

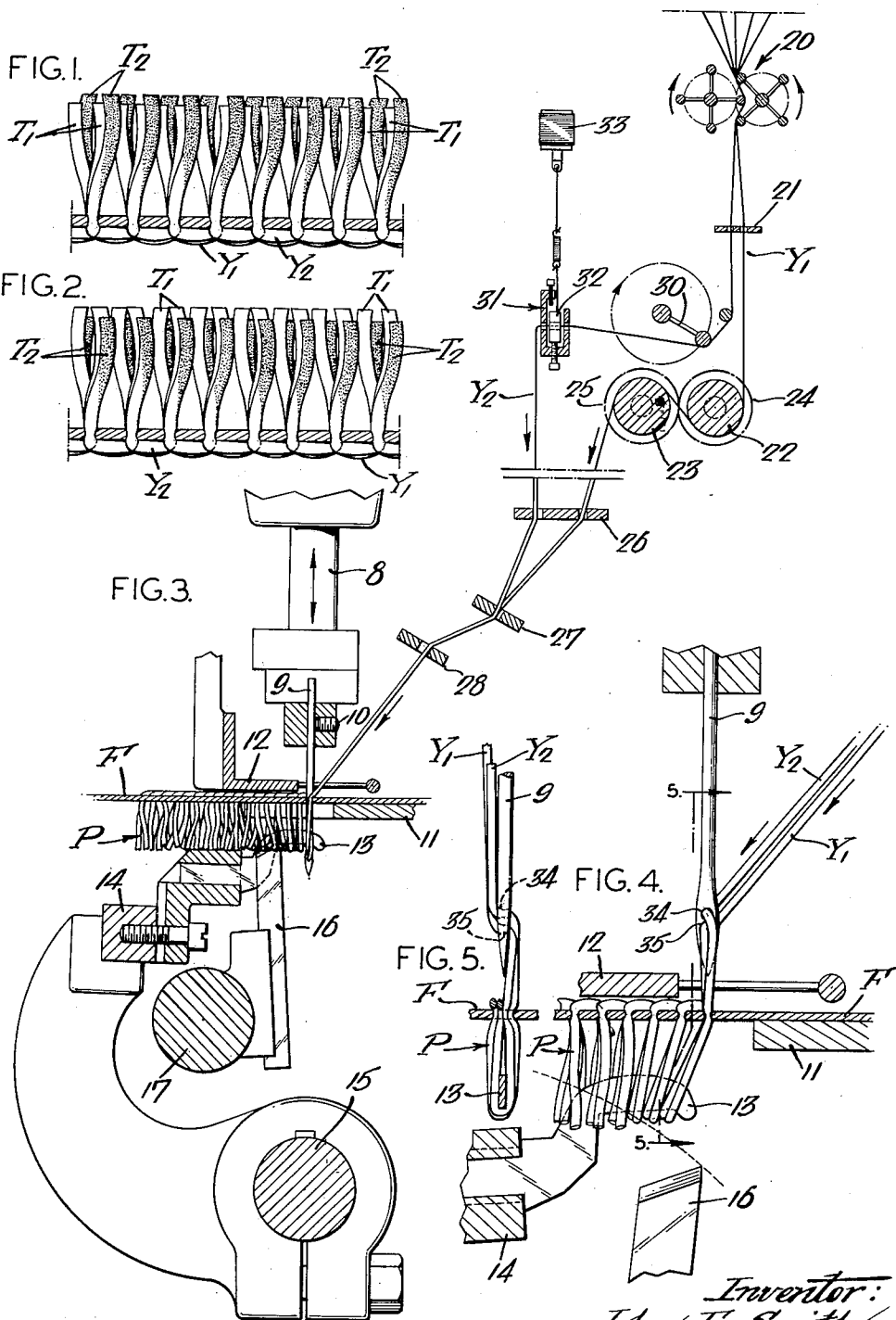
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INDUSTRIAL APPARATUS, METHOD, AND PRODUCT

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INDUSTRIAL APPARATUS, METHOD, AND PRODUCT

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This invention relates to tufting machines and methods for fabricating pile fabrics of the floor covering type. More particularly the invention pertains to the method and apparatus for selectively providing variable height tufts in a cut pile tufted carpet.

The ability to provide variable pile heights in a tufted carpet in accordance with a pre-determined pattern is well known in the case of uncut or loop pile fabric. This so called "pattern tufting" is usually done by pulling back a previously formed loop after it has been released from the looper so that it is drawn down below higher loops in a high pile area. In the case of cut pile, however, this procedure cannot be employed because a plurality of loops are retained on the looper until they are severed by the cutting means. Since the loops are retained by the looper at a constant height, no substantial variation in their length can be achieved. Furthermore, once the loops are cut, it is obviously impossible to pull back previously stitched pile yarns. It has been unexpectedly discovered, however, that it is possible to vary the length of the tuft legs in a manner sufficient to change the appearance of the pile surface even though the loops are all cut.

A primary object of the invention, therefore, is to provide means for controlling the relative height of pile tufts in a cut pile tufted fabric.

A further object is to provide a method for fabricating a tufted pile fabric in which the height of selected pile tufts is controlled in accordance with a pre-determined pattern.

A still further object of the invention is to provide a tufting pile fabric in which selected pile tufts are lower than adjoining pile tufts.

Further objects will be apparent from the specification and drawings in which

FIG. 1 is an enlarged diagrammatic view of a section of tufted carpet in which the cut pile tufts of one type or color are higher than adjoining tufts of a different type or color,

FIG. 2 is a view showing either a different area in the same row of stitches as shown in FIG. 1 or it also represents an adjoining row of stitches in which the two types of tufts are reversed,

FIG. 3 is a schematic sectional view of a tufting machine constructed in accordance with the present invention,

FIG. 4 is an enlarged sectional detail showing the manner in which the relative height of the tufts is controlled, and

FIG. 5 is a sectional detail as seen at 5-5 of FIG. 4.

The invention comprises essentially the control of separate pile yarns which are each threaded through the eye of the same tufting needles. The yarns preferably are of contrasting color or twist in order to enhance the pattern effect. One of the yarns is fed to the tufting machine and the needle at a constant controlled tension so that the height of all tufts formed from this yarn are substantially the same. The other yarn is controlled by a pattern tensioning means so that the tension on this yarn is selectively increased or decreased in accordance with the pattern control device. While it is not essential that each of the yarns be threaded through the eye of the same or every needle in a multiple needle tufting machine, I have found that it is desirable to thread the

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machine in this manner because the relative difference in tuft height is of necessity only a fraction of the height of the tuft leg in a cut pile fabric, so that the best effect is achieved when the pile yarns of contrasting color are each threaded through the same needles.

Referring now more particularly to the drawings, a conventional cut pile tufting machine as shown in FIG. 3 has a needle bar designated at 8 to which there are secured a plurality of tufting needles 9 by means of set-screws 10. The needle bar oscillates vertically to provide pile yarns P on the underside of a backing fabric F which is intermittently fed over needle plate 11 and under stripper bar or presser foot 12. A looper 13 is mounted on a looper bar 14 which oscillates in timed relation with the needle bar 8 by means of suitable control mechanism through a shaft 15. The knife 16 is mounted on a second oscillating shaft 17 and is positioned to sever the foremost loops which have been picked up on looper 13. The above mechanism for manufacturing cut pile tufted fabrics is conventional in the art and a more detailed description thereof is, therefore, believed to be unnecessary.

The pile yarns Y_1 and Y_2 are fed to the tufting machine from a creel, not shown, through constant speed control means 20. From thence the yarns Y_1 proceed through a stationary yarn guide 21 and over constant speed feed rolls 22 and 23 which are drivingly engaged with each other through meshing gears 24 and 25. Yarns Y_1 are then led to each needle 9 through a series of yarn guides 26, 27, and 28. The other yarns Y_2 are fed through yarn guide 21 and thence to an intermittent yarn feeding element 30 from whence they are carried through a selective pattern tension device 31 which comprises a movable guide 32 controlled by the energization of a solenoid 33 to selectively increase or decrease the tension on the yarns Y_2 . After leaving the pattern tension control means 31, the yarns Y_2 are likewise carried through stationary guides 26, 27, and 28 to the needles 9. The operation of such a pattern tension device is described in my co-pending applications Serial No. 569,308, now Patent No. 2,782,905, and Serial No. 464,588, now Patent No. 2,782,741.

Referring now to FIGS. 4 and 5, it will be understood that the tension in yarns Y_1 remains constant for any setting of the feed rolls 22 and 23. Therefore, the height of tufts T_1 , T_1 (FIGS. 1 and 2) remains the same. It has been found, surprisingly enough however, that if a second yarn is fed through the same needle 9 and permitted to run through the needle under little or no tension, the tufts T_2 , T_2 made therefrom can be controlled to be noticeably longer than the tufts T_1 , T_1 formed from yarns Y_1 . When the solenoids 33 are energized to provide maximum tension on selected yarns Y_2 , this apparently has the effect of stretching the length of yarns over the looper so that when they are cut by knives 16, the relaxed and contracted tufts will be substantially shorter than tufts T_1 . This effect is shown in FIG. 2. It will be understood that a pattern attachment such as shown in the above applications or any other well-known variety is employed to selectively control the tension in certain of the pile yarns Y_2 in accordance with a predetermined pattern. Therefore, for any given row of transverse tufts all of the solenoids 33 will not be simultaneously actuated unless the pattern calls for a uniform tuft height across the fabric.

As a result of this method of controlling the tension in a cut pile tufting machine, it is possible to completely change the color and, therefore, appearance in any given selected face area. When yarns Y_1 and Y_2 are of contrasting color and the pattern device is operated to provide maximum tension on yarns Y_2 , the predominating color in this area as shown in FIG. 2 will be that of yarns Y_1 . On the other hand, when the tension in yarns

Y_2 is released by means of the pattern tension control, then the predominating color in these areas will be that of yarns Y_2 and tufts T_2 as shown in FIG. 1. To describe the effect achieved somewhat differently, the relative heights of tufts T_2 in FIGS. 1 and 2 may be considered to be those of maximum tension in FIG. 2 and of minimum tension in FIG. 1, whereas the constant height of tufts T_1 in both FIGS. 1 and 2 represents the application of a median or intermediate tension as applied to yarns Y_1 .

Even greater contrast can be achieved by judicious selection of the yarns Y_2 with regard to twist and extensibility under tension. In other words, a yarn having a relatively high ability to be elongated under tension and then to contract when the tension is relaxed will enable very unusual and novel effects to be achieved in a cut pile tufted fabric which have not heretofore been possible. The contrasting yarns Y_1 and Y_2 should be maintained in close relationship to obtain the maximum effect. This is partly due to the inherent nature of a tufted pile carpet which, as currently produced, must make pile in every row as the tufting operation advances. In other words, unlike the Wilton carpet, there are no dead yarns carried in or on the back. Consequently, I prefer to thread both yarns through each needle. However, the size of the yarns must be such that, with respect to the size of the needle eye, there is little or no tension robbing from one yarn to the other. Such undesirable characteristic could be eliminated if the yarns Y_1 and Y_2 are threaded in alternate needles or in separate eyes 34 and 35 of the same needle. However, depending upon the gage of the machine, the pile height, and type of yarns, this might not provide as noticeable a difference in the appearance as can be achieved with threading both yarns through the same needle.

Having thus described my invention, I claim:

1. The method of fabricating a cut pile tufted fabrics to provide pattern areas which comprises stitching a first series of pile yarns and a second series of pile yarns simultaneously through a backing fabric, one of said series of yarns being under constant tension and the other series of yarns being under variable tension with one of said series of yarns being under a greater tension than the other of said series of yarns, holding said first and second series of pile yarns on looper means, simultaneously cutting both of said series of yarns on one side of the backing fabric while said yarns are held under their respective tensions on said looper means, whereby the yarn series under greater tension when cut will relax and contract to produce tufts of a length less than the tufts formed from the other yarn series.

2. The method of fabricating a cut pile tufted fabric to provide pattern areas which comprises stitching a first series of pile yarns and a second series of pile yarns on the same series of needle means simultaneously through a backing fabric, one of said series of yarns being under constant tension and the other series of yarns being under variable tension with one of said series of yarns being under a greater tension than the other of said series of yarns, holding said first and second series of pile yarns on looper means, simultaneously cutting both of said series of yarns on one side of the backing fabric while said yarns are held under their respective tensions on said looper means, whereby the yarn series under greater tension when cut will relax and contract to produce tufts of a length less than the tufts formed from the other yarn series.

3. The method of fabricating a cut pile tufted fabric to provide pattern areas which comprises stitching a first series of pile yarn and a second series of pile yarn simultaneously through a backing fabric, one of said series of

yarns being under constant tension and the other series of yarns being under variable tension, the tension of said series of yarns under constant tension being greater than the said series of yarns under variable tension, holding said first and second series of pile yarns on looper means, simultaneously cutting both of said series of yarns on one side of the backing fabric while said yarns are held under their respective tensions on said looper means, whereby the yarn series under constant tension when cut will relax and contract to produce tufts of a length less than the tufts formed from the series of yarns under variable tension.

4. The method of fabricating a cut pile tufted fabric to provide pattern areas which comprises stitching a first series of pile yarn and a second series of pile yarn simultaneously through a backing fabric, one of said series of yarns being under constant tension and the other series of yarns being under variable tension, the tension of said series of yarns under variable tension being greater than the said series of yarns under constant tension, holding said first and second series of pile yarns on looper means, simultaneously cutting both of said series of yarns on one side of the backing fabric while said yarns are held under their respective tensions on said looper means, whereby the yarn series under variable tension when cut will relax and contract to produce tufts of a length less than the tufts formed from the series of yarns under constant tension.

5. A cut pile carpet tufting machine having a needle plate over which a length of backing fabric is fed, a bank of oscillating needles for inserting pile yarns through said backing fabric, first feeding means for feeding a first series of pile yarn to needles under constant tension, second feeding means for simultaneously feeding a second series of pile yarns to the same needles under a variable tension, the yarns fed from one of said feeding means being under a greater tension than the yarn from the other of said feeding means, means including looper means for receiving the first and second series of pile yarns and cutting means for holding and cutting the loops of pile yarn formed from said first and second series of pile yarns while said yarns are held under their respective tensions, whereby the yarns under greater tension, when cut, will relax and contract to produce tufts of a length less than the tufts formed from the other yarns under lesser tension.

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