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2,297,708

METHOD OF MAKING PILE FABRICS

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FIG. I

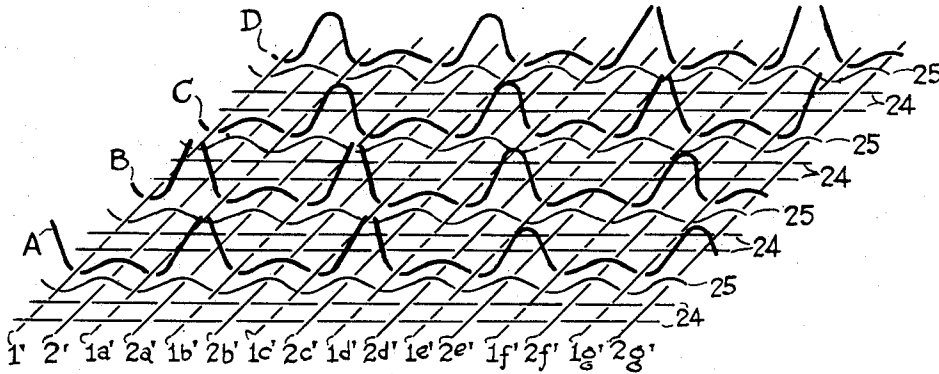


FIG. II

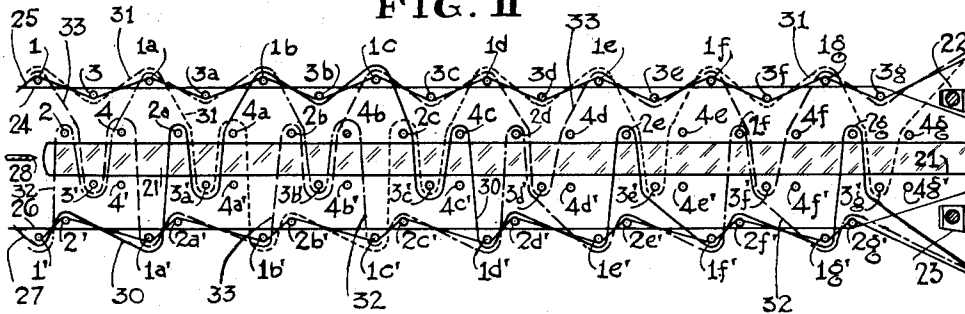
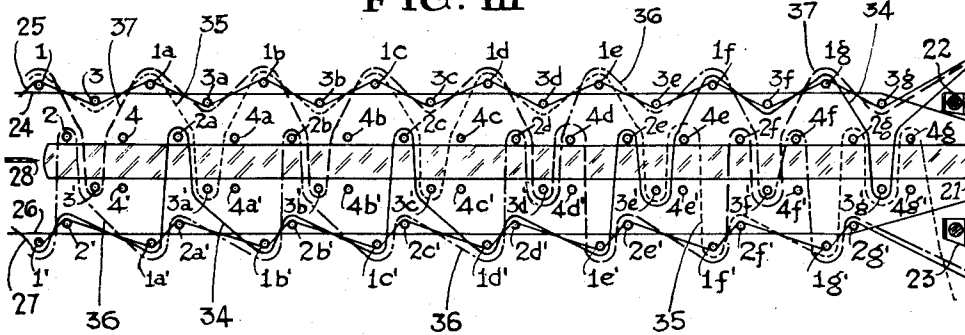


FIG. III



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METHOD OF MAKING PILE FABRICS

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This invention relates to an improvement in the method of simultaneously making two pile fabrics face to face on a loom equipped with non-sheddable warpwise gauges and a reciprocating knife or other loom cutter, each fabric having W cut tufts or both uncut lower W loops and higher cut W tufts.

It is known that pile fabrics may be woven simultaneously face to face with interconnecting pile yarns which are severed on the loom to form cut pile tufts in each fabric having heights greater than one-half the distance separating the two grounds during weaving by causing the interconnecting pile yarns to follow a sinuous course as by looping about ground-free wefts supported on opposite sides of the warpwise gauges. This method of weaving is disclosed in United States Letters Patents 2,108,288 to Kubicky and 2,108,046 to Drobile.

My present concept represents a novel improvement upon the manner of weaving disclosed in the Kubicky and Drobile patents, and effects the production of an improved fabric.

According to my improvement, pile fabrics may be woven face to face with higher cut tufts or self-separating loops together with higher cut tufts which are regularly secured to the backing in the same warpwise row by the so-called fast or W interlacing. By "regularly secured" is meant secured at such regular intervals that the number of ground wefts (preferably one) between legs of adjacent tufts is the same throughout the warpwise row.

My improved method of weaving also permits staggering of both loops and cut tufts in next adjacent warpwise rows which, together with the regularity of interlacings in each row, makes possible the production of fabrics having uniform density of pile coverage and totally lacking the ribbiness which characterized the earlier fabrics. Self-separating loops and higher cut pile tufts may be placed in the same warpwise row in any desired number or sequence without interrupting the regularity of the interlacings. Moreover, loops and higher cut tufts may occur in the same row weftwise across the fabric in any desired or predetermined order or sequence.

I am accordingly able to simultaneously produce loop and higher cut tuft fabrics preferably on a double shuttle loom, each fabric having checked or other pleasing design in which the cut tuft area, as well as the loop pile area, is uniformly dense and without ribbiness.

It is an object of this invention to provide an improved method of producing two pile fabrics

simultaneously face to face on a loom having non-sheddable warpwise gauges and a reciprocating or other type of loom cutter, each fabric having cut tufts higher than one-half the distance separating the two grounds during weaving formed by the severance of ground-interconnecting pile yarns, said higher cut tufts being regularly secured to the backing in each warpwise row by the so-called W interlacing.

Another object of this invention is to provide a method of simultaneously producing two fabrics on the type of loom above described, each fabric having self-separating uncut pile loops and higher cut pile tufts in the same warpwise row in any desired number or sequence, said loops and higher cut tufts being regularly secured to the backing by the so-called W interlacing.

Another object is to provide a method of simultaneously weaving two fabrics as above described, each having self-separating uncut pile loops and higher cut pile tufts occurring in the same warpwise row regularly secured to the backing by the W interlacing, said loops and higher cut tufts being staggered in next adjacent warpwise rows.

Another object is to provide a method of weaving as above described in which tight and slack ground warps are employed to hold the ground wefts of each fabric in two different planes, and in which the loops and higher cut tufts are regularly secured to the backing by looping about and between three successive wefts, two of which are on the back side of the tight warps and the intermediate of which is on the face side of the tight warps.

A further object is to provide a method of simultaneously weaving two pile fabrics each having uncut loops and higher cut tufts in the same rows both warpwise and weftwise of the fabric in any desired or predetermined number or sequence and regularly secured to the backing by the W interlacing.

These and other objects of invention will be manifest from a consideration of the specification, claims and the illustrated embodiments, in which:

Figure I is a diagrammatic perspective view of a section of the improved fabric produced by my improved method of weaving, showing four rows of pile. The spacing is exaggerated to more clearly show the weave.

Figures II and III are diagrammatic views showing my improved method of simultaneously producing two fabrics of the type illustrated

in Figure I. Figure II depicts the weaving of the first two dents of Figure I, that is, pile rows A and B, and Figure III depicts the weaving of the last two dents, or pile rows C and D.

Referring to the drawing, as shown in Figures II and III, wefts of cotton or other suitable yarns are laid on both sides of non-sheddable warpwise gauges 21, which may be strips of metal sufficiently thin to pass through the reed dents and having their free ends terminating within the woven fabric a short distance beyond the fell line.

Wefts laid above the gauges are identified in the illustrations by reference numerals 1, 2, 3, 4, 1a, 2a, 3a, 4a, 1b, 2b, 3b, 4b, 1c, 2c, 3c, 4c, 1d, 2d, 3d, 4d, 1e, 2e, 3e, 4e, 1f, 2f, 3f, 4f, 1g, 2g, 3g, 4g, while wefts below the gauge are indicated by reference numerals, 1', 2', 3', 4', 1a', 2a', 3a', 4a', 1b', 2b', 3b', 4b', 1c', 2c', 3c', 4c', 1d', 2d', 3d', 4d', 1e', 2e', 3e', 4e', 1f', 2f', 3f', 4f', 1g', 2g', 3g', 4g'. Wefts in the same vertical weft plane, such as 1 and 1', may preferably be laid simultaneously as by shuttles 22 and 23, picked simultaneously from the same or opposite sides of the loom. A single shuttle, may, however, be employed if desired.

Above the gauges tight warps 24 and slack warps 25 are shedded to interlace with alternate wefts 1, 3, 1a, 3a, 1b, 3b, 1c, 3c, 1d, 3d, 1e, 3e, 1f, 3f, 1g, 3g, to form the upper ground fabric. The other alternate wefts 2, 4, 2a, 4a, 2b, 4b, 2c, 4c, 2d, 4d, 2e, 4e, 2f, 4f, 2g, 4g, are left free of the ground warp interlacings and are supported by the warpwise gauges 21. These ground-free wefts may be termed face wefts and may serve to support loops of pile yarn, as hereinafter described.

The interlacings of the tight and slack ground warps with the alternate wefts is regular and such that alternate ground wefts 1, 1a, 1b, 1c, 1d, 1e, 1f, 1g, are above or on the back side of the tight warps and the other alternate ground wefts 3, 3a, 3b, 3c, 3d, 3e, 3f, 3g, are below or on the face side of the tight warps.

Below the gauges tight warps 26 and slack warps 27 are shedded to interlace with alternate pairs of successive wefts to form the lower ground fabric, leaving the other alternate pairs of successive wefts free of ground warps to serve as face wefts for supporting looped pile yarns, as hereinafter described.

In Figures II and III of the drawing, wefts 1', 2', 1a', 2a', 1b', 2b', 1c', 2c', 1d', 2d', 1e', 2e', 1f', 2f', 1g', 2g' are shown interlaced with the tight and slack ground warps 26 and 27, while wefts 3', 4', 3a', 4a', 3b', 4b', 3c', 4c', 3d', 4d', 3e', 4e', 3f', 4f', 3g', 4g' are shown free of ground wefts to form face wefts. The alternate interlaced wefts 1', 1a', 1b', 1c', 1d', 1e', 1f', 1g' are below or on the back side of tight warps 26 and the other alternate interlaced wefts 2', 2a', 2b', 2c', 2d', 2e', 2f', 2g' are above or on the face side of the tight warps.

It will be observed that the wefts of the lower ground fabric which are below or on the back side of the tight warps 26 are in the same vertical weft planes as the wefts of the upper ground fabric which are above or on the back side of the tight warps 24 of the upper ground.

The tight and slack ground warps in both the upper and lower ground fabrics may preferably occur weftwise across the fabric in the sequence of two tight warps and then one slack warp repeated successively, with the pile loops and tufts supported between the tight warps, the slack

warps weaving with the pile. Other combinations of tight and slack warps may if desired be employed, the requirement to be met being that tight warps be provided in sufficient number and distribution to support alternate ground wefts in a plane above or below that of the other alternate ground wefts.

The ground weaves illustrated in Figures II and III of the drawing may be considered as a four-pick repeat in which the first pair of wefts 1 and 1', preferably thrown simultaneously, are ground wefts in the upper and lower fabrics respectively, each weft being on the back side of the tight warps of its respective ground. The second pair of wefts 2 and 2' consists respectively of a ground-free face weft above the gauges and a ground weft in the lower ground on the face side of the tight warps. The third pair of wefts 3 and 3' consists respectively of a ground weft in the upper ground on the face side of the tight warps and a ground-free face weft below the gauges. The fourth pair of wefts 4 and 4' are both ground-free face wefts, one being above the gauges and the other being below.

It will be understood that the upper and lower grounds shown in the illustrations and described above may be reversed if desired. It will also be understood that the direction of weaving may be reversed, that is, the fabric may be woven from right to left as viewed in the drawing, Figures II and III, in which case the four-pick repeat may be considered as again beginning with a pair of ground wefts, one weft each in the upper and lower fabrics respectively, each weft being on the back side of the tight warps of its respective ground. The second, third and fourth pairs of wefts of the four-pick repeat in this direction as shown in the drawing are: a pair of ground-free face wefts, one weft on each side of the gauges; a ground weft, and a ground-free face weft, the ground weft being on the face side of the tight warps of the upper ground; and finally a ground-free face weft and a ground weft, the ground weft being on the face side of the tight warps of the lower ground.

In each of Figure II and Figure III there is illustrated the weaving of two adjacent dents, the pile tufts and loops being staggered in next adjacent rows. The lower portion of fabric produced in Figure II is identical to that of pile rows A and B of the fabric shown in Figure I, while the lower portion of fabric produced in Figure III is identical to that of pile rows C and D of Figure I. Reference numeral 28 depicts the reciprocating loom knife or cutter by which the interconnecting pile yarns are severed to form higher cut pile tufts.

In Figure II pile forming yarns 30 and 31, which may be of wool, mohair, acetate, viscose, nylon, casein, cotton, or other fibers or blends thereof, weave oppositely to each other. The pile yarn 30 is shown secured to the lower ground fabric by looping about and between ground wefts 1', 2' and 1a', and pile yarn 31 is shown secured to the upper ground fabric by looping about and between ground wefts 1, 3 and 1a. Each pile yarn is then looped about two ground-free face wefts, the first of which is located between the gauges and the opposite ground and the second of which is located between the gauges and the ground to which the pile yarn is secured. In the illustration, pile yarn 30 is shown looping about face weft 2a above the gauges and then about face weft 3a' below the gauges, while pile

yarn 31 is shown looping about face weft 3a' and then about face weft 4a. Each pile yarn is then taken to and secured in the ground opposite to that to which it was first secured. Pile yarn 30 is shown being taken to the upper ground and being secured therein by looping about and between ground wefts 1b, 2b and 1c, and pile yarn 31 is shown being taken to and secured in the lower ground by looping about and between ground wefts 1b', 2b' and 1c'.

Each pile yarn may then be returned to the ground to which it was first secured by again looping each pile yarn about a pair of ground free face wefts located on opposite sides of the gauges. In the illustration, pile yarn 30 is shown looping about face wefts 3c' and 4c before returning to the lower ground, and pile yarn 31 is shown looping about face wefts 2c and 3c' before returning to the upper ground. Note that in each case the interconnecting pile yarns are looped about face wefts on opposite sides of the gauges located in next adjacent weft planes, and that one of the face wefts is in common a support for each of the oppositely weaving pile yarns.

It will be observed that the manner of weaving described and illustrated permits the interconnection of opposite grounds with pile forming yarns having a length greater than the distance which separates the two grounds during weaving, and that when the fabrics are woven off the ends of the warpwise gauges the grounds may be spread apart to straighten the interconnecting pile forming yarns without interlocking occurring between the two oppositely weaving interconnecting pile yarns. It will further be noted that the method of weaving shown and described permits the said oppositely weaving interconnecting pile yarns to be regularly secured to the ground fabrics. As shown in the illustration, a single ground weft separates each group of three successive ground wefts which secure pile yarns to the grounds.

According to my method of weaving, the oppositely weaving pile yarns which have been interconnecting the two opposite ground fabrics may at any time be shed to form self-separating uncut pile loops instead of interconnections.

Referring to Figure II pile yarn 30 is shown forming a loop in the lower ground fabric by being taken over face weft 2e located above the gauges and then returned to the lower ground and secured therein in the usual manner. Pile yarn 31 is shown forming a loop in the upper fabric by being taken under face weft 3e' located beneath the gauges and then returned to the upper ground and secured therein. These loops may be repeated as frequently as is desired in any single warpwise row and without interrupting the regularity with which the pile yarns are secured to their respective grounds. It will be seen from the drawing that where loops are formed a single ground weft separates the groups of three successive ground wefts which secure pile yarns, as is also the case where higher cut tufts are formed.

In Figure II the pile loops of the lower ground could have been formed by passing the pile yarn 30 over face weft 4e instead of over face weft 2e, as in each case the loops of the two grounds would be self-separating and no interlocking would occur.

Referring again to Figure II, pile yarns 32 and 33 shown therein are in the next adjacent dent to that of pile yarns 30 and 31. Pile yarns 32 and 33 weave similarly to that above described

but form interconnections and loops which are staggered to those formed by pile yarns 30 and 31. For example, pile yarn 32 secured to the lower ground is looped about face wefts 2 and 3' located on opposite sides of the gauges, and then taken to and secured in the upper ground by looping about and between ground wefts 1a, 3a and 1b. Pile yarn 33, secured to the upper ground, is looped about face wefts 3' and 4, located on opposite sides of the gauges, and then taken to and secured in the lower ground by looping about and between ground wefts 1a', 2a' and 1b'.

Each of the pile yarns 32 and 33 is then shown returning to the ground to which it was first secured in the manner herein described, after which the pile yarns are shown as forming self-separating pile loops. Pile yarn 32 is shown forming loops over face wefts 2d and 2f, and pile yarn 33 as forming loops about face wefts 3d' and 3f'.

The interconnections and loops formed by pile yarns 32 and 33 are regularly secured to the grounds and their relationship to the staggered interconnections and loops of the adjacent warp pile row is such that after weaving the fabrics off the ends of the wires the grounds may be spread apart to separate the loops and to straighten the interconnecting yarns for cutting without entanglement or interlocking occurring between any of the threads.

In Figure III is diagrammatically shown the method of weaving pile rows C and D of the fabric of Figure I. These pile yarns are in the two dents next adjacent to those occupied by the pile yarns forming rows A and B of the fabric. The loops and cut tufts of rows C and D are complementary to those of A and B, that is, weftwise across the fabric, the loops of pile rows C and D are in line with the cut tufts of pile rows A and B, and the cut tufts of pile rows C and D are in line with the loops of rows A and B. This may be clearly seen in Figure I.

Referring to Figure III and beginning at the left hand side of the drawing, pile yarns 34 and 35 are shown weaving simultaneously and oppositely to each other to form pile loops in the lower and upper grounds respectively. Pile yarn 34 is shed to form loops supported by face wefts 2a and 2c, and pile yarn 35 is shed to form loops drawn about face wefts 3a' and 3c'. Each pile yarn is then shown as being shed to form a looped interconnection with the opposite ground. Pile yarn 34 is shown being taken up to the upper ground and then returning to the lower ground, and pile yarn 35 is shown going to the lower ground and then returning to the upper ground. Each pile yarn intermediate the two grounds forms loops about face wefts supported free of the grounds on opposite sides of the gauges.

Pile yarns 36 and 37 are in the next adjacent dent to pile yarns 34 and 35 and are shown weaving loops and interconnections in staggered relationship to those formed by pile yarns 34 and 35.

Taking the four dents together, it will be seen from the illustrated drawing that lower loops and higher cut tufts may occur in the same row weftwise across the fabric as well as warpwise of the fabric. It will further be seen that the interlacings of the pile yarns with the grounds are regular and uniform throughout, that either loops or cut tufts may be staggered in next adjacent warpwise rows and that the relationship

between the weft and pile threads is such that the grounds may be spread apart to separate the loops and to straighten the interconnecting pile lengths without entanglement or interlocking taking place among any of the threads.

According to my improved method it is consequently possible to simultaneously weave two fabrics face to face each having checked or striped or other predetermined design formed by lower uncut loops and higher cut tufts in which the cut tuft and loop areas are each uniformly dense and free of ribbiness or other irregularity which would be present if the tufts or the loops were not staggered or were not regularly secured to the backing.

Having described my invention, I claim:

1. In the weaving of two pile fabrics simultaneously face to face on a loom equipped with stationary warpwise gauges having free ends, the steps which include laying wefts on both sides of the gauges, interlacing alternate wefts on one side of the gauges with ground warps to form ground, leaving the other alternate wefts free of ground warps to form face wefts, interlacing alternate pairs of successive wefts on the other side of the gauges with ground warps to form ground, leaving the other alternate pairs of successive wefts free of ground warps to form face wefts, securing pile forming warp yarns simultaneously to each ground by looping the said yarns about and between three successive ground wefts, then looping the pile yarns of each ground about a face weft located between the gauges and the opposite ground, then looping each said pile yarn about a face weft located between the gauges and the ground to which the pile yarn is first secured, the two face wefts about which each pile yarn is looped being in next adjacent vertical weft planes, and then securing each of the said pile yarns to the opposite ground by looping about and between three successive ground wefts, weaving the interconnected grounds off the ends of the gauges, spreading the grounds apart and severing the interconnecting pile yarns to form cut pile W-tufts.

2. In a method of weaving as described in claim 1, characterized in that in both the upper and lower grounds some of the ground warps are tight and others are slack, and in that the ground wefts in each ground are so interlaced with the tight and slack ground warps that alternate ground wefts are on the back side of all of the tight warps and the other alternate ground wefts are on the face side of all of the tight warps, the ground warps of each ground which are on the back side of the tight warps being in the same vertical weft plane, and further characterized in that of the three successive ground wefts about and between which the pile yarns are looped two of the wefts are on the back side of the tight warps and the intermediate weft is on the face side of the tight warps.

3. In the weaving of two pile fabrics simultaneously face to face on a loom equipped with stationary warpwise gauges having free ends, each fabric having loops and higher cut tufts, the steps which include laying wefts on both sides of the gauges, interlacing alternate wefts on one side of the gauges with ground warps to form ground, leaving the other alternate wefts free of ground warps to form face wefts, interlacing alternate pairs of successive wefts on the other side of the gauges with ground warps to form ground, leaving the other alternate pairs

of successive wefts free of ground warps to form face wefts, securing pile forming warp yarn simultaneously to each ground by looping the said yarn about and between three successive ground wefts, forming pile loops by looping the pile yarns of each ground about a face weft located between the gauges and the opposite ground, the face wefts on opposite sides of the gauges being in next adjacent vertical weft planes, and then again securing each pile yarn in the same ground to which it was first secured by looping about and between three successive ground wefts, forming interconnecting pile yarns by looping the pile yarns of each ground about a face weft located between the gauges and the opposite ground, then looping each pile yarn about a face weft located between the gauges and the ground to which it was first secured, the face wefts on opposite sides of the gauges about which a pile yarn is looped being in next adjacent vertical weft planes, then passing each pile yarn to and securing it in the opposite ground by looping about and between three successive ground wefts, weaving the interconnected grounds off the ends of the gauges, spreading the grounds apart and severing the interconnecting pile yarns to form cut pile tufts, whereby uncut pile loops and higher cut pile W-tufts are formed in the same warpwise row.

4. In a method of weaving as described in claim 3, further characterized in that the pile loops and higher cut tufts are staggered in next adjacent warpwise rows.

5. In a method of weaving as described in claim 3, characterized in that in both the upper and lower grounds some of the ground warps are tight and others are slack, and in that the ground wefts of each ground are so interlaced with the tight and slack warps that alternate ground wefts are on the back side of all of the tight warps and the other alternate ground wefts are on the face side of all of the tight warps, the ground wefts of each ground which are on the back side of the tight warps being in the same vertical weft planes, and further characterized in that of the three successive ground wefts about and between which pile yarns are secured two of the wefts are on the back side of the tight warps and the intermediate weft is on the face side of the tight warps, and still further characterized in that the loops and higher cut tufts are staggered in next adjacent warpwise rows.

6. In the method of weaving as described in claim 3, characterized in that the face weft about which the pile yarn is looped to form an uncut loop is in the same vertical weft plane as the ground weft located between the two groups of three successive ground wefts, each which secure the pile yarn to the ground.

7. In the method of weaving as described in claim 3, characterized in that the loom is a double shuttle loom and in that the wefts are laid simultaneously on both sides of the gauges.

8. In the weaving of two pile fabrics simultaneously face to face on a loom equipped with stationary warpwise gauges having free ends, each fabric having loops and higher cut tufts, the steps which include laying wefts on both sides of the gauges, interlacing alternate wefts on one side of the gauges with ground warps to form ground, leaving the other alternate wefts free of ground warps to form face wefts, interlacing alternate pairs of successive wefts on the other side of the gauges with ground warps to form ground,

leaving the other alternate pairs of successive wefts free of ground warps to form face wefts, securing pile forming warp yarns simultaneously to each ground by interlacing each yarn about and between three successive ground wefts, forming warp pile loops in each ground by looping pile yarn from each ground about a face weft located between the gauges and the opposite ground, the face wefts on opposite sides of the gauges being in next adjacent vertical weft planes, then again securing each pile yarn in the same ground to which it was first secured by interlacing about and between three successive ground wefts, simultaneously with the formation of the said warp pile loops forming interconnections between the two grounds by looping pile yarn from each ground about a face weft located between the gauges and the opposite ground, then looping each said pile yarn about a face weft located between the gauges and the ground to which it was first secured, the face wefts on opposite sides of the gauges about which the pile yarn is looped being in next adjacent vertical weft planes, then passing each said pile yarn to and securing it in the opposite ground by interlacing about and between three successive ground wefts, then weaving the interconnected grounds off the ends of the gauges, spreading the grounds apart to straighten the interconnecting pile yarns, the pile loops being self-separating, and severing the interconnecting pile yarns to form cut pile tufts, whereby uncut pile loops and higher cut pile W tufts are formed in the same row weftwise across the fabric.

9. In a method of weaving as described in claim 8, further characterized in that the pile loops and higher cut tufts are staggered in next adjacent weftwise rows.

10. In a method of weaving as described in claim 8, further characterized in that pile loops and higher cut pile W tufts are formed in the same warpwise row, as well as in the same weftwise row, each pile yarn being regularly secured to the backing by looping about and between three successive ground wefts.

11. In the weaving of two pile fabrics simultaneously face to face on a loom equipped with stationary warpwise gauges having free ends, the steps which include laying wefts on both sides of the gauges, interlacing alternate wefts on one side of the gauges with ground warps to form ground, leaving the other alternate wefts free of ground warps to form face wefts, interlacing alternate pairs of successive wefts on the other side of the gauges with ground warps to form ground, leaving the other alternate pairs of successive wefts free of ground warps to form face wefts, securing pile forming warp yarns simultaneously to each ground by looping the said yarns about and between three successive ground wefts, then looping each pile yarn about two face wefts, the first of which is located between the gauges and the opposite ground and the second of which is located between the gauges and the ground to which the pile yarn is secured, one of said face wefts being looped by both of said pile yarns, said looping being on the same side of the said weft, and then securing each said pile yarn to the opposite ground by looping about and between three successive ground wefts, weaving the interconnected grounds off the ends of the gauges, spreading the grounds apart and severing the interconnecting pile yarns to form cut pile tufts.

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