

May 28, 1929.

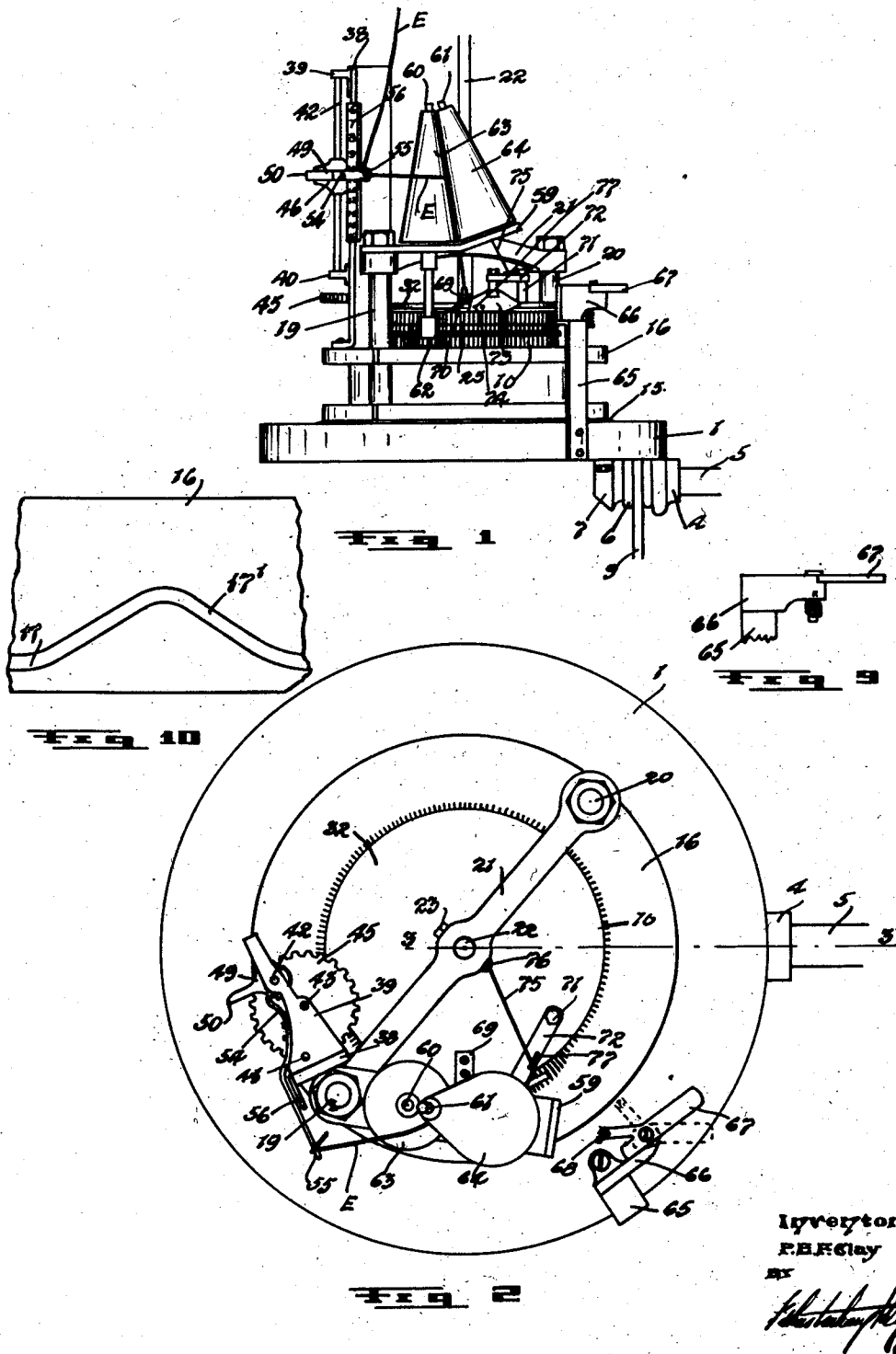
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1,715,224

MACHINE FOR MAKING SURGICAL ELASTIC GARMENTS

Filed Nov. 11, 1926

3 Sheets-Sheet 1



May 28, 1929.

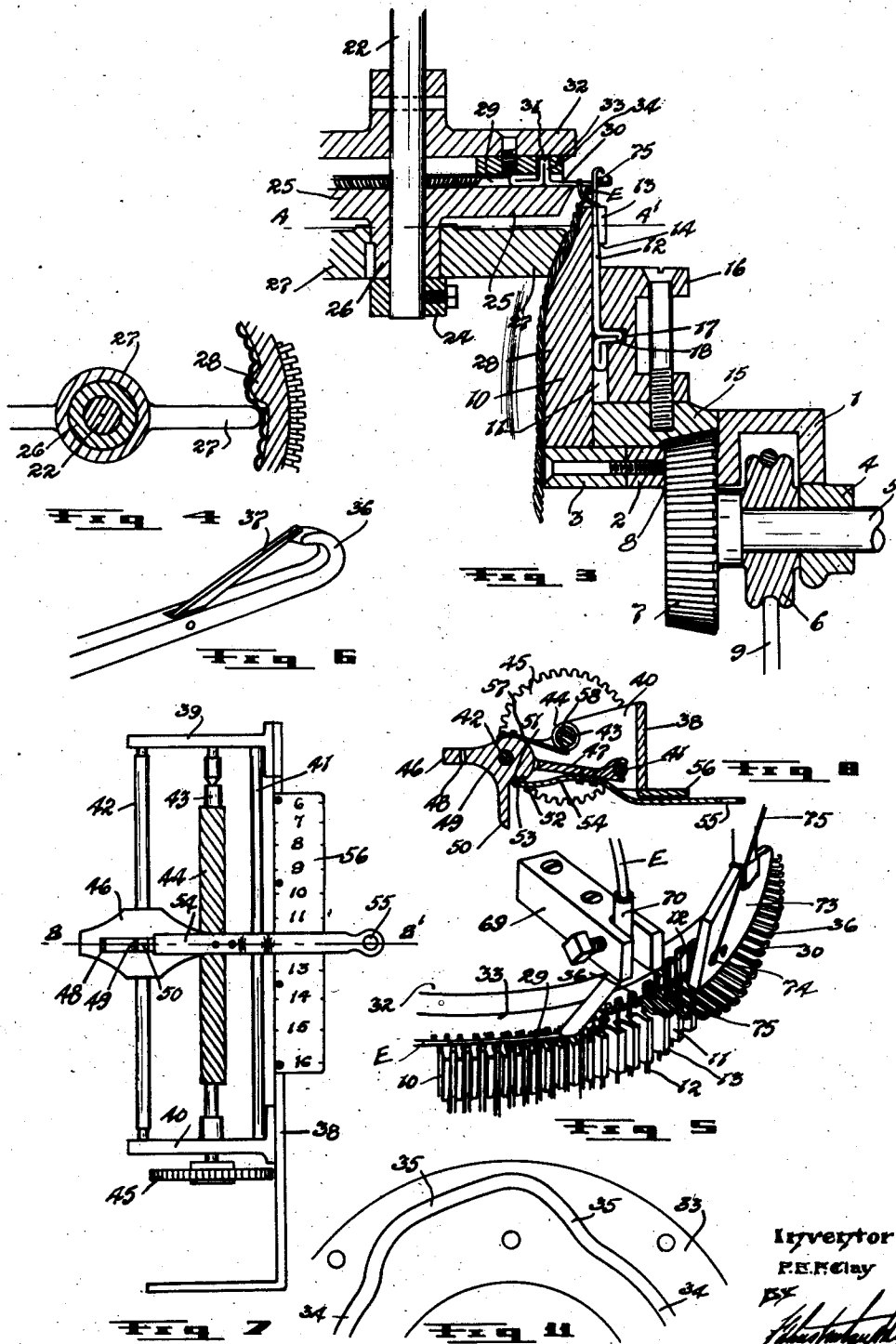
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3 Sheets-Sheet 3

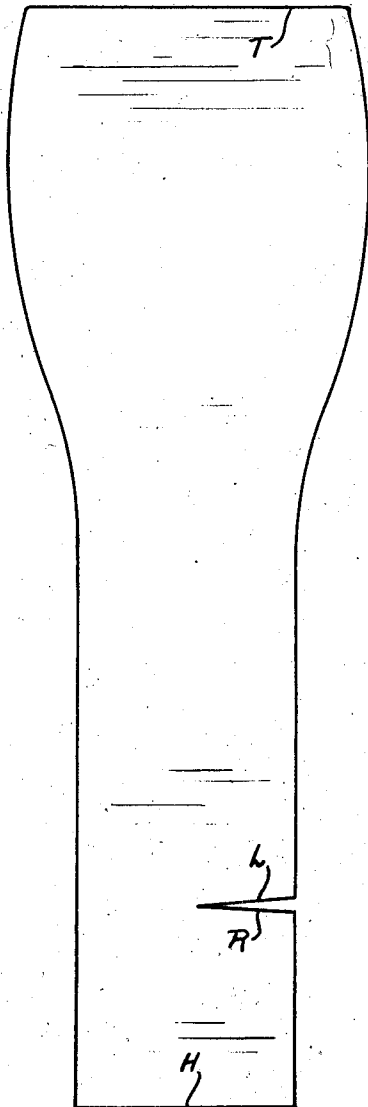


Fig. 12

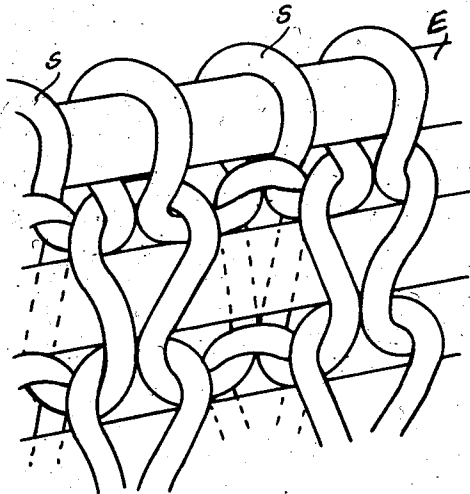


Fig. 13

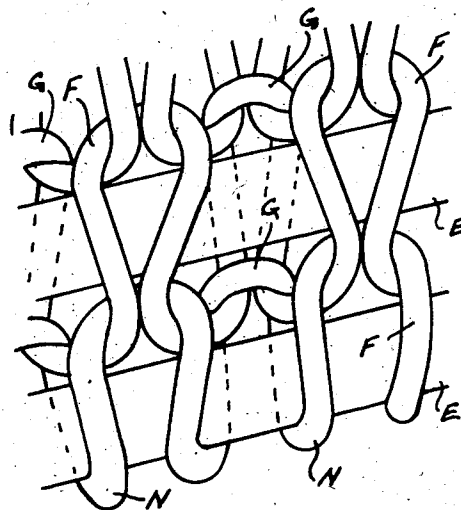


Fig. 14

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING SURGICAL ELASTIC GARMENTS.

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The invention relates to improvements in surgical elastic garments and method of making the same and an object of the invention is to provide a garment knitted in such a manner that the points of the garment most susceptible to wear cannot unravel when the stitching at such points becomes cut or worn through and such that upon the cut or worn stitches being removed, a finished edge remains identical to the original edge formed.

A further object of the invention is to provide means for regulating the tension of the elastic thread fed to the machine.

A further object of the invention is to construct the latter appliance in a simple, durable and inexpensive manner and such that it can be readily mounted on the machine and further to construct such device so that it can be set to automatically and gradually decrease the tension of the elastic thread being fed to the machine.

A further object is to construct the latter device so that it can be hand regulated if desired and also such that it can be set to maintain a fixed tension in the elastic thread for a definite period as desired by the operator.

A further and more specific object is to provide in a machine for knitting an elastic stocking, a stitch arrangement which permits the lower end of the stocking and the upper side of the heel slit of the stocking to be knit so that they will not unravel upon the stitches at such points becoming cut or worn through and such that when the worn stitches at such points are removed, a finished edge is again presented.

With the above more important and other minor objects in view, which will become more apparent as the description proceeds, the invention consists essentially in the arrangement and construction of parts hereinafter more particularly described, reference being had to the accompanying drawing, in which:—

Fig. 1 is a side view of a knitting machine embodying my invention.

Fig. 2 is an enlarged detailed plan view of the parts appearing in Figure 1.

Fig. 3 is a vertical sectional view at 3—3' Figure 2.

Fig. 4 is a horizontal sectional view at 4—4' Figure 3.

Fig. 5 is a perspective view showing the arrangement of the needles and adjacent parts in the location where the knitting is done.

Fig. 6 is a perspective view of one end of one of the needles.

Fig. 7 is an enlarged detailed face view of the device controlling the elastic thread.

Fig. 8 is a horizontal sectional view at 8—8' Figure 7.

Fig. 9 is a side view of the upper end of the trip device.

Fig. 10 is a face view showing the offset in the lower cam groove.

Fig. 11 is an inverted plan view of the upper cam showing the offset in the groove thereof.

Fig. 12 is a side view of a surgical elastic stocking knitted by the machine.

Fig. 13 is a perspective view showing the arrangement of the loops and the elastic thread as they appear at the upper end of the stocking and also at the under side of the heel slit formed in the stocking.

Fig. 14 is a perspective view showing the arrangement of the loops and the elastic thread as they appear at the lower end of the stocking and at the upper side of the heel slit.

In the drawings like characters of reference indicate corresponding parts in the several figures.

The general arrangement of the upper parts of the knitting machine herein shown is of ordinary construction with the exception that I provide more knitting needles and a special device for regulating the tension of the elastic thread and a trip for actuating the latter device when desired. I have not considered it necessary to enter into a detailed description of the machine structure as such machines are well known to those familiar with the art and accordingly have limited my description and drawings to the particular parts of the machine with which my invention is concerned.

The bed 1 of the knitting machine is in the form of an annular ring provided with an inwardly extending continuous flange 2, the bed being stationary and suitably supported in any desired manner. To the flange 2, an annular ring 3 is permanently fastened. The bed carries a bearing 4 for a driving shaft 5 which is fitted with a driving pulley 6 and a bevel gear 7, the bevel gear having the upper side thereof passing through a suitable slot 8 provided in the flange 2. The pulley is driven by an applied belt 9 from a suitable source of power.

The ring 3 carries a stationary vertically disposed annular needle guide 10 which is

provided on the outer face with a plurality of equi-spaced vertically disposed channels or grooves 11 in which the vertical needles 12 are slidably mounted. The ribs 13 between the channels are cross slotted to form a circumscribing horizontally disposed continuous channel 14, the purpose of which will be later described.

On the lower end of the needle guide I mount rotatably an annular gear 15 which meshes continuously with the bevel gear 7 and which is supported by the underlying flange 2 and ring 3. A cam ring 16 is permanently bolted to the gear 15 and encompasses the needle guide and is provided on the side next the needle guide with a cam groove 17 which receives a guide finger 18 extending outwardly from and formed as an integral part of each needle. The groove 17 is for the greater part in the horizontal plane but it is provided at the front side of the machine with an offset portion 17' (see Figure 10) adapted to successively lift and lower the needles as they are turned with the needle guide.

Diametrically opposing posts 19 and 20 extend upwardly from the cam ring and are permanently secured thereto and the upper ends of the posts carry a cross bar 21. A vertically disposed shaft 22 extends downwardly centrally through the cross bar, being fastened thereto by a jam screw 23 (see Figure 2) and has the lower end terminating centrally within the needle guide. A collar 24 is secured to the lower end of the shaft 22 and on the shaft above the collar I mount rotatably a disc 25 forming a horizontally disposed needle guide and here it will be observed that the upper face of the disc is contained in a horizontal plane positioned slightly above the horizontal plane containing the upper end of the needle guide 10.

To the hub 26 of the disc I permanently secure a cross bar 27 and the ends of the cross bar terminate immediately to the side of similar vertical ribs 28 formed on the inner side of the needle guide 10. As before explained, the needle guide 10 is stationary and as the shaft 22 is turned in a counter clockwise direction, the ribs of the needle guide 10 contacting with the ends of the arm prevent the rotation in a counter clockwise direction of the horizontal needle guide 25.

The horizontal needle guide is provided with a plurality of radially disposed equi-spaced slots 29 on its upper face and in these slots a plurality of horizontally disposed needles 30 are slidably mounted, these needles being similar to the former needles but having considerably shorter shanks as best shown in Figure 3 and being provided also with upstanding fingers 31. A disc 32 overlies the horizontal needle guide and is permanent-

ly fastened to the shaft 22 and to the under side of said latter disc, I secure the horizontally disposed needle cam 33 which is provided with a cam groove 34 which receives the upstanding fingers 31 of all the horizontal needles. The cam groove 34 is provided at the front side of the machine with an offset portion 35 (see Figure 11). The needles in all cases have their exposed ends provided with a hook 36 and with a pivoted latch 37, the free end of which lies on the outer tip of the hook (see Figure 6). In knitting machines of this type as now on the market, the horizontal and vertical sets of needles are arranged in a two to one ratio and when such machines are in operation with two vertical needles to one horizontal needle. The stitch is undesirable for the reason that when a garment is knitted with such a stitch, it will unravel from either end of the garment. This arrangement is obviously very undesirable at points in the garment where it is subjected to hard wear or usage which in the stocking shown is at the lower end H and at the upper side L of the heel 90 slit.

In a machine as constructed by me, I employ the same number of horizontal and vertical needles and the needles are alternated in the manner best shown in Figure 5. With the needles arranged in the latter manner, the stitch formed is as shown in Figure 14 where it will be observed that there is a series of loops F at one side of the elastic thread E which loops are alternated with a series of loops G at the opposite side of the elastic thread E. With such an arrangement of loops which is only possible by having the same number of vertical and horizontal needles in the machine, there is a distinct advantage as the stocking can be knitted so that the lower end H thereof and the upper side L of the heel opening terminate in the stitch as shown in the lower part of Figure 14.

As the lower end H of the stocking and the upper side L of the heel opening are the parts which take the most wear and are most liable to be broken, it is desirable that the stitches at these points be of such a nature that they will not unravel if they become cut or broken and such is the case with the stitching arranged as it appears in Figure 14 where it will be observed that the lowermost loops could be cut or worn off at the points N without permitting the remaining upper part of the stocking to unravel. Obviously if these lower loops were cut, they could be pulled out and the then remaining loops would not unravel and will still retain the elastic thread passing through.

The arrangement of the stitches at the lower side R of the heel opening and at the upper end T, and in accordance with my arrangement, is as shown in Figure 13 where it

will be observed that the terminating loops at the points R and T mentioned are all gathered on the passing elastic thread. As the point R is under the arch of the foot when the stocking is worn and the point T is above the calf, there is very little possibility of the loops becoming worn or cut and accordingly the possibility of the stocking fraying at these points is practically negligible. The advantage accordingly of this type of stitch in an elastic garment of this kind is quite a feature as it provides a garment which can have the points of greatest wear presenting a stitch which will not unravel in the event of the terminating series of stitches being worn through or cut.

As the manner in which the needles of a machine of this kind operate to form stitches and the manner in which the elastic thread is woven into the stitches is well known to those familiar with this type of machine, I have not considered it necessary to give a description of the actual knitting operation.

In the making of elastic garments such as stockings, it is desirable to vary the tension of the elastic thread in order to shape the garment. Obviously if the rate at which the elastic thread is fed into the machine is varied, the thread will be brought into tension or slackened off and such will effect the shape of the garment being knitted. I have provided an attachment on the machine for this purpose and such is now described.

On the cam ring 16 I mount a vertically extending standard 38 which is provided with upper and lower brackets 39 and 40, the brackets carrying inner and outer guide rods 41 and 42 and a rotatably mounted spindle 43. The spindle is provided with a worm 44 and has the lower end thereof extending through the bracket 40 and fitted with a gear wheel 45.

On the guide rod 42 I mount slidably a head 46 which is fitted with an extending arm 47, the free end of the arm being forked and slidably receiving the guide rod 41. The head is transversely slotted as indicated at 48 and in the slot I place a latch 49 rotatably mounted on the rod 42. The latch presents an outstanding arm 50 and two notches 51 and 52 at the base of the arm and these notches are adapted to be engaged by a tit or catch 53 located at one end of a spring bar 54 permanently riveted to the arm 47. The other end of the spring bar extends horizontally in front of the standard 38 and terminates in an eye 55. A gauge plate 56 is attached to the front edge of the standard and is provided with a scale having numbers indicating the varying circumferences of a garment or stocking to be knitted in the machine. A spring 57 is secured permanently to the inner side of the latch and is provided with a tit 58 which engages with the worm 44.

According to the arrangement shown, the

tit 58 will be held in engagement with the worm when the tit 53 is in the notch 51 and the head 46 and parts associated therewith will be caused to move up or down as desired at which time, the eye carrying end of the bar 54 acts as an indicator operating over the scale 56. It will be apparent that if the arm 50 be turned in a direction such that the tit 53 enters the notch 52, the bar 57 will be rotated in a direction which will clear the tit 58 from the worm and thereby permit the head and parts associated therewith to move freely down.

To the upper end of the post 19 I secure a transversely extending arm 59 which has the outer end thereof upwardly deflected. The bar carries two upwardly converging spindles 60 and 61, the spindle 61 being permanently secured to the upwardly deflected end of the bar and the spindle 60 being rotatably carried by the bar and having the lower end thereof fitted with a gear wheel 62 which is adapted to engage with the shanks of the needles 12 at the point 14 hereinbefore mentioned. As the vertical needles are all equi-spaced, they form a convenient drive for the gear wheel 62. To the spindle 60 I secure a cone 63 and on the spindle 61 I rotatably mount a cone 64 and as the cone 63 is driven, the cone 64 is rotated thereby.

To the bed 1 of the machine I secure an upstanding standard 65 which supports a bracket 66 and the bracket carries pivotally a trip 67 which is fitted with a vertically disposed pin 68. The trip is shown in full outline in Figure 2 in non-operating position, that is, in a position such that the pin 68 will not engage with the gear wheel 45 when the machine is in operation. When the trip is thrown to the position shown in dotted outline in Figure 2, the pin is adapted to engage the gear wheel 45 and accordingly the gear wheel is rotated one tooth displacement for each revolution of the machine, such resulting in the turning of the worm and the gradual moving down of the head 46 and parts associated therewith.

To the disc 32 I secure a forked block 69 and in the fork of the block I mount a tube 70 which leads downwardly to the needles. The elastic thread E which is fed into the machine passes first through the eye 55, then between the cones 63 and 64 and then downwardly through the tube 70 to the needles where it is incorporated between the stitches of the stocking. To the disc 33 I secure also a post 71 which carries a horizontally disposed arm 72 and the free end of the arm supports a vertically disposed plate 73 positioned in the manner best shown in Figure 5. The plate is supplied with an opening or hole 74 and the stitch forming thread 75 which provides the series of loops F and G hereinbefore mentioned is passed downwardly through an eye 76 attached to the cross bar

21, then outwardly through an eye 77 secured to the bar 72 and then downwardly through the hole 74 where it is fed to the needles.

When a garment such as an elastic stocking is being knitted on this machine, the lower or small end of the stocking is knit first and one accordingly sets the head in its upper position on the guide rods so that the elastic thread will be fed to the machine between the upper ends of the cones. The setting is gauged by reference to the gauge plate 56 on which the varying circumferences of the stockings are indicated. As the lower end of the stocking does not vary in circumference for a considerable length, one will throw the trip 67 to the non-operating position with the result that the head 46 will remain in its initial set position which is such that the elastic thread is fed through between the upper ends of the cones. The feeding of the thread between the upper ends of the cones is comparatively slow due to the comparatively small diameter of these cones at such point and consequently the elastic thread will be in considerable tension between the cones and the needles which results in the knitted part of the stocking contracting to a comparatively small circumference in the open area of the machine within the needle guide 10.

The upper part of the stocking is gradually enlarged to accommodate the calf of the leg and this gradual enlarging is effected by swinging the trip 67 into a position such that it will engage the arm 50 once each revolution of the machine. This results in the head 46 being fed by the worm gradually downwardly and as the head moves down, the elastic thread is fed quicker to the machine with the result that there is less tension developed between the cones and the needles than formerly. If it is desired to decrease the circumference of the upper end of the stocking to be knitted, this is done by hand manipulation and at such time, one throws the trip 67 into the non-operating position and then turns the gear wheel 45 in a direction which will raise the eye 55 gradually.

From the above description, it will be apparent that I can provide an elastic garment which has exceptional wearing qualities as it will not unravel when the stitches are cut or worn through at the points where the garment is subjected to greatest wear and further that I provide a simple and positive appliance for feeding the elastic thread into the machine and in a manner such that its tension can be readily varied to control the circumference of the garment at varying points as the same is being knit.

What I claim as my invention is:—

1. In a machine for knitting a garment having an elastic thread therein and embodying a rotary head, a pair of upstanding contacting cones carried by and rotating with the head

and between which the elastic thread is fed to the machine, means for driving one of the cones as the head rotates, a rotatably mounted worm shaft carried by the head and positioned parallel to the contacting sides of the cones, a member mounted to slide parallel to the worm shaft and carrying a guide through which the elastic thread is fed to the cones, means for selectively connecting the sliding member to the worm shaft to cause the said member to be shifted in the turning of the worm shaft and means for rotating the worm shaft intermittently as the head rotates.

2. In a machine for knitting a garment having an elastic thread therein and embodying a rotary head, a pair of upstanding contacting cones carried by and rotating with the head and between which the elastic thread is fed to the machine, means for driving one of the cones as the head rotates, a rotatably mounted worm shaft carried by the head and positioned parallel to the contacting sides of the cones, a suitably supported stationary spindle parallel to the worm shaft, a head slidably mounted on the spindle, said head carrying an eye receiving the elastic thread feeding to the cones, means for selectively coupling the head to the worm shaft to cause the coupled head to shift endwise on the spindle in the rotation of the worm shaft and means for intermittently rotating the worm shaft.

3. In a machine for knitting a garment having an elastic thread therein and embodying a rotary head, a pair of upstanding contacting cones carried by and rotating with the head and between which the elastic thread is fed to the machine, means for driving one of the cones as the head rotates, a rotatably mounted worm shaft carried by the head and positioned parallel to the contacting sides of the cones, a suitably supported stationary spindle parallel to the worm shaft, a head slidably mounted on the spindle, said head carrying an eye receiving the elastic thread feeding to the cones, means for selectively coupling the head to the worm shaft to cause the coupled head to shift endwise on the spindle in the rotation of the worm shaft, a gear wheel connected to the worm shaft and an adjustable striker engageable with the gear wheel and adapted to turn the gear wheel each revolution of the machine.

4. In a machine for knitting a garment having an elastic thread therein and embodying a rotary head, a pair of upstanding contacting cones carried by and rotating with the head and between which the elastic thread is fed to the machine, means for driving one of the cones as the head rotates, a rotatably mounted worm shaft carried by the head and positioned parallel to the contacting sides of the cones, a pair of suitably mounted stationary spindles spaced from and parallel to the worm shaft, a transversely slotted head

slidably mounted on one of the spindles, an arm extending from the head and slidably engaging the other of the spindles, a latch located in the slot and rotatably mounted on the former spindle, means for locking the latch in two adjusted positions, a member carried by the latch and adapted to be engaged with or clear of the worm shaft depending on the adjustment given the latch, a guide member carried by the sliding head 10 and through which the elastic thread is fed to the cones, a gear wheel secured to the worm shaft and an adjustable striker engageable with the gear wheel and adapted to turn the same once each revolution of the rotary head. 15

Signed at Winnipeg, this 21st day of October, 1926.

PHILIP E. F. CLAY.