Jan. 10, 1956 H. POPE, JR 2,729,957

METHOD OF KNITTING AND THE PRODUCT THEREOF

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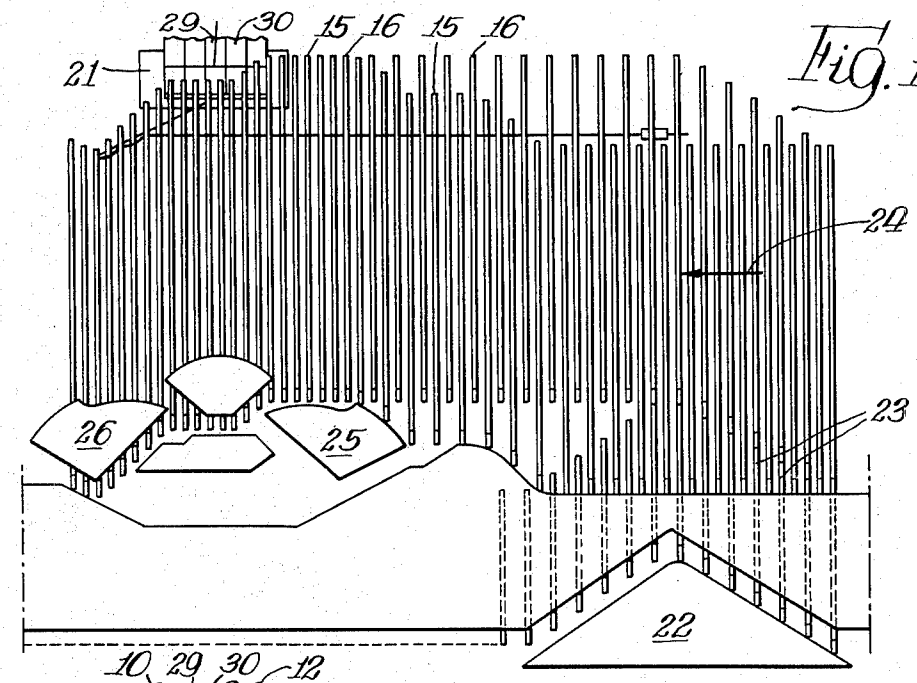


Fig. 1.

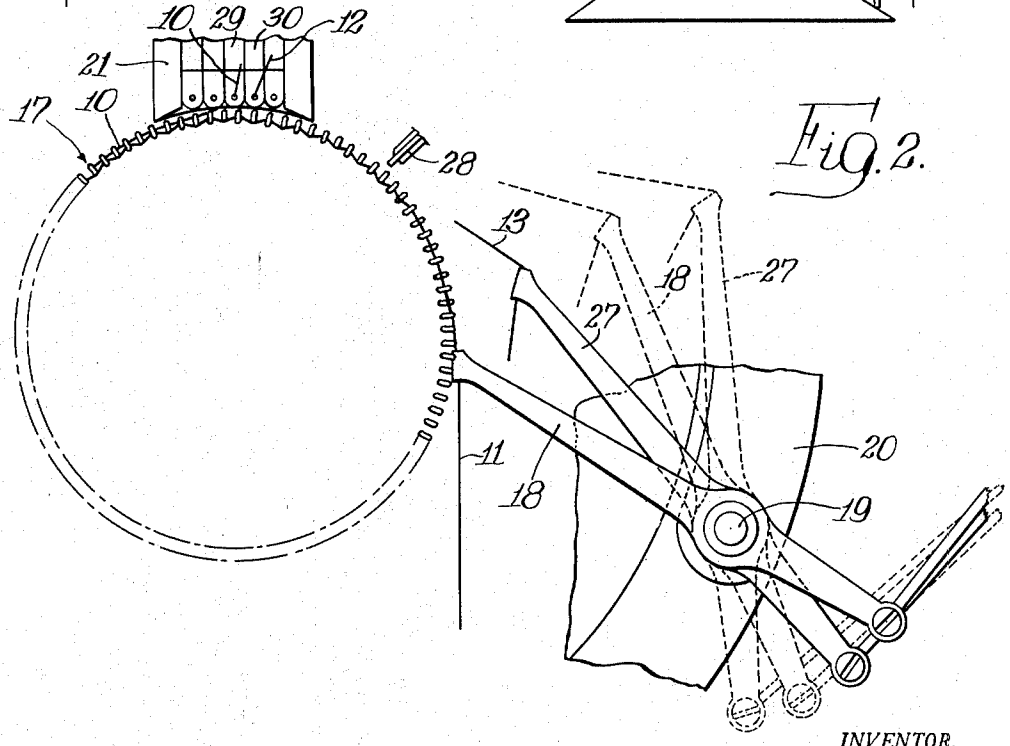


Fig. 2.

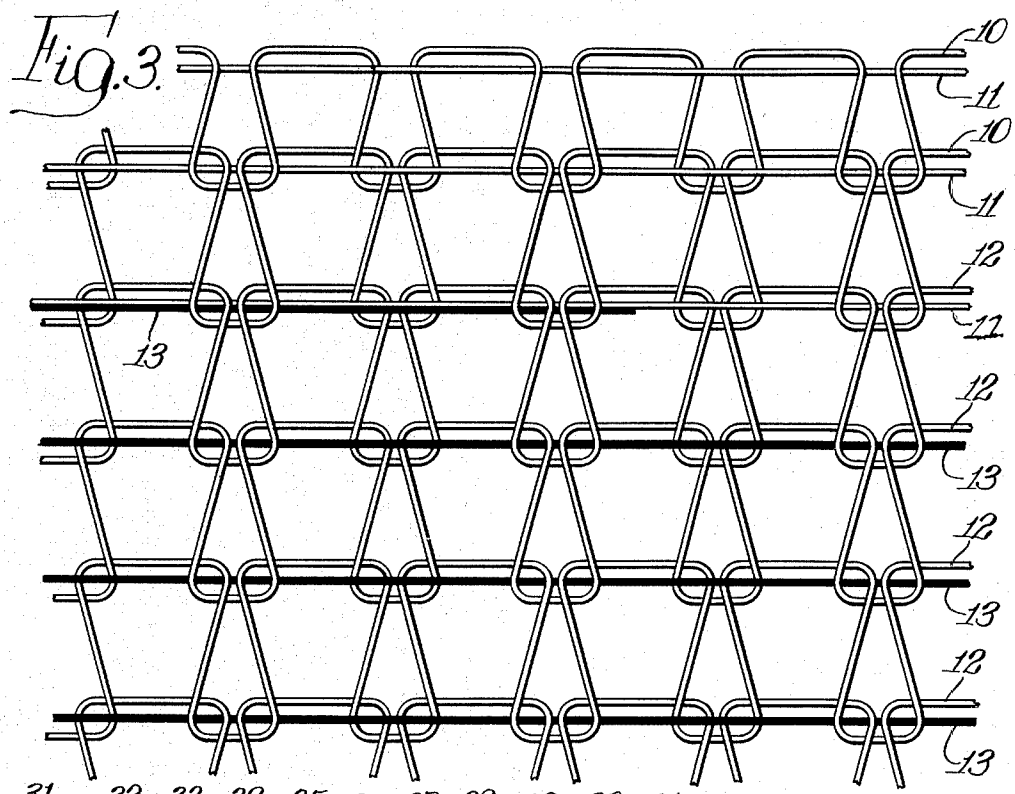
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Fig. 3.



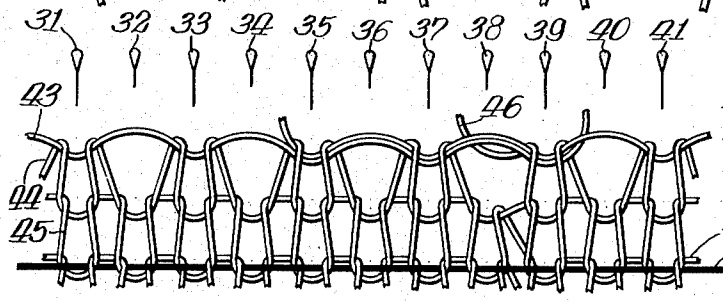


Fig. 4.

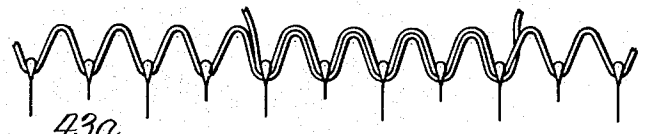


Fig. 5.

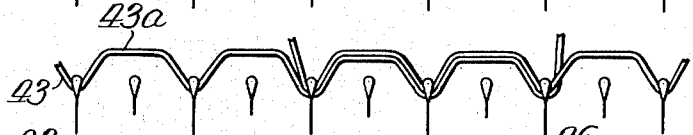


Fig. 6.

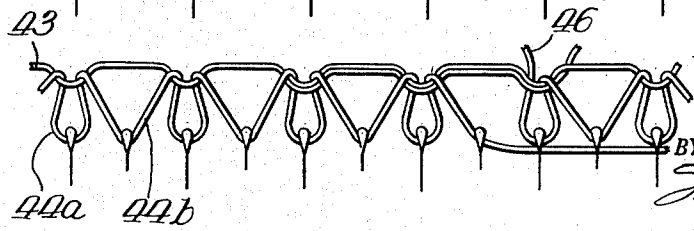


Fig. 7.

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METHOD OF KNITTING AND THE PRODUCT THEREOF

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Application December 24, 1952, Serial No. 327,860

6 Claims. (Cl. 66—172)

This invention relates to improvements in hosiery and in methods of knitting and its purpose is to provide improved elastic top hosiery produced in a novel manner.

Elastic top hosiery is commonly produced in the form of men's half hose having an elastic yarn or thread laid in around the top in spaced courses of the knitted inelastic yarn to provide an elastic selvage edge and an elastic top portion adapted to adhere to the leg of the wearer. Although usually produced as a plain knit fabric, hosiery of this type has a rib-like formation at the top due to the contraction of the elastic yarn. Elastic top stockings of this type have been unsatisfactory in that the selvage edge including the first course of elastic yarn tends to roll outwardly and downwardly so that the stocking has an objectionable rolled edge. Further, it has been found that when knitting such hosiery on circular knitting machines, any tendency for the occurrence of "missed stitches" usually occurs in the first course where the elastic yarn is laid in to provide the selvage edge so that the first course of rubber or other elastic is sometimes not properly interlocked with the inelastic yarn in this course.

It has been discovered that the above mentioned difficulties may be overcome by knitting one or more courses at the top of the stocking with the use of yarn formed of vegetable fibre or the like which is capable of being dissolved, and then knitting subsequent courses with a cotton yarn or the like while laying in the inelastic yarn in the usual fashion, following which the yarn in the first course or courses is dissolved, leaving an elastic selvage edge. A yarn which is suitable for knitting the initial course or courses is that known as "alignate" which is a hydrophyllic vegetable colloid extracted from sea kelp and having the property of being soluble in water or alkaline solutions. By this improved method a stocking is produced having a smooth selvage edge which lies flat against the leg of the wearer without rolling and which is free of objectionable missed stitches. These and other objects and advantages of the invention will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which two forms of the improved method of knitting and two examples of the product thereof are illustrated. In the drawings,

Figure 1 shows a development of a part of the knitting wave and cams of a circular knitting machine of the Scott & Williams type which may be used in carrying out the improved method of the present invention;

Fig. 2 is a somewhat diagrammatic top plan view of the structure shown in Fig. 1, showing the manner in which the various yarns are fed to the needles;

Fig. 3 shows an enlarged elevation of a portion of the knitted fabric at the top of a stocking made according to the present invention with the use of knitting apparatus such as that illustrated in Figs. 1 and 2;

Fig. 4 shows an elevation on an enlarged scale of a portion of fabric knitted by a modified method of the

present invention and illustrating the relation of the active and inactive needles to the loops of the initial knitting courses;

Fig. 5 shows a portion of the endless series of latch needles employed in producing the fabric shown in Fig. 1, illustrating the engagement of the yarn with all of the needles in knitting the first course;

Fig. 6 shows the condition when some of the yarn loops shown in Fig. 5 have been removed from the hooks of the needles prior to placing a new yarn for the second course in these hooks; and

Fig. 7 shows the subsequent relation of the yarn to the needle hooks during the knitting of the second course.

The apparatus illustrated in Figs. 1 and 2 for producing the fabric shown in Fig. 3 is substantially like that shown and described in United States Letters Patent of James T. Getaz, No. 2,054,217, dated September 15, 1936, except that provision is made for handling a greater number of yarns. In the use of this apparatus according to the present invention one or more of the initial courses, preferably two courses, are formed from two alginate yarns, one yarn **10** being knitted while the other yarn **11** is laid into the loops of the knitted fabric, as shown in Fig. 3. After two courses a yarn **12** of cotton, wool or the like is introduced into the knitting operation in place of the yarn **10** and an elastic yarn **13** formed largely or wholly of rubber or the like, is dropped into the loops in place of the other alginate yarn **11**. Thereafter, the knitting is continued with the yarns **12** and **13** until an elastic top of the desired extent is obtained, whereupon the elastic yarn **13** is discontinued and the plain knitting is continued with the yarn **12** of cotton, wool or the like until the stocking is completed. Then, the initial courses made up of the alginate yarns **10** and **11** are dissolved, as hereinafter more fully described, leaving the finished stocking with an elastic yarn **13** around its top edge.

In carrying out the invention in the manner just described, the alginate yarn **11**, which is to be threaded through the loops of the first course formed by the alginate yarn **10**, is introduced into the machine at a point sufficiently in advance of the knitting wave to allow the yarn to be interlaced in front of jackless needles **15** and behind alternate needles **16** having jacks, as well as below the latches of the needles **15**. In the same revolution of the needle cylinder during which the yarn **11** is interlaced between the needles, the other alginate yarn **10** is introduced into the hooks of all of the needles after the yarn **11** has been interlaced. The two yarns **10** and **11** thus come to the knocking-over point **17** with the yarn **11** behind one needle and below the latch of the next, while the looping yarn **10** lies in the hooks of all of the needles. After passing the knocking-over point **17**, the yarn **11** is free of all of the needles. The successive loops of the yarn **10** extend on opposite sides of the yarn **11** which is thus secured. After two courses have been knitted in this fashion with the alginate yarns **10** and **11**, the yarn **12** of cotton, wool or the like is brought into the knitting operation to replace the yarn **10** and the elastic yarn **13** replaces the alginate yarn **11**, being preferably arranged to overlap the alginate yarn **11** at the beginning of the third course as shown in Fig. 3. In knitting with the yarns **12** and **13** the same procedure is followed as when knitting with the yarns **10** and **11**, the elastic yarn **13** being introduced in advance of the knitting point and interlaced with the needles as when employing the yarn **11**. The knitting then continues with the yarns **12** and **13**.

The alginate yarn **11** is preferably fed by means of a yarn finger **18** pivoted on a post **19** extending upwardly from the base **20** of the knitting machine. This arm moves into operative relationship to the needles **15** and **16** in a horizontal plane slightly above the sinker cap.

The end of the finger **18** applies the yarn **11** at a point on the needle circle which is immediately following the crest of the cam **22** which raises the jacks **23** under alternate needles **16** as the needle cylinder rotates in the direction of the arrow **24**. The alginate yarn **11** is thus laid against the shanks of the needles **16** and the finger **18** is so located that the latches of these needles are raised above the yarn so that the yarn **11** is laid in and not knitted in. After the yarn **11** is laid against the raised needles **16**, the jackless needles **15** rise on the stitch cam **25** and interlace the yarn **11** by passing in front of it. All of the needles then reach the draw-down cam **26** at the same level. Thus, the interlacing of the yarn **11** is effected without disturbing the normal knitting wave.

The elastic yarn **13** is also fed to the needles by a finger **27** pivoted on the post **19** and actuated in the usual manner when the finger is not in use. When either feeding finger **18** or **27** is not in use it may be swung to an inactive position, shown by dotted lines in Fig. 2, and the yarn fed thereby may be held by a combined cutter and clamp **28**. The yarns **10** and **12** which are looped by the needles in the knitting operation are fed by the usual fingers **29** and **30** mounted on the throat plate **21** in advance of the knocking-over point **17**. The feeding of the alginate yarn **11** by the arm **18** should start slightly in advance of the feeding of the alginate yarn **10** in the throat plate by the arm **29**. Also, the feeding of the elastic yarn **13** to the needles by the arm **27** should take place slightly in advance of the feeding of the yarn **12** to the throat plate by the finger **30**. The yarns from any of these arms may be cut off and the yarn clamped while the arm is inactive.

Instead of following the procedure explained above, the preliminary courses made up of alginate yarn may be formed by other known methods such as that disclosed in United States Letters Patent of Robert W. Scott, No. 1,148,056, dated July 27, 1915, after which an elastic yarn and a yarn formed of cotton, wool or the like, may be substituted and knitted as above described. This modification is illustrated in Figs. 4, 5, 6 and 7 of the drawings which show diagrammatically some of the needles of a circular knitting machine, these needles being identified by the numbers **31**, **32**, **33**, **34**, **35**, **36**, **37**, **38**, **39**, **40** and **41**. The initial course **43** of alginate yarn is laid in the hooks of all of the needles as shown in Fig. 5 with the yarn preferably overlapped between some of the needles, for example, between the needles **35** and **39**. The initial course **43** is then enveloped by the loops of the next course **44** of the same alginate yarn. These loops of the next course pass recurrently in front of and behind the yarn of the first course and, for this purpose, the bights **43***a* of the yarn are removed from the hooks of alternate needles, prior to placing the yarn of course **44** on the hooks, the bights **43***a* being cast off behind the needles on which they are formed, as shown in Fig. 6. The second course may then be formed, beginning at any point on the series of needles, such as the point **46**, by feeding the yarn to the hooks of the needles then located alternately in front of and behind the yarn of the initial course **43** and subsequently casting off the loops **44***a* of the yarn of the second course, as shown in Fig. 7. Each of the needles then retains in its hook either a loop **44***a* or a bight **44***b* of the yarn of the second course, as set forth in said Scott Letters Patent.

After the second course **44** of the alginate yarn is formed in the manner just referred to, another course **45** is knitted in the usual manner, using all of the needles, and thereafter the succeeding courses are knitted with a yarn **47**, of cotton, wool or the like, which is substituted for the alginate yarn. When the knitting is started with the yarn **47**, an elastic yarn **48** is then laid in, either in every course or in spaced courses, according to the method described above until an elastic top portion of the desired extent has been formed, after which the knitting of the stocking continues with the yarn **47** alone.

Whatever knitting procedure is followed in forming the initial course or courses of alginate yarn, the knitted alginate yarn is then removed by dissolving it, thereby leaving the elastic top with a selvage edge bounded by an elastic yarn or thread. Although alginate yarn, technically known as calcium alginate rayon, may be dissolved with water, its dissolution may be more quickly and perfectly effected by an alkaline solution such as sodium carbonate or sodium hexametaphosphate or tetra sodium pyrophosphate. The viscosity of alginate solutions is reduced in the presence of sodium chloride (common salt) and it is preferable to add a quantity of salt to the solution.

The dissolution of the alginate fibre in the knitted stocking is preferably carried out by adding the separating or dissolving agent during the wetting process immediately before the dyeing of the hosiery.

It has been found that to remove alginate in the presence of wool it is desirable to use substantially the following proportions by weight:

100 pounds of hosiery or other fabric
2,000 pounds of water
15 pounds of common salt
7.5 pounds of tetra sodium pyrophosphate

The mixture is agitated gently for a period of from 15 to 30 minutes with the solution at a temperature of about 120° Fahrenheit.

When there is not wool present in the hosiery, the alginate may be more cheaply removed by using a dissolving solution made up according to the following proportions:

100 pounds of knitted hosiery or fabric
2,000 pounds of water
4 pounds of soda ash

This mixture is agitated gently for a period of fifteen minutes.

In either of the examples just referred to other alkalies may be substituted for those mentioned.

Although certain examples of the improved method and of the improved product have been disclosed by way of illustration of the present invention, it will be understood that the invention may be formed and practiced in various ways without departing from the scope of the appended claims. In the claims, the term "body yarn" may be interpreted to include yarns formed of cotton, wool, nylon or other fibres.

I claim:

1. A stocking comprising a top having a course knitted with alginate yarn only and adjacent said course other courses knitted with a body yarn and an elastic yarn laid in the loops of said body yarn.

2. A stocking comprising a knitted course of alginate yarn only and having a separate alginate yarn laid in the loops of said course, and adjacent said course a plurality of courses of body yarn having elastic yarn laid in the loops thereof.

3. The method of knitting a stocking top which comprises the steps of forming a selvage edge from a yarn capable of being dissolved, then kniting succeeding courses of the stocking top from a body yarn, and then dissolving said first named yarn.

4. The method of knitting a stocking top which comprises the steps of knitting a selvage edge from a yarn capable of being dissolved, then knitting succeeding courses of the stocking top from a body yarn, and laying an elastic yarn in the loops of said body yarn.

5. The method of knitting a stocking top which comprises the steps of knitting a selvage edge from a yarn capable of being dissolved, then knitting succeeding courses of the stocking top from a body yarn, laying an elastic in the loops of said body yarn, and then dissolving said first named yarn.

6. The method of knitting a stocking top which comprises the steps of knitting a top course with alginate yarn, laying a second alginate yarn in the loops of said course,

then knitting succeeding courses of body yarn, laying an elastic yarn in the loops of at least one of said last named courses, and then dissolving said alginate yarn.

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