 186 and 187 serve to rotatably receive a shaft 190 upon which is mounted between said side bars a fabric engaging tensioning roller 191. This roller may likewise be provided with a knurled or serrated surface or any other friction surface may be utilized and such roller 191 as shown in Fig. 18 is mounted directly opposite the above described roller 173. Shaft 190 is provided at one end thereof with a pinion gear 192 which meshes with a second pinion gear 193 carried by the shaft 172 at the end thereof opposite to the spur gear 174.

As best shown in Fig. 18 side bars 186 and 187 carrying the roller 191 are urged toward the frame 164 and the roller 173 by compression springs 194 received in recesses 195 in the side bars 186 and 187, the tension of springs 194 being controlled by screw threaded studs 196 extending through these springs and threadedly received in the side bars 165 and 166 of the frame 164. Adjustment of the studs 196 will govern the frictional en-

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gagement of the rollers 173 and 191 with the knitted fabric passing therebetween. Stop means is provided in the form of screw threaded studs 197 extending through the upper ends of side bars 186 and 187 these studs 197 engaging the edges of side bars 165 and 166 of the frame 164 to prevent surface engagement of the rollers 173 and 191 when fabric is not present therebetween.

Fixed within the housing 147 is a ring 198 which may be secured in place by screw threaded fastening means or the like 199 the inner surface 200 of ring 198 being complementary to the outer surface 156 of ring 155 this ring 198 constituting the driving element of a cone clutch. Since the sleeve 146 is rotated by engagement of the keys 145 and the slots 144 movement of the ring 155 downwardly into engagement with the surface 200 of the ring 198 will result in stopping rotation of the ring 155 with relation to the sleeve 146 which will result in rotation of pinion gear 157. Rotation of this gear will, through the shaft 158, universal joint 185, shaft 184, universal joint 183, shaft 181, worm 180 and worm wheel 179 drive the roller 173 and through the pinion gears 192 and 193 will drive the roller 191.

The entire assembly including the sleeve 146, frame 164, the tube 169 and cup 170 rotates and may also move upwardly in accordance with the tension applied to the fabric passing downwardly between the rollers 173 and 191 and this upward and downward movement of the assembly is controlled by an automatic means for varying the tension applied to the fabric. As best shown in Figs. 1, 2 and 18 this tensioning means comprises an arm 201 pivotally mounted at 202 on a bracket 203 attached to the frame 11 of the knitting apparatus. Arm 201 is provided adjacent one end thereof with a yoke 204 the arms 205 and 206 of which extend on diametrically opposite sides of the housing 147 and these arms 205 and 206 are provided with studs 207 and 208 extending through the apertures 150 and serving to rotatably support rollers 209 and 210 which engage the lower surface of flange 168 on the upper end of tube 169. Stop means in the form of brackets 211 and 212 are secured to the collar 149 of housing 147 by screw threaded fastening means or the like 213 and 214 and the upper ends of these brackets 211 and 212 are bent inwardly at 215 and 216 into the path of movement of the arms 205 and 206 and prevent upward movement of these arms beyond a certain point. The opposite end of arm 201 is provided with a rod 217 pivotally mounted at 218 and rod 217 serves to receive weights 219 which serve to counterbalance the weight of the vertically movable assembly within the housing 147. Weights 219 may be varied in accordance with the weight of this assembly.

Since it is necessary to vary the tension applied to the fabric at different stages in the knitting operation means is provided to vary the counterbalancing effect of arm 201 and this may well take the form of a carriage comprising spaced plates 220 depending on each side of the arm 201 these plates being provided with rollers 221 which engage the upper edge of arm 201 and permit movement of the plates 220 therealong. Depending from plates 220 is a rod 222 which may receive a series of weights 223, these weights being variable in accordance with the downward force required.

The position of plates 220 on the arm 201 is determined by a linkage system comprising a link 224 pivotally attached at 225 to the plates 220 the opposite end of link 224 being pivotally attached at 226 to a bell crank lever 227 pivotally mounted at 228 on bracket 203. Bell crank lever 227 is also connected by means of a link 229 with a rocker arm 230 pivotally mounted at 231 on a bracket 203. The end 232 of rocker arm 230 comprises a cam follower which serves to engage a raised cam 233 and a low cam 234 on the pattern control drum 68. Plates 220 and weights 223 carried thereby are normally urged toward the right as viewed in Fig. 1 by a tension spring 235

attached at one end to the bell crank lever 227 and at the opposite end 236 to an extension of the bracket 203.

As shown in Fig. 18 knitted fabric 75 passes downwardly through the sleeve 14 and the remainder of the tubular structure within the housing 147 and between the tensioning rollers 173 and 191. Assuming the mechanism to be in the position shown in Fig. 18 it will be seen that the entire weight of the assembly within the housing 147 together with the tubular member 169 and the cup 170 will be supported by the fabric 75 held between the rollers 173 and 191. The weight of this assembly is only counterbalanced by the arm 201 and the weights 219 and 223 thereon. The total effect of this counterbalancing action will be dependent on the location of the weights 223. With these weights in the position shown in Fig. 1 substantially the entire weight of the vertically movable assembly within the housing 147 will be exerted on the fabric being knitted while with the weights 223 moved to their extreme left hand position as viewed in Fig. 1 substantially all tension will be removed from the fabric 75 since in this position the arm 201 will exert an upward force through the rollers 209 and 210 on the flange 168 of tubular member 169 to substantially support the entire assembly within the housing 147 thus removing all downward force from the fabric 75.

As knitting progresses the fabric 75 will move downwardly and consequently will permit the assembly within the housing 147 to also move downwardly until such time as the tapered surface 156 of the internal ring gear 155 engages the tapered surface 200 of the ring 198 fixed in the housing 147. Upon such engagement, since the ring gear 155 is rotating, movement of this gear will be stopped by engagement with the surface 200 and since the sleeve 146 which carries the shaft 158 and pinion gear 157 will continue to revolve gear 157 will be rotated by engagement with the teeth on the internal ring gear 155 which is held stationary by engagement with the surface 200 of ring 198. This will result in rotation of the connected shaft and gearing which drives the rollers 173 and 191. Such rotation of these rollers will result in moving the entire assembly upwardly on the fabric being knitted and will thereby maintain tension thereon in accordance with the weights 223 on the arm 201.

Immediately upon movement of the assembly upward the surface 156 of the ring gear 155 will be disengaged from the surface 200 of the ring 198 resulting in stopping of the rotation of pinion gear 157 and rotation of the rollers 173 and 191. This will result in no further upward movement of the assembly until the ring gear 155 again engages the ring 198 to cause the rotation of the pinion gear 157 and rollers 173 and 191. This intermittent engagement and disengagement of the ring gear 155 and ring 198 continues throughout the knitting operation and results in substantially uniform downward tension being applied to the fabric being knitted regardless of the speed of knitting thereof. In the design of the instant machine the speed of rotation of the rollers 173 and 191 is sufficient to move the assembly upwardly at approximately four times the rate of knitting but obviously this proportion could be varied to suit any particular circumstances and the same is given for illustrative purposes only and is not to be considered in any way as limiting the application of the principal described.

As stated above the side bars 186 and 187 which are pivotally mounted at 188 and 189 and carry the roller 191 are movable toward and away from the roller 173 and consequently will accommodate passage of the transfer section of the sock and also the pull top section. Since this is a continuous knitting operation in which the fabric is knitted in one continuous piece such movement is necessary in order to freely pass these portions of the fabric without releasing the grip of the tensioning rollers 173 and 191 thereon since if such fabric is to be perfectly knitted it is imperative that absolute control over the tension thereon be maintained at all times.

In a typical operation and assuming that a pull top section 81 has just been completed and a rib top section is about to be started the end 232 of rocker arm 230 will occupy a position between the end of lower cam 234 and raised cam 233 on pattern drum 68 thus resulting in the weights 223 occupying the position shown in Fig. 1. In this position a maximum downward tension is exerted on the fabric by the rollers 173 and 191 and for certain types of knitting this downward pull will be of the order of four pounds, however this pull may be varied as desired. Such a tension will be maintained throughout the entire rib top knitting operation the engagement and disengagement of ring gear 155 and ring 198 resulting in rotation of the rollers 173 and 191 to move the assembly upward on the fabric as it is being knitted and to maintain the required tension thereon. Upon completion of the rib top 76 the end 232 of the rocker arm 230 will engage the raised cam 233 on the pattern drum 68 resulting in movement of the weights 223 to their extreme left hand position on the arm 201 as viewed in Fig. 1 which will result in counterclockwise movement of the arm 201 and consequent raising of the tube 169 by engagement of the rollers 209 and 210 with the flange 168 and release of substantially all tension on the fabric. The only tension remaining in the fabric will be as a result of the elasticity thereof which is not entirely relieved by this upward movement of the tensioning assembly. This release of tension during the transferring operation permits the formation of the elongated loops 84 and materially contributes to transfer of single loops only from the dial needles to the cylinder needles and therefore results in a perfect transfer.

Upon completion of the transfer operation the end 232 of the rocker arm 230 moves away from the raised cam 233 onto the lower cam 234 resulting in moving the weights 223 to the right as viewed in Fig. 1 and in this position the downward tension exerted by the tension assembly within the housing 147 is of the order of one pound since the weights 223 occupy a position only slightly to the right of their extreme left hand position occupied during the transfer operation. This downward tension is of the order of approximately one pound which is applied throughout the plain knitting operation.

At the completion of the plain knitting operation the end 232 of the rocker arm 230 moves off of the lower cam 234 resulting in movement of the weights 223 to the position shown in Fig. 1 at which time full downward tension of approximately four pounds is applied to the fabric. This tension continues through the formation of the pull top section and as stated above continues during the knitting of the rib top.

The automatic tensioning means above described materially contributes to the production of perfect knitted fabric since as is well known in the art it is necessary to provide a sufficient tension to prevent the dropping of stitches from the needles and also this tension must not be great enough to result in excessive needle breakage. Likewise, as is well known in the art, the tension required for different types of knitting such as rib knit and plain knit is considerably different and the mechanism above described automatically compensates for these different types of knitting and also automatically provides for the release of tension during the transfer operation which is necessary in order to provide a perfect transfer without the possibility of transferring more than one dial stitch loop to a cylinder needle. It is therefore evident that the tensioning mechanism above described materially contributes to the operation of the transfer knitting machine of this invention and constitutes an integral and necessary part thereof.

It has been found that in performing a transfer knitting operation that the quality of the resulting fabric is materially improved by providing mechanism as described above which operates to push the loops previous to the stitch loops carried by the dial needles inwardly immedi-

ately prior to the transferring operation in order to insure that only a single dial stitch loop is transferred to the cylinder needles and likewise in conjunction with this operation it has been found that it is advantageous to provide means to elongate these loops in order to provide more space for the dial needles to pass through. Furthermore, it has been found that the tension applied to the knitted fabric materially influences the transferring operation since if the tension is too great the loops tend to contract and prevent proper passage of the cylinder needles therethrough and mechanism has therefore been provided as described above in order to remove tension from the fabric during the transferring operation. Furthermore, since in a transfer knitting operation it is only practical to knit the fabric as a continuous piece thus necessitating the use of so called pull top sections it has been found that it is necessary to compensate in these pull top sections for the additional material provided by the heel and toe pouches and that the most convenient way of compensating for this additional material is to provide for tapered courses in the pull top section. This has been accomplished by the stitch length control mechanism described above and this mechanism also constitutes a very important part of the instant invention. It will therefore be seen that all of the various mechanisms described above namely the loop pusher mechanism, the stitch length control mechanism and the automatic tension mechanism all contribute to the production of a perfect knitted fabric produced during a transfer knitting operation and as a result of the coordinated operation of all of these operations perfect knitted fabric is obtained thereby.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawing and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. In an automatic transfer knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism comprising an arm pivotally mounted for movement toward and from said dial needles, a loop pusher finger carried by said arm, a stop for limiting movement of said arm and finger toward said dial needles, an adjustable link connecting said arm and a bell crank lever, a push rod connected to said bell crank lever and disposed in the path of movement of a cam on said machine whereby upon engagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of cylinder needles through the loops carried by said dial needles during the transfer operation, resilient means for urging said finger away from said dial needles after completion of a transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

2. In an automatic transfer knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate transfer of such loops to certain of said cylinder needles, loop pushing mechanism comprising an arm pivotally mounted for movement toward and from said dial needles, a loop pusher finger carried by said arm, an adjustable link connecting said arm and a bell crank lever, a push rod connected to said bell crank lever and disposed in the path of movement of a cam on said machine whereby upon en-

gagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, resilient means for urging said finger away from said dial needles after completion of a transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

3. In an automatic transfer knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate transfer of such loops to certain of said cylinder needles, loop pushing mechanism comprising an arm pivotally mounted for movement toward and from said dial needles, a loop pusher finger carried by said arm, an adjustable link connecting said arm and a bell crank lever, a push rod connected to said bell crank lever and disposed in the path of movement of a cam on said machine whereby upon engagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

4. In an automatic transfer knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate transfer of such loops to certain of said cylinder needles, loop pushing mechanism comprising an arm pivotally mounted for movement toward and from said dial needles, a loop pusher finger carried by said arm, linkage means connecting said arm and a push rod disposed in the path of movement of a cam on said machine whereby upon engagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

5. In an automatic transfer knitting machine having cylinder needles and dial needles, loop pushing mechanism comprising an arm pivotally mounted for movement toward and from said dial needles, a loop pusher finger carried by said arm, linkage means connecting said arm and a push rod disposed in the path of movement of a cam on said machine whereby upon engagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

6. In an automatic transfer knitting machine having cylinder needles and dial needles, loop pushing mechanism comprising a finger pivotally mounted for movement toward and from said dial needles, linkage means connecting said finger and a push rod disposed in the path

of movement of a cam on said machine whereby upon engagement of said push rod with said cam said finger will be moved toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

7. In an automatic transfer knitting machine having cylinder needles and dial needles, loop pushing mechanism comprising a finger pivotally mounted for movement toward and from said dial needles, cam means on said machine for moving said finger toward said dial needle to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

8. In an automatic transfer knitting machine having cylinder needles and dial needles, loop pushing mechanism comprising a finger pivotally mounted for movement toward and from said dial needles, means on said machine for moving said finger toward said dial needles to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles, means for applying tension to the knitted fabric during the knitting operation and means for releasing the tension on the fabric during the transfer operation.

9. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, a tension spring for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a gear on said machine, a face cam on said gear having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said face cam or into the path of movement of a second face cam on said gear having a series of high portions of different length whereby upon en-

agement of said cam follower with the low portion of said first face cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first face cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second face cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second face cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

10. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, resilient means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a gear on said machine, a face cam on said gear having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said face cam or into the path of movement of a second face cam on said gear having a series of high portions of different length whereby upon engagement of said cam follower with the low portion of said first face cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first face cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second face cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second face cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

11. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to pro-

vide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, resilient means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a gear on said machine, a first cam on said gear having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said gear having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

12. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, resilient means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a first cam on said machine having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be

formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

13. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a first cam on said machine having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

14. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a lever fixed to a rock shaft, a cam follower secured to said rock shaft, a first cam on said machine having high and low portions, a

belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm one end of which is engageable with said rock shaft to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portions of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

15. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a cam follower, a first cam on said machine having high and low portions, a belt shipper drum on said machine high, and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, a link connecting said rocker arm to a second rocker arm, means operable in response to movement of said second rocker arm to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

16. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam

to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a cam follower, a first cam on said machine having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, a rocker arm one end of which constitutes a cam follower disposed in the path of movement of said high and low cams on said belt shipper drum, means operable in response to movement of said rocker arm to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portion of the hosiery.

17. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising a link connecting said cam and a cam follower, a first cam on said machine having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, means operable by said cams on said belt shipper drum to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

18. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to

a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising means connecting said cam and a cam follower, a first cam on said machine having high and low portions, a belt shipper drum on said machine, high and low cams on said belt shipper drum, means operable by said cams on said belt shipper drum to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

19. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising means connecting said cam and a cam follower, a first cam on said machine having high and low portions, means to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine having a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with the lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

20. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths comprising means connecting said cam and a cam follower, a first cam on said machine having high and low portions, means to move said cam follower into the path of movement of said first cam or into the path of movement of a second cam on said machine hav-

ing a series of high portions of different lengths whereby upon engagement of said cam follower with the low portion of said first cam a slightly elongated stitch will be formed in the course immediately preceding the transfer operation and upon engagement of said cam follower with the high portion of said first cam a relatively longer stitch will be formed to facilitate the transfer operation and whereby upon movement of said cam follower into the path of movement of said second cam a plurality of elongated stitch courses of different lengths will be formed in accordance with lengths of the high portions of said second cam to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

21. An automatic transfer knitting machine as defined in claim 20 in which said first and second cams are concentrically disposed with relation to each other.

22. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having cylinder needles and dial needles, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide a series of tapering courses of elongated stitches in said pull top section comprising a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths whereby a slightly elongated stitch will be formed in the course immediately preceding the transfer operation, a relatively longer stitch will be formed to facilitate the transfer operation and a plurality of elongated stitch courses of different lengths will be formed to provide a tapering pull top section compensating for the extra fabric knitted in the heel and toe portions of the hosiery.

23. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed by stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for urging said cam to a position for forming stitches of normal length, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths and for forming said straight courses, a pattern drum on said machine intermittently rotatable in timed relation to the operation of said machine, an actuating cam on said drum, a cam follower disposed in the path of movement of said actuating cam, a link connecting said follower and a bell crank lever and a link connecting said bell crank lever and said stitch length control cam whereby upon engagement of said follower with said actuating cam said stitch length control cam will be moved downwardly a predetermined distance to form the plain knit leg, heel, foot and toe portions.

24. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed by stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the

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butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different length and for forming said straight courses, a pattern drum on said machine intermittently rotatable in timed relation to the operation of said machine, an actuating cam on said drum, a cam follower disposed in the path of movement of said actuating cam, a link connecting said follower and a bell crank lever and a link connecting said bell crank lever and said stitch length control cam whereby upon engagement of said follower with said actuating cam said stitch length control cam will be moved downwardly a predetermined distance to form the plain knit leg, heel, foot and toe portions.

25. In a automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed by stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths and for forming said straight courses, a pattern drum on said machine intermittently rotatable in timed relation to the operation of said machine, an actuating cam on said drum, a cam follower disposed in the path of movement of said actuating cam, means connecting said follower and said stitch length control cam whereby upon engagement of said follower with said actuating cam said stitch length control cam will be moved downwardly a predetermined distance to form the plain knit leg, heel, foot and toe portions.

26. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed of stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths and for forming said straight courses, a pattern drum on said machine, an actuating cam on said drum, a cam follower disposed in the path of movement of said actuating cam, means connecting said follower and said stitch length control cam whereby upon engagement of said follower with said actuating cam said stitch length control cam will be moved downwardly a predetermined distance to form the plain knit leg, heel, foot and toe portions.

27. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed of stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a

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plurality of positions for forming elongated stitches of different lengths, cam means on said machine, a cam follower disposed in the path of movement of said cam means, means connecting said follower and said stitch length control cam whereby upon engagement of said follower with said cam means said cylinder needles will be moved downwardly a predetermined distance to form said straight courses the operation of said cam means being such that said straight courses will be formed periodically to separate said groups of tapered courses.

28. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, each pull top section comprising a plurality of groups of tapered stitch courses, each course being formed of stitches of varying length, said groups being separated by straight courses formed of stitches of the same length as the shortest stitches in said tapered courses, said knitting machine having cylinder needles and dial needles, a stitch length control cam adjustably mounted adjacent said cylinder needles and engageable with the butts on said cylinder needles to move the same downwardly a predetermined distance in accordance with the position of said cam, means for moving said cam to a plurality of positions for forming elongated stitches of different lengths and additional means on said machine for moving said stitch length control cam whereby said cylinder needles will be moved downwardly a predetermined distance to form said straight courses, the operation of said additional means being such that said straight courses will be formed periodically to separate said groups of tapered courses.

29. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom in concentric relation to said cylinder, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, compression spring means for urging said second roller toward said first roller, adjustable stop means for limiting movement

of said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, a flange adjacent the upper end of said tube and a fabric receiving cup removably attached to the lower end of said tube by a bayonet joint whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a tension spring connected to said bell crank lever and said base frame for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said tension spring to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

30. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom in concentric relation to said cylinder, automatic fabric tensioning means disposed within said

housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second roller towards said first roller, adjustable stop means for limiting movement of said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, a flange adjacent the upper end of said tube and a fabric receiving cup removably attached to the lower end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

31. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear

rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops of certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom in concentric relation to said portion, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second roller towards said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, a flange adjacent the upper end of said tube and a fabric receiving cup removably attached to the lower end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low por-

tions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

32. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, means associated with said dial needles and operable when transferring to spread stitch loops carried by said dial needles to facilitate the transfer of such loops to certain of said cylinder needles, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom in concentric relation to said cylinder, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, and a flange adjacent the upper end of said tube, whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward

force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

33. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom in concentric relation to said cylinder, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a

cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, and a flange adjacent the upper end of said tube, whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

34. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said

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fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

35. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to loops carried by said dial needles inwardly to facilitate the passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections, to compensate for the extra fabric knitted in the heel and toe portion of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second

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sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members; a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, said fabric passing between said rollers and being frictionally engaged thereby, resilient means for urging said second rollers toward said first roller, means for driving said rollers to move said frame said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said roll shafts, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, resilient means for urging said carriage toward the pivotal mounting of said frame, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said resilient means to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

36. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate the passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portion of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic tensioning means disposed within said housing and including a first sleeve fixed to said ring

gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft mounted in said side members, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said roll shafts, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

37. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portion of the hosiery, a tubular

housing mounted in said bed plate and depending therefrom, automatic tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said roll shafts, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

38. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a

tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to re-engage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

39. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, auto-

matic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to re-engage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and a link connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

40. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric ten-

tioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

41. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotat-

able therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a second fabric engaging roller carried by said frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, a clutch ring fixed within said housing and having a tapered frictional surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

42. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said

second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a second fabric engaging roller carried by said frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, a clutch ring fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

43. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a second fabric engaging roller carried by said frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with

said internal ring gear, drive means connecting said pinion gear and said rolls, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, means carried by said yoke and engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

44. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a second fabric engaging roller carried by said frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said

assembly comprising an arm pivotally mounted on said base frame, means on one end of said arm engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight on said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement of said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

45. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a second fabric engaging roller carried by said frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, means on one end of said arm engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight on said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement of said

low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

46. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, loop pushing mechanism operable to push loops previous to the loops carried by said dial needles inwardly to facilitate passage of the cylinder needles through the loops carried by said dial needles during the transfer operation, means for providing elongated stitch loops to be transferred from said dial needles to said cylinder needles and to provide series of tapering courses of elongated stitches in said pull top sections to compensate for the extra fabric knitted in the heel and toe portions of the hosiery, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said ring gear, a first fabric engaging roller rotatably mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said assembly, a pinion gear rotatably mounted in said assembly and meshing with said internal ring gear, drive means connecting said pinion gear and said rolls, means fixed within said housing and engageable with said internal ring gear to provide a clutch, whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, means on one end of said arm engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight on said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

47. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and

including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, compression spring means for urging said second roller toward said first roller, adjustable stop means for limiting movement of said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom, a flange adjacent the upper end of said tube and a fabric receiving cup removably attached to the lower end of said tube by a bayonet joint whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, a tension spring connected to said bell crank lever and said base frame for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame, and means connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position by said tension spring to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

48. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear

rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

49. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam, said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting for said arm to exert

maximum tension on said fabric during a rib knitting operation.

50. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a bell crank lever pivotally mounted on said base frame, a link connecting said carriage and said bell crank lever, means for urging said carriage toward the pivotal mounting of said arm, a cam on said machine having high and low portions, a cam follower pivotally mounted on said base frame and means connecting said cam follower and said bell crank lever whereby upon engagement of said cam follower with said high cam, said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

51. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by

said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

52. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotat-

ably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch, a fabric receiving tube secured to said frame and depending therefrom and a flange adjacent the upper end of said tube whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one end of said arm, rollers carried by said yoke and engaging the lower surface of said flange, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

53. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said ring gear, a first fabric engaging roller rotatably mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said assembly, a pinion gear rotatably mounted in said assembly and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, a yoke on one

end of said arm, means on said yoke engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight suspended from said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

54. In an automatic transfer knitting machine for knitting hosiery separated by pull top sections as a continuous piece of fabric said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a dial disposed over the upper end of said cylinder, dial needles carried by said dial, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said ring gear, a first fabric engaging roller rotatably mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said assembly, a pinion gear rotatably mounted in said assembly and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle, automatically adjustable counterbalancing means for said assembly comprising an arm pivotally mounted on said base frame, means on one end of said arm engaging said assembly, a carriage movable between the opposite end of said arm and the pivotal mounting therefor, a weight on said carriage, means for automatically moving said carriage on said arm comprising a cam on said machine having high and low portions, a cam follower and means connecting said cam follower and said carriage whereby upon engagement of said cam follower with said high cam said carriage will be moved toward the end of said arm to raise said assembly and release tension on said fabric during the transfer operation and upon engagement with said low cam said carriage will be moved to an intermediate position to exert partial tension on said fabric during a plain knitting operation and upon disengagement of said cam follower and said cam said carriage will be moved to a position adjacent said pivotal mounting to exert maximum tension on said fabric during a rib knitting operation.

55. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to

said ring gear and rotatably therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft said fabric passing between said rollers and being frictionally engaged thereby, compression spring means for urging said second roller toward said first roller, adjustable stop means for limiting movement of said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch, a fabric receiving tube secured to said frame and depending therefrom and a fabric receiving cup removably attached to the lower end of said tube whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle.

56. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft, said fabric passing between said rollers and being frictionally engaged thereby, compression spring means for urging said second roller toward said first roller, adjustable stop means for limiting movement of said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring

gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle.

57. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a gear fixed to each end of said first roll shaft outwardly of each side member, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, a gear fixed to one end of said second roll shaft outwardly of one of said side bars and meshing with one of said gears on said first roll shaft said fabric passing between said rollers and being frictionally engaged thereby, means for urging said second roller toward said first roller, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and the other of said gears on said first roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle.

58. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first

sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame comprising spaced side members carried by said second sleeve and depending therefrom, a first fabric engaging roller carried by a first roll shaft rotatably mounted in said side members, a movable frame comprising spaced side bars pivotally mounted on said frame, a second fabric engaging roller carried by a second roll shaft rotatably mounted in said side bars, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said roll shaft, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle.

59. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, the circumferential surface of said internal ring gear being tapered and providing one member of a cone clutch, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, a clutch ring fixed within said housing and having a tapered friction surface complementary to the tapered surface of said internal ring gear to provide the other member of said cone clutch whereby upon engagement of said clutch surfaces said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch surfaces, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch surfaces and repeat the operating cycle.

60. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cyl-

inder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

61. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve fixed to said ring gear and rotatable therewith, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

62. In a knitting machine for knitting fabric in a continuous piece, said knitting machine having a base frame, a bed plate carried by said base frame, a ring gear rotatably supported by said bed plate, a cylinder carried by said ring gear, cylinder needles carried by said cylinder, a tubular housing mounted in said bed plate and depending therefrom, automatic fabric tensioning means disposed within said housing and including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said ring gear, a first fabric engaging roller mounted in said movable

frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said assembly, a pinion gear rotatably mounted in said assembly and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

63. A method of knitting hosiery separated by pull top sections as a continuous piece of fabric in a knitting machine having cylinder needles and dial needles, said method comprising knitting a rib top section by utilizing said cylinder needles and said dial needles while applying tension to said fabric, knitting a course of slightly elongated stitches at the end of said rib top section, knitting a course of substantially elongated stitches, releasing the tension on said fabric, spreading the substantially elongated dial stitches, pushing back the stitch loops previous to said substantially elongated stitches and transferring said substantially elongated stitches from said dial needles to said cylinder needles, knitting a plain knit portion including the heel and toe portions of said hosiery utilizing only said cylinder needles while applying a different degree of tension to said fabric and knitting a pull top section comprising a plurality of series of tapered courses separated by straight courses of elongated stitches of intermediate length by knitting a first course of substantially elongated stitches and elongated stitches of intermediate length, knitting a second course of a less number of substantially elongated stitches and a greater number of intermediate length stitches, knitting a third course of a still less number of substantially elongated stitches and a still greater number of intermediate length stitches and knitting a straight course of intermediate length stitches to complete one series and repeating such operations to provide the required number of series to compensate for the extra fabric knitted in the heel and toe portions of the hosiery.

64. A method of knitting hosiery separated by pull top sections as a continuous piece of fabric in a knitting machine having cylinder needles and dial needles, said method comprising knitting a rib top section by utilizing said cylinder needles and said dial needles while applying tension to said fabric, knitting a course of slightly elongated stitches at the end of said rib top section, knitting a course of substantially elongated stitches, releasing the tension on said fabric, spreading the substantially elongated dial stitches and transferring said substantially elongated stitches from said dial needles to said cylinder needles, knitting a plain knit portion including the heel and toe portions of said hosiery utilizing only said cylinder needles while applying a different degree of tension to said fabric and knitting a pull top section comprising a plurality of series of tapered courses separated by straight courses of elongated stitches of intermediate length by knitting a first course of substantially elongated stitches and elongated stitches of intermediate length, knitting a second course of a less number of substantially elongated stitches and a greater number of intermediate length stitches, knitting a third course of a still less number of substantially elongated stitches and a still greater number of intermediate length stitches, knitting a straight course of intermediate length stitches to complete one series and repeating such operations to provide the required number of series to compensate for the extra fabric knitted in the heel and toe portions of the hosiery.

65. A method of knitting hosiery separated by pull top sections as a continuous piece of fabric in a knitting machine having cylinder needles and dial needles, said method comprising knitting a rib top section by utilizing said cylinder needles and said dial needles, knitting a course of slightly elongated stitches at the end of said rib top section, knitting a course of substantially elongated stitches, spreading the substantially elongated dial stitches and transferring said substantially elongated stitches from said dial needles to said cylinder needles, knitting a plain knit portion including the heel and toe portions of said hosiery utilizing only said cylinder needles and knitting a pull top section comprising a plurality of series of tapered courses separated by straight courses of elongated stitches of intermediate length by knitting a first course of substantially elongated stitches and elongated stitches of intermediate length, knitting a second course of a less number of substantially elongated stitches and a greater number of intermediate length stitches, knitting a third course of a still less number of substantially elongated stitches and a still greater number of intermediate length stitches, knitting a straight course of intermediate length stitches to complete one series and repeating such operations to provide the required number of series to compensate for the extra fabric knitted in the heel and toe portions of the hosiery.

66. A method of knitting hosiery separated by pull top sections as a continuous piece of fabric in a knitting machine having cylinder needles and dial needles, said method comprising knitting a rib top section by utilizing said cylinder needles and said dial needles, knitting a course of slightly elongated stitches at the end of said rib top section, knitting a course of substantially elongated stitches and transferring the substantially elongated dial stitches from said dial needles to said cylinder needles, knitting a plain knit portion including the heel and toe portions of said hosiery utilizing only said cylinder needles and knitting a pull top section comprising a plurality of series of tapered courses separated by straight courses of elongated stitches of intermediate length by knitting a first course of substantially elongated stitches and elongated stitches of intermediate length, knitting a second course of a less number of substantially elongated stitches and a greater number of intermediate length stitches, knitting a third course of a still less number of substantially elongated stitches and a still greater number of intermediate length stitches, knitting a straight course of intermediate length stitches to complete one series and repeating such operations to provide the required number of series to compensate for the extra fabric knitted in the heel and toe portions of the hosiery.

67. In a knitting machine for knitting fabric in a continuous piece, said knitting machine including a tubular housing depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve, means for rotating said sleeve from said machine, a longitudinally extending slot in said sleeve, an assembly comprising a second sleeve slidably received over said first sleeve, a key on said second sleeve slidably disposed in said slot for rotatably driving said second sleeve upon rotation of said first sleeve by said ring gear, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement of said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said

internal ring gear to provide a clutch whereby upon engagement of said clutch, said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

68. In a knitting machine for knitting fabric in a continuous piece, said knitting machine including a tubular housing depending therefrom, automatic fabric tensioning means disposed within said housing and including a first sleeve, means for rotating said sleeve from said machine, an assembly comprising a second sleeve slidably received over said first sleeve, means for rotatably driving said second sleeve upon rotation of said first sleeve, a frame carried by said second sleeve and depending therefrom, a first fabric engaging roller rotatably mounted in said frame, a movable frame pivotally mounted on said frame, a second fabric engaging roller rotatably mounted in said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers for moving said frame, said movable frame and said second sleeve upwardly by reason of the frictional engagement between said rollers and said fabric comprising an internal ring gear rotatably mounted on said second sleeve, a pinion gear rotatably mounted in said second sleeve and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

69. In a knitting machine for knitting fabric in a continuous piece, said knitting machine including a tubular housing depending therefrom, automatic fabric tensioning means disposed within said housing and including an assembly comprising a vertically moving frame, means for rotatably driving said movable frame from said machine, a first fabric engaging roller mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between the rollers and said fabric comprising an internal ring gear rotatably mounted on said assembly, a pinion gear rotatably mounted in said assembly and meshing with said internal ring gear, drive means connecting said pinion gear and said rollers, means fixed within said housing and engageable with said internal ring gear to provide a clutch whereby upon engagement of said clutch said rollers will be rotated to move said assembly upward on said fabric to disengage said clutch, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch and repeat the operating cycle.

70. In a knitting machine for knitting fabric in a continuous piece, said knitting machine including a housing depending therefrom, automatic tensioning means disposed within said housing and including an assembly and comprising a vertically movable frame, means for rotatably driving said movable frame from said machine, a first fabric engaging roller mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said rollers and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers and said fabric comprising said clutch member rotatably

mounted on said assembly, a driving connection between said clutch member and said rollers, a second clutch member within said housing and engageable with said first clutch member to drive said rollers and move said assembly upward on said fabric to disengage said clutch member, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch members and repeat the operating cycle.

71. In a knitting machine for knitting a fabric in a continuous piece, automatic fabric tensioning means including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said machine, a first fabric engaging roller mounted in said movable frame, a second fabric engaging roller carried by said movable frame, said fabric passing between said roller and being frictionally engaged thereby, means for driving said rollers to move said assembly upwardly by reason of the frictional engagement between said rollers, and said fabric comprising a clutch member rotatably mounted on said assembly, a driving connection between said clutch member and said rollers, a second clutch member fixed to said machine and engageable with said first clutch member to drive said rollers and move said assembly upward on said fabric and disengage said clutch members, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage the clutch members and repeat the operating cycle.

72. In a knitting machine for knitting fabric in a continuous piece, automatic fabric tensioning means including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said machine, a fabric engaging roller mounted in said movable frame, said fabric being frictionally engaged by said roller, means for driving said roller to move said assembly upwardly by reason of the frictional engagement between said roller and said fabric comprising a

clutch member rotatably mounted on said assembly, a driving connection between said clutch member and said roller, a second clutch member fixed to said machine and engageable with said first clutch member to drive said roller and move said assembly upward on said fabric to disengage said clutch members, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said clutch members and repeat the operating cycle.

73. In a knitting machine for knitting fabric in a continuous piece, automatic fabric tensioning means including an assembly comprising a vertically movable frame, means for rotatably driving said movable frame from said machine, a fabric engaging roller mounted in said movable frame, said fabric being frictionally engaged by said roller, means for driving said roller to move said assembly upwardly by reason of the frictional engagement between said roller and said fabric comprising disengageable means mounted on said assembly and on said machine and drivingly connected to said roller to move said assembly upward on said fabric to disengage said last named means, the weight of said assembly exerting a downward force on said fabric to tension the same, said assembly moving downward as additional fabric is knitted to reengage said last named means and repeat the operating cycle.

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