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H. L. SHUTTLEWORTH

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PILE FABRIC AND METHOD OF WEAVING

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Fig. 1,

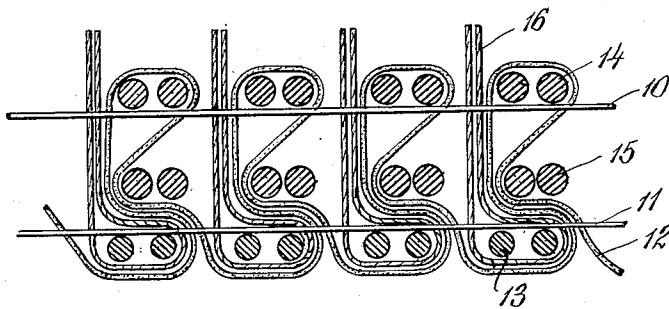


Fig. 2,

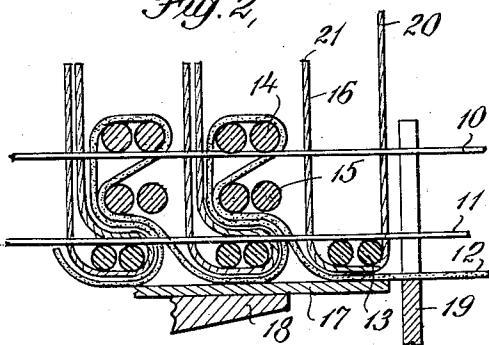


Fig. 3,

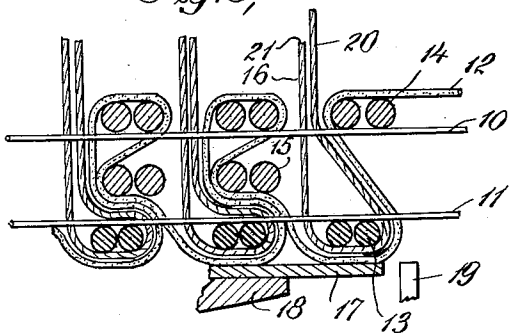


Fig. 4,

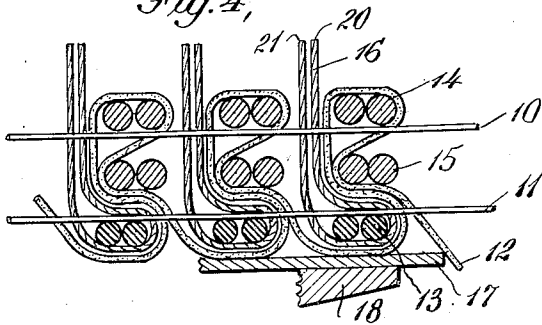


Fig. 5,

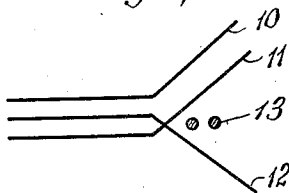


Fig. 6,

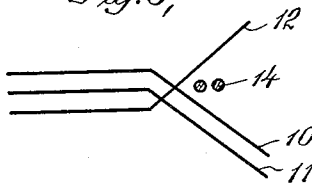
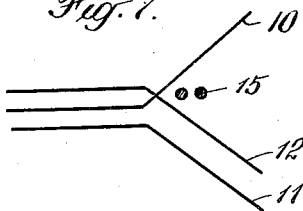


Fig. 7,



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PILE FABRIC AND METHOD OF WEAVING

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Application October 8, 1932. Serial No. 636,822

5 Claims. (Cl. 139—401)

This invention relates to the art of weaving pile fabrics and is concerned more particularly with a novel pile fabric of the Axminster type and a method of weaving it. The new fabric is of the kind in which the pattern is visible on the back and it is superior to similar fabrics of prior construction in that it has a back which is even and smooth without rough spots and lumps, and the yarns forming the pile tufts are drawn tightly about the weft threads and secured firmly in position. This fabric can be woven in accordance with the method of the invention on looms of the usual Crompton and Knowles type with certain additional features, and the new method of weaving can be carried on rapidly and efficiently on such a loom so that the cost of manufacture is low.

Axminster fabrics having patterns visible on the back, as now woven on the Crompton and Knowles loom, are commonly made with a jute filling, and the pile yarns are looped around a shot of filling at the back of the fabric so that the yarns are visible at the back and thus produce the back pattern. The jute filling used is coarse and not uniform in size and weight, and as a consequence, the bottoms of the loops of the pile yarns which are visible on the back are uneven, and this gives the back of the fabric a rough and lumpy appearance. Another objectionable feature of such a fabric is that the pile loops can not be drawn tightly around the weft shots, because of the roughness of the weft, and this adds to the uneven appearance of the back and results also in the pile yarns not being firmly bound in place in the fabric.

In an Axminster fabric of the type referred to, it is necessary to employ a relatively stiff weft, such as jute, to oppose the cotton warp, because, unless the weft has considerable stiffness, the weft threads will be crimped under the tension of the warp threads during the weaving, resulting in a weaving in or shrinkage in the width of the woven fabric. Such a shrinkage is undesirable for obvious reasons, and in particular, it interferes with the insertion through the warp of the tube frames which carry the pile yarns and may, in fact, prevent the individual pile yarn ends from being properly placed between the warp threads to be looped around the weft threads. Weft threads of jute inserted by a needle so that each weft shot consists of two strands are sufficiently coarse and stiff so as not to be crimped during the interweaving of the warp threads, and the use of jute insures that the fabric will remain the same width as the tube frame.

The rough uneven jute threads, however, have the disadvantages above pointed out, but, if a softer and more uniform weft thread were used, such as a cotton thread, the soft weft would be crimped by the tension on the warp threads and the resulting shrinkage would be prohibitive. To overcome this difficulty, it has been proposed to employ cotton thread which has been sized for weft in Axminster fabrics, but the use of sized cotton weft in substitution for jute increases the cost of the fabric and such weft does not give the body of the fabric the desired stiffness.

The fabric of this invention avoids the disadvantages of the prior fabrics above mentioned, and is superior thereto in that it has a smooth back with the necessary stiffness, the full pattern is visible on the back, and the fabric can be manufactured at a low cost. The smooth and even back is obtained by using weft shots of both jute and unsized cotton, with the cotton weft employed on the back of the fabric and having the pile yarns looped about it and the jute weft inserted as the other shots and serving to prevent weaving in. Since the cotton weft threads are smooth and even, the pile yarns can be drawn tightly about them to produce the desired smooth even back, while the jute weft shots give the fabric the desired body stiffness. The manner in which the weft shots of jute are inserted in accordance with the new method insures that the pile tufts will be firmly bound in place and drawn tightly about the cotton weft shots during the weaving operations.

The new fabric is of the three-plane type, preferably including three shots of weft per row of tufts, binder warps, and two sets of stuffer warps. In the weaving of the fabric, the first shot of weft, which is a double strand of unsized cotton, is inserted to lie below the lower stuffer warps and the pile yarns are looped around this first shot. The second shot of weft, which consists of a double strand of coarse jute, lies above the upper stuffer warps, and the third shot of weft, also a double strand of coarse jute, lies between the upper and lower stuffer warps. The insertion and beating up of the second and third shots forces the ends of the pile loops against each other and in contact with the fell of the fabric and this causes the pile yarns to be drawn tightly against the lower shot around which they are looped. The binder warps pass over the top of the shots which lie above the stuffer warps and below the shots which lie below the stuffer warps, the binder warps preferably consisting of a single set of threads so manipulated as to be looped about the top and

bottom shot of each cycle and to pass at one side of the middle shot. To insure that the pile yarns will be held firmly in position and in tight engagement with the weft shot about which they are looped, the lengths of pile yarn are engaged from beneath immediately after their insertion in the fabric and are held tightly against the bottom weft shot of the cycle while the top and middle weft shots are being inserted and beaten up.

For a better understanding of the invention, reference may be had to the accompanying drawing, illustrating the preferred form of the new fabric. In the drawing,

Fig. 1 is a view in longitudinal section through one form of the new fabric with the threads separated to illustrate the weave more clearly;

Fig. 2 is a similar view showing the fabric just after the insertion of the first weft shot of a cycle;

Fig. 3 is a similar view showing the fabric just after the insertion of the second weft shot of the cycle;

Fig. 4 is a similar view showing the fabric just after the insertion of the third weft shot of the cycle; and

Figs. 5, 6, and 7 are diagrammatic views illustrating the manipulation of the warp threads during the insertion of the first, second, and third weft shots of a cycle, respectively.

With reference now to the drawing, the fabric illustrated includes an upper set of stuffer warps 10, a lower set of stuffer warps 11, binder warp threads 12, and weft shots 13, 14, and 15, respectively. The weft shot 13 of each cycle is inserted to lie below the lower stuffer warps and this weft shot is made of relatively small unsized cotton thread. This thread is smooth and uniform in diameter and so soft that it would be crimped by the tension of the warp threads. The weft shots 14 and 15 are relatively coarse and of jute, and they are stiff enough to withstand the tension of the warp threads without being crimped. Looped about the first weft shot of each cycle are tuft yarns 16, and, since these yarns are exposed at the back of the fabric, the pattern is visible both on the face and on the back.

In weaving the new fabric, the usual Crompton and Knowles loom is employed, the loom being provided with an additional press plate 17 movable over the fixed breastplate 18 of the loom, the press plate being of any suitable construction, for example, that shown in United States Patent No. 1,804,008 to W. B. Greaves, et al. In addition, the loom is provided with a needle which has an eye to which access may be had through the side of the needle and suitable guides and selectors are employed so that the needle may insert cotton or jute weft in the fabric as may be required. Such a needle together with a mechanism for threading it is disclosed in my pending application, Serial No. 591,992, filed February 10, 1932.

In the weaving of the fabric, the usual tube frame dips into the warp to insert the pile yarns 16 and thereafter the first weft shot 13 of each cycle is inserted. The ends of yarn from the tubes extend down below the weft shot 13 and are turned around beneath the weft shot by the advance of the press plate 17. The free ends of the yarn are then turned up and passed between the warp threads by the usual comb 19, the insertion of the pile yarns being carried on under such conditions that one end 20 of each yarn lies somewhat above the other end 21. During the insertion of the first weft shot, the warp

threads are manipulated to produce the shed illustrated in Fig. 5, both stuffer warps 10 and 11 being raised and binder warp 12 being lowered.

Upon completion of the insertion of the first shot and the looping of the pile yarns about it, the second shot is inserted in the shed illustrated in Fig. 6, in which the binder warps 12 are raised and the two stuffer warps 10 and 11 are lowered. During the insertion of this shot, the press plate 17 remains in contact with the bottoms of the tuft yarns looped about the first shot 13, holding the tuft yarns in tight engagement with that shot. As the second shot 14 is beaten up by the reed, plate 17 is retracted slightly but continues to hold the tuft yarns in engagement with the shot about which they are looped. When the second shot 14 is beaten up, it forces the end 20 of each loop toward the end 21 and this draws the end 20 downward toward the fabric to a slight extent.

The third shot 15 of the cycle is now introduced into the shed illustrated in Fig. 7 in which the stuffer warps 10 are raised and the stuffer warps 11 and binder warps 12 lowered, the shot 15 thus lying between the upper and lower stuffer warps with the binder warps passing at one side of it. As this shot is beaten up, the plate 17 which has been moved to fully advanced position following the beating up of shot 14, is again retracted so as not to contact with the reed, but the plate continues to hold the tuft yarns tightly against the weft shot 13 about which they are looped. Upon the beating up of the third weft shot 15, the ends 20 of the tuft loops are drawn down into line with the ends 21 and at the same time, the tuft loops are forced into contact with the weft shots of the cycle previously introduced. The sequence of operations described is repeated with the insertion of successive cycles.

It will be observed that in the weaving of the new fabric, the pile yarns which are looped about the lower weft shot are held in continuous contact with that weft shot during the insertion of the second and third shots of each cycle. As these later shots are inserted and beaten up, they draw the pile loops tight and, as a consequence, the tuft yarns are in tight engagement with the bottom weft shot and this, together with the evenness and uniformity of the cotton threads used for the first weft shots of each cycle, gives the back the desired smooth, even appearance. The use of the coarse jute for the second and third shots of each cycle gives the fabric the necessary stiffness and body and prevents weaving in or shrinkage.

The fabric thus has the advantages accompanying the use of both jute weft and unsized cotton weft without the disadvantages previously attendant upon the use of such weft materials.

This application constitutes a continuation in part of my co-pending application, Serial No. 591,992, filed February 10, 1932.

I claim:

1. A three plane pile fabric of the Axminster type which comprises stuffer warp threads in upper and lower levels, shots of weft inserted in cycles of three with one shot of each cycle lying below the lower stuffer warp threads, another shot of said cycle lying above the upper stuffer warps, and another shot of said cycle lying between said upper and lower stuffer warps, pile yarns looped about said first shots of said cycles and lying at one side of the other shots thereof with the ends of said yarns projecting upwardly above the top

of the fabric, and binder warps each of which passes beneath the bottom weft shot of each cycle lying below the lower stuffer warps and upward and over the top of the top weft shot of the same cycle which lies above the upper stuffer warps and then downward to the bottom shot of the next cycle, the middle shot of each cycle which lies between the upper and lower stuffer warps and the bottom shot of the same cycle lying on opposite sides of the binder warps.

2. A pile fabric of the Axminster type which comprises stuffer warp threads in upper and lower levels, shots of weft inserted in cycles of three with the first shot inserted in each cycle lying below the lower stuffer warp threads, said shot being of relatively small size and of unsized cotton, the second shot inserted in said cycle lying above the upper stuffer warps, and the third shot inserted in said cycle lying between said upper and lower stuffer warps, said second and third shots being relatively coarse and of jute, pile yarns looped about said first shots of said cycles and lying at one side of the other shots thereof with the ends of said yarns projecting upwardly above the top of the fabric, and binder warps each of which passes beneath the first shot in each cycle and upward and over the top of the second shot of said cycle and thence downward to the first shot in the next succeeding cycle, the first and third shots of each cycle lying on opposite sides of the binder warps.

3. A pile fabric of the Axminster type which comprises stuffer warp threads in upper and lower levels, shots of weft inserted in cycles of three with the first shot inserted in each cycle lying below the lower stuffer warp threads, the second shot inserted in said cycle lying above the upper stuffer warps, and the third shot inserted in said cycle lying between said upper and lower stuffer warps, pile yarns looped about said first shots of said cycles and lying at one side of the other shots thereof with the ends of said yarns projecting upwardly above the top of the fabric, and binder warps each passing underneath the first shot of each cycle and then over the top of the second shot of said cycle, the first and third shots of each cycle lying in loops of the binder warps opening in the plane of the fabric and in opposite directions.

4. A method of weaving pile fabrics consisting of stuffer warps in upper and lower levels, binder warps, weft shots in cycles of three, and pile yarns looped about weft shots, which comprises inserting the first weft shot of each cycle to lie below the lower stuffer warps, looping lengths of pile yarn about said weft shot, pressing the bottoms of the loops of pile yarn from beneath into tight contact with said shot, inserting the second shot of said cycle above the upper stuffer warps and beating it up to force the ends of said pile yarns together and toward the fell of the fabric, and inserting the third weft shot of said cycle to lie between the upper and lower stuffer warps and beating it up to force the pile yarns against the fell of the fabric, said binder warps being manipulated during insertion of the weft shots of a cycle so as to pass under the first weft shot of the cycle, then up and over the second shot of said cycle, and down to the first shot of the next succeeding cycle with both upwardly and downwardly extending portions of the binder warps lying at the same side of the third shot of said cycle, said loops of pile yarn being pressed into tight contact with the bottom of the first shot of a cycle throughout the insertion and beating up of the second and third shots of said cycle.

5. A method of weaving pile fabrics consisting of stuffer warps in upper and lower levels, binder warps, weft shots in cycles, and pile yarns looped about weft shots, which comprises inserting lengths of pile yarn between the warp threads, inserting the first weft shot of a cycle to lie beneath said stuffer warps of the lower level, looping said lengths of pile yarn around said shot, inserting the second and third weft shots of said cycle to lie above the upper stuffer warps and between the upper and lower stuffer warps, respectively, and manipulating the binder warps to cause all said warps to pass underneath the first shot of each cycle, upward at one side of the third shot of the cycle, over the second shot of the cycle, and down at the same side of said third shot to the first shot of the next succeeding cycle with the first and third shots of each cycle lying on opposite sides of the binder warps.

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