April 14, 1959 F. J. VENDETTI 2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Filed April 26, 1954 5 Sheets-Sheet 1

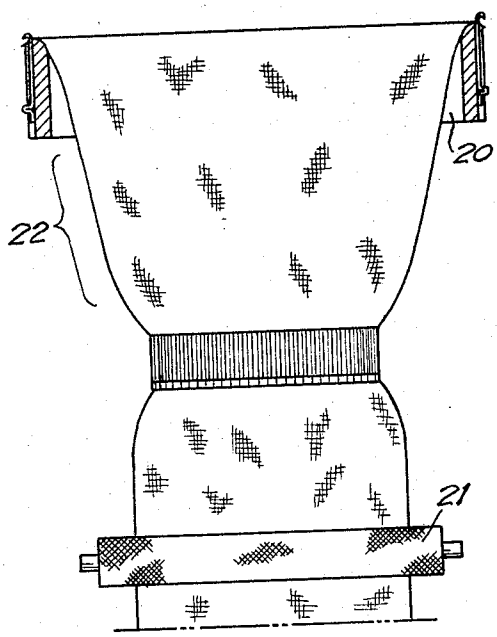


Fig. 1

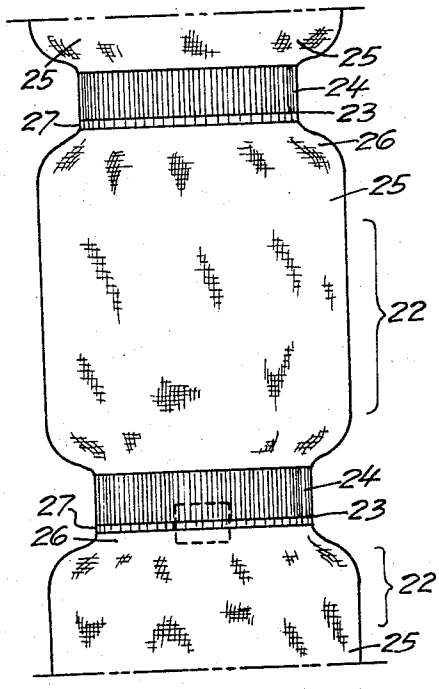


Fig. 2

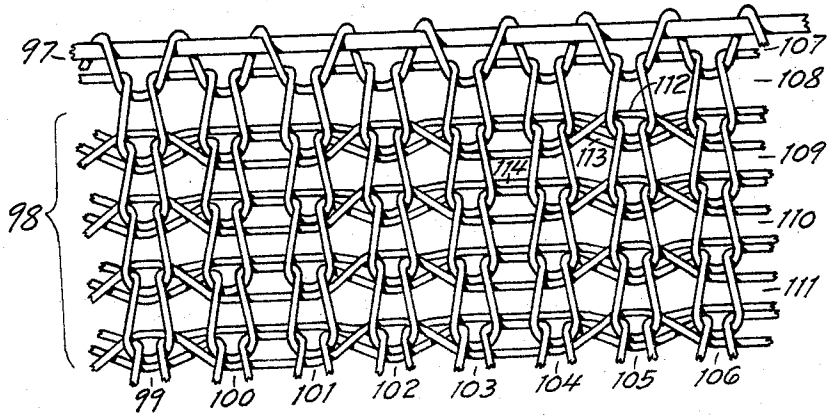


Fig. 3

INVENTOR.
FRANK JOHN VENDETTI
BY Nathan Levin
ATTORNEY

April 14, 1959 F. J. VENDETTI 2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Filed April 26, 1954 5 Sheets-Sheet 2

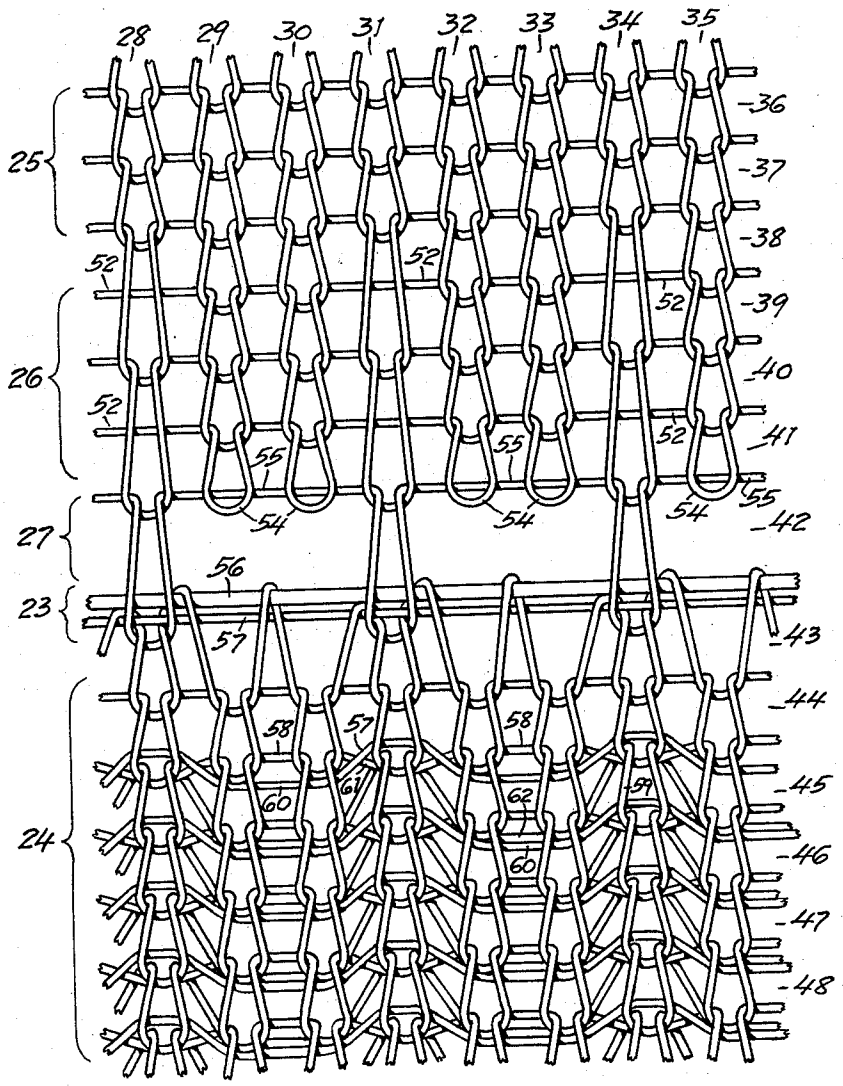


Fig. 3.

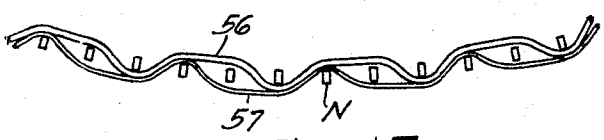


Fig. 18.

INVENTOR.
FRANK JOHN VENDETTI
BY Nathan Levin
ATTORNEY

April 14, 1959 F. J. VENDETTI 2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Filed April 26, 1954 5 Sheets-Sheet 3

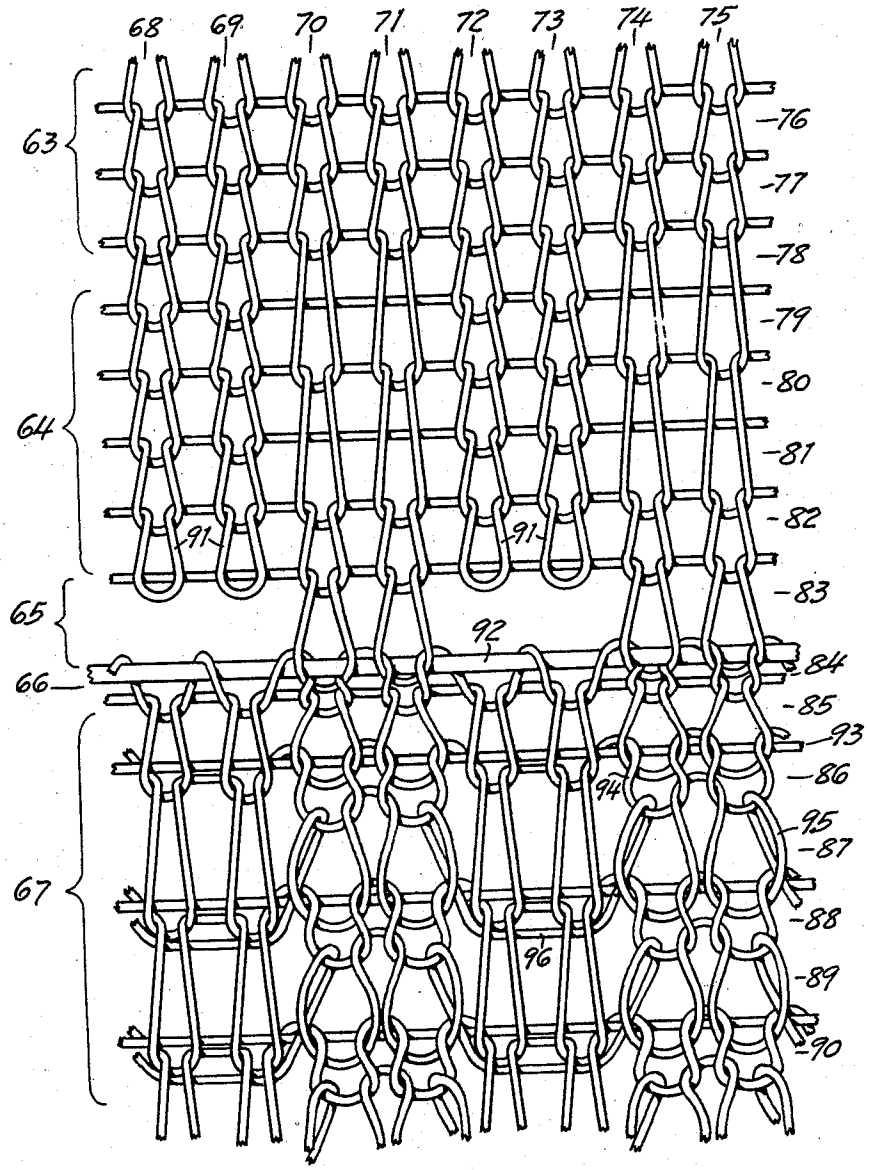


Fig. 4

INVENTOR.
FRANK JOHN VENDETTI
BY Nathan Levin
ATTORNEY

April 14, 1959 F. J. VENDETTI 2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Filed April 26, 1954 5 Sheets-Sheet 4

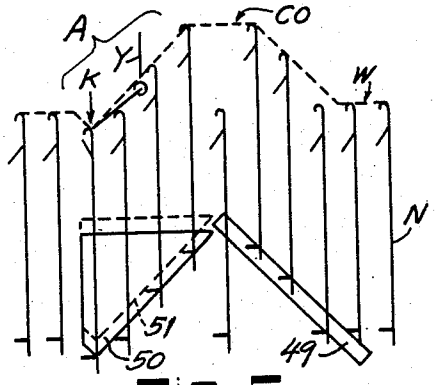


Fig. 6.

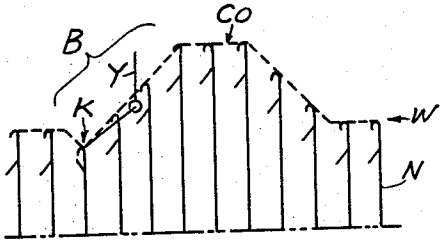


Fig. 7.

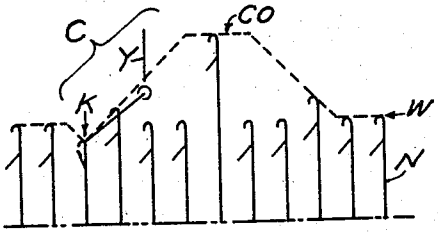


Fig. 8.

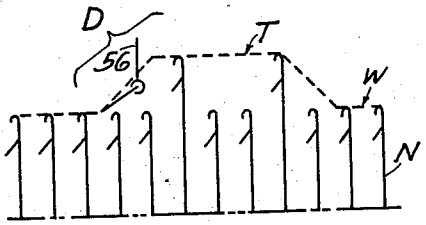


Fig. 9.

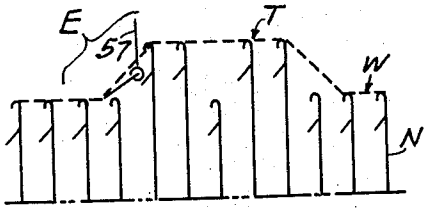


Fig. 10.

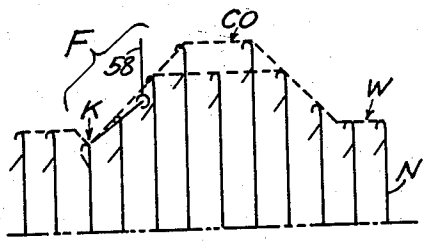


Fig. 11.

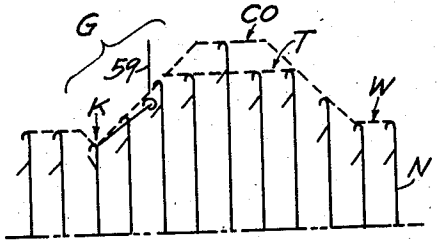


Fig. 12.

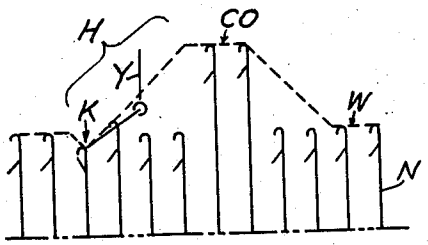


Fig. 13.

INVENTOR.
FRANK JOHN VENDETTI
BY Nathan Levin
ATTORNEY

April 14, 1959 F. J. VENDETTI 2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Filed April 26, 1954 5 Sheets-Sheet 5

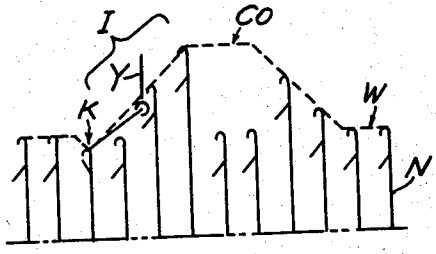


Fig. 14.

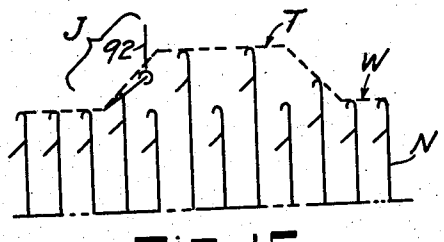


Fig. 15.

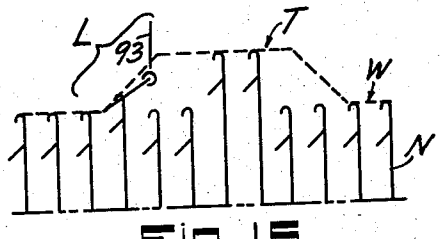


Fig. 16.

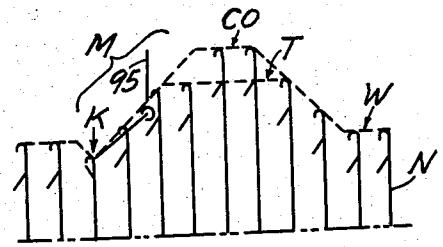


Fig. 17.

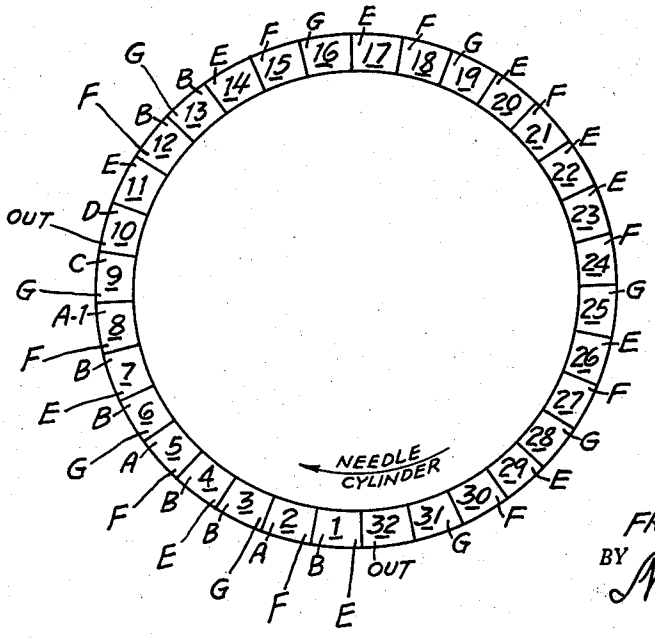


Fig. 18.

INVENTOR.
FRANK JOHN VENDETTI
BY Nathan Levin
ATTORNEY

United States Patent Office 2,881,603 Patented Apr. 14, 1959

2,881,603

KNITTING MACHINE AND METHOD OF KNITTING

Frank John Vendetti, Philadelphia, Pa., assignor, by mesne assignments, to Scott & Williams, Inc., Laconia, N.H., a corporation of Massachusetts

Application April 26, 1954, Serial No. 425,505

13 Claims. (Cl. 66—9)

The present invention relates to the art of knitting and more particularly to novel plain or jersey fabric and to the machine and method of making the same.

It is an object of the invention to provide continuous draw-thread connected separable tubular jersey knit fabric sections each of which has a selvage formed of elastic and of non-elastic yarns, an adjoining simulated or mock rib border or cuff portion formed of elastic and of non-elastic yarns, a following body portion formed of non-elastic yarn, and a terminal run-resisting portion of non-elastic yarn, in which the fabric sections are connected during the knitting thereof by a removeable draw-thread course of non-elastic yarn placed between the final course of the run-resisting portion and the selvage.

It is also an object to provide a machine and a method of operating the machine to produce the novel fabric sections.

It is a further object to provide the fabric sections with non-curling edges. In the stitch construction of one such selvage a single elastic yarn is incorporated with the non-elastic yarn while in another stitch construction a pair of elastic yarns are incorporated with the non-elastic yarn.

It is still a further object to provide the fabric sections with border portions the fabric of which simulates the appearance of true rib fabric. In the stitch construction of one such border portion the fabric simulates the appearance of true two and two rib fabric while in other stitch constructions the fabric simulates the appearance of true two and one rib fabric. The stitch constructions are such that the border portions, by the appropriate use of differently colored yarns, may be provided with walewise extending stripes.

It is an additional object to produce the fabric of this invention automatically upon a multiple feed sinker top machine in which the character of the knitting at certain of the individual feeds is adapted to be changed in accordance with the stitch requirements of the several portions of the fabric so that successive fabric courses are formed of the individual yarns fed to the needles at successive feeds of the machine. Furthermore, so that with the same needle selection, as made by the inclined wheels of each feed of such a machine, the various portions of the fabric sections may be made even though the individual stitch constructions of these portions differ from each other.

Additional objects and advantages of the invention will be apparent from the following description thereof which should be read in connection with the accompanying drawings.

In the drawings:

Figure 1 is a schematic view showing the production of the novel fabric upon an open top type of machine having a single circular series of latch needles in which the fabric extends from the needles through the take-up rollers.

Figure 2 is a view of the novel fabric sections of the present invention.

Figure 3 is an enlarged diagrammatic stitch view of a portion of the fabric indicated in dotted lines in Figure 2, showing the terminal run-resisting portion of one fabric section, the connecting draw-thread to the next fabric section, and the selvage edge and two and one mock rib border portion of the said next fabric section.

Figure 4 is a view similar to Figure 3 showing a modified selvage edge and a two and two mock rib border portion.

Figure 5 is a view showing a modified form of two and one mock rib border portion.

Figures 6 through 17 are schematic views showing the needle selections at each of a plurality of feeds used in making the fabric sections.

Figure 18 is a schematic view showing the relationship of the needles and the pair of elastic yarns used in making one form of the selvage edge.

Figure 19 is a schematic view of a 32 feed circular knitting machine showing the character of the knitting and the changes thereof at each of the feeds.

The novel draw-thread connected fabric sections of the present invention may be made upon any type of jersey knitting machine, preferably having a multiple number of knitting stations or feeds, in which the needles may be selectively arranged for each of the special stitch constructions forming a part of the fabric, and in which the feeding of the elastic and the non-elastic yarns may be selectively controlled in conjunction with the needle selections. Generally such a machine, which may have either a stationary or a rotary cylinder, will have a needle cylinder **20** upon the needles of which the fabric will be knitted and will have rotating take-up rolls **21** adapted to advance and to tension the fabric as it is being made, Figure 1. It will be understood that the showing of Figure 1 is schematic only and is intended to show the general arrangement of parts in which the novel fabric is under tension during its construction.

The needle cylinder **20** and the rolls **21** are preferably part of a machine in which the needles and the yarns are adapted to be selectively controlled at each feed of a multiple feed circular sinker top knitting machine. The invention is not limited to the product of a circular machine nor to a multiple feed machine and may be made upon any jersey knitting machine of any number of feeds in which the stitch constructions and the yarns of each course of knitting may be varied in accordance with the requirement of the fabric. Regardless of the machine used, the resultant draw-thread connected sections of fabric are illustrated in Figure 2 wherein each section **22** comprises a beginning selvage edge course **23**, an adjoining mock rib border portion **24**, a following jersey body portion **25**, a terminal run-resisting portion **26**, and a draw-thread course **27** connecting the final course of the portion **26** of one section **22** with the selvage edge **23** of an adjoining section. It will be understood that the draw-threads **27** may be pulled, after cutting at one or more places, from the fabric to separate the sections **22** from each other. The separated sections may then be used in any desired manner in garment or other manufacture. The walewise length of the body portions **25** and of the border portions **24** may vary without departing from the invention.

A part of the fabric, enclosed by the dotted lines of Figure 2, is shown in enlarged detail in Figure 3 wherein the stitch construction of the several parts of one of the sections **22** may clearly be seen. In Figure 3, containing needle formed stitch wales **28** through **35** and courses **36** through **48**, the jersey body fabric is shown in the courses **36** and **37** as being plain knit without a design therein. It will be understood that the body portion **25** may be unadorned or may be formed with any desired type of knitted pattern or design therein, and may be formed of

a single yarn (changeable for striping) if a single feed machine is used or may be formed of a plurality of yarns (also changeable for striping) in multiple course spirals when a multiple feed machine is used to make the sections **22**. This use of single or of multiple yarns, depending upon the number of feeds, is also applicable to other parts of the fabric without further specific reference thereto. A knitting station having feed B set up to make plain jersey fabric is shown in Figure 7 wherein all the latch needles N are raised from a welt level W to a cast off or latch clearing level CO and are then retracted to a knitting level K where stitches are formed of a non-elastic yarn Y fed to all the needles, after which the needles N are returned to welt level W, in a manner well known in the art, and one or more such feeds B may be used to make the body portion **25**. The needle level indicated as CO in the drawings is intended to be that level at which yarn, in any form in the needle hook or on its latch, passes off the end of the opened latch of the needle onto its shank as the needle is raised, this level also being known as the latch clearing level.

The run-resisting portion **26** of the fabric is shown in the courses **38** through **41** in which the courses **38** and **40** are formed on all the needles at a feed or feeds set up like feed B of Figure 7 and in which the courses **39** and **41** are formed on certain of the needles N at a feed or feeds set up like feed A of Figure 6. At each feed A every third needle N remains at welt level W while the intervening pairs of the needles are raised to cast off level CO so that as the raised needles are retracted to knitting level K they form stitches of non-elastic yarn Y which floats to the rear of the non-raised needles. In Figure 6 a design wheel of usual inclined construction is indicated at **49** as the means by which the needles may be selectively raised but it will be understood that any type of needle selecting means may be used, depending upon the type of machine. A movable stitch cam of usual construction is shown at **50** to retract the needles to knitting level and the upward position of the stitch cam is shown in dotted lines at **51** in which position the needles are retracted to welt level W as may be required for other courses of knitting. While the other illustrated feeds do not show the design wheel **49** and the stitch cam **50**, it will be understood that they may be used at such feeds to selectively advance and to retract the advanced needles. The floats of yarn Y, in back of the non-raised needles at feed A, are shown in Figure 3 at **52** in wales **28**, **31**, and **34** of the courses **39** and **41** where they are at the rear of the fabric behind stitches formed on these same needles in courses **38** and **40** at feed B, which latter stitches were held on the non-raised needles at feed A. While two courses having the floats **52** have been shown, it will be understood that the run-resisting portion **26** may contain a greater number of such courses if desired and that the yarns may be tucked instead of being floated, by having the non-raised needles raised to tuck level T at the feed A, for a modified form of run-resistant stitch formation. Generally the number of plain and of float-containing courses may vary depending upon the number of feeds on the machine and depending upon the number of courses needed to prevent running back of the cast off stitches of the cast off course for any particular fabric.

A cast off course is preferably formed in the fabric following the course **41** and this consists of casting off the stitches from certain of the needles while holding the stitches on the other needles. In the present instance this is done by casting off the stitches in those wales in which the floats were not formed, namely the wales **29**, **30**, **32**, **33**, and **35**, the cast off stitches being those which were formed by the raised needles at the last feed A and the casting off is preferably done at a feed set up similarly to feed A (and designated feed A–1 in Figure 19) but at which no yarn is fed. Passage of such a feed A–1 will leave the fabric suspended on every third needle of the machine by the stitches in wales **28**, **31**, and **34** of course **41** while the intervening pairs of cast off stitches will be free of the needles and of following fabric courses as indicated at **54**, these stitches **54** being free to run back to a certain extent to the run-resistant portion **26** which acts to prevent the running back of the stitches from continuing throughout the body **25**.

The draw-thread **27** connecting adjacent sections **22** is next knitted and this comprises the course **42** which is formed at a feed set up like feed C of Figure 8 wherein every third needle (the ones which have the stitches of course **41** thereon) is advanced to cast off level CO and retracted to knit stitches of a non-elastic yarn Y (which may be stronger than the regular body yarn) while the intervening pairs of bare needles (cleared of stitches at feed A–1) remain at welt level W so that the yarn is floated past them. This results in stitches in every third wale **28**, **31**, and **34** in course **42** with floats of yarn **55** therebetween and the length of yarn used for course **42** is thus shorter than it would have been if stitches were formed on all the needles of the machine. The thus shortened draw-thread is easier to remove from the fabric than a yarn which has been knitted in every wale.

While the cast off course has been shown as having the spaced pairs of cast off stitches, it should be understood that the number and the spacing of the cast off stitches may vary and that the draw-thread will be knitted through the non-cast off stitches to connect the sections **22**. It should also be understood that the fabric may be made without a cast off course, if so desired, in which event the run-resistant portions may be eliminated and that in this instance the draw-thread, knitted through all of the stitches of the final course of the body portion, will be undesirably long.

Once the draw-thread has been formed, the selvage edge **23** of a succeeding section **22** may be started, and in the form shown in Figure 3, this comprises a pair of elastic yarns **56** and **57** incorporated with the non-elastic yarn of the fabric. For this purpose the needles next pass through a feed set up as feed D of Figure 9 wherein every third needle (one of each pair of bare needles) is advanced from the welt level W to the tuck level T and is then retracted to the welt level to take the relatively heavier elastic yarn **56** in the hooks thereof while the intervening pairs of needles remain at the welt level so that the elastic yarn **56** is floated to their rear, the interlacing of the elastic yarns being shown in Figure 18. At feed D the stitch cam will have been raised to dotted line position **51**, as shown in Figure 6, to retract the needles to welt level only and the elastic yarn will be retained in position around the needles by the hooks of the usual sinkers. Then the needles are caused to pass through a feed set up as feed E of Figure 10 wherein the spaced pairs of bare needles (bare of non-elastic yarn since being cast off at feed A–1), one of each pair of which has the elastic yarn **56** in its hook, are advanced from welt level W to tuck level T and are then retracted to the welt level to take the lighter elastic yarn **57** in the hooks thereof while the intervening single needles (having stitches of the draw-thread thereon) remain at the welt level so that the elastic yarn **57** is floated to the rear thereof. It will be understood that the stitch cam at feed E is in raised position **51** and that the elastic yarn **57** is also retained in tucked position on the needles by the sinker hooks. As shown in Figure 18, the elastic yarn **56** will be in front of (in the hook) every third needle (bare) and to the rear of the intervening pairs of needles while the elastic yarn **57** will be in front of (in the hook) the same third needles (along with the elastic yarn **56**) and the bare needles adjacent thereto while being in back of the remaining needles (along with the elastic yarn **56**) which have the draw-thread stitches thereon. The needles, with the elastic yarns so interlaced, are then caused to pass through a feed such as feed B wherein all the needles are advanced to cast off level from which they are retracted to knitting level K

after having been fed the non-elastic yarn Y, the resulting course being shown at **43** in Figure 3 wherein loops of the non-elastic yarn are drawn through the draw-thread stitches in wales **28**, **31**, and **34**, and wherein the elastic yarns **56** and **57** (which dropped below the needle latches as the needles were raised at this feed B) are cast off to be interlaced in the sinker wales of the first row of loops of a section **22**. More specifically, the yarn of course **43** in the sinker wale between needle formed wales **28** and **29** (and in corresponding sinker wales) extends over both elastic yarns **56** and **57**, while in the sinker wale between needle formed wales **29** and **30** (and in corresponding sinker wales) the yarn extends between the elastic yarns and over only the elastic yarn **56**, and while in the sinker wale between the needle formed wales **30** and **31** (and in corresponding sinker wales) the yarn extends between the elastic yarns and over only the elastic yarn **57**, to form the selvage edge **23** of the fabric section **22**. In this way there is a separate starting loop for each wale of the new section of fabric and the elastic yarns form a part of the selvage edge and keep the same from ravelling. While elastic yarns of different diameters are shown, which were fed under a certain amount of tension, the larger elastic yarn aids in keeping the edge in flat non-curled condition but it will be understood that both elastic yarns may be of the same size. It should be noted that the draw-thread of course **42** may be removed and will leave a selvage edge in which the non-elastic yarn of every one of the sinker wales of the course **43** will be interlaced with one or the other or both of the elastic yarns.

After the selvage edge, the border portion **24** may be made and this commences with the course **44** which is made by causing the needles to next pass through a feed set up as feed B of Figure 7 which will knit a plain jersey course of non-elastic yarn. Thereafter each of the courses **45** through **48** (and as many more as may be required for a desired length of mock rib border) is made of a pair of non-elastic yearns, designated **58** and **59**, and of an elastic yarn, which may be like the elastic yarn **57**, by causing the needles to pass through three feeds for each course. Considering the course **45**, the first feed following the course **44** is set up as feed E of Figure 10 at which an elastic yarn **57** is fed to the same spaced pairs of tuck level needles, the feed E operating in the manner previously described. Then the needles are caused to pass through a feed set up like feed F of Figure 11 in which spaced pairs of needles (spaced by a single needle), of the wales **29** and **30** and of corresponding wales, knit the non-elastic yarn **58** of this feed and in which the intervening single needles tuck this yarn. It should be noted that the needles knitting at feed F had the elastic yarn on them in tuck position from feed E, so that as these needles are knitted, they cast off the tucked elastic yarn **57** along with the stitches of course **44**, this cast off portion of the elastic yarn **57** being shown at **60**. The tucked portion of the yarn **58**, fed at feed F to the intervening needles, is shown at **61** along with the stitches of course **44**. The needles are then caused to pass through a feed set up as feed G of Figure 12 in which the action is the reverse of feed F, namely where in feed F there were two needles knitting and one tucking, there are now two needles tucking and one knitting, and this causes the single needles, of the wale **31** and corresponding wales, to knit non-elastic yarn **59** and at the same time cast off stitches of course **44** and the tucks **61** of yarn **58**, while the pair of tucking needles take the yarn **59** in position at tuck level, the tucked portion thereof being indicated at **62**. The needles are then caused to pass through a repeat of the three feeds E, F, and G for each course of the border **24**. It should be noted that starting with the course **46**, the pairs of needles knitting at the feeds F will have tucks **60** of the elastic yarn as well as tucks **62** of the non-elastic yarn **59** to cast off as the yarn **58** is knitted.

While the elastic yarn of the border portion **24** has been shown as incorporated unknit with the non-elastic yarns, it should be understood that the elastic yarn may be incorporated in other ways, as by knitting stitches thereof, in the border portion within the general concept of the invention as it relates to a series of connected individual fabric sections. Furthermore it should be noted that portions of mock rib fabric, in addition to being adjacent the selvage edge, may be placed within the body portion **25** of the fabric sections **22** for ornamental or for other purposes.

Once the border **24** has been made of sufficient length, the needles are caused to pass through feeds set up as feed B for jersey knitting of non-elastic yarn for the body **25** until it is time to start the run-resistant courses at which time the above set forth method of knitting will be repeated to form the next following section **22**.

Attention is directed to the fact that, starting with the course **45**, only the yarn **59** appears in every third wale of the border **24** while only the yarn **58** appears in the intervening pairs of wales, so that vertical stripes may be made in the border by having these yarns of different colors or of other different characteristics and that the single wale color will be at least partially hidden from view until the border **24** is stretched. Every third wale, of the yarn **59**, is forced to the rear of the fabric by the elastic yarn **57** to a relatively submerged position, while at the same time the elastic yarn forces the intervening spaced pairs of wales, of the yarn **58**, upwardly from the face of the fabric to give a rib-like appearance to the border and in this instance the appearance is that of a two and one rib fabric. It will be noted that the elastic yarns are preferably fed to the needles under a certain amount of controlled tension and that the diameter of the border portion **24** in comparison to the diameter of the knitted tube body portion **25** will depend, for a given diameter of elastic yarn, upon the amount of such tension and upon the special stitch construction of the present border portion. It is preferred that the elastic yarns be fed under relatively light tension so that the border portion will not be reduced too greatly in diameter in comparison to the body portion **25** and to this end the stitch construction is of substantial aid, for it has been found that the present arrangement of the non-elastic yarns (which widen out and thicken the fabric) make it possible to use such light tension on the elastic yarns and provide a sufficiently expandable mock rib border portion of satisfactory diameter, feel, and thickness insofar as the rib-like characteristics thereof are concerned.

While the present fabric may be made upon many types of machines, it is preferably made upon a multiple feed sinker top machine having chain positioned means adapted to selectively control the yarns, the needles, the nullifying cams, and the stitch cams at each of its feeds. In Figure 19 the knitting action of each feed of a thirty two feed sinker top machine (preferably having a rotary cylinder) is illustrated as the machine is set up to make the fabric sections of Figure 2. Assuming that the body portion **25** of a section **22** is being knit, then all thirty two feeds will be arranged by the chain controlled means to be set up as feeds similar to feed B of Figure 7 so that thirty two courses of plain fabric will be knit upon each rotation of the needle cylinder. When the body **25** is finished and the run-resistant portion **26** is to be made, the chain positioned means will be set to change the feed set ups of certain of the feeds, and, starting with feed **1**, this feed will be permitted to remain set up as a feed B to make course **38**; the feed **2** will be changed so as to be set up as a feed similar to feed A of Figure 6 to make course **39**; the feed **3** will remain set up as a feed B to make course **40**; the feed **4** will remain set up as a feed B to make a plain course similar to the course **40** (so that there will be two plain courses **40** between courses **39** and **41** of Figure 3); the feed **5** will be set up as a feed similar to feed A to make course **41**; the feeds **6** and **7** will re-

main set up as feeds B to make plain courses similar to the course 40 (so that there will be two plain courses between courses 41 and 42); the feed 8 will be set up as a feed similar to feed A with the yarn withdrawn (designated feed A–1) to cast off the stitches of course 41; the feed 9 will be set up as a feed similar to feed C of Figure 8 to make course 42; the feed 10 will be set up as a feed similar to feed D to feed elastic yarn 56 for the selvage edge; the feed 11 will be set up as a feed similar to feed E to feed elastic yarn 57 for the selvage edge; the feed 12 will remain set up as a feed B to make course 43; the feed 13 will remain set up as a feed B to make course 44; the feeds 14, 15, and 16 will be set up as feeds similar to feeds E, F, and G, respectively, to form course 45; the feeds 17 through 31 will be set up as five adjacent series of three feeds each, in which each series of three feeds will be set up as feeds similar to feeds E, F, and G, respectively, to consecutively form the courses 46, 47, and 48 (and following like courses); and the feed 32 will be thrown out of action by causing the needles to pass by at welt or at tuck level, by withdrawing the yarn, and by raising the stitch cam to level 51.

This completes a round of the machine and as the next round starts, the feeds 1 through 9 will be set up as three adjacent series of three feeds each, in which each series of three feeds will be set up as feeds similar to feeds E, F, and G, respectively, to form additional courses of the border 24; the feed 10 will be thrown out of action simply by withdrawing the elastic yarn 56; the feed 11 will remain set up as a feed E; and the feeds 12 and 13 will be set up as feeds similar to feeds F and G, respectively, so that feeds 11, 12, and 13 will act to form a course of the border portion. It will be noted that all of the machine feeds (except feeds 10 and 32 which are out of action) are now set up as continuing series of three feeds E, F, and G, and the machine is permitted to operate with this feed set up until a complete border portion 24 has been knitted. When it is desired to discontinue knitting the border and to start the body 25 knitting, the chain means will again start with feed 1 and will change the feed set ups at each of the thirty two feeds (including the feeds 10 and 32 which may be used for the body) so that each feed is set up as a feed B for plain knitting the body 25.

The reason for throwing out feeds 10 and 32 is to provide a multiple of three feeds in action for the mock rib knitting since each course thereof requires the use of three feeds. It should be noted that each feed which is set up as a feed E has its feeding yarn changed from non-elastic to elastic yarn for so long as it remains so set up after which the yarns are again changed so that non-elastic yarns are fed to the needles. It should also be noted that the machine is supplied with one or more of the usual latch openers following feed 8 (at which the cast off is made) so that the bare needles will have opened latches at the feeds next placing yarn on the bare needles.

The run-resistant portion of the fabric as made upon the machine set up of Figure 19 differs slightly from the fabric as shown in Figure 3 in that certain extra plain courses (made on feeds 4, 6, and 7) were added, however this does not detract from the effectiveness of the run-resisting action. In the present instance these courses were added because it was more convenient to set up the machine this way for the most effective use of its feeds. Attention is directed to the fact that at each feed where a needle selection is required, its wheel 49 is set up for the particular two and one (or one and two) needle selection and for the proper needle-level separation required at that feed so that when the nullifying cam of each feed (between its wheel and its stitch cam) is in lowermost position, each feed will provide the needle level separation of its wheel selection; when each nullifying cam is in its intermediate position each feed will still provide the same needle selection but those needles which previously were at welt level will now be at tuck level; and when each nullifying cam is in its uppermost position it will raise all the needles so that each feed will act as a plain feed similar to feed B. Thus with the same basic wheel selection at each feed along with the appropriate use of the nullifying cams, it is possible to provide for the different stitch constructions of the various parts of the sections 22 on a machine of the inclined wheel needle selecting type, whereby certain of the feeds may have as many as three different feed set ups. This is important since it permits the character of the knitting to be changed at each feed so that the fabric may be economically made upon a fast-producing multiple feed machine. The stitch cam 50 remains at lower level when knitting stitches at a feed (or when making the cast off course) and is moved to upper level 51 when no stitch loops are formed.

A modification of the fabric is illustrated in Figure 4 in which certain portions of the fabric sections are of a different stitch construction. In Figure 4 the body portion of a modified form of a section 22 is shown at 63, the run-resisting portion is shown at 64, the draw thread is shown at 65, the selvage edge is shown at 66 and the mock rib border portion is shown at 67, the fabric illustrated having the needle formed stitch wales 68 through 75 and the courses 76 through 90. The courses 76 and 77 are formed on feeds set up as feed B which provides plain jersey body courses. The courses 78, 80, and 82 are also formed on feeds set up as feed B, however, in courses 78 and 80 the pairs of spaced stitches in the wales 70 and 71 and in the wales 74 and 75 are held while the courses 79 and 81 are formed on feeds set up as feed H of Figure 13. The difference of portion 64 of Figure 4 over the portion 26 of Figure 3 is that in the former the needle set up is two and two whereas in the latter it is two and one. Following plain course 82 the needles are caused to pass through a feed set up as feed H without yarn thereat so that spaced pairs of loops are cast off as shown at 91. The needles are then caused to pass through a feed set up as feed I of Figure 14 wherein the spaced pairs of bare needles (made bare by the cast off course) remain at the welt level missing the non-elastic yarn while the intervening pairs of needles are raised to cast off level and are retracted to knitting level to knit stitches of the yarn Y, thus forming the draw-thread course 83. The needles (some of which are bare) are then caused to pass through a feed set up as feed J of Figure 15 wherein alternate needles remain at welt level while the intervening needles are raised to tuck level to take the elastic yarn 92 in their hooks (retaining the draw-thread course stitches) and are then retracted to welt level, the elastic yarn passing to the rear of the welt positioned needles. This causes the elastic yarn 92 to be interlaced in front of and in back of every other needle. The needles are then caused to pass through a plain feed set up as feed B wherein all the needles take non-elastic yarn Y and when they are retracted to knitting level the needles will cast off the tucks of the elastic yarn (along with the stitches of the draw-thread course on some of the needles) so that the elastic yarn will be interlaced with the non-elastic yarn of each sinker wale to form the selvage edge 66 at the same time that the course 84 is formed. Removal of the draw-thread course will leave a selvage edge as shown in Figure 5. The needles are then caused to pass through a feed set up as feed B wherein plain course 85 is formed. Then the needles pass through a feed set up as feed L of Figure 16 wherein spaced pairs of needles (of wales 72 and 73 and corresponding wales) remain at the welt level and wherein the intervening pairs of needles take the elastic yarn 93 at tuck level and are retracted to welt level to place the elastic yarn in back of the non-raised needles. The elastic yarn 93 may be of smaller diameter than the elastic yarn 92 used for the selvage edge. The needles are then caused to pass through a feed set up as feed B wherein all the needles knit a non-elastic yarn 94 while the tucked portions of the elastic yarn 93 are cast off in

course 86. Then the needles pass through a feed set up as feed M of Figure 17 wherein spaced pairs of needles (of wales 74 and 75 and of corresponding wales) knit the yarn 95 to form course 87 in which the yarn 95 is tucked on the intervening pairs of needles as shown at 96. The needles then pass through succeeding series of three feeds each, in each series of feeds there is fed in succession an elastic yarn 93, a non-elastic yarn 94 and a non-elastic yarn 95 to form the following courses of the mock rib border portion. It will be noted that in the modification of Figure 4 the border simulates a two and two rib fabric and that there are twice as many stitches in the raised wales 70 and 71 and corresponding wales than there are in the submerged intervening wales 72 and 73 and corresponding wales. The extra number of stitches in the raised wales increases the mock rib effect as it makes these wales thicker than the adjoining wales of a lesser number of stitches. The border may have a walewise striped effect by having the yarns 94 and 95 of different colors for the yarn 94 is the only one forming stitches in the submerged wales while the yarn 95 forms larger stitches which substantially hide the smaller stitches of the yarn 94 in the raised wales, the action of the elastic yarn and of the two-course held stitches contributing to the smaller stitches.

The sections 22, with the modifications of Figure 4 or with the modifications to be described in connection with Figure 5, may be made upon a multiple feed sinker top machine after the general method outlined in connection with the fabric of Figure 3 with the inclined wheels arranged to make the necessary needle selections.

Another modification of the mock rib border portion is shown in Figure 5 wherein 97 designates the selvage edge which is similar to the selvage edge 66 of Figure 4. It is obvious that the selvage of Figure 3 could be used with fabric modification of Figures 4 or 5 in place of the single elastic yarn selvage. The border portion is shown at 98 and the stitches thereof are in wales 99 through 106 in the courses 107 through 111, the course 107 forming the selvage edge along with the elastic yarn. Course 108 is a plain course formed by having the needles pass through a plain feed set up as feed B. In making the border, the needles then pass through a feed set up as feed E wherein an elastic yarn 112 is interlaced about the needles, being tucked in the wales 103 and 104 and in corresponding wales. This elastic yarn passes to the rear of the intervening single needles which form the intervening wales. The needles then pass through a feed set up as feed F in which the needles forming the pair of adjacent wales 103 and 104 (and corresponding spaced pairs of wales) upon which the elastic was tucked upon preceding feed E, knit a non-elastic yarn while the intervening single needles (of wale 102 and corresponding wales) pass by at a tuck level so that this yarn is tucked in these single wales as shown at 113. At this feed F, as the spaced pairs of needles knit the non-elastic yarn, they will cast off the tucked elastic yarn thereon. Then the needles pass through a feed set up as feed C wherein the single intervening needles knit a second non-elastic yarn while said spaced pairs of needles remain at welt level so that this second non-elastic yarn is floated to the rear of the fabric as shown at 114, the single needles casting off the tucks of the first non-elastic yarn at the same time. The last three described feeds are used to make the course 109 and the succeeding courses 110 and 111 are each formed of a like series of three feeds. Here again the border may have walewise stripes since separate yarns only are knitted in the raised pairs of spaced wales, 103 and 104 and the like, and in the intervening submerged spaced single wales, 102 and the like. The mock rib effect of the Figure 5 fabric causes the border 98 to simulate a two and one rib fabric somewhat similar to the border portion fabric of Figure 3. It will be understood that the border of Figure 5 may form a part of a complete section 22, of a series of draw-thread connected fabric sections.

My invention is not limited to the specific details and formation of stitches herein shown, and described in the embodiments selected for purposes of illustration, as variations may be made in the series of connected fabric sections and in the machine and method of making the same, and within the scope of the following claims.

While the mock rib jersey fabric has been shown as forming the border portions of fabric sections of relatively large diameter, it is of general use as a mock rib fabric in the knitting art and as an example thereof it may be made of smaller diameter as when made on a hosiery machine of one or more feeds, and may be used (along with a suitable elastic yarn selvage edge course) as an integrally formed mock rib top portion for hosiery, within the scope of the appended claims.

I claim:

1. In a method of knitting a selvage for a weft knit jersey fabric on a circular series of needles of a circular knitting machine, the step of interlacing an elastic yarn to the front of every third needle and to the rear of the intervening pairs of needles, the step of interlacing a second elastic yarn to the front of said third needles and to the front of one of each of said pairs of needles and to the rear of the other of each of said pairs of needles, and the step of feeding a non-elastic yarn to all the needles and at the same time drawing needle loops of the non-elastic yarn while casting off said elastic yarns to form said selvage.

2. In a method of knitting a selvage for a weft knit jersey fabric on a circular series of needles of a circular knitting machine of which every third needle has a fabric stitch thereon while the intervening pairs of needles are bare, the step of interlacing an elastic yarn in front of corresponding ones of each of said pairs of needles and to the rear of the needles therebetween, the step of interlacing a second elastic yarn to the front of said pairs of needles and to the rear of the stitch-bearing third needles, and the step of feeding a non-elastic yarn to all the needles and at the same time drawing needle loops of the non-elastic yarn while casting off said elastic yarns and said stitches to form said selvage.

3. In a method of knitting a selvage for a weft knit tubular jersey fabric on a single circular series of latch needles of a multiple feed knitting machine in which every third needle has a fabric stitch thereon while the intervening pairs of needles are bare, the step of causing said needles to pass through a feed with corresponding ones of each of said pairs of needles at tuck level and with the needles therebetween at welt level and at the same time feeding an elastic yarn to be taken by the tuck level positioned needles and to pass to the rear of the welt level positioned needles, the step of causing said needles to pass through a second feed with said pairs of needles at tuck level and with said stitch-bearing third needles at welt level and at the same time feeding a second elastic yarn to be taken by the tuck level positioned needles and to pass to the rear of the welt level positioned needles, and the step of causing all of said needles to be positioned at clearing level and to pass through a third feed at which a non-elastic yarn is fed to all of the needles and at the same time drawing needle loops of the non-elastic yarn while casting off said elastic yarns and said stitches to form said selvage.

4. In a method of knitting jersey mock rib fabric of elastic and of a pair of non-elastic yarns on a circular series of needles of a multiple feed circular knitting machine, the step of causing said needles to pass through a first feed at which said elastic yarn under tension is interlaced in front of spaced groups of adjoining needles positioned at tuck level and to the rear of the intervening needles therebetween positioned at welt level, the step of causing said needles to pass through a second feed at which one of said pair of non-elastic yarns is fed to

said groups of needles positioned at clearing level and in which one yarn is fed to said intervening needles positioned at tuck level and at the same time retracting said series of needles to knitting level to form stitches of said one yarn on said groups of needles while they cast off said tucked elastic yarn along with previously formed stitches of said one yarn and along with previously formed tucks of the other yarn of said pair of non-elastic yarns and while said intervening needles retain said tucked one yarn along with previously formed stitches of said other yarn, the step of causing said needles to pass through a third feed at which said other yarn is fed to said intervening needles positioned at clearing level and in which said other yarn is fed to said groups of needles positioned at tuck level and at the same time retracting said series of needles to knitting level to form stitches of said other yarn on said intervening needles while they cast off said tucked one yarn along with previously formed stitches of said other yarn and while said groups of needles retain said tucked other yarn along with previously formed stitches of said one yarn, and repeating said steps to form said fabric.

5. A method as set forth in claim 4 in which each group of said spaced groups of needles comprises at least a pair of needles and in which said intervening needles are single needles.

6. In a method of knitting jersey mock rib fabric of elastic and of a pair of non-elastic yarns on a circular series of needles of a multiple feed circular knitting machine, the step of causing said needles to pass through a first feed at which said elastic yarn is interlaced in front of alternate pairs of needles positioned at tuck level and to the rear of the intervening pairs of needles positioned at welt level, the step of causing said needles to pass through a second feed at which all of said needles form stitches of one of said non-elastic yarns, the step of causing said needles to pass through a third feed at which the intervening pairs of needles form stitches of the other of said non-elastic yarns and in which the alternate pairs of needles tuck said other yarn, and repeating said steps to form said fabric.

7. In a method of knitting jersey mock rib fabric of elastic and of a pair of non-elastic yarns on a circular series of needles of a multiple feed circular knitting machine, the step of causing said needles to pass through a first feed at which said elastic yarn is interlaced to the rear of every third needle positioned at welt level and in front of the inbetween pairs of needles positioned at tuck level, the step of causing said needles to pass through a second feed at which said pairs of needles form stitches of one of said non-elastic yarns and in which the third needles tuck said one yarn, the step of causing said needles to pass through a third feed at which said third needles form stitches of the other of said non-elastic yarns and in which said pairs of needles are at welt level to miss said other yarn, and repeating said steps to form said fabric.

8. In a method of knitting on a multiple feed circular knitting machine having a fabric advancing and tensioning take-up and having a circular series of latch needles to form a continuous series of draw-thread connected separable sections of tubular jersey knit fabric each of which has a beginning selvage, in which said series of fabric sections are advanced under tension by the take-up as they are made on the needles, the step of arranging the character of the knitting on a number of the feeds to knit non-elastic yarns to form a jersey body portion for a fabric section, the step of re-arranging the character of the knitting on selected feeds to knit non-elastic yarns to form run-resistant courses while other feeds form a cast off course and a draw-thread course for said fabric section, the said run-resistant courses containing stitch constructions to limit the run back of the cast off stitches of said cast off course despite the take-up tension on the fabric, the step of re-arranging the character of the knitting on selected feeds to manipulate elastic and non-elastic yarns to form a selvage for the succeeding fabric section, the step of re-arranging the character of the knitting on selected feeds to incorporate elastic and to knit non-elastic yarns to form a mock rib portion for said succeeding fabric section, the step of re-arranging the character of the knitting on the feeds according to the first named step to form a jersey body portion for said succeeding fabric section, and the repeating said steps to form said series of fabric sections.

9. In a method of knitting on a multiple feed sinker top circular knitting machine to form a continuous series of draw-thread connected separable sections of tubular jersey knit fabric each of which has a beginning selvage, the step of arranging the character of the knitting on a number of the feeds to knit non-elastic yarns for a number of revolutions of the machine to form a jersey fabric body portion for a fabric section, the step of re-arranging the character of the knitting on selected feeds for the following revolution of the machine to knit non-elastic yarn to form a draw-thread course for said fabric section and to manipulate elastic and non-elastic yarns to form a selvage for the succeeding fabric section and to incorporate elastic and to knit non-elastic yarns to form courses of a mock rib border portion for said succeeding section, the step of re-arranging the character of the knitting on selected feeds to continue the formation of said mock-rib-border-portion courses for a number of revolutions of the machine, the step of re-arranging the character of the knitting on the feeds according to said first named step to form a jersey fabric body portion for said succeeding section, and repeating said steps to form said series of fabric sections.

10. In a method of knitting on a multiple feed circular knitting machine having a circular series of needles to form a continuous series of draw-thread connected separable sections of tubular jersey knit fabric sections each of which has a beginning selvage, the step of arranging the character of the knitting on a number of the feeds to knit non-elastic yarns to form a jersey body portion for a fabric section, the step of re-arranging the character of the knitting on selected feeds to knit non-elastic yarns to form run-resistant courses while other feeds form a cast off course and a draw-thread course for said fabric section, said draw-thread course having stitches formed on spaced needles and having stitch-connecting yarn floats therebetween, the step of re-arranging the character of the knitting on selected feeds to manipulate elastic and non-elastic yarns to form a selvage for the succeeding fabric section, the step of re-arranging the character of the knitting on selected feeds to incorporate elastic and to knit non-elastic yarns to form a mock rib portion for said succeeding section, said mock rib border portion having spaced upstanding and intervening submerged wales of which said submerged wales are formed on said spaced needles, the step of rearranging the character of the knitting on the feeds according to said first named step to form a jersey body portion for said succeeding section, and repeating said steps to form said series of fabric sections.

11. A method as set forth in claim 10 in which said draw-thread comprises a course having stitches formed on every third needle and in which said submerged wales are formed on said third needles.

12. A circular multiple feed knitting machine having a fabric take-up and having a circular series of needles adapted to form a continuous series of draw-thread connected separable jersey fabric sections each of which has a beginning selvage, in which said take-up is adapted to advance and to tension said fabric sections as they are made by and upon said needles, a number of the feeds being adapted to knit non-elastic yarns for a number of machine revolutions to form a jersey body portion for each of said fabric sections, certain of the feeds being

adapted to knit non-elastic yarns in a following machine revolution to form run-resistant courses while other feeds form a cast off course and knit a draw-threaded course for each of said fabric sections, still other of the feeds being adapted to incorporate tensioned elastic and to knit non-elastic yarns during the said following machine revolution to form a selvage and courses of mock rib fabric for each of said fabric sections, the feeds being adapted to incorporate tensioned elastic and to knit non-elastic yarns during following machine revolutions to form additional mock rib courses for each of said fabric sections.

13. A circular multiple feed knitting machine having a circular series of latch needles adapted to knit a continuous series of draw-thread course connected individual jersey knit tubular fabric sections, each of said sections being formed of a plurality of elastic and of a plurality of non-elastic yarns arranged in multiple course spirals and having a beginning selvage of elastic and of non-elastic yarns, an adjoining mock rib border portion of elastic and of non-elastic yarns, a following body portion of non-elastic yarns, and a terminal run-resisting portion of non-elastic yarns, the said draw-thread being of non-elastic yarn and connecting the selvage of one section with the run-resisting portion of an adjacent section, each of said yarns being fed to the needles at individual ones of said feeds, the said machine having a sufficient number of feeds so that end courses of the

body portion of a section, the run-resisting portion of said section, the draw-thread course between the run-resisting portion of said section and the selvage of the following section, the selvage of the following section, and courses of the mock rib border portion of the following section are all made during a single revolution of the machine.

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