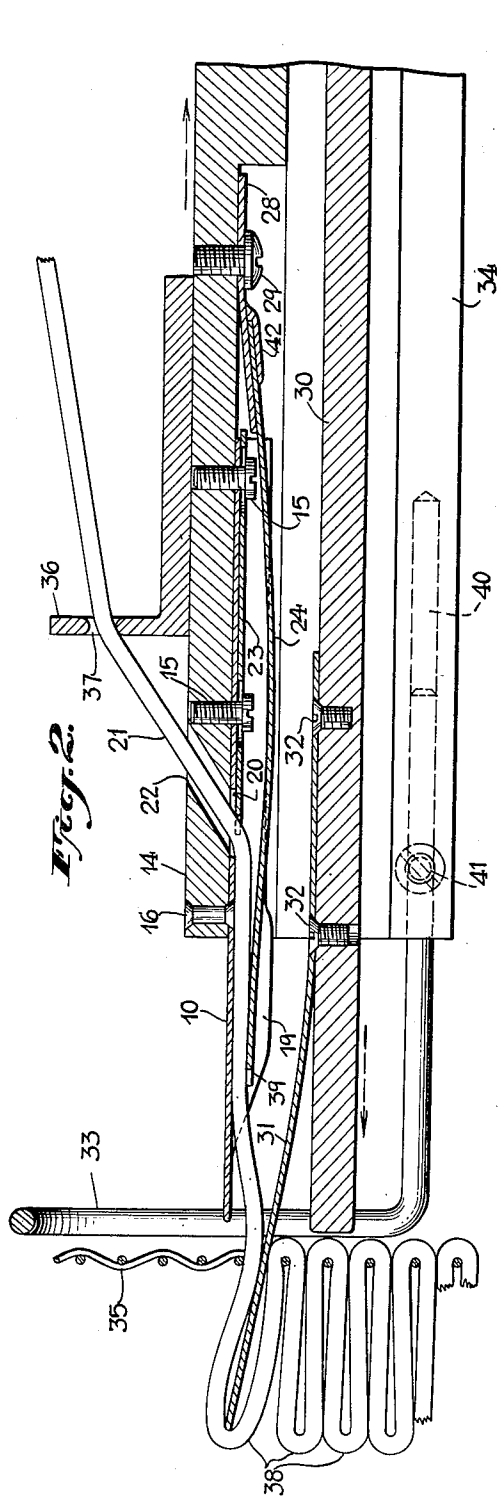
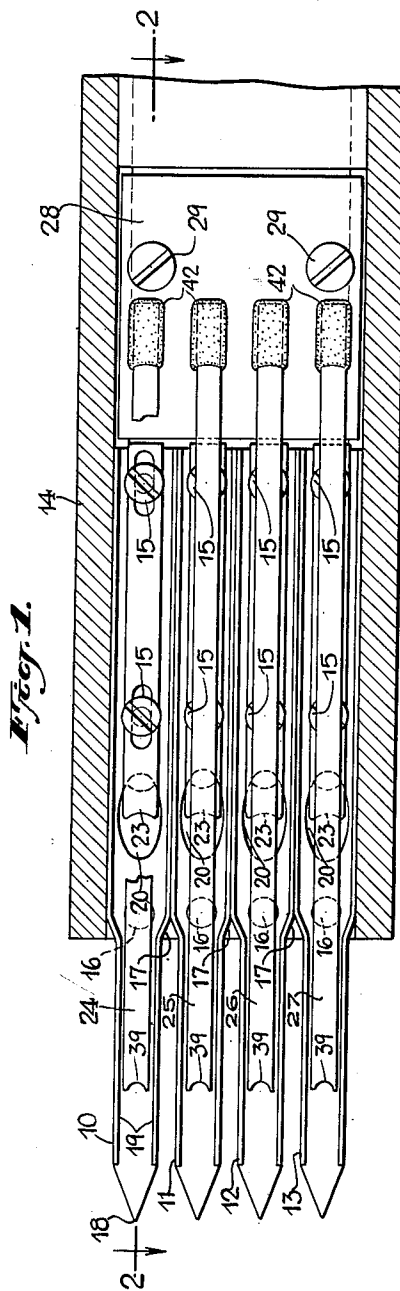


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CARPET TUFTING MACHINE  
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## CARPET TUFTING MACHINE

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2 Claims. (Cl. 112—79)

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This invention pertains to carpet manufacture, and more especially to the manufacture of tufted carpet having either an uncut or a cut pile, as desired. The invention comprises an improved needle assembly for the production of carpet of this character in special designs, configurations and dimensions.

The needle assembly of the invention is especially applicable for use in the power driven carpet tufting machine of the copending joint application of myself and Joseph Miller, Serial No. 128,314, filed November 19, 1949, and the copending application of myself, Serial No. 148,946, filed March 10, 1950, the first of which describes a machine for producing tufted carpet having an uncut pile, and the second of which describes a modification thereof for producing a tufted carpet, the pile of which is cut as each tuft is formed.

In each machine of said copending application, there is provided a longitudinally displaceable needle thrust bar, on one end of which the needle assembly is mounted for tufting a base fabric stretched perpendicular to the direction of needle travel, the opposite end of the needle thrust bar being linked to a power driven eccentric for reciprocating the same. The machine of the first application is also provided with a stepper thrust bar spaced from and displaceable parallel to the needle thrust bar, on one end of which adjacent the needle, a stepper assembly is mounted, the end being provided with a cam roll engaging a cam of roughly D-shaped contour mounted on the eccentric drive shaft for reciprocating the stepper in intermittent timed relation to the needle for effecting the tufting operation as described therein. The stepper takes the form of strips of spring steel having V notches in their ends for catching the yarn and forming the tufts as the needles are withdrawn from the base fabric.

In the machine of the second application which is generally similar to the first, each stepper comprises two oppositely bevelled blades of spring steel which are mounted in superimposed and slidable engagement, providing in one relative position to each other a V notch therebetween for forming the tuft as aforesaid, but being thereafter relatively displaceable to cut the tuft when formed thereby to produce a pile cut carpet. These blades are respectively mounted on the ends of a pair of stepper thrust bars which are independently and longitudinally displaceable to effect the tufting and pile cutting operation aforesaid by means of a pair of cams mounted on the

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eccentric shaft which reciprocates the needle thrust bar.

The needles described in the aforesaid copending applications comprise sheet metal stampings of tempered steel or equivalent, which are outwardly flared from their points toward the bases thereof, and slightly back of the points the flared metal is bent at right angles to provide reinforcement and stiffness of the needles. Somewhat back of the point, each needle is provided with an elongated needle hole for passage of the yarn therethrough. In order to impose an appropriate tensioning on the yarn during operation of the machine, resilient prongs extend along the underside of the needles, these prongs being longitudinally adjustable with respect to the needles for adjusting the effective size of the needle holes and hence for adjusting the friction on the yarn passing through the holes.

During the tufting process, the portion of the aforesaid needles comprising the needle holes and the ends of the tensioning prongs must pass through the foundation fabric. Since the attitude of the yarn with respect to the tensioning prongs changes as the yarn passes through the fabric, the tension on the yarn may vary. In addition, the yarn on the upper side of the needles is forced through the fabric between the upper surface of the needles and the strands of the foundation fabric increasing the yarn tension, abrading the yarn and tending to distort the fabric. The increase of tension also tends to cause previously formed loops to pull out of the fabric.

When a heavy foundation fabric is used, a relatively stiff needle is required. The needles described in the above-mentioned application are weakened at a portion near the points thereof because of the location of the needle holes adjacent thereto.

The needle of the present invention is an improvement over the needles described in the above-mentioned copending application. It has been found that when the needle of the present invention is used with the tufting machine of said co-pending application, both improved operation and an improved product are obtained.

The needle of the present invention comprises a sheet metal stamping of tempered steel or equivalent, which is outwardly flared from its point toward its base. Slightly back of the point, the flared metal is bent at right angles to provide reinforcement and stiffness of the needle. The needle is adapted to be fastened to a needle thrust bar, and a resilient yarn tensioning prong, fast-

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ened to the thrust bar, extends along the under side of the needle. A needle hole is provided in the portion of the needle which is mounted against the thrust bar rather than in the portion of the needle extending in front of the thrust bar, and a yarn passageway aligned with the needle hole is provided in the thrust bar itself. An end of the tensioning prong is mounted adjacent the needle hole and the prong is longitudinally adjustable with respect to the needle so that the size of the needle hole and hence the yarn tension may be controlled.

In addition a guide prong is provided adjacent one side of the needle to carry the yarn through the foundation fabric in cooperation with the needle. This guide prong extends in front of the needle thrust bar and an end of the guide prong is adjacent the needle at a point in front of the needle hole. Thus, the yarn is better protected from abrasion with the strands of the fabric, and is drawn between relatively friction-free surfaces and is held in a fixed attitude with respect to the tensioning prong. In addition, the guide prong provides a smooth sliding surface for a stepper prong.

The invention may be more clearly understood by reference to the following detailed description read in connection with the accompanying drawings, in which:

Fig. 1 is a plan view as viewed from below of the needle assembly of the invention as mounted on the end of a needle thrust bar, while Fig. 2 is a longitudinal section as taken along the line 2-2 of Fig. 1 and showing the needle and needle thrust bar assembly, and also the cooperating stepper and stepper thrust bar assembly of a tufting machine in accordance with the co-pending application, Serial No. 128,314 aforesaid.

Referring to the drawings, four needles 10, 11, 12 and 13 are mounted in lateral contiguous alignment on the under side of needle thrust bar 14, being secured to the thrust bar by screws as at 15. The screws pass through appropriately drilled apertures in the base portions of the needles and are threaded into the thrust bar 14. In addition, the needles are attached to the thrust bar in front of their needle holes by rivets as at 16. For additionally maintaining the needles 10, 11, 12 and 13 in rigid assembly and contiguous alignment, they may be soldered together along the contiguous longitudinal edges of the base portions as at 17. The needles comprise sheet metal stampings of tempered steel or equivalent which are outwardly flared from their points 18 toward their bases and slightly back of the points, the flared metal is bent at right angles in the manner indicated at 19 to provide reinforcement and stiffness. Back of the points and behind the point of attachment of the needles to the thrust bar 14, each needle is provided with an elongated hole 20 for passage of the yarn 21 therethrough. A corresponding series of holes aligned with the holes in the needles is provided in the thrust bar 14 as indicated at 22.

In order to impose a proper tensioning on the yarn during operation of the mechanism, resilient prongs 23 extend along the grooves between the side walls of the needles on the under side of the needles, these prongs being longitudinally adjustable in relation to the holes in the needles by means of the screws 15, which pass through elongated holes in the prongs 23. By virtue of this construction and assembly, the effective apertures of the needle holes 20 may be adjusted in accordance with the diameter of the yarn em-

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ployed by adjusting the prongs 23 in greater or lesser overlapping relation with respect to the needle holes 20.

It will be noted that for the reasons given above the needle holes 20 are not in the free ends of the needles extending beyond the end of the thrust bar 14, but instead have been placed in the needles 10, 11, 12 and 13 so that they are in a portion thereof that does not pass through the foundation fabric 35 during the tufting process. However, the yarn 21 should be held near the points of the needles during the process so that yarn loops 38 will be formed. For these reasons, I have provided guide prongs 24, 25, 26 and 27 adjacent the points of the needles. The guide prongs are in the form of strips of resilient material, such as spring steel, and they have concave notches as at 39 in their forward ends for engaging the yarn 21. The guide prongs are held in sockets 42 on stamping 28, as by frictional engagement with the sockets or by soldering, welding, etc. and the stamping 28 is attached to the thrust bar 14 by means of screws as at 29. Thus, the prongs 24, 25, 26 and 27 are movable and aligned with the needles 10, 11, 12 and 13. Since, in the preferred embodiment, the guide prongs are resilient, the yarn 21 may pass between the needles and the guide, even though the guide prongs in the absence of the yarn may touch the needles, but the prongs may also be relatively stiff and be spaced from the needles by a distance substantially equal to the diameter of the yarn 21.

A reciprocatory stepper thrust bar 30 is mounted below the needle thrust bar 14 and carries adjacent the end thereof a group of stepper prongs 31 corresponding in number to the number of needles and mounted in alignment with the needles. The stepper prongs 31 are secured to the stepper thrust bar 30 by means of screws, as at 32, passing through appropriate apertures in the stepper prongs and threaded into the thrust bar 30. The stepper prongs 31 are made of a resilient material, such as spring steel, or equivalent, and the prongs are bent upwardly toward the needles, as shown in Fig. 2. The stepper prongs have formed in their outer ends concave notches which are adapted to receive and grip the yarn 21 during the tufting operation.

The thrust bars 14 and 30 are supported by a frame 34 and are slidably displaceable longitudinally in grooves provided in the frame. The frame 34 also carries at the forward end thereof a wire guard 33 in the shape of an inverted U for regulating the degree of penetration of the needles and steppers through the foundation fabric 35 and hence for determining the height of tufting. The guard 33 is held in a pair of holes in the end of the frame 34 as at 40 by means of screws as at 41.

A guide 36 having apertures 37 corresponding in number to the number of strands of yarn being fed to the needles is provided on top of needle thrust bar 14. The guide 36 may be fastened to the thrust bar 14 by means of screws or may be fastened thereto in any other well known manner, such as by welding, soldering, etc.

As described in detail in the above-mentioned co-pending application Serial No. 128,314, the end of the tufting machine is held during operation with the guard 33 against the foundation fabric 35. The needle thrust bar 14 is regularly reciprocated so that the needle assembly penetrates the fabric 35 between the strands thereof. At the peak of the forward motion of the thrust bar

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14, the needles and their cooperating guide prongs extend through the fabric 35 a distance sufficient to form the yarn loops 38. At this time, the ends of the guide prongs are inside the tops of the yarn loops 38. Before the needle assembly is withdrawn from the foundation fabric, the stepper thrust bar 39 which is intermittently reciprocated in appropriately timed relation to the needle thrust bar forces the stepper prongs through the foundation fabric 35 between the strands which have previously been separated by the needle assembly. The stepper prongs penetrate the fabric a distance sufficient to hold the loops, as indicated in Fig. 2, thus replacing the guide prongs as supports for the yarn 21 at the inside of the top of a loop. The needle assembly is then withdrawn and passed along to the next position with respect to the foundation fabric. After the needle assembly reaches its fully withdrawn position and commences the next penetration of the fabric, the stepper prongs are withdrawn from the fabric. The tufting process then proceeds repetitiously in the manner just described.

It will be observed that as the needle assembly passes through the fabric 35, the upper surface of the yarn 21 is protected from abrasion with the strands of the fabric by the needles. During the pulling of the yarn through the needle holes for the forming of the loops 38, the yarn slides between relatively friction free surfaces of the needles and the guide prongs, and during the entire travel of the needle assembly, the yarn is held in a fixed attitude with respect to the tensioning prongs 23 subjecting the yarn to an even tension. Furthermore, the guide prongs provide a smooth sliding surface for the stepper prongs when the stepper prongs are in contact therewith.

While the principles of the invention have been described in connection with a specific form of apparatus, it is to be understood that the description has been given by way of example only and other modifications thereof, which will be readily apparent to those skilled in the art, may be made without departing from the scope of the invention which is defined by the claims appended hereto.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

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1. A needle assembly for yarn tufting machines comprising a thrust bar having an aperture therein, a needle having a hole therein and mounted on said thrust bar with one side adjacent said bar and with a free end extending beyond the end of said bar, said hole being aligned with said aperture and both being adapted to permit the passage of said yarn therethrough, a guide prong having a concave notched end, means mounting said guide prong on said thrust bar on the opposite side of said needle and with said notched end adjacent the free end of said needle, a tensioning prong, and means adjustably mounting said tensioning prong on said thrust bar between said needle and said guide prong and with an end thereof adjacent the hole in said needle, said adjustable mounting means permitting adjustment of the said tensioning prong with respect to said hole.

2. A needle assembly for yarn tufting machines comprising a thrust bar having a plurality of apertures therein, a plurality of needles each having a hole therein, means mounting said needles on said thrust bar with the holes in said needles in alignment with the apertures in said thrust bar and with one end of each of said needles extending beyond the end of said bar, said holes and said apertures being adapted to permit the passage of said yarn therethrough, a plurality of resilient guide prongs and means mounting said guide prongs on said thrust bar on the side of said needles opposite from said thrust bar and with the ends of said guide prongs adjacent the ends of said needles extending beyond said bar.

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