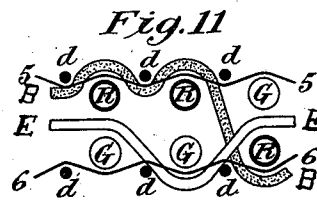
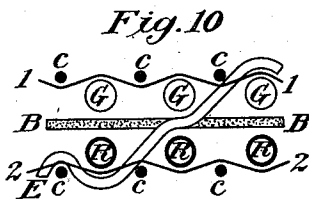
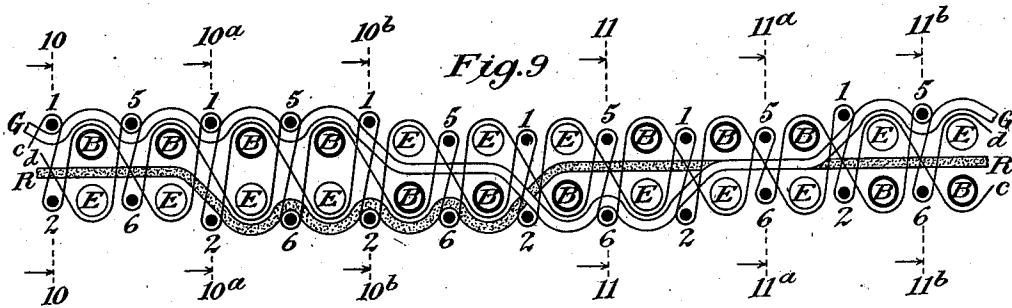
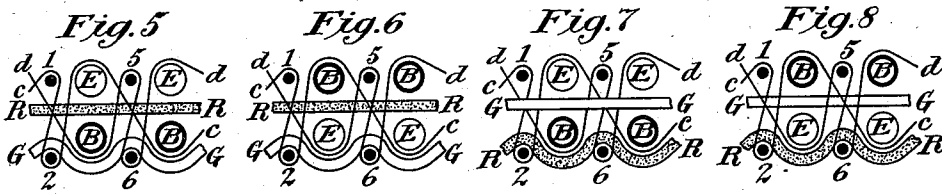
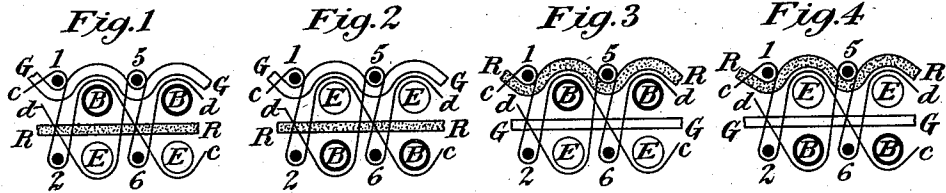


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WOVEN FABRIC.

APPLICATION FILED SEPT. 29, 1909.

1,012,825.

Patented Dec. 26, 1911.



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WOVEN FABRIC.

1,012,825.

Specification of Letters Patent.

Patented Dec. 26, 1911.

Application filed September 29, 1909. Serial No. 520,185.

To all whom it may concern:

Be it known that I, THOMAS BENTON DORNAN, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Woven Fabrics, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates to fabrics such as are used for carpets and rugs, and more particularly to that class of such fabrics in which the pattern and color effects are produced by figuring warp threads and figuring weft threads associated with suitable binding threads.

The object of my invention, generally stated, is to produce a reversible, tightly-woven, homogeneous fabric of the type above referred to, in which a great variety of color effects is attained with a small number of figuring threads, thereby securing a pleasing variety in the patterns together with economy in material.

More specifically, the object of the invention is to produce a fabric of the type above referred to in which, without any increase in the number of figuring threads used, two entirely distinct patterns may be displayed upon the two faces of the fabric, so that the same rug or carpet may present, according as it is laid with one face or the other upward, either one of two patterns having, if desired, nothing in common but the several colors of the component threads.

In Letters Patent of the United States No. 765,961, granted to me July 26, 1904, and No. 781,407, granted to me January 31, 1905, I have disclosed fabrics of the reversible type, in which two sets of figuring warp threads are combined with figuring weft threads and with binding warp threads and binding weft threads. In both of these fabrics the patterns on the two faces are merely color reversals of each other, that is, they are similar except that a given color on one face is always directly opposite a different given color on the other face.

In the fabric of the present invention I may, and preferably do, use the same number of figuring warp threads and figuring weft threads as in the fabrics of my patents above referred to, but I do not confine myself to the use of warp effects opposite to

warp effects, and weft effects opposite to weft effects as in such prior fabrics, but, to the contrary, I use, in addition to these old effects, combinations of the figuring threads in which a warp effect on one face is directly opposite to a weft effect on the other face, and vice versa. By this thread combination I am enabled to produce any desired pattern on one face opposite to any other desired pattern on the other face, the sole restriction upon the two different designs being that the same thread cannot appear upon both faces at once.

I produce my novel fabric by operating the jacquard mechanism in a novel manner. In place of cutting the cards according to a single pattern, I use cards cut according to the two patterns to be produced. These cards are then arranged and laced together in such order that a card cut to produce a given transverse line in one pattern is immediately followed by a card cut to produce the corresponding line on the other pattern, and so on throughout the cards.

The binding threads are preferably controlled, in the usual manner, by means of an automatic lift, and I have found that an arrangement of binding threads similar to that disclosed in my Patent No. 765,961, above referred to, combines with the new arrangement of figuring threads of the present invention, to the production of a highly satisfactory fabric notwithstanding the greater variations of structure characteristic of the present invention.

I shall now describe the embodiment of my invention illustrated in the accompanying drawings, and shall thereafter point out my invention in claims.

Figures 1 to 8, inclusive, are diagrammatic longitudinal sections, or sections taken on planes parallel to the warp threads, of portions of a fabric, each view showing eight shots of weft threads, and the different views illustrating the eight novel thread combinations embodying the present invention. Fig. 9 is a diagrammatic longitudinal section of a portion of a fabric in which several of the new thread combinations shown in Figs. 1 to 8, inclusive, are juxtaposed with combinations of threads heretofore employed for presenting different patterns on the two faces of the fabric. Fig. 10 illustrates, in transverse section, side by side and woven together, units of structure

and design such as would be obtained by transverse sections on planes indicated by the lines 10—10, 10^a—10^a, and 10^b—10^b in Fig. 9, and Fig 11 is a similar view illustrating transverse sections on planes indicated by the lines 11—11, 11^a—11^a, and 11^b—11^b in Fig. 9.

In all of the views the threads shown in cross-section are exaggerated in size relatively to the threads shown longitudinally, and the threads are separated both vertically and horizontally for clearness of illustration.

The novel combinations of threads illustrated in Figs. 1 to 8 are all characterized by the fact that where a figuring warp thread appears on one face of the fabric, a figuring weft thread appears immediately opposite on the other face of the fabric. In these figures the two figuring warp threads are designated as G and R, respectively, and represent threads belonging to two sets of figuring warp threads of different colors. The figuring weft threads are also of two colors, and are designated as B and E, respectively. It will be apparent from these figures that the novel combinations are characterized by the fact that in each case one figuring weft thread is inclosed between the two figuring warp threads, while the other figuring weft thread appears upon either the upper or the lower face of the fabric, as the case may be. In previous fabrics of the type to which this invention relates the figuring threads have been arranged in such a manner that the two successive shots of figuring weft thread were either both between the figuring warp threads, so as to show warp effects on both faces of the fabric, or both outside of the figuring warp threads, so as to show weft effects on both faces. The new thread combinations add to these old combinations such a number of variations of structure and such an independence of the color effects on the two faces of the fabric that the patterns on the two faces may be planned in entire independence of each other except for the fact that the same thread may not appear on both faces of the fabric at the same time.

The complete fabric is composed of figuring warp threads G and R, binding warp threads *c* and *d*, figuring weft threads B and E, and binding weft threads in pairs, marked 1 and 2, and 5 and 6, to indicate their numerical order as shots in each unit of structure of the weave. The successive shots of weft threads are, first, a binding weft thread 1, then a binding weft thread 2, then a figuring weft thread B, then a figuring weft thread E, then a binding weft thread 5, then a binding weft thread 6, then a figuring weft thread B, and then a figuring weft thread E. Eight shots of weft threads are necessary for a repeat of the

weave, so that a unit of structure longitudinally of the fabric is comprised in eight shots of weft threads.

Transversely of the fabric two figuring warp threads G and R and two binding warp threads *c* and *d* are comprised in a unit of structure. The design unit transversely of the fabric corresponds with the unit of structure. The design unit longitudinally of the fabric is one-half of the unit of structure, since the figuring weft threads comprising the third and fourth shots of any unit of structure, and the figuring warp threads as they pass above or below or between these figuring weft threads, may be varied independently of the figuring weft threads which constitute the seventh and eighth shots of each unit of structure and the figuring warp threads in their relation to these figuring weft threads. The binding warp threads *c* and *d* are interwoven with the weft threads in the manner disclosed in my prior Patent No. 765,961, hereinbefore referred to. Considering the binding warp threads *c* in Fig. 9, in the first set shown, commencing at the left, this thread passes first over the binding weft thread 1 of the upper ply, then under the binding weft thread 2 of the lower ply, this binding weft thread 2 being immediately below the binding weft thread 1, then over the figuring weft thread B, which constitutes the third shot of weft threads, then between the binding weft threads 5 and 6, and then below the figuring weft thread E, which constitutes the eighth shot of weft threads. The binding warp thread *d* passes between the binding weft threads 1 and 2, then under the figuring weft thread E which constitutes the fourth shot of weft threads, then over the binding weft thread 5, then under the binding weft thread 6, and then over the figuring weft thread B, which constitutes the seventh shot of weft threads. This completes a unit of structure or repeat of the weave, and the same general arrangement is followed in succeeding units of structure or repeats of the weave except for the variations in the positions of the figuring threads which the invention contemplates and which may be effected for the production of the desired design or designs.

By the arrangement of binding threads above described, the figuring threads of the fabric are bound tightly together, making a homogeneous and close-woven fabric. The figuring warp threads, where they appear on the face, are indented between the figuring weft threads lying beneath so as to form distended loops somewhat resembling the pile-loops of a Brussels carpet in appearance, and the figuring weft threads, where they appear on the face, are similarly indented, as shown in Figs. 10 and 11.

In the fabric shown, four distinct colors

may be employed in the figuring threads and for purposes of illustration it may be assumed that the figuring warp threads R are red, the figuring warp threads G are green, the figuring weft threads B are black, and the figuring weft threads E are ecru. With such colorings of the figuring threads, the upper face of the fabric, as shown in Fig. 9, commencing from the left, will present, first, a green warp effect comprising four successive loops of a figuring warp thread G, then an ecru weft effect composed of three successive loops of figuring weft threads E, then a black weft effect composed of three successive loops of figuring weft threads B, and then a green warp effect composed of two successive loops of a figuring warp thread G. On the lower face the arrangement is entirely different. Here there are two loops of ecru weft threads, then four loops of a red warp thread, then two loops of a green warp thread, then two loops of ecru weft threads, and then two loops of black weft threads.

It will be obvious that in the fabric described the changes in the colors on one face occur at different points from those on the other face and are independent thereof, and this is true not only in respect to the longitudinal lines of the fabric, as illustrated in the longitudinal section Fig. 9, but will be equally true as to transverse lines of the fabric as illustrated in Figs. 10 and 11.

In Fig. 10 is shown on the upper face of the fabric, first, two successive loops of green figuring warp threads G, and then a loop of an ecru figuring weft thread E, while on the lower face is shown, first, a loop of an ecru figuring weft thread E, and then two successive loops of red figuring warp thread R.

In Fig. 11 is shown on the upper face, first, two successive loops of a black figuring weft thread B, and then a loop of a green figuring warp thread G, while on the lower face is shown, first, a loop of a green figuring warp thread G, then a loop of an ecru figuring weft thread E, and then a loop of a black figuring weft thread B.

Figs. 9, 10 and 11 do not illustrate all of the eight new thread combinations shown in Figs. 1 to 8, inclusive, but it will be apparent that they are all interchangeable with any of the thread combinations shown. Fig. 9 illustrates in the first repeat of the weave one of the novel weft structures characteristic of the present invention, to wit, that shown in Fig. 1. The second repeat of the weave is one of the structures disclosed in my before-mentioned Letters Patent No. 765,961. The third repeat of the weave is the novel structure shown in Fig. 7. The fourth repeat of the weave is in the first unit of design therein half of the novel structure shown in Fig. 5 and in the sec-

ond unit of design therein half of the novel structure shown in Fig. 6. The fifth repeat of the weave is a structure shown in my before-mentioned Letters Patent No. 765,961, and the sixth repeat of the weave is the novel structures shown in Fig. 2. Fig. 10 illustrates in the first unit of structure and design the novel structure shown in Fig. 1, in the second unit one of the structures disclosed in my before-mentioned Letters Patent No. 765,961, and in the third unit the novel structure shown in Fig. 7. Fig. 11 illustrates in the first unit of structure and design the novel structure shown in Fig. 6, in the second unit a structure shown in my before-mentioned Letters Patent No. 765,961, and in the third unit the novel structure shown in Fig. 2.

The thread combinations shown are highly advantageous in that, notwithstanding the great variations of structure, the tension of the binding warp threads is substantially equalized throughout the fabric, resulting in a uniformly tightly bound and evenly woven fabric. At the portions of the fabric where a warp effect appears on one face while a weft effect appears on the other face, the binding weft threads will be drawn more deeply into the body of the fabric on the face where the weft effect appears than on the face where the warp effect appears, but, by reason of the fact that each binding warp thread in its relation to the figuring weft threads binds first a figuring weft thread of one ply in one unit of design and then a figuring weft thread of the other ply in the next unit of design, there results a substantial equalization of tension which attains the desired evenness of weaving.

As the function of the binding threads is chiefly mechanical, and as they are comparatively slender, they may be black, as in that case they do not substantially impair the colors of the fabric but have the effect of defining and shading the rows of loops. They may be variously colored, however, if desired.

For simplicity in illustration I have shown my fabric as comprising single figuring threads, each represented by a single circle, but in weaving this fabric I may employ two or more warp threads controlled as one thread, in place of one heavy warp thread, or two or more weft threads in the same shed in place of a single heavy weft thread. Where such an arrangement is adopted the binding warp threads may be located either between the two groups of figuring warp threads constituting adjacent units of design, or interposed between the threads constituting a single unit of design, the latter arrangement being, however, preferable in fabrics of this type. It is obvious that various modifications may be made in the construction shown above particularly

described within the principle and scope of my invention, as defined in the following claims.

I claim:

5 1. A woven fabric comprising figuring weft threads, two sets of figuring warp threads, binding warp threads and binding weft threads, the figuring threads being arranged to produce at some points in the
10 fabric a warp effect on one face opposite a weft effect on the other face, and each binding warp thread being arranged to pass alternately above and below binding weft threads on both faces of the fabric.

15 2. A woven fabric comprising two sets of figuring warp threads, two sets of figuring weft threads, binding warp threads, and binding weft threads, the figuring threads being arranged at some portions of the fabric with one figuring warp thread between the figuring weft threads and the other
20 figuring warp thread outside of the figuring weft threads, so as to produce at a given point in the fabric a warp effect on one face and a weft effect on the opposite face, and the binding warp threads being arranged to bind the binding weft threads with a single binding weft thread in each loop of binding warp threads, and to bind the figuring
30 weft threads with a plurality of figuring weft threads in each loop of binding warp threads.

3. A woven fabric comprising figuring weft threads, two sets of figuring warp threads, binding warp threads and binding weft threads, the figuring warp threads being arranged at some points between the figuring weft threads and at other points outside of the figuring
35 weft threads, the warp effects and weft effects thus produced being juxtaposed on

each face of the fabric independently of the other face, so as to produce two different patterns on the two faces and the binding warp threads being arranged to bind the
45 binding weft threads with a single binding weft thread in a loop of binding warp threads, and to bind the figuring weft threads with a plurality of figuring weft threads in each loop of binding warp
50 threads.

4. A woven fabric comprising figuring weft threads, figuring warp threads, binding weft threads, and binding warp threads, the weft threads being arranged in sets of
55 eight weft threads each, four figuring weft threads and four binding weft threads in each set, the binding warp threads binding the binding weft threads with a single binding weft thread in each loop of binding warp threads and binding the figuring weft threads with two figuring weft threads in each loop of binding warp threads, and the
60 figuring warp threads being arranged in pairs, with one figuring warp thread between the figuring weft threads and the other figuring warp thread outside of the figuring weft threads at some points in the fabric, both figuring warp threads between the figuring weft threads at other points in
65 the fabric, and both figuring warp threads outside of the figuring weft threads at still other points in the fabric, so as to produce upon the two faces of the fabric two independent and distinct patterns comprising
70 both warp effects and weft effects.

In testimony whereof I have affixed my signature in presence of two witnesses.

THOMAS BENTON DORNAN.

Witnesses:

S. D. BAILEY,
J. H. YARNALL.