July 9, 1940. R. H. LAWSON ET AL 2,207,463

SELECTIVE CONTROL OF SINKERS, NEEDLES, AND JACKS

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FIG. 1

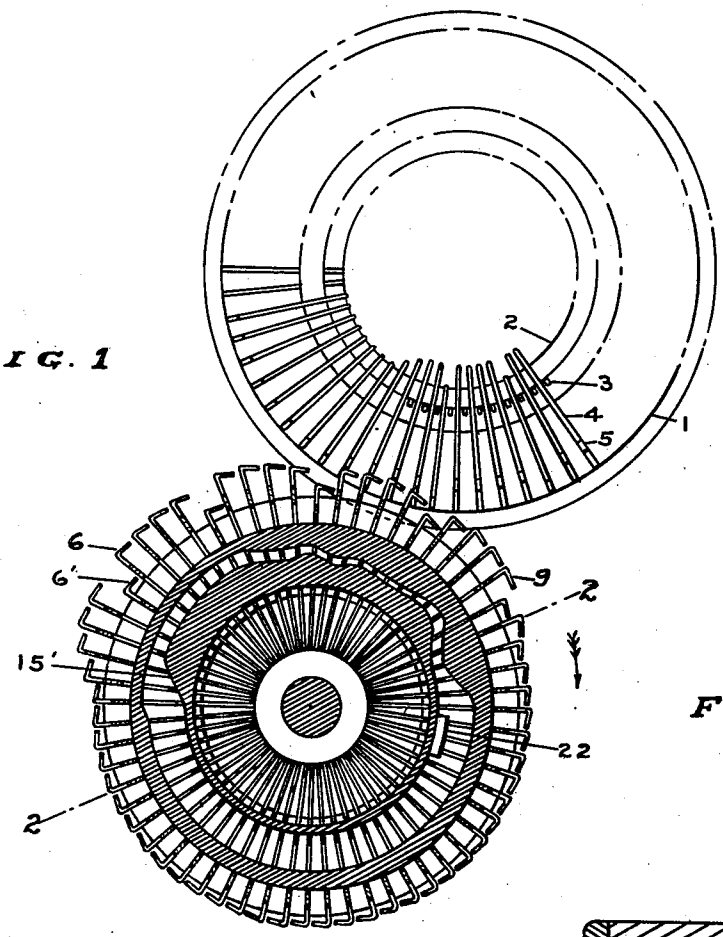


FIG. 3

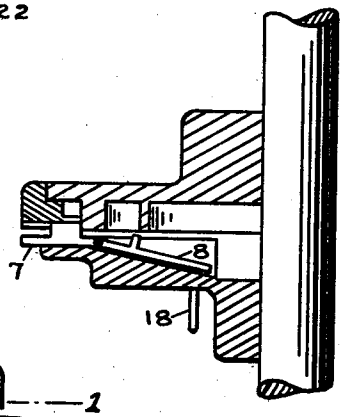
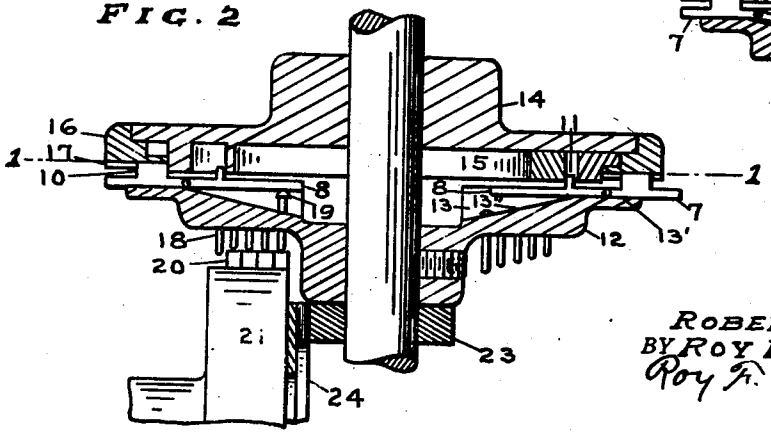


FIG. 2



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FIG. 4

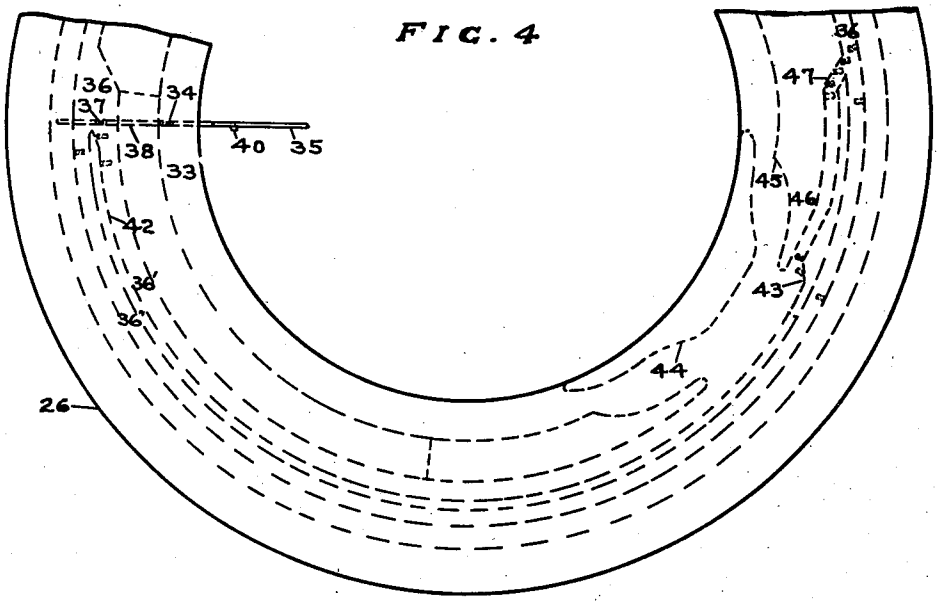


FIG. 5

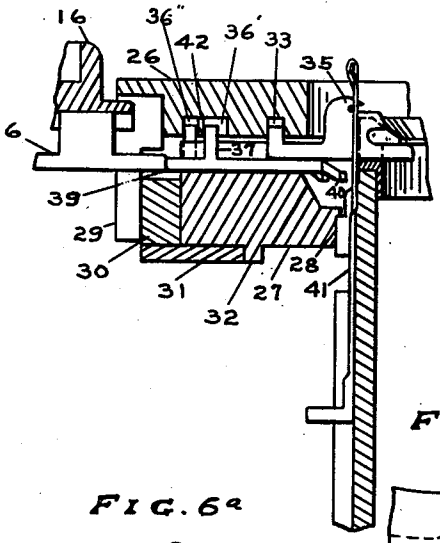


FIG. 6

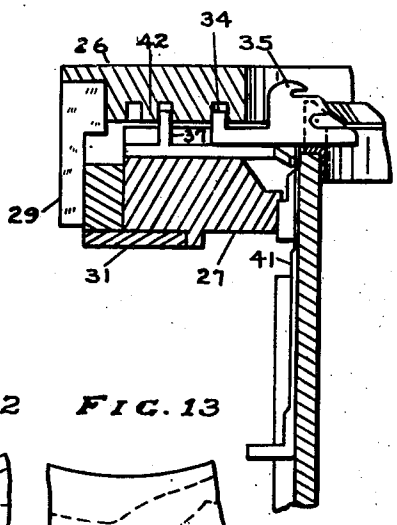


FIG. 12

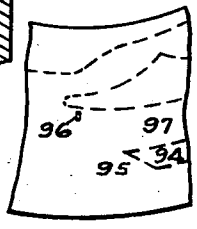


FIG. 13

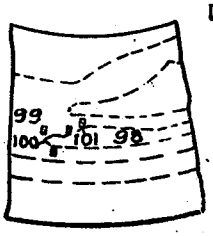
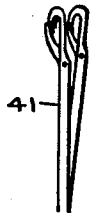


FIG. 6a



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FIG. 7

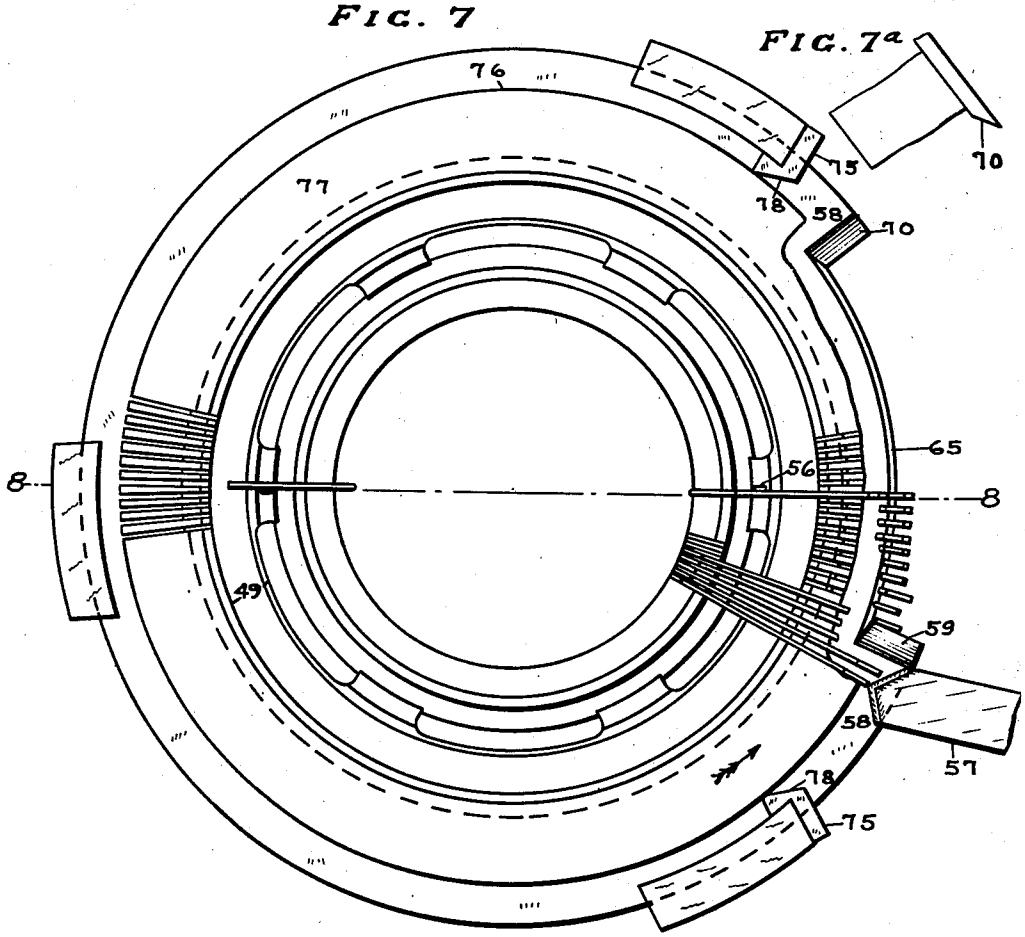
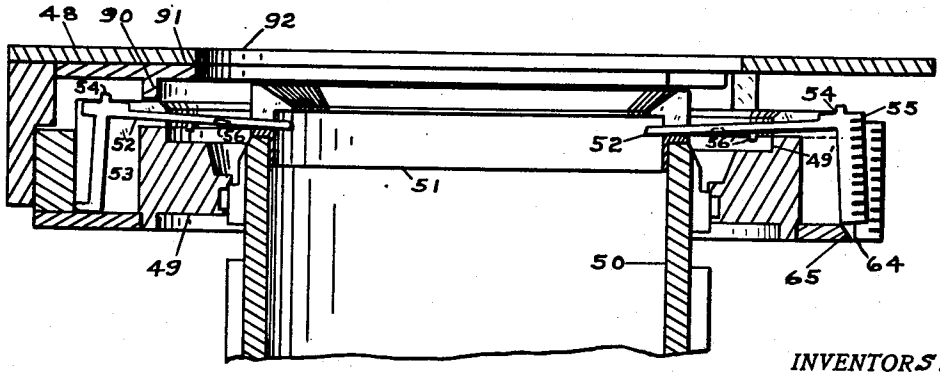


FIG. 7a

FIG. 8



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FIG. 9

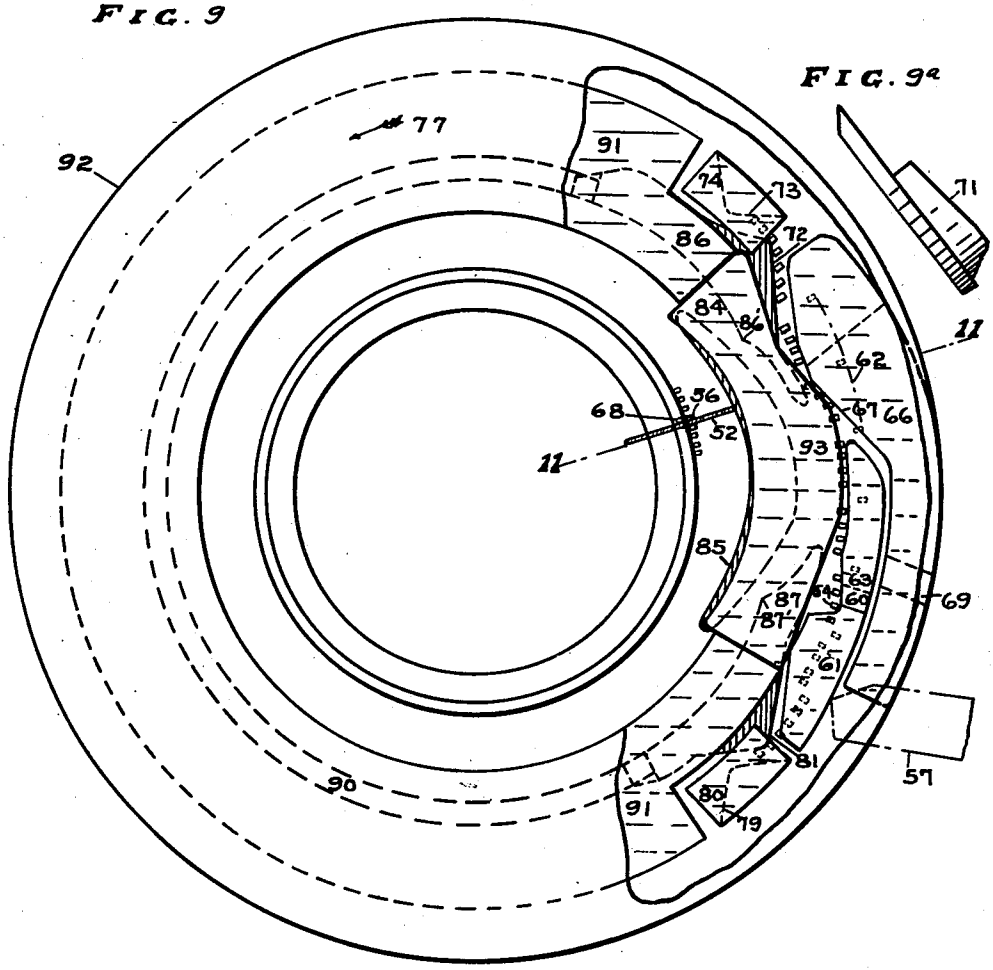
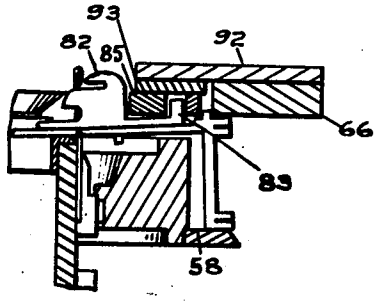


FIG. 9a

FIG. 10



FIG. 11



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UNITED STATES PATENT OFFICE

2,207,463

SELECTIVE CONTROL OF SINKERS, NEEDLES, AND JACKS

Robert H. Lawson, Pawtucket, and Roy F. Lovell, Providence, R. I., assignors to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application September 16, 1929, Serial No. 392,853
Renewed March 24, 1939

11 Claims. (Cl. 66—50)

This invention relates to an improved control for selecting instrumentalities for reverse plating knitting. It now is common in machine knitting to reverse plate by selective control of certain reverse plating instrumentalities, in some cases the needles themselves and in other cases the sinkers and in still other cases so-called jacks that act upon the sinkers or directly upon the needles. According to the present disclosure the reverse plating instrumentalities take the form of jacks radially slidable in grooves cut in a dial positioned in a manner similar to the dials shown in the patent to Robert H. Lawson, 1,605,896, Nov. 2, 1926, which jacks are adapted to be selectively controlled to thereby act upon certain of the sinkers or needles whereby the said selected sinkers or needles reverse plate at desired wales and in desired courses.

In the drawings:

Fig. 1 discloses a jack dial in cooperative relationship with the sinker head, the dial in section, the section taken on the line 1—1, Fig. 2;

Fig. 2 is a vertical sectional view taken on the line 2—2, Fig. 1 and showing the dial cap;

Fig. 3 is a view in section similar to Fig. 2 showing one-half only of the dial;

Fig. 4 is a plan view of a modification showing a segment of a sinker cap, the cams and jack butts shown in dotted lines;

Fig. 5 is a sectional view of the sinker head and cap showing in addition thereto a part of the needle cylinder and selector dial in section;

Fig. 6 is a view similar to Fig. 5 but taken at a later period in the cycle of operations;

Fig. 6a is an enlarged detail view supplementing Fig. 6 and showing the relative positions of a needle deflected for reverse plating and a second needle in normal position;

Fig. 7 is a top plan view of another modified form of the invention showing the sinker head and a few jacks in position, the sinkers not shown;

Fig. 7a is a detail view of one of the cams, Fig. 7, for operating the jacks;

Fig. 8 is a sectional view taken along the line 8—8, Fig. 7, and with the sinker cap in position;

Fig. 9 is a top plan view of the sinker cap, the top plate broken away to show the actuating cams;

Fig. 9a is a detail view of one of the cams, Fig. 9;

Fig. 10 is a view in side elevation of the cap and certain of the cams shown in Fig. 9;

Fig. 11 is a view in vertical section taken on the line 11—11, Fig. 9;

Fig. 12 is a fragmentary view of a modified form of sinker cap with jacks therein to be both selected and moved to reverse plating position at or adjacent the knitting point, and;

Fig. 13 is a similar view of a further modification but with selection only of the jacks adjacent the knitting point, the dividing cam actuating the jacks to cause reverse plating.

Referring specifically to Figs. 1, 2, and 3, the sinker head is indicated at 1 and the needle cylinder at 2. Needles 3 are adapted to be guided in grooves or tricks cut in the outer cylinder wall as usual. Sinkers 4 with butts 5 are shown in Fig. 1 each of which is adapted to be selected by means of a jack 6 the latter in turn selected in a manner about to be described. The jacks each consist of an outer part 7, and an inner part 8 hingedly connected together. The part 7 has an end 9 turned at substantially a right angle to engage a companion sinker butt 5, and has also a butt or projection 10 while the part 8 is provided with a butt 11. The jacks 6 are mounted for radial movements in grooves or tricks 13 cut in the dial 12 which grooves are in part horizontally disposed and in part inclined to the horizontal.

Positioned above the dial is a dial cap 14 which latter carries a cam 15 adapted to guide the jacks 6 and control their movements radially, a portion 15' of the said cam imparting outward radial movements to selected ones of the jacks 6 as will be presently described. While the dial 12 is mounted for circumferential movements in the direction of the arrow, Fig. 1, the dial cap 14 is fixed against turning by any suitable means. Between the dial cap 14 and dial 12 is positioned a ring 16 having radial slots 17 cut therein and adapted to receive and guide, for radial movements, the butts 10 of the outer parts 7 of the jacks. The ring 16 thus rests upon and is driven by the butts or projections 10 of the jacks, the jacks in turn supported and driven by the dial 12. The inner surface of the ring 16 is circumferentially grooved as shown, Fig. 2, to provide a bearing between it and the stationary dial cap 14.

Any suitable means may be provided for selectively controlling the movements of the jacks 6. As shown, Fig. 3, the parts 7 of the jacks normally rest upon the horizontal seats 13' of the grooves, and the hinged parts 8 upon the inclined walls 13'' thereof or upon pins 18 headed at 19 and slidably received in holes drilled through the said walls 13''. Preferably, a single pin projects within each groove. Adjacent pins which are located

at different distances from the outer circumference of the dial 12 correspond in positions to cams 20 carried by a drum 21. If five circumferential series of pins 18 are utilized, the pins in every fifth groove 13 are the same distance from the periphery of the dial 12.

The drum 21, carrying the cams 20, is supported from any convenient part of the machine frame and its cams 20 are adapted to raise certain ones of the pins 18, which latter in turn raise the hinged parts of the jacks 8 from the position shown in Fig. 3 to that of Fig. 2. As shown in Fig. 2 when cams 20 are positioned beneath four of the five pins, the four jacks above the said four pins are raised and then moved forward or projected by cam 15' and the sinkers companion to the said four jacks are moved forward to reverse plating position. With the arrangement of drum cams 20 under the pins 18, as shown in Fig. 2, the jacks assume the relative positions indicated in Fig. 1, i. e., four adjacent jacks are in their forward or projected positions due to the cam portion 15' having acted upon the jack butts 11 and radially projected the same to their outermost positions. On the other hand, the outermost pins 18 (every fifth pin), Fig. 2, are not raised by a cam 20 for the course of knitting, and consequently every fifth jack remains retracted with the hinged parts 8 thereof in the position shown in Fig. 3, and with their jack butts 11 below the effective cam surface 15. The jacks in a retracted position such as indicated by the reference character 6', Fig. 1, do not radially displace their companion sinkers when moved adjacent thereto by the relative rotation of the sinker head 1 and dial 12, with the result that the yarns plain plate at the wales controlled by the said retracted sinkers.

After the sinkers have been selected and have actuated their sinkers for one course of knitting, continued rotation of the dial 12 brings the jacks contained therein around in the direction of the arrow, Fig. 1, until the projected jacks are retracted by the cam 15. Before retraction, the jacks after having been projected by the cam 15', rest upon horizontal seats 13' on the dial 12 and forward of the inclines 13'' with the result that the hinged portions of the jacks remain in the horizontal positions to which they are initially raised by their pins 18. Normally, upon retraction by the cam 15, the hinged portions 8 of the jacks fall by gravity into the position shown in Fig. 3. However, if certain of the jacks are restrained from dropping back they are positively relowered or repositioned by means of a cam 22 connected to cam 15 which cam 22 is in such a position as to relower the jacks immediately after they have been retracted.

In the form shown the cam drum 21 is racked around or moved, preferably, one step circumferentially each course of knitting and as one means for accomplishing the racking a single toothed gear or pinion 23 may be provided as shown, Fig. 2, connected to the hub of the dial 12, said tooth engaging the teeth of gear 24, fast to one side of the cam drum 21, once each revolution of the dial. The cam drum is thereby moved around one step for each course of knitting or as desired. Any other suitable means may be substituted for the interengaging tooth 23 and gear 24 herein disclosed.

If reverse plating be desired for the ensuing course in the same wales as in the preceding course, cams 20 will be positioned upon the cam drum 21 to be in the same relative positions as were the corresponding cams 20 for the previous course of knitting; the rotation of the dial 12 bringing the pins 18, that have been relowered, around adjacent the said cams 20 whereupon the pins as they reach the cams 20 ride up inclines thereon thereby again elevating or raising the jacks positioned above the raised pins 18 with the result that the projecting cam 15' will again engage the butts 11 of the selected jacks as indicated in Fig. 1. If a different selection of jacks for reverse plating is desired for an ensuing course of knitting, the racking of the drum 21 will bring around a set of cams 20 arranged differently than were the cams 20 for the first course. For example, three cams only may be brought to a position where they will be engaged by the three inner series of rotating pins 18. The two outer series of rotating pins 18 not having cams thereunder for the ensuing course of knitting will not be raised and consequently their jacks will remain in the retracted position indicated by 6', Fig. 1, and the fabric will have three reverse plated wales followed by two plain plated wales in turn followed by three reverse plated wales and so on. With the arrangement of pins 18 shown in the drawings, every fifth pin is positioned the same radial distance from the axis of the dial 12 so that with a cam 20 in position, the latter will cause reverse plating at every fifth wale unless certain of the pins 18 be removed in which event plain plating alone occurs throughout such wales. Any desired pattern may be knit in a stocking or other fabric within the range of the number of rows of pins 18 and cams 20 on the drum 21, five in the present disclosure being shown though more rows may be used if desired.

During heel and toe knitting it is desirable that the drum 21 be not racked so that the jacks will not be actuated or radially displaced. In order to accomplish this purpose the dial is, preferably, raised in the manner disclosed in the mentioned Lawson patent.

Instead of selecting the pins 18 by the cam drum 21 and cams 20 as above described, the pins 18 may be divided into series, and each series of pins controlled by a rotating drum or other means having rows of lugs or cams each row extending along the drum somewhat in the arc of a circle corresponding in position to the more or less circular arrangement of pins 18 in each sector of the dial 12 or other support for the said pins though the pins 18 may be arranged more or less in a straight line depending upon the length of the hinged portions 8 of the jacks. As they approach the projecting cam 15' the hinged portions of the jacks are selectively raised by racking or moving the drum under each sector thus in turn bringing lugs or cams under and selectively raising the pins 18 in each sector. The raising of the jacks permits the cam 15' to engage the jack butts and force them outwardly, the horizontal portions 13' of the guiding grooves for the jacks then retaining the hinged portions thereof elevated. Each sector of pins is controlled in the same manner, each drum rotating with the dial 12 and acting only upon its jack pins 18.

In place of the drums, rolls may be provided, one under each sector of pins 18, each roll carrying an endless or other Jacquard sheet or band with lugs or cams thereon to raise the desired ones of the pins 18 in each sector.

Referring to Figs. 4, 5, 6, and 6a wherein is disclosed mechanism for reverse plating by needle deflection, 26 designates a sinker cap and 27

a sinker head which is connected to and driven by the cylinder in the usual manner at 28. The sinker cap 26 remains stationary during circular knitting and has connected thereto at intervals depending brackets 29 the latter connected to and supporting a ring 30, the said ring 30 supporting in turn a horizontally disposed circular plate or ring 31. The rings 30 and 31 provide a bearing and support for the sinker head 27 as the latter rotates relatively to the sinker cap 26. An annular rib 32 depending from the sinker head 27 bears against the inner edge or surface of the plate 31.

The sinker cap is provided with a raceway 33 traversed by butts 34 of sinkers 35, and a second raceway 36 in which travel butts 37 of jacks 38 positioned in the same grooves or slots with their companion sinkers which sinkers are slidably seated upon the jacks. The jacks have adjacent their outer ends tails 39 and adjacent their forward ends lateral lugs or projections 40 the latter adapted to engage needles 41 for a purpose presently to be described. The jack raceway 36 is provided by a cam 42, certain of the jack butts 37, after selection, traversing the forward or inner division 36' of the raceway 36 and other jacks, not selected, moving along the division 36'' of the raceway 36 to the rear of the dividing cam 42.

The means for selecting the jacks 38 consists of jacks 6 similar in all respects to the jacks 6 disclosed in Figs. 1, 2, and 3 hereof, and operated and controlled in the same manner or in a different manner if desired. The jacks 6, or rather such of them as have been previously selected, engage tails 39 of the jacks and push their butts 37 forward of the dividing cam 42 so that they move along in the forward division 36' of the raceway 36 while the non-selected jacks, i. e., the ones not engaged and moved by selector jacks 6, pass back of the dividing cam and traverse the path 36'' as before stated.

After selection, the jacks, selected and non-selected, move along their respective raceways 36' and 36'' and without change in their relative positions until they arrive at the knitting point. At this point the selected jacks engage a cam or incline 43 by which they are advanced or pushed forward, their lateral projections 40 engaging companion needles 41 and deflecting the latter as indicated by the relative, deflected and non-deflected, positions Fig. 6a. The deflection of the needles must be so timed as to occur just after the body and plating yarns are within the needle hooks but before the needles have descended to their full depths as is well understood in the art.

The sinkers which travel in their customary knitting path or raceway 33 are retracted by the cam 44 and again advanced by the cam 45 to knock over the old stitches as is usual in knitting machines of the type herein disclosed.

After the selected jacks have been engaged by the cam 43 to deflect their needles, the jacks are retracted as their butts are engaged by the cam incline 46. Thereafter the cam 47 further retracts the jacks by engaging their butts 37, the butts then joining the non-deflected jack butts at this point in the cycle of operations. Thereafter all of the jack butts traverse the raceway 36 until again divided by the selector 16 and cam 42 for the next following course of knitting.

Referring specifically to Figs. 7, 7a, 8, 9, 9a, 10 and 11, wherein a second modified form of the invention is disclosed reverse plating is the result of needle deflection and in the said figures 48 represents the sinker cap and 49 the sinker head which is adapted to turn with the needle cylinder shown at 50. A stitch ring 51 mounted fixedly upon the upper portion of the needle cylinder serves to guide sinkers as is usual in Banner and other machines and also acts as a guide for jacks about to be described.

In this form of the invention the jacks 52 are mounted to slide radially of cylinder 50 in slots cut in the sinker head defined by walls 53 (see Fig. 8), and the sinkers (not shown) are also guided in the said slots and seat upon the jacks 52. Said jacks 52 are provided with butts 54 to be engaged by a cam as will be described, each jack also having selector butts 55, twelve in this instance, although each jack may have any desired number of selector butts. Adjacent the forward or inner portion each jack has a lateral lug 56 adapted to engage and deflect a needle and effect reverse plating as disclosed in Figs. 4, 5, 6, and 6a, and a second lug or butt 56' acting as a stop to limit outward movements of the jack by engaging a shoulder 49' on the sinker head.

The dividing cam 42 of Figs. 4, 5, and 6 is not used and the jacks while they pursue different paths are selected in a manner quite different from that disclosed in Figs. 4, 5, and 6. The specific means for selecting the jacks consists of a series of superposed selector plungers 57, twelve in this instance, one in position to engage the uppermost butt 55 of each jack, a second in position to engage the second butt, a third in position to engage a third butt, etc. If all of the butts 55 are on all of the jacks reverse plating will occur at every wale and in every course but by breaking off or removing certain of the butts as shown by the jack at the left of Fig. 8, and selectively controlling movements of the plungers 57 to and from the butts, desired reverse plating selections may be obtained. The plungers 57 are selectively moved forward a sufficient distance to select the jacks by any suitable means not a part of the present invention. The jacks 52 move with relation to the sinker cap 48 in the direction of the arrow Fig. 7 and when they reach a point opposite the plungers 57 certain ones of the latter are moved forward a short distance and during such movement engage certain ones of the jacks having butts 55 at the levels of the selected plungers, that is, if a given jack has a butt 55 at the level of a plunger selected and moved forward by other means (not shown), the said jack will be moved forward a short distance and when so moved will ride along the horizontal surface 58 of the sinker head. Thereafter upon continued rotation of the jacks in the direction of the arrow, Fig. 7, the selected and non-selected jacks arrive at an incline 59 formed by cutting away the sinker head. At this point in the cycle a cam 60, which is part of the cam plate 61, engages upper nibs or butts 54 of the non-selected jacks depressing the jacks and causing the lower extremities thereof to ride down the incline 59 and along an idle path 62. The nibs 54 of the other or selected jacks are engaged by a forwardly facing cam or edge 63 also part of plate 61 and are moved forward a slight distance and miss the depressing cam 60. The non-selected jacks, depressed by cam 60, move along with points 64 thereof on a level or substantially so with the lower edge of a cam or incline 65 the latter forming part of the sinker head. On the other hand the selected jacks, moved forward a short distance by the cam 63

as before stated, remain at their upper level with their lower points 64 positioned as shown in Fig. 8, although they may drop slightly due to their own weight to such a position that their points 64 are substantially midway of the incline 65. The nibs 54 of the non-selected jacks continue to move along at a lower level than do the nibs 54 of the selected jacks, the former passing beneath the cam plates 61 and 66 as shown in Fig. 9, while the nibs 54 of the selected jacks are cammed forward slightly by the incline 63 and then further advanced by the cam 67 carried by and part of the cam plate 66. The movements imparted to the jacks by cam 67 cause their nibs or lateral projections 56 to engage and deflect companion needles 68 rearwardly or toward the axis of the needle circle as indicated in Fig. 9 and as more clearly shown in Fig. 6a, with the result that the body and plating yarns are turned over at the wales of the deflected needles as before described with respect to the modification shown in Figs. 4, 5, 6, and 6a.

The cam plate 66 is cut away at 69 to make room for the plungers 57, the bevel shown serving to depress such jacks as may have broken butts or nibs 54 and 56'.

After the needles have been deflected to reverse plate their jacks are retracted to join the non-selected group of jacks. As before stated the nibs 54 of the selected jacks pass beneath the cam plates 61 and 66 when in the retracted position 62 shown in Fig. 9. As they leave the cam plate 66 the cam or incline 70, Figs. 7 and 7a, engages the lower edges of the non-selected jacks and raises them until they rest upon the surface 58 of the sinker head. The beveling of the cam plate 66 at 71, Fig. 9a, while it serves no useful purpose during circular knitting, depresses or sinks all of the jacks by engaging their nibs 54 during the heel and toe knitting. The previously selected jacks are retracted after passing the knitting point by a cam 72 engaging the nibs 54, Fig. 9, and retracting the jacks until they join the non-selected jacks raised by cam 70. The nibs 54 of all of the jacks are then moved forward by cam 73 which is carried by cam plate 74. The camming forward of the jacks by the cam 73 prevents the jacks from coming into contact with a shoulder 75 on the outer wall 76 of the jack raceway 77. In the event that a jack nib 54 is broken off the rear edge of the jack, formed by the breakable butts 55, is engaged and moved forward by a supplemental cam 78, Fig. 7, which cam does not extend to the full height of the raceway wall 76. After passing the cam 73 the jacks travel around in the raceway 77 until they reach a cam 79 carried by a cam plate 80 and identical in construction with the cam 73. The cam 79 performs no useful function during circular knitting but during heel and toe work functions in the same manner as does the cam 73 but during the reverse strokes of the needle cylinder. The nibs 54 of the jacks which move past the cam 79 are then retracted slightly by and cam 81 and thereafter pass under the cam plate 61 to be again selected by the plungers 57 for the next following course of knitting.

The sinkers 82, as disclosed in Figs. 7, 7a, 8, 9, 9a, 10 and 11 do not assist in the reverse plating but merely perform the usual knitting functions and are provided with the usual butts 83 which traverse a raceway 84 in the direction of the arrow, Fig. 9, during circular knitting. The sinker raceway 84 is provided, adjacent the knitting point, with the regular sinker cams 85, 86, and 87. The cams 86 and 87 have thereon the usual stitch knockover points 86' and 87' respectively which latter are operative during the reverse strokes of heel and toe knitting only. Each cam 86 and 87 is reduced at 88 which reduced ends overlap reduced ends 89 of a rib or flange 90 which constitutes the outer wall of the raceway 84 for the sinker butts 83. A plate 91 carried by the top cap plate 92 of the sinker cap 48 has integrally or otherwise connected thereto rib 90 and the sinker advancing cams 86 and 87. The sinker retracting cam 85 is attached to plate 93 which is a continuation of the circular plate 91 and carries in addition to the cam 85 sinker advancing cams 86 and 87. The cams 72 and 81 are each integral, respectively, with the sinker cams 86 and 87.

In Fig. 12 is disclosed a fragmentary view of a modification of the sinker cap and wherein the dividing cam 42 of Figs. 4, 5, and 6 is omitted and the outer wall 94 of the raceway is recessed as at 95, but not for the full depth of the butts 96 of the needle deflecting jacks, to permit the jacks 6 of the selector 16 to engage the needle deflecting jacks and advance them fully at the knitting point. The jacks advanced fully at the knitting point, in turn, engage the companion needle shanks and deflect the needles to reverse plate in the manner disclosed in Figs. 4, 5, 6, and 6a.

In this form of the invention selector jacks 6 fully advance the needle deflecting jacks and consequently deflect the needles, at the knitting point without resorting to a preliminary division of the jack butts 96 which travel in a raceway 97.

In Fig. 13 still another modification of the invention is disclosed. In this form a dividing cam 98 divides the jack butts 99 substantially at the knitting point and certain ones of the butts 99 of the jacks are moved forward of the point 100 of the dividing cam immediately in advance of the knitting point by selecting means such as selector 16. Immediately thereafter an incline 101 of the cam 98 engages the selected jack butts 99 and further advances the jacks which as they are moved forward, engage the needles and cause a reversal in the normal plating relation of two threads in the same manner as disclosed in Figs. 4, 5, 6, and 6a.

Although the several forms of the present invention specifically disclosed herein refer to reverse plating, the invention is not necessarily limited thereto but includes as well float thread plating, i. e., the knitting of two or more yarns throughout the greater part of the wales and courses of the fabric and wherein a plating or other yarn is not knit in by certain of the needles during certain courses but appears in the fabric as floats at the rear of the body yarn which latter in such wales and courses appears as the face yarn.

Furthermore this invention contemplates any selective control of sinkers or needles in circular or other machines, and wherein during or as a part of such selection, sinkers or needles are selectively controlled for the production of ornamental or other effects by means of jacks or other instrumentalities and wherein such jacks and/or sinkers are selected by movements imparted to them that raise or position their butts to be engaged by means such as a cam or cams whereby the latter impart to the jacks and/or sinkers their final movements at or adjacent the knitting point. The final movements of the jacks, sinkers or other instrumentalities may be defined as being right line movements and substantially at

right angles with respect to the selective movements.

When selectively controlling sinkers the latter may be selected as, for example, disclosed in Figs. 1, 2, and 3 hereof, to produce sinker drop stitch effects, or designs in pile loop fabric.

The needles may be selectively advanced to reverse plate, i. e., moved or bent as disclosed in the Lawson Patent 1,690,076, Oct. 30, 1928, and the jacks which control their lateral movements may be selected in a manner similar to that disclosed in Figs. 7–11 inclusive.

Although specific terms have been herein employed to designate the several parts of the mechanism herein disclosed, this invention is not to be limited otherwise than as dictated by the scope of the claims.

We claim:

1. In a circular knitting machine of the independent needle type, needles and sinkers mounted therein to move in cooperative knitting waves, means in cooperation therewith adapted selectively to control the sinkers so that reverse plating may occur in desired wales and desired courses, said means consisting of a member mounted to rotate in time with the needle cylinder having jacks mounted therein for independent movements, the jacks being adapted by their movements selectively to control movements of the sinkers, the said jacks having butts thereon adapted to travel in an active path where they are so controlled as to impart movements to their companion sinkers, said jack butts also being adapted to move in an inactive path which inactive path is at a lower level than the before mentioned active path.

2. A knitting machine of the independent needle type, needles and sinkers independently mounted therein, in combination with jacks independently and laterally movable bodily with respect to the needles, and adapted by such independent movements to modify the movements of the needles, means adapted to control the movements of the jacks including means to select certain of the jacks and other means adapted thereafter to actuate the selected jacks whereby the mentioned modification of certain of the needle movements is obtained.

3. An independent needle knitting machine having needles and sinkers independently mounted therein, in combination with jacks which jacks have butts thereon and are thereby adapted to be selectively controlled during the knitting of courses, in combination with means for selecting the jacks adapted, first, selectively to divide the jacks into an active set and an inactive set, said means thereafter being adapted further to actuate the active set of jacks to move them bodily at right angles with respect to the needles whereby the jacks modify the movements of the needles after at least one thread is within the needle hooks and thereby cause variations in the knitted fabric.

4. An independent needle machine of the circular type, needles and sinkers mounted for independent movements therein, jacks independently mounted, in combination with means positioned adjacent to the knitting point and adapted selectively to divide the jacks which thereafter are adapted to move in two paths, the jacks when in one path being active and when in the other being inactive, means adapted further to move the active jacks bodily at right angles to the needles to modify the needle movements after at least one thread is within the needle hooks, whereby to vary the appearance of the knitted fabric.

5. An independent circular knitting machine, needles and sinkers therein, jacks independently mounted in cooperative relationship with the needles and slidable substantially at right angles relatively thereto, butts on the jacks, means adapted to engage the mentioned butts in one position of the jacks, other butts upon the jacks, means adapted selectively to engage the second mentioned butts thereby to position the first mentioned butts at different levels so that the means first mentioned will control the movements of such selected jacks, thereby to modify the needle movements.

6. A circular knitting machine of the independent needle type, needles and sinkers mounted therein for independent, cooperative knitting movements, threads fed in plating relation to the needles and sinkers, means for modifying the relative movements of the needles and sinkers to cause one thread to be knit in as the face thread at selected wales and courses only, said means including jacks slidable transversely with respect to the needles, and devices selectively to position the jacks as desired so that the latter may travel in either an active path at one level or in an inactive path at another level, the jacks when travelling in the active path causing a variation in the normal plating relation of the threads.

7. An independent needle knitting machine, needles independently mounted therein, and members in cooperation therewith which are mounted for slidable movements transverse with respect thereto, a cam adapted to move selected ones of the said members transversely, the said members having butts, and means adapted selectively to position the butts of the said members so that certain of the said butts will be engaged by the cam and the members moved transversely of the needles, the transverse movement of the members causing the needles companion to the members to be laterally deflected.

8. In an independent needle knitting machine, knitting instrumentalities including needles and sinkers, means adapted to cooperate with certain of the said instrumentalities including jacks having butts, said jacks being bodily movable transversely of the needles, a single cam adapted to engage the butts and move selected ones of the said jacks to a cooperative relation with certain ones of the said instrumentalities, whereby the jacks when engaged by the said single cam communicate, to the said certain ones of the said instrumentalities, movements differentiated with respect to the usual stitch forming and knocking over movements thereof, means for selecting desired ones of the said jacks by positioning them so that their butts will be at a level for engagement by the said single cam and at a level other than the level of the other butts.

9. In an independent needle knitting machine having knitting instrumentalities including needles and sinkers, means adapted to cooperate with certain of the said instrumentalities and including jacks having butts, a single cam adapted to engage the butts and move selected ones of the said jacks to a cooperative relation with certain ones of the said instrumentalities whereby the jacks when engaged by the said single cam communicate to the said certain ones of the said instrumentalities movements differentiated with respect to the usual stitch forming or knocking-over movements thereof, and means for selecting desired ones of

the said jacks by causing them to be selectively elevated lengthwise of the needles so that the butts of said jacks will be positioned for engagement by the said single cam.

10. An independent needle knitting machine having needles and sinkers independently mounted therein, in combination with jacks which jacks have butts thereon and are thereby adapted to be selectively controlled during the knitting of courses, in combination with means for selecting the jacks adapted, first selectively to divide the jacks into an active set and an inactive set, said means thereafter being adapted further to actuate the active set of jacks at right angles with respect to the needles and by right line movement of the jacks substantially at right angles to the first selective movement thereof, whereby the jacks modify the movements of the needles after at least one thread is within the needle hooks and thereby cause variations in the knitted fabric.

11. In a knitting machine, means for feeding threads to the needles, needles and sinkers and other knitting instrumentalities, said other instrumentalities having butts and being movable in the direction of the needles, the butts of said other instrumentalities adapted to be positioned at either of two levels lengthwise of the needles, means for selectively acting upon the said instrumentalities to position some of the said butts at one level, and other means to act upon the said butts at that level to impart movements to them in the direction of the needles to cause the threads to be acted upon in such a manner as to affect the character of the knitting.

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