

July 10, 1934.

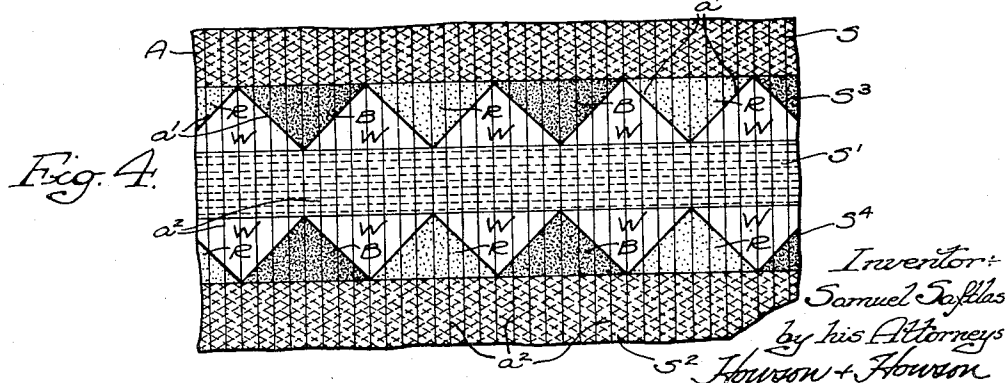
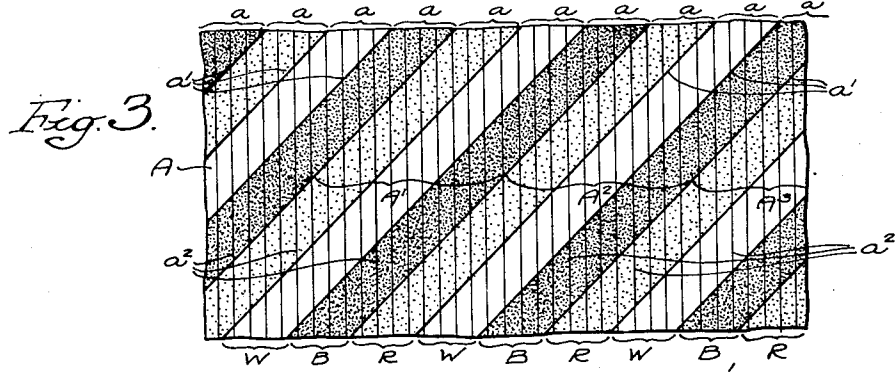
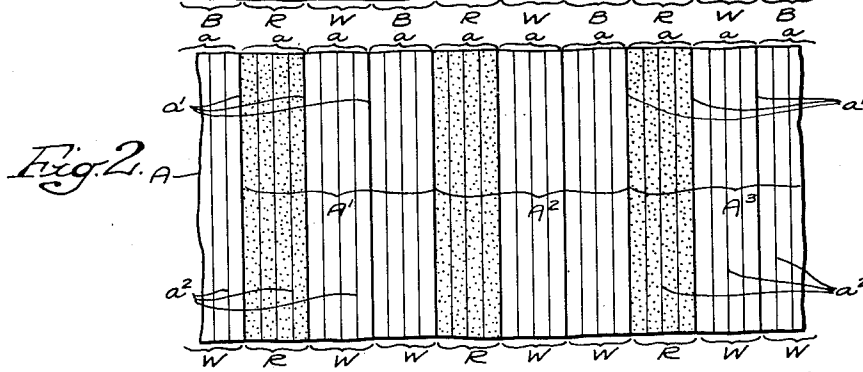
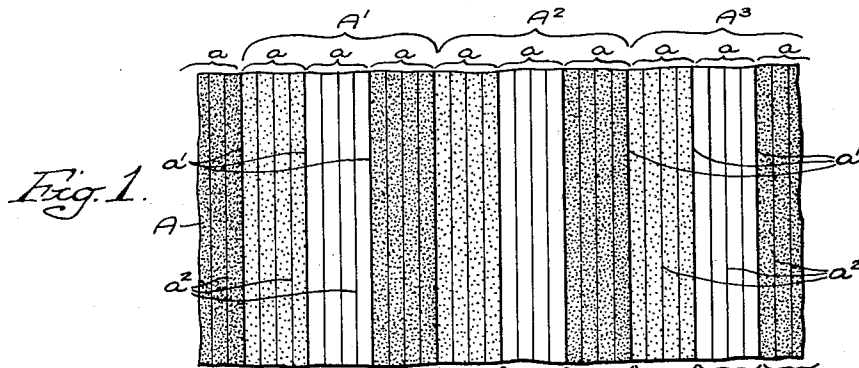
S. SAFTLAS

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Filed March 10, 1931

7 Sheets-Sheet 1



July 10, 1934.

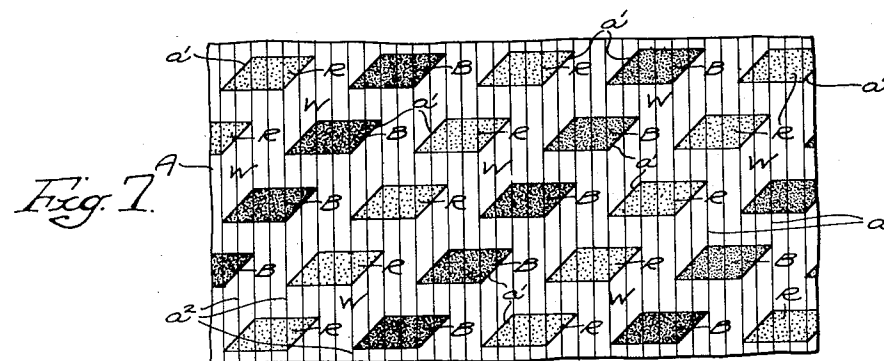
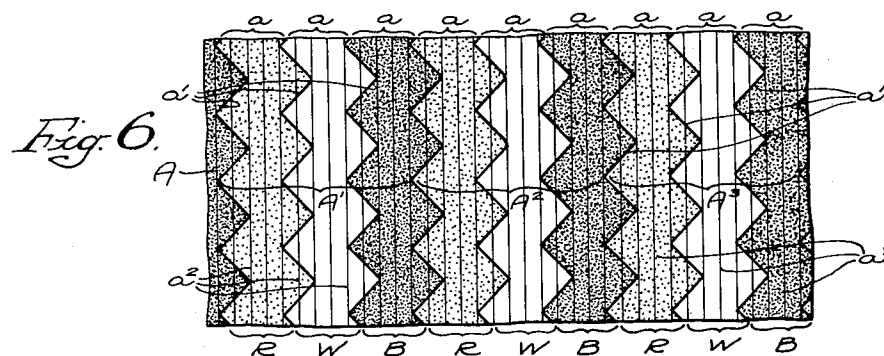
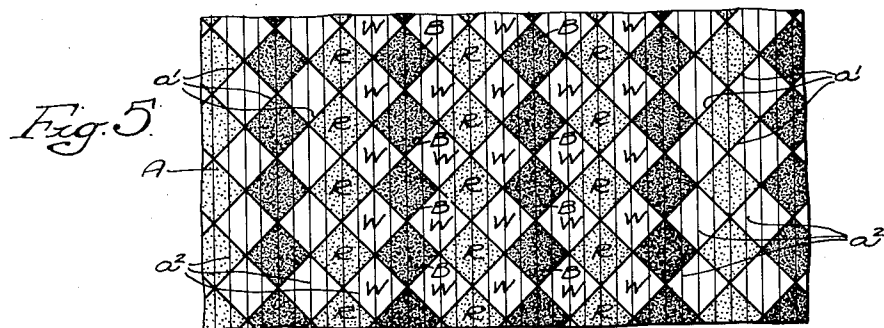
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7 Sheets-Sheet 2



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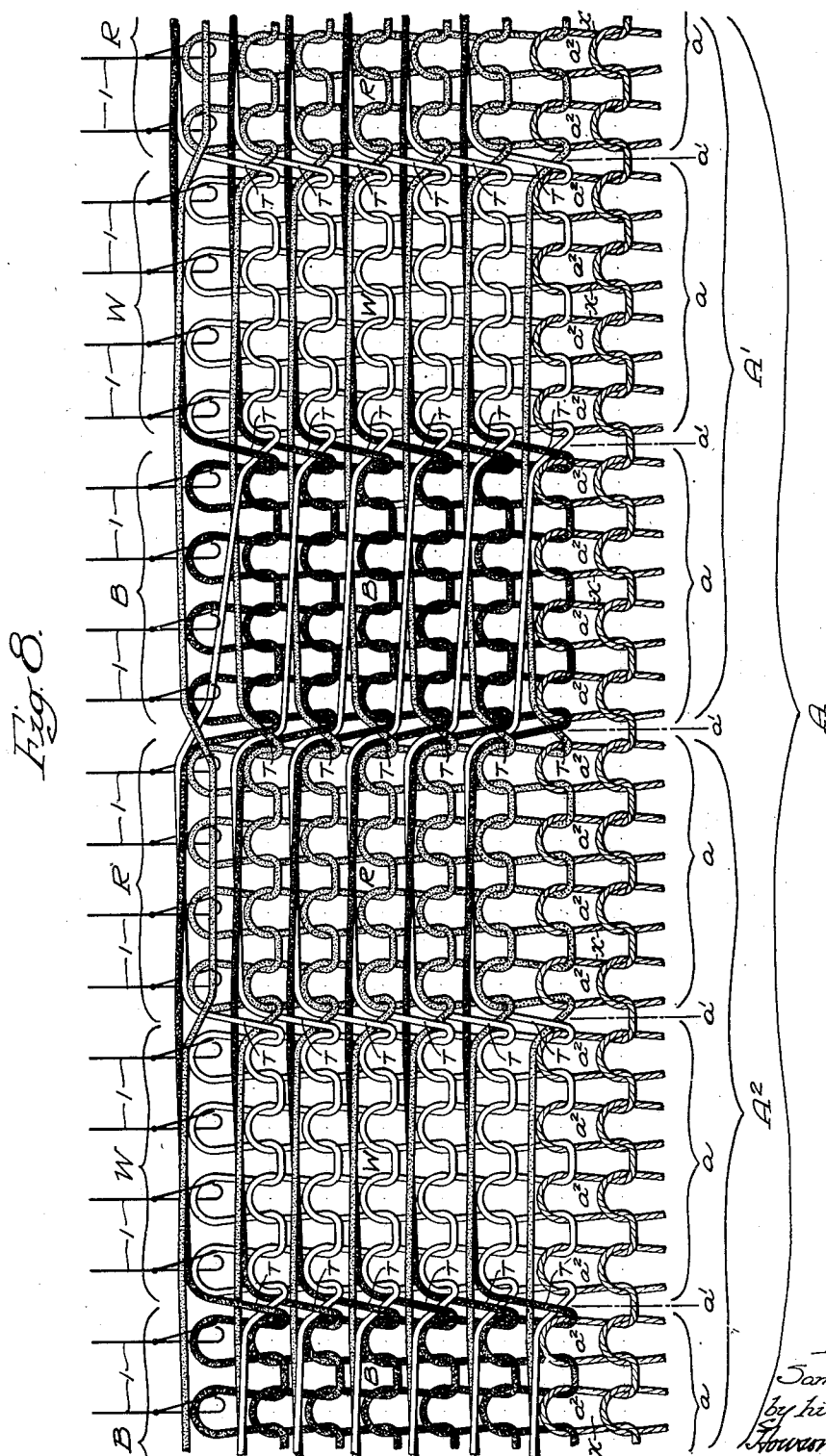
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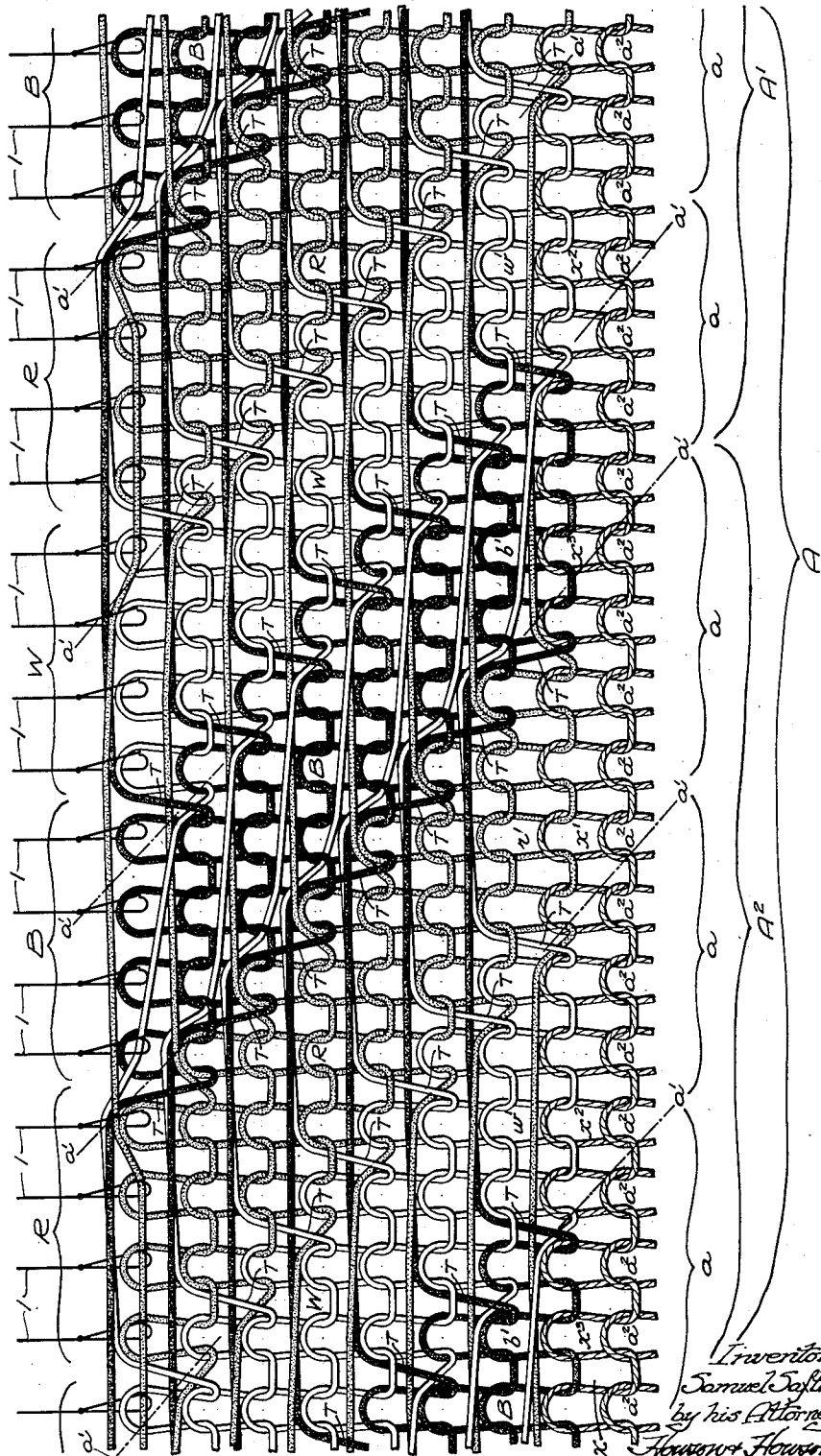
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Fig. 9.



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7 Sheets-Sheet 5

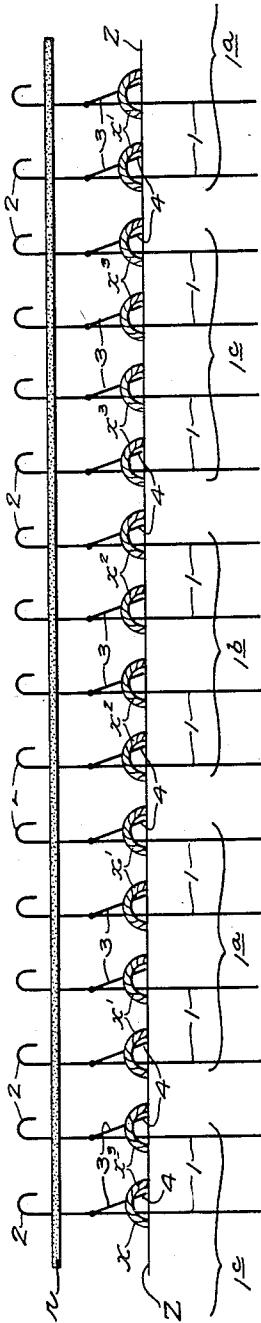


Fig. 10.

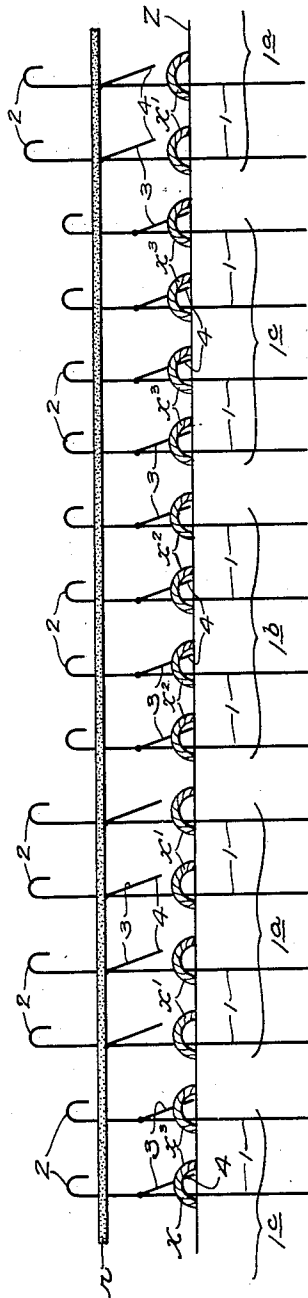


Fig. 11.

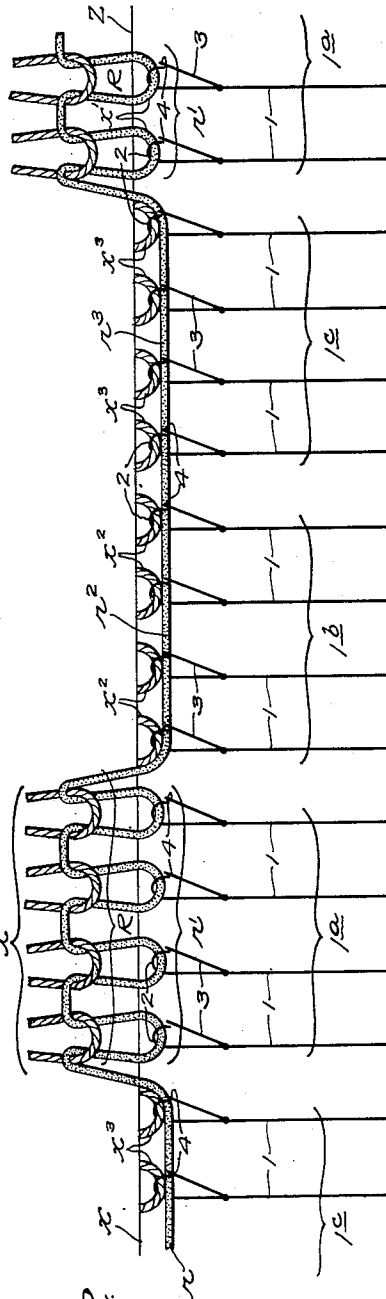


Fig. 12.

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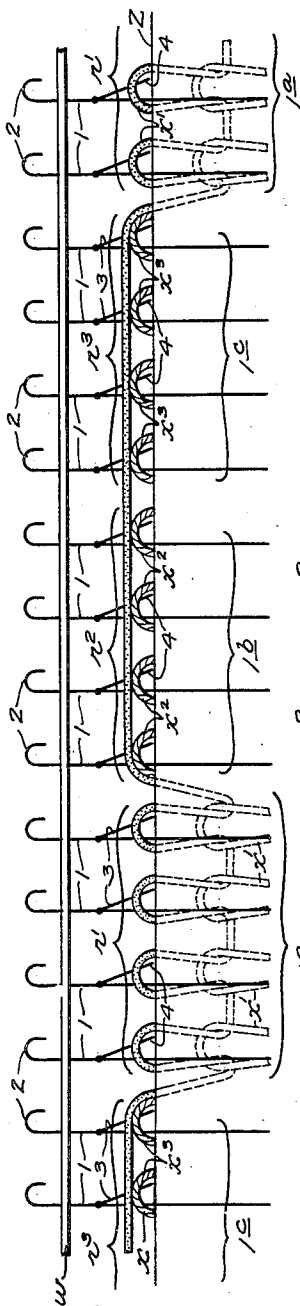


Fig. 13.

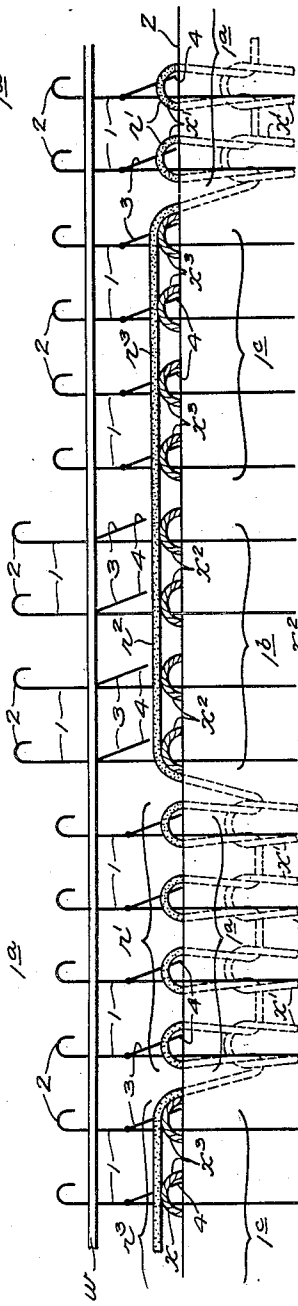


Fig. 14.

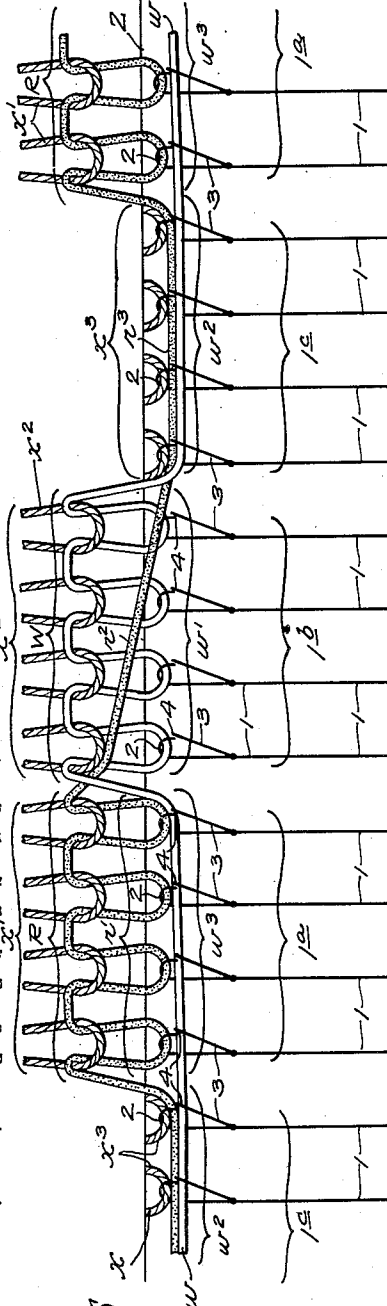


Fig. 15.

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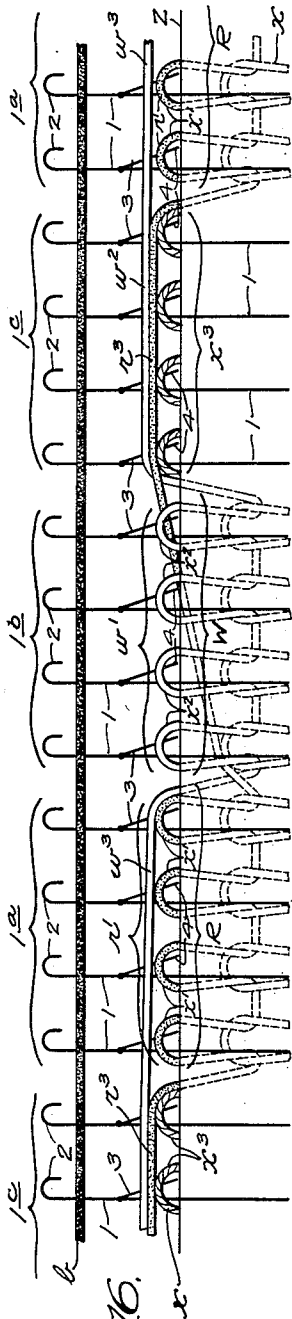


Fig. 16.

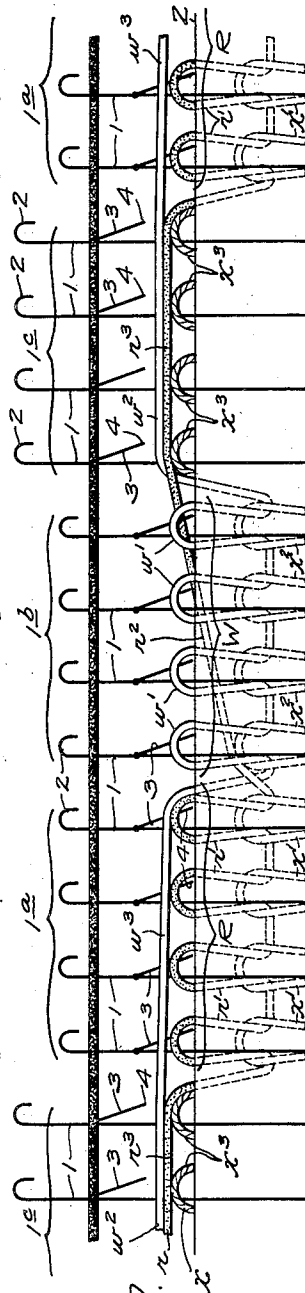


Fig. 17.

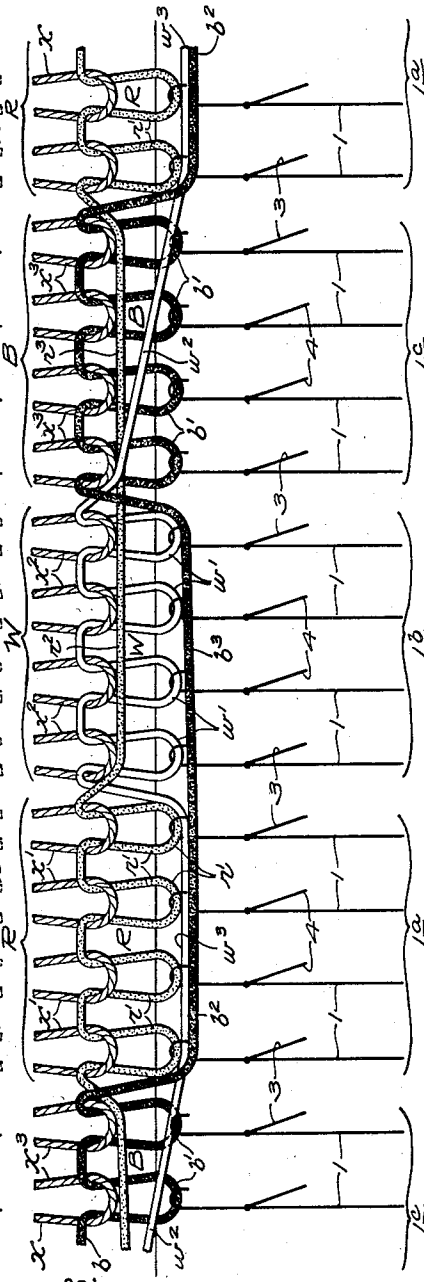


Fig. 18.

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UNITED STATES PATENT OFFICE

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KNITTED FABRIC

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Application March 10, 1931, Serial No. 521,555

4 Claims. (Cl. 66—201)

The primary object of this invention is to produce a composite knitted fabric which shall consist of various sections, or areas, respectively composed of different threads, with the threads of adjacent sections so joined together or interknit as to form in the aggregate an ultimate unitary fabric, wherein some of the sections may take the form of designs and other sections, either singly or in multiple, may constitute a suitable background for the design sections, or may in themselves form other designs joined to the first-mentioned designs, in a manner to produce the ultimate unitary fabric.

Another object of the invention is to produce a composite fabric of the above-mentioned type, wherein each stitch of which the fabric is composed will be formed of but a single thread, or a like number of thread units, thus making the surface of the fabric uniformly smooth or even throughout.

Another object of the invention is to produce a fabric of the above-mentioned type wherein any one or each course of the fabric stitches may contain three or more different colors disposed in successive or other selective order coursewise of the fabric without plating or otherwise superimposing thread units in any of the stitches of the fabric.

Another object of the invention is to produce a fabric of the above-mentioned type wherein the various sections of the fabric will extend, as stripes, parallel to each other and in a direction walewise of the fabric or at an angle with respect to the wales of the fabric, in groups of three or more differently colored sections disposed in successive or other selective order coursewise of the fabric.

Another object of the invention is to float the thread, of which any one section of the fabric is composed, walewise across the other sections of the group to which that section belongs and across the sections of the next successive group until that particular thread is called upon to produce a corresponding section in the next successive group of sections, and to tie the thread in, on the back of the fabric, at each place where adjacent sections are joined together, thus eliminating long objectionable floats.

As an example, it is generally conceded that a float extending coursewise across four to six wales in a knitted fabric is not objectionable, therefore, in making a composite fabric, in accordance with the principles of the present invention, wherein each section of the fabric does not exceed six wales in width, the fabric may be composed of as

many different colors, coursewise, as desired, with the various colors being called in any desired order or according to any selection, and the idle threads when not being called to form sections of the fabric will float across the sections being formed and be tied in at each walewise line of juncture between adjoining sections.

Prior to this invention it has been deemed impractical to produce composite striped goods employing more than two colors in succession coursewise of the fabric, due to the formation of long untied floats on the back of the fabric and even with the employment of but two colors the strips formed by each color could not exceed six wales in width, for the same reason, but when producing fabric according to the principles of the present invention any desired number of colors may be employed in succession coursewise of the fabric and each stripe formed may be of any desired width, without producing floats greater than six wale-widths in length.

The fabric is adapted to be produced on any conventional type of multi-feed knitting machine equipped with mechanism for selectively moving the needles to latch clearing, thread taking, and stitch casting positions, or the fabric may be produced on a hand frame whereby the needles may be manually or mechanically moved to the positions noted, selectively.

The construction of the fabric and the method of producing it in accordance with the principles of the present invention will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 diagrammatically illustrates a piece of fabric composed of groups of three differently colored sections disposed in successive order repeats coursewise of the fabric, with the side lines of the sections extending parallel to the wales;

Fig. 2 is a view similar to Fig. 1 but showing the first section, in each of the groups of three sections, as composed of one color while the other two sections of each group are composed of a different color;

Fig. 3 is a view similar to Fig. 1 but showing the side lines of the sections as extending at an angle with respect to the wales of the fabric;

Figs. 4, 5, 6 and 7 show other forms of designs having three different colors in each of certain groups of courses of the fabric stitches;

Fig. 8 shows an enlarged stitch diagram of the back of the piece of fabric shown in Fig. 1;

Fig. 9 shows an enlarged stitch diagram of the back of the piece of fabric shown in Fig. 3; and

Figs. 10 to 18 diagrammatically show the needle

positions as in starting the striped portion of the fabric shown in Figs. 1 and 8, illustrating how each differently colored thread for the respective sections of the groups of sections are called into action to produce the sections and to tie the floats in at the juncture lines between adjacent sections.

In order to describe in the simplest manner the operations involved in producing a composite fabric of the nature described above the simplest form of the invention, i. e. that illustrated in Figs. 1 and 8, will be employed for the purpose of illustration.

In these figures of the drawings and in the needle diagrams shown in Figs. 10 to 18, a piece of fabric A is shown as being composed of a plurality of sections a , a , joined at juncture lines a^1 , a^1 which, in Figs. 1 and 8, are shown as extending parallel to the wale lines a^2 , a^2 of the fabric.

The sections a , a are grouped as indicated at A^1 , A^2 , A^3 , etc., three sections to each group coursewise of the fabric in this instance and the sections in each group are, in the instance shown in Figs. 1 and 2, of different colors, such as indicated at R, W and B, which for the purpose of illustration may be designated as red, white and blue respectively.

Each section a , in the present instance, is shown as having a width of four needle wales, but it will be here understood that each section may include from one wale to six, or any other number of wales, depending upon the length of the floats deemed practical under certain conditions and in certain classes of fabric. In fine gage goods the number of wales per section may be increased and in coarse gage goods the number of wales per section width may be reduced, to keep the length of the floats between tie-in points within a length deemed practical under the particular conditions at hand.

Referring to Figs. 8 and 10 to 18, a plurality of needles 1 are shown, these needles being divided into groups 1^a , 1^b , 1^c , in the present instance, each being adapted to form the stitches comprising the wales a^2 of one section a of the fabric A.

The knitting line of the hand frame or knitting machine is indicated at z .

The needles 1 in Fig. 10 are all shown as having their hooks 2 and latches 3 disposed above the knitting line z with the points 4 of the latches approximately at the knitting line z or below the knitting line to hold the course of stitches, held on the needles, over the latches of the needles.

In Figs. 8 and 10 this course of stitches is designated at x and constitutes the last course of a plain heading on the fabric before the start of a designed portion of the fabric, or a horizontal strip of plain fabric disposed intermediate designed portions of the fabric.

As shown in Fig. 10 with the needles and the course x of stitches disposed as shown therein, the first design thread r (red) is fed to the needles between the hooks 2 and the latches 3.

The groups of needles 1^a which are to form the stitches of the first sections a of each group of sections A^1 , A^2 , A^3 , etc., coursewise of the fabric, for example, the needles that are to form the stitches for the red sections R of the fabric, are raised to cause the stitches x^1 of the course x held on these needles to clear the latches; that is, to cause the stitches x^1 of the course x to get below the points 4 of the latches 3, as shown in Fig. 11.

The needles 1 are then lowered, until the hooks

2 of the needles come below the knitting line z . During this lowering movement of the needles the needles a^1 on which the stitches x^1 had cleared the latches draw the thread r through the stitches x^1 to form the first course of stitches r^1 of the sections R of the fabric, the portions r^2 , r^3 of the thread r , lying intermediate the sections r^1 , float across the needles 1^b , 1^c on which the stitches of the other sections of the fabric are to be produced, as illustrated in Fig. 12.

All the needles are then raised to the level or thread-taking position shown in Fig. 13 and the thread w (white) which is to produce the next series of sections W of the fabric is fed to the needles, the groups 1^b of needles on which the sections W are to be formed are raised further, as shown in Fig. 14, to the latch-clearing position wherein the stitches x^2 of the course x and the sections r^2 of the floating thread r are disposed below the points 4 of the latches 3 of the groups 1^b of the needles 1.

All the needles 1 are then lowered to the stitch-casting position, shown in Fig. 15, the needles 1^b drawing the thread w through the stitches x^2 of the course x to form the stitches w^1 of sections W, and casting the stitches x^2 and the section r^2 of the thread r over their hooks 2. The portions w^2 and w^3 of the thread w lying intermediate the sections W of the fabric float across the needles 1^c and 1^a respectively, between the hooks 2 and the latches 3 thereof.

All the needles 1 are then raised to the level or thread-taking position shown in Fig. 16 and the thread b (blue) is fed to the needles between the hooks 2 and the latches 3 thereof, after which the groups 1^c of needles are raised to their latch-clearing positions, wherein the stitches x^3 of the course x , the sections r^3 of the thread r , and the sections w^2 of the thread w are in position below the points 4 of the latches 3, as shown in Fig. 17.

All the needles are then lowered to the stitch-casting position shown in Fig. 18 wherein the needles 1^c have drawn the thread b through the stitches x^3 of the course x to form the stitches b^1 of the sections B of the fabric, at the same time casting the stitches x^3 of the course x , the floating sections r^3 of the thread r and the sections w^2 of the thread w over their hooks 2, the intermediate portions b^2 and b^3 of the thread b floating across the needles of the groups 1^a and 1^b respectively.

It will be here noted upon reference to Fig. 18 that the thread b as it comes into action on the needles 1^c crosses the floating threads r and w at the line of juncture a^1 between the adjacent sections W and B, the tie-in points being clearly illustrated at T in Figs. 18 and 8.

The first course of the designed portion of the fabric has now been completed and as shown in Figs. 8 and 18 the stitches r^1 , w^1 and b^1 of the first design course are connected walewise of the fabric to the stitches x^1 , x^2 and x^3 of the plain course x , and the sections R, W and B of the composite fabric are tied together coursewise of the fabric by the floating sections of the threads r , w and b crossing the sections intermediate those in which these individual threads form the stitches of the relatively spaced sections, the floats being tied in at each juncture line between adjacent sections to form the ultimate unitary fabric.

It will be here noted that each thread r , w or b , as it comes into action from a floating position ties in the other two floating threads at the

tie-in points T located along the juncture lines a^1 between adjacent sections.

If the sequence of operations just described is carrier on successively the composite fabric shown in Figs. 1 and 8 will be produced, wherein the side lines a^1 , a^1 , of the sections R, W and B will extend parallel to the wale lines a^2 of the fabric, but it upon the completion of each course in the designed section of the fabric the operations on needle groups are shifted bodily one needle to the right for the formation of the stitches of the next course, the effect illustrated in Figs. 3 and 9 will be produced, wherein the side lines or juncture lines a^1 of or between adjacent sections extend at an angle to the wale lines a^2 of the fabric, and the tie-in points T will consistently follow along the lines a^1 to tie in the floating threads in each course at the lines of juncture between adjacent sections R, W and B of the fabric A.

If it is desired to make a narrow stripe of one color, for example, red, alternating with a relatively wide stripe of another color, for example, white, as shown in Fig. 4, two adjacent groups of needles, for example, groups 1^b and 1^c will be supplied with different threads w of the same color (white) while the other group 1^a will be supplied with a thread of a different color (red). Thus by making adjacent sections a of a similar color the floating thread of the other section will be tied in at the juncture line between the two sections of the same color as well as at the juncture lines between the differently colored stripes of relatively different widths, so that a tie-in of the floats will be obtained at every fourth wale, for example, coursewise across the fabric.

Obviously, by shifting the group operations bodily one needle to the right or to the left for each successively formed course the lines of juncture between sections may be caused to extend at an angle to the wale lines a^2 , in a continuous diagonal form, as in Fig. 3 or in a zig-zag form as shown in Fig. 6.

To change the angle of inclination of the juncture lines a^1 the group operations may be repeated in any desired number of courses successively before a bodily coursewise shift of the group operations is effected, and the greater the number of successive courses between shifts the lesser becomes the angle between the suture lines a^1 and the wale lines a^2 .

By dropping needles from one group and adding them to an adjacent group in the formation of successive courses the lines of juncture between adjacent sections may be caused to follow any desired outline and the floating threads will be tied in on the back of the fabric in the same manner as above noted.

Two simple forms of designs produced by dropping needles from one group and adding them to adjacent groups are clearly shown in Figs. 4 and 5.

Fig. 4 shows a fabric composed of a plurality of horizontal strips S, S¹, S² of plain fabric, of various colors or of a similar color, such as would be produced by the formation of courses x , Figs. 8 and 9, successively formed, with interposed design strips S³ and S⁴ formed therein, each design stripe being composed of three different colors, for example, red (R), white (W) and blue (B) with the suture lines a^1 disposed at angles to the wale lines a^2 of the fabric.

Fig. 5 shows an all-over check design composed of blocks of three different colors red (R), white (W) and blue (B) respectively, the various

sections being joined along suture or juncture lines a^1 in the manner above noted, and the floats form one block to another, coursewise of the fabric being tied in at the suture lines as above described and as shown in the drawings, Fig. 9.

From the description of the simple forms of designs shown in the drawings and from the description attendant thereto, it will be obvious that practically any desired form of intricate design may be provided, by proper manipulation of the needles and thread feeds, and that in no case will any stitch of the fabric contain more than a single thread unit; thus an even surfaced composite fabric composed of any desired number of sections tied together to form the ultimate unitary fabric may be produced.

While the needles have been described as all being raised and lowered to and from the thread-taking position at the formation of each section of each course of stitches, obviously only those about to cast stitches to form the new stitches of the next course need be operated while the other groups remain in the thread-taking position; and while the operations have been described as taking place across the entire width of the fabric at one time, as in a flat knitting frame, obviously when using a circular frame the thread taking and stitch casting operations may be carried out in successive order around the frame, the needles being moved to their correct positions for the proper operation at the proper time by any desired form of needle selecting mechanism formed in conventional types of knitting machines now on the market.

I claim:

1. A composite knitted fabric composed of three or more sections extending substantially walewise of the fabric and disposed in successive order coursewise of the fabric with the juncture lines of adjacent sections disposed at an angle to the natural wale lines of the fabric, a thread unit individual to each section, the thread unit of one section floating coursewise across the adjacent sections and interlocked with the thread units of said adjacent sections to tie the sections together to form a unitary fabric.

2. The process for producing composite knitted fabric composed of three or more sections disposed in successive order coursewise of the fabric, said process consisting in feeding an individual thread unit for each section in successive order to the needles on which the fabric is being knit, advancing the needles on which the stitches of one section of the fabric is to be formed to a latch-clearing position when the thread unit for such section is fed to the needles and subsequently retracting the needles of such section to cast the previously formed stitches and the thread units of the adjacent sections floating across the needles of said section from the needles of said section, whereby juncture lines will be definitely established between adjacent sections, the adjacent sections will be tied together, and the said floating threads will be tied into the fabric at said juncture lines, said process further comprising the dropping of needles from the group of needles on which one section is being knit and adding such dropped needles to the group knitting the next adjacent section to produce variations in the juncture lines to cause the section to assume desired contours of outline during the knitting of subsequent courses of stitches.

3. A knitted fabric comprising three or more face sections extending substantially walewise of

the fabric and disposed in successive order coursewise of the fabric with the juncture line of adjacent sections disposed at an angle to the natural wale lines of the fabric, a thread unit individual to each section, the thread unit of one section floating coursewise across the adjacent sections and interlocked with the thread units of said adjacent sections to tie the floating portions of the thread units into the fabric.

- 10 4. The process for producing knitted fabric comprising three or more face sections disposed in successive order coursewise of the fabric, said process consisting in feeding an individual thread unit for each section in successive order to the needles on which the fabric is being knit, advancing the needles on which the stitches of one section are to be formed to a latch-clearing position

when the thread unit of such section is fed to the needles and subsequently retracting the needles of such section to cast the previously formed stitches and the thread units of the adjacent sections floating across the needles of said section from the needles of said section, whereby juncture lines will be definitely established between adjacent sections and the said floating threads will be tied into the fabric at said juncture lines, said process further comprising the dropping of needles from the group of needles on which one section is being knit and adding such dropped needles to the group knitting the next adjacent section to produce variations in the juncture lines to cause the sections to assume desired contours of outline during the knitting of subsequent courses of stitches.

SAMUEL SAFTLAS.

20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150