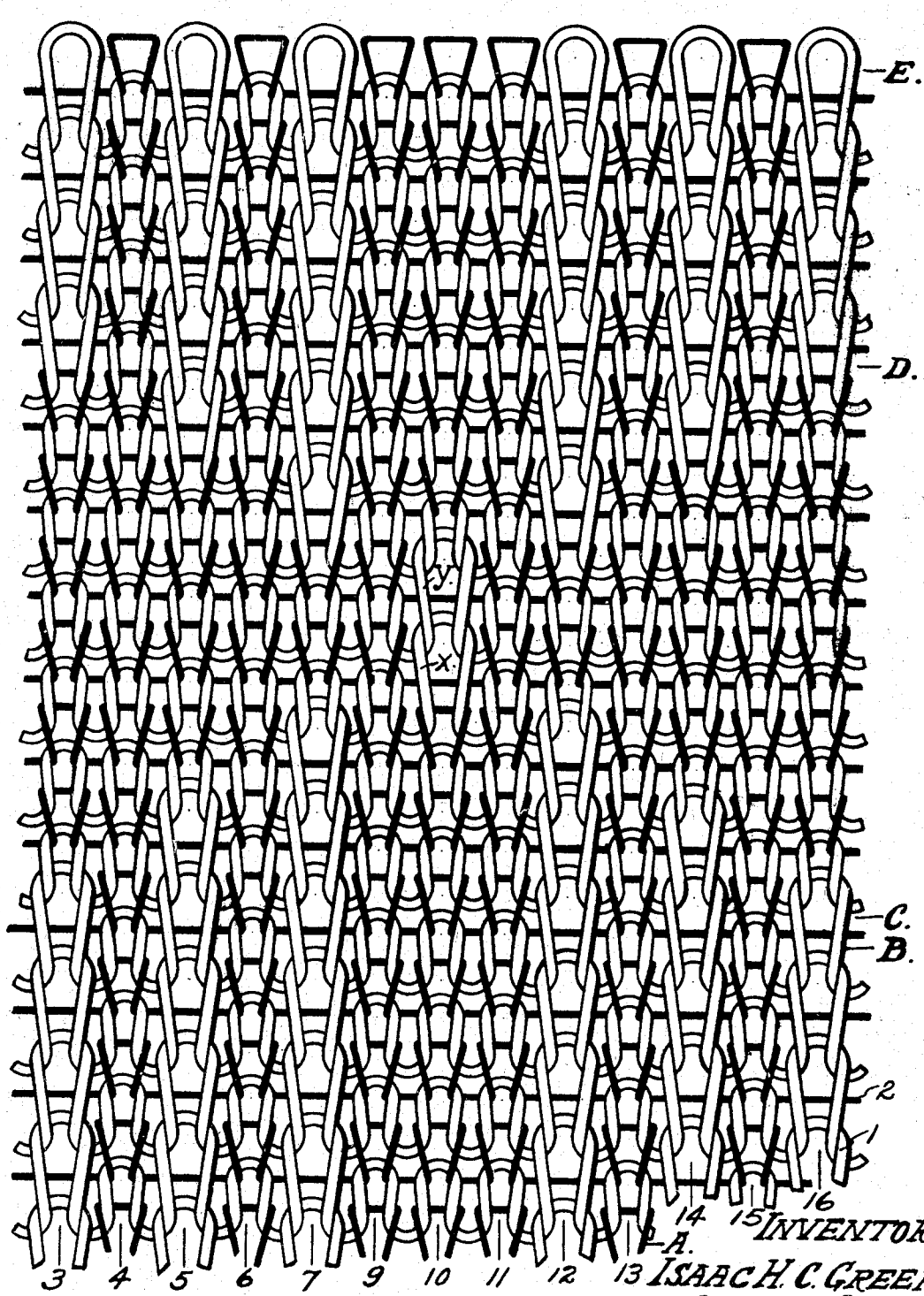
Dec. 21, 1943. I. H. C. GREEN 2,337,189

KNITTED FABRIC AND METHOD

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FIG. 1.



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FIG. 4.

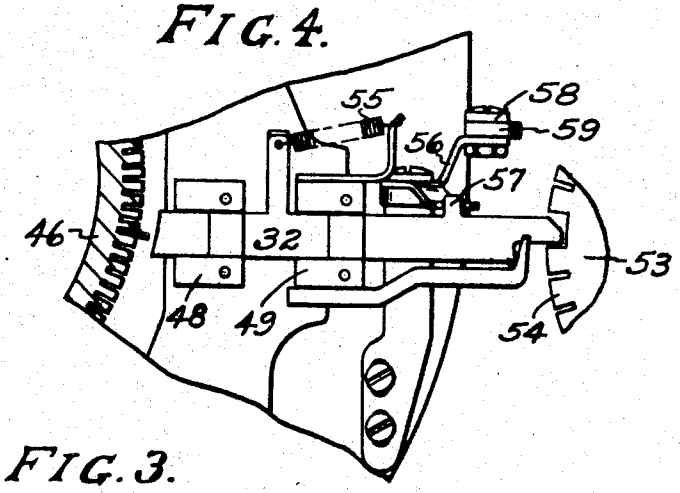
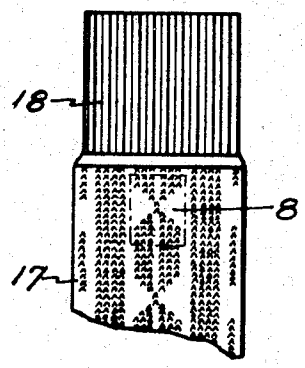


FIG. 3.

FIG. 2.



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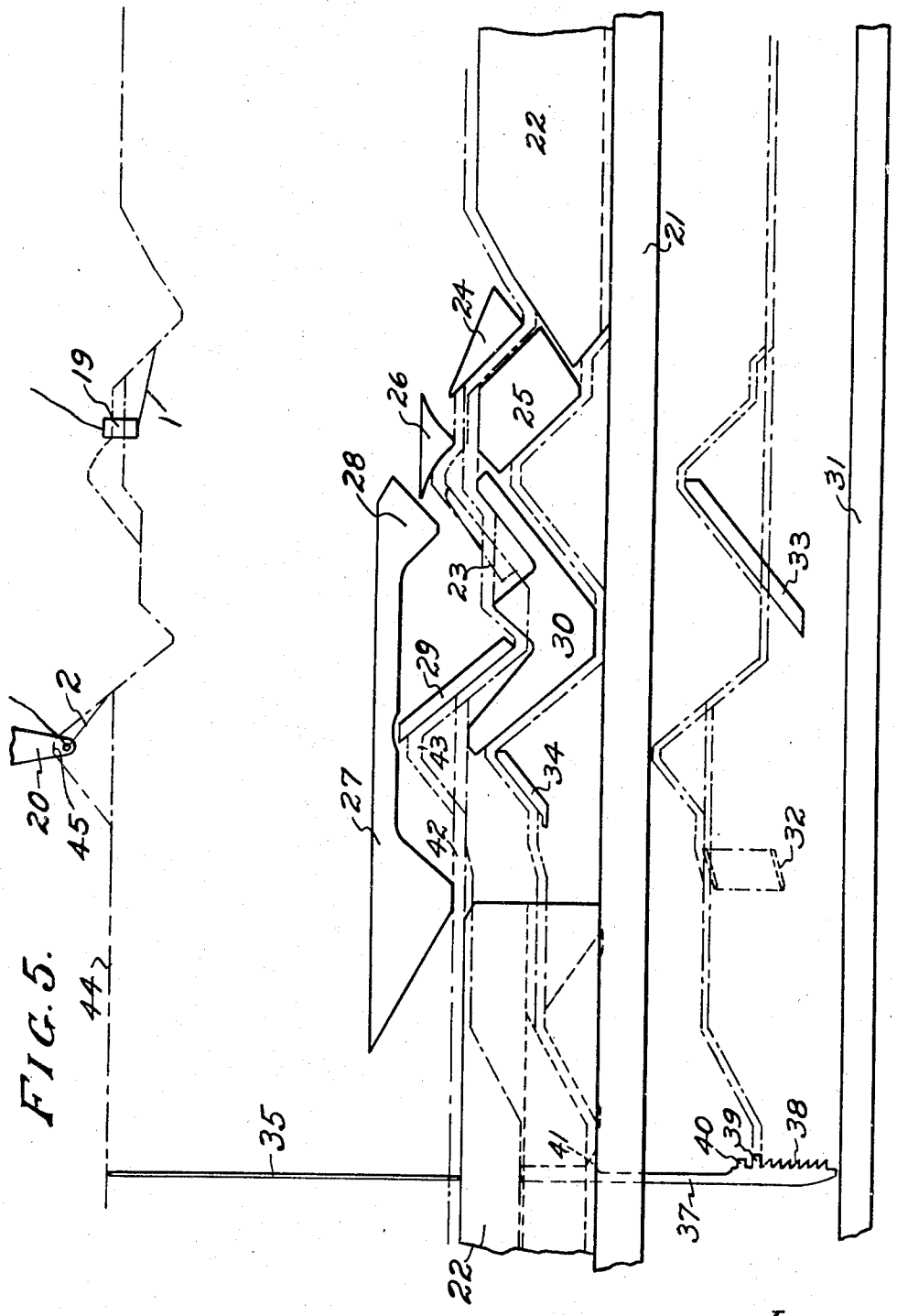


FIG. 5.

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2,337,189

KNITTED FABRIC AND METHOD

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Application May 15, 1942, Serial No. 443,083

11 Claims. (Cl. 66—201)

This invention concerns knitting in circular, independent needle knitting machines and the fabric produced thereby. The fabric is plain knitted, that is, is not knitted by a so-called rib machine or a machine having two series of needles, but displays a ribbed appearance, more specifically, an ornamental ribbed appearance.

One of the objects of the present invention is that of producing an ornamental effect in knitted fabrics such as hosiery, for example, and producing these effects in circular, independent needle type machines. The specific ornamental effects with which the case is concerned, as generally understood, have been producible, to this time, only in machines having two blanks or series of needles such as rib machines, the most common of these being the so-called links and links type, double cylinder machine. In fabrics knitted on that type of machine, selective actuation of needles has been practiced so that pattern work is accomplished by selective disposition in the fabric of so-called plain or face stitches and rib stitches. In machines having a single bank or series of needles, the tendency of the fabric coming therefrom is to lie flat except in instances where elastic yarns are employed to draw the same into ribs or to pucker the fabric in some manner.

According to the present invention patterned ribbed effects are produced in a plain knitted fabric in a two feed knitting machine of the circular, independent needle type having a single bank of needles only and by feeding and selectively controlling at the feeding stations, yarns one of which is preferably coarse as compared to a yarn fed at the other station and which is relatively fine. The last mentioned yarn is knitted at spaced wales only in certain areas while the first mentioned yarn is, throughout the entire fabric, preferably knitted at all wales. According to the simplest form of fabric to be made, a two feed machine is employed and the relatively coarse and light yarns are incorporated in the fabric at alternate courses. In certain wales, of course, the light yarn floats and throughout a great extent of such wales a single yarn only may appear at the face. In producing raised portions of fabric which would correspond to the plain or face wales of a true rib fabric, the relatively light yarn is knitted at spaced wales only in a predetermined number of wales and courses constituting the area of fabric which is to appear as raised or as face wales of a rib knitted fabric.

To create the appearance of the rib portion of true rib, patterned fabric, both yarns are knitted throughout those areas at each wale. Of course, the yarns alternate as to courses in which they are knitted. Areas thus treated lie below the face of the stitches knitted in areas as first described. By properly patterning the entire surface of a fabric, or any desired portion thereof, a plain knitted fabric construction results having raised and relatively depressed areas which have an ornamental appearance and which at a glance give the impression of having been formed by selective operation of a true rib type machine in which stitches may be drawn either to the face of the fabric or to the back thereof at will.

The method and machine involved as well as the fabric will be described by reference to the accompanying figures of drawings in which:

Fig. 1 is a conventional illustration of a section of fabric shown very much enlarged and illustrating the manner of knitting and the actual structure of the fabric by means of which the particular appearance is created;

Fig. 2 is a conventional illustration of part of a stocking to which the invention has been applied;

Fig. 3 is a sectional view through a typical knitting machine of one type and showing selecting means adapted to be used in producing the patterned effect;

Fig. 4 is a fragmentary view of part of the mechanism shown in Fig. 3, the same being represented as seen in plan; and

Fig. 5 is a diagrammatic view in which cams, yarn feeding means, needles and jacks and the pathways traversed by needle and jack butts are illustrated;

Now referring to Fig. 1, a section of fabric is illustrated in which there are patterned areas similar to parts of the areas illustrated in Fig. 2. The yarn 1 is a relatively coarse yarn while the yarn 2 of much finer count alternates with the yarn 1, however, it is to be understood that this 1 x 1 alternation is the simplest form of fabric which may be made. Other schemes may be employed such as a 2 x 2, 2 x 1 or other arrangements depending upon the effect desired. The fabric has a more pronounced ribbed appearance, that is, the raised portions stand out more clearly from the depressed or unraised area when the yarn 2 is appreciably finer than the yarn 1, although it is to be understood that satisfactory results are obtained even if both yarns are of the same size.

The yarn 1 is preferably fed at a separate feeding station from that at which the yarn 2 feeds

and that station at which the yarn 1 feeds may be an ordinary knitting station; by that it is meant that the yarn is merely controlled to feed continuously, all needles are raised, their latches cleared, and all are thereafter drawn down to knit stitches. The yarn 2 is fed at what may be termed an auxiliary feeding station; at any rate, a separate station and at that feed the needles are to be selectively raised for clearing their latches, taking the yarn 2 and knitting it at desired wales. If the machine is a hosiery frame such as the well-known Banner type hosiery knitter, the yarn 1 will preferably be fed at the main feeding station and the yarn 2 at a secondary or auxiliary feeding point.

From the course A up to and including the course B, the wales 3, 4, 5, 6 and 7 are knitted in a manner to produce a raised or ribbed effect standing out from the face of the fabric as at the right upper corner of the squared area generally designated by numeral 8, Fig. 2. The stocking in Fig. 2 is, of course, knitted from the top downwardly; the fabric in Fig. 1 progresses from the bottom toward the top. In these courses A—B, the wales 3, 5 and 7 stand out from the face of the fabric while the wales 4 and 6 are drawn to the back and are more or less submerged by the face wales. The yarn 2 may be knitted under varying degrees of tension and with varying sizes of stitch, and in so doing, the character of the fabric may be varied to project the face wales more or less. The contrast in size of yarns is also variable to effect the above mentioned characteristics of the fabric.

At wales 9, 10 and 11, yarn 1 is knitted at the main side or at its particular feeding station by every needle and the yarn 2 is likewise continuously knitted at each revolution of the machine in the so-called auxiliary side at least up to and including the course C. This fabric will merely be plain two-feed fabric and does not have a raised appearance, but lies with its face at a level below the surface of the fabric as determined by the projection of wales 3, 5 and 7. When thus knitted in the ordinary gages and with ordinary tightness of stitch, each area presents an appearance which is determined by the entire surface knitted in either one manner or the other, and the distinguishing characteristics of each particular wale or course are not picked up by the eye at a casual glance. In other words, the so-called face areas present a distinctive appearance throughout their entirety while the plain areas which are herein referred to as the rib portions of the fabric affect the eye similarly but, of course, their actual appearance is one of contrast.

The wales 12, 13, 14, 15 and 16 are practically identical with wales 3—7 and that particular part of the fabric constitutes a so-called raised or face area.

Now beginning with the course C and progressing upwardly, the pattern at the sides narrows to a point at the loop x, this narrowing being bounded by lines including the end loop at either side at course B and including two intermediate loops between those loops and loop x. At the wales 9, 10 and 11 the unraised fabric, so-called, terminates just below the loop x.

At the other side of the pattern, that is, above loop x and beginning with loop y the reverse takes place. The pattern widens out from the point at the loop y to course D and the pattern continues up through course E and so on as far as desired.

This Fig. 1 shows only a few courses which go to make up a complete patterned fabric, and, of course, this particular figure and design is only given by way of example. Any configuration within the scope of the pattern controlling means employed on the machine may be availed of and the total surface of raised or plain knitted sections, so-called, may constitute any desired proportion of the entire fabric as compared to the so-called rib sections or areas.

In Fig. 2 the leg of a stocking is indicated by numeral 17 and has a pattern the blocked area 8 of which has been shown in detail, Fig. 1. The top of the stocking 18 may be any type of stocking top such as a true rib top, an elastic type self-supporting garter top or, more preferably, will be a mock rib top of accordion type.

In producing the fabric two feeding points are employed and yarn 1 is preferably fed at a so-called main feeding station wherein there are several feeding levers, one of said levers being shown at 19, Fig. 5. In knitting hosiery the other levers at this feeding station would have other yarns threaded through them and yarn changes may be effected at desired times for the usual purpose of knitting hosiery. A second yarn feeding means 20 serves to introduce and feed the yarn 2 at a so-called auxiliary feed. This yarn feeding means may be movable to and from a feeding position in any well-known manner.

In machines of the type such as are used for knitting hosiery a cam plate 21 has a raise cam 22 fixed thereon and also has a main cam block on which are a front stitch cam 23, rear stitch cam 24, center raise cam 25 and a top center or guard cam 26. The front stitch cam 23 is movable into and from a needle butt engaging position, means for accomplishing that purpose being well-known to those skilled in the art.

An elongated cam 27 serves several purposes, one being that of instep cam, while the elongated portion and the point 28 at the end adjacent the cam 26 serve to guide needles into the pathway of cam 26 after said needles have been raised for wrapping or other purposes, that only being essential in the event wrap stripe knitting is done in addition to the patterning of which this case is descriptive. Needle butts are drawn down by stitch cam 29 after the yarn 2 is taken and a cam generally indicated by numeral 30 serves to raise needles after passing the cam 29 and before approaching the main cam block, also controls jacks by moving them down to a safe position in the event the needle should fail to do so.

Beneath the plate 21 and above the base plate 31 of the machine are a series of jack selecting plungers 32 and a jack raising cam 33. Another jack cam 34 known as a master cam is located above the plate 21 and is spring pressed into position to engage jack butts but is movable outwardly upon improper contact of the butts with the point of the cam. Needles 35 are of the usual type employed in these machines and have butts shown at 36, Fig. 3. Beneath needles are jacks 37, these jacks having a plurality of removable butts 38 which are of saw tooth shape. Then there are two so-called square butts 39 and 40. The butts 39 are long butts and are on alternate jacks in the event a 1 x 1 arrangement or set-up is contemplated. The top plunger 32 is movable inwardly to a point for engaging these long butts to raise needles for making a 1 x 1 rib top such as the top 18. They also are con-

trolled by cam 33 at the main feeding station so as to raise needles to clear latches and take yarn while intermediate jacks fail to raise their needles. In that event needles not raised may take yarn but will tuck. Of course, the front stitch cam 23 is to be withdrawn at appropriate courses and is projected inwardly when all needles are to clear and knit off.

Each jack has a master butt 41 engageable with cam 34. Selection of any of the butts 38 or 39 by plungers 32 raises jacks so that the master butt 41 thereof which would otherwise have passed below cam 34 is caused to engage the cam so that the jack and needle will be raised. Needles, butts of which were moving in pathway 42, are then raised up to a butt pathway 43 and their hooks elevated from pathway 44 to elevation 45 thereby taking yarn 2 in their hooks. The other needles merely move along at the same level and do not have the yarn 2 engaged by their hooks, but pass in front of that yarn so that it will float at the back of wales knitted by such needles.

The short butts 40 are on those jacks at the sole side of the machine, that is, under short butt needles, and serve in the making of a plain sole. A cam (not shown) contacts these butts at certain times in a manner well-known but which will not be described here since it constitutes no part of the present invention.

In Figs. 3 and 4 the details of selecting mechanism are shown and a needle 35 and jack 37 are shown in a slot in the needle cylinder 46. The plate 21 has fixed thereto a block with a base 47 and two upright members 48 and 49. Plungers 32 are slidable in slots in the upright members 48 and 49.

On a suitable projection from the circular base of the machine a spindle 50 has rotatable thereon a drum generally indicated by numeral 51 and which is built up of several interconnected pieces. The usual friction member 52 bears on the top of the drum and prevents overtravel or unintentional movement of the same. The drum is periodically moved around by ratcheting means not shown in detail here since the same is well-known and is illustrated in other patents including Patent #2,208,698. A series of pattern discs 53 are fixed to the drum and revolve with it as it is ratcheted about the spindle 50. These discs have lugs or butts 54 which engage the outer ends of plungers 32 and push the plungers inwardly against the tension of springs 55.

The projections or butts 54 are broken off in accordance with pattern requirements and plungers 32 move in to engage such of the butts 38 as are on jacks. That raises needles at the auxiliary feeding station to take the yarn 2 or fails to raise needles in that way thereby determining the knitting of the pattern, since when appropriate needles do not take the yarn 2 the accordion type fabric will result and alternate or other wales will be projected to the face of the fabric. In areas in which all needles are elevated at the auxiliary side of the machine, plain fabric which forms the lower or depressed areas is made.

The top plunger 32 is especially controlled so as to engage the long butts 39 only when making a 1 x 1 rib top. That special control is by a bell crank lever 56, one arm of which engages a projecting lug 57 and the other arm of which is connected at 58 to a depending link 59. This link 59 connects to and is actuated by suitable pattern means on one of the main cam drums.

The cam 33 is movable under pattern control (not shown) and may be moved to butt engaging position at desired times for tucking. Likewise, the front stitch cam 23 is pattern controlled to be moved in and out for allowing certain of the needles to tuck and for controlling the length of the held or tuck stitches.

Tension to be applied to the yarns is governed by the elasticity desired in the finished fabric and the degree to which raised or so-called plain areas are to stand out beyond the depressed or so-called rib areas. The finer yarn must be tensioned enough to create the raised effect at those areas which are to stand out at the face. Of course, the more tension the less will be the elasticity of the fabric, but if the raised areas do not predominate, there will be sufficient kinking of the yarn, that is, a sufficient number of independent stitches at the non-raised areas to give a good resulting elasticity even when applying considerable yarn tension.

The ornamentation of a plain knitted fabric by the above described method may be employed independently or may be combined with other types of ornamental effects. Horizontal striping or yarn change will make it possible to have colored effects in addition to the simulated links-and-links patterning, also other types or ornamental work such as tucking, plating and reverse plating, and wrap striping may be employed thereby introducing colored designs in or over the differently disposed areas having raised and depressed surfaces.

The invention has been described as applied to fabrics knitted in a hosiery knitting machine of circular type. It is applicable to other fabrics such as body fabrics knitted on larger type machines or to any of the flat knitted fabrics wherein the invention may easily be applied to such machines having a single bank of needles. One mechanism and mode of operation of the same have been described, but it is to be understood that this is by way of example only, and those skilled in the art may, from the disclosure of this case, practice the invention in other machines and by other means. The invention is not limited other than by the scope of the appended claims.

I claim:

1. A plain knitted fabric having portions thereof the surfaces of which are disposed at different levels so that one stands out at the face of the fabric, and having at those areas which stand out at the face two yarns knitted in consecutive courses, one in all wales and the other in spaced wales only, and in those areas which remain at a lower elevation or do not stand out at the face of the fabric having both of said yarns knitted in all wales, at least some of both of said areas occurring in the same courses.

2. A plain knitted fabric having patterned areas some of which stand out at the face of the fabric and others of which remain at a level lower than the surface of those areas first mentioned, said fabric being knitted from two yarns one of which is of finer count than the other, the said yarn of finer count being knitted at spaced wales only in areas which stand out from the face of the fabric, but at all wales on the said areas which remain at the said lower elevation or do not stand out at the face of the fabric, at least some of both of said areas occurring in the same courses.

3. A plain knitted fabric having patterned areas some of which stand out at the face of the fabric and others of which intervene between the

borders of those areas which stand out from the face of the fabric and assume a lower elevation as compared to the face of the first mentioned areas, said fabric being knitted from two yarns one of which is of substantially finer count than the other, said yarns being knitted alternately in consecutive courses, and at the said areas which stand out from the face of the fabric, the yarn of finer count being drawn into knitted stitches at alternate wales only, at least some of both of said areas occurring in the same courses.

4. A method of knitting a plain (not rib) fabric including the steps of knitting two yarns, one said yarn in all wales at each course in which it appears and the other said yarn at all wales in courses in which it is knitted and at certain areas of said fabric, but at spaced wales only at remaining areas, whereby the first mentioned areas will appear at a relatively low elevation and the other said area will appear raised as compared to said first mentioned areas, at least some of both of said areas occurring in the same courses.

5. A method of knitting a plain (not rib) fabric to ornament the same by forming relatively raised and depressed areas at the surface of the fabric which includes the steps of feeding two yarns one of which is appreciably finer than the other, and so controlling the knitting of said yarns that at depressed areas both yarns are drawn into knitted stitches at all wales in their respective courses within said depressed areas, while at the relatively raised or elevated surfaces or areas, the said finer yarn is drawn into stitches at alternate wales and is floated behind intermediate wales, at least some of both of said areas occurring in the same courses.

6. A method of knitting a plain (not rib) fabric to ornament the same with relatively raised and depressed areas at the surface of the fabric including the steps of feeding two yarns and so controlling the knitting of the said two yarns that depressed areas are formed by knitting both said yarns into independent stitches at each wale in their respective courses, and raised areas by forming one of the said yarns into stitches at each wale while the other of said yarns is formed into independent stitches at spaced wales only, at least some of both of said areas occurring in the same courses.

7. A method of knitting a plain (not rib) fabric to ornament the same with relatively raised and depressed areas at the surface of the fabric including the steps of feeding two yarns and so controlling the knitting of the said two yarns that depressed areas are formed by knitting both said yarns into independent stitches at each wale in their respective courses, and raised areas by forming one of the said yarns into stitches at each wale while the other of said yarns is formed into independent stitches at every other wale only, at least some of both of said areas occurring in the same courses.

8. A method of knitting a plain (not rib) fabric and ornamenting said fabric by knitting in such a manner that certain areas thereof stand out from the face of the fabric as raised areas while other or intermediate areas appear as depressed, that is, not raised areas, including the steps of feeding two yarns and controlling the knitting of said yarns so that the said raised areas are formed by knitting one yarn continuously at each wale while knitting the other yarn at every other wale only, and forming the so-called depressed areas by drawing both said yarns into knitted loops at each wale in their respective courses, at least some of both of said areas occurring in the same courses.

9. A method of knitting plain (not rib) fabric which will have patterned areas the surfaces of which are at different levels so that one type of said patterned area will have its surface at an elevated or raised position with respect to the other, which includes the steps of feeding and knitting two yarns and causing patterned areas to be knitted by selective disposal of stitches knitted from one of the yarns which includes knitting one of the said yarns at non-adjacent wales only, at least some of both of said areas occurring in the same courses.

10. A method of knitting a plain (not rib) fabric including as steps therein the feeding of at least two yarns and knitting each yarn in its independent courses and forming patterned areas in the fabric by drawing one of said yarns in the courses in which it appears and forming it into stitches at each wale, and drawing the other of said yarns into stitches at non-adjacent wales only throughout certain areas and at other areas in all wales, so that at those areas in which the second mentioned yarn is drawn into stitches at non-adjacent wales, the surface of the fabric will be disposed at a higher elevation than at those areas in which both yarns are drawn into stitches at all wales, at least some of both of said areas occurring in the same courses.

11. A plain knitted fabric having alternate courses drawn from one yarn and intermediate courses drawn from a second yarn and in which ornamentation is effected by causing certain areas to be raised from the surface of the fabric when compared to intervening areas, and in which the said raised areas have the said one yarn drawn into stitches at each wale at alternate courses and the second yarn at intermediate courses drawn into stitches at non-adjacent wales only, said intervening areas having both yarns drawn into stitches at each wale in their respective courses, at least some of both of said areas occurring in the same courses.

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