

April 16, 1935.

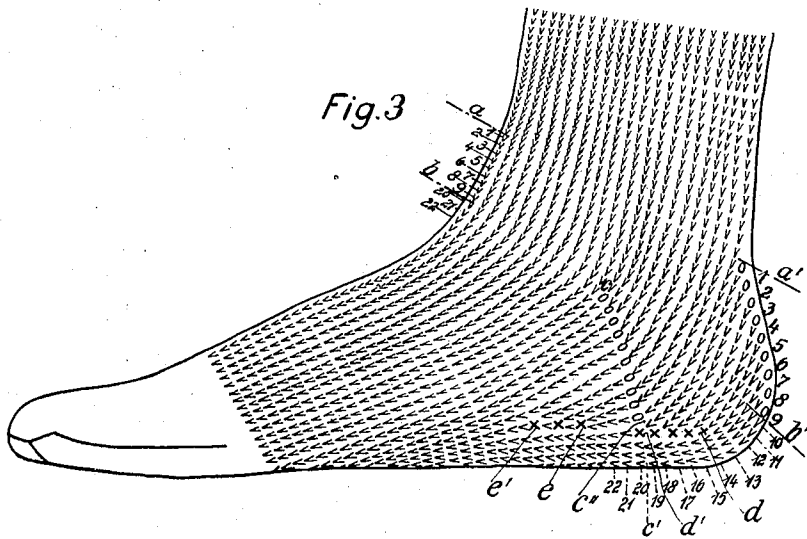
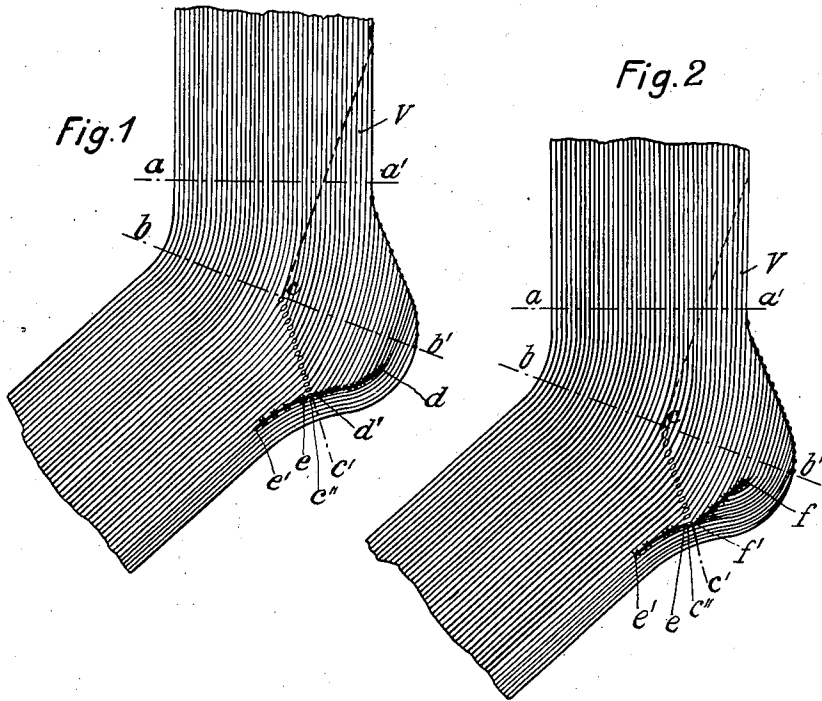
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1,998,369

STOCKING

Filed July 19, 1933

2 Sheets-Sheet 1



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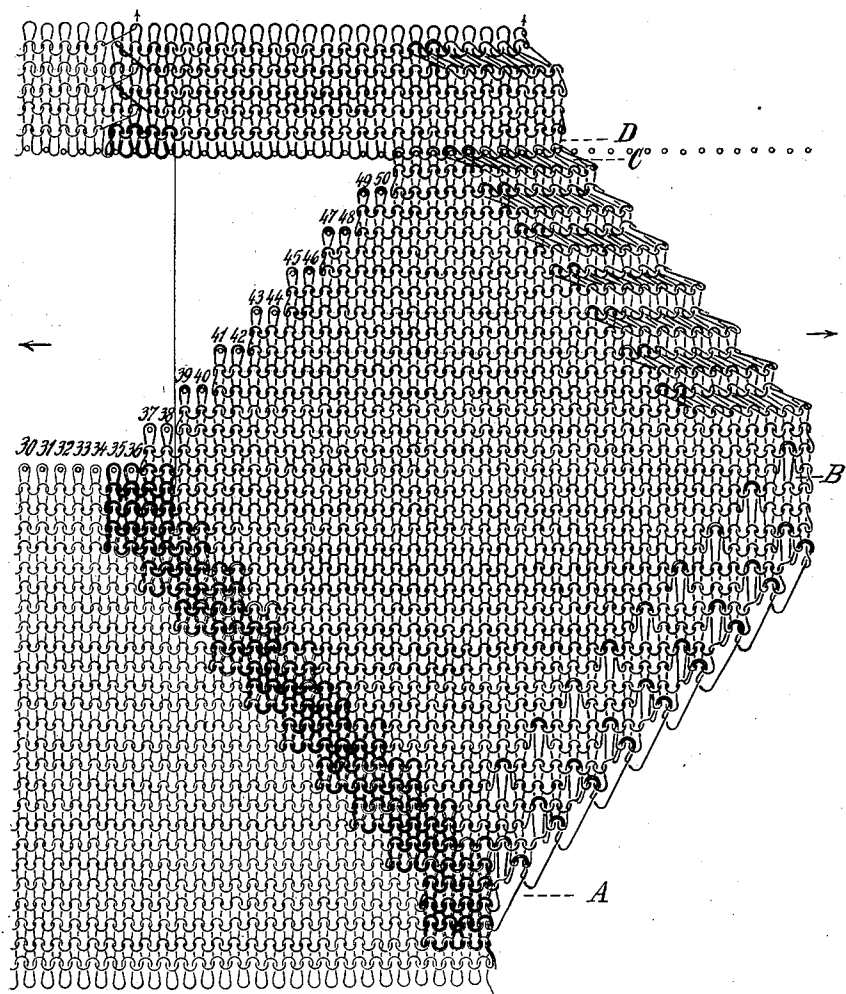
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Fig. 4



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# UNITED STATES PATENT OFFICE

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## STOCKING

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3 Claims. (Cl. 66—187)

The present invention relates to a method of making stockings in a single operation on a flat knitting machine as well as to stockings thus manufactured.

5 Prior to this invention the heel portions of stockings manufactured in a single operation were made either with discontinued rows of loops, i. e. with the loops of the instep placed in suspense, or with continued rows of loops, that is to say, 10 simultaneously in continuous rows of loops with the instep connecting them.

The enlargement of the heel of stockings made hitherto in a single operation only partially fits a human's foot, because with heels made with the 15 loops of the instep placed in suspense, the outward extension of the heel portions begins simultaneously with the bending of the foot and therefore too deeply. Consequently tearings of the loops result in the corner of the heel. On the other 20 hand, if the heel portions are enlarged with continuous rows of loops the bending of the foot would not sufficiently correspond to a human's foot and loop accumulations would result in the instep.

25 The object of the present invention is to avoid these disadvantages. To this end the rows of loops which lie in the range of the enlargement of the heel following the rows of loops of the leg part continuously run over the whole width of the 30 stocking to a point in the vicinity of the ankle, then a gore is worked in the lower part of the heel while the instep loops are placed in suspense, whereupon rows of loops follow which run over the whole width of the foot.

35 According to the new method at the beginning of the heel new loops are formed in the range of the continuous rows of loops which run over the whole width of the stocking and which in the finished stocking end in front of the row of loops 40 extending about above the ankle. Such loops may be formed by casting on, by widening of selvedge loops adapted to be looped, by loops extending over two needles or the like. Thereupon the instep loops remain on their needles and in the 45 formation of the rows of loops of the heel parts the number of the working needles on the inner side of the heel parts is gradually reduced while the loops on the needles of the heel parts to be cut out remain on these needles. This may be 50 obtained by altering the course of the thread guide and by using a correspondingly working press or the like. During the time the number of the working needles on the inner side of the heel parts is reduced, loops of the heel parts are simultane- 55 ously narrowed for the purpose of obtaining the

heel narrowing. The connecting loops formed on these needles may be made in any manner and may, for instance, be selvedge loops or split loops interconnected with the loop heads formed on the needles placed in suspense. 5

By the change of continued and discontinued rows of loops a stocking is now produced on a flat knitting machine which in the instep has about the same number of rows of loops and in the 10 ankle has about the same bending of the foot as a transferred stocking with French foot made on two knitting machines. The new stocking, moreover, has an enlargement of the heel corresponding to the shape of a human's foot as the heel is 15 widened by adding new selvedge loops at the bulge of the heel and not shaped from the leg portion. Any tearing of the loops in the corner of the heel is hereby obviated.

Moreover, with the method according to the invention the right-angled finish of the heel in 20 the manner of a pocket heel may more easily be obtained which on flat knitting machines is hitherto only possible by transferring or widening of the heel portions. This is due to the fact that 25 according to the invention the connecting line between the heel and the sole which extends about vertically to the sole is produced already during the heel rounding and the pocket heel line running at a right angle to the above mentioned 30 connecting line may be made without difficulty, so that then the usual instep narrowing may be started with.

Furthermore, instead of the pocket heel line extending at a right angle to the connecting line 35 and therefore parallel to the seam of the sole, the French narrowing line running obliquely to both these lines may be obtained.

The essential feature of the stocking according to the invention and the process for obtaining 40 same is that in the upper part of the heel in front of the row of loops, extending in the finished stocking about above the ankle, mainly continuous rows of loops are formed, whereupon, after 45 the formation of these rows of loops, the loops of the heel are made while at the same time the instep loops are placed in suspense. The nature of the invention is not altered, if, for the purpose of obtaining a special shape, some rows of loops 50 are formed in the heel part only, i. e., with the instep loops placed in suspense in that part in which the outward extension of the heel portions is effected with continuous rows of loops, or, 55 55 reversely, in that part in which during operation the middle part is placed in suspense and then the number of these needles placed in suspense is in-

creased and simultaneously the number of needles in the heel portions is reduced. The nature of the invention is also not altered if for the purpose of a desired formation or for the purpose of reducing the tension of the loops on the needles placed in suspense at this part some passing through rows of loops are introduced.

In the accompanying drawings two modifications of heel portions of a stocking according to the invention as well as a diagram of loops are shown by way of example.

Fig. 1 shows a side view of the heel portion of a stocking having a pocket heel and illustrates the course of the wales.

Fig. 2 is a similar diagrammatic view of the heel portion of a stocking with French narrowing in the heel.

Fig. 3 is a view showing the position of the loops of a portion of a stocking having a pocket heel and fitted to a human's foot.

Fig. 4 illustrates the formation of the loops of some courses.

As shown in Fig. 1, the stocking is made in known manner up to the line  $a-a'$  with or without of the high heel splicing V. From the line  $a-a'$  to the line  $b-c-b'$  the enlargement of the heel is made with continuous rows of loops.

On the line  $b-c$  the instep loops are now placed in suspense and the heel rounding and the bending of the foot has been effected by increasing the number of needles of the middle part  $b-c$  and reducing the number of needles working on the inner side of the heel portions  $c-b'$  respectively. This process is similar to the manufacture of a pouch heel. During this operation narrowing is effected from the line  $d$  to the line  $d'$  without return movement of the tickler. The connecting line  $c-c'$  between heel and sole and the narrowing line  $d-d'$  in the fashion of a pocket heel are produced.

If the fabric is finished to the line  $b-c-c'$ , i. e. the gore  $b'-c-c'$  is knitted, then again further knitting is effected in continuous rows of loops, whereupon the usual instep narrowing  $e-e'$  may begin.

The stocking according to Fig. 2 is made about in the same manner as that shown in Fig. 1. During narrowing in the lower parts of the heel, however, the tickler, after having narrowed the corresponding number of loops for two needles, is returned each time for one needle, before it again narrows for two needles. In this manner the so-called French narrowing  $f-f'$  results.

Fig. 3 illustrates the position of loops of a stocking according to Fig. 1. For the sake of clearness a great gauge has been assumed. In practice, of course, the number of loops is much greater.

From the example it is obvious that after the leg portion has been finished to the line  $a-a'$ , enlarging has been effected to the line  $b-b'$  in any manner. It has been assumed that this enlarging was effected in nine rows of loops 1-9 by the formation of new wales. In the line  $b-c-b'$  the enlargement of the heel is completed. Now the loops  $b-c$  are placed in suspense and further operation occurs in the part  $c-b'$  of the rows of loops only. According to the example shown the number of needles in the rows of loops 10-20 in the middle part placed in suspense has been increased while the number of the working needles has been reduced on the inner side of the heel portions.

During increasing the number of instep needles placed in suspense in the middle part and the re-

duction of the width of the heel portions respectively, the heel portions in the rows of loops 14-20 of the form of heel in question are simultaneously narrowed, whereby the narrowing line  $d-d'$  results.

With the row of loops 20 the heel formation proper is completed; the heel part  $b'-c-c'$  has resulted.

Now, from the row of loops 21 knitting is again effected in continuous rows of loops in well known manner. Then the usual instep narrowing  $e-e'$  may follow in known manner.

The direction of the connecting line  $c-c'$  between heel and sole which runs at about a right angle from the angle to the sole is, of course, determined by the succession of the loop changes and the gauge of the fabric respectively.

According to the example shown in Fig. 3 the number of loops of the heel parts is altered in each row. In the manufacture of stockings in usual fine gauge, however, the number of loops between  $c-b'$  and  $c-c'$  is preferably altered in each second row of loops.

Fig. 4 illustrates the method of loop formation of single rows of a right-hand heel part.

After completion of the leg part the fabric has been enlarged from line  $a-a'$  Fig. 1 or Fig. 4 by the formation of new wales whereby simultaneously a splicing thread has been worked in in a well known manner.

Row A would correspond to row 1 of the stocking part of Fig. 3. In row B which corresponds to row 9 of Fig. 3 the enlargement of the heel is completed.

Now the instep loops which hang on the needles 30-36 are placed in suspense. Further knitting is effected in both heel parts only. According to the example shown three rows of loops are made first which on the outside have the same width. Towards the inner side, however, the first of this row of loops is worked to the needle 37 only and the next row extends from this needle to the same selvedge needle as the preceding row. The third row which begins on the same selvedge needle ends on needle 39. This portion of manufacture corresponds to the manufacture of the rows of loops 10-13 of Fig. 3.

In the following row of loops beginning on needle 39 a number of selvedge loops are narrowed for two needles so that the following row of loops begins two needles inwardly at the selvedge. This row of loops again is completed two needles earlier; it ends on needle 41. In the next row of loops which begins on the same needle, the same number of selvedge loops is narrowed for two needles, so that the next following row again begins two needles further inwardly.

The same operation, i. e. the production of two rows of loops always which are shortened for two needles at the inner side of the heel parts and in one row of which a number of selvedge loops is narrowed for two needles, is repeated until the heel formation is completed.

According to the example chosen the number of loops of the heel parts is reduced to the needle 50 inclusive.

In row C the fabric is completed to row 20 of Fig. 3.

From row D, row 21 of Fig. 3, knitting begins again in continuous rows of loops over the whole width.

With regard to the diagrammatic representation of the loop formation in Fig. 4 it is to be noted that in the knitting machine the needles 37-50 and therefore the loops hanging on them lie in

one row as indicated by rings below the row D.  
What I claim is:

1. A stocking made in a single operation on a flat knitting machine comprising an enlarged upper heel part extending into the vicinity of the ankle consists of rows of loops continuously running over the whole width of the stocking, a gore comprising narrowed rows of loops in the lower part of the heel following said first named rows of loops and a foot portion consisting of rows of loops running over the whole width of the stocking.

2. A stocking as claimed in claim 1 in which a connecting line formed by said gore extends from the heel part to the sole part at about a right angle to the narrowing line resulting from the heel narrowing.

3. A stocking as claimed in claim 1 in which a connecting line formed by said gore extends from the heel part to the sole part under an acute angle to the narrowing line resulting from the heel narrowing.

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