Nov. 17, 1959 H. F. NOWICKI 2,912,945

HIGH AND LOW PATTERN ATTACHMENT FOR TUFTED PILE FABRICS

Filed Oct. 18, 1956 3 Sheets-Sheet 1

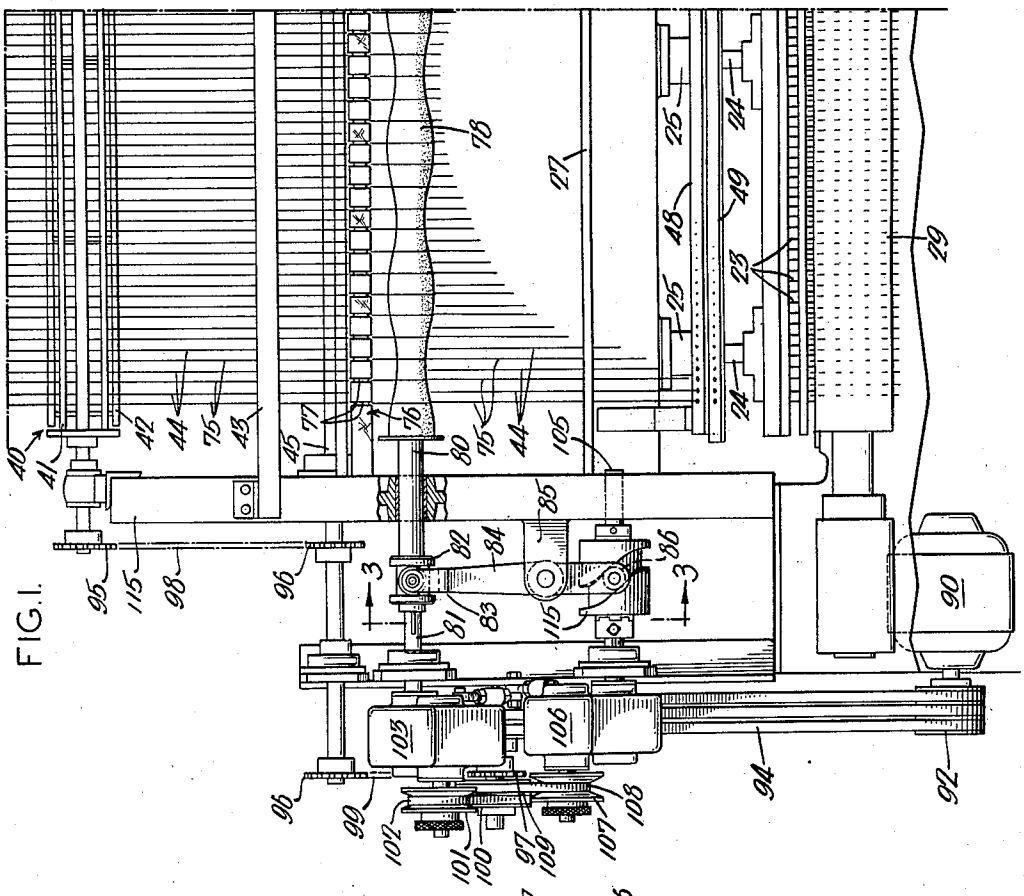


FIG. 1.

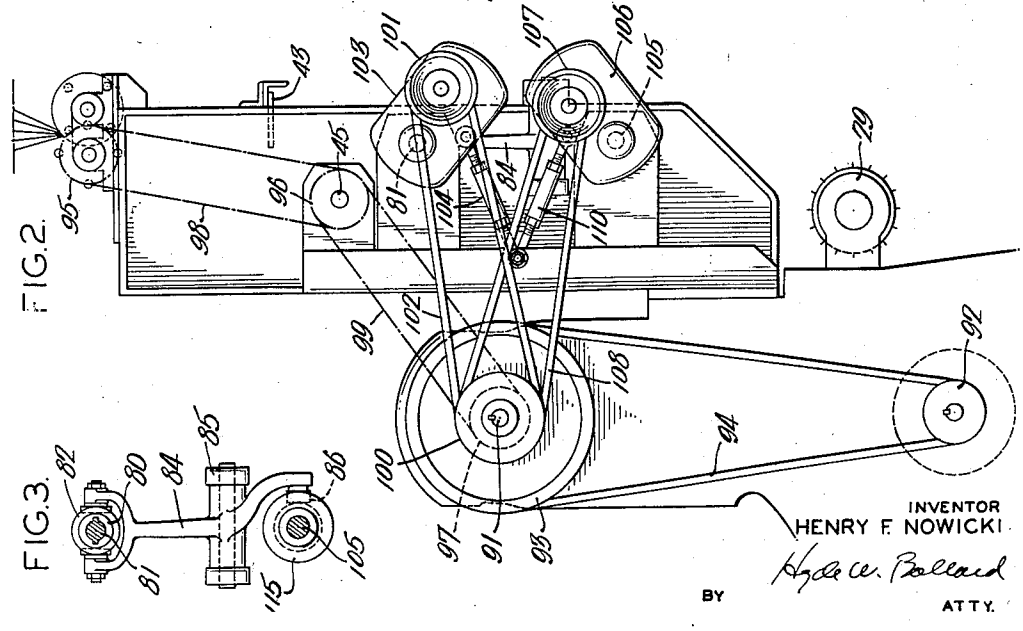


FIG. 2.

FIG. 3.

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FIG. 4.

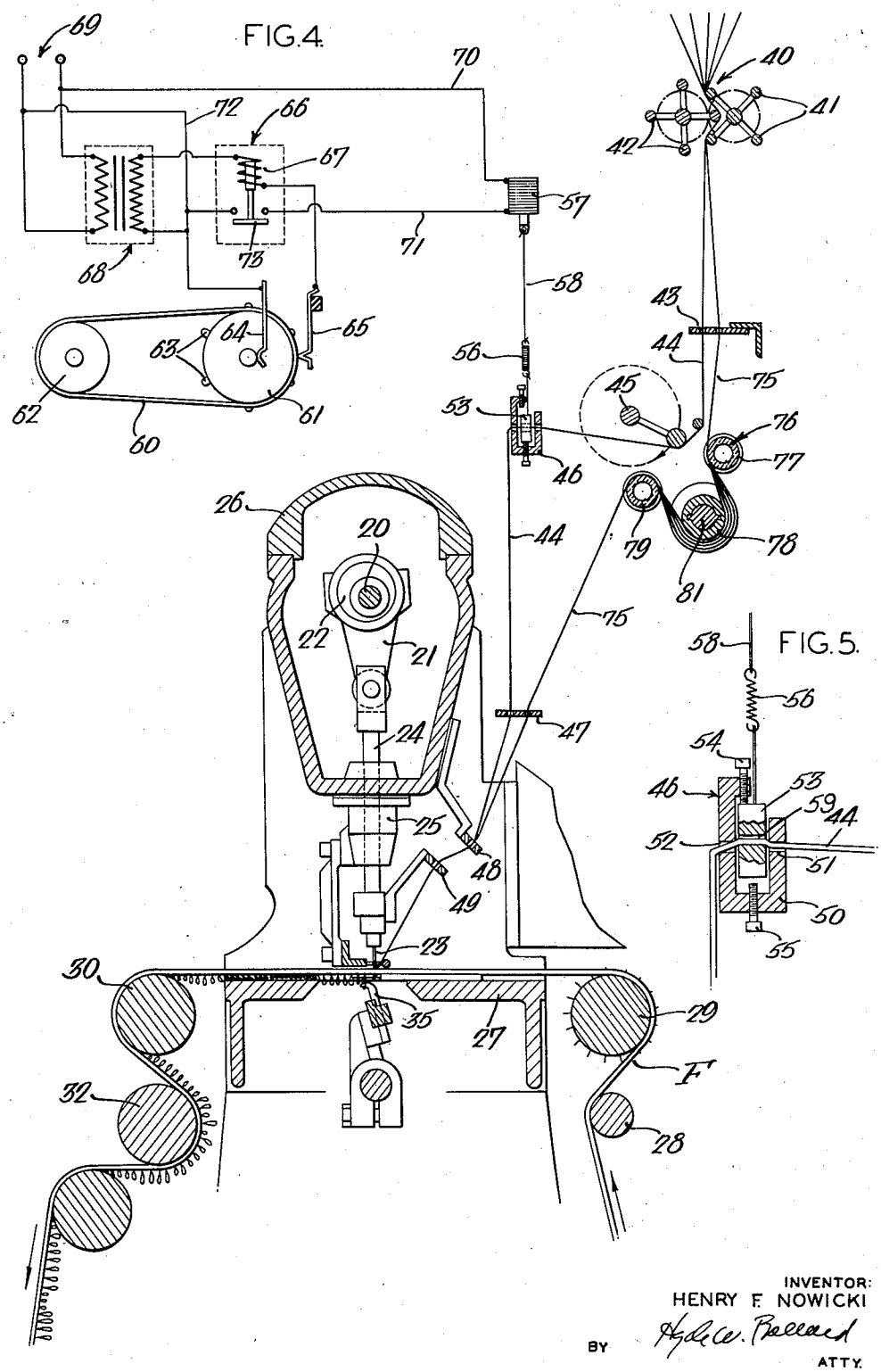


FIG. 5.

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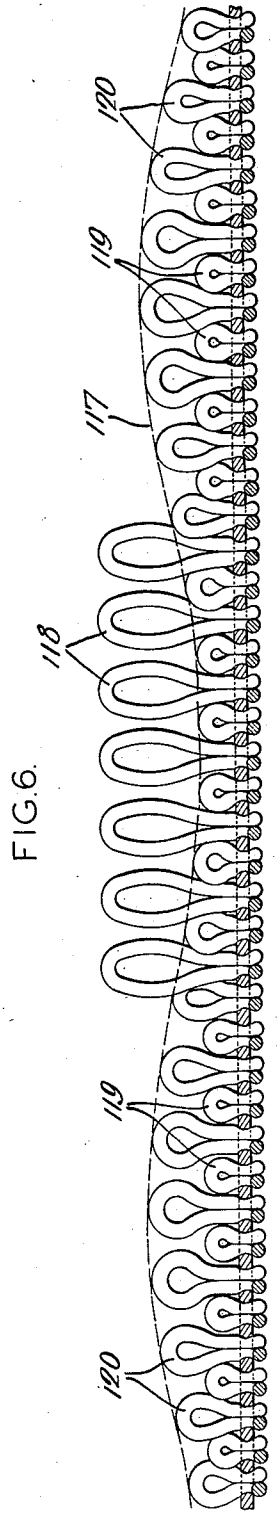


FIG.6.

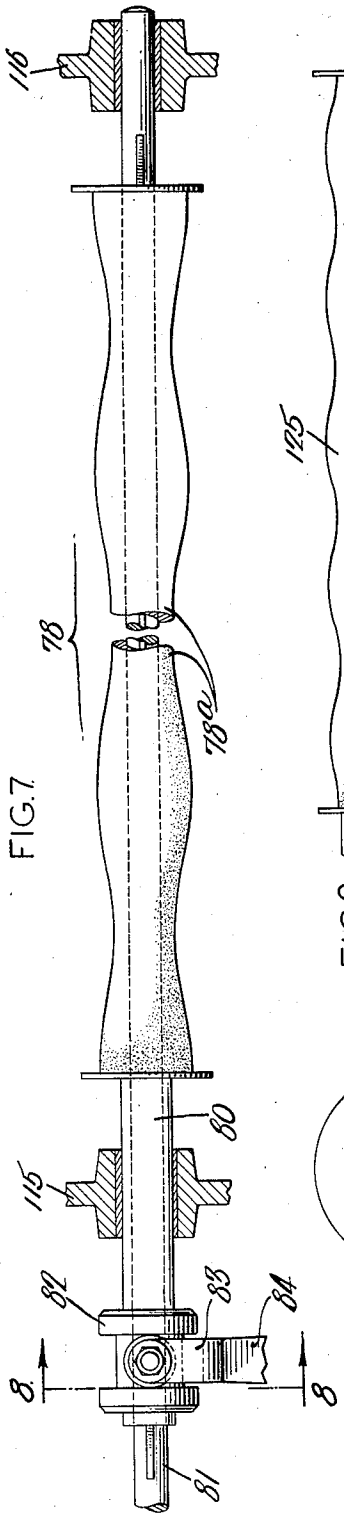


FIG.7.

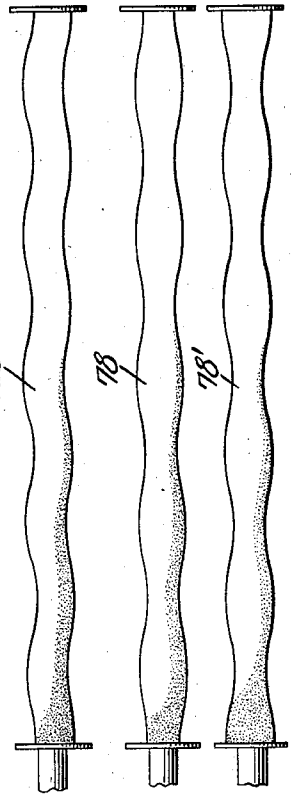


FIG.9.

FIG.10.

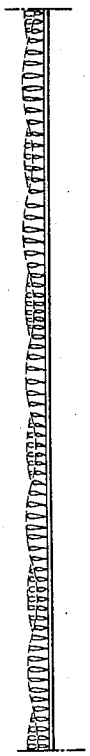


FIG.11.

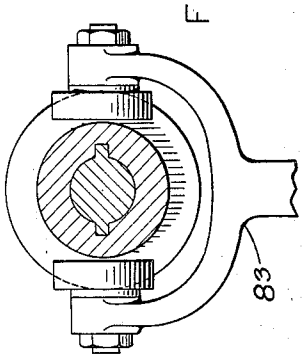


FIG.8.

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2,912,945

HIGH AND LOW PATTERN ATTACHMENT FOR TUFTED PILE FABRICS

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Application October 18, 1956, Serial No. 616,837

5 Claims. (Cl. 112—79)

This invention pertains to pile fabrics and more particularly to a tufting machine and a fabric produced thereon suitable for floor coverings.

In view of the current demand for sculptured or carved effects in floor coverings, various expedients have been devised for providing different heights of pile in such a fabric. An example of an attachment for a tufting machine which provides different heights of pile may be found in co-pending application Serial No. 591,755, filed June 15, 1956, in the name of Philip F. Moonan et al. The present invention contemplates a specific improvement which may be employed with the general type of tufting machine shown in the above-mentioned application.

It has been found that interesting and novel effects can be produced in a tufted carpet by using one or more rollers to control selected yarn ends in such a way that a different height is given to the selected ends in relation to a varying height of other non-selected ends. Previously the additional control rollers provided the same height for each end passing over the rollers weftwise of the fabric. The present invention contemplates the use of a contoured roller or rollers so that the varying peripheral speed will provide pile of different height across the fabric. In order to avoid straight longitudinal valleys, the contoured roller may be oscillated axially with any desired frequency.

The primary object of the invention, therefore, is to provide in a pattern tufting machine at least one contoured control roller for selected yarn ends.

A further object of the invention is to provide an attachment for a tufting machine in which a contoured roller may be oscillated back and forth across the tufting machine so that varying feed speeds are imparted to different yarn ends.

A further object of the invention is to provide a tufted pile floor covering in which selected yarn ends are given an undulating contour both warpwise and weftwise of the fabric.

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

Fig. 1 is a fragmentary view of a tufting machine embodying the present invention,

Fig. 2 is an end view of the structure of Fig. 1,

Fig. 3 is a sectional detail as seen at 3—3 of Fig. 1,

Fig. 4 is a schematic sectional view of a tufting machine and the control apparatus,

Fig. 5 is an enlarged sectional detail of a part of Fig. 4,

Fig. 6 is a diagrammatic weftwise section of a fabric produced in accordance with the present invention,

Fig. 7 is an enlarged detail of one of the contoured rollers,

Fig. 8 is an enlarged sectional detail as seen at 8—8 of Fig. 7,

Fig. 9 shows a further modified "cork-screw" type of pattern control roller,

Fig. 10 shows a modification utilizing a pair of contoured rollers, and

Fig. 11 is a diagrammatic view representing a weftwise section of a portion of the fabric produced with the rollers of Fig. 9.

The invention comprises essentially the provision of a shaped or contoured roller over which some of the pile yarn ends are carried to thereby control the feed of these yarn ends to the tufting needle and consequently the height of the pile formed therefrom. If the contoured roller is driven at constant speed, the portions of the roller having the greatest diameter will feed yarn faster than the portions having the smallest diameter due to the difference in peripheral speed between said portions. Intermediate feeds will be given to yarn ends passing over the tapered areas between the swollen areas and the constricted areas of the roller. In the event that the contoured roller remains axially stationary, each row of pile will be substantially the same height warpwise of the fabric. However, if the roller is caused to oscillate, it is possible to provide an undulating height in the same row of pile warpwise of the fabric.

Referring now more particularly to Figs. 4 and 5, the conventional tufting machine for carpets and the like includes a needle motion consisting of a crankshaft **20** to which a plurality of connecting rods **21**, **21** are secured and by which the various rods **21** are actuated in a vertical reciprocatory manner by means of eccentrics **22**. The needles **23** which are secured in shafts **24** and guided in sleeves **25** are therefore caused to rapidly reciprocate through the backing fabric F in the conventional manner. The needle motion is contained in a suitable housing **26** which is mounted over the bed **27** of the tufting machine. The backing fabric feeds from a supply, not shown, around a tension roll **28**, a pin feed roll **29**, across the bed **27**, over guide roll **30**. From thence the fabric passes around a tension roll **32** to the take up (not shown). A plurality of loopers **35** mounted on a rock shaft **36** cooperate to form and/or cut the pile as it is inserted through the backing fabric F by needles **23**.

The pile yarn is supplied from a creel, not shown, through a feed and tensioning device **40** which comprises paddles having interdigitating blades **41** and **42**. The pile yarn then passes through a separator guide **43** so that the yarn ends **44** of one color pass around and through a feeding reel **45** and individual tensioning elements **46**. From thence the pile yarn **44** passes downwardly through guides **47**, **48**, and **49** to needles **23**. The formation of the high and low loops in yarn ends **44** may be controlled in any convenient or conventional manner, but I prefer to utilize a tension assembly **46** (Fig. 5) which comprises a stationary U-shaped channel **50** having yarn end guiding apertures **51** and **52**. A movable block or sinker **53** is free to travel up and down in the member **50** between limits determined by setscrews **54** and **55**. The sinkers **53** are connected through springs **56** individually or in a group to a bank of solenoids one of which is designated **57** by means of cords **58**. In a de-energized condition solenoids **57** permit the sinkers **53** to drop, thus aligning the guide apertures **51** and **52** with an aperture **59** in the sinker. Under these conditions no tension is applied to the yarn **44** and high pile is formed.

A pattern tape **60** (Fig. 4) is driven in timed relation to the operation of the tufting machine by means of one of two pattern rollers **61** and **62**. Roller **61** is provided with pins **63**, **63** for engaging one edge of the pattern tape and the tape is either cut out or provided with electrically conductive areas which permit an electrical circuit to be closed at certain intervals between contact arms **64** and **65**. Closing of the circuit between contact arms **64** and **65** energizes selected solenoids **57** through relay **66** which has its armature winding **67** connected across

transformer 68 which is in turn connected to a source of current supply 69. The current for solenoid 57 likewise is tapped from supply 69 through leads 70, 71, and 72, the latter two of which are connected to terminals of relay switch 73.

The other series of yarn ends 75 passes from yarn separator 43 around a stationary guide 76 which may be a roller, a glass rod, or a glass tube having a plurality of circumferential grooves 77, 77 as seen more clearly in Figure 1. From guide 76, yarn 75 passes around the undulating feed roller 78 to be described more fully hereinafter, thence around a second guide roller or bar 79 similar to guide 76 from which it is carried through guides 47—49 to needles 23. The undulating roller 78 may be provided with a suitably roughened surface to prevent slippage of the yarn ends and consequently to insure positive control of the feed. The yarn ends 75, passing around roller 78, may be fed through every alternate needle 23 or certain groups of needles, or may be fed through all or some of the needles together with the yarn ends 44.

With roller 78 turning at constant speed, it will be noted that the feed for the various yarns across the tufting machine will vary, depending upon the peripheral speed of the contact surface of roller 78 which engages each yarn end. This would, of course, provide in any one roll a series of loops or tufts all of the same height. In order to obviate the line or striped effect which such operation might produce, it is desirable to oscillate roller 78 axially to break up the tendency to stripe by providing loops of different heights not only weftwise but warpwise of the fabric. It will be apparent to those skilled in the art that even though the roller is not oscillated, the appearance of stripes can be minimized by a judicious arrangement of the overall pattern, particularly where the yarn ends controlled by the undulating roller 78 are used as a background of relatively lower pile.

In Figure 1, there is shown suitable mechanism for controlling both the rotational speed of roller 78 as well as the mechanism for oscillating the roller along its axis. The roller shell 78*a* is keyed to an elongated sleeve 80 that is axially slidable upon a splined shaft 81. A collar 82, attached to one end of sleeve 80, is engaged by yoke 83 (Figs. 1, 7, and 8) so that the collar can rotate in accordance with the turning of shaft 81, but axial control of sleeve 80 on shaft 81 is governed by a rocker arm 84, journaled in bracket 85, and provided with a cam follower 86 at its opposite end.

The main drive is from motor 90 which drives the main shaft 91 through pulleys 92, 93, and belt 94. Auxiliary drive for the beaters 40 is provided through suitable sprockets 95, 96, 97, chains 98 and 99. Drive for roller 78 is from shaft 91 through pulley 100, variable speed pulley 101, and belt 102. A reducing element 103 may be positioned between pulley 101 and shaft 81. Tension of belt 102 is achieved through an adjustable turnbuckle 104. A similar arrangement is provided to drive shaft 105 through reducing unit 106, variable speed pulley 107, belt 108, and sheave 109 on pulley 100. Adjustment of belt 108 is similarly provided by means of a turnbuckle 110. Shaft 105 carries a barrel cam 115 which oscillates lever 84 through cam follower 86. It will therefore be observed that controlled oscillating motion is imparted to roller 78 in accordance with the speed with which shaft 105 turns.

Figure 7 shows on an enlarged scale how sleeve 80 is journaled in the side frame members 115 and 116. When the roller 78 is not oscillated, which would be the case if belt 108 were disconnected, the pile, which may be in the form of loops, undulates weftwise in the fabric as shown by the broken line 117 in Fig. 6. Loops 118 and 119 are illustrative of other heights of loops controlled by the mechanism shown in Fig. 4 rather than the single row of loops 120 under control of roller 78. A modification is shown in Fig. 9 in which the cork-screw type or helical roller 125 is substituted for the undulating roller 78. This cork-screw shape provides variable height pile warpwise of the fabric since each yarn end is constantly being fed with a variable speed due to the helical surface of roll 125. If desired, the contoured roller 125 can be oscillated in the same manner as shown in connection with roller 78 to provide increased variations in patterned effects.

An additional variation may be used in which two groups of yarn ends are formed over a pair of undulating rollers 78 and 78′. Figure 10 indicates how the swollen and constricted portions of these two rollers are designed to complement each other, thereby providing a pattern which is shown in the weftwise fabric section of Figure 11.

My improved contoured pattern control roller is simple, effective, and enables the fabric designer to achieve a wide variety of sculptured effects which have heretofore been possible only on carpet looms. It will also be understood that many variations of the shaped roller may be made within the scope of the invention.

Having thus described my invention, I claim:

1. In a tufting machine for manufacturing pile fabrics, a plurality of tufting needles, a bed over which said needles oscillate to insert spaced apart yarn ends into a backing material, a roller having a concentric undulating periphery over which a plurality of spaced apart yarn ends are adapted to be guided, means for turning said roller at a constant predetermined speed, and means for guiding the spaced apart yarn ends around the periphery of said roller.

2. Apparatus in accordance with claim 1 having means for varying the speed of said roller.

3. Apparatus in accordance with claim 1 having means for oscillating said roller axially.

4. Apparatus in accordance with claim 1 in which the roller has a helically formed periphery.

5. Apparatus in accordance with claim 1 having a pair of rollers with complementary aligned concentric undulating peripheries.

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