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J. J. McDONOUGH

2,948,130

MULTIPLE-FEED CIRCULAR KNITTING MACHINES

Filed June 12, 1956

3 Sheets-Sheet 1

Fig. 1.

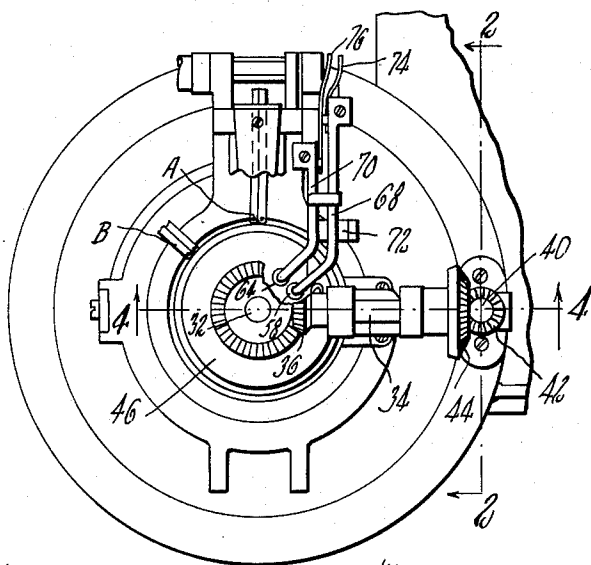


Fig. 2.

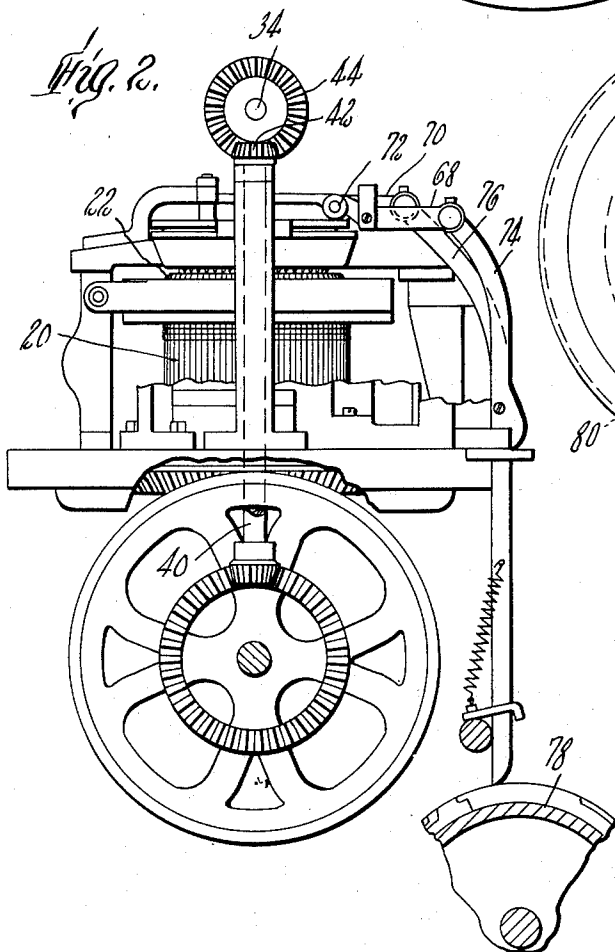
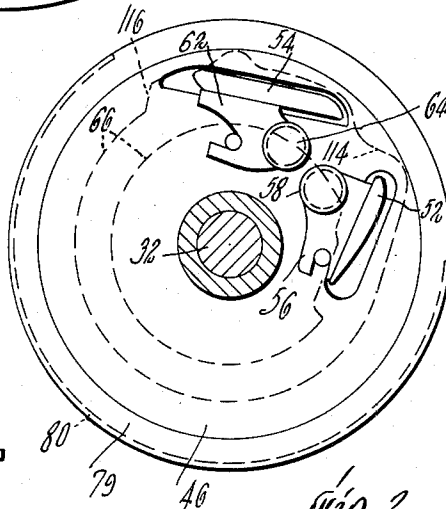


Fig. 3.

Inventor
John J. McDonough
Maxwell Fish
Atty.

Aug. 9, 1960

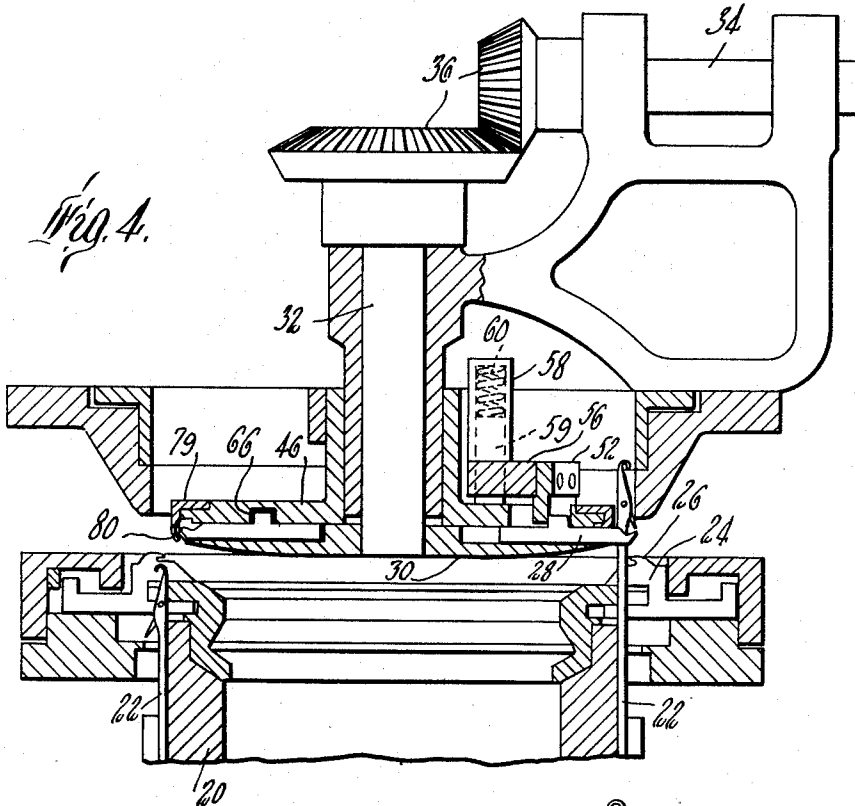
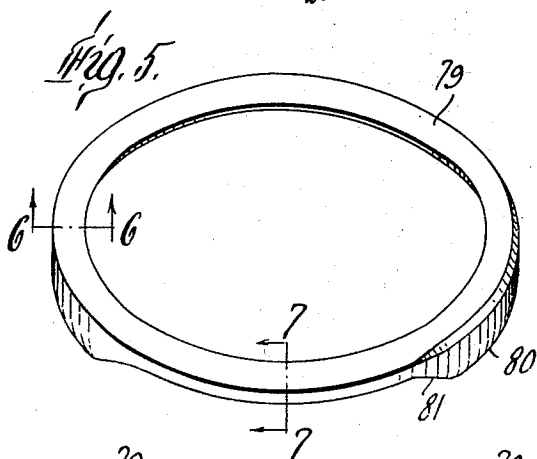
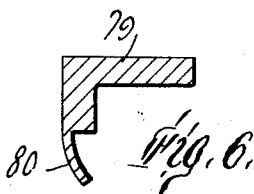
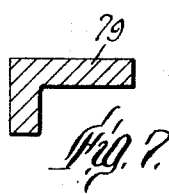
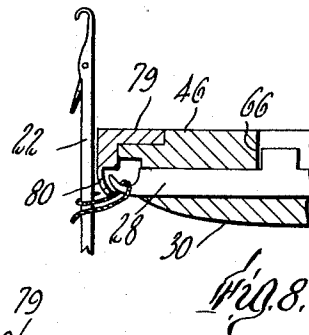
J. J. McDONOUGH

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3 Sheets-Sheet 2



Inventor
John J. McDonough
Maxwell Fish
Atty.

Aug. 9, 1960

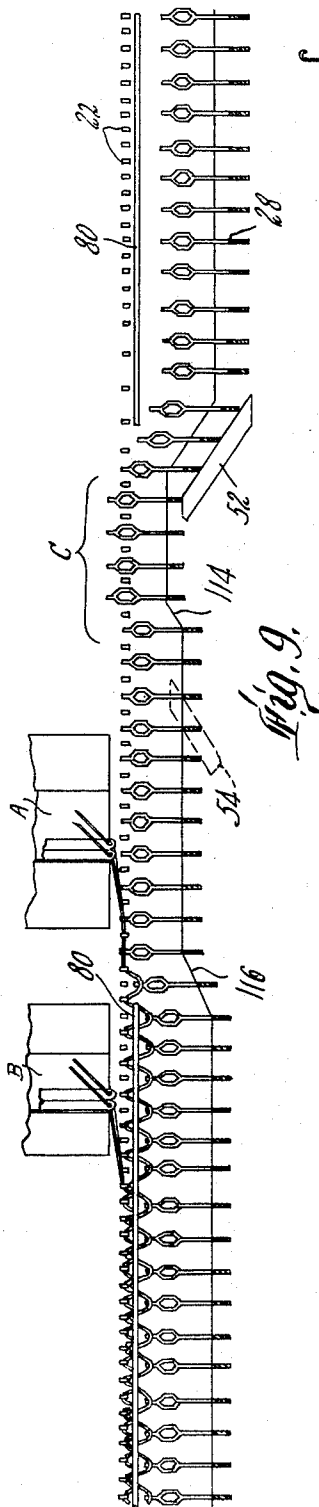
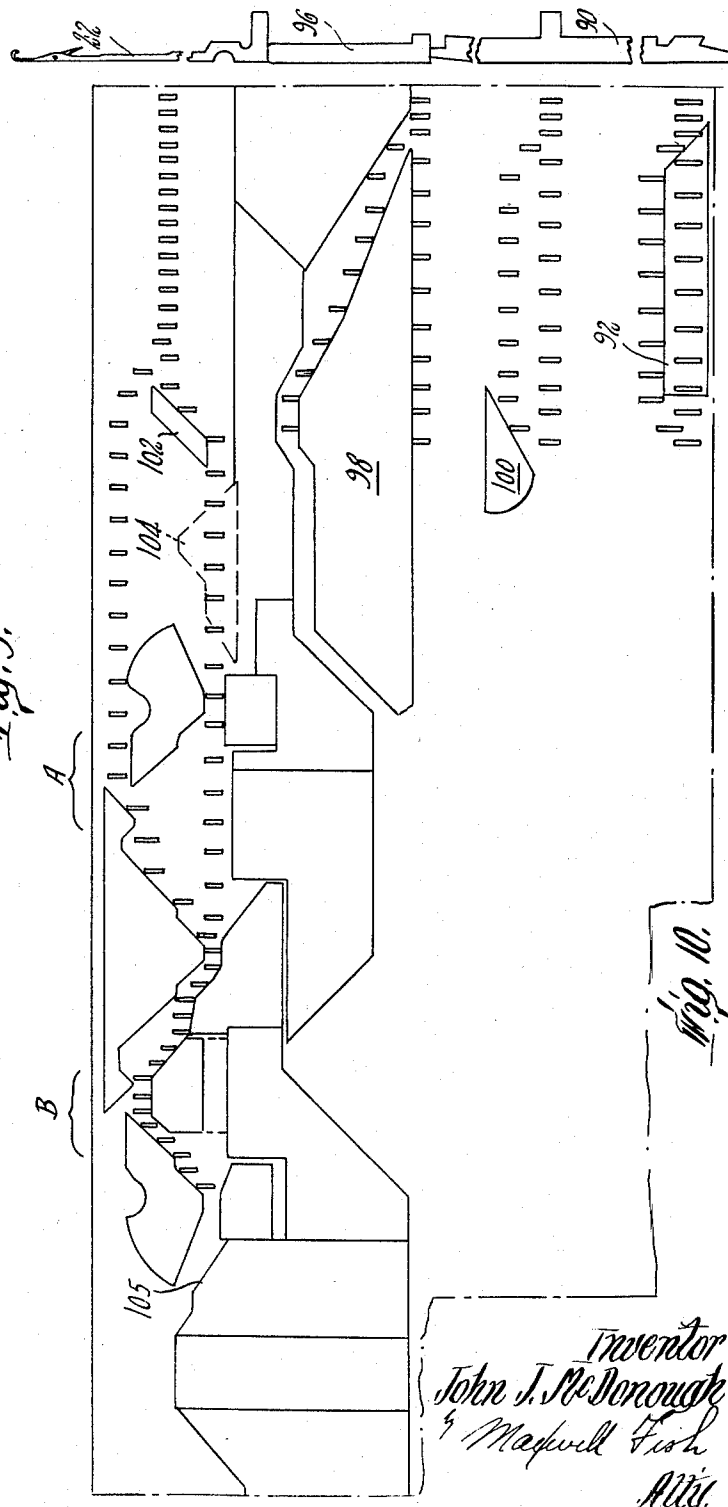
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MULTIPLE-FEED CIRCULAR KNITTING MACHINES

Filed June 12, 1956

3 Sheets-Sheet 3



1

2,948,130

MULTIPLE-FEED CIRCULAR KNITTING MACHINES

John J. McDonough, Laconia, N.H., assignor to Scott & Williams, Inc., Laconia, N.H., a corporation of Massachusetts

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11 Claims. (Cl. 66—41)

The present invention relates to improvements in multiple-feed circular knitting machines and method of operating the same, and more particularly to a novel mechanism and method of producing a welted fabric starting from bare needles having the make-up of the fabric combined with the set-up of the welt.

The invention is herein disclosed as embodied in a two feed fine gauge circular hosiery machine provided with radially moving transfer jacks which, together with their actuating cams and automatic control means, are adapted for setting up and holding an initial course of welt loops for the knitting of an inturned welt while the initial course of the stocking is being formed on bare needles and thereafter for transferring said loops to the needles to close the welt.

The machine illustrated in the drawings is an all-multiple feed $3\frac{3}{4}$ " cylinder, 400 needle, 75 gauge hosiery knitting machine of the general type illustrated in the patent to McDonough No. 2,576,962 dated December 4, 1951, for Circular Multiple Feed Hosiery Knitting Machine and Method of Operating Same.

However, it should be understood that the method to be described may be used in machines having more than two feeds, one of which is described in the Page Patent 2,146,647.

The transfer dial and transfer jacks employed for the knitting of an inturned welt are particularly shown in a U.S. patent to Scott No. 1,282,958 dated October 29, 1918, for Machine for Knitting Welted and Other Fabrics. The transfer jacks are arranged to be projected radially outwardly in slots formed in the transfer dial over selected needles at a level which is slightly above the top of the sinker nebs.

With this construction and arrangement of the transfer jacks it will be understood that the setting up course of welt loops which is formed on the jack hooks and bare alternate needles is positioned above the normal range of the sinkers, so that the sinker nebs are ineffective to hold down these loops during the subsequent advance of the needles to form the next succeeding course. In accordance with the teaching of the prior art, in order to avoid losing these initial loops from the hooks of the transfer jacks, a third course set-up of the welt was employed in which two initial courses of knitting of the new stocking were knitted by the needles and sinkers, the sinkers being advanced in the normal manner to cause their nebs to hold down the sinker wale loops. After the knitting of these courses the transfer jacks were brought into operation and cooperated with alternate needles in the knitting of the third course to form a setting-up course of welt loops on the jacks and said alternate needles. In this manner the sinker nebs which engaged with the sinker wale loops of the previously formed courses operated automatically to hold down and to retain the initial welt loops formed in the third course on the hooks of the transfer jacks. Subsequently, upon completion of the welt knitting the transfer jacks and welt loops held thereon would be advanced to the trans-

2

fer position for the transfer of said loops to the previously inactive intermediate needles to close the welt.

In accordance with the present invention, it is proposed to form an initial setting-up course of the welt on the hooks of the transfer jacks and on selected needles in the first course of knitting, and to hold said loops securely on the hooks of the transfer jacks independently of the sinkers until the continued knitting of a following course on the needles and on the normally cooperating sinkers has brought the sinker nebs into operation. After the knitting of a sufficient number of welt courses, the course of setting-up loops of the welt held on the hooks of the transfer jacks is transferred to the needles to close and complete the welt.

The knitted fabric having an inturned welt formed with a first course set-up in this manner has a number of novel characteristics not found in comparable fabrics in the prior art. Especially in fine gauge fabrics having an inturned welt, the first course set-up has resulted in imparting to the fabric a new and improved appearance. The improved construction has been found to have stretch characteristics at least equal to adjacent portions of the fabric, thus avoiding the so-called tight-string effect which is characteristic of the third course set-up and has tended in the past to cause weakness and breakage along the courses preceding the set-up of the welt. And, a welted fabric knitted in accordance with the invention to produce a first course set-up has proved substantially stronger and more durable than such fabrics formed with a third course set-up. The forming of the first welt course on the alternate needles and relatively high transfer jacks results in the formation of long loops in this initial course having at least as much lateral elasticity as the following courses.

Further in accordance with the invention the illustrated machine is provided with a novel hold-down or guard means which is operative during the knitting of the initial welt setting-up course to engage and to hold down the loops formed on the hooks of the transfer jacks, so that the loops are securely held on the hooks as they are withdrawn to an intermediate holding position and until the needles have been elevated to engage and to draw down the yarn for a second course of knitting which is formed in the normal manner on all of the needles and the cooperating sinkers.

In the preferred form of the invention, the guard means referred to, takes the form of a flange-like member which is arcuately shaped to follow the periphery of the transfer dial and which extends downwardly beyond the ends of the hooks of the transfer jacks when withdrawn to their intermediate welt loop holding position.

It should be borne in mind that in referring to the first or initial course of knitting or make-up, reference is actually made to the yarn taken by alternate bare needles which, while extending over the sinker platforms, does not form complete stitches until the needles combine with the previously inactive intermediate needles and pass through a knitting cycle a second time resulting in stitches on all needles. The term set-up is used to denote the course of loops extending from alternate needles over the transfer jack hooks rather than over the sinker platforms.

The invention is shown in a preferred form as embodied in a two feed hosiery knitting machine in which a yarn feeding means acts at a first feeding station to feed yarn to the alternate needles and project jacks for the knitting of the combined make-up and set-up course, and in which a yarn feeding means is employed at a second yarn feeding station to feed yarn to all of the needles subsequent to the withdrawal of the transfer jacks, to form a second or completing course of knitting in which all of the needles draw their loops downwardly in a nor-

3

mal manner, so that the sinker wale loops are engaged and held by the nebs of the sinkers prior to the rise of the needles preparatory for the knitting of a third course. It will be noted that the arcuate guard member, referred to, is of sufficient length to extend at least from just past the first feeding station to a point beyond the second feeding station and preferably may extend substantially beyond said second feeding station, but is terminated prior to a point at which the jacks would again be advanced for the transfer of their held loops to selected needles to close the welt.

A feature of the invention consists in the combination with the transfer jacks of the fixed arcuate guard shown in a multiple-feed circular knitting machine in which yarn is fed to the needles at a second yarn feeding station for the knitting of a second course on the needles, and the cooperating sinkers. With this arrangement of the machine, a continuous guard surface is provided from the point where the transfer jacks are moved rearwardly to their intermediate loop holding position in the formation of the first or making up course until after the needles have been raised to take yarn for the knitting of the second course, whereas in a single feed machine, the gap which is necessarily provided in the guard ring to permit the advance of the jacks to the transfer position to close the welt, would permit the loops held by the jacks to spring forward and become disengaged therefrom as the needles rose to clear their latches prior to taking yarn for the second course.

A preferred embodiment of the invention is shown on the accompanying drawings, in which:

Fig. 1 is a fragmentary plan view of the knitting head;

Fig. 2 is a fragmentary view in elevation of the knitting head taken on a line 2—2 of Fig. 1;

Fig. 3 is a detail plan view of the transfer jack cam assembly including the movable transfer jack advancing and withdrawing cams, and the guard provided in accordance with the invention;

Fig. 4 is a sectional view in elevation taken on a line 4—4 of Fig. 1, but on a larger scale, of the upper end of the needle cylinder, sinker ring and transfer dial assembly;

Fig. 5 is a perspective view of the guard ring provided in accordance with the invention;

Fig. 6 is a detail sectional view taken on a line 6—6 of Fig. 5;

Fig. 7 is a detail sectional view taken on a line 7—7 of Fig. 5;

Fig. 8 is a detail sectional view of a transfer jack, the guard, and a cooperating needle illustrating the manner in which the loops of the initial welt course are held down by the guard as the needles rise to take yarn for the knitting of a second course;

Fig. 9 is a developed view of the transfer jacks showing the manner in which they are advanced to take the bars of yarn extending between alternate needles during the initial or set-up course of the welt and are then withdrawn behind the guard prior to the feeding of yarn for a second course at the second feed station;

Fig. 10 is a developed view of the cam ring showing the manner in which the needles and needle jacks are controlled for the knitting of a first and second course at the first and second feed stations respectively; and

Fig. 11 is a modified form of the guard ring shown in Fig. 5.

The Scott and Williams all-multiple feed circular hosiery machine illustrated in the drawings as embodying in a preferred form the several features of the invention is provided with a revolving needle cylinder 20 with independent latch needles 22 and independent sinkers 24 with stitch-holding nebs 26 (see Fig. 4). The machine is also provided with a series of welt transfer jacks 28 movable radially from within the needle series to cooperate with the needles at a level substantially above the

4

operating level of the sinkers 24. The transfer jacks 28 are mounted for sliding movement in the radial slots of a transfer dial 30 which is mounted coaxially with and directly above the needle cylinder, and is driven synchronously therewith through connections which include a vertical shaft 32 to the lower end of which the dial 30 is secured, a horizontally disposed shaft 34 connected by beveled gears 36 with the vertical shaft 32, and a vertical drive shaft 40 (see Fig. 2) which at its upper end is connected through beveled gears 42, 44, with the shaft 34, and at its lower end is connected in the usual manner with the drive for the needle cylinder.

The transfer dial 30 is provided with a dial cap 46 which is mounted for angular and longitudinal adjustment from the frame of the machine, and is arranged to carry therein operating cams for advancing and retracting the transfer jacks. In accordance with the usual arrangement in these machines approximately half of the transfer jacks are provided with long butts, and the remaining jacks are provided with short butts, and mechanism is provided for raising and lowering the movable jack advancing and retracting cams in such a manner as to enable the said cams to be brought more efficiently into operation at the desired point in the rotational cycle of the needle cylinder and jack dial. Inasmuch as the mechanism for raising and lowering the jack operating cams is well known in the art, a brief reference only will be made thereto.

The operating cams for the transfer jacks (see Figs. 3 and 4) include a movable transfer jack advance cam 52, a movable transfer jack retracting cam 54 and fixed transfer jack retracting cams 114 and 116. The cam 52 is carried by a cam block 56 supported from dial cap 46, and has formed thereon an upward extending cell 58 which overlies a pin 59 mounted on the dial cap 46. A compression spring 60 acts against the cell 58 and normally lifts the cell 58, cam block 56 and cam 52 out of contact with any of the transfer jack butts.

The transfer jack retracting cam 54 is similarly mounted on a cam block 62 similarly provided with an upwardly extending cell 64 and is acted upon by a compression spring which serves to lift the retracting cam out of contact with both the long and short butts of the transfer jacks. As best shown in Fig. 3 the transfer butts are adapted to ride within a peripheral groove 66 in the underside of the dial cap which is of sufficient width to permit movement of the transfer jack butts from one to another of their several operating and inoperative positions.

Suitable connections actuated from one of the pattern controls of the machine are provided for automatically depressing and releasing the cam blocks to determine the operation at the desired times of the transfer jacks carried by the dial 30.

As shown in Figs. 1 and 2 the cells 58 and 64 are adapted to be engaged and depressed by means of actuating levers 68 and 70 which are mounted to turn on a fixed pivot 72 and are adapted to be controlled by means of vertically disposed push rods 74 and 76 which are in turn controlled by means of cams on a pattern drum 78 of the machine. Inasmuch as such connections are well known in the art, and are part of the disclosure more particularly of the Scott patent, above referred to, further illustration and description thereof is believed unnecessary.

The transfer jacks are mounted in pairs and are restrained against radial movement by being crimped or bowed slightly to create light friction against the sides of the slots in which they are carried.

In the illustrated construction two movable transfer jack cams only are provided in the dial cap 46. The jack advance cam 52 is arranged to push out all of the transfer jacks. The transfer jack retracting cam 54 draws back all of the transfer jacks. And the two cams are independently operated through the connections above

5

referred to. With this arrangement the transfer jack retracting cam 54 is left in operation after the move of drum 78 which effects the transfer of the loops held on the transfer jacks to the previously inactive intermediate needles and remains in action through the balance of the stocking and is finally moved out of action at the same time that the completely knitted stocking is pressed off from the needles. The transfer jack retracting cam 54 thus operates as a guard cam to prevent inadvertent advance of the transfer jacks throughout the above-named portions of the knitting.

In accordance with the present invention the dial cap 46 is provided with a guard ring 79 having formed thereon a downwardly extending flange or guard 80 which extends arcuately around the transfer dial. The guard 80 is located outwardly beyond the tips of the transfer jack hooks when withdrawn to the intermediate loop holding position, projects downwardly to a point approximately opposite the bottom line of the hooks and at its leading end is provided with an inclined surface to permit the loops to pass easily onto it. As shown in Figs. 6 and 8, the guard 80 is arcuately curved downwardly to conform with the shape of the ends of the transfer jack 28 to insure the proper holding down of the loops on the transfer jacks. Satisfactory results, however, have been obtained with a guard which extends vertically downwardly as shown in the modification of Fig. 11. As shown in Fig. 4, and as indicated in the somewhat diagrammatic development of the dial cam layout (Fig. 9), the leading end of the guard is located between a first yarn feeding station A of the machine and a second feed station B so that loops taken on the transfer jack hooks during the feeding of a first course of yarn to alternate needles at the first or right hand feed station A will be engaged and held down securely by the guard immediately as the transfer jacks reach their semiretracted loop holding position determined by cam 116. The guard is arranged to extend arcuately around the periphery of the dial through an angle of approximately 235° , being terminated at a point in advance of the first feeding station A and prior to the point at which the jacks 28 will be advanced to their transfer position as indicated at C in Fig. 9 when the held loops are transferred to the needles at the end of the welt knitting operation. The primary function of the guard in accordance with the invention is to hold down the initially formed welt loops taken on the hooks of the transfer jacks during that portion of the knitting when only the first course of loops is being drawn down by alternate needles, and particularly during the subsequent rising movement of the needles as the knitting wave is formed for the knitting of the second course at yarn feeding station B. The portion of the guard which may be considered most essential is that which extends from a point beyond the right hand or first feeding station A to just beyond the second or left hand feeding station B, at which yarn is fed to the needles for the knitting of a second course, which is knitted in the normal manner on all of the needles and the sinkers so that the sinker wale loops of the second knitted course will be held down by the sinker nebs. When the second course has been knitted, the loops of the initial setting-up course on the hooks of the transfer jacks will be held down firmly, thus eliminating the chance of their becoming disengaged. There is however, some advantage in carrying the guard around the periphery of the dial as far as permissible to further insure the holding of the loops of the setting-up course on the hooks of the transfer jacks during the knitting of the second and succeeding welt courses.

The operation of knitting a combined make-up and set-up course on the hooks of the transfer jacks and the needles is briefly described as follows:

It is assumed that the transfer jacks located around substantially one-half of the transfer dial are provided with short butts, the remaining transfer jacks being provided with long butts, and that the needles with their

6

cooperating jacks may be similarly grouped into half long and half short butt needles to enable the transfer jack and needle operating cams to be brought readily into and out of operation. While this operation of bringing the respective transfer jack and needle series into and out of operation is well known and has not therefore been fully illustrated, the preliminary operation of the transfer jack and needle cams, in order to bring these elements into operation, is referred to briefly in the following statement of operation.

The developed Figs. 9 and 10 show the start of the first course set-up with lower cylinder jacks 90 (see Fig. 10) selectively divided on cam 92 which in turn divides the cylinder needles 22 through the intermediate jacks 96 which are raised by cams 98 causing alternate needles to be elevated above cam 102 which meanwhile lowers the intermediate or unselected needles. The raised jacks 90 are then lowered by cam 100. Cam 104 has been moved outwardly to an inoperative position allowing the intermediate needles lowered by cam 102 to pass with their hooks below the level of the transfer jacks so that as the transfer jack cam 52 steps into active position above the short advance butt transfer jacks 28 the long butt jacks may be moved out into the vacant spaces between the alternate needles.

Referring particularly to Fig. 9 cam 54 is lowered into an intermediate active position toward the transfer jacks in which it will engage and draw back the long butt jacks only. Cam 52 has been lowered into an intermediate active position to engage and move out the long butt transfer jacks which are thereupon drawn back by cam 54 to avoid taking yarn at feed A as it is lowered into feeding position, toward the end of the long butt series of jacks.

While the long butt transfer jacks are moving out on cam 52, it is fully lowered to engage and advance the approaching short butt transfer jacks.

After the last of the series of long butt transfer jacks passes cam 54 it is raised completely.

The short butt transfer jacks advanced, as above described, by cam 52 are slightly retracted by a fixed cam 114 to a position with their hooks in alignment with those of the alternate needles so that the yarn previously lowered into feeding position at station A will be taken by both. The short butt transfer jacks are then further retracted by a fixed cam 116 to their welt loop holding position.

Following the advance of all of the short butt transfer jacks into operation the cam 52 still in its lowermost operating position will engage and advance the long butt transfer jacks into operation in the manner described for the short butt transfer jacks so that the entire circular series of transfer jacks will engage a first course of yarn at station A and will be partially retracted to the welt loop holding position indicated at the left in Fig. 9.

While the long butt transfer jacks during their second passage are being advanced by cam 52 it is raised to its intermediate position to allow the short butt transfer jacks to pass beneath it. Subsequently, when the long butt transfer jacks are all retracted and the short butt transfer jacks are passing beneath it, the cam 52 is fully raised to its inoperative position.

As previously noted for the knitting of the combined make-up and set-up the needles 22 are selected and raised into operating position by their operating cams 92 and 98 acting respectively on lower and upper jacks 90 and 96 so that alternate needles 22 are raised to take yarn at station A and the intermediate needles which underlie the transfer jacks are drawn down by cam 102. All of the needles are then raised to knit at station B, the yarns having been lowered into feeding position closely following those at station A, so that a second course is knitted at station B on all the needles following immediately the knitting of the make-up course at station

A. The formation of the combined make-up and set-up course on alternate needles and the transfer jacks at station A and the knitting of the second course on all the needles at station B, therefore, takes place during substantially a single revolution of the needle cylinder.

After the last long butt transfer jack passes the fixed retracting cam 116 the second time the entire series of transfer jacks will have been moved to the welt loop holding position as above set forth, and after the needles associated with the last long butt jack have knit at station B, the combined make-up and set-up is complete.

After a complete revolution of the needle cylinder, during which at station A yarn is taken by alternate needles and the transfer jacks and at station B yarn is taken and knit by all needles, selection of the jacks to be elevated by cam 92 to cause the intermediate needles as well as the alternate needles to knit at station A is delayed, so that during the second revolution of the needle cylinder a third course is knit only on alternate needles at station A, followed by a fourth course knit on all needles at station B and succeeding courses knit on all needles at both stations during knitting of the balance of the welt.

The delay in selecting all needles to knit at station A is chiefly for the sake of appearance, since due to conditions of timing, advancement of the control drum to begin the complete selection immediately following the set-up would be rather difficult, whereas, it may be readily accomplished at the end of a second revolution of the needle cylinder. However, a satisfactory stocking may be produced without delaying the introduction of all needles at station A to the extent just described.

It will be understood that after the needles stop dividing, that is, after all the needles are being elevated above both cams 102 and 104, cam 102 is withdrawn and cam 104 is moved into active position.

Upon completion of the welt knitting the loops held on the transfer jacks are transferred to the intermediate needles to close the welt in a conventional manner which is in accordance with the disclosure of the patents to Scott No. 1,282,958 and to McDonough No. 2,576,962, above referred to.

Following the transfer, cam 52 is raised completely out of action and cam 54 is permitted to remain in its active position during knitting of the balance of the stocking to prevent accidental outward movement of jacks previously described.

The invention having been described what is claimed is:

1. The method of producing an inturned welt having a combined make-up and set-up on a multi-feed hosiery knitting machine having a circular series of independent needles, sinkers, and welt transfer jacks movable radially from within the needle series, which comprises, first from bare needles forming an initial setting-up course of loops upon the jacks and upon alternate needles of said series, retiring the transfer jacks, but permitting them to retain their loops, holding said setting-up loops on the transfer jacks and subsequently knitting a plurality of courses on all of the needles of said series to form a welt fabric, imparting relative movements to needles of said series and to said transfer jacks to transfer the loops of said setting-up course held by the jacks to the needles, retiring said transfer jacks, and thereafter continuing to knit on needles of said series.

2. The method of producing an inturned welt having a combined make-up and set-up on a multi-feed hosiery knitting machine having a circular series of independent needles, sinkers, welt transfer jacks movable radially from within the needle series, and guard means for retaining on the transfer jacks the initial row of welt setting-up loops formed thereon, which comprises forming an initial making-up course upon the jacks and upon needles of said series, relatively positioning the transfer jacks and said guard means to hold said initial row of welt setting-up loops on the transfer jacks, feeding yarn to needles

of said series to form a second course of knitting, and moving the sinkers relatively to the needles to hold down the loops of said second course, knitting a plurality of courses to form a welt fabric, imparting relative movements to needles of the series and said jacks to transfer the loops of said setting-up course held by the jacks to the needles, and thereafter continuing to knit on needles of the series.

3. The method of producing an inturned welt having a combined make-up and set-up on a circular multi-feed hosiery knitting machine having a circular series of independent needles, sinkers, welt transfer jacks movable radially from within the needle series and disposed above the level of the sinkers, means for feeding yarns to the needles, and a guard arranged to hold down an initial row of welt setting-up loops formed on said transfer jacks, which comprises forming a making-up course of loops upon the jacks and upon needles of said series, said loops extending above the level of the sinkers, positioning the transfer jacks relative to said guard to cause the guard to hold said loops on the jacks, feeding yarn to needles of said series to form a course of knitting to be held down by said sinkers, knitting a plurality of courses to form a welt fabric, imparting relative movements to needles of the series and said jacks to transfer the loops of said setting-up course held by the jacks to the needles, retiring said transfer jacks, and thereafter continuing to knit on needles of the series.

4. A method of producing an inturned welt having a combined make-up and set-up on a hosiery knitting machine having a circular series of independent needles, sinkers, welt transfer jacks movable radially from within the needle series and disposed above the level of the sinkers, a plurality of yarn feeding stations and a guard projecting downwardly over the retracted jacks extending from the first to at least beyond a second of a plurality of feed stations, which comprises, forming a making-up course of loops upon the jacks and upon needles of said series at the first of said stations extending above the level of the sinkers, retiring the transfer jacks behind said guard thereby forcing said jacks to retain their loops, feeding yarn to needles of said series at a second of said stations with the loops of the setting-up course held down between the needles and jacks by said guard to form a second course to be held down by said sinkers, knitting a plurality of courses to form a welt fabric, imparting relative movements to needles of the series and said transfer jacks to transfer said loops held by the jacks to said needles, retiring said transfer jacks, and thereafter continuing to knit on needles of the series.

5. A method of producing an inturned welt having a combined make-up and set-up on a multi-feed hosiery knitting machine having a circular series of independent needles, sinkers, welt transfer jacks movable radially from within the needle series to lie between alternate needles and disposed above the level of the sinkers, at least two yarn feeding stations, and a guard arranged to force downwardly portions of at least those loops held on the transfer jacks from the first to at least beyond the second yarn feeding station, which comprises, forming a making-up course of loops upon the jacks and alternate needles of said series, said loops extending above the level of the sinkers, positioning the transfer jacks relative to said guard to cause the guard to hold said loops on the jacks, feeding the yarn to all of the needles of said series at a second of said feeding stations with the loops of the making-up course held down between the needles and jacks by said guard to form a second course, moving the sinkers relatively to said needles to hold down the loops of said second course, knitting a plurality of courses to form a welt fabric, imparting relative movements to the intermediate needles of the series and said jacks to transfer the loops of said making-up course held by the jacks to said needles, and thereafter continuing to knit on needles of the series.

6. A method according to claim 5 in which a third course, following the knitting of said second course on all the needles at said second yarn feeding station, is knitted at the first yarn feeding station on the sinkers, and said alternate needles only.

7. For use in a circular independent needle hosiery machine a transfer jack assembly comprising a rotatable radially slotted transfer dial, transfer jacks having loop supporting hooks and provided with upwardly extending butts radially movable in the slots of the dial, a relatively stationary dial cap having butt engaging cam surfaces for advancing and retracting said jacks, and a guard mounted from said dial cap disposed outwardly of the transfer jacks for a relatively withdrawn position of the jacks, projecting downwardly over said hooks and arcuately about a portion of said dial cap.

8. In a circular independent needle hosiery knitting machine having a rotary needle cylinder and independently movable needles mounted therein, sinkers, and at least two yarn feeding stations adapted for feeding respectively first course and second course yarns, the combination of mechanism for forming an inturned welt comprising a transfer dial supported coaxially with the needle cylinder, and transfer jacks carried on said transfer dial movable radially of said cylinder above the level of the sinkers and having a relatively withdrawn loop holding position and adapted to be projected radially outwardly for engaging an initial making-up course of welt loops, and an arcuately shaped guard supported concentrically with the needle series and transfer dial and arranged to extend downwardly beyond the ends of the retracted transfer jacks for holding down said initial making-up welt loops engaged on said jacks and of a length to extend from the first to at least beyond the second of said feed stations.

9. A circular independent needle hosiery knitting machine having in combination a circular series of independent needles, and sinkers movable with relation to the needles in a knitting cycle, welt transfer jacks movable radially from within the needle series above the level of the sinkers, a plurality of yarn feeding stations spaced from one another about said circular series of needles, means for feeding yarn at a first one of said stations, means for relatively moving the transfer jacks and needles of the series with relation to said first feeding station to form a first making-up course of welt loops on said jacks and on selected needles including means to retire said jacks with said initial loops held thereon, a guard extending peripherally of the needle series and downwardly beyond the ends of said retracted transfer jacks from the first feed station to at least beyond a second feed station thereby forcing said jacks to retain their stitches, and means for feeding yarn to needles of said series at a sec-

ond of said feed stations to form a second course of knitting on the needles and sinkers to be held down by said sinkers.

10. In a circular independent needle hosiery knitting machine, the combination of a rotatable needle cylinder, independently movable needles mounted therein, at least a first and a second yarn feeding station spaced about the cylinder sinkers, and means at each of said stations for feeding yarns to the needles, a transfer jack assembly cooperating with the needles for the knitting of an inturned welt comprising a radially slotted transfer dial, transfer jacks having loop supporting hooks provided with upwardly extending butts radially movable in the slots of the dial, a relatively stationary dial cap having butt engaging cam surfaces for advancing and retracting said jacks, and a guard mounted from said dial cap adapted for a relatively withdrawn position of the jacks to project downwardly over said hooks and arcuately about said dial cap from the first to at least beyond said second yarn feeding station for holding down loops of an initial welt course on the hooks of the jacks.

11. In a circular independent needle hosiery knitting machine having a rotary cylinder, a series of independent needles, a series of sinkers movable transversely between the needles, and having fabric hold-down nebs, the combination of mechanism for knitting an inturned welt with a first course set-up which comprises a series of welt setting-up instrumentalities movable radially from within the line of needles above the level of the sinkers, at least two yarn feeding stations, means operable at one of said yarn feeding stations for advancing the needles and said instrumentalities relatively to the needles to form a first setting-up course on the needles and upon said instrumentalities and thereafter for withdrawing said instrumentalities to a loop holding position, means operable at a second of said yarn feeding stations for advancing the needles for the knitting of a second and following welt course on the needles and cooperating sinkers, a device for holding the initial loops on said instrumentalities prior to and during the advancing movement of the needles to knit a second course of loops, and means for relatively advancing said instrumentalities and needles to return the initial row of held loops to the needles to close the welt.

References Cited in the file of this patent

UNITED STATES PATENTS

864,433	Scott	Aug. 27, 1907
1,282,958	Scott	Oct. 29, 1918
1,641,101	Scott	Aug. 30, 1927
2,387,768	Page et al.	Oct. 30, 1945
2,387,769	Page et al.	Oct. 30, 1945
2,576,962	McDonough	Dec. 4, 1951