

Nov. 7, 1961

C. T. SMITH
STITCH REGULATOR

3,007,325

Filed Aug. 15, 1958

4 Sheets-Sheet 1

FIG. 1

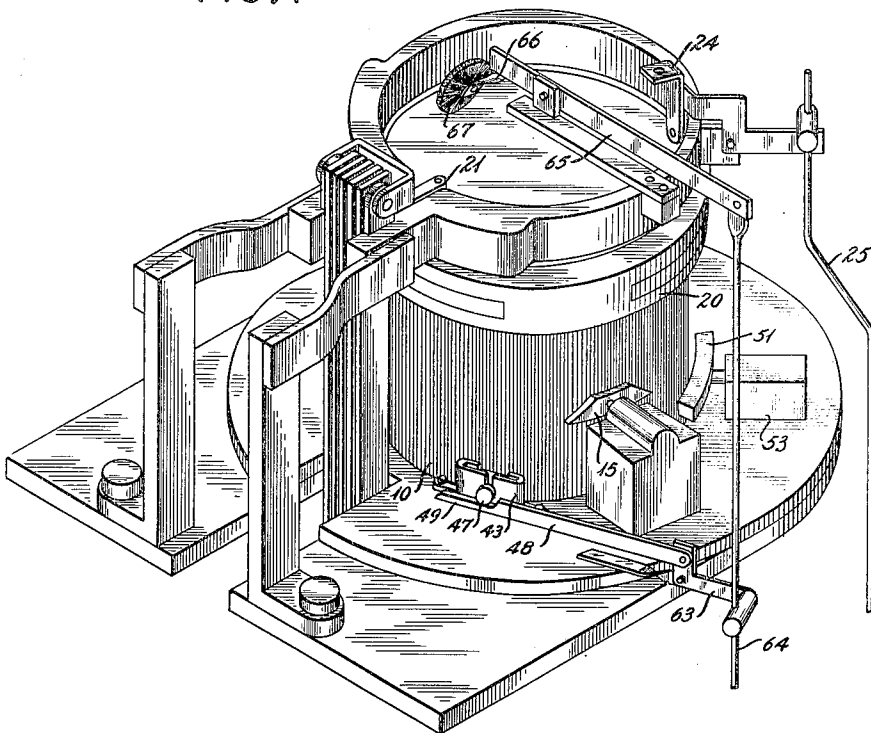


FIG. 6

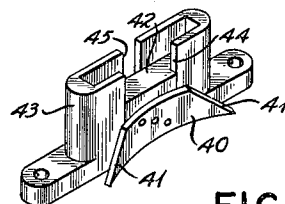
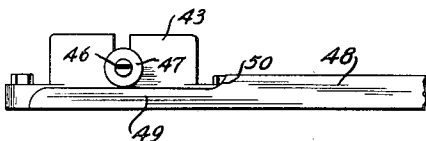


FIG. 7

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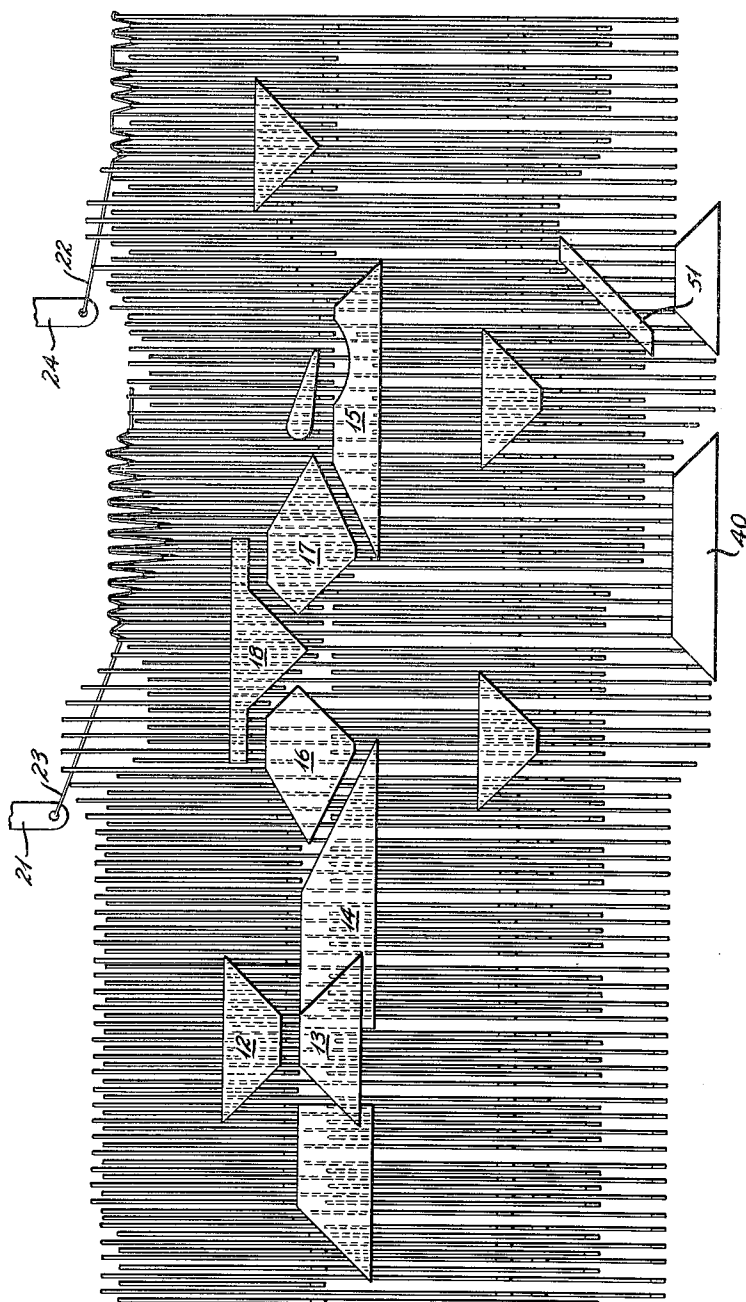


FIG. 2

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FIG. 3

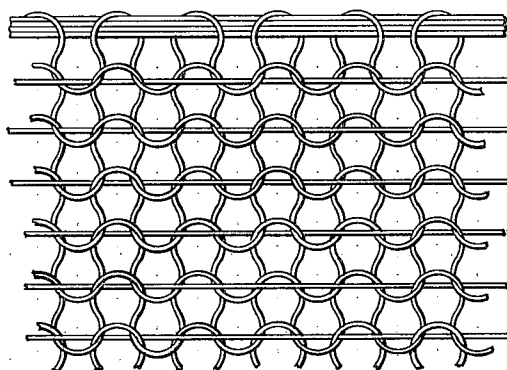
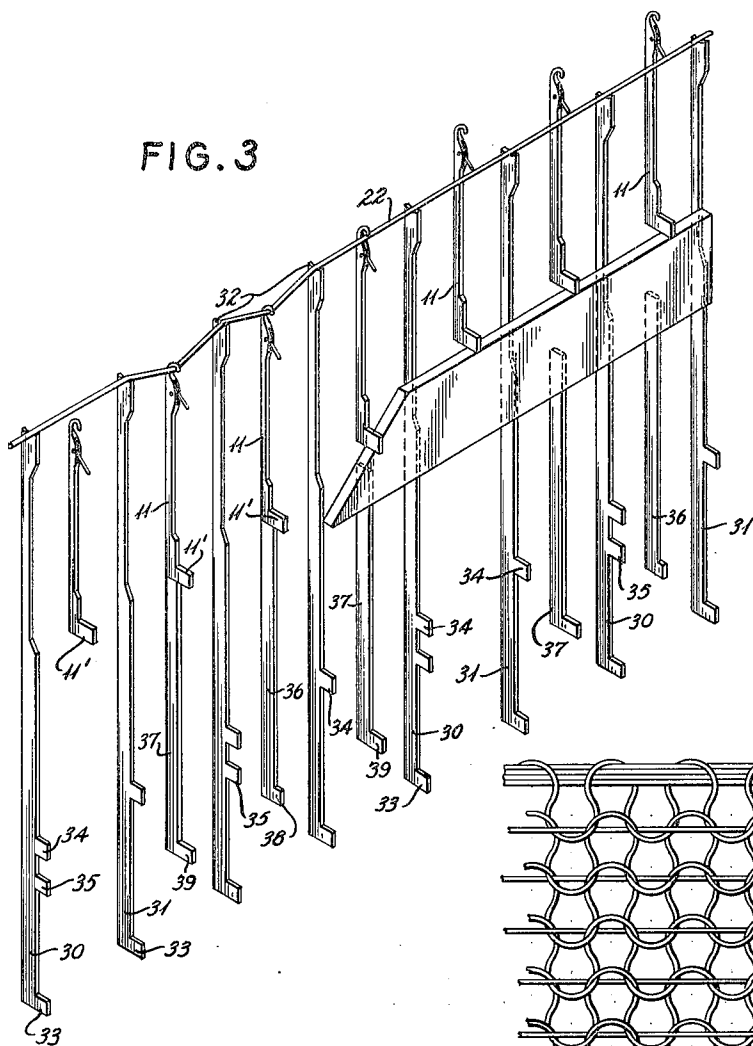


FIG. 4

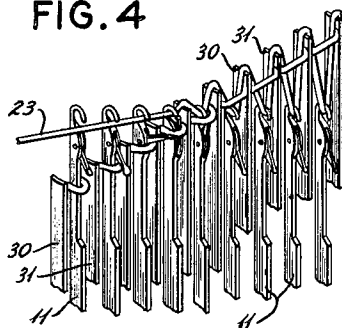


FIG. 5

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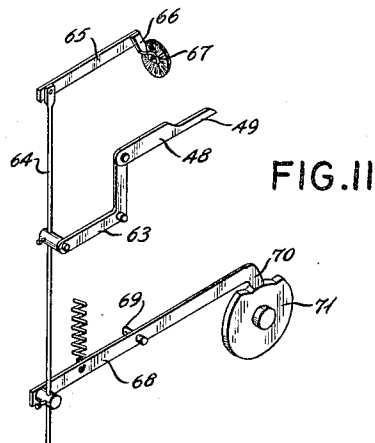
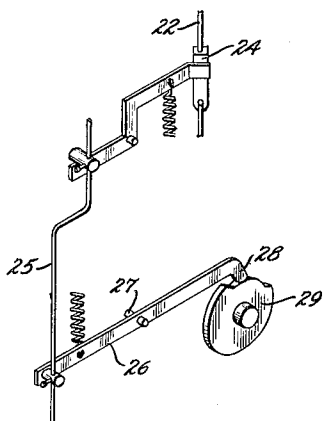
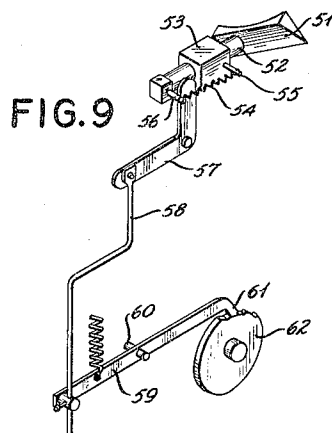
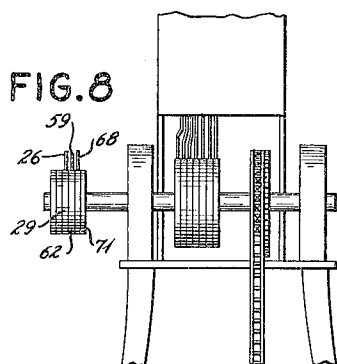


FIG. 10

FIG. 12

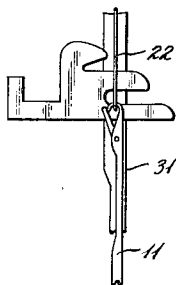
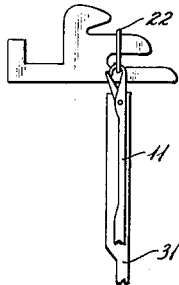


FIG. 13

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3,007,325

STITCH REGULATOR

Charles T. Smith, Nashville, Tenn., assignor, by mesne assignments, to Morpul, Inc., Greensboro, N.C.

Filed Aug. 15, 1958, Ser. No. 755,277

3 Claims. (Cl. 66—90)

This invention relates to the manufacture of commodities of various kinds including the production of knitted fabrics and to the machinery and equipment by which such fabrics are manufactured or produced.

The invention is concerned particularly with circular knitting in which independently operated needles are used, with the amount of stretch of the articles knitted, and with the modification of the knitting processes to provide different looseness or amount of stretch in the knitted articles as well as with the equipment employed in the knitting operations, and most especially with the production of certain types of knitted fabric having a looseness or amount of stretch beyond the capacity of the conventional knitting machine, as the top portion of certain hosiery, and the means for producing the same.

Heretofore in the knitting processes certain difficulties have been encountered resulting in an unsatisfactory end product from the viewpoint of quality and cost of production. In the manufacture of certain types of loosely knit fabric, and certain knitted fabrics using both regular yarn and an elastic yarn where the body yarns are knit over the sinkers and the elastic yarn is laid in on the sinkers as in the conventional knitting machine considerable difficulty has been encountered in producing stitches in the body yarn of the desired looseness. Also difficulty has been experienced in laying the elastic yarn in sufficiently loose.

It is an object of the invention to overcome difficulties on the order of those enumerated and to improve prior practices by providing an easily adjustable stitch regulator whereby the looseness of the body yarn stitches and the looseness of the elastic yarn courses can be easily and simply varied to suit requirements.

Another object of the invention is to provide simple and inexpensive auxiliary mechanism in the form of stitch regulating means associated with knitting by being applied to the cylinder of a knitting machine in a manner to regulate the stitch length of the body yarns and the tension of the elastic yarn courses.

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

FIG. 1 is a perspective of the head of a knitting machine to which the present invention has been applied;

FIG. 2, a layout of the cam and needle arrangement in conjunction with the stitch regulator of the present invention;

FIG. 3, a diagrammatic view illustrating the manner of use of the stitch regulator in conjunction with elastic thread;

FIG. 4, a diagrammatic view illustrating the manner of use of the stitch regulator in conjunction with body yarn;

FIG. 5, a fragmentary diagrammatic view of the knitted product;

FIG. 6, a side elevation of the stitch regulator cam;

FIG. 7, a detailed perspective of the structure of FIG. 6 viewed from the opposite side;

FIG. 8, a fragmentary front elevation of a portion of a knitting machine illustrating the pattern drum, the main drum, and the pattern chain;

FIG. 9, a diagrammatic perspective illustrating the operation of the elastic jack lifting cam;

FIG. 10, a diagrammatic perspective of the operation of the elastic feed finger;

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FIG. 11, a diagrammatic perspective of the operation of the stitch regulator cam;

FIG. 12, a diagrammatic view showing the stitch regulator in inoperative position; and

FIG. 13, a diagrammatic view showing the stitch regulator in operative position.

Briefly stated, the present invention comprises a relatively thin adjustable stitch regulator for each of the independently operated needles of a conventional circular knitting machine employed in the production of hosiery and in which it is desired to incorporate an elastic thread in the knitting process. The stitch regulators which may be mounted in grooves between each of the independently operated needles, have each a concavity in their upper surfaces for engaging the body yarns and/or the elastic yarn and a series of projections or butts along one side of their lower portion adapted to be engaged by cams, which cause the stitch regulators to move vertically to adjust the length of stitch of the body yarns and also adjust the tension in the elastic yarn courses when the needles carrying the thread are depressed below the level of the stitch regulators. The looseness or the amount of stretch of the finished article may be varied by changing the vertical disposition of the stitch regulator raising cams.

With continued reference to the drawings, a knitting machine is provided with a head having a cylinder 10 on which independently operated needles 11 are mounted for knitting seamless socks or the like. The knitting machine head is provided with the usual knitting cams such as switch cams 12 and 13, end cams 14 and 15, front and back stitch cams 16 and 17, center guard cam 18 and widening and narrowing picks used in the knitting of the heel and toe portions. Also the head is provided with a sinker cap 20, a body yarn feed finger 21, and operating arms or levers for the various parts of the machine.

The top of a sock may have an elastic thread 22 interlaced with body yarn 23. The elastic thread 22 is fed through a feed finger 24 pivotally mounted on the head of the machine and is adapted to be moved into and out of operative position by a rod 25 pivotally attached to one end of lever 26 and such lever is supported by a pivot pin 27. The lever also has a downwardly extending finger 28 at its opposite end which engages a cam 29 on the pattern drum.

In order to regulate the stitch length in the body yarns and the tension in the elastic yarn courses a series of long, narrow, substantially flat stitch regulators 30 and 31 are provided mounted in slots in the cylinder 10 with alternate regulators 30 and 31 positioned between alternate needles 11. The regulators 30 and 31 have concavities 32 in their upper surfaces which engage the body yarn 23 and the elastic thread 22. The regulators 30 and 31 are provided with outwardly extending butts 33 at their lower extremities and butts 34 a portion of the way up their lengths. The regulators 30 have an additional butt 35 adjacent to the butt 34 and between the butts 33 and 34.

Some of the needles 11 are provided with long narrow substantially flat jacks 36 and 37. The jacks 36 are provided with outwardly extending short butts 38 at their lower extremities and the jacks 37 are provided with outwardly extending long butts 39 at their lower extremities substantially in the same plane as the short butts 38.

A stitch regulator cam 40 is employed to cause upward movement of the regulators 30 and 31. Such stitch regulator cam, having inclined surfaces 41, is mounted on a slide block 42 vertically slidable in a housing 43. The housing 43 is adapted to have a slot 44 in one side which acts as a guide for the slide block 42 and prevents side movement thereof. The housing 43 has a slot 45 in the

side opposite the slot 44 and through which slot 45 extends a shaft 46 having a roller 47 mounted thereon outside the housing 43. Vertical movement of the slide block 42 and the stitch regulator cam 40 is controlled by a relatively long slide 48 having a reduced end portion 49 and a curved portion 50 connecting the slide 48 and the reduced portion 49. The roller 47 normally engages the upper surfaces of the end portion 49 and in order to raise the stitch regulator cam 40 the slide 48 is moved forwardly which causes the roller 47 to roll upwardly along the curved portion 50 until it rests upon the upper surface of the slide 48. When the stitch regulator cam 40 is raised, the inclined surface 41 will be engaged by the butts 33 of the stitch regulators 30 and 31 and cause upward movement thereof.

An elastic jack lifting cam 51 engages the butts 38 and 39 of the needle jacks and in certain phases of the operation will engage the butts 35 of the stitch regulators 30. The elastic jack lifting cam 51 is mounted on a shaft 52, which is slidable within a housing 53 and normally is urged forwardly by a spring 54 having one end mounted on a pin 55 in the housing 53 and the other end on a pin 56 in the end of the shaft 52. The cam 51 is held in retracted position by a pivotally mounted bell crank 57, the upper end of which is in engagement with the pin 56 and the lower end of which is attached to a rod 58. The lower end of the rod 58 is pivotally attached to one end of lever 59 such lever being supported on a pivot pin 60 and the opposite end being adapted to have a downwardly extending finger 61 engaging a cam 62 on the pattern drum.

The slide 48 is operated by a bell crank 63 pivotally connected to a rod 64 intermediate the ends thereof. The upper end of the rod 64 is connected to one end of a pivoted lever 65 and the opposite end of such lever supports a strip 66 on which is pivotally mounted a revolving circular brush or the like 67. The lower end of the rod 64 is pivotally connected to one end of a lever 68 supported by a pivot pin 69 and has a downwardly extending finger 70 on its opposite end engaged by cam 71 on the pattern drum.

In the production of a sock, the front stitch cam is taken out of operation, and a series of courses of elastic thread are placed in the hooks of the knitting needles. The elastic jack lifting cam 51 is moved radially towards the cylinder sufficiently to engage the jacks 37 with the long butts 39. Also the elastic jack lifting cam engages the butts 35 of the stitch regulators 30 and the elastic feed finger 24 is moved into operative position. The elastic jack lifting cam 51 causes elevation of alternate needles which engage the elastic thread 22 stressed by stitch regulators 30 also actuated by the elastic jack lifting cam.

After the desired number of courses of elastic thread are placed in the needles, the front stitch cam is returned to operative position, and the body yarn feed finger 21 and stitch regulator cam 40 are moved into operative position. The body yarn is then looped over the elastic threads which are on the needles and a portion of the sock is knitted in which the body yarn is engaged by each of the needles, the elastic thread is engaged by alternate needles and both body yarn and elastic thread are knit over the top of the stitch regulators instead of conventional sinkers.

After the desired number of courses are made in this manner, the elastic jack lifting cam 51 is moved as far as possible toward the center of the cylinder and the remainder of the top of the sock is knitted. Each of the needles 11 engages the body yarn to knit over the tops of the stitch regulators and part of the needles engage the elastic thread and part of them do not engage such elastic threads. The elastic threads do not form part of the knitted loops but are merely laid in behind some of the loops of body yarn.

Half of the needles are adapted to be raised by the

jacks 37, half of the remaining needles are adapted to be raised by jacks 36, and the remaining fourth of the needles do not have jacks. Outwardly extending needle butts 11' on each of the needles 11 are engaged by the conventional switch cams 12 and 13, end cams 14 and 15, front and back stitch cams 16 and 17, and center guard cams 18 to perform the knitting operation of the body yarn.

In order to lay in the elastic thread in the main portion of the top of the sock, three needles 11 of each group of four needles are provided with jacks 36 and 37 and the fourth needle 11 does not have a jack, thus three needles of every four will be raised to engage the elastic thread 22 and the fourth needle will pass under such elastic thread. When the needles are again raised the elastic thread will be removed from the needles and the needles will engage the body yarn to form the loops. In this loop forming operation three of the needles will be behind the elastic thread and the fourth needle, which did not engage the elastic thread, will be in front of such thread in forming the body yarn loop. In this manner the elastic thread is placed behind every fourth stitch. The spacing of the elastic thread with relation to the body yarn may be varied merely by the addition or removal of the jacks 36 and 37.

The length of the body yarn stitches may be varied by raising the stitch regulator cam 40 to a lesser or greater height, and the tension on the elastic yarn courses may be varied by adjusting the height of stitch regulator cam 51.

During the knitting operation of this top portion of a sock the body yarns are knit over the tops of the stitch regulators, the conventional sinkers serving only to hold down the knitted material while the needles are being raised. After completion of this top portion of the sock the stitch regulators are lowered to an inoperative position and knitting is over the sinkers in the conventional manner during the remaining portion of the sock.

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 illustrated in the drawings and described in the specification, but only as indicated in the accompanying claims.

What is claimed is:

1. A circular knitting machine for knitting hosiery in which elastic thread is incorporated in at least a portion thereof and having separate body yarn and elastic thread feeds, comprising a cylinder, a plurality of independently operable needles mounted on said cylinder, knitting cams spaced about said cylinder to axially reciprocate said needles, a stitch regulator mounted on said cylinder adjacent each of said needles, cam means for causing said stitch regulators to move axially and engage the body yarn of said hosiery and control the length of the stitch formed therewith, separate cam means for causing said stitch regulators to move axially and engage said elastic thread to control the tension thereof, said stitch regulator comprising a long narrow substantially flat member having a concavity in its upper surface to engage said body yarn and said elastic thread and having outwardly extending butts at its lower extremities for engaging said cam means to cause axial movement of said stitch regulators.

2. The combination of a circular knitting machine for knitting hosiery in which elastic thread is incorporated in at least a portion thereof and having separate body yarn and elastic thread feeds, said machine having a cylinder and a plurality of independently operable knitting needles mounted thereon and a long narrow substantially flat stitch regulator adjacent each of the knitting needles, each of said stitch regulators having a concavity in its upper surface to engage said body yarn and said elastic thread and adapted to cooperate with said needles to govern the

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length of the stitch of the body yarn and to govern the tension of said elastic thread.

3. A circular knitting machine for knitting hosiery in which elastic thread is incorporated in at least a portion thereof comprising a cylinder, a plurality of independently operated needles axially reciprocable on said cylinder, knitting cams spaced about said cylinder to reciprocate said needles, a series of long narrow substantially flat stitch regulators having concavities in their upper surfaces associated with said needles, separate cam means to operate said regulators in conjunction with said needles to control the length of the stitch formed by the body yarn and to control the tension of the elastic thread.

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