

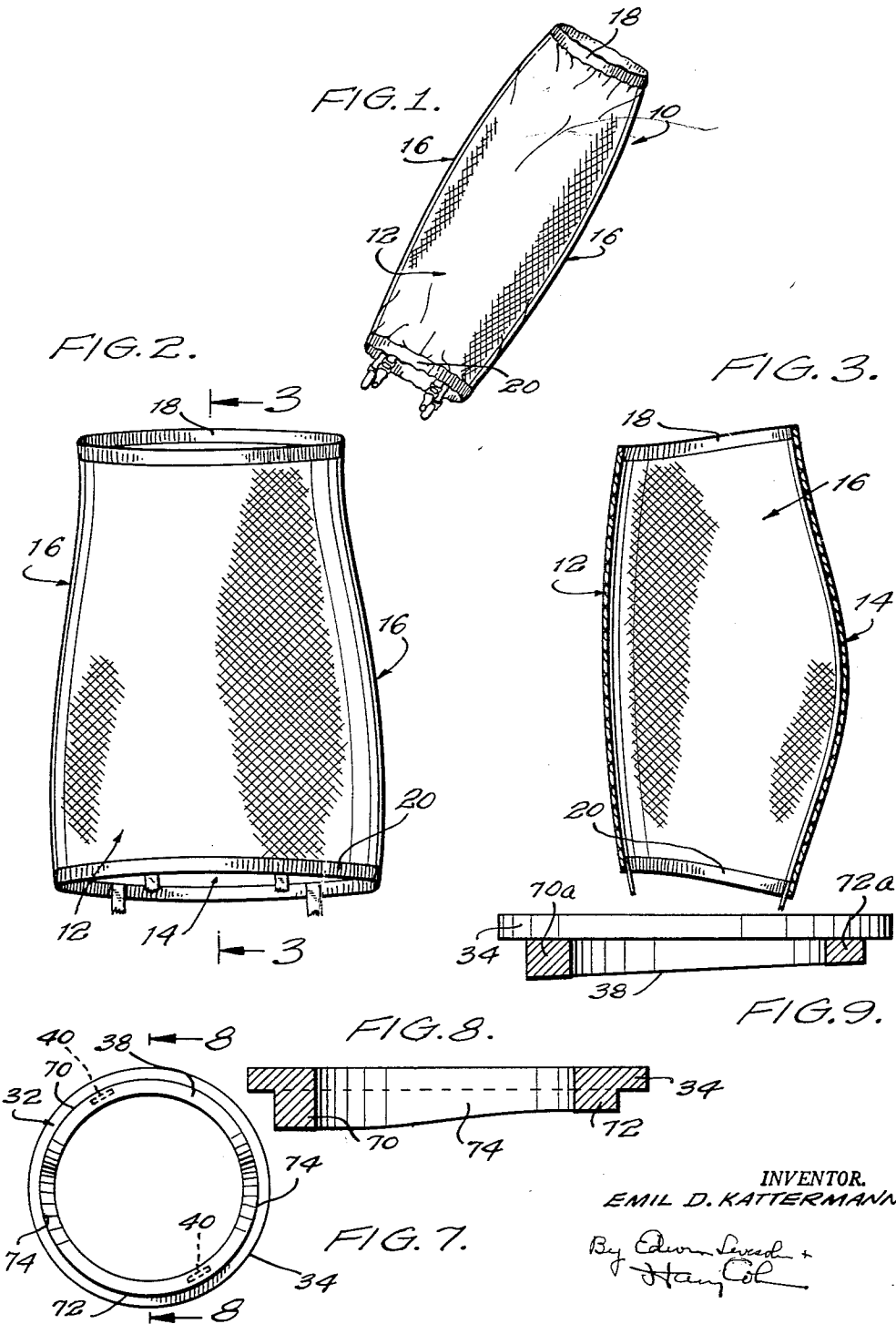
Aug. 16, 1955

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APPARATUS FOR PRODUCING KNIT ARTICLES
HAVING PARTS OF DIFFERENT LENGTHS

2,715,327

Original Filed April 27, 1951

2 Sheets-Sheet 1



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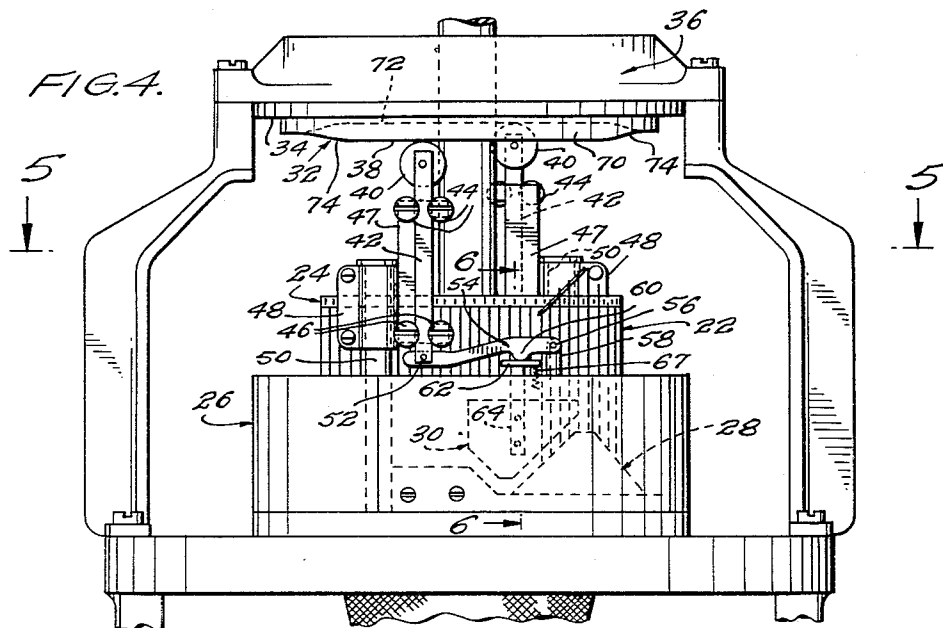
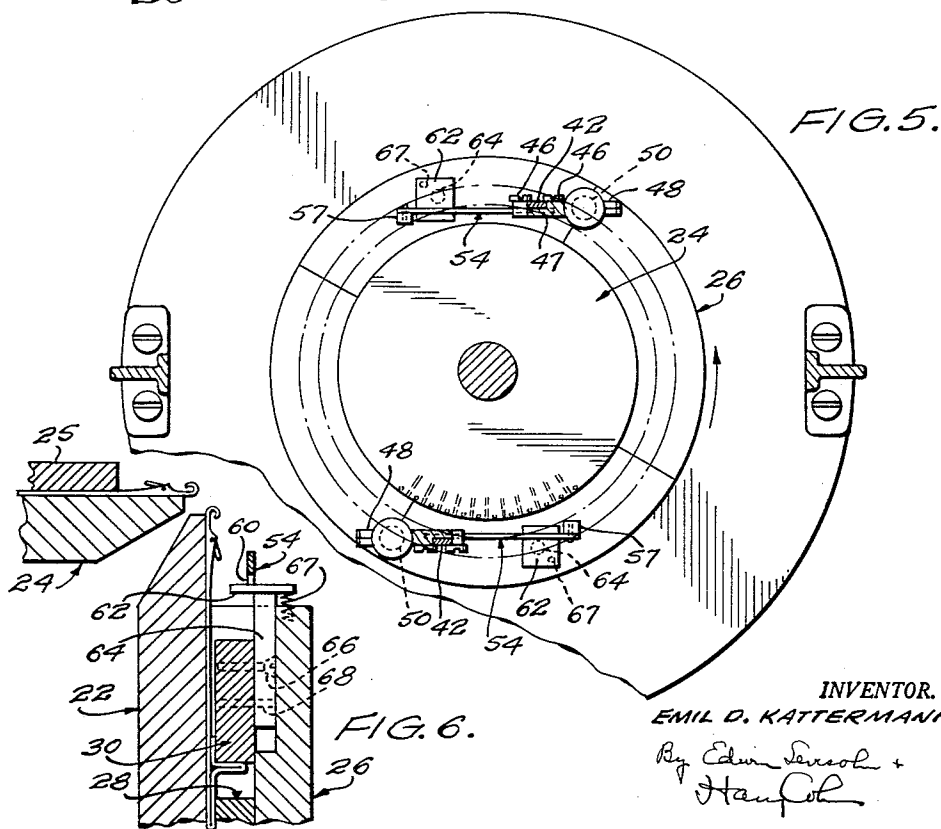
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APPARATUS FOR PRODUCING KNIT ARTICLES HAVING PARTS OF DIFFERENT LENGTHS

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Original application April 27, 1951, Serial No. 223,274, now Patent No. 2,699,055, dated January 11, 1955. Divided and this application July 23, 1953, Serial No. 369,875

3 Claims. (Cl. 66—27)

The present invention relates to knit girdles and other articles of personal wear and to a method of and apparatus for producing such articles in such manner that one portion thereof extending transversely of the knit courses is longer than another similarly extending portion.

The primary object of the present invention is to provide a knit foundation garment, for example a girdle, which is longer at the back of the garment than at the front thereof in order to provide the necessary dimension of the back part in accordance with the requirements of the figure of the wearer, and to accomplish this result so that the change from the longer back portion of the girdle to the shorter front portion thereof is gradual rather than sharp or abrupt.

Another object is to provide a simple method of producing knit articles which are of different lengths in different portions thereof extending transversely of the knit courses.

Another object of the invention is to enable a girdle or other article of personal wear having parts of different lengths to be produced on a circular knitting machine of conventional type with a comparatively simple attachment on the machine to adapt it for accomplishing the desired result.

The above and other objects, features and advantages of the present invention, as well as the invention itself, will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a perspective view of a lady's girdle, of one type, embodying the present invention;

Fig. 2 is a front view of the girdle illustrating it in expanded condition in its normal use on the wearer;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a view in elevation of part of a circular knitting machine, of conventional form, provided with the attachment of the present invention;

Fig. 5 is a sectional view on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view on the line 6—6 of Fig. 4;

Fig. 7 is a bottom plan view of part of the attachment provided on the knitting machine in accordance with the present invention;

Fig. 8 is a sectional view on a larger scale, on the line 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 8 showing a modification.

Referring now to the drawings in detail, the girdle 10 in connection with which the present invention is illustrated and described is of the type disclosed in my application Serial No. 168,531, filed June 16, 1950 and now Patent No. 2,555,974. As disclosed in said application, the girdle is of the elastic two-way stretch type and has a very high degree of stretch circumferentially of the wearer, as may be noted by a comparison of Figs. 1 and 2 herein. It will be understood however that the present invention is not limited to this type of girdle. Said girdle 10 comprises a front part 12, a back part 14 and side parts 16, all of said parts being in integrally knit relation and forming the circumferentially continuous body portion of the

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girdle. The knit fabric body comprising said parts 12, 14 and 16, is produced in a circular knitting machine having cylinder needles and dial needles which in the operation of the machine produce a rib-knit fabric.

As clearly illustrated by Figs. 1 to 3, the rear part 14 of the girdle is longer than the front part 12 thereof and said two parts are connected to each other in integral relation by the side portions 16 which decrease gradually in length from the back part 14 to the front part 12. For producing the above mentioned portions of different lengths, the girdle is knit so that the loops at the back part 14 of the girdle are longer than the loops at the front part 12 of the girdle. In the side portions 16, the loops decrease progressively in length from the back part of the girdle to the front part thereof. As a result of this method of knitting the girdle, the latter is provided with the longer back and the shorter front part without an abrupt or sharp difference in length between the two parts, and as a result the girdle has a better fit on the wearer, is more comfortable and has a better appearance. It will be understood that although the loops are of different lengths in the different parts of the girdle as just described, this is not readily discernable in the completed girdle in the relaxed or non-tensioned condition of the latter, although as indicated in Fig. 1, the girdle is longer at its back than at its front. As usual, the girdle is provided with the circumferentially extending knit waistband portion 18 at the upper end of the body portion of the girdle and with a knit garter belt or cuff portion 20 at the lower end of said body portion of the girdle. Knit parts 18 and 20 need not have loops of varying lengths, it being sufficient to provide these loops of different length in the main body-encircling part of the girdle which extends vertically between the band 18 and the garter cuff 20. Thus, pursuant to the present invention said body-encircling part of the girdle, constituted by portions 12, 14 and 16 of different lengths, is preferably a rib-knit fabric, produced on a circular knitting machine, and is preferably formed entirely of elastic yarn of the character described in my above mentioned prior application. It will be understood however that as to certain aspects of the present invention the latter is not to be limited to this specific type of elastic girdle.

The method of making the girdle of the present invention and the knitting machine mechanism utilized for accomplishing the desired result will now be described with particular reference to Figs. 4 to 8, and also with reference to Fig. 9 in connection with a modification of the garment which may be made pursuant to the present invention.

Referring to Fig. 4 there is shown a circular knitting machine of the type having a needle cylinder indicated generally at 22 and a needle dial indicated generally at 24 with a dial cap indicated at 25, and the cam ring for the cylinder needles is indicated at 26. In the type of machine here shown, the needle cylinder 22 is stationary and the cam ring 26 revolves around the axis of the needle cylinder. A conventional needle-raising cam is indicated at 28 and a companion needle-lowering cam is indicated at 30. In accordance with the present invention cam 30 instead of being adjusted to a fixed position according to the length of the required loops, as in the usual machine, is movable to various positions during each revolution of the cam ring 26, so as to result in the knitting of loops which are of different lengths in the same course of the circular knit fabric. More particularly, the arrangement is such that cam 30 is lowered to a greater degree during the operation of knitting the part of the course in the back part 14 of the girdle than said cam is lowered during the operation of knitting that part of the course which is in the front part 12 of the girdle, with intermediate needle-lowering movement of said cam for knitting portions of the course which are in the side

parts 16 of the girdle. This operation is accomplished pursuant to the present invention by the provision of the stationary ring cam member 32, shown more clearly in Figs. 4, 7 and 8.

Said ring cam member 32 comprises a circular part 34 which is fixed in stationary position to the frame part 36 of the knitting machine. The lower circular surface 38 of cam ring 32 engages a cam follower 40, here shown as a roller, carried by a vertically movable rod 42 which is guided for movement by the vertical guide 47 in which said rod is slidably held by the upper and lower sets of members 44 and 46. Said guide 47 is carried by a bracket 48 which is fixed to the post 50. The latter is mounted on the top of the cylinder-needle cam ring 26 and rotates with the latter during the operation of the machine. The lower end of rod 42 is pivotally connected at 52 to a lever 54 which is pivotally connected at 56 to a stud 58 at the top of cam ring 26. As clearly shown in Fig. 4 the intermediate part 60 of lever 54 bears on the head 62 of a rod 64 which is fastened to the needle-lowering cam 30 in any suitable way as by screw 66 and a pin 68 (Fig. 6). A spring 67 interposed between the headed end 62 of rod 64 and the top of the cam ring 26 retracts the cam 30 upwardly and also holds head 62 resiliently against lever 54 whereby to hold cam follower 40 in engagement with cam surface 38 of cam 32.

As will be evident from an inspection of Figs. 4, 7 and 8, the cam ring 32 is designed so that during the rotation of the needle-cylinder cam ring 26, rod 42 and consequently the needle-lowering cam 30 is depressed the distance required to produce the loops of varying lengths in the parts 12, 14 and 16 respectively, and of course it will be understood that said cam 30 is depressed to a greater extent during that part of the course in which the back part of the article is being knit than in that part of the course in which the front part 12 of the article is being knit, with intermediate gradual changes in the depression of the cam, i. e., gradual decrease in the depression stroke of cam 30 in the portions of the course between the knitting of the back part 14 and the front part 12. As illustrated in Fig. 8 it will be noted that the cam ring 32 is of variable thickness, being thicker at the circumferentially extending portion 70 which is operable during the knitting of the longer loops and thinner at the circumferentially extending portion 72 which is operable during the knitting of the shortest loops, and which has two spaced circumferentially extending portions 74, between portions 70 and 72, which gradually decrease in thickness for gradually decreasing the lengths of loops in the side parts 16 of the girdle, the decrease occurring of course from the part of the cam which is operable during the knitting of the back part of the girdle to the part 72 of the cam which is operable during the knitting of the front part of the girdle. As shown in Figs. 4, 5 and 6, it will be noted that the linkage for operatively interconnecting the needle-lowering cam 30 and the stationary cam member 32 lies within the projected area of the cam ring 26 and is disposed in external relation therewith.

In Fig. 9, a modification of the cam is illustrated and it will be evident that the length of the loops in parts 12, 14 and 16 are correspondingly modified. More particularly, as here shown, instead of knitting a back part with a series of wales of the same length, and a front part with a series of wales of the same length but shorter than the wales of the back part, with gradual change in the length of the loops between said two series of wales, in the same course, the design of the cam ring is such that it decreases gradually in thickness between the thickest portion 70a and the thinnest portion 72a, so that in each course the length of the loop will vary from a maximum in one or a few wales at the back of the knit fabric body centrally thereof to a minimum at one or a few wales at the front of the article centrally thereof.

As shown by Figs. 4, 6 and 7 there are two sets of mechanisms 42, 54, 60 and a needle-lowering cam 30 for each set, as the particular machine to which the present invention has been applied in actual practice is a two-feed machine. It will be understood that there is a yarn feed for supplying yarn to the cylinder and dial needles in the region of the companion cams 28 and 30 of each set, as in the usual two-feed circular knitting machine. It will be obvious of course that the invention does not depend on the number of yarn feeds, on the contrary a machine may be provided with only one yarn feed or with more than two yarn feeds, the machine however having companion cams 28 and 30 and a cam-lowering mechanism 42, 60 and 62, for each cam 30 of each set of cams, depending upon the number of yarn feeds. It will be understood that only one cam ring 32 is required irrespective of the number of yarn feeds.

This is a division of my application Serial No. 223,274 filed April 27, 1951, now Patent No. 2,699,055.

While I have shown and described the preferred embodiments of my invention in respect to the article, method and machine, respectively, for practising my invention, it will be understood that various changes may be made in each of these branches of my invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

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

1. In a circular knitting machine having a set of cylinder needles and a set of dial needles and a relatively movable cam ring including a needle-lowering cam for actuating said cylinder needles to form a rib knit fabric, means for operating said needle-lowering cam to lower certain of said cylinder needles more than others in the same course comprising movable spring retracted means for resiliently holding said needle-lowering cam in one position and resiliently opposing movement of said cam in the needle-lowering direction, a cam mounted in stationary relation relative to said cylinder needles, and linkage means for operatively connecting said stationary cam to said spring retracted means, said cam ring and said needle-lowering cam being rotatable about said cylinder needles and said stationary cam having a peripherally continuous lower cam surface, said linkage means including a cam follower in operative engagement with said cam surface, said cam follower being biased into said engagement by said spring retracted means, and said linkage means being mounted on said knitting machine in externally disposed relation with said cam ring.

2. In a circular knitting machine having a set of cylinder needles and a set of dial needles and a relatively movable cam ring including a needle-lowering cam for actuating said cylinder needles to form a rib knit fabric, means for operating said needle-lowering cam to lower certain of said cylinder needles more than others in the same course comprising movable spring retracted means for resiliently holding said needle-lowering cam in one position and resiliently opposing movement of said cam in the needle-lowering direction, a cam mounted in stationary relation relative to said cylinder needles, and linkage means for operatively connecting said stationary cam to said spring retracted means, said cam ring and said needle-lowering cam being rotatable about said cylinder needles and said stationary cam having a peripherally continuous lower cam surface, said linkage means including a cam follower in operative engagement with said cam surface, said cam follower being biased into said engagement by said spring retracted means, said linkage means lying within the projected area of said cam ring.

3. In a circular knitting machine having cylinder needles and a relatively movable cam ring including a needle-lowering cam for actuating said needles to knit a fabric, means for operating said needle-lowering cam to lower certain of the needles more than others in the same

course comprising a control cam operatively connected to said needle-lowering cam for moving the latter in needle-lowering direction for lowering certain of said needles more than others in the same knitting course, said control cam being mounted in stationary relation relative to said cylinder needles and having a peripherally continuous cam surface, linkage means lying within the projected area of said cam ring for operatively connecting said control cam to said needle-lowering cam, said linkage means including a cam follower in operative engagement with said cam surface, and means for biasing said cam follower into engagement with said cam surface.

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