UNITED STATES PATENT OFFICE.

RUDOLPH GRAEBER, OF CHEMNITZ, GERMANY, ASSIGNOR TO SCHUBERT & SALZER MASCHINENFABRIK AKTIENGESellschaft, OF CHEMNITZ, GERMANY, A FIRM.

PROCESS FOR THE MANUFACTURE OF STOCKINGS.

This invention concerns an improved method for the manufacture of stockings in a single cycle of operations on a flat knitting machine.

According to the present invention, in a method of knitting stockings wherein heel portions are made simultaneously with a foot portion, connecting them by increasing the number of loops when the leg portion has been completed, the number of loops is increased in accordance with the length of the heel to be made and the desired shape of heel is obtained simply by narrowing. The number of needles carrying loops is progressively there reduced by narrowing the succeeding rows of loops, thus shaping the heel portion.

The nature of the intermittent operations of shifting the loops inwardly and of transferring the loops by narrowing depend upon the form of heel to be manufactured.

Connecting rows, slack courses or the like, having the length of the heel, are preferably provided at the commencement of the sinker row on the increased number of needles; these need not be connected with the main knitting but merely provide for a better looping, setting on or the like.

Examples of stockings produced according to the method of the present invention are illustrated in the accompanying drawings in which:

Figure 1 is a schematic representation of the completed parts of a stocking after finishing the heel, the heel portions 6 and 7 being separated from the central foot portion 8;

Figure 2 schematically shows the process of manufacturing stockings according to the present invention; it is supposed that the knitting has reached the lines a—y and the portions 6 and 7 are joined to the portions 8 along the lines a—a' and b—b';

Figure 3 illustrates the finished heel as it appears when still in the knitting machine;

Figure 4 shows the same after being removed from the machine;

Figure 5 is a modified execution shown as in Figure 1;

Figure 6 is the same modified execution corresponding to Figure 3, that is, the stocking still being in the machine;

Figure 7 illustrates a further modification, viewed as in Figure 1;

Figure 8 is a similar representation of the still further modification of the stocking;

Figure 9 represents the latter modification of the stocking as it appears when still in the machine;

Figure 10 shows a partly finished modified heel portion;

Figure 11 is a finished stocking manufactured according to the method described with reference to the Figures 1 to 3, and

Figure 12 is a finished stocking manufactured in accordance with the example explained with reference to Figure 8.

A stocking such as that illustrated in Fig. 1 is produced according to the present invention, in the following manner.

When the leg 1 of width I is finished up to the row of loops indicated in Fig. 1, by a thick line the loops are sunk in the width II. In this method it does not matter whether the additional widths 2—3 and 4—5 and the width I are each knitted by a thread guide or whether one or both additional widths are knitted together with the width I by a single threaded guide. The length of each of the additional rows of loops 2—3 and 4—5 corresponds to the required length of the heel portion. From the points a and b the middle part 8 is narrowed towards the points c and d. The rows of loops a—c and b—d are then connected to the rows of loops a—e and b—f respectively and the connections correspond to g—h and k—l (in Fig. 4). If from the commencement of the additional widths, separate thread guides are used in these widths, the loops from a—c and a—e or b—d and b—f are connected by a split-connection or the like. If the work is continued with a thread guide which simply passes from the width I to the width II (Fig. 1) narrowing is effected only over the distances a—c and b—d by an inwardly directed loop transfer. According to Fig. 2 the knitting is continued up to the line w—y. Up to the point a' the rows of loops a—c and a—e and up to the
point b' the rows of loops b—d and b—f are connected together; on account of the narrowing of the middle portion 8 the two heel portions 6 and 7 hang in the machine in the form of a bag (Fig. 3).

During the narrowing operation the width of the pieces 6 and 7 is transferred inwardly, thereby working their meshes into the meshes of the piece 8.

Figure 5 shows that according to this improved method the rows of loops of the heel portions 6 and 7 extend at right angles to the rows of loops of the leg portion 1 and of the adjoining foot portion 8. This has the advantage that a ladder in the leg portion is prevented from running beyond the heel portion whereas in stockings made according to known methods a ladder in the leg portion may extend to the heel portion.

The narrowing from a and b or a' and b' is effected to the extent of one or more loops in each row or with interruptions according to the desired form of heel to be made. The part g—h (Fig. 11) may accordingly be made more or less inclined.

In the example illustrated in Figs. 5 and 6 longitudinal running-on rows or the like 9 and 10 are knitted at the commencement of the two heel portions 6 and 7. These may, as in the example shown in Fig. 5, be connected to the portion 1 or may be made without this connection. This figure shows, moreover, heel portions having narrowing rows 11 and 12 which are arranged either quite close to the edge or some distance therefrom. When narrowing from a—c and b—d, one or more loops of the heel portions 6 and 7 must temporarily be excluded from the narrowing.

To obtain an ankle similar to the known types instead of the pointed heel shown in Fig. 11 a portion 13 of the foot part 8 adjoining the leg 1 is strengthened. The guides for the reinforcing threads commence from the points m and m', Fig. 7 respectively which lie upon the same wales as the points c and d respectively to which the heel narrowing is carried out. The finished heel portion as produced according to the present invention is shown in Fig. 12.

In order to obtain the heel cap required for a pocket heel the rows of loops at the outer edge of the heel portions are offset as shown at 11 in Figs. 8 and 9, in which case loop-connecting rows, running-on rows, setting-on rows or the like also may be provided.

If, as diagrammatically shown in Fig. 10 some loops are omitted as indicated at 12 and the holes formed thereby are subsequently connected by looping or the like, a pocket heel with an inclined seam will be formed.

The characteristic feature common to all the modifications resides in the arrangement of the rows of the heel portions relative to the loops of the leg portion. This arrangement differs from that exhibited by stockings made according to known methods in a single cycle of operation. The oblique shape of the heel is not obtained by narrowing the heel portions but by narrowing the center foot portion arranged between the heel portions and connecting the latter.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The herein described method of manufacturing stockings on a flat knitting machine wherein heel portions are made simultaneously with the foot portion, consisting of connecting the heel portions to the foot portion by increasing the number of loops when the leg portion has been completed, increasing the number of loops for the heel portions in accordance with the length of a heel to be made, and while so producing the heel, shaping of the same by narrowing inwardly, thereby decreasing the number of meshes in the heel portions and working the latter into the meshes of the foot portion.

2. The herein described method of manufacturing stockings on flat knitting machine wherein heel portions are made simultaneously with the foot portion, consisting in connecting the heel portions to the foot portion by increasing the number of loops when the leg portion has been completed, increasing the number of loops for the heel portions in accordance with the length of the heel to be made, maintaining the increased number of loops for a certain number of rows, dependent upon the width of the heel to be obtained, and shaping the heel portions by narrowing inwardly, thereby decreasing the number of meshes in the heel portions and working the latter into the meshes of the foot portion.

3. The herein described method of manufacturing stockings on flat knitting machine wherein heel portions are made simultaneously with the foot portion, consisting in connecting the heel portions to the foot portion by increasing the number of loops when the leg portion has been completed, increasing the number of loops for the heel portions in accordance with the size of the heel to be made, and while so producing the heel shaping the same by narrowing inwardly, thereby by decreasing the number of meshes in the heel portions and working the latter into the meshes of the foot portion, the narrowing being effected in the outer rows of loops of the heel portions.

4. The herein described method of manufacturing stockings wherein heel portions are made simultaneously with the foot portions, consisting in connecting the heel por-
tion to the foot portion by increasing the number of loops when the leg portion has been completed, increasing the number of loops for the heel portions in accordance with the size of the heel to be made, leaving out several loops at the outer edge of the heel portions, closing the openings resulting therefrom to form a heel cap required for a pocket heel, and shaping the heel by narrowing inwardly thereby decreasing the number of meshes in the heel portion and working the latter into the meshes of the foot portion.

In witness whereof I have hereunto set my hand.

RUDOLPH GRAEBER.