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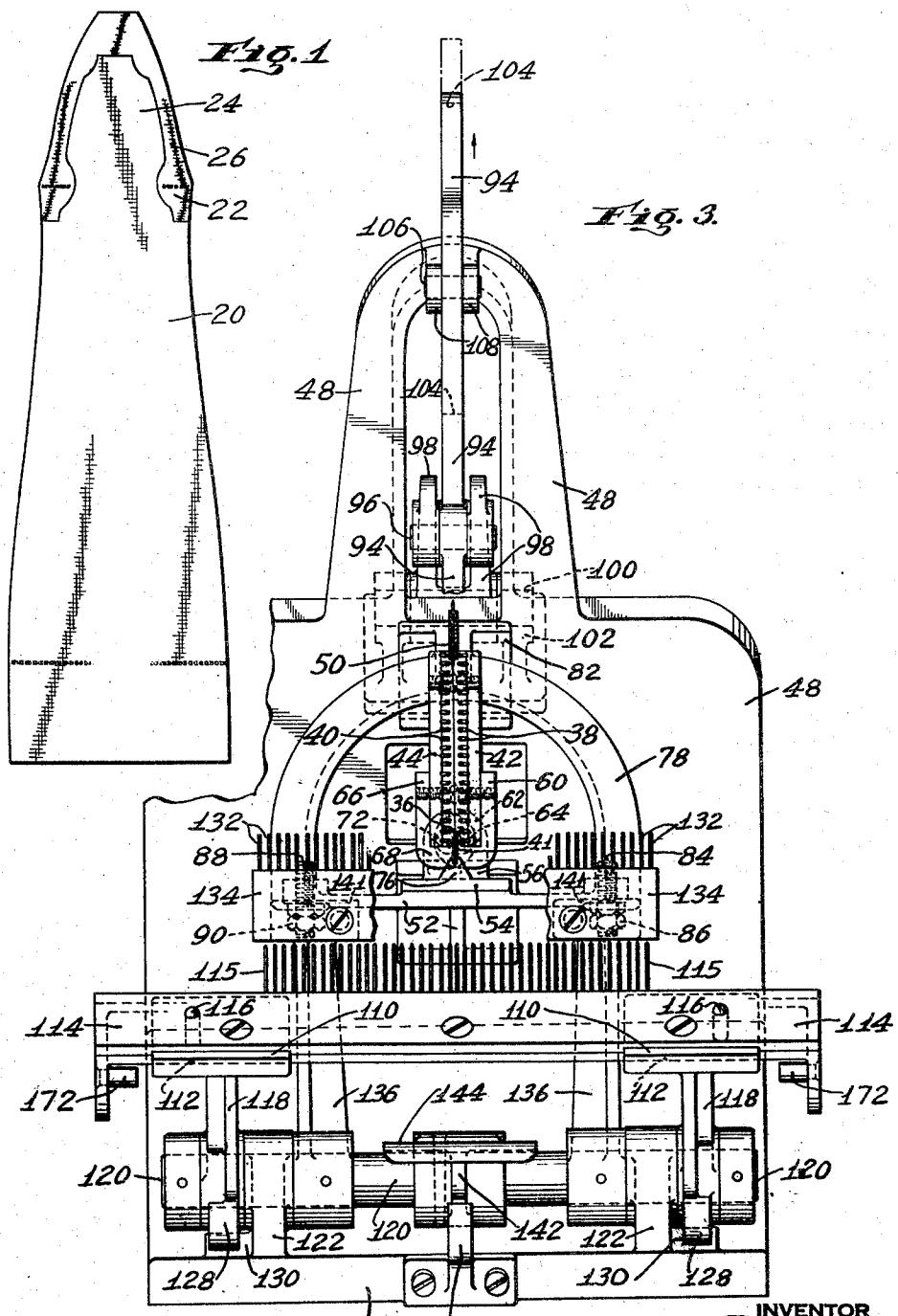
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2,267,527

METHOD AND APPARATUS FOR TOPPING KNITTED FABRIC

Filed Feb. 13, 1937

4 Sheets-Sheet 1



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Fig. 4.

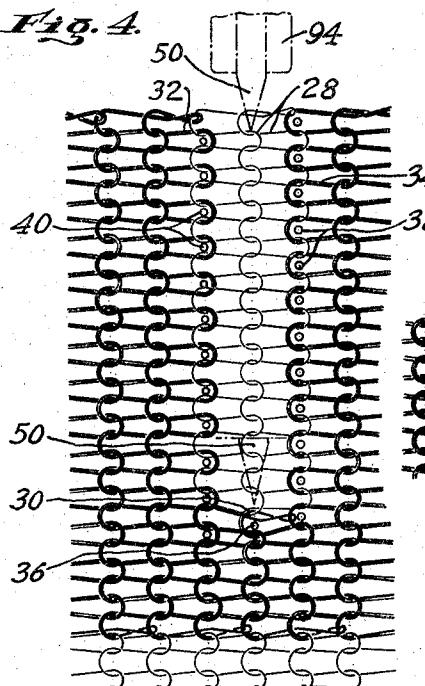
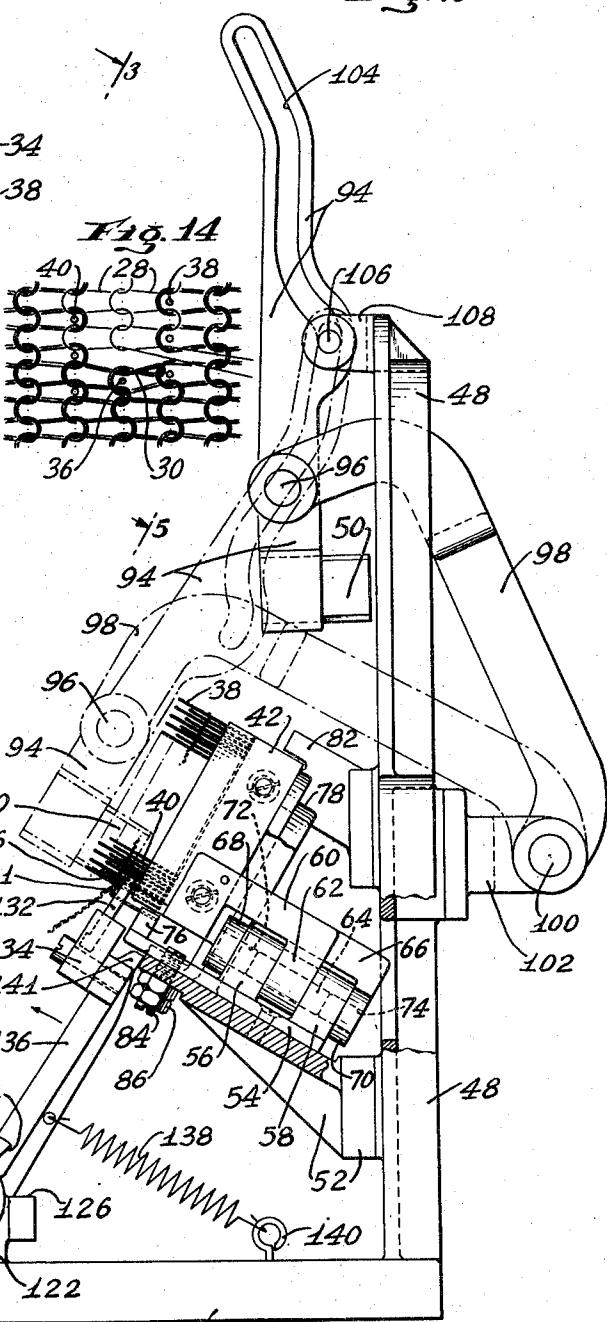


Fig. 2



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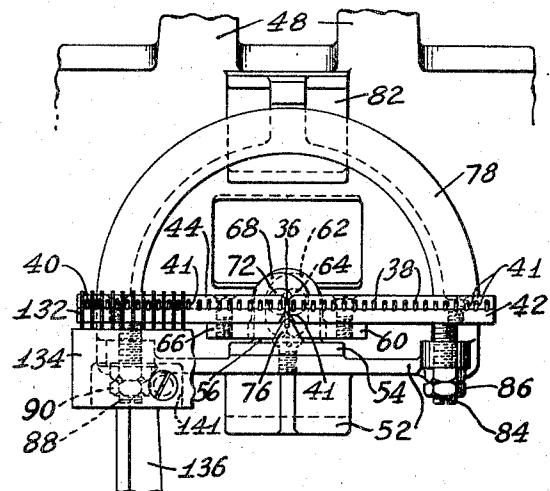


Fig. 5.

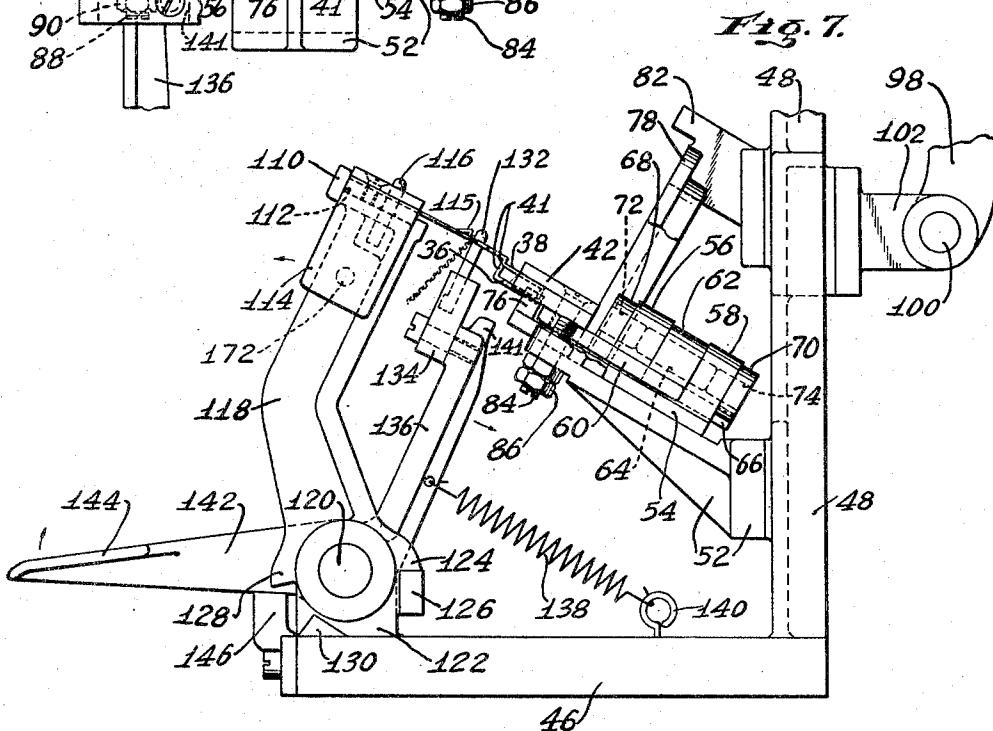
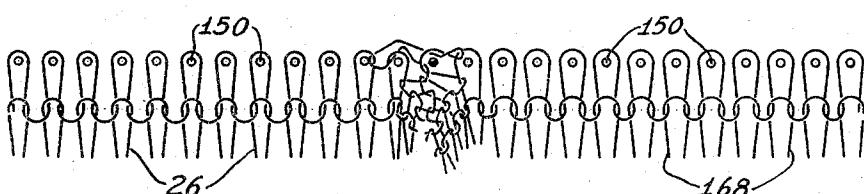


Fig. 7.

Fig. 6.



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FIG. 8.

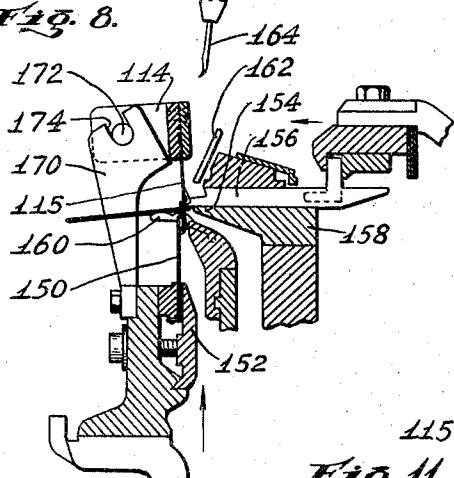


FIG. 9.

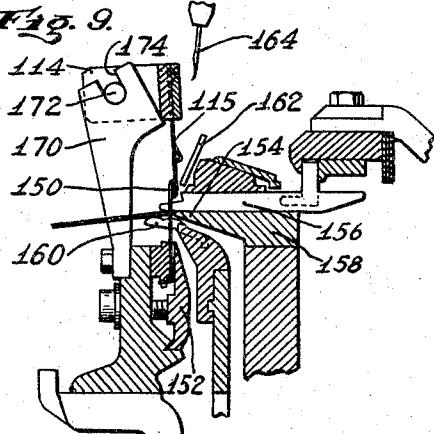


FIG. 10.

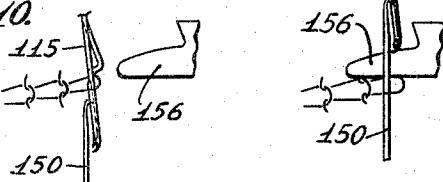


FIG. 11.

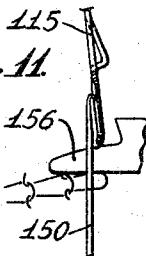


FIG. 12.

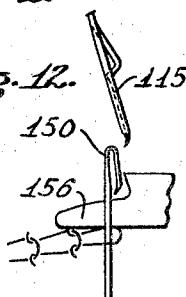
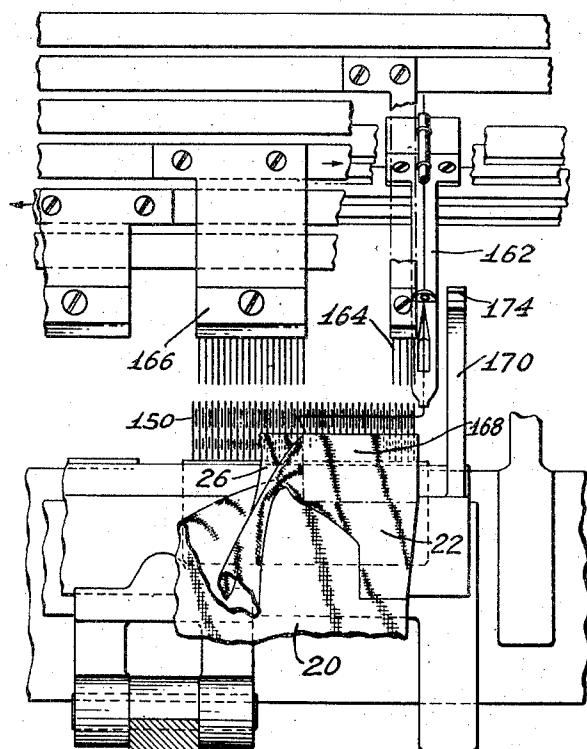


FIG. 13.



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METHOD AND APPARATUS FOR TOPPING
KNITTED FABRIC

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Application February 13, 1937, Serial No. 125,569

20 Claims. (Cl. 66—148)

The present invention relates to a method of topping the last course of leg fabric and the first course of foot fabric of a combination blank into which the heel is to be knitted onto the needles of a heel knitting machine, and to a novel and improved apparatus for performing this operation.

In the manufacture of full-fashioned stockings, it has been proposed, as set forth in applicant's copending application Serial No. 110,707, filed November 13, 1936, to knit a combination foot and leg stocking blank in a continuous operation on one machine, and thereafter on a separate machine to knit the heels into the last course of leg fabric, at the same time causing the inner selvage edges of succeeding heel courses to be interknitted with the adjoining loops of the first course of foot fabric to form the finished blank. In the transferring of a combination blank of this description to a heeling machine for the knitting of the heels, those portions of the last course of leg fabric and the first course of foot fabric into which the heels are to be knitted, must be separated by the cutting or removal of the intervening fabric course loops, and then transferred in straight line relationship to the needles of the heeling machine.

In accordance with the present invention, a novel method of topping the foot and leg stocking blank onto the needles of a heeling machine, is proposed, which will enable this operation to be performed quickly and efficiently and without risk of drop stitches or subsequent runs in the fabric.

Further in accordance with the present invention, a novel and improved topping stand is provided having topping points constructed and arranged to permit the topping of the last course of leg fabric and the first course of foot fabric onto these points in the parallel position in which these courses appear in the combination foot and leg blank, together with means for subsequently moving the topping points and the loops supported thereon into a spaced straight line relationship to facilitate the transfer of these loops to the needles of a heeling machine.

A valuable feature of applicant's topping stand consists in the provision of two topping point sections which are constructed and arranged with the points of one section extending upwardly beyond the points of the other section when in parallel relation thereto, so that the operator is enabled to top the loops of one course onto all the points of the longer point section, and thereafter as a separate operation, to top the con-

nected parallel course onto the points of the shorter topping point section as a separate and following operation.

The several features of applicant's method and apparatus as herein described and claimed, together with the advantages to be obtained thereby, will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which Fig. 1 illustrates a combination full-fashioned stocking blank in which the foot portion is knitted directly onto the leg and high heel portions thereof; Fig. 2 is a view in side elevation of the topping stand to receive the combination foot and leg blank shown in Fig. 1; Fig. 3 is a view in front elevation of the topping stand illustrated in Fig. 2; Fig. 4 is a somewhat diagrammatic view on an enlarged scale showing the loop structure of the blank shown in Fig. 1 at the juncture of the high heel and sole portions of the blank; Fig. 5 is a view in front elevation of a portion of the topping stand shown in Fig. 3, but with the topping points moved from a parallel to a straight line position; Fig. 6 is a somewhat diagrammatic view on an enlarged scale showing the relative positions of sole and heel portions of the stocking blank after the knitting of a number of heel courses; Fig. 7 is a view in side elevation of a portion of the mechanism shown in Fig. 2, with the parts in the position during the transfer of the fabric from the topping points to the quills of a transfer bar; Fig. 8 is a detail sectional view in side elevation showing a portion of the heeling machine and transfer bar during the transfer of the fabric from the transfer bar to the heeling machine; Fig. 9 is a view similar to Fig. 8, taken at the completion of the transfer operation; Figs. 10, 11 and 12 are somewhat diagrammatic detail views illustrating successive steps in the operation of the transfer points, needles and cooperating sinkers to transfer the fabric to the needles of the heeling machine; Fig. 13 is a detail view in front elevation of a portion of the heeling machine showing particularly the position of the fabric on the needles after the knitting of a number of heel courses; and Fig. 14 is a fragmentary view similar to Fig. 4, but with the partial non-reinforced courses illustrated formed from a separate knitting yarn.

A combination foot and leg stocking blank to be transferred onto a heeling machine in accordance with applicant's method, is shown in Fig. 1 of the drawings, and comprises a leg 20 having reinforced high heel portions 22 and a

foot 24 with reinforced sole portions 26 which are formed by continuous knitting into a combination foot and leg blank. Between the leg and foot portions of the blank, as best shown in Fig. 4, two partial non-reinforced courses 28 are provided, which serve to provide a line of demarcation between those portions of the last course of foot fabric and the first course of the sole fabric into which the heels are subsequently to be knitted. During the knitting of the partial courses above referred to, the knitting with the reinforcing yarn is continued on a small number of needles so that a reinforced selavage loop 30 is provided at the inner ends of the partial non-reinforced connecting courses 28 to form the heel corner of the finished blank. It will be understood that the courses 28 may be knitted with a separate yarn as shown in Fig. 14, so that when these connecting loops are subsequently removed, as by cutting or by pulling out the yarn forming these loops, to separate the reinforced high heel and sole portions of the blank, no yarn forming the body portion of the fabric will have been broken or cut.

In accordance with applicant's method, it is proposed to top the last course of leg fabric loops designated at 32 and the first course of reinforced sole fabric loops designated at 34, together with the selavage loop 30 onto a series of topping points comprising a stationary point 36 and two additional point sections designated respectively at 38 and 40, which are arranged in parallel relationship as shown in the diagrammatic Fig. 4, that is, in substantially the same positions in which the fabric loops appear in the combination blank. It will be noted that the topping operation, as thus far described, is carried out prior to the cutting or removal of the partial non-reinforced courses 28, so that when the high heel and sole portions of the fabric are now separated, all of the disengaged fabric loops are supported by the topping points to prevent any possibility of dropping these loops.

In order to perform the topping operation as above described, it has been found of considerable assistance to the operator to have one of the two parallel series of points shown in Fig. 4, of greater length than the other series of points, so that the operator is enabled first to top one of the fabric courses onto the longer series of points, and then after these have been pushed well onto the shank portions of the points, to top the other of said courses onto the shorter series of points. The topping operation performed in this manner, one course at a time, eliminates any difficulty which might otherwise be encountered in successively placing and maintaining the loops on the topping points in closely adjacent parallel position, and requires no more than the usual amount of skill on the part of the operator. As best shown in Figs. 3, 5 and 7, of the drawings, a portion of the shank of each of the points 36, 38 and 40, is provided with an offset or bend 41 which serves to bring the points into proper alignment, and also provides a support for limiting the downward movement of the fabric loops onto the shanks of the points during the topping operation, so that the fabric will with certainty be located to the front side of the transfer comb when moved into a straight line position as hereinafter more fully described.

In accordance with a preferred form of applicant's method, the loops forming the partial courses 28 are severed to permit the separation of the two parallel topping point sections and the

loops supported thereon, which are now moved outwardly into a straight line relationship in which all of the points are spaced to register with the quills of a transfer bar which may be of ordinary description, and is utilized for transferring the fabric loops from the topping points to the needles of the heeling machine.

An alternative method of removing the partial connecting courses 28 to separate the reinforced high heel and toe course loops topped onto the parallel sections of the topping point bar, is illustrated in Fig. 14. As shown in this figure, the courses 28 are knit with a separate yarn having the ends thereof located at the heel corner. This 10 yarn may be cut at the outer selavage edge, and the two severed ends then pulled lengthwise out of the fabric. This method of removing the connecting courses 28 is particularly applicable when knitting with smooth surface yarns which are 15 readily drawn through the fabric, and has the advantage of removing from the fabric all of the 20 yarn forming the partial courses 28.

In order to facilitate in carrying out the several steps of applicant's method as above described, a novel topping stand is employed having the stationary topping point 36 to receive the heel corner selavage loop 30, and on each side thereof, the two sets of topping points 38 and 40 carried respectively on section bars 42 and 44 pivotally 25 supported to swing from a vertical parallel position outwardly to a straight line position in which all of the points are in an evenly spaced straight line relationship. It will be noted that the points 38 and the stationary point 36 are somewhat longer than the points 40 of the second movable section.

As best shown in Figs. 2, 3 and 7, applicant's 30 topping stand comprises a base or bed plate 46 having formed on the rear end thereof, a vertically extending support 48 on which are carried the several sections of applicant's topping point bar and a knife element 50 hereinafter more fully to be described. A bracket 52 secured to the front face of the support 48, carries a hinge 35 plate 54 having formed thereon two upwardly extending lugs 56 and 58 which are journaled to form bearing supports for the topping point section bars 42 and 44. The section bar 42 is rigidly secured to a rearwardly extending wing member 50 60 having formed thereon a lug 62 which engages between the lugs 56 and 58, and is journaled to receive a bearing pin 64. The point section bar 44 is rigidly secured to a rearwardly extending wing member 66 having formed thereon two lugs 68 and 70 which are fitted respectively with bearing pins 72 and 74 fitted into bearing sockets formed in the outer surfaces respectively of the lugs 56 and 58. An upwardly extending lug 76 formed on the forward end of the hinge plate 54, provides a support for the stationary topping point 36 to receive the selavage loop 30 as above described. As best shown in Fig. 3 of the drawings, the pivotal axis of the bearing pin 64 about which the point section bar 42 swings, is located slightly to the right of the center of the machine, and substantially in line with the bottom point 38, so that this point will be retained in spaced relationship with the stationary point 36 when the bar 42 is swung from its vertical to its horizontal or straight line position. Similarly, the pivotal axis of the topping point section bar 44 provided by the bearing pins 72 and 74 is located slightly to the left of the center of the machine in line with the bottom point 40 of this section, so that this point

is maintained in spaced relation to the stationary point 38 during the swinging movement of the section bar 44 from a vertical to its horizontal or straight line position. In order to provide additional support for the point bars 42 and 44 at their outer ends in each of their operating positions, an arcuate shaped guide support 78 is provided secured at its lower ends to laterally extending arms formed on the bracket 52, and at its uppermost point by means of a supporting bracket 82 on the vertical support 48. The point section bar 42 is supported in its straight line or horizontal position by means of a stop screw 84 and locking nut 86. The point section bar 44 is similarly supported in its horizontal or straight line position by means of a stop screw 88 and a locking nut 90.

Applicant's topping stand is provided with a cutting mechanism for severing the partial non-reinforced courses 28 connecting the course of high heel fabric loops and the reinforced sole fabric loops which have been topped onto the points of the topping stand as shown in Fig. 4. This cutting mechanism comprises the knife 50 which is supported in the lower end of a knife arm 94 pivotally connected by means of a pin 96 to the forked end of a lever 98 mounted to turn about a pivot pin 100 on a rearwardly extending bracket 102 on the vertical support 48. In order to control the position of the knife 50 during the swinging movements of the lever 98 about its pivot 100, a curved slot 104 is formed in the knife arm 94 to receive a pin 106 which is supported at both ends in ears 108 which project forwardly from the support 48 to each side of the knife arm 94. As shown in full lines in Fig. 2 of the drawings, the knife member 50 is located in its uppermost or withdrawn position. As the lever 98 is now swung forwardly and down, the knife is moved forwardly and then between the two series of topping points 38 and 40 to sever the partial non-reinforced connecting courses 28. The dot-and-dash position shown in Fig. 2, indicates the bottom extremity of the knife movement. The operation of the knife may be readily controlled by the operator through any convenient means, as, for instance, a hand lever (not shown) which may be supported to turn with the lever 98.

The topping stand illustrated in the drawings, is constructed and arranged to transfer the fabric loops topped onto the points of the topping bar, to the quills of a transfer bar in order to transfer the fabric loops to the needles of the heeling machine. To this end applicant's topping stand is provided with a transfer bar support 110 which comprises a laterally extending arm or plate having formed therein a groove 112 to receive a transfer bar 114 with quills 115 which may be of ordinary description, and two upwardly extending positioning pins 116 arranged to fit into corresponding sockets in the transfer bar 114. The transfer bar support 110 is carried on two lever arms 118 loosely pivoted on a rock shaft 120 which is supported in bearing lugs 122 on the bed plate 46. The rearward movement of the transfer bar support 110 about its pivot into engagement with the points of the topping point bar, is limited by engagement of lugs 124 on the supporting arms 118 with stationary lugs 126 formed on the rear side of the bearing lugs 122. Forward movement of the transfer bar support 110 away from the topping bar, is limited by the engagement of lugs 128 on the supporting arms 75

118 with stationary lugs 130 formed on the bearing lugs 122.

In order to effect the transfer of the loops from the points of the topping stand to the quills 115 of the transfer bar 114, the topping stand herein disclosed is provided with a transfer comb comprising teeth 132 which are supported on a comb bar 134 to extend upwardly between the points of the topping bar when in horizontal or straight line position. The comb bar 134 is carried on upwardly extending arms 136 rigidly secured at their lower ends to the rock shaft 120. A tension spring 138 connected at one end to the lever arm 136 and at its other end to an eye bolt 140 on the bed plate 46, tends to move the comb 134 rearwardly to a limiting position determined by the engagement of a stop 141 formed on the comb bar 134 with the forward end of the bracket 52. For this position of the comb bar 134, the teeth 132 will be located rearwardly of the bent portions 41 of the topping points and fabric loops held thereon when the points are brought into mesh with the teeth of the comb by their outward swinging movements to the straight line position. After the points of the topping point bar have been moved into straight line relationship as above described, the transfer point bar 114 is moved rearwardly on its support 110 to its limiting position determined by the engagement of the stops 124 with the lug 126 in which the quills 115 of the transfer bar 114 are engaged with the points of the topping point bar. The comb 134 with the teeth 132 is now moved forwardly against the pressure of the spring 138 to force the fabric loops from the points onto the quills 115. This movement of the comb bar 134 is conveniently controlled by means of a manual control element in the form of a forwardly extending lever arm 142 secured to a middle portion of the rock shaft 120, and provided at its forward end with a pad 144 which may be readily pressed downwardly by the operator to secure the desired operation of the comb. The transfer movement of the comb 134 with the downward movement of the manually operable lever arm 142 is limited by the engagement of the lever arm 142 with a stop lug 146 secured to the front edge of the bed plate 46.

The steps of transferring the fabric from the transfer bar 114 to the needles of a machine for knitting the heels, may be briefly described in connection with Figs. 8 to 13 inclusive, of the drawings. As clearly shown in these figures, the heeling machine is of the general type which comprises a series of spring beard needles 150 supported on a needle bar 152 to move as a unit with relation to a press edge 154, independently movable yarn measuring sinkers 156 supported in a bed 158, and knockover elements 160. The machine is also provided with a yarn carrier 162 and narrowing mechanism including heel narrowing points 164 and a separate transfer point bar 166 for successively transferring loops of the first course of sole fabric held on inactive needles to an adjacent active needle to cause these loops to be interknitted with the inner selvage edges of successively knitted heel fabric courses 168 (see Figs. 6 and 13). Inasmuch as the construction and mode of operation of the heeling machine forms specifically no part of the present invention, and will be more fully set forth in another application shortly to be filed, no further description of this machine is believed necessary.

As shown in the drawings, the transfer bar 114 is placed in supporting brackets 170 formed on each end of the needle bar 152, in which pins 172 on the transfer bar 114 engage within slots 174 formed in the brackets 170 to register the quills 115 with the needles 150. The needles are now moved rearwardly and up, the sinkers at the same time being advanced so that the fabric is engaged thereby and forced from the quills onto the shanks of the needles 150, as shown in the diagrammatic views Figs. 10 and 11. The transfer bar can now be removed from the needles as indicated in Fig. 12, to permit the knitting of the heel courses.

It is to be noted that the particular construction of the topping stand herein shown and described is such that only one high heel portion 22 and corresponding sole portion 26 at one side of the stocking blank can be transferred at one time onto the transfer bar points 115 for engagement with needles of the heeling machine for the knitting of heel courses. Therefore, while I have described the topping and transfer of the high heel and sole portions at one side only of the stocking blank for the interknitting of heel courses therewith, it will be understood that after heel courses have been interknitted with the high heel and corresponding sole portions at one side of the stocking blank, the topping and transfer operations of the high heel portion and corresponding sole portion at the other side of the stocking blank may be repeated for the interknitting of heel courses therewith.

The invention having been described, what is claimed is:

1. A topping bar comprising two movable topping point sections each having a series of topping points, and hinge connections for said sections constructed and arranged to permit movement of said sections from a parallel vertical position to a straight line horizontal position in which a normal spaced relationship is maintained between all the adjoining points of said bar.

2. A topping bar comprising two movable sections each having a series of topping points and in which the points of one section are longer than the points of the other section, and hinge connections for said sections constructed and arranged to permit movement of said sections from a parallel vertical position to a straight line horizontal position in which a normal spaced relationship is maintained between all the adjoining points of said bar.

3. A topping bar comprising a central topping point section having at least one topping point, two additional topping point sections, each having a series of topping points and located one at each side of said central section, and a hinge connection between said central section and each of said adjacent sections constructed and arranged to permit movement of said adjacent sections from a parallel position at an angle to said central section to straight line positions with relation to said central section, in which a normal spaced relationship is maintained between all of the adjacent points of said bar.

4. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points, and pivotal supporting means for said sections constructed and arranged to permit relative swinging movements of said sections about axes located at adjacent ends of said sections between a parallel vertical position and a straight line horizontal position in

which a normal spaced relationship is secured between all of the adjacent points of said bar.

5. A topping stand having a topping bar comprising two movable topping point sections, the points of one section being longer than the points of the other section, and pivotal supporting means for said sections arranged to permit movement thereof from a parallel vertical to a straight line horizontal position in which a normal spaced relationship is maintained between all the adjoining points of said bar.

15 6. In a topping stand, a topping bar comprising two topping point sections including a series of points on each of said sections, a stationary topping point located between two adjacent end points of said bars when in parallel position, and pivotal supporting means for said sections constructed and arranged to permit movement thereof from a parallel to a straight 20 line position in which the normal point spacing is maintained between said stationary point and adjacent end points of the two sections.

7. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points, pivotal supporting means for said sections constructed and arranged to permit relative swinging movements of said sections from a straight line horizontal to a parallel vertical position, a transfer bar having 30 transfer points and supporting means for the same, and loop transfer means comprising a comb movable to force fabric held on the topping points onto the points of the transfer bar.

8. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points and including means for limiting the movement of fabric loops topped onto said points downwardly on the shank portions thereof, pivotal supporting means for said sections constructed and arranged to permit relative swinging movements of said sections from a parallel vertical to a straight line horizontal position, and loop transfer means including a transfer comb having teeth arranged to 45 extend between the topping points and to the rear of the fabric supported thereon upon movement of said topping points to straight line horizontal position.

9. In a topping stand a topping bar comprising two movable topping point sections, each having a series of topping points with off-sets in the shank portions thereof, pivotal supporting means for said sections constructed and arranged to permit relative swinging movement of said sections from a parallel vertical to a straight line horizontal position, and loop transfer means including a transfer comb having teeth arranged to extend between the topping points and to the rear of said off-sets upon movement of said topping points to straight line horizontal position.

10. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points with off-sets in the shank portions thereof and in which the points of one section are longer than the points of the other section, pivotal supporting means for said sections constructed and arranged to permit relative swinging movements of said sections from a parallel vertical to a straight line horizontal position, loop transfer means comprising a comb having teeth arranged to extend between the topping points and to the rear of said off-sets upon movement of said topping points to a straight line horizontal position, and

a transfer bar having quills arranged to register with the topping points in straight line horizontal position.

11. In a topping stand, a topping bar comprising two movable topping point sections, supporting means for said sections constructed and arranged to permit relative swinging movements of said sections about axes located at adjacent ends of said sections upwardly from a straight line horizontal position to a parallel vertical topping position, a knife movable to cut the fabric topped onto said parallel topping point section, loop transfer means comprising a comb having teeth arranged to extend between the topping points and to the rear of the fabric upon movement of said topping points to straight line horizontal position, and supporting means for registering the points of a transfer bar with the points of said topping bar.

12. In a topping stand, a topping bar comprising two movable topping point sections constructed and arranged to permit relative swinging movements of said sections about axes located at adjacent ends of said sections from a straight line horizontal transfer position to a parallel vertical topping position, a knife, and means for moving the knife between said topping point sections when in parallel vertical position to sever fabric topped onto both of said sections.

13. In a topping stand, a topping bar comprising a central topping point bar section having at least one topping point, two additional topping point sections each having a series of topping points and located one at each side of said central section, pivotal supporting means for said additional sections having their axes substantially at the inner ends of said additional sections for moving said sections to a parallel position, and supporting means for registering a transfer bar with said topping points in straight line position.

14. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points and in which the points of one section are longer than the points of the other section, pivotal supporting means for said sections having axes substantially at the inner ends of said sections and on which said sections are movable from the straight line horizontal position to a parallel vertical topping position, a transfer bar having points adapted to register with all the points of said topping bar in straight line horizontal position, and supporting means for said transfer bar.

15. In a topping stand, a topping bar comprising two movable topping point sections each having a series of topping points, the points of one of said sections being longer than the points of the other of said sections, and means for supporting said sections in parallel vertical position for topping separated courses of a knitted fabric thereon.

16. In a topping stand, a topping bar comprising two movable topping point sections each having a series of topping points, the points of one of said sections being longer than the points of the other of said sections, means for supporting said sections in parallel vertical position for topping separated courses of a knitted fabric thereon, and means for cutting the fabric extending between said topping points.

17. The method of transferring to a needle series for the knitting of the heels, a combination foot and leg stocking blank having the portions of the last course of leg fabric and the first course of foot fabric extending between the heel corners and the selvages integrally connected by one or more partial connecting courses of knitting, which comprises the steps of topping the loops of one of said courses into which the heel is to be knitted onto the points of the topping point section, topping the loops of the other of said courses into which the heel is to be knitted onto the points of a second topping point section held in parallel relation thereto and at a lower level, topping the inner selvage wale loop or loops forming the selvage at the heel corner onto a point or points extending between adjacent ends of said topping point sections, removing said partial connecting courses to separate the two courses of loops held on the two point sections, moving all of the points of said topping point sections into a spaced straight line relationship, and thereafter transferring all of the supported loops from the topping points to a transfer bar.

18. In a topping stand, a topping bar comprising two movable topping point sections, each having a series of topping points; pivotal supporting means for said sections constructed and arranged to permit relative swinging movements of said sections from a straight line on a horizontal plane to a parallel position on a vertical plane; a transfer bar having transfer points, and means for supporting the same in a horizontal plane; loop transfer means comprising a comb movable in a horizontal plane to force fabric on the topping points onto the points of the transfer bar; and cutting means mounted for operative vertical movement between said topping point sections when in paralleling position in vertical plane to sever fabric topped onto both of said sections for their movement to straight line position in horizontal plane.

19. In a topping stand having a series of topping points to receive parallel courses of knitted fabric for subsequent transfer in single line relation, the combination of two topping point sections relatively swingable from a parallel topping to a single line transfer position, and a selvedge topping point located between adjacent end points of said sections.

20. In a method of topping a combination foot and leg stocking blank for the knitting of heels on a needle series, said blank having portions of the last course of leg fabric and first course of foot fabric spaced apart with the looped selvage at the heel corner disposed therebetween, the steps of: topping the loops of one of said courses into which the heel is to be knitted onto a first topping point section; topping the loops of the other of said courses into which the heel is to be knitted onto a second topping point section held in parallel relation to said first topping point section; topping said looped selvage onto a third topping point section extending between adjacent ends of said first and second topping point sections; and thereafter relatively moving said sections to position the same into straight line relationship.

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