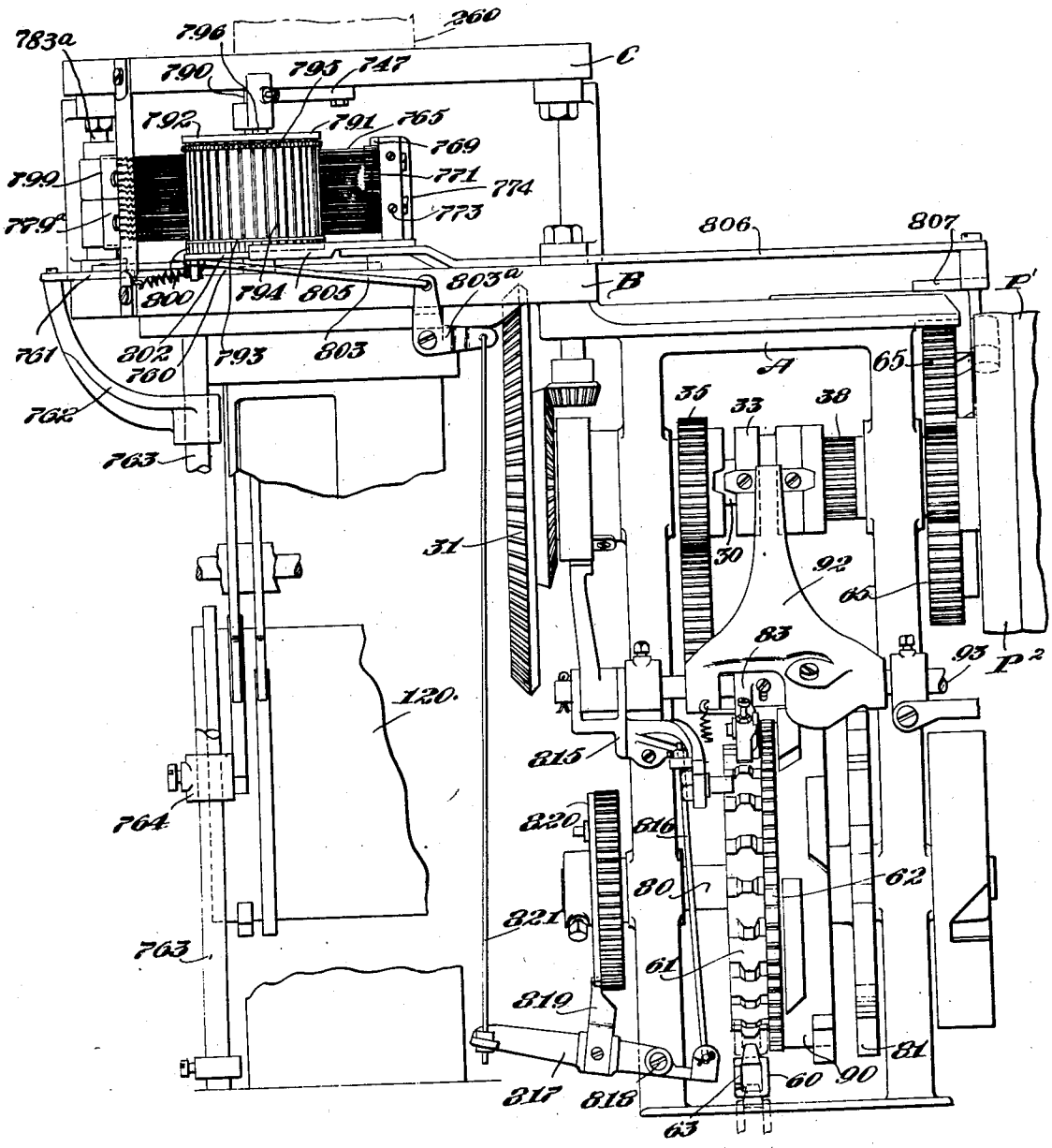
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PATTERN MECHANISM FOR KNITTING MACHINES

Filed May 2, 1929 5 Sheets-Sheet 1

Fig. 1



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PATTERN MECHANISM FOR KNITTING MACHINES

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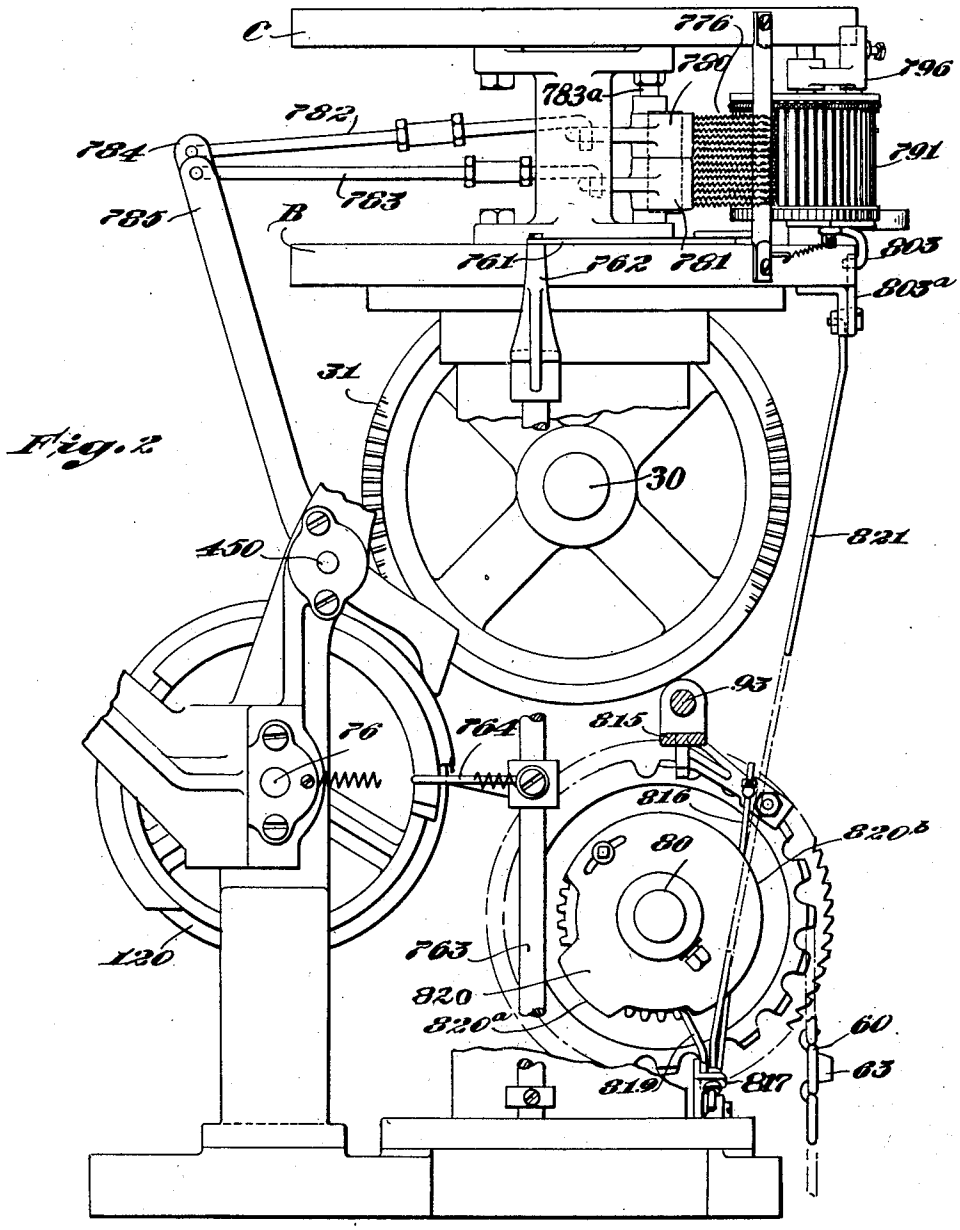


Fig. 2.

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PATTERN MECHANISM FOR KNITTING MACHINES

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Fig. 3

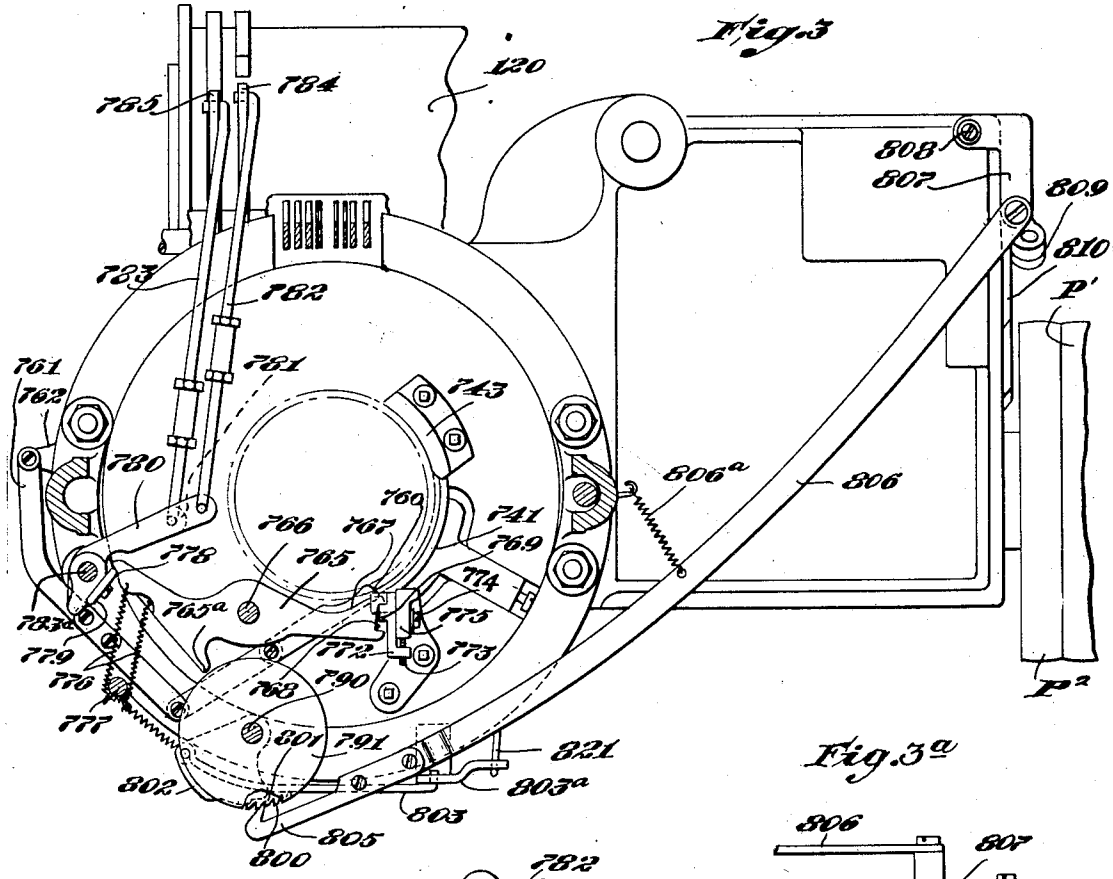


Fig. 3a

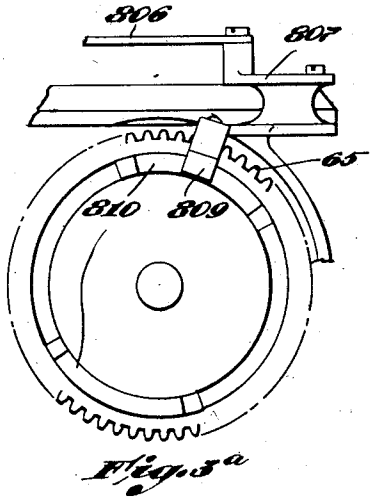
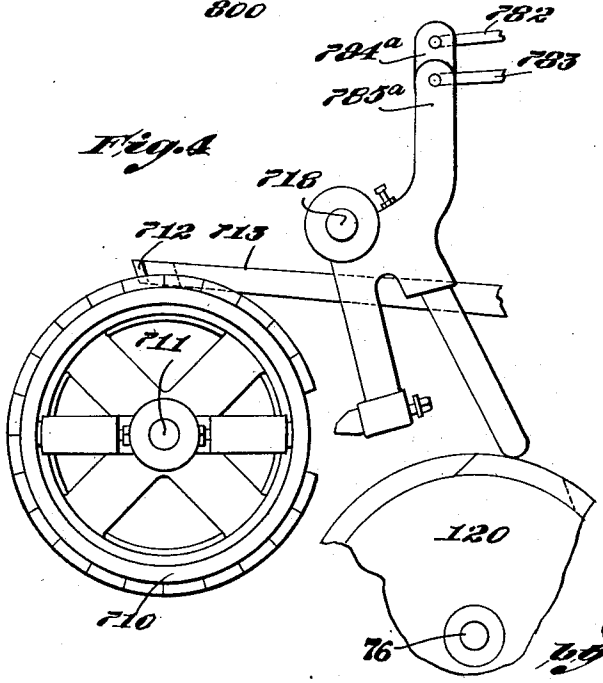


Fig. 3a

Fig. 4



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PATTERN MECHANISM FOR KNITTING MACHINES

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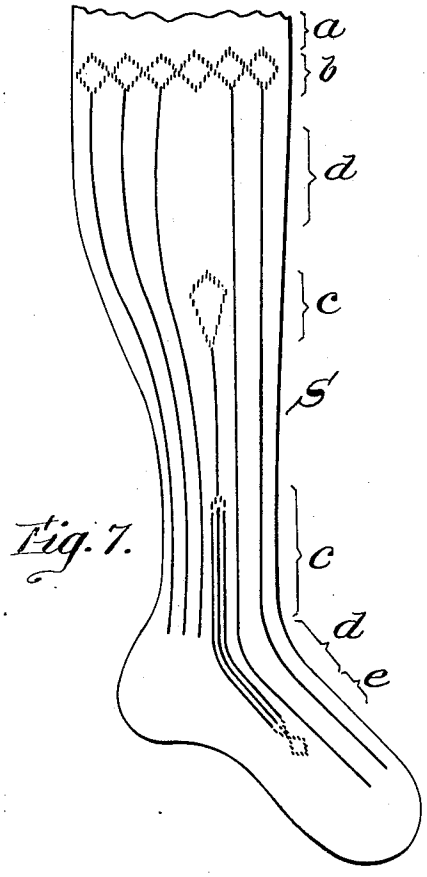


Fig. 7.

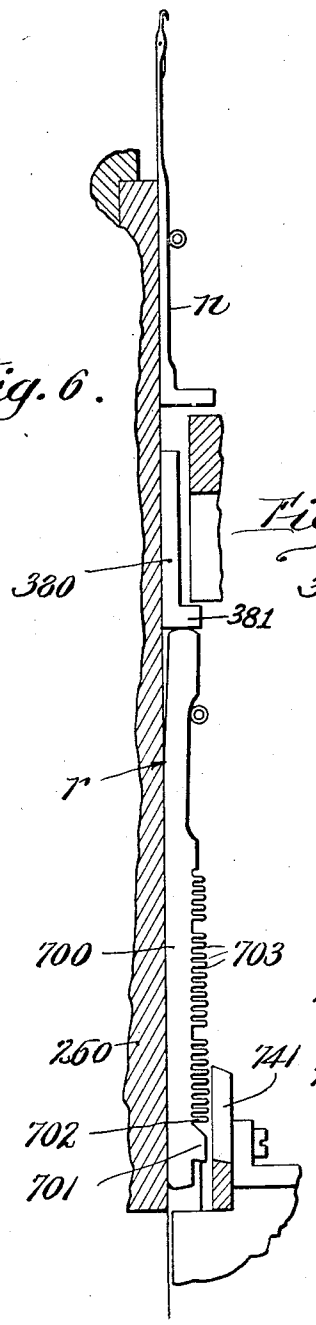


Fig. 6.

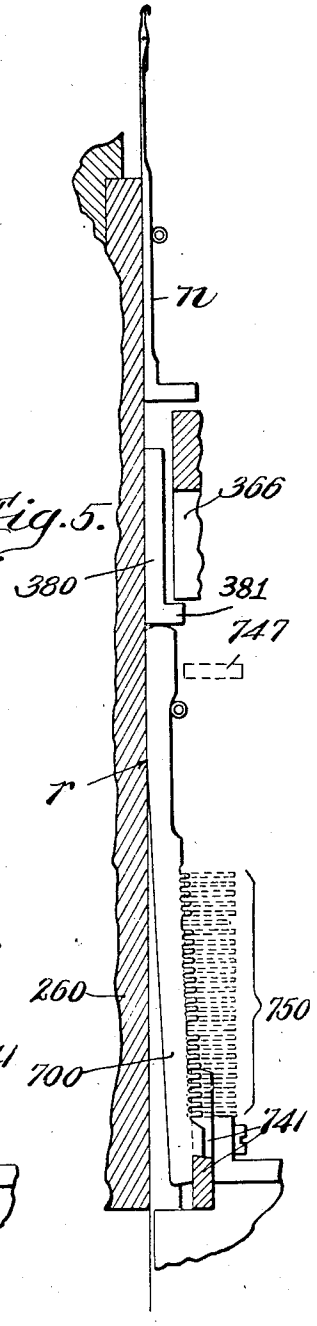


Fig. 5.

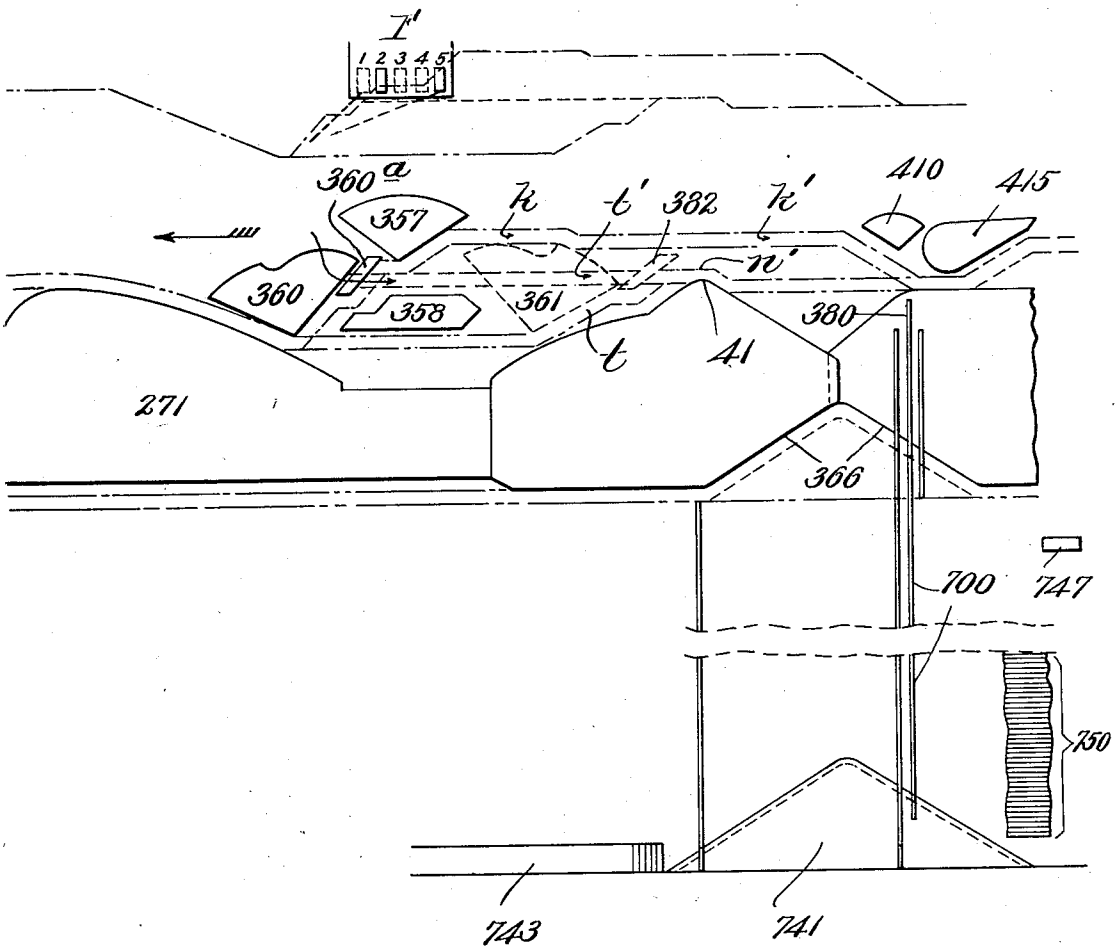
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PATTERN MECHANISM FOR KNITTING MACHINES

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Fig. 8.



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Patented Aug. 14, 1934 1,969,853

UNITED STATES PATENT OFFICE

1,969,853

PATTERN MECHANISM FOR KNITTING MACHINES

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Application May 2, 1929, Serial No. 359,962

16 Claims. (Cl. 66—50)

This invention relates to pattern mechanism for knitting machines. The invention is especially advantageous for use in any kind of knitting machine in which it is desirable, without interfering with the operation of the machine to make stockings or other knit articles or fabrics, to provide for making an extensive or a repeated pattern (or a considerable extent of unrepeated pattern), and desirable also to provide for making a different pattern or a different element of pattern at places in the knit product.

A machine according to this invention can automatically make stockings, socks or half-hose, or sleeve tubes and body tubes for knit garments; gloves and other articles, for example, variably ornamented with extended or repeated patterns having internal or incidental different elements of pattern, or different borders.

A principal object of this invention is accordingly to provide for selecting and actuating knitting instruments, individually or by groups, to form pattern variations in the fabric made by them; to repeat an operation of, or extend, vary and change the order of operation of instrument selecting devices to make a pattern in a predetermined cycle as many times (to cover relatively as large an extent of fabric) as desired; and also to provide for operating the same instrument-selecting devices specially and serially at predetermined times, so often as desired, according to another predetermined pattern. Another object of the invention is to provide for doing these things without increasing the number, or complicating the nature, of the instruments required for the production of simple patterns, without making it more difficult than customary to set up and prepare for operation, or to use for patterned knitting, the said instruments.

For these purposes a knitting machine having the capacity to knit a different kind of fabric according to the selective presentation to the needle-actuating means of individual needles at each course according to this invention may include, in combination with usual needle-actuating devices for knitting and yarn feeding devices for normally making plain or ordinary fabric with suitable yarn changes, automatically actuated mutable devices for selecting needles to be presented severally according to two or more different patterns; and also include devices for causing the operative effect of the selecting devices to be shifted or changed to respond to one or to another of said patterns; and devices to provide for continuance of operation or cessation of operation according to any part of any of said patterns, during a predetermined following duration of knitting or extent of fabric produced.

The invention will be described in connection with a preferred instance of practice as embodied in a knitting machine on which it is desired to produce pattern effects in the fabric by a pattern control of the operation of individual needles to make at times a normal and at times a different kind of stitch; for examples, a stitch behind which a yarn or yarns concerned in the knitting or normal stitches of the same course is floated; or in which stitches are tucked or missed; or in which there is a relation of float stitches or tuck stitches to yarns of a different color or kind fed to or changed in relation to the operation of the patterning needles. One machine of a kind to which this invention may desirably be applied and in connection with which it will be described is any machine of the well known Scott & Williams type, for example as built under the United States patents to Robert W. Scott No. 1,148,055, July 27, 1915; No. 1,282,958 dated October 29, 1918; No. 1,256,062 dated February 12, 1918; and No. 1,237,256 dated August 14, 1917, and under the United States patent to I. W. Grothey No. 1,678,385 dated July 24, 1928. Such a machine already provides according to said Grothey patent, for the selection of individual needles normally to take and knit with, or occasionally to miss or to float (or tuck with) yarns fed to them at their stitch-making point, according to the movements of selector jacks in the needle grooves adapted to be rocked in their grooves, and having differently positioned butts, as a consequence of the position of movable reader cams, which cams cause the jacks to miss or be worked by an advancing cam, and in turn move their needles to normal or special positions in the machine at each course. The machine may comprise for the present additional purposes in accordance with the present invention, a plurality of needle selector patterns (which may be made up by mutable pattern indications on a movable pattern surface or drum), and also may comprise the provision of individual and independent indication-transmitting or "reader" devices adapted to cause, at different positions of the pattern surface or drum, the selection by each of them of a different jack or series of jacks (and therefore needle or series of needles) to take a fully operative or a differently operative or inopera-

tive path, in respect to one at least of yarns fed for knitting, the knitting cams and other devices, so as to float or to tuck, or not to float or to tuck at any needle in one or more courses. The embodiment of the invention to be described also comprises means for preventing any effect on the jacks and needles of the pattern transmission or reader devices corresponding to one or more of different patterns set on the pattern surface, and means for independently preventing the effect of the remaining reader devices, together with means for predetermining by a primary, or main or other pattern surface of the machine, severally or conjunctively, when any series, and which series of, the reader devices shall be operative, when they are not all inoperative or all operative.

The machine will now be described with the aid of the accompanying drawings showing certain preferred forms of the device only, in which

Fig. 1 is a front elevation showing devices according to the invention as applied to one of the Scott & Williams machines adapted to make stockings with float stitch patterns;

Fig. 2 is a left side elevation of the machine according to Fig. 1;

Fig. 3 is a plan of devices shown in Figs. 1 and 2 on a plane above the lower bed-plate;

Fig. 3ª is a detail right side elevation;

Fig. 4 is a left side elevation corresponding to Fig. 2 showing operating connections to an auxiliary pattern surface also capable of determining yarn changes for striping;

Figs. 5 and 6 are diagrammatic vertical sections on radial planes of the needle carrier respectively showing needles, needle jacks and selector jacks typical of positions for determining a float stitch and a plated body-fabric stitch at the respective needles;

Fig. 7 is a diagram side elevation of a typical product; and

Fig. 8 is an internal development of one species of cam devices for operating the needles, needle jacks and selector jacks.

Referring now to Figs. 1, 2, 3, 3ª and 5, the machine may be a circular machine and comprise in the preferred form devices for all of the usual stocking knitting functions; for example, for making in separate succession stockings having an integral inturned welt or hem, or an integral ribbed top; the product may have any of the usual features of knit stockings including a leg fashioned by variation of stitch length, having usual areas of reinforced or spliced fabric, and having reciprocally knit narrowed and widened heels and toes of any desired particular construction. In general the machine comprises a frame A, Figs. 1 and 2, housing driving and motion changing devices, primary and main pattern devices, which frame may support an overhanging bed plate B having a horizontal needle carrier driver bevel gear, not shown, bearing therein and providing a splined sleeve mounting for the needle carrier. Bed plate B provides a mounting for selector device operating means, and may in turn support an annular bed plate C carrying the usual needle-controlling cams, cam-ring, picker mechanism, web-holder mechanism, latch guard ring, instrument dial, if any, and yarn-feeding devices, not shown, appurtenant to the particular kind of hosiery or other machine to which this invention may be applied.

The grooved needle carrier 260, Figs. 1, 2, 3, 5 and 6, is a longer cylinder than usual for circular knitting machine needle carriers, providing in each of its tricks or grooves for the usual needles *n*, which may be any kind of needles, shown as latch needles having their hooks forward of the rear line of their shanks; for needle jacks 380 having operating butts 381; and for selector or pattern jacks 700, which may be jacks having a rocking point at *r* on their backs and operating butts 701, of the kind described and claimed in said Grothey patent presently more particularly described. The selector jacks 700 are in the lower part of the carrier 260 exposed between the bed plates B and C, and these jacks are thus desirably positioned to be operated upon by instruments mounted on or in the space between said bed plates. The usual instruments for hosiery machine needle control carried by the annular bed plate C may operate in their old relation, except as herein mentioned. The needles and web-holders work in the upper part of the carrier cylinder 260. The machine may have, as usual, supported above the bed plate C the usual latch ring structure, the usual instrument dial and its supporting and driving devices; the usual yarn feed fingers for the yarns supported, guided, tensioned, etc., in the usual overhead bracket and devices mounted on a standard carried by the frame. As customary, the activities of the machine are in the first instance controlled by a primary pattern surface made as a mutable link chain 60 on a sprocket 61 integral with or attached to a ratchet 62 loose on main pattern shaft 80, moved forward by a pawl, not shown, one tooth at each several, for example four, revolutions of the main shaft 30 carrying the driving bevel gear 31 for the needle cylinder. Shaft 80 carries a drum 90 for shifting a yoke 92 on slide rod 93 and clutch element 33 to connect shaft 32 to either the reciprocally driven pinion 35 or the rotary pinion 38, which latter may be driven by a tubular axle from pulley P' through a plate gear 65, Figs. 1 and 3ª, or indirectly at an increased speed by gearing to a pulley P², all as usual. Motions of shaft 80 and drum 120, geared to it, are a consequence of the coaction of a reciprocating pawl with a rack wheel, not shown as determined by a racking pawl controller 83 on slide rod 93 which is in turn positioned by lugs on the right hand side of links of the chain 60. The chain 60 is for the present purposes provided with a series of lugs 63 on its mutable links corresponding to places in the length of the fabric at which the pattern devices are to be stopped when a repeat of the pattern is finished.

Cams mounted directly on and rotating with the main pattern surface represented by the shaft 80 and its adjuncts, such as various kinds of cams mounted on the drum 120 for motion in unison with the shaft 80, are relied upon for the control of the devices at the knitting head or above the bed plate C for the usual activities of the machine in knitting a stocking. Shaft 80 and the drum 120 turn through one whole revolution in the production of each article, but machines of the kind referred to are often so made as to provide for occasional or special motions of the yarn fingers for making stripes and other colored patterns by auxiliary pattern surfaces; as shown in Fig. 4, for example, there may be mounted parallel to the axis 76 for the drum 120 and shaft 80 at the back of the machine an auxiliary pattern drum 710 on a shaft 711, integral with or attached to a ratchet at the end

of the drum 710, and adapted to be racked by a pawl tooth 712 on a pawl 713, and conveniently reciprocated. The pawl 713 may run in contact with any form of controller causing the pawl 713 to be disengaged from its ratchet after having turned the drum 710 a predetermined distance. A period of such motions of drum 710 may, as usual, be determined by connection from chain 60, drum 120, or any other pattern surface of the machine to pawl controller for pawl 713, all as well known.

This machine is particularly well adapted to knit structural patterns comprising distributed stitches containing floats of one at least of two yarns caused to pass to the back of the fabric, comprising at this stitch a normal or a tucked loop of the other yarn or other yarns; or patterns containing wales or series of missed stitches; or patterns having normal areas of plated fabric ornamented by patterns of stitches of the concealed yarn of the plating couple, made as the result of floating the plating yarn behind a stitch of the body or normally-concealed yarn.

All of the desirable conditions for patterning the fabric may be satisfied by providing for a pattern controlled separation of a selected needle from its normal path, for the purpose of missing operative contact with a yarn not to be taken by it at the next passage by a stitch cam; or for taking a new yarn without having cleared its previous loop; or for passing in front of one yarn of a plating couple of which this needle takes and knits the other yarn. By appropriate provision of cam paths, any of these operations may follow as a consequence of providing for lifting all of the needles *n*, except pattern-selected needles, at any point ahead of the stitch-cam and yarn feed.

For example, referring now to Fig. 8, usual stitch cams 360 and 361 with top center cam 357 and, if desired, a bottom center cam 358, may be provided for rotary and reciprocatory knitting, as usual in conjunction with riser cams on cam ring 271 lifting the butts in needles *n* at 41 to the tuck point, at which previous loops are not cleared. A switch cam 415 and guard cam 410 may serve the usual stocking-knitting purposes. A dividing cam 382 may upon occasion be moved into contact with butts of needles *n* to switch them below the leading stitch cam 361 and center cam 358, in path *t*, whereupon the needles pass yarns fed from any of the fingers 1, 2, 3, 4, 5 of the series F of yarn feed guides without contact with the new yarn until after knitting at the apex of cam 360. Cam 361 and cam 382 may be severally removed radially out of contact with the butts of needles *n*. In that case, needles passing at 41 retain their level at tuck position in path *t'* until they contact with either the face of stitch cam 360 or a supplemental cam 360^a which may be inserted to depress the needles at an earlier time in respect to a main or body yarn fed by fingers 1 or 2 to needles taking a normal path at *k* or *k'*. When needles travel in path *t'* they do not operatively take a plating yarn fed at a considerable lead, as from finger 5, but are fed with the main yarn from fingers 1 or 2 by the motion of their neighboring needles at cams 360^a or 360. Needles in poth *k*, *k'* take both yarns in plating relation. Stitches made at needles in path *t'* show an internal float of yarn from fingers 4 or 5 behind a face loop of body yarn from fingers 1 or 2; if these needles have had their latches cleared this face loop is an ordinary loop; if they are cleared at intervals of several courses, it is a tuck loop; if latches have been cleared and the cams adjusted to cause the needles to take path *t*, these needles drop their stitches. The machines improved may provide a movable clearing cam, not shown, operating ahead of switch cam 415, and when this is in use needles taking the path *t'* show the color of yarn from fingers 1 or 2, whereas the needles taking path *k'*, *k* show loops regularly plated on their faces with yarn from fingers 4 or 5; needles in path *t* either retain previous loops or cast off, depending on whether they have been cleared.

The needles are distributed in the several paths by the operation of the needle jacks 380 at cam surfaces 366 as controlled by the selector jacks 700. As shown in Figs. 1, 3, 6 and 8, a cam 741 on bed B, which may be beveled to engage undercuts on the butts 701, raises or advances the jacks 700 which reach it in the position of Fig. 5, and these jacks 700 lift the jacks 380 and needles along the leading slope 366 to path *k'*. If cam 361 is operative, there is no pattern knit, since all the needles reach path *k* before the knitting point. Before the jacks 700 reach the cam 741, their lower ends are rocked outwardly by a cam arm 747, and they are thereafter acted upon selectively to return some of them out of reach of cam 741 by reader cam levers 765 having cam ends effective ahead of the position of cam 741. Elsewhere than opposite cams 741, 747 and 750, the jacks 700 may be held in the position of Fig. 5 by a cam ended ring 743.

Referring now to Figs. 1, 2, 3 and 6, the selector jacks 700 are provided with a series, of which there may be twenty-five or more, of spaced butts 702, 703 extending from above the operating butt 701 to a point below the rocking point *r*. The operation of the following slope 366 on the butts of jacks 380 levels the selector jacks 700 at a point ahead of the cam 741, and the butts 702, 703 are removed where desired on the jacks of each needle so as to provide any desirable series at any of, for example, twenty-five different levels of butts, or butt spaces having no butt, for a first selection of needles not to be advanced to path *k'*. Obviously a reader cam at 750 at the selected level will cause the needle *n* corresponding to such a jack to take the path *t'* or *t*, depending on the position of cams 382 and 361. If the fifth butt from the bottom of every twentieth jack 700 is removed, a reader cam at the level of this fifth butt will cause a vertical stripe in the fabric at every twentieth needle, but this may be intermitted or stopped by moving these jacks away from cam 741 by any of their other butts.

The lowest butts 702 may be present on alternate jacks only, and may be operated upon by the cam end of a lever 760 pivoted on bed B for the purpose, in connection with dividing cam 382, Figs. 1, 2 and 4, of sending alternate needles under the stitch cams for making starting selvages, to permit ribbing, and other purposes having to do with the structure of the products familiar to users of the said Scott & Williams machines. Lever 760 may be worked by a link 761, arm 762, vertical shaft 763 and arm 764 taking against a cam surface on the end of main pattern drum 120.

Opposite the levels of the respective butts 703, a series of pattern indication transmission devices, hereinafter referred to as reader cam levers 765, are pivoted in horizontal planes on a

vertical shaft 766 extending between bed plates B and C, and provided with cam ends at 750 (Figs. 5 and 8) and recesses at 768 to straddle a vertical stop 769 milled to receive spacer inserts 771 (Fig. 1), for the reader cam levers, these parts being integral with or attached to an adjustable plate 772 having set screws at 773 and holding screws 774 in enlarged holes in a standard 775 fastened on bed plate B, to adjust stop 769 and spacer inserts 771 to guide the cam ends of levers 765 at the selector jack butt levels. Levers 765 have operating lugs 765a, and staggered holes at alternate levels for tension springs 776 connected in pairs around a vertical bar 777 having a lower end screwed on the face of bed B. Each of the levers 765 has a tail surface at 778 held by the springs 776 against one of a plurality of vertical stop plates 779, 779a adjustable each on a stop lever of a series 780, 781, shown as two, pivoted one above the other on vertical stud 783a on bed B. The plates 779, 779a are stops for severally holding out of action a series of the reader cam levers less than the whole series, and there may be as many such plates and levers 780, 781 as desired.

Levers 780, 781 may be connected to be operated by an existing pattern surface of the machine at different parts of the stocking, as by links 782, 783 respectively to vertical indicator levers 784, 785 horizontally pivoted at 450, Fig. 2, and worked by cams on the main pattern surface of drum 120, or otherwise pattern operated. For example, see Fig. 4, when the pattern drum 710 is in use for a stripe pattern by yarn changes, the indicator levers 784a or 785a on shaft 718 may be substituted to work the links 782, 783 according to indications from the auxiliary pattern on drum 710, whenever they are permitted by cams on drum 120.

The cam end of each reader cam lever 765, unless it is held by one of the stop plates 779, is forced inwardly by its individual spring 776 to rock any selector jack 700 having a butt 703 in its plane out of the way of cam 741, and so to determine a pattern stitch at the needle of that jack. Each lever may work as many jacks as there are needles in each course. Since any jack may be rocked by any of the butts 703 as well as by another, this invention provides for rocking them by orderly motions first of one series and then of another series of the reader cam levers, each series working with butts 703 at different parts of jacks 700. This in turn permits these orderly motions to be given by a pattern surface having one part to operate one series and another part to operate another series, for example the series respectively capable of being held out of operation by the plates 779, 779a, respectively of the pattern-controlled levers 780, 781. Shifting from one pattern to another is a function of levers 780, 781.

On a vertical stud 790, for example, erected on bed plate B, there may be mounted for rotation a mutable auxiliary pattern surface for working the levers 765. A preferred construction as shown comprises a radially and longitudinally slotted drum 791 having heads 792 and 793, of which the lower may have an annular undercut, to receive one beveled end of inserts 794 held in by a spring band 795, and having projecting faces with spaced lugs respectively to work against one of the lugs 765a of the levers 765. A space between lugs on one of these inserts permits a lever 765 at its level to select all jacks 700 having butts 703 at its level to make a pattern stitch on their needles. In practice, with levers 765 arranged to be worked in two series, the inserts 794 may have one pattern of any number less than twenty-five desired spaces on one end, and another pattern on the remainder of twenty-five spaces on the other end, corresponding in each case to the levers 765 controlled by the respective stops 779, 779a.

The drum 791 is intermittently advanced under pattern control by any suitable means. Integral with or attached to the drum 791 is ratchet 800, for example, having as many teeth as there are slots and inserts 794, of which one tooth is a low tooth 801. Also pivoted on the stud 790 a pawl guard 802 under ratchet 800 having concentric levels of three different radii is provided to be swung by a link 803 and a connection presently explained, to control the engagement of a hook pawl 805 on a link 806 held by spring 806a against ratchet 800. Link 806 may be worked through a sufficient stroke by a rocker 807 pivoted at 808 on frame A, and having an anti-friction roll 809 in contact with cams 810 mounted in a concentric groove in the face of plate gear 65. There may be so many cams 810 as to move the pawl 805 once in every revolution of the needle cylinder, or a lesser number. When the guard 802 is positioned with its surface of shortest radius opposite the pawl 805, the ratchet and drum 791 are continually driven. When the surface of intermediate radius is opposite the pawl, the ratchet stops when the low tooth is reached by the pawl. When the surface of greatest radius is opposite the pawl, the ratchet is held in inoperative position. A suitable brake 796 may take against the top of drum 791 and be fastened to the upper end of stud 790.

The link 803 and pawl guard 802, motions of which control actuation of the auxiliary pattern drum 791, are preferably controlled by indications severally from both the primary pattern surface (chain 60) and from the main pattern surface (an adjunct of shaft 80). A preferred form of connection provides means moving with shaft 80, which controls the general operation, to hold the auxiliary pattern safely out of possibility of action during making heels and toes and performing any other structural operation in which pattern operation of the needles is unnecessary or with which pattern operation would interfere. By controlling the intervals of operation of this auxiliary drum from the primary pattern at other times, the pattern can be varied by control from either the chain or a part on shaft 80, or both, and extended throughout every part of the article being made. Links on chain 60 having lugs 63 on their left-hand sides may work a rocker 815 straddling frame A and slide rod 93 and having a pin to receive one end of wire link 816 to one end of lever 817 pivoted on frame A at 818, and provided with a follower 819 for the periphery of a safety cam 820 on the end of shaft 80 having high parts 820a corresponding to the heel (or other special knitting operations) and an intermediate part 820b corresponding to the toe and beginning of another stocking permitting drum 791 to be rocked to a stop at low tooth 801. The other end of lever 817 is connected by wire link 821 to a bell-crank lever 803a on the front face of bed plate B, having one arm bored to receive link 803.

The operation will now be evident. Selector jacks 700 may have so many of their butts 703 at the upper end of the series on each jack as correspond to the number of reader cam levers 765 controlled by stop plate 779 left in place, or sheared off, to determine what recurrent series of the needles is to knit a pattern stitch and what series is to knit the ground at each course of so many courses as there are reader cam levers in the group controlled by stop plate 779 and its lever. The recurrence of like jacks (in the sense of having the same butt formation) determines the lateral extent (number of stitches per course) in the direction of the courses of a repeat of this pattern for any course. The recurrence of a like insert in the slots of drum 791 determines the length of a pattern repeat in the direction of the wales. An arrangement of the lower series of butts 703 and of the lower series of lugs on the inserts in drum 791 may independently cooperate with the remaining series of reader cam levers, when stop levers 780 and 781 are worked to stop one series of levers 765 from acting on the jacks 700, and release the other series. Whenever the drum 791 is stopped from being rocked one step at each course knit, or more or less frequently, the jacks 700 which have been selected at the last course knit will continue to be selected, so that longitudinal lines in the pattern knit may be formed indefinitely by moving the pawl guard 802 to the right of Fig. 1, either by a lug 63 on chain 60, or the cam 820 or by the effect of low tooth 801 of ratchet 800. The pattern effect of all of the jacks 700 may be obliterated for any number of courses by the operation of all of the stop plates 779, 779a. Presuming two different patterns on the upper and lower parts of the surface of drum 791, one of these patterns may be repeated indefinitely by continuing to turn the drum with one of the stop plates only released; and the design knit may be changed to the design of the other part of said drum by reversing the positions of said stop plates as a consequence of a main pattern indication; or all the patterns on drum 791 may operate at the same time, all of the stop plates being released.

Referring to Fig. 7, and supposing operation from top to toe, the section *a* of the stocking S shown may, for example, be of plain plated fabric knit during withholding from release of all of the levers 765 by the stop levers 780, 781. Section *b* may be knit during serial operation of drum 791 and release of the upper section of reader cam levers 765 by stop lever 780. Sections *c* and *e* may be knit as the result of freeing the lower section of levers 765 by releasing stop lever 781, and operating stop lever 780, drum 791 being operated. Longitudinal repetition of the pattern reached as at *d*, Fig. 7, at any stage may be effected by stopping drum 791 by working controller 802 by a high lug 63 to hold drum 791 at an attained position, whereupon the same jacks 700 will be selected repeatedly for course after course. Any jack 700 having all of its butts 703 will knit a longitudinal stripe throughout the fabric, except when cam 361 is in action.

Drum 791 may be moved through as many revolutions as desired for a repeat of any of the patterns represented by one part or another part of its surface according to the control of its motions from the primary pattern surface or the main surface and the control of the pattern transmission devices 765 from the main or the auxiliary pattern devices of the machine. The capacity to make particular patterns with the aid of this device is therefore practically unlimited.

I claim:

1. Pattern mechanism for knitting machines having in combination a needle carrier, needles in said carrier, yarn feeding devices and needle cams for determining a normal or a special patterning stitch on said needles according to the position of a needle in its carrier before passage by said cams, in combination with selector jacks for the needles, a cam for working each of the jacks to change the position of a needle in its carrier before passage of said needle cams; butts on the jacks at different levels adapted to be reacted upon for positioning the jacks inoperatively in respect to the jack cam; a series of pattern-indication transmitting reader cam levers adapted to contact with or not to contact with jack butts according to their position to displace jacks; an auxiliary pattern surface adapted to be moved in contact with said reader cam levers to position them; and independently movable means for stopping operation of each of a plurality of series of said reader cam levers by said auxiliary pattern surface.

2. Pattern mechanism for knitting machines having in combination a needle carrier, needles in said carrier, yarn feeding devices and needle cams for determining a normal or a special patterning stitch on said needles according to the position of a needle in its carrier before passage by said cams, in combination with selector jacks for the needles, a cam for working each of the jacks to change the position of a needle in its carrier before passage of said needle cams; butts on the jacks at different levels adapted to be reacted upon for positioning the jacks inoperatively in respect to the jack cam; a series of pattern-indication transmitting reader cam levers adapted to contact with or not to contact with jack butts according to their position to displace jacks; an auxiliary pattern surface adapted to be moved in contact with said reader cam levers to position them; independently movable means for stopping operation of each of a plurality of series of said reader cam levers by said auxiliary pattern surface, and automatic devices operating according to the progress of a fabric article being made for operating said stopping means for the reader cam levers.

3. Pattern mechanism for knitting machines having in combination a needle carrier, needles in said carrier, yarn feeding devices and needle cams for determining a normal or a special patterning stitch on said needles according to the position of a needle in its carrier before passage by said cams, in combination with selector jacks for the needles, a lifter cam for moving each jack to change the position of its needle, said jacks having each a series of butts or butt spaces severally adapted to determine at passage by a reader cam an operative or inoperative position of said jack in relation to its lifter cam; a series of levers carrying reader cams corresponding to said butts or butt spaces on the jacks; a pattern surface providing a plurality of different patterns at different parts of its width adapted to be moved in contact with and to operate said reader cam levers; stop-

ping means for causing series of said levers corresponding to said different patterns respectively to be withheld from operative contact with said pattern surface, and means for causing said stopping means to be effective in relation to said different patterns at different times.

4. In a pattern mechanism, a pattern surface and means to advance said surface in the direction of one of its dimensions, the dimension of said surface at right angles to said direction being sufficient to accommodate indications for a plurality of different patterns side by side, a series of pattern indication transmission levers extending across the pattern surface to be severally moved by indications on said surface of said patterns respectively, in combination with a series of stop devices each in one position adapted to hold out of operation by said surface during the continued orderly advance of said surface, all of said levers appurtenant to one of said patterns, and means for independently setting said stop devices in said position.

5. In a pattern mechanism, an endless pattern surface and means to advance said surface in the direction of one of its dimensions, means to cause cessation of advance after one complete circuit of said surface, the dimension of said surface at right angles to said direction being sufficient to accommodate indications for a plurality of different patterns side by side, a series of pattern indication transmission levers extending across the pattern surface to be severally moved by indications on said surface of said patterns respectively, in combination with a series of stop devices each in one position adapted to hold out of operation by said surface, during the continued orderly advance of said surface, all of said levers appurtenant to one of said patterns, means for independently setting said stop devices in said position, and means automatically controlled to change the position of said stop devices and to advance said pattern surface through another extent of motion.

6. Pattern mechanism for knitting machines having therein a primary pattern surface and means for continually advancing said surface; a main pattern surface for controlling timely structural changes to make an article product; means for intermittently operating said main pattern surface according to indications of said primary pattern surface, in combination with an auxiliary pattern mechanism comprising a pattern surface, connections for operating knitting instruments to ornament the product according to said auxiliary pattern surface; means for advancing said auxiliary pattern surface at times indicated by said primary pattern surface, and means on said main pattern surface for preventing the operation of said advancing means during the making of structural changes in the fabric knit.

7. In a knitting machine of the kind having means defining a yarn feed point, a series of knitting instrumentalities arranged to act upon yarn delivered at said feed point, a set of cams for determining whether an ordinary or a patterning stitch shall be produced by the action of said knitting instrumentalities upon the yarn delivered at said feed point according to the position attained by said instrumentalities prior to their passage by said set of cams, a series of selector jacks for said instrumentalities, and a jack cam adapted to move said instrumentalities, according to a position attained by each jack in respect to said jack cam, the combination with said jacks of jack selecting means comprising a pattern surface having thereon two or more different sets of pattern indications, a plurality of sets of transmission devices each corresponding to one of said sets of pattern indications and each adapted to transmit motion from said indications to any jack of the series, each set of transmission devices being independently operative by its corresponding set of pattern indications to produce any desired number of pattern repeats in the fabric as the corresponding knitting instrumentalities pass said set of knitting cams, and means for selectively determining the response of any of said sets of transmission devices to the corresponding set of pattern indications.

8. In a knitting machine of the kind having means for delivering yarn at a predetermined feed point, a series of needles adapted to act upon yarn delivered at said feed point, a set of knitting cams for actuating said needles to make an ordinary or a patterning stitch according to the position attained by said needles prior to their passage by said set of cams, a series of selector jacks and a jack cam adapted to move the needles according to a position attained by each jack in respect to its cam, the combination with jack selector means comprising a pattern surface having two or more complete sequences of pattern indications, each such sequence of pattern indications being independently operative to position the jacks as the corresponding needles approach said feed point for actuation by said set of knitting cams, and means for selectively determining which one of said sequences of pattern indications shall be operative during the knitting of a given portion of the fabric at said feed point.

9. In a pattern device for knitting machines, in combination a needle carrier, means for delivering yarn at a predetermined feed point, needles, a set of knitting cams for actuating the needles to knit at said feed point, and means for knitting at said cams according to indications of an automatically movable main pattern surface, a primary pattern surface continually operated and connections thereto for determining motions of said main pattern surface, displaceable jacks for the needles and a cam for causing jacks displaced to select needles to take a different path at said set of knitting cams, an auxiliary pattern surface having jack selecting indications, and transmitting connections for displacing jacks according to indications on said auxiliary pattern surface, means for moving said auxiliary pattern surface, and pattern controlled means for preventing selection of certain at least of said jacks in response to indications upon said auxiliary pattern surface while the latter continues to move.

10. In a pattern device for knitting machines, in combination a needle carrier, means for delivering yarn at a predetermined feed point, needles, a set of knitting cams for actuating the needles to knit at said feed point, and means for knitting at said cams according to the indications of an automatically movable main pattern surface, displaceable jacks for the needles and a cam for causing jacks displaced to select needles to take a different path at said knitting cams, an auxiliary pattern, transmitting connections for displacing jacks according to sets of indications disposed at different parts respectively of said auxiliary pattern, means for moving said auxiliary pattern, and means for se-

lectively preventing operation of said transmitting connections by one or another of said sets of indications while said pattern device continues to move and to actuate other of said connections in respect to another set of said indications whereby to knit fabric from yarn delivered at said feed point to form fabric having a stitch pattern according to the selected set of pattern indications.

11. In a knitting machine of the kind having means for delivering yarn at a predetermined feed point, a series of needles adapted to act upon yarn at said feed point, a set of knitting cams for actuating said needles to make an ordinary or a patterning stitch according to the position attained by said needles prior to their passage by said set of cams, the combination with selector jacks for the needles having like series of butts or butt spaces, means for leveling said jacks, reader cam levers at the respective levels of said butts or butt spaces, springs acting upon said reader cam levers, thereby normally tending to move jacks having butts at their respective levels into inoperative position, but adapted to be independently positioned to permit jacks to move to operative position, pattern means normally operative to work said reader cam levers, a plurality of withholding members each engageable with a predetermined group of such levers, and pattern controlled means operative to position said withholding members independently one of another, whereby selectively temporarily to render inoperative one or another group of said levers.

12. In a knitting machine of the kind having means for delivering yarn at a predetermined feed point, a series of needles adapted to act upon yarn delivered at said feed point, a set of knitting cams for actuating said needles to make an ordinary or a patterning stitch according to the position attained by said needles prior to their passage by said set of cams, the combination with selector jacks for the needles, means for rocking the lower ends of said selector jacks outwardly, needle jacks interposed between each needle and a selector jack, an advancing cam for normally positioned selector jacks, a needle jack cam adapted to level the selector jacks, presser devices resiliently actuated for moving individual jacks inwardly to inoperative position, and pattern controlled means for making any selected presser device inoperative.

13. A circular knitting machine comprising usual knitting instrumentalities including needles, a set of knitting cams and means for feeding yarn to be knit by the needles in passing said cams, and pattern means for determining the type of stitch formed by individual needles from said yarn at said knitting cams, said patterning means comprising a single pattern surface having thereon a plurality of sets of indications each set constituting a full pattern repeat, and means for selectively determining the effective operation on the needles, prior to their passage by said set of stitch cams, of any of said sets of indications.

14. A circular knitting machine comprising usual knitting instrumentalities including needles, a set of knitting cams and means for feeding yarn to be knit by the needles in passing said cams, and pattern means for determining the type of stitch formed by individual needles at said needle cams, said pattern means comprising an endless pattern surface having thereon a plurality of sets of pattern indications each set being adapted to produce a full pattern repeat during one cycle of movement of the pattern surface, and means for selectively determining the set which is from time to time to be effective to control the character of the stitches formed from the yarn delivered to the needles by said feeding means.

15. A circular knitting machine comprising usual knitting instrumentalities including needles, a set of knitting cams, means for feeding yarn to be knit by the needles in passing said cams, and pattern means for determining the type of stitch formed by individual needles at said knitting cams, said pattern means comprising an endless pattern surface provided with pattern indications, means for advancing said surface cycle after cycle, and pattern controlled means operative to determine the effective action of selected sets of pattern indications on the needles whereby to determine the character of stitch formed from the yarn delivered to the needles by said feeding means.

16. A circular knitting machine comprising usual knitting instrumentalities including needles, a set of knitting cams, means for feeding yarn to be knit by the needles in passing said cams, and pattern means for determining the type of stitch formed by individual needles at said knitting cams, said pattern means comprising an endless pattern surface provided with pattern indications capable of forming an uninterrupted succession of pattern repeats each corresponding to one complete cycle of movement of the pattern surface, and means operative during the movement of such surface selectively to determine such indications as shall be effective to control the stitch formation at said set of knitting cams from yarn delivered to the needles by said feeding means.

ALBERT E. PAGE.