Sept. 24, 1940. T. SMITH ET AL 2,216,051

KNITTING MACHINE

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Fig. 1.

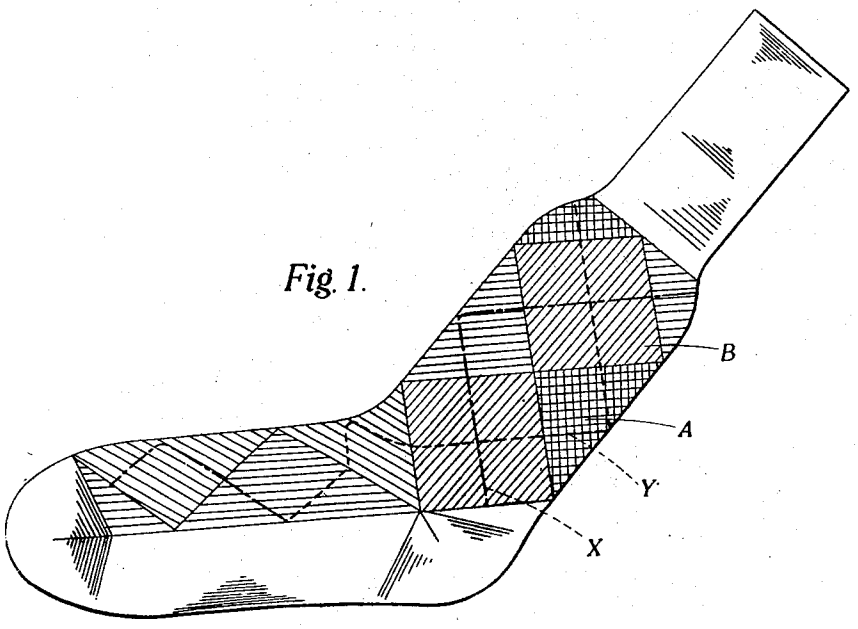
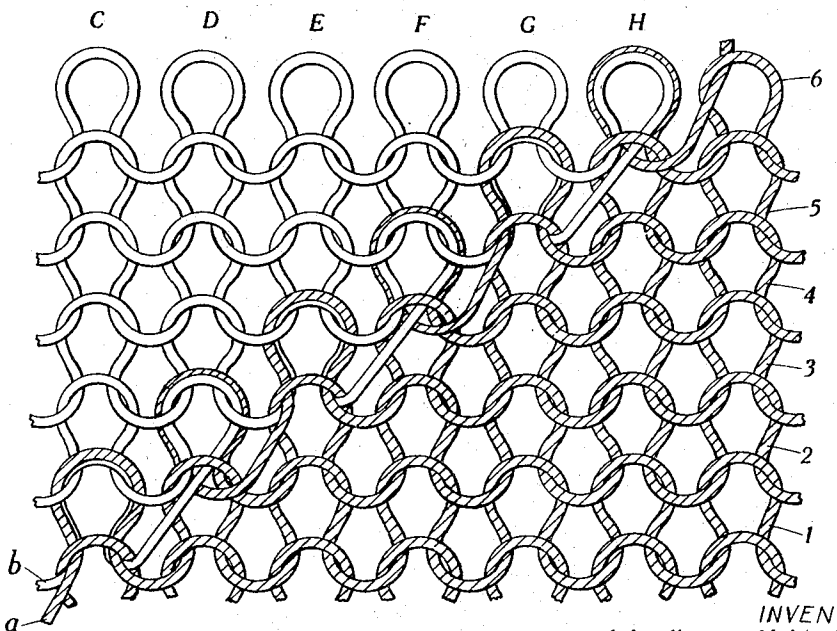


Fig. 2.



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Sept. 24, 1940. T. SMITH ET AL 2,216,051

KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 2

Fig. 4.

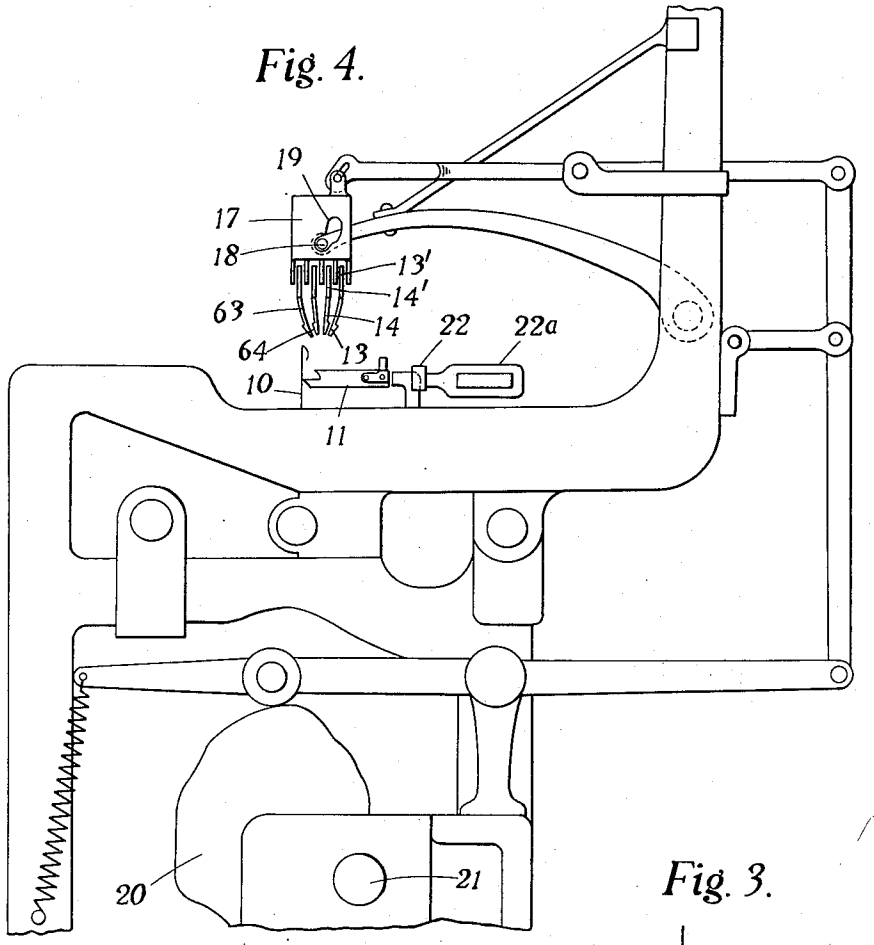
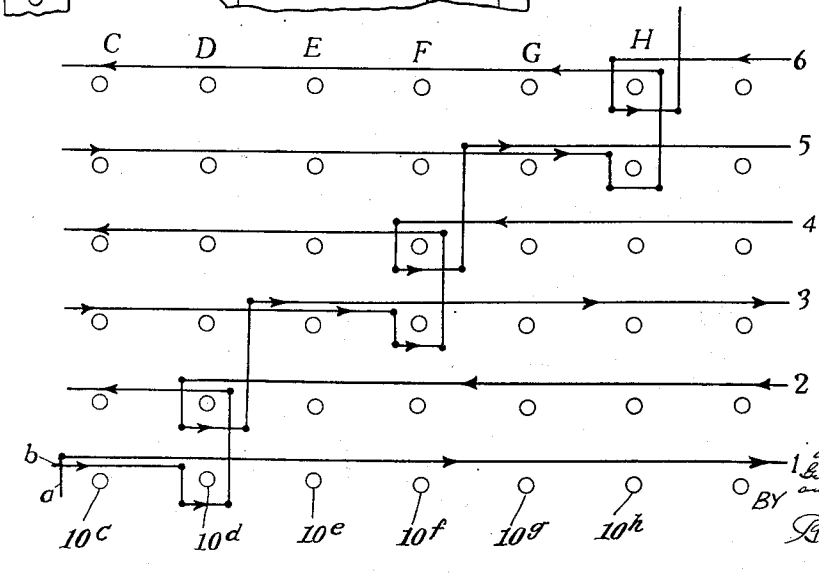


Fig. 3.



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KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 3

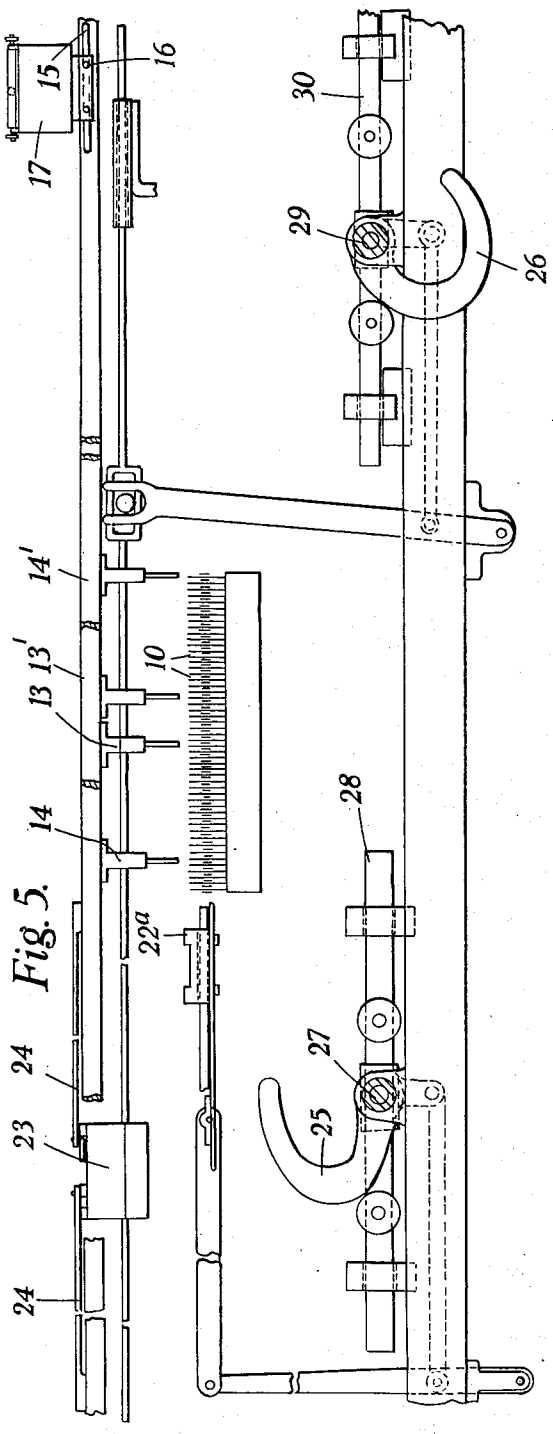


Fig. 5.

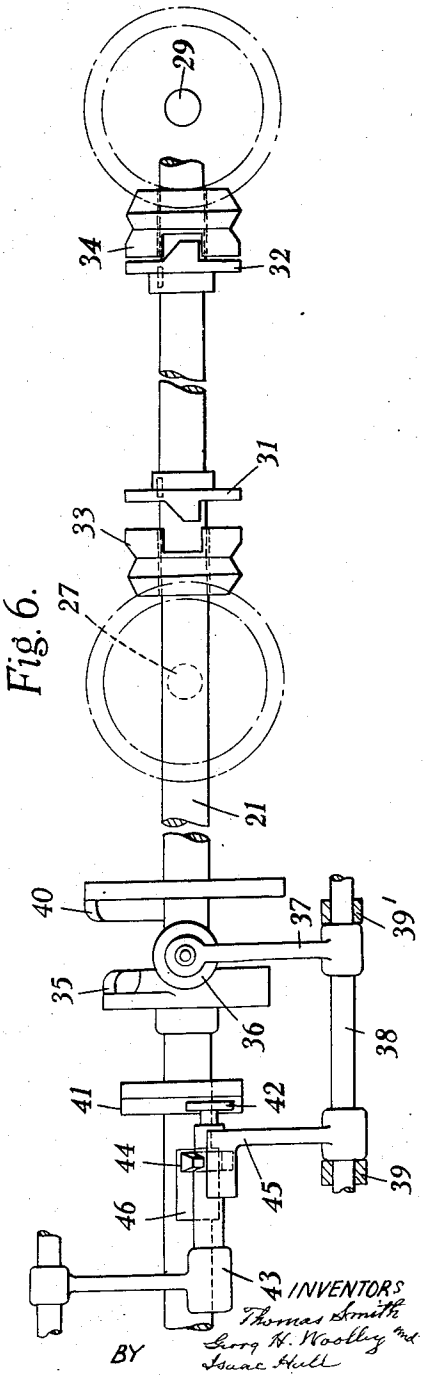


Fig. 6.

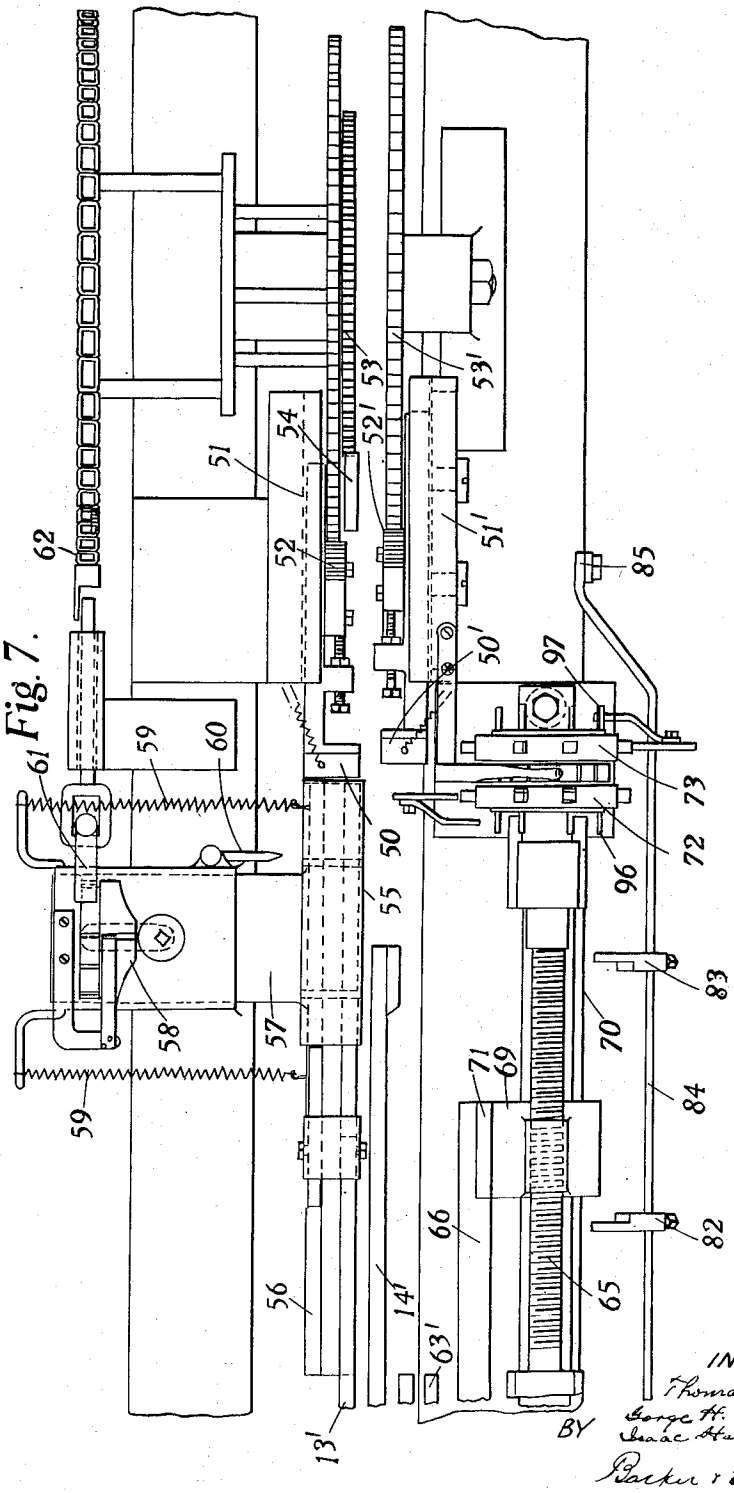
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KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 4

Fig. 7.



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Sept. 24, 1940. T. SMITH ET AL 2,216,051

KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 5

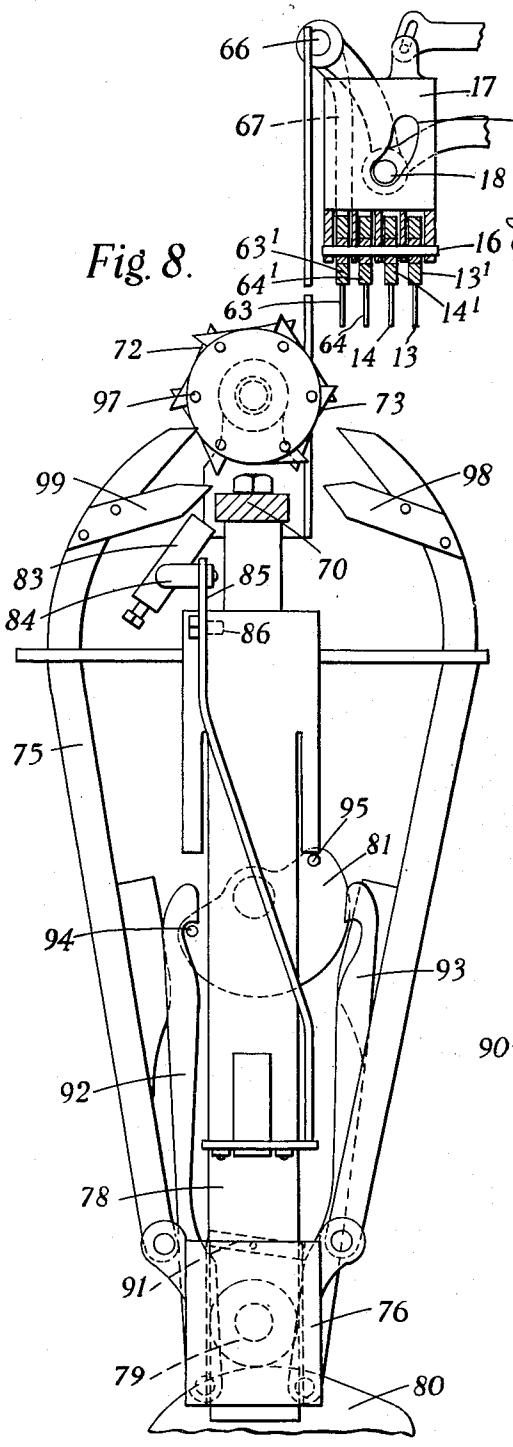


Fig. 8.

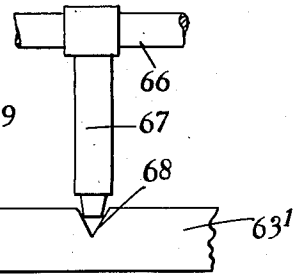


Fig. 9.

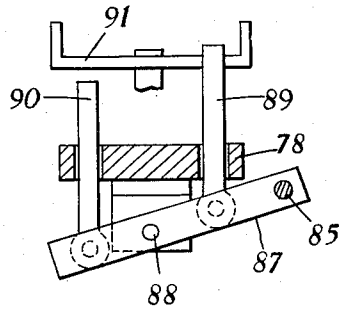


Fig. 10.

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Sept. 24, 1940. T. SMITH ET AL 2,216,051

KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 6

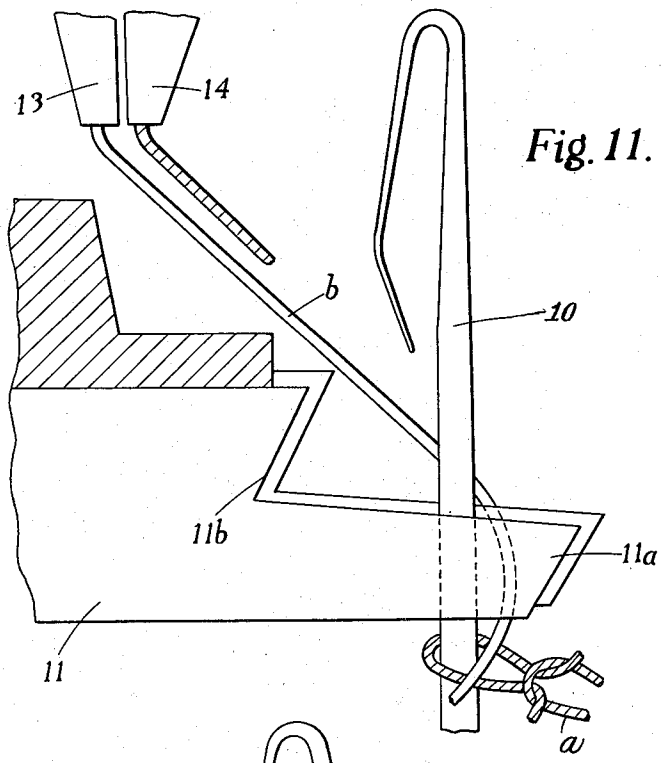
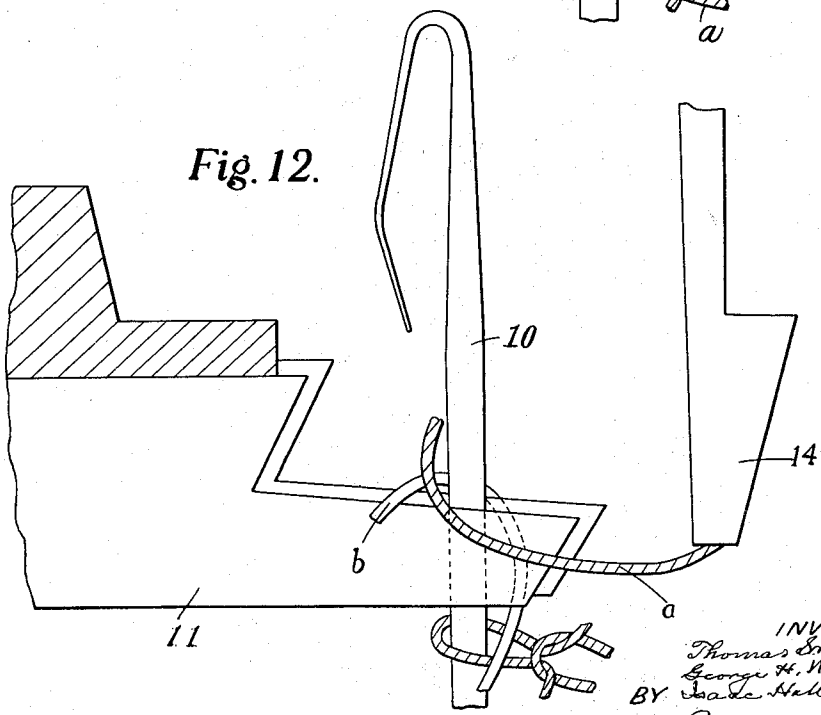


Fig. 11.

Fig. 12.



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KNITTING MACHINE

Filed Sept. 9, 1937 7 Sheets-Sheet 7

Fig. 13.

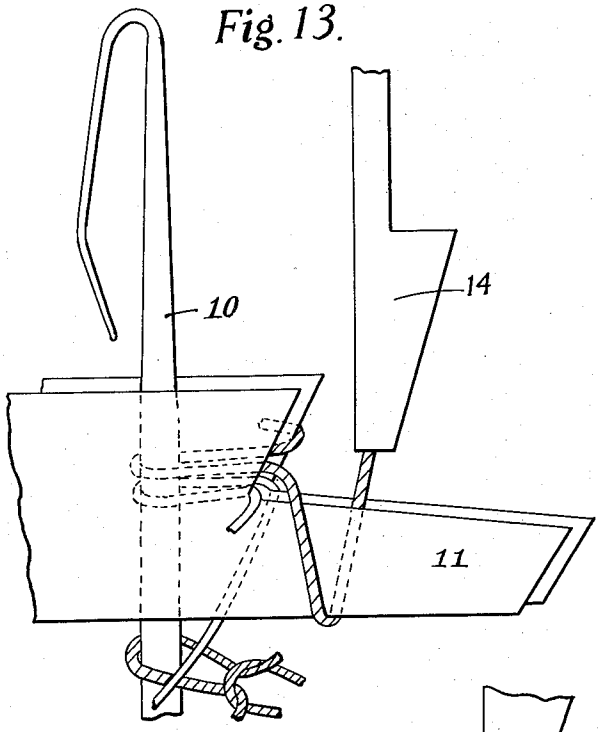


Fig. 14.

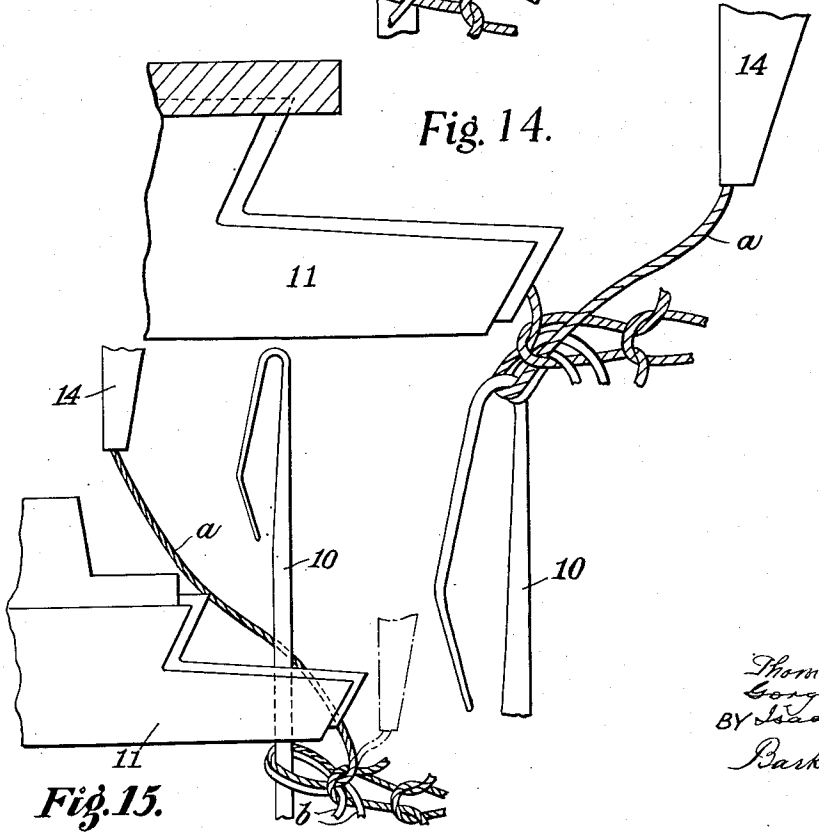


Fig. 15.

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Patented Sept. 24, 1940 2,216,051

UNITED STATES PATENT OFFICE

2,216,051

KNITTING MACHINE

Thomas Smith, George Henry Woolley, and Isaac Hall, Shepshed, England

Application September 9, 1937, Serial No. 163,136
In Great Britain February 25, 1937

17 Claims. (Cl. 66—128)

This invention is for improvements in and relating to knitting and knitting machines and is chiefly concerned with effecting improvements in the production of intarsia fabric. Intarsia fabric is weft knitted fabric composed of a plurality of different weft yarns which are substituted one for another at predetermined intermediate points in each or certain of the courses so that a given course consists of a predetermined number of stitches of one yarn followed by a predetermined number of stitches of another yarn without the withdrawn yarn floating behind the yarn substituted for it. In other words, one yarn is fed to and kintted by one group of the needles and another yarn is then fed to and knitted by a succeeding group of the needles.

In order to effect a good joint at the point of change-over between two yarns (i. e., at the line of demarkation between two differently coloured areas of the pattern) it is necessary to have a certain amount of over-lap. In the production of such fabric on any machine other than one (such for example as a hand frame, hand frames being largely employed for the production of intarsia patterns) in which the laying of the threads is controlled by hand, this over-lap is usually in the order of three needles, that is to say, there are three stitch loops at the line of demarkation that are knitted of both threads, and hence this line of demarkation is not so clear as is desirable.

It is an important object of this invention to avoid this disadvantage, particularly by the provision of mechanism whereby the over-lap may be restricted to one needle, and to facilitate the production of intarsia fabric upon a Cotton's Patent or straight bar knitting machine. According to this invention, in the production of intarsia patterns both threads (i. e., the threads knitted on successive groups of needles) are wrapped around one and the same needle.

The invention provides a knitting machine having a line of needles, a plurality of weft thread feeders, means for operating them each to supply its thread to a different group of the needles, which groups are contiguous and over-lap to the extent of at least one needle, means for lapping the fed threads around said over-lap needle or needles, and means for causing the needles to knit courses of weft stitches from said fed threads.

As will readily be understood, such a machine is of the greatest utility and has the greatest patterning scope if means or provided for varying reciprocally the number of needles in the groups; that is to say, course after course the number of needles in one group is either increased or decreased, the number of needles in the adjacent group being simultaneously and equally decreased or increased as the case may be. The invention also includes the provision in a knitting machine for making intarsia work, of means for lapping the fed weft threads around the over-lap needle or needles.

The invention is chiefly concerned with straight bar or Cotton's Patent machines. According to one aspect of the invention, there is provided in such a machine a plurality of yarn carriers for feeding weft threads to the needles, means for traversing said carriers over different successive groups of the needles in the same course, means for lapping said weft threads around the end needles of the groups, and means for causing the needles to knit. The invention also includes a straight bar or Cotton's Patent machine having means for passing a weft thread carrier transversely of the line of needles from one side thereof to the other and back again, and for shogging it over at least one needle space while at the back to lap its thread around at least one needle. In referring to the needles, by the back is meant the plain side thereof and by the front is meant the hooked or bearded side; in referring hereinafter to a Cotton's Patent machine by the front thereof is meant the side at which the operator stands and towards which the fabric is drawn off the needles. Hence the back of the line of needles is presented to the front of such a machine.

In order that the invention may be better understood reference will now be made to the accompanying drawings, in which

Figure 1 shows a sock produced according to this invention,

Figure 2 is an enlarged view showing the front face of a portion of the fabric thereof,

Figure 3 is a diagram showing the carrier movements for producing the courses shown in Fig. 2,

Figures 4 and 5 are respectively an end view and a front elevation of a Cotton's Patent or straight-bar knitting machine according to this invention, but omitting certain parts which are well understood and are not necessary to a description of the invention.

Figure 6 is a detail thereof,

Figure 7 is a plan, of an end portion of said machine, showing the stops for the carrier rods,

Figure 8 is an end elevation of mechanism for shogging certain warp thread carriers, known as embroidery carriers,

Figures 9 and 10 are details of said shogging mechanism,

Figures 11–15 inclusive are enlarged views illustrating the action of the weft thread carriers.

Before proceeding to a description of the mechanism by which this invention is carried into effect it will be convenient first to describe the characteristic features of the product of that invention. In Fig. 1 there is shown a fully-fashioned sock patterned by different coloured diamonds, such as A and B, knitted from different threads. Diamonds are shown by way of example because they are the most usual form of pattern adopted in intarsia work, but the invention may be applied to intarsia patterns in which the respective areas are of other shapes. In Fig. 2 there is shown a portion of the fabric, including the line of junction between two diamonds or other areas, the courses being numbered 1 to 6 inclusive and the wales being lettered C to H inclusive. It will be seen that the top left-hand portion is knitted from the thread *b* while the bottom right-hand portion is knitted from the thread *a*, corresponding respectively to the areas marked B and A in Fig. 1. At the line of division, however, the selvedged edges of the two areas overlap, for in each course both threads are knitted into one common loop. Thus, for example, in course 1 the threads *a*, *b*, are knitted into one loop in wale C and in course 2 they are both knitted into one loop in wale D. Because of this restricted overlap the line of demarkation between the two areas is more abrupt and the pattern definition is better than is usual in intarsia fabric produced solely by mechanical means. This effect is achieved by feeding the two threads to different consecutive portions of the line of needles, but with an overlap of at least one needle between said portions and by lapping the said threads around the overlap needle. The thread carrier movements for producing these six courses which it has been elected to illustrate in Fig. 2 are more clearly shown in Fig. 3. In this figure the movements for each course are numbered 1 to 6 respectively and the needles on which the wales C to H of Fig. 2 are produced are indicated by circles numbered respectively **10***c* to **10***h*. In course 1 the traverse to the right of the carrier feeding the thread *a* commences at the left-hand side of the needle **10***c* and the traverse of the carrier feeding the thread *b* ends at the right of that needle. Therefore both threads are fed to this needle, which is the overlap needle, and are knitted by it. At the end of the traverse, however, the carrier for the thread *b* is swung to the back of the line of needles and is then shogged one needle space to the right. It is shogged through one needle space because in each course the overlap is displaced by one wale. Were it desired to displace the overlap by more than one wale, then of course, the shogging machine could be greater than one needle space in extent.

In the second course the traverse to the left of the carrier for the thread *a* is restricted by a like amount so that it ends at the left of needle **10***d*. Preparatory, however, to the traverse of the carrier for thread *b* to the left the carrier is moved to the front of the line of needles. Hence both threads are fed to the needle **10***d*, it being understood that the traverse of the two carriers is simultaneous. At the end of said traverse to the left of the carrier for the thread *a* said carrier is swung to the back of the line of needles and is shogged backwards (i. e., in the direction in which the overlap is displaced) by one needle space. As a result of these movements both threads are lapped around the overlap needle **10***d* and are knitted by it.

Prior to the commencement of course 3 the carrier for thread *a* is moved to the front of the line of needles between needles **10***d* and **10***e*, it is then traversed to the right. The traverse at the front of the needles of the carrier for thread *b* terminates between needles **10***e* and **10***f* so that in this course both threads are fed to needle **10***e*. The said carrier is at the termination of the traverse swung to the rear of the line of needles, between said two needles, and is shogged one needle space to the right behind needle **10***f*, for it is around said needle that both threads have to be lapped in course 4.

To put the matter generally, the traverse of the yarn carriers **13**, **14** (Figs. 4 and 5) is so controlled that at the end of its traverse at an intermediate point in the division of needles any one carrier lays its yarn in front of the first needle to which yarn has been supplied by the next carrier, so that there is an overlap of one needle between the two yarns. Moreover before making its return traverse in the reverse direction said carrier is passed through the needles and is shogged one needle space either in the reverse direction, if at the next course that particular yarn is to be knitted by a lesser number of needles (as is the case with yarn *a* in Figs. 2 and 3) or in the same direction if at the next course that yarn is to be knitted by a greater number of needles (as in the case of yarn *b* in Figs. 2 and 3) and is then moved through the needles to the front thereof preparatory to making the return traverse. This shogging is effected and the extent of the traverse is controlled by adjustable stops at the end of the machine as is hereinafter described.

In order to permit of the movement of the carriers transversely of the line of needles each carrier rod is provided with a longitudinal slot **15** (Fig. 5) the length of which is determined by the maximum traverse required of that carrier. These slots are provided all at about the same place in the length of the carrier rods thereby permitting at least one support bar such as is indicated at **16** to pass through the slots in all carrier rods. Desirably an anti-frictional roller encircles the said bar within each slot. This transverse bar is supported beneath a carrier block **17** in which all the carriers are guided, the said block being itself transfixed by a stationary rod **18** extending along the length of the machine so that the block may rock upon said rod and in its rocking movements may cause the yarn carriers to move across the line of the needles **10**.

It is also desirable however, to impart a rising and dipping movement to the yarn carriers. For this purpose, the said support rod **18** extends through a slot **19** in the block. This slot has a vertical upper part terminating in a lower part that is inclined downwards towards the front of the machine. Hence, when the block is raised, the first part of the movement (during which the support rod **19** engages the vertical part of the slot) results in the main in an upward movement of the carriers; the latter part of the movement of the block (during which the support rod is engaged in the inclined part of the slot) also results in the carriers being swung towards the rear of the machine, that is to say, from the back or plain side of the needles towards the front or bearded side thereof. These rising and falling movements are imparted to the block by suitable link

work from a cam 20 on the main shaft 21 of the machine.

In a multi-division machine, it is desirable to provide a plurality of such blocks and their associated mechanism.

The rising and falling movement of the carriers is necessary to ensure firstly, that when the carriers are at the front of the needles they are above the top edge of the sinkers 11 and so do not interfere with the loop sinking and measuring advance of the latter, and secondly, that the thread bar which is passed behind (i. e., at the plain side) of the last needle of a group is looped underneath the bottom edge of the adjacent sinker.

In order to facilitate this passage of the lap-loop beneath the bottom edge of the last sinker, the sinkers employed differ somewhat from the sinkers normally employed in Cotton's Patent machines. Instead of having a round neb below the throat, the upper edge of the neb 11*a* terminates at a sharp point whence the front edge slopes backwards (i. e., towards the butt) until it meets the lower edge. The angle of this front edge is approximately the same as is the angle of the front edge of the throat or catch 11*b*.

The complete movement of each yarn carrier therefore, comprises the following stages:

1. Yarn laying traverse.
2. Passage through the needles from front to back. This movement is accompanied by a small dip.
3. A shog of one needle space.
4. An upward movement to bring the lower end of said carrier above the top edge of the sinkers so that it does not obstruct their forward advance. At this stage, the slur-cock 22 is traversed to sink the loops, the needles sink in knitting and the sinkers are first retracted slightly, as is usual, and are then advanced to assist in the knock-over.
5. A dipping movement to bring the lower end of the carrier below the bottom edge of the sinkers.
6. Passage back between the needles to the front thereof and a simultaneous rise to its initial position prior to laying the return course.

For further elucidation of these movements reference is directed to Figs. 11 to 15. In Fig. 11 the carrier 13 has been passed from back to front of the needles, lapping its thread around the overlap needle shown, and is about to commence its transverse (upwards from the plane of the paper). In Fig. 12 the carriers have completed their traverse and carrier 14 has been moved through the needles to the back, dipping in such movement. The yarn *a* is thus passed around the overlap needle which was the first needle to which the yarn *b* was fed. The said carrier 14 is now shogged one needle space in the reverse direction and is raised somewhat. Simultaneously the sinkers advance, as shown in Fig. 13, and the yarn *a* is caught beneath the sinker next to the overlap needle. The needles now knit, and the sinkers recede, as in Fig. 14, while at the next stage, shown in Fig. 15 the carrier is swung to the front of the needles and is simultaneously raised, ready to lay a new course in the reverse direction. As a result it will be noticed that the yarn *a* is lapped around the overlap needle shown in Fig. 15.

In order to permit of these movements of the carriers, each carrier rod is connected at the rear to a friction box 23 by means of two converging pivoted compound links (24, Fig. 5).

Because all the carriers operating to feed threads to a division of needles complete their traverse before the sinkers advance, it is necessary to have two draws, one for the carriers and one for the slur-cock. Therefore, two draw cams 25 and 26 (Fig. 5) are provided, together with mechanism for connecting them to the main shaft of the machine at the appropriate periods. Moreover, the sinkers are all jack sinkers, being operated by the slur-cock to sink loops at every needle space.

The draw cam 25 on a cross shaft 27 operates the draw bar 28 which is connected by appropriate mechanism to the holder 22*a* of the slur-cock 22. Likewise the draw cam 26 on the cross shaft 29 operates the draw bar 30 which is connected by appropriate mechanism to the friction box which is shown at 23.

The mechanism by which the cross shafts 27 and 29 for the two draw cams are periodically connected to the main shaft 21 is shown in detail in Fig. 6. Fixed to the main shaft there are two dog clutch members 31 and 32 co-operating respectively with loose bevels 33, 34, which bevels mesh respectively with bevels on the shafts 27, 29. According to whether the main shaft is shogged to the right or to the left one or other of these bevels 33, 34, is clutched thereto, and one or other of the shafts 27, 29 is driven. In the position shown in the drawings the shaft 29 and the draw cam 26 are driven.

As the main shaft continues to rotate from the position shown a cam flange 35 moves into contact with a truck 36 on a lever 37 attached to a rock shaft 38, this rock shaft being held against endwise movement by means indicated diagrammatically at 39 and 39^1. As a result the main shaft is moved to the left so that the bevel 34 is de-clutched and the bevel 33 clutched to said shaft, and the cam 25 is driven instead of the cam 26. At the next revolution it is necessary to shog the main shaft to the right. For this purpose there is another cam flange 40 on the main shaft, said flange being at a greater radius than the flange 35. Hence the truck 36 must be moved outwards to the appropriate radius from the main shaft. This is effected by means of a cam 41 on the main shaft co-operating with a truck 42 carried by a rocking lever 43. This latter also carries a rocking arm 44 adapted to push against an arm 45 on the rock shaft 38. Hence at the appropriate time the truck 36 is moved into the track of the cam flange 40 and the main shaft 21 shogged to the right.

As the cam 41 operates on the truck 42 at each revolution the truck 36 would be pushed into the track of the flange 40 at each revolution, and the return shog to the left would not be effected, unless special precautions are taken. For this purpose that end of the arm 44 which is adjacent to the main shaft extends underneath the latter, and on the main shaft there is a cam 46. When the main shaft is in its right-hand position this cam is so placed as to engage the arm 44 so that, in that revolution, the arm will be rocked to raise its other end clear of the lever 45, with the result that the truck 36 is not forced outwards into the track of the flange 40, but remains in the track of the flange 35 and the shaft 21 is shogged to the left. This shogging movement to the left moves the cam 46 to a position in which it does not operate the arm 44. Therefore at the next revolution the arm 44 pushes the lever 45 outwards, and the truck 36 is therefore moved outwards into the track of the flange 40 and the main shaft is shogged to the right.

As has already been mentioned, stops 50, 50' for the carrier-rods 13^1, 14^1, are provided at each end of the machine. At each end there is one stop for each carrier-rod, it being borne in mind that each carrier-rod may, and in the majority of machines according to this invention will, have a plurality of carriers attached to it. Because of the movements which the carrier-rods make in a direction transverse to their length, the end faces of these stops 50, 50^1, (Fig. 7) are substantially wider than normal. The stops are slidably mounted on blocks or supports 51, 51^1, and are each provided with a comparatively sharp nose 52, 52^1, respectively engaging the periphery of an eccentric stepped disc 53, 53^1, the steps on the periphery of the discs being so arranged as to give the desired shogging motion to the carriers. Each nose is adjustably mounted on the stop and spring means are provided for biassing it against the periphery of the appropriate disc. In the case where there are two weft carrier-rods and it is desired to effect a reciprocal variation in the number of needles in the groups to which the carriers on said two rods feed their yarns, at each end of the machine there are two stops, one for each rod, and two eccentric discs, as shown. The eccentricity of these discs is opposite, however, so that while one stop such as 50 is adjusted in one direction, the other (such as 50^1) is adjusted in the opposite direction. The discs may be racked in either forward or reverse direction by a clawker indicated at 54.

Means are also provided for adjusting one carrier-rod 13^1 endwise through a distance equivalent to the maximum width of one needle group (i. e., equivalent to the maximum number of needles to which a carrier such as 13 on said rod feeds its yarn in any one course and, in the case of a diamond pattern, equivalent to the width of the diamond in the pattern). For this purpose, a removable distance piece 55, (Fig. 7) equal in length to the said maximum width, is provided for insertion between the end of said carrier rod and its stop 50. This distance piece is slidably mounted upon a support 56 for movement in the direction of the length of the carrier rod in accordance with the movement of the stop, but it is also adjustable laterally into and out of its obstructive position.

The support for the distance piece therefore comprises a transverse slide 57 and a cam 58 for moving it in a direction transverse to the movement of the carrier rods. In the retraction of this distance piece to the inoperative position by springs 59 in order to displace the pattern, the cam first permits movement of the slide half-way. The carrier-rod 13^1, at the end of its traverse, therefore hits the end face of the distance piece 55 near one edge of the latter, and as the carrier-rod is moved laterally during the passage of the carrier through the needles, it moves off said end face. The cam thereupon makes a further movement to permit withdrawal of the distance piece completely, and at the same time a similar piece is inserted at the other end of the frame.

A locating peg 60 is provided to prevent the distance piece 55 from being displaced lengthwise of the carrier rods when in the inoperative position.

The cam 58 is racked by a clawker 61 and the operation of this clawker is determined by a pattern chain 62.

Additional carriers such as 63, 64 on the carrier rods 63^1, 64^1 (Figs. 4 and 8) are provided to feed warp or wale thread to the needles in the production of an Argyle pattern, the threads fed thereby being termed embroidery threads. Each one is knitted by one or two needles in each course, and the carriers are so shogged that the embroidery lines formed thereby traverse diagonally as shown at X and Y in Fig. 1. Each embroidery thread carrier is gradually shogged for half the width of the division of needles and is then shogged backwards in the reverse direction, there being two carriers on each rod, one rod being shogged in one direction and the other in the opposite direction.

In order to cause the embroidery thread carriers 63, 64 to lap their threads round the needles the carrier rods 63^1, 64^1 are also supported in the bock 17 in a like manner to the rods 13^1, 14^1. The shogging of each embroidery rod is controlled by a screw, there being a screw 65 at one end of the machine for the rod 63^1 and a like screw at the other end of the machine for the rod 64^1. One screw and its associated mechanism is shown in Figs. 7, 8, 9 and 10 it being understood that this mechanism (like the remainder of the mechanism shown in Fig. 7) is duplicated at the other end of the machine. Mounted in suitable guides above the carrier rods there is a slidable rod 66 carrying a depending finger 67 adapted to co-operate with a V-shaped slot 68 in the top edge of the rod 63^1. As the rod 63^1 is moved laterally, and is raised and lowered, by reason of the movement of the block 17 this finger 67 enters and leaves the slot 68. It is periodically moved (e. g., at each course) through one needle space by the screw 65 and in this manner the embroidery thread carrier 63 is periodically shogged by one needle space. The screw 65 extends through and moves the block 69 which is slidably mounted on the bar 70 and is connected by arm 71 to the rod 66. Attached to the screw there are two oppositely-disposed ratchet wheels 72, 73 with their associated scissor-like clawkers 74, 75. The latter are pivoted at their lower ends upon a block 76 slidably mounted upon a vertical post 78. This block is provided with a truck 79 whereby it is raised and lowered by the cam 80 on the main shaft. According to whichever clawker is operative the screw is turned in one direction or the other and the said clawkers are controlled by a bluffing segment 81 pivoted to the post 78. This segment may be turned to bluff either of the clawkers. In the position shown the clawker 74 is bluffed.

In order to render one clawker inoperative and the other one operative at each end of the traverse of the embroidery thread carriers (i. e., after one diagonal of the pattern has been completed) stops 82, 83 are provided upon a rod 84 for engagement by the screw block 69. This rod 84 is connected to a lever 85 pivoted at 86 to the top of the post 78. At its lower end said lever 85 is attached to a horizontal lever 87 pivoted at 88 to a bracket on the post, and projecting from said lever 87 through the post 78 are two pins 89, 90. Therefore when the block 69 is at one extremity of its travel the lever 87 is moved to cause one pin to project through the post and at the other extremity of its travel is moved to cause the other pin to project through the post. Pivoted on the rising and falling block 76 there is a rocker 91 which, as the block rises, is tilted by one or other of the plungers 89, 90 to force one or other of two pawls 92, 93 outwards. These pawls are

arranged to hook over pins 94, 95 on the bluffing segment 81 and to rotate the latter as the block 76 descends. In this manner one or other of the screw-racking pawls 74, 75 is bluffed and the other rendered operative. It will be noticed that pins such as 96, 97 project from the outer faces of the ratchet wheels 72, 73 and each clawker 74, 75 has a finger 98 or 99 for engaging these pins towards the termination of the upward stroke of said clawker to ensure that the full movement required is imparted to the screw 65.

We claim:

1. In a straight bar united needle knitting machine, having a line of needles, a plurality of weft thread feeders, means for operating them each to supply its thread to a different group of the needles, which groups are contiguous and overlap to the extent of at least one needle, and means for lapping the fed threads around said over-lap needle.

2. In a straight bar united needle knitting machine for making intarsia fabric with an overlap between adjacent areas, said machine having a plurality of needles; a plurality of thread feeders each arranged to traverse said needles to the extent of a fabric area; and means arranged to cause said carriers to lap their threads around at least one overlap needle at the ends of their traverse to produce a join between adjacent areas of the intarsia pattern.

3. In a Cotton's Patent knitting machine, a plurality of needles; a plurality of yarn carriers arranged to feed weft threads to said needles to produce an integral width of fabric; means for traversing said carriers over different successive groups of said needles in the same course of said integral width of fabric; and means arranged to cause a lapping of said weft threads around the end needles of said groups to produce a join between adjacent areas of said integral width of fabric.

4. In a united needle straight bar knitting machine, having a line of needles, a plurality of weft thread carriers, means for moving a plurality of them over different consecutive portions of the line of needles but with an over-lap of at least one needle between said portions and for thereby supplying thread from one carrier to a portion of the needles of said line and thread from another carried to a consecutive portion of the needles of the line and to at least one needle of the first-said portion, and means for lapping said threads around a needle at the juncture of said portions.

5. In a Cotton's Patent knitting machine for knitting intarsia fabric, a line of needles; a plurality of weft thread carriers arranged to traverse successive groups of said needles to supply thread thereto to be knitted into adjacent areas of the intarsia pattern; and means arranged to swing said carriers transversely at the ends of their traverse of a needle group to lap their threads around a needle to produce a join between the contiguous areas of the intarsia pattern.

6. In a united needle straight-bar knitting machine, a plurality of weft thread carriers, means for moving a plurality of them over different consecutive portions of the line of needles but with an overlap of at least one needle whereby at the end of its traverse at an intermediate point in the line of needles any one carrier supplies its yarn to the first needle to which yarn has been supplied by the next carrier at the commencement of the traverse of said next carrier, and means, operating before the carriers make their reverse thread-laying traverse, for moving the first said carrier from front to back of the needle line, for shogging it at least one needle space, and for moving it from back to front of the needle line.

7. In a united needle straight-bar knitting machine, a plurality of weft thread carriers, means for moving them over different consecutive portions of the line of needles but with an overlap of at least one needle between consecutive portions, means for moving each carrier, which terminates its traverse at an intermediate point in the line of needles beyond said over-lap needle, from front to back of the needles, for moving or shogging it behind at least one needle, and for moving it from back to front of the needles, said carrier movements repeating course after course.

8. In the combination claimed in claim 3, means for varying the traverse of the carriers and the position of the overlap.

9. In the combination claimed in claim 7, means for varying the traverse of the carriers and the position of the overlap, as between one course and the next, and means for shogging said carrier at the back of the needles in the direction in which the overlap is shifted.

10. In a united needle knitting machine for making intarsia work, means for feeding the threads, of which two adjoining areas are knitted, to an overlap needle in each course, means for shifting the point of overlap course after course, means for passing, in the course preceding each one wherein the overlap is displaced, one of said threads behind the needle which is the overlap needle of said one course, and means for passing the other thread around said overlap needle in said one course.

11. In a united needle straight-bar knitting machine, a plurality of carrier rods, at least one weft thread carrier on each rod, means for traversing said rods and for thereby feeding the yarns from the carriers thereon to different groups of the needles, which groups are contiguous but overlap to the extent of at least one needle, a yarn from a carrier on one rod being fed to a group of needles which is next to, and overlaps to the extent of at least one needle, a contiguous group to which yarn is fed from a carrier on another of the rods, means for varying the rod traverse to effect a reciprocal variation in the number of needles comprised in each of two of the contiguous groups that are supplied one from a carrier on one rod and the other from a carrier on another rod, and thereby to effect a displacement of the overlap as between one course and the next, and means for lapping the threads around the overlap needle.

12. In a Cotton's Patent knitting machine comprising the combination claimed in claim 1, at least one carrier rod on which the said feeders are mounted, a support for each such rod, through which the latter is slidable for thread laying, and means for moving said support transversely of the line of needles to effect a like movement of the feeders in lapping the threads.

13. A machine according to claim 3, having two sets of draw mechanisms, one for the carriers and the other for the sinkers.

14. A machine according to claim 3, equipped only with jack sinkers and having a jack sinker at each space between successive needles.

15. In a Cotton's Patent knitting machine, the

combination with the mechanism of claim 1, of two carrier rods each carrying at least one of the feeders, stops for the traverse of each rod, and means for adjusting said stops to effect simultaneous variations, in opposite directions or senses, of the traverse of the two rods.

16. A knitting machine according to claim 5, having at least one warp-thread feeder for feeding a wale thread to at least one needle in each course, means for swinging said warp thread feeder across the line of needles simultaneously with the weft thread carriers and means for shogging said feeder to feed its thread to different needles in successive courses.

17. In a machine according to claim 11, the combination with the means for traversing the rods, of stop mechanism for variably determining the extent of their traverse, displaceable distance pieces equal in length to the maximum width of a group of needles to which any carrier feeds its thread, for insertion between the rods and the stop mechanism, and means for inserting and withdrawing said distance pieces and for thereby controlling the bodily displacement of the rods over a distance equal to said maximum width to cause each carrier to feed its thread to a different group of needles.

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