July 4, 1939. L. SPORDICK 2,165,077

KNITTING MACHINE

Filed July 12, 1938 3 Sheets-Sheet 1

Fig. 1.

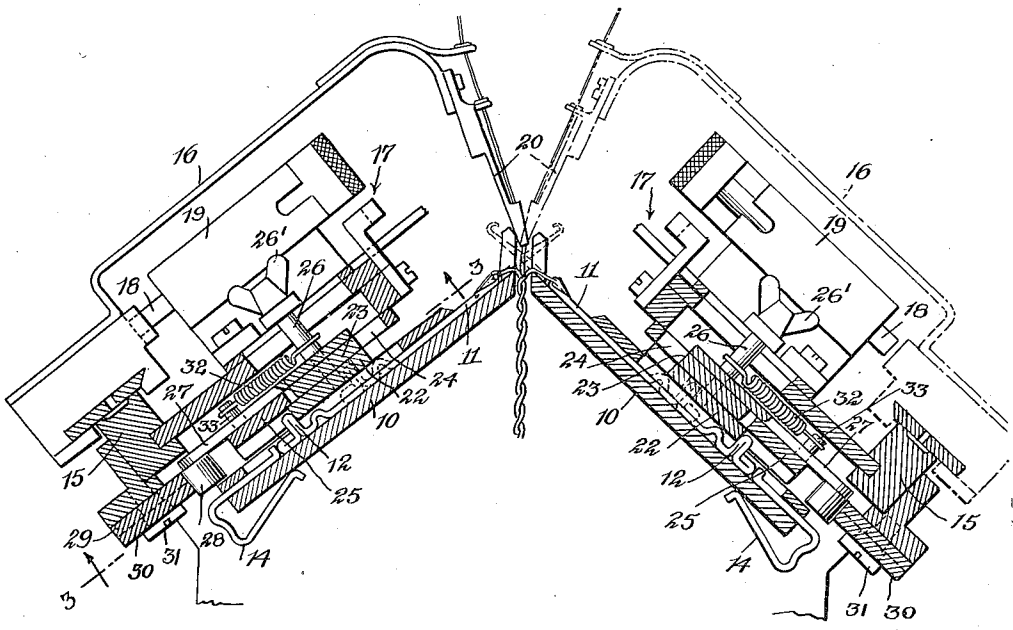


Fig. 2.

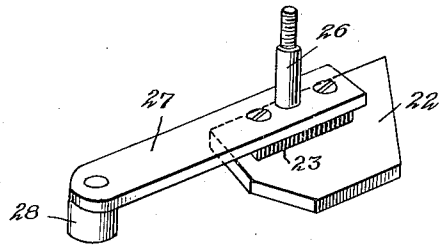
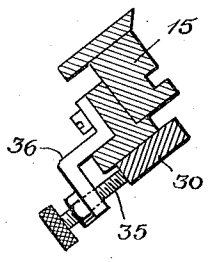


Fig. 4.a



WITNESSES

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KNITTING MACHINE

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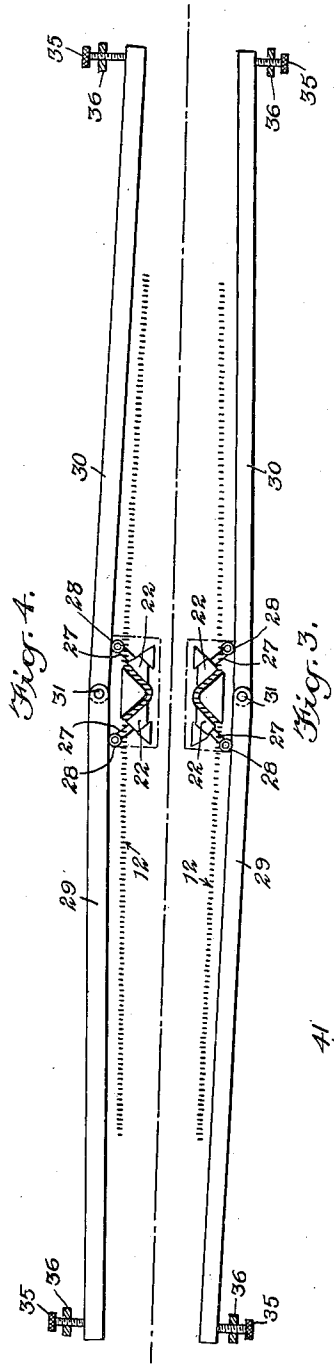


Fig. 4.

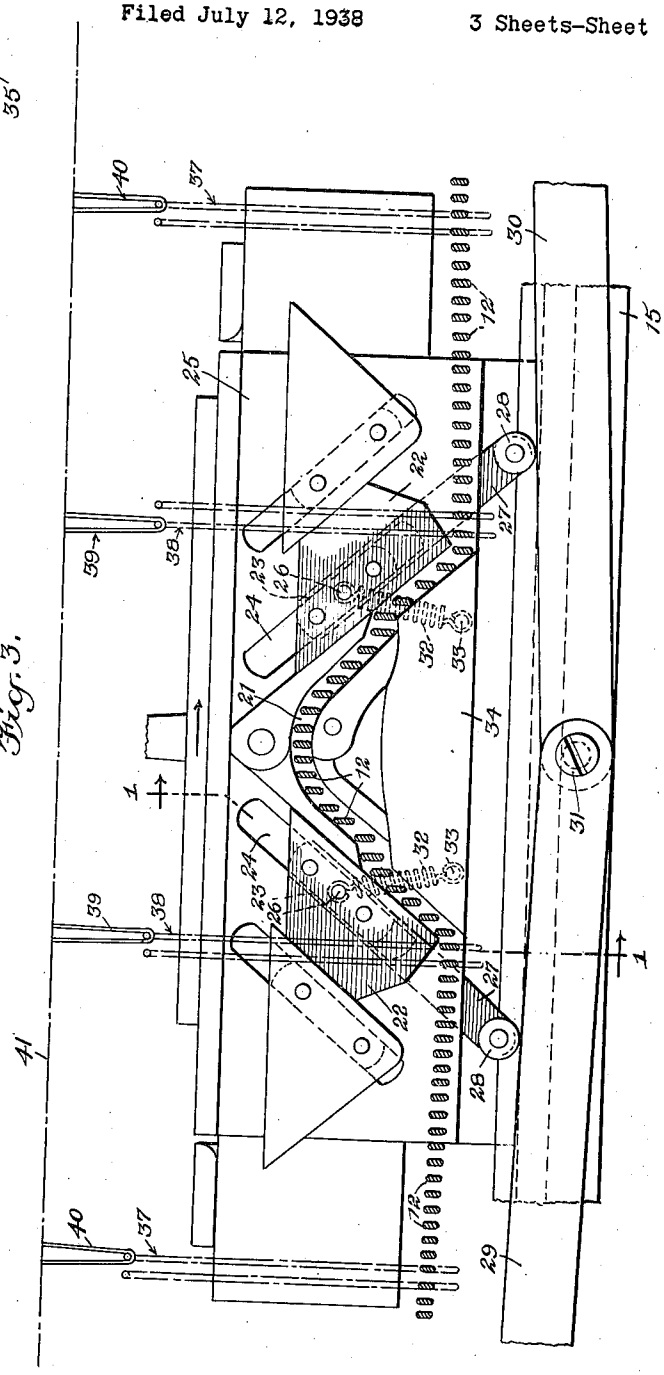


Fig. 3.

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KNITTING MACHINE

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Fig. 5.

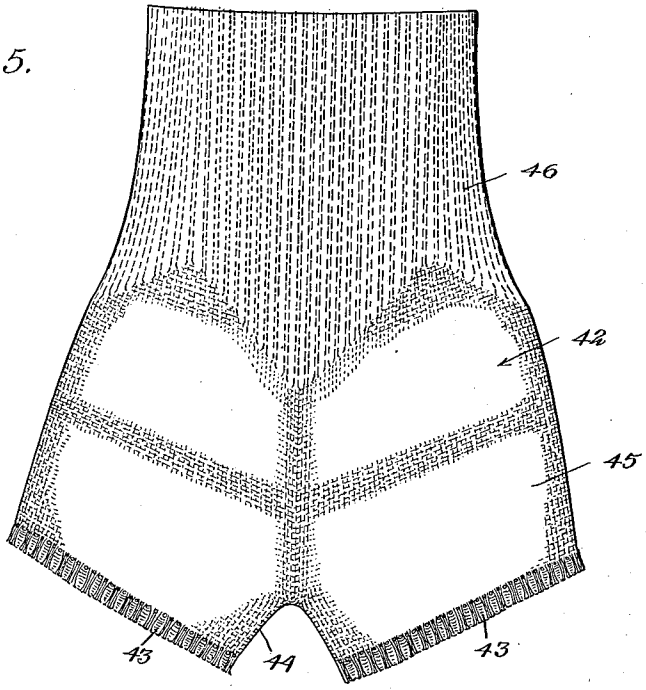


Fig. 6.

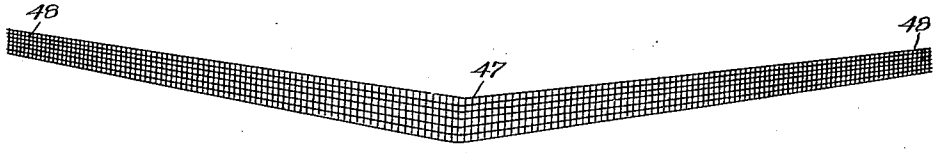
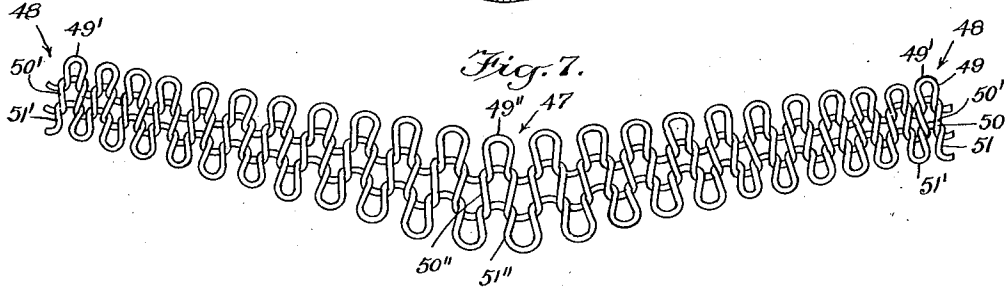


Fig. 7.



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UNITED STATES PATENT OFFICE

2,165,077

KNITTING MACHINE

Louis Spordick, Brooklyn, N. Y., assignor, by direct and mesne assignments, to Surftex Inc., Jersey City, N. J., a corporation of New Jersey

Application July 12, 1938, Serial No. 218,724

3 Claims. (Cl. 66—71)

This invention relates to improvements in knitting machines and attachments therefor.

It is an object of the invention to provide an improved knitting machine which may be used in knitting fashioned knitted articles to the desired shape so that it is unnecessary to cut the article to the desired shape after it is knitted or to hand finish it.

A further object is the provision of an improved knitting machine for knitting fashioned knitted articles which can be adjusted in a simple and convenient manner to knit articles of many different shapes.

Among other objects is the provision of an improved attachment for knitting machines which is of relatively simple and inexpensive construction, which can be applied to the standard type of knitting machine so as to enable the machine to knit fashioned or shaped knitted articles, and which can be adjusted so as to vary the shape of the article being knitted.

Heretofore in the knitting of fashioned articles, particularly garments having an irregular longitudinal shape it was necessary to cut the knitted article or garment to the desired shape or to hand finish it. It is a prime object of this invention to provide an improved knitting machine and attachment for knitting machines whereby the article or garment can be knitted to the desired shape. In its broader aspects my invention contemplates means for automatically varying and adjusting the positions of the stitch cams on the knitting machine so that the size of the loops in each knitted course are graduated or varied in size in accordance with a predetermined pattern so as to produce an article of the desired shape.

For a fuller understanding of the invention reference should be had to accompanying drawings in which:

Fig. 1 is a cross sectional view in the direction of the arrows on the dotted line in Fig. 3 showing the needle beds, carriages and associated mechanism on a machine embodying my invention:

Fig. 2 is a detailed view showing a stitch cam having an adjusting arm attached thereto so as to cause the automatic adjustment of the stitch cam in accordance with my invention:

Fig. 3 is a bottom plan view of one of the carriages of the knitting machine in the direction of the arrows on the line 3—3 of Fig. 1:

Fig. 4 is a schematic view of the stitch cams, guide tracks, adjusting arms and associated mechanism for causing the automatic adjustment of the stitch cams:

Fig. 4a is a detailed view of the bracket used in adjusting the guide tracks:

Fig. 5 is a view of a panel for fashioned knitted bathing trunks of the type that may be made from a knitting machine embodying my invention:

Fig. 6 is a detailed view of the shaded area extended across the center of the panel shown in Fig. 5: and

Fig. 7 is an enlarged view of the central portion of Fig. 6 showing the graduated arrangement of the stitches that can be formed by a machine embodying my invention.

In carrying out my invention I provided a knitting machine with guide means for automatically varying the adjustment of the stitch cams so that each of the courses may be provided with graduated stitches. My invention may be embodied in any type of knitting machine and may be integrally embodied in the machine or may take the form of an attachment to be applied to a standard knitting machine. In the accompanying drawings I have illustrated by invention as embodied in a standard type of flat knitting machine which is provided with double inclined needle beds 10 on which are disposed the parallel rows of needles 11 in the usual manner. The needles are of conventional construction and are provided with butts or shoulders 12, whereby they are shifted across the needle beds to cause the formation of knitting loops. The lower ends of the needles are engaged by the stops 14 which take the form of clips frictionally engaging the lower ends of the needle beds. Disposed adjacent each of the needle beds 10 are the bars or rails 15 which extend the entire length of the needle beds and serve to support the yarn carriers 16 and the carriages 17 in the usual manner. The carriages 17 are adapted to shift longitudinally of the needle beds so as to cause the reciprocal movement of the needles and the yarn carriers 16 may be coupled to the carriages so as to shift therewith by means of the carriage plungers 18 mounted in the supporting cylinders 19. The supporting cylinders 19 are mounted on the carriages 17 and the plungers 18 may be shifted to the retracted position shown on the right-hand side of Fig. 1 so as to release the yarn carriers or to the coupled position shown on the left hand side of Fig. 1 so as to couple the yarn carrier to the carriage. When the yarn carrier is coupled to the carriage as shown on the left hand side of Fig. 1 it will shift across the needle bed with the carriage and, on the other hand, when it is uncoupled from the carriage it will remain in a stationary position.

The yarn carrier on the right hand side of Fig. 1 has been uncoupled from the carriage and accordingly is merely indicated in dotted lines. Extending downwardly from the yarn carriers 16 are the yarn guides 20 which serve to feed the yarn downwardly to the needles in the usual manner as shown.

So as to cause the reciprocation of the needles to form the knitting loops the lower portion of each carriage 17 is provided with a cam track 21 positioned so as to engage the butts of the needles and cause the needles to shift upwardly at an angle and towards the opposite needle bed as shown in dotted lines in Fig. 1 and thence downwardly again. The extent of the movement may be varied by adjusting the positions of the adjustable stitch cams 22 which are provided with elongated shoes 23 mounted in the slots 24 formed in plate 25—plate 25 being mounted on the carriage. The shoes 23 may be shifted in slots 24 so as to adjust the relative positions of the stitch cams 22 and in that way the size of the stitches may be controlled. Normally the stitch cams are secured in adjusted position by means of wing nuts or thumb screws 26' which are threaded to the ends of the screw threaded pins 26 attached to the stitch cams. Pin 26 extends upwardly through the plate 25 and the spacer plates to the top of the carriage as shown where it is engaged by the thumb screws 26'.

The mechanism heretofore described forms part of one standard type of knitting machine in which my invention may be embodied, but it is to be understood that my invention may also be employed with other types of knitting machines. So as to provide for the automatic adjustment of the stitch cams with a resulting variation in the size of the stitches I attach an adjusting arm 27 to the pin 26 of each of the stitch cams as shown, and provide a roller 28 to the lower end thereof. The arms 27 preferably depend downwardly at an angle parallel to the slots 24 and I provide guide members for engaging the rollers 28 to cause the shifting of the arms 27 and of the stitch cams 22 as the carriage 17 shifts across the needle bed. The guide may take the form of a pair of guide tracks 29 and 30 pivotally connected to the bars 15 on each side of the machine adjacent the center thereof as shown at 31.

Each of the guide tracks 29 and 30 are independently adjustable and are so positioned as to be engaged by the rollers 28 formed on the adjusting arms 27. So as to insure engagement between the guide tracks and the rollers 28 I also provided the springs 32 connected between the pins 26 of the stitch cams and fixed pins 33 mounted on plate 34. Thus it will be appreciated that when the thumb screws 26' are loosened so as to permit the stitch cams to shift the springs 32 will pull the stitch cams 22 downwardly with the result that the rollers 28 will engage the guide tracks 29 and 30. The relative angles at which the guide tracks 29 and 30 are disposed can be varied by means of the set screws 35 which engage the ends of the guide tracks 29 and 30 and are threaded to the brackets 36 mounted on bars or rails 15 as shown most clearly in Figs. 4 and 4a.

It will be appreciated that the size of the stitches or loops formed by the knitting needles depends upon the downward limit of the path of movement of the needles 11 will be relatively short, cams 22 are adjusted so as to be positioned adjacent the tops of the slots 24, the downward movement of the needles 11 will be relatively short with the result that the loops formed by the needles 11 will be relatively small. Likewise, when the stitch cams are adjusted to the lower end of the slots 24 the downward path of movement of the needles will be relatively long with the result that the loops formed thereby will be relatively large. By disposing the guide tracks 29 and 30 at angles the position of the stitch cams will vary as the carriages reciprocate and the variation in the position of the stitch cams produces a corresponding variation in the downward limit of the path of movement of the needles with a result that the loops in each knitted course will be of graduated size. This is illustrated in Fig. 3 where the position of several of the needles, of one of the needle beds when in their lowermost position have been indicated in dotted lines at 37 and 38. In the drawings the guide tracks 29 and 30 are illustrated as adjusted to a position to incline upwardly from the center of the machine towards the two sides thereof, that is the guide tracks approach the top of the needle beds at the two ends thereof.

It will be appreciated that as the carriages reciprocate the springs 32 pull the stitch cams downwardly so that the rollers 28 engage the guide rails. When the carriages are positioned adjacent the center of the machine as shown in Figs. 3 and 4, the stitch cams will be positioned adjacent the lower end of the slots 24 with the result that the loops formed by the needles are relatively long as shown at 39. As the carriages approach either end of the machine the stitch cams necessarily shift upwardly due to the inclined position of the guide tracks with the result that the stitches formed by the needles as the carriage approaches the two ends of the machine are smaller, as shown at 40. The broken line 41 in Fig. 3 represents the position of the top of the needle bed and it will be seen that a line drawn between the lower end of the loops 39 and lower end of the loops 40 and extended beyond the loops 40 gradually converges with the line 41. This clearly illustrates the graduated arrangement of the loops that can be obtained by means of my invention.

In Fig. 4 I have illustrated schematically the arrangement of the guide tracks and adjusting arms with reference to the stitch cams on a flat knitting machine having a double needle bed of the type shown in cross section in Fig. 1. For the sake of clarity all portions of the machine not directly concerned with the automatic adjustment of the stitch cams have been eliminated and it will be seen from Fig. 4 that the rollers 28 on the ends of the arms 27 connected to the stitch cams ride directly on the guide tracks 29 and 30 with the result that the positions of the stitch cams are automatically varied as the two carriages reciprocate.

One use to which a machine embodying my invention may be applied is the manufacture of fashioned knitted garments such as bathing trunks and in Figs. 5, 6 and 7 I have illustrated the front panel of a pair of fashioned knitted bathing trunks which may be made on my improved machine. A fashioned knitted garment or article of the type that may be made on my improved machine forms the subject matter of my co-pending application which was filed on the same date as the present application and is more fully described therein.

In Fig. 5 the entire front panel is shown and is designated by the numeral 42. The panel may be knitted to the shape indicated on a machine embodying my invention with the central portion

of the panel longer than the lateral edges thereof. In using my machine to knit an article of this character the guide tracks 29 and 30 are adjusted to the positions shown in Figs. 3 and 4, i. e., so as to incline towards the top of the needle beds adjacent the two ends of the machine. The lower portion of the panel may be formed with a cuff 43 knitted with a two-and-one rib and also with a split center as indicated at 44 having a selvage edge. The center portion of the panel is provided with a plain rib stitch as indicated at 45 and the upper portion may be provided with a graduated fashioned rib top as indicated at 46. The particular type of knitting stitches or ribs employed of course may be varied. However throughout the entire panel the stitches are of graduated arrangement, as indicated diagrammatically in Fig. 6, the stitches adjacent the central portion 47 are larger than the stitches adjacent the edges 48. This is shown most clearly in Fig. 7 which illustrates the central portion of three knitted courses 49, 50 and 51 of the garment. It will be seen that the loops 49', 50', and 51' adjacent the two edges of Fig. 7 are smaller than the loops 49'', 50'', and 51'' adjacent the center of Fig. 7. The result of this graduated arrangement of the loops in each course is the formation of a fashioned knitted panel as shown in Fig. 5 which is of greater length adjacent the center than adjacent the edges, with the lower edges of the panel inclined upwardly from the center towards the two edges thereof as clearly shown in Fig. 5.

It will be appreciated that the relative length of the various portions of the panel may be varied by adjusting the inclined position of the tracks 29 and 30, also an irregular contour can be given to the ends of the fashioned knitted article by substituting tracks having an irregular surface for the tracks 29 and 30, which are provided with straight or plain surfaces. From the foregoing description of my invention it will be appreciated that I have provided an improved knitting machine and an attachment for knitting machines whereby a fashioned knitted article may be knitted to the desired shape in a relatively simple and convenient manner without the necessity of cutting the article or hand finishing it.

It should be understood of course that modifications may be made in the illustrated and described embodiment of my invention without departing from the invention as set forth in the accompanying claims.

I claim:

1. A flat knitting machine comprising a needle bed, a plurality of needles supported on the needle bed and shiftable longitudinally so as to cause the formation of knitted loops arranged in transverse courses, a carriage mounted on the machine and shiftable longitudinally of the needle bed to cause the shifting of the needles, a pair of adjustable stitch cams mounted on the carriage for controlling the shift movement of the needles and thereby control the size of the knitted loops formed by the needles, a pair of guide tracks pivotally mounted on the machine adjacent the center of the needle bed and extending towards the two ends of the needle bed, an arm connected to each of the stitch cams and provided with a roller engaging the guide tracks, means for urging the rollers into contact with the guide tracks and means for adjusting the positions of the guide tracks.

2. An attachment for a knitting machine having a shiftable stitch carriage with stitch cams thereon for controlling the size of the stitches comprising a guide track, means for pivotally mounting the guide track on a knitting machine adjacent the stitch carriage, means for pivotally adjusting the angle of the guide track relative to the path of movement of the stitch carriage, and an arm adapted to be connected to a stitch cam of the knitting machine and provided with a roller adapted to engage the guide track.

3. An attachment for a knitting machine having a shiftable stitch carriage with stitch cams thereon for controlling the size of the stitches comprising a pair of guide tracks having means for pivotally connecting them together and for pivotally attaching them to a knitting machine, means for adjusting the relative angles of said guide tracks, arms adapted to be connected to the stitch cams of the knitting machine and provided with rollers adapted to engage the guide tracks to vary the adjustment of the stitch cams, and means for urging the rollers into contact with the guide tracks.

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