

Feb. 28, 1939.

H. E. HOUSEMAN ET AL
KNITTING MACHINE AND PROCESS

2,148,985

Original Filed Jan. 19, 1933 5 Sheets-Sheet 1

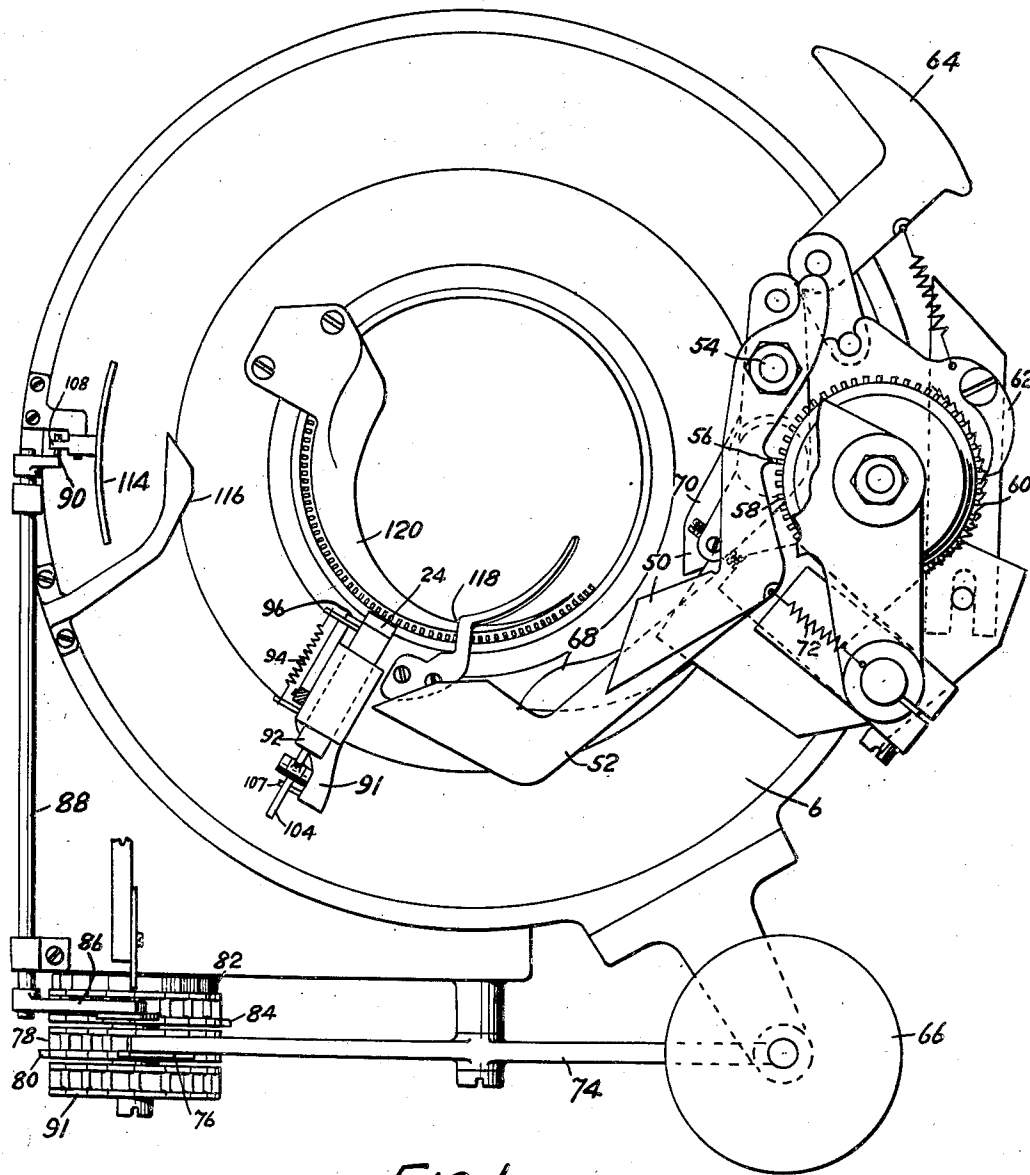


FIG. 1.

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Original Filed Jan. 19, 1933 5 Sheets-Sheet 2

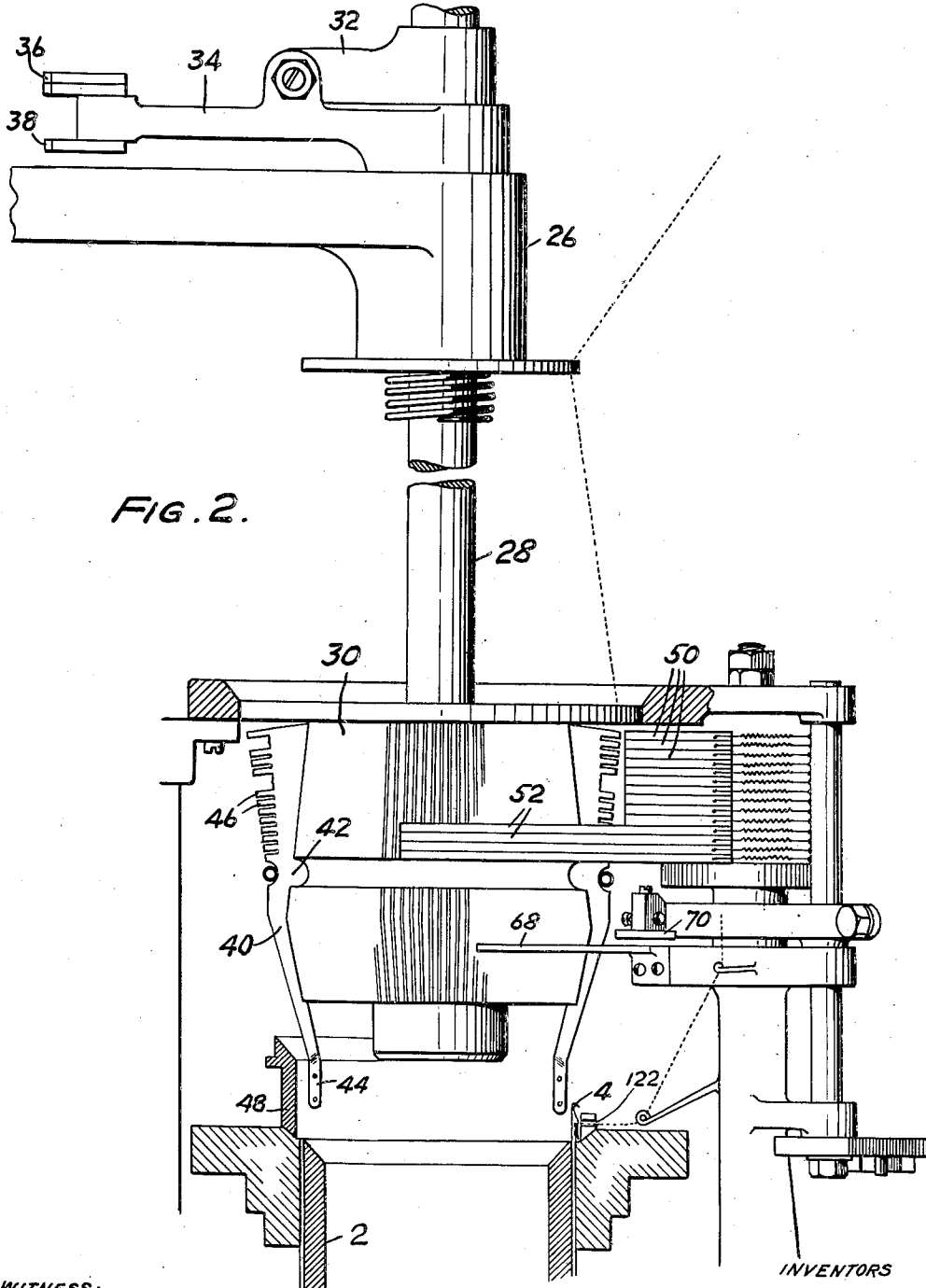


FIG. 2.

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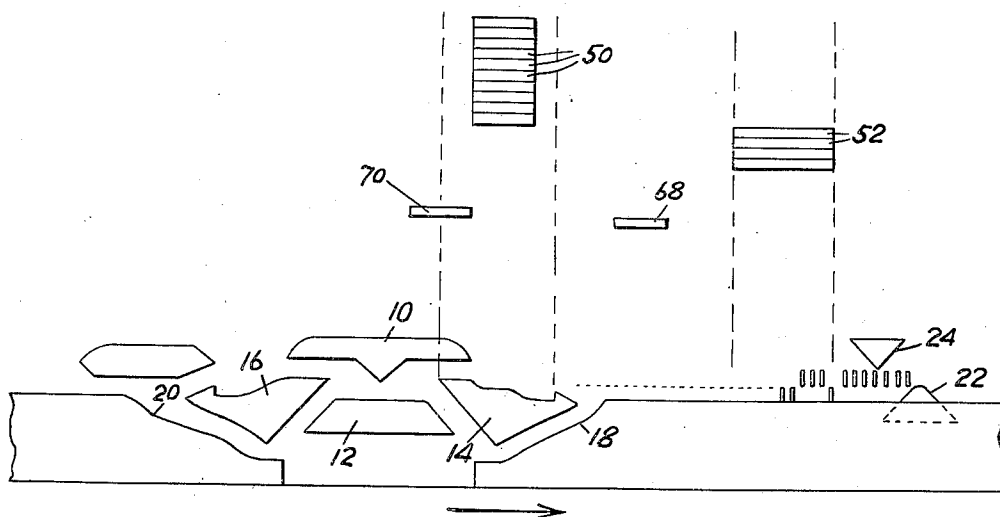


FIG. 4.

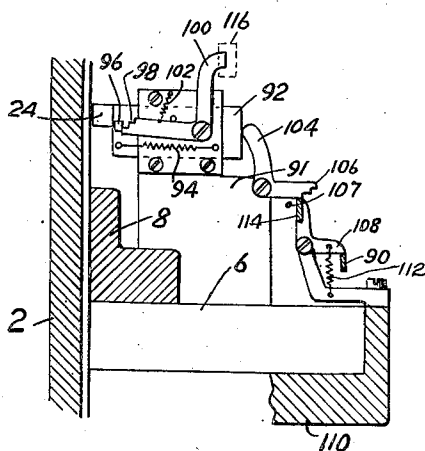


FIG. 3.

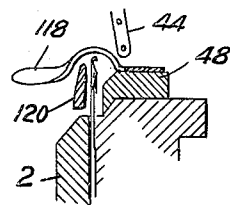


FIG. 5.



FIG. 6.

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KNITTING MACHINE AND PROCESS

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5 Sheets-Sheet 4

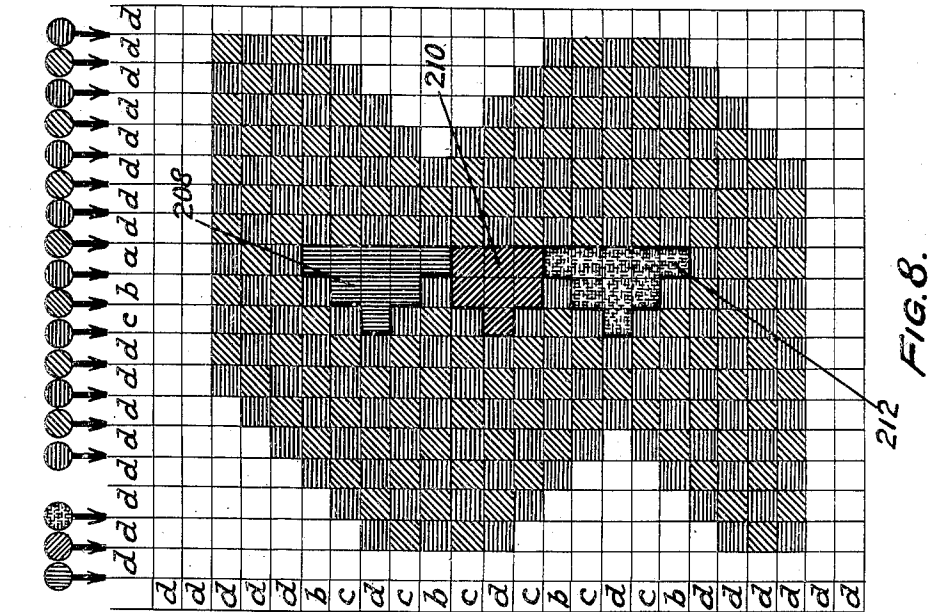


FIG. 8.

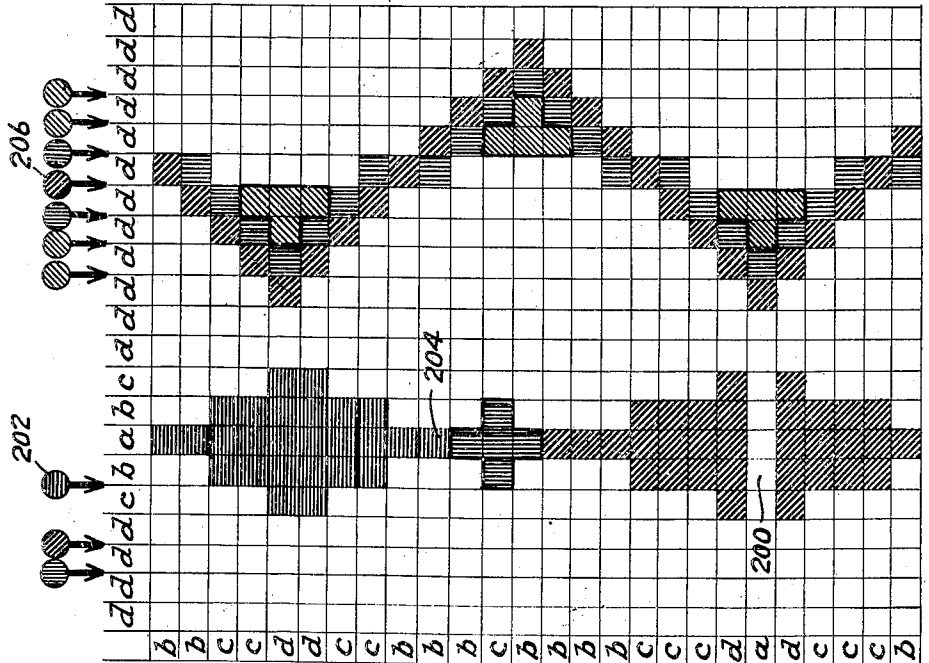


FIG. 7.

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5 Sheets-Sheet 5

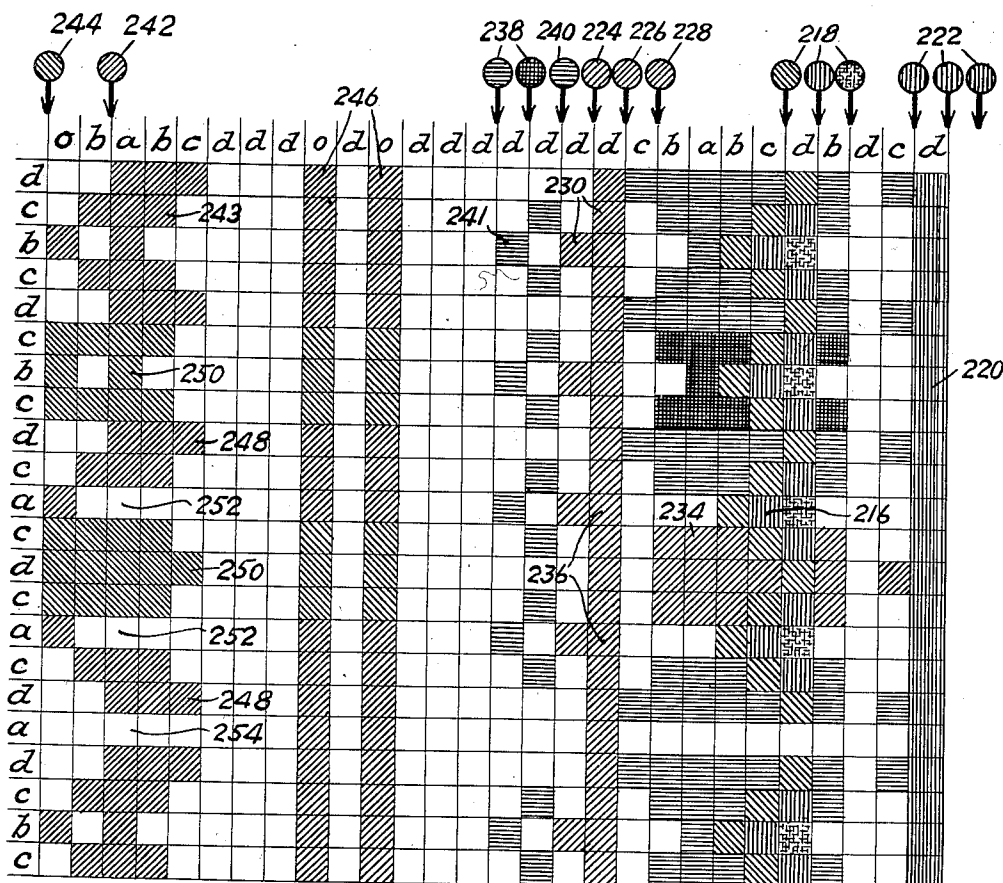


FIG. 9.

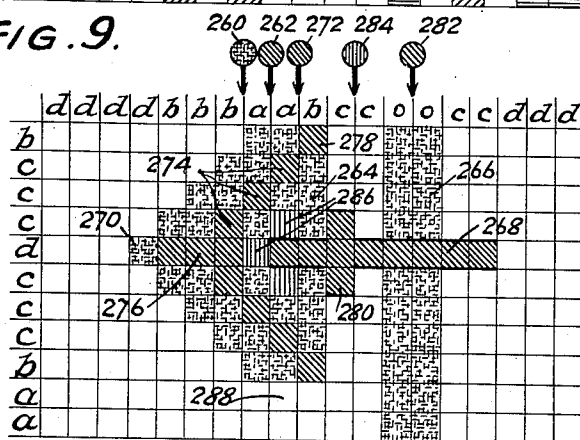


FIG. 10.

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UNITED STATES PATENT OFFICE

2,148,985.

KNITTING MACHINE AND PROCESS

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Application January 19, 1933, Serial No. 652,522
Renewed March 5, 1936

15 Claims. (Cl. 66—135)

This invention relates to a knitting process and a machine for most efficiently carrying out such process, the invention primarily relating to the production of designs by wrapping.

The production of designs by causing suitable fingers to wrap individual needles is well known. To produce wrapping or fail to produce wrapping at predetermined times has been accomplished either by the control of the wrap yarn fingers or the needles which may be moved either to positions to take yarn from the wrap fingers or to avoid taking such yarn in the formation of predetermined courses. Further elaborate effects are produced by causing relative shogging between the wrap yarn laying devices and the needles so that zigzag patterns result, the same wrap yarn producing loops in more than one wale.

In order to produce wide bands or the like by the above mentioned process it is necessary to associate with each of the needles forming loops in such desired band an individual wrap finger carrying an individual wrap yarn. In order to more readily form wide panels including a number of wales the process known as panel wrapping has been carried out, the machines for the production of such panel wrapping being provided with fingers each of which presents a single yarn to a plurality of needles in the formation of a single course. Various methods have been devised for causing suitable fingers to present wrap yarns in this fashion to a number of needles. One of the most satisfactory of such methods involves the use of an abutment which retards the yarn, in the case of a rotary needle machine, while the needles and wrap fingers continue to move so that the presentation of the yarn to a plurality of needles takes place.

The processes heretofore involved in the production of panel wrapping do not lend themselves readily to the formation of elaborate designs. That is, it is not generally feasible to secure wrapping of different colored yarns on adjacent needles.

The present invention relates to the avoidance of the drawbacks of both individual needle wrapping and panel wrapping indicated above. Specifically, the process and machine relate to combined panel and individual needle wrapping in the same fabric.

Specifically, the invention relates to more than merely the provision for both individual needle and panel wrapping in the same fabric, as indicated above. The machine is designed to effect shogging for the production of zigzag designs of both types. Furthermore, the machine is capable of producing individual needle wrapping on needles which may also in the same course be panel wrapped. There is also provided in accordance with the invention an improved method

of varying the width of a panel and also for producing panels of the same color of extraordinary width which may change colors in the direction of the wales. In brief, patterns of extreme intricacy may be produced by the process and machine of the present invention, as will be more apparent following the description of the details of the mechanism.

Other objects of the invention relating particularly to association of various parts for carrying out the features indicated above in the simplest manner will become apparent from the following description read in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a portion of the improved mechanism, being more or less diagrammatic in nature, inasmuch as conventional and well known parts are omitted;

Fig. 2 is a vertical section of a similar nature showing primarily the controlling means for the wrap fingers;

Fig. 3 is a radial vertical section showing certain needle controlling elements;

Fig. 4 is an inside development of the needle cams together with a diagrammatic illustration of their relationship to wrap finger controlling cams;

Fig. 5 is a detailed vertical section showing the arrangement for the production of panel wrapping;

Fig. 6 illustrates the different types of needles used in the machine; and

Figs. 7, 8, 9 and 10 show diagrammatically characteristic types of fabrics which may be formed on the machine together with the set-up of needles, wrap fingers and pattern mechanism to effect the production thereof. In these views, the faces of the fabrics are shown, the successive courses being shown in order from top to bottom and the squares representing loops, surface plating by wrap yarns being indicated by shading. The type of needle corresponding to each wale is indicated at the top of the fabric, and controlling cam positions corresponding to the various courses are indicated at the left. Wrap fingers are indicated in their relationships to the needles for the knitting of the first course. The resultant needle and wrap finger showing is that which would appear when viewed from the interior of the needle cylinder corresponding to the inside development of Fig. 4.

The improved machine involves elements shown in greater detail in the applications of Harold E. Houseman, Serial No. 422,818, filed January 23, 1930, now Patent No. 1,892,702; Stanley R. Shelmire, Serial No. 469,056, filed July 19, 1930; and Paul Bristow and Harold E. Houseman, Serial No. 529,518, filed April 11, 1931, now Patent No. 1,922,119; to which reference will be made in the following description for a more complete under-

standing of details of operation and construction.

The machine forming the preferred embodiment of the invention is of the stationary needle-rotary cam type and includes a needle cylinder 2 in which are slidably mounted in the usual fashion needles 4 provided with the usual butts and being without shoulders or having shoulders of four different lengths, as will be pointed out in greater detail hereafter. The stationary needle cylinder has associated therewith a stationary sinker dial while both the needle and sinker cams rotate for the production of stitches. The main yarn supply and fingers for feeding the same also rotate. The revolving parts of the machine are carried by a rotary disc 6 to which the needle cams generically designated at 8 are secured. These needle cams include the top center cam 10, the bottom center cam 12, the stitch cams 14 and 16 and the end cams 18 and 20 together with the usual associated cams and instrumentalities most of which are omitted in the present showing. Besides the conventional cams there is provided a fixed cam 22 designed to operate on the butts of the needles to raise the needles together with a radially movable cam 24 designed to selectively engage the shoulders of needles and lower them. This last cam together with its operating connections will be more fully described hereafter.

An overhanging bracket 26 rotatably and slidably supports an upright spindle 28 which carries at its lower end a slotted wrap finger supporting head 30. To the upper portion of the spindle 28 there is secured a radially extending arm 32 releasably engaged by the adjustable screws carried by an arm 34 rotatable about the axis of the spindle above the bracket 26 and carrying ratchet teeth 36 and 38 cooperating with suitable pawls for shogging, as illustrated in detail in the Harold E. Houseman application referred to above. For the purposes of the present case it is only necessary to point out that under the action of suitable controlling mechanism operated by pattern chains shogging movements are imparted to the wrap finger carrier 30 so that slight angular movements of the same relative to the fixed needle cylinder are obtained, these shogging movements being angularly equal to or multiples of the angular spacing of needles. While the wrap finger carrier will be generally referred to as stationary, this term is used to differentiate from the revolving controlling cams since so far as the operation is concerned the wrap fingers are effectively angularly fixed with respect to the axis of the needle cylinder when wrapping movements take place.

The wrap fingers and the controlling mechanism are similar to those disclosed in the Shelmire and Bristow and Houseman applications referred to above. The wrap fingers 40 are provided with center projections 42 engaging within an annular groove of semi-circular cross section to form a fulcrum for the rocking of the fingers within the axially extending slots so that their lower twisted ends 44 may be moved through the circle of needles and returned inwardly to effect the wrapping of yarns thereabout. The lower ends 44 are so twisted that the needles act thereon as cams causing the fingers to pass outwardly on one side of their corresponding needles and pass inwardly on the other side thereof so as to lay within the hooks of the needles the yarns threaded through the openings in the lower portions of the wrap fingers. These yarns extend upwardly to suitable stationary supplies, the positions of these supplies being such that the limited

angular shogging movements do not interfere with their proper feed.

The upper portions of the wrap fingers above their pivots 42 are provided with butts 46 which may be selectively broken away, if desired, for the purpose of patterning. While any suitable number of butts may be used, there are in the present instance 14 butt positions to which correspond controlling cams 50 and 52. The upper ten of these are short, as illustrated most clearly in Fig. 1, and have active edges of relatively limited angular extent. The lower four of the cams are considerably longer as indicated at 52 in Fig. 1 and are provided with active edges of substantial angular extent. While in the present instance four of these longer cams are illustrated, it is obvious that the distribution of the long and short cams may be varied as desired.

The cams 50 and 52 are similarly actuated, each of them being provided with a projection 56 arranged to be acted upon selectively by the butts carried by tricks 58 supported in a suitable trick wheel. Intermittent step by step movements are imparted to this trick wheel upon rotations of the moving parts about the needle cylinder by the action of a pawl 62 upon a ratchet 60 secured to the trick wheel. The pawl 62 has movements imparted thereto by the selective engagement of a member 64 with a disc 66 having a fixed angular position but movable vertically under the control of an arm 74 having a follower 76 acted upon by lugs of varying heights formed on the links of a pattern chain 78 carried by a sprocket 80 journaled on a stud which carries a plurality of other sprockets all of which are connected together and have imparted thereto intermittent step by step movements upon each revolution of the knitting cams by a ratchet and pawl arrangement of conventional type as indicated in Fig. 1. Fixed return cams 68 and 70 are provided as shown, these cams being adapted to act upon the wrap fingers below their pivots to return their lower ends within the needle circle following their outward movements. The various controlling means for the wrap fingers are described in greater detail in the Shelmire application already referred to. As pointed out in that application the various cams 50 and 52 may be taken out of action as a unit at desired times in the knitting operations. The tricks carried by the trick wheel are provided with butts which may be selectively broken away to control the formation of various patterns.

The sprocket 82, locked to the sprocket 80, has trained thereover a second chain 84 the links of which carry lugs of varying heights adapted to act upon a lever 86 secured to a shaft 88 extending transversely of the machine and carrying at its inner end an arm 90 the function of which will be described later. A third sprocket 91 locked to the others carries the chain which controls the shogging movements of the wrap finger carrier as described in the Harold E. Houseman application above referred to.

The use of wrap finger controlling means capable of acting at angularly different points together with the return cams associated therewith are shown in the Bristow and Houseman application.

The cam 24 is carried by a radially movable slide 92 supported in an upstanding bracket 91 secured to the rotating disc 6. A spring 94 urges the slide 92 outwardly to a position determined by the engagement of a laterally extending lug 96 on the slide with one of the steps 98 formed

on the horizontal arm of a bell crank 100 or with the bracket 91. A spring 102 urges the bell crank 100 in a clockwise direction as viewed in Fig. 3, its movements being limited by a suitable stop. A bell crank 104 pivoted to the bracket 91 has an upwardly extending arm arranged to engage the slide 92 to move the same inwardly against the action of the spring 94. The horizontal arm of the bell crank 104 is notched at its outer end to provide a series of steps 106. A bell crank 108 pivoted on a fixed portion 110 of the machine frame overlies the arm 90 being urged downwardly in contact therewith by a spring 112. The upstanding arm of this bell crank carries a cam 114 designed to selectively act upon the steps 106. Clockwise movement of the bell crank 104 is limited by a pin 107 extending outwardly from the bracket 91. A fixed cam 116 is arranged to engage the upwardly extending arm of bell crank 100 to rock it counterclockwise as illustrated in Fig. 3 thereby freeing slide 92 for movement to such position as may be determined by the position of lever 104 under the action of cam 114.

In the present instance there are three shoulders 98 adapted to engage the lug 96 carried by the slide of the cam 24. As a result the cam 24 may occupy four alternative positions engaging any one of the three steps 98 or the bracket 91. Similarly three steps 106 are provided on the bell crank 104 which may be selectively engaged by the cam 114 which, however, may also occupy an extreme outer position in which it fails to engage any of these shoulders.

To correspond with the four positions of the cam 24 there may be provided in the setup of the machine needles having shoulders of any of four different lengths or having no shoulders. These needles are illustrated in Fig. 6, the numeral 4 being applied specifically to the needles without shoulders while the needles with shoulders are designated 4a, 4b, 4c and 4d respectively. The butts on these needles are of long, short or intermediate type depending on the positions in the needle circle so that heels and toes may be knit in the usual fashion. So far as the present case is concerned, however, no distinction is made between the short and long butt needles inasmuch as the only characteristics which need be considered are the lengths of shoulders or the absence thereof. The positions of the cam 24 are such that the cam may engage the shoulders of needles 4d only, 4c and 4d only, 4b and 4c and 4d only or all four types of shouldered needles while failing of course to engage those needles which are not provided with shoulders. The outermost position of the cam 24 is such that the shoulders of needles 4d will always be engaged thereby and depressed due to the cooperation of the cam with the needles as indicated in Fig. 4. The respective positions of the cams referred to above will be hereafter described as positions a, c, b and a respectively, it being understood that in the position b, for example, the cam will engage and depress needles 4b and also those carrying longer shoulders, namely, 4c and 4d.

As illustrated in Figs. 1 and 5 there is provided immediately beyond the point where wrap fingers are swung outwardly by the action of cams 52 an abutment 118 of well known conventional type used for panel wrapping, this abutment serving to carry the wrap yarn through a predetermined angular distance so that it will be engaged by the hooks of selectively raised needles

for the production of panel wrapping. The abutment 118 and the cams 52 and 68 are so designed that the wrap fingers which are to produce panel wrapping are held outwardly and the yarn is sufficiently spread so that there may be wrapped upwardly of twenty needles on a 220 needle machine. The proper relationship of movements of the wrap fingers and form of the abutment to effect this may conform to well known practice. In other words, the parts may be adjusted so that panels of a maximum width of approximately one inch may be produced. A guard 120 of the usual type is provided inwardly of the needle circle. Both the abutment 118 and the guard 120 are secured to the latch ring 48.

In the operation of the machine which is designed to do its patterning during rotation the cams move relatively to the needles in the direction indicated by the arrow in Fig. 4. The cam 22 which is fixed with respect to the various knitting cams raises all of the needles which are thereafter selectively lowered by the action of the cam 24. Those needles which are lowered are not wrapped by the fingers acted upon at the position of the cams 52. Those needles which remain in upper position are panel wrapped by the action of the fingers selectively moved outwardly through the needle circle by the cams 52 and thereafter returned by the cam 68. It may be pointed out that for panel wrapping, needles cannot safely be wrapped by two different fingers at this point unless the successive fingers performing the panel wrapping are spaced by a distance greater than the maximum width of a panel inasmuch as the abutment 118 insures panels of substantially identical length if all of the needles are raised. This constitutes one of the usual limitations of a panel machine and the only means for securing wrapping on adjacent needles has been the establishment of successive panel wrapping points preceding the point of drawing the stitches.

Following the placing of the wrap yarns within the hooks of the needles by the panel wrapping mechanism, all of the needles rise over the cam 14 to a position to be selectively individually wrapped by wrap fingers controlled selectively by the cams 50 and returned by the cam 70 just prior to being lowered to draw stitches at the feed point of the main yarn or yarns. In the present instance the feeding of the main yarn is conventionally shown as through an eye 122 although it will be understood that the usual selectively operable yarn fingers may be provided to secure yarn changes.

The mechanical operations involved in wrapping in the described machine have been previously indicated. There will now be described the production of characteristic types of fabric which will make clear the elaborate nature of designs which may be formed according to the present process.

In Figs. 7 to 10 inclusive the fabric has been conventionalized to the extent that each of the square in the grids shown in these figures represents a loop. The color obtained by plating each loop is indicated by suitable hatching. A horizontal row of squares represents a portion of a single course while a vertical row represents a portion of a wale corresponding to a certain needle. The character of the needles forming the respective wales is indicated by the letters running across the tops of the diagrams. Above these letters are represented the positions of

wrap fingers during the formation of the initial courses shown at the tops of the figures. The colors of the yarns carried by the representative wrap fingers are illustrated by the hatching within the circles corresponding to the hatching indicating the colors of the wrapped loops. The letters vertically arranged at the left of the figures indicate the positions of the cam 24 during the formation of the loops represented in the successive courses. As pointed out in the description of these figures, the convention which is adopted illustrates the wrap fingers and needles in conformity with Fig. 4 while the faces of the fabrics are illustrated.

In the following description the wrap fingers will be said to be shogged "forward" when they move in a direction opposite that of the cams, i. e. counterclockwise, away from needles to be panel wrapped, or to the left relatively to the needles as viewed in Figs. 7 to 10.

With the above general explanation there will now be described the characteristics of the various illustrated fabrics.

Referring first to Fig. 7 there is disclosed therein a fabric comprising figured panel wrapping and shogged and patterned individual needle wrapping. Except in the course indicated at 200 for the formation of which the cam 24 occupies the position *a* there is panel wrapping on one or more needles. The needles on which panel wrapping occur are of the types 4a, 4b and 4c arranged as indicated. The other needles forming the portion of the fabric which is illustrated are of the type 4d and are always depressed by the cam 24 so that panel wrapping thereon does not take place. By following the loops formed by the finger 206 carrying a green yarn, the steps of shogging may be readily seen. The three fingers which are used to form the panel wrapping are shown as near the needles to be wrapped as they may be in order to successfully form the design illustrated. That is, in spite of the fact that the shogging of fingers at the time loop 206 is formed has taken place one step backward of that illustrated at the top of Fig. 7, the finger 202 is in position to form this loop. Of course, the wrap fingers may occupy positions forward of those illustrated limited only by the possible width of the panel formed by the machine. It is immaterial in the operation whether or not the fingers used for panel wrapping are capable of wrapping those needles on which individual wrapping is to take place. As will be pointed out later, in fact, panel wrapping and individual wrapping may take place on the same needles with one overlapping the other. In the fabric shown in Fig. 7 there is no double use of the same finger to produce both individual needle wrapping and panel wrapping although this may be done as will be pointed out hereafter. Of course, single as well as multiple needles may be wrapped by panel wrapping which term is used herein to designate such wrapping as is effected by the action of the cams 52 and abutment 113 and may be said to involve moving a wrap yarn in an extended path whereby it may be engaged with one or more predetermined needles as contrasted with individual needle wrapping as effected by cams 50 in which a wrap yarn is moved in a restricted path to cause it to be engaged only with a single needle irrespective of positions of needles closely adjacent said single needle. It will be noted that the fingers used for panel wrapping are successively brought into action during the formation of the vertical panel. An unwrapped series of loops such as 200 can of

course be produced in a generally wrapped series of wales by withdrawal of the wrap fingers from action as well as by the manipulation of cam 24 to lower all of the needles on which panel wrapping may occur.

The design formed by individual needle wrapping is produced in an obvious fashion by selectively bringing into action and taking out of action the various fingers on both sides of the center finger 206. Of course, this pattern may be interrupted by the removal of all of the individual needle wrapping fingers from action and may take numerous forms well known in the art. Primarily, this fabric is illustrated to indicate the non-interference of shogging and patterning by individual needles with panel wrapping and vice versa.

In Fig. 8 there is illustrated another type of fabric which may be produced by the present machine. In this case the wrap fingers are shogged and selectively brought into action and removed from action to produce a hollow individually wrapped figure. The openings therein indicated at 208, 210 and 212 are filled by panel wrapping produced in the present instance by three fingers which are cut out of action or brought into action selectively as will be obvious. In this fashion with a minimum of complication a quite intricate filled-in design may be produced. As will be obvious hereafter, various loops within the panel wrapped portion may be plated by individual needle wrapping. The manipulation of the needles to produce the panel wrapping will be obvious from a consideration of the types of needles and the positions of the cam 24 indicated in the figure.

In the fabric illustrated in Fig. 9 there are illustrated a number of peculiar results effected by the present machine. In this fabric a shogged individually wrapped pattern indicated at 216 is formed by the wrap fingers 218 which are selectively brought into action in an obvious fashion by the action of cams 50 on butts thereon. An individually wrapped vertical panel at 220 is produced on a single wale by the use of three wrap fingers 222 carrying the same color yarn. By the use of the three fingers this vertical panel can be produced in spite of the shogging. Ordinarily in a machine capable of panel wrapping a panel of this character independent of shogging could be produced by panel wrapping independently of the shogging in the manner analogous to that illustrated in Fig. 7. In the present instance, however, this panel falls either within or very close to the range of a panel formed by panel wrapping with yarns of other colors. As a consequence, even though a multiple number of wrap fingers are necessary for its production individual wrapping is relied upon for its formation.

The three fingers 224, 226 and 228 are similarly used to form the panel indicated at 230 which, in the present instance, is illustrated as having side projections. The finger 228, however, is also available for panel wrapping at 234 although this finger 228 is used to individually wrap the loops indicated above and below the panel wrapped portion 234 at 236. It will thus be seen how the same finger may be used for both individual needle wrapping and panel wrapping. Fingers 238 serve to produce the other colored portions by panel wrapping. The finger 240 serves to form the portions 241 by individual needle wrapping. It is to be noted that this pattern follows the shogging movements. The arrangement of the series of fingers including 238, 240, 224, 226

and 228 may be particularly pointed out inasmuch as this illustrates the freedom of position of the panel wrapping fingers which may be suitably interspersed among the individually wrapping

fingers which, of course, must occupy definite positions for the production of any given design.

As has already been indicated panel wrapping at the same wrap point can only be used where there is a spacing of the panel wrapping fingers by an amount depending upon the arc of their action. In the present instance, it is assumed that panel wrapping by fingers 242 and 244 would not serve to wrap the needles forming any portions of the righthand wrapped panel. In general, it might happen that these fingers would have to be moved further to the left than illustrated in the figure. The fingers 242 and 244 serve to form the panels 246. The needles involved in this case are without shoulders so that wrapping always takes place so long as either of the fingers 242 or 244 is in action. Of course, this panel may be interrupted by removing both of the fingers from action just as each is removed for replacement by the other. The fingers 242 and 244 also wrap in the portions indicated at 248 and 250. The finger 244 is always forward of the extreme lefthand needle which is capable of taking panel-wrapping yarns at 52 and, accordingly, the forward boundaries of the portions 250 which are wrapped by the yarn of finger 244 are not affected by the shogging. These portions are affected, however, by the positions of the cam 24 except the extreme lefthand wale which is formed on a needle without shoulders. The portions 248 on the other hand have their shape determined both by the shogging and the positions of the cam 24 as will be obvious inasmuch as the finger 242 can only wrap needles to its rear as illustrated in Fig. 9. Accordingly in the extreme lefthand panel of Fig. 9 it is shown how panel wrapping may be independent of or dependent upon the shogging for the production of figures. There may be particularly pointed out the courses indicated at 252 in which wrapping takes place on the extreme forward needle irrespective of the fact that the other panel needles are not wrapped, while there may be contrasted the course 254 in which the extreme forward needle is not wrapped because the finger 242 is to the rear thereof. It is thus seen that shogging may be used instead of removal of a finger from action to break a panel formed on a needle which is always in raised position to receive a wrap yarn if any is presented.

In Fig. 10 there is illustrated a fabric in which individual needle wrapping takes place over panel wrapping and a wrap finger is used for both individually wrapping and panel wrapping needles. The fingers 260 and 262 are used for panel wrapping, the former being also used for individual wrapping at 270. The shogging which takes place determines the forward extremity of the wrapping by the finger 260 which produces the portions 264 and 266. The finger 262 produces the panel wrapping indicated at 268. The finger 272 individually wraps needles forming loops indicated at 274 which are plated over the panel wrapping by the finger 260, and at 276 over the panel wrapping 268 of the same color. Alternatively finger 272 may be rendered inactive at 276. At 278 this finger produces individual needle wrapping which does not overlap the panel wrapping inasmuch as the needle forming 278 is not wrapped by the finger 260 in the first course. The fingers 282 and 284 produce individual needle wrapping at 280 and 286. The arrowhead is ter-

minated at 288 by removing the individual wrapping fingers from action and causing all of the panel needles except those forming the panel 266 to be removed from action.

The above four examples illustrate the great variety of effects producible by the process and machine of the present case. It will be readily seen that these effects are of a far more elaborate nature than those producible by panel or individual needle wrapping alone.

What we claim and desire to protect by Letters Patent is:

1. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof.

2. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof; and, in the formation of another course, moving the last named wrap yarn in a restricted path whereby it can be engaged only with a different single needle to form a shogged pattern.

3. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving one or more of a series of wrap yarns restrictedly whereby any so moved can be engaged only with a single needle irrespective of the positions of needles on both sides of and closely adjacent to any needle thus individually wrapped; and, in the formation of another course, moving a different one or more of said series of wrap yarns restrictedly in a similar fashion, but so that at least one yarn is engaged with a single needle other than that with which it was previously engaged to thereby form a shogged pattern.

4. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof; and, in the formation of another course, moving the first named wrap yarn in an extended path whereby it may be engaged with a different plurality of predetermined needles.

5. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the forma-

tion of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof; and, in the formation of another course, moving the first named wrap yarn in an extended path whereby it may be engaged with a different plurality of predetermined needles, and moving the second named wrap yarn in a restricted path whereby it can be engaged only with a different single needle to form a shogged pattern.

6. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle next to one of said predetermined needles irrespective of positions of needles closely adjacent to said single needle on both sides thereof.

7. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single one of said predetermined needles irrespective of positions of needles closely adjacent to said single needle on both sides thereof.

8. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with needles located on both sides of one or more predetermined needles without being engaged with said predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single one of said predetermined needles irrespective of positions of needles closely adjacent to said single needle on both sides thereof.

9. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof; and, in the formation of another course, moving a different wrap yarn in a restricted path whereby it can be engaged only with the same single needle.

10. A knitting machine including a circle of needles, main yarn feeding means, means for actuating said needles at a knitting point to draw stitches, means for selectively positioning needles, means for moving a wrap yarn in an extended path whereby it may be engaged with a plurality of positioned needles to produce panel wrapping,

and means for moving a wrap yarn in a restricted path whereby it can be engaged with only a single needle to produce individual needle wrapping irrespective of positions of needles adjacent said single needle on both sides thereof.

11. A knitting machine including a circle of needles, main yarn feeding means, means for actuating said needles at a knitting point to draw stitches, wrap fingers, means for shogging said wrap fingers whereby they may be located in selected operative relationships to the needles, means for selectively locating needles in positions to receive yarns from wrap fingers, means for selectively moving wrap fingers to panel wrap a plurality of needles so located, and means for selectively moving wrap fingers to individually wrap needles irrespective of positions of needles adjacent any of said individually wrapped needles on both sides thereof.

12. A knitting machine including a circle of needles, main yarn feeding means, means for actuating said needles at a knitting point to draw stitches, wrap fingers, means for selectively locating needles in positions to receive yarns from wrap fingers, means for selectively moving wrap fingers to panel wrap a plurality of needles so located, and means for selectively moving wrap fingers to individually wrap needles irrespective of positions of needles adjacent those individually wrapped on both sides thereof.

13. A knitting machine including a circle of needles, main yarn feeding means, means for actuating said needles at a knitting point to draw stitches, wrap fingers, means for selectively locating needles in positions to receive yarns from wrap fingers, means for selectively moving wrap fingers to panel wrap a plurality of needles so located, and means for selectively moving wrap fingers to individually wrap needles irrespective of positions of needles adjacent those individually wrapped on both sides thereof, said wrap fingers being capable of both panel and individual needle wrapping.

14. A knitting machine including a circle of needles, main yarn feeding means, means for actuating said needles at a knitting point to draw stitches, wrap yarn carrying fingers adapted, by contact with needles, to pass to one side thereof while moving outwardly and to the other side while moving inwardly, means for actuating at least one of said wrap fingers to cause it to wrap solely the needle with which it contacts irrespective of positions of needles adjacent said needle on both sides thereof, and means engaging the yarn carried by at least one of such fingers to cause it to engage a plurality of needles to produce panel wrapping.

15. The method of knitting a fabric having wrap designs on a circular series of needles which are movable at a knitting point to draw stitches of main and wrap yarns including, in the formation of a course, moving a wrap yarn in an extended path whereby it may be engaged with a plurality of predetermined needles, and moving another wrap yarn in an extended path whereby it may be engaged with a different plurality of predetermined needles; and moving a wrap yarn in a restricted path whereby it can be engaged only with a single needle irrespective of positions of needles closely adjacent to said single needle on both sides thereof.

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