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2,826,223

PILE WIRE FOR USE IN CARPET LOOMS

Filed Sept. 21, 1955

2 Sheets-Sheet 1

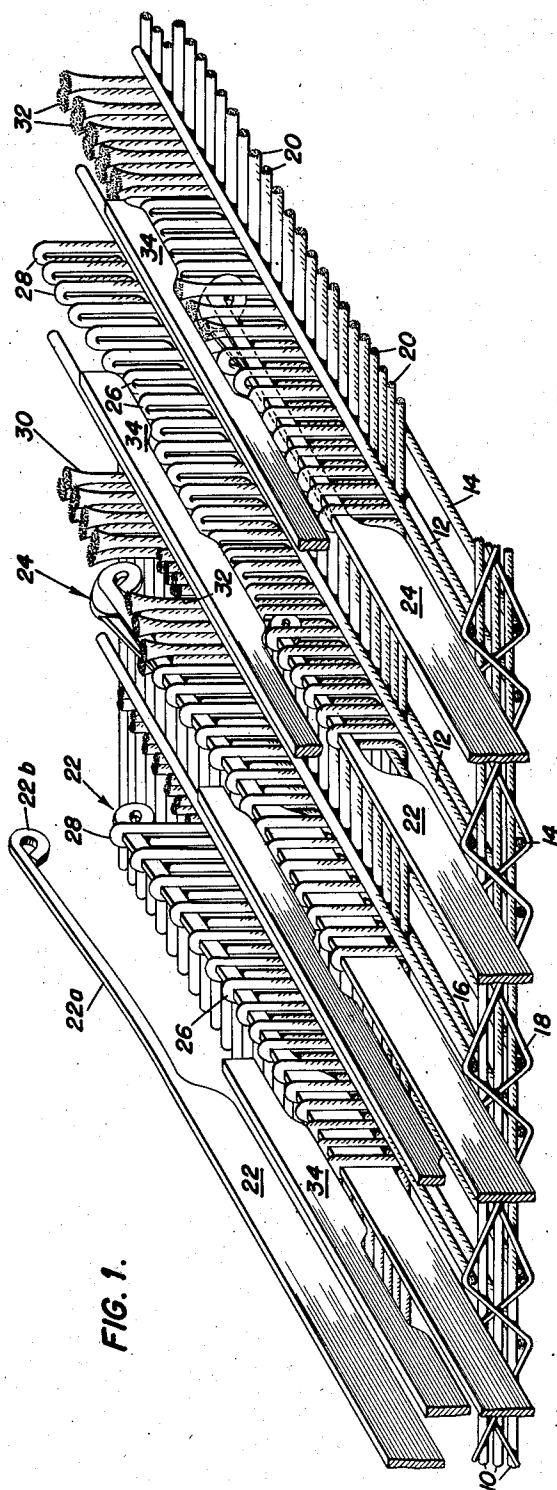


FIG. 1.

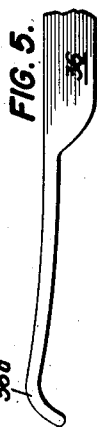


FIG. 5.

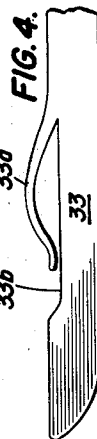


FIG. 4.



FIG. 2.



FIG. 3.



FIG. 6.

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2 Sheets-Sheet 2

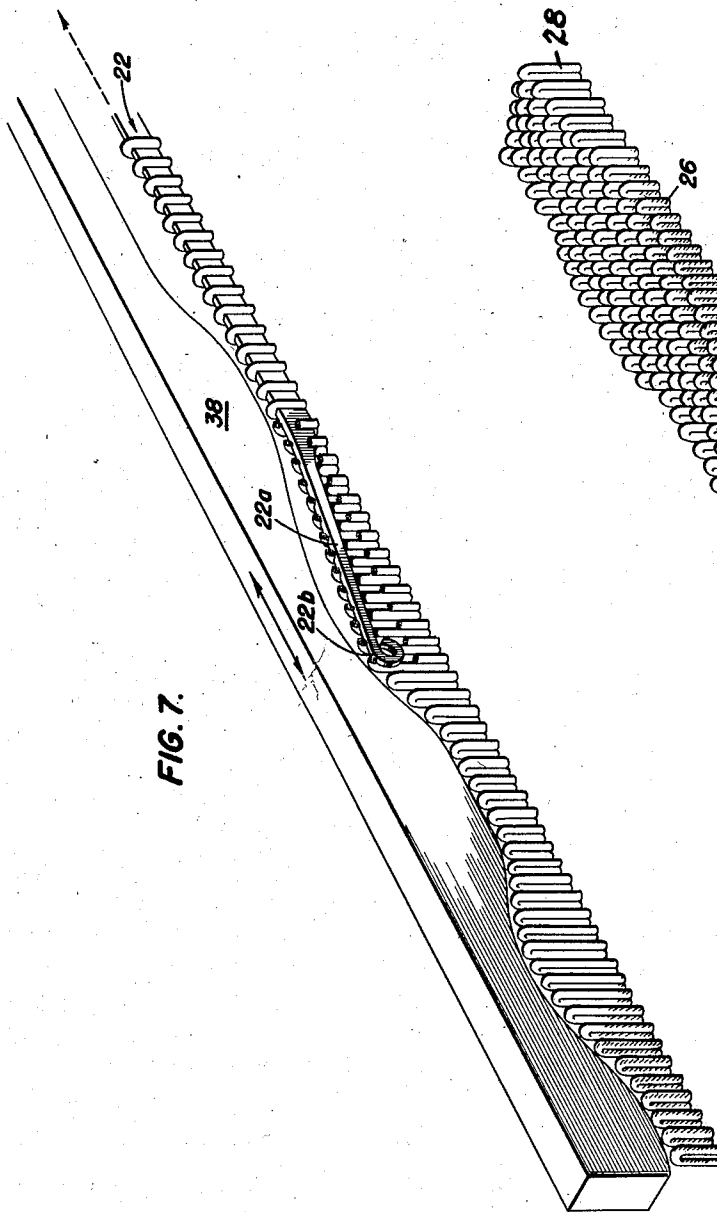


FIG. 7.

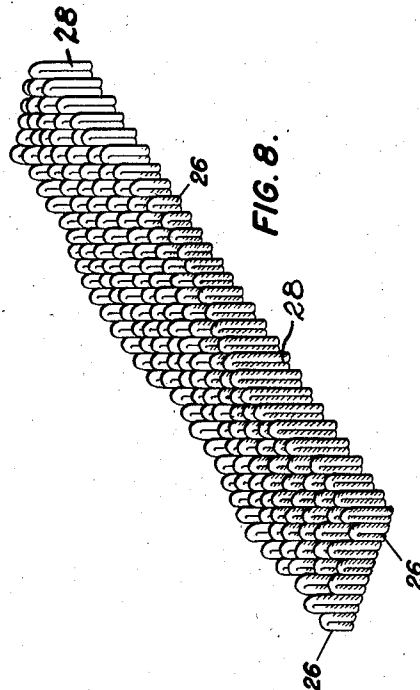


FIG. 8.

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1

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PILE WIRE FOR USE IN CARPET LOOMS

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3 Claims. (Cl. 139—44)

The present invention pertains to the weaving of loop pile fabrics in which the loops in some rows are of varying heights. A similar result has been achieved previously by utilizing a set of pile wires comprising a knob wire having a shank with a straight, low loop forming edge between wires of special shape having upper edges shaped irregularly to provide high and low loop forming portions connected by inclined loop forming portions, the high and low loop forming portions of said wires being arranged with the high portions of one wire opposite the low portions of the other. Various series of shaped and straight wires utilizing a larger number of wires can be employed according to the character of the fabric to be woven.

Where, as represented by Groat Patent 2,532,903, pile fabrics of different patterns have been woven with patterned or scalloped wires, it has been necessary that the pile yarn be fed into the loom from creels, because the use of beams would tend to tear the fabric to pieces during the weaving process in Wilton or velvet power looms.

It is a principal object of this invention to provide means by which a patterned pile fabric is producible on wire looms through a difference in pile height of yarn rather than by the outline of different colors; and whereby production of the fabric is independent of both a jacquard machine and scalloped wires, even though it can be used in conjunction with either.

A further objective of the invention is to so utilize a novel pile wire in combination with a pattern profile member that the same wire can be used repeatedly for different patterns instead of requiring individual sets of wires for each pattern effect to be achieved therewith.

These and other objects and advantages of the invention will be more fully understood from the following detailed description of a preferred embodiment, when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side perspective view of a fabric being woven in accordance with the principles of this invention, and in which the weave structure has been opened up for clarity of illustration;

Fig. 2 shows in side elevation a pile wire having a spring tip formation with a rounded end in advance of a cutting element;

Fig. 3 shows in side elevation another form of a plain pile wire having a modified form of rounded end;

Fig. 4 is a side elevation of a different form of pile wire in which a spring formation is located rearwardly of the advancing end;

Fig. 5 illustrates in side elevation the spring tip formation of a slightly modified pile wire;

Fig. 6 is a side elevation of a profile member or cam strip, partly broken and cross-sectioned, adapted to function in cooperation with the specially formed pile wires of the present invention;

Fig. 7 is a side perspective view of a pile wire with

2

spring tip formation and a cooperating profile member, together with a row of pile loops of varying height; and

Fig. 8 is a top perspective view of the exposed end portions only of a plurality of loop pile rows as they appear on the pile surface of a fabric woven in accordance with this invention.

The pile fabric used for purposes of illustration and shown in detail in Fig. 1 is of the type made on Wilton or velvet looms or the like. More particularly, this figure pertains to a pile fabric of this kind in which pile tufts of varied height in a single pick have been produced by the novel pile wire and profile strip means and procedure of this invention. While the backing may be of any suitable construction, the fabric of Fig. 1 comprises a plurality of stuffer warps 10 and two series of weft threads 12 and 14 lying above and below the stuffer warps 10 and being bound in position by crossed chain binding warps 16 and 18. A plurality of pile warps 20 extending through the length of the fabric backing lie between the stuffer warps 10 and the upper series of weft threads.

As the pile yarn warps 20 are raised a wire is inserted in the shed, after which the pile yarn warps are looped over the wire by lowering the pile warps to pass under the next upper weft thread 12. The pile yarns raised over the spring tipped wires 22, 22 and the spring tipped cutting wires 24, 24 will form rows of uniform loops that are subsequently converted to rows comprising low and high loops 26 and 28, or low and high tufts 30 and 32 in the rows formed by the spring tipped cutting wires 24. To achieve these effects a plurality of profile members 34 cooperate individually with each wire in determining the height and position in the row of pile loops or tufts as the case may be.

Before setting forth in detail the procedure followed in producing such novel results by the use of pile wires, it will be necessary to explain fully the unique characteristics of the wires employed and the construction and function of the profile members.

The pile wires utilized hitherto for generally similar purposes, whether plain, knob, or cutting, have been characterized by an upper edge of fixed configuration. In the previously known methods such wires have been used repeatedly in sets having their respective high and low upper edge portions longitudinally disposed relative to each other in such a way that withdrawal of a wire will increase the height of the loop formed over it either by stretching the embedded portions of yarn or decreasing the height of the preceding loop of the same yarn end. Reliance may also be placed on the stretch or elasticity of the yarn to permit the loop to expand and pass over the high portion of the pile wire when there is no preceding loop from which extra material can be drawn.

At the left side of Fig. 1 there is shown in side perspective a pile wire 22 provided at its free end with an upwardly inclined, reduced and coplanar tip 22a of spring steel that is formed with a rounded end 22b produced by downwardly and reversely bending the tip portion. There is thus provided a rounded end, resilient ramp strip extension of the otherwise plain pile wire 22. Fig. 3 shows in side elevation a slightly modified pile wire 23 that differs from the pile wire 22 only in edge, rather than face engaging, relation of the end surface of the rounded end 23b to the underside of the reduced ramp strip. In both instances the angle or inclination is of the order of 15 to 20 degrees and the length of the ramp strip portion is of the order of 1/4 to 1 1/2 inches. As shown the height of the reduced ramp strip is much less than that of the remainder of the pile wire.

Figs. 4 and 5 illustrate in side elevation the tip and tip end portions of further modified pile wires 33 and

3

36, respectively, having generally similar upwardly inclined resilient ramp strips.

In Fig. 4 the pointed free end portion of pile wire 33 is provided with an upwardly arched hump 33a formed by severing and bending one end of the upper end portion so that the unconnected end will slide readily on the plane surface 33b when depressed from above.

Fig. 5 shows in side elevation the tip and tip end portion of the modified pile wire 36 that is substantially similar to pile wire 23; it differs therefrom only in the slightly lesser inclination of its tip and a rounded end 36a that is bent downwardly but not reversely.

The pile wire 24, the tip end portion of which is shown in side elevation in Fig. 2, is distinguished by the addition of a cutting blade 40 to a pile wire shaped very much like the pile wire 23 of Fig. 3. In order to receive the right triangle shaped blade 40, a rounded abutment formation 24a projects vertically above the outer end of the ramp strip extension as a smooth curve continuation of the rounded end 24b. A blade receiving slot 24c in the formation 24a and the upper edge of the ramp strip receive and secure the blade 40 in the position shown, with its cutting edge uppermost and inclined downwardly from the tip end and lying a small distance beneath the uppermost part of the rounded end 24b.

Detailed consideration will now be given the elongated profile members or pattern blocks 34 that are positioned in vertically aligned cooperative relation to the non-cutting and cutting pile wires 22 and 24 in the pile forming operations illustrated in Fig. 1; and shown separately in Fig. 6 in operative position. These pattern determining members may be formed from rectangular metal strips, seasoned wood, molded or shaped plastic of requisite physical properties, cast iron, flexible steel stock, or any other material having suitable physical properties for the purpose. Those first used in practicing this invention were fashioned from wood, hence the term "pattern blocks." Such pattern blocks, 34, are required to have a length corresponding to the total width of the woven fabric, a height determined by the working space available on the loom, but not less than the highest pile to be produced, plus a small additional upper edge or backbone portion to accommodate the maximum profile indentation (compare Fig. 6). The wire width is dependent on the number of wires to be inserted within the area above the wires, or required for a total set of wires, or the length of the pattern repeat.

A typical profile or cam profile is displayed by the pattern block 34 of Fig. 6, which comprises straight rises 34a and 34b spaced by straight falls or indentations 35a having sloped ends 36a and 36b. The profile or cam surface of blocks 34 may take the form of rounded, angular and straight sections combined in a variety of ways in accordance with the pile pattern desired, and limited to some extent by the ability of the rounded end on the spring tip of the pile wire to follow closely.

The basic principles of this invention can best be explained with reference to the elementary showing of Fig. 7 in which a single non-cutting pile wire 22 and an individual elongated profile member or pattern block 38 are disposed in cooperating working relation. The pattern block 38 is in a fixed position of longitudinal adjustment and the pile wire 22 is in a position of partial withdrawal toward the right of the figure.

In reaching the partially withdrawn position shown the spring tip 22a passed first a short portion of the pattern block 38 having a maximum and uniform rise to raise low pile loops 26 of uniform height, and then moved into a symmetrical curved fall or indentation in which pile loops of progressively increasing height, reaching a maximum height loop 28 and diminishing to a minimum height pile loop 26. The rounded end 22b of spring tip 22a after reaching the position shown in the next succeeding fall or indentation continues to follow

4

the fall or rise of the pattern block 38 until the opposite end of the pile row is reached. It will be noted that the thickness of the pile yarn loops always spaces the rounded end portion of spring tip 22a from the profile surface of the pattern block 38 so that there is no wear on the latter.

From the foregoing description of the function of pile wire 22, it will be apparent that the rounded ends of the spring tip portions of pile wires 23, 24, and 36 will function similarly in raising loop pile under pattern blocks 34 or 38 or any such equivalent profile member.

The pile wire 33 of Fig. 4, while easy to construct from conventional pile wire blanks, is not as capable of following closely all the indentations of the cam surface of a pattern block that has abrupt or sharp changes of direction. It does, however, afford a wire that is rugged and requires a minimum of headroom.

An examination of the progress of the cutting pile wires 24 of Fig. 2 through the alternate loop pile rows of the fabric undergoing weaving in Fig. 1 will show that these wires are similarly controlled in their upward springing by respective pattern blocks 34, 34. Cut and uncut piles are obtainable with the same wire in a given row depending upon the use of pattern blocks having rises sufficiently great to suppress the cutting action of the blades 40 carried by the pile wires 24 in the manner shown in Fig. 4 and previously described.

The use through the teachings of this invention of pile wires with depressible spring tip portions extending above the upper edge of the respective pile wire, and pattern blocks controlling and regulating the action of the spring tip portions on yarn warps initially looped over the pile wires will produce a pile surface of the character shown in Fig. 8 in which groups of pile loops may be made to differ stepwise or progressively up and down in a single row, with the loop pattern of said row repeated in another row or varied in weftwise position, or replaced by a different pattern through use of a pattern block 34 or 38 having a significantly different cam profile.

An almost limitless variety of row pattern of loops can be obtained in a single row or group of rows through predetermined or random shifting or longitudinal displacement of each pattern block of a set. The pile rows having cut pile produced by use of cutting wires 24, as previously explained, can also be varied as widely through longitudinal displacement of the respective cooperating pattern blocks in either direction.

The novel pile wires of this invention embodied in the illustrative wires 22, 23, 36, and 33 represent a subcombination having separate utility apart from the pattern blocks 34 with which they have been combined. For example, use of the pattern blocks is unnecessary in obtaining the same effects when using a standard Wilton type loom having a jacquard mechanism for raising the pile yarns in a predetermined manner. In that instance the novel pile wires herein disclosed will have a function generally similar to a knob wire.

Having thus described my invention, what I claim as novel and desire to secure by Letters Patent of the United States is:

1. A pile wire for use in wire looms comprising a plain wire of uniform height and thickness having at its free end a resiliently depressible, upwardly projecting coplanar spring ramp strip of much lesser height terminating in a downwardly turned rounded end part extending in coplanar relation above the adjacent part of uniform height when undepressed.

2. The pile wire as described in claim 1 in which the upper outer end portion of the ramp strip carries a pile cutting blade device that is ineffective when the ramp strip is depressed.

3. A pile wire for use in wire looms comprising a plain wire of uniform height having at its free end a resiliently depressible, upwardly projecting spring coplanar ramp strip of much lesser height terminating in a

downwardly turned end part extending in coplanar relation above the adjacent part of uniform height when undepressed and having a rounded, vertically projecting abutment formation, the rear edge portion of the abutment formation and the adjacent upper edge portion of the ramp strip being formed with a continuous vertical slot, and a cutting blade mounted in said slot for cutting pile loops when the ramp strip is in its upwardly projecting position.

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5

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