

[54] **LOOPER APPARATUS FOR TUFTING
UNIFORM CUT PILE**

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[51] Int. Cl. **D05c 15/24**

[58] Field of Search **112/79 R, 79 FF, 221, 80,
112/266, 410**

[56] **References Cited**

UNITED STATES PATENTS

3,730,115 5/1973 Passons et al. 112/79 R

3,735,715 5/1973 Passons et al. 112/79 R

FOREIGN PATENTS OR APPLICATIONS

620,125 3/1963 Belgium 112/79 R

Primary Examiner—H. Hampton Hunter

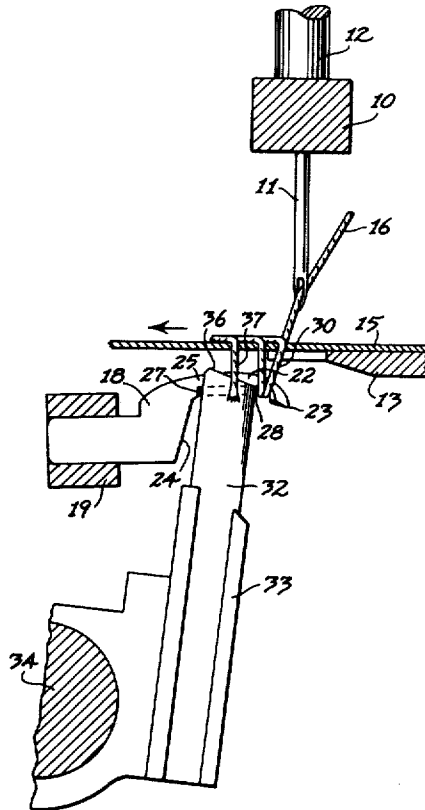
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[57]

ABSTRACT

A tufting looper mechanism including a looper element or hook and a knife member disposed against one face of the bill of the looper element only and means for reciprocally moving the looper element and knife member relative to each other at an angle for cutting a yarn loop held by the looper element to form cut pile yarn ends of equal length.

6 Claims, 5 Drawing Figures



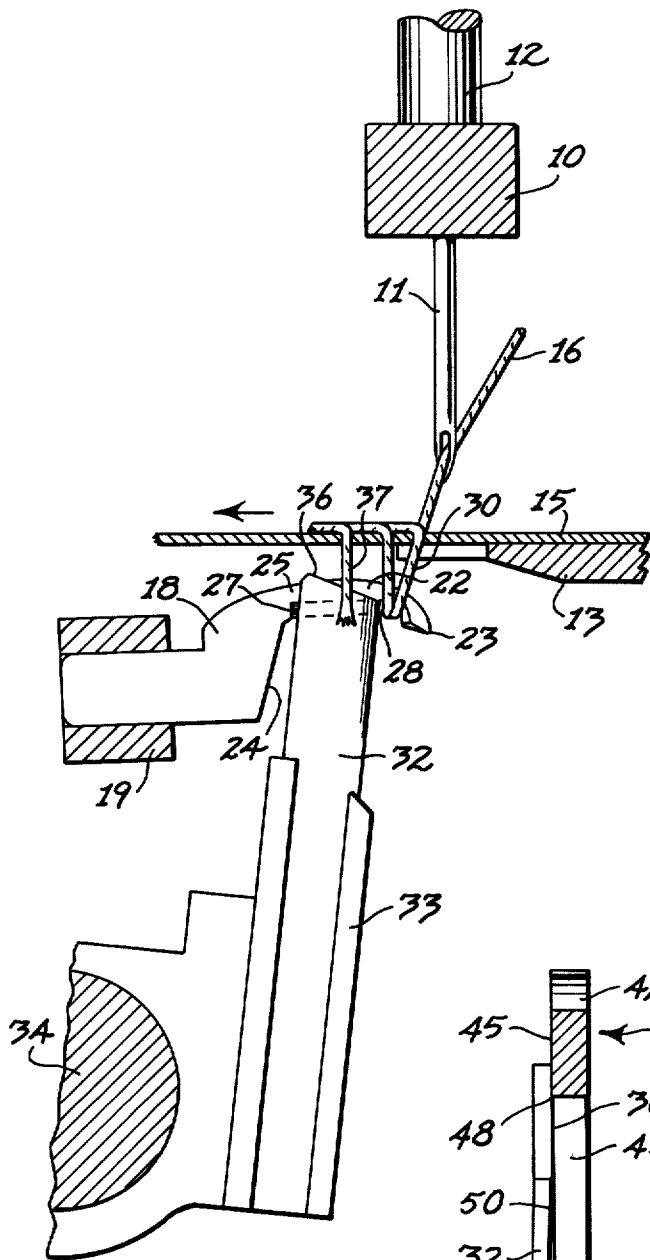


Fig. 1

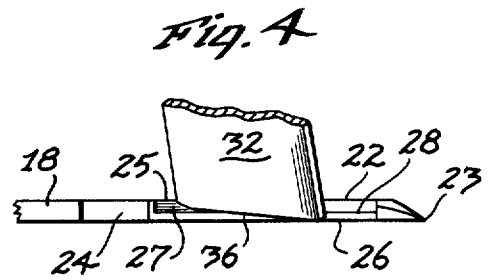


Fig. 4

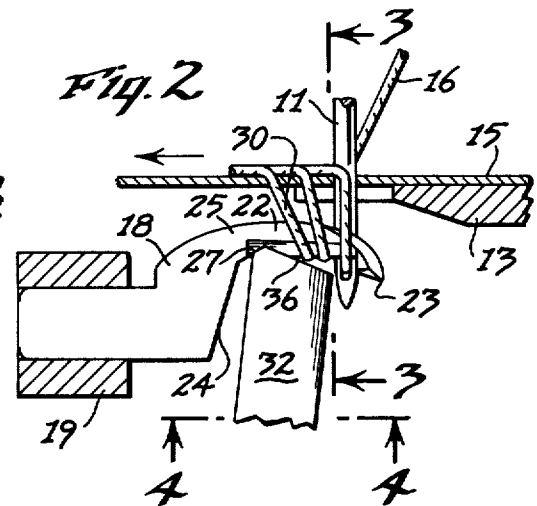


Fig. 2

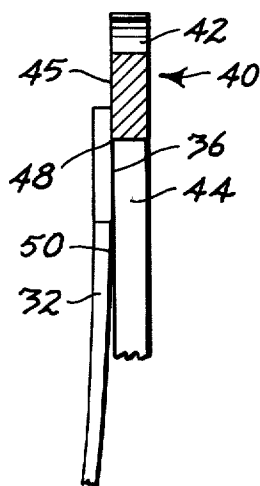


Fig. 5

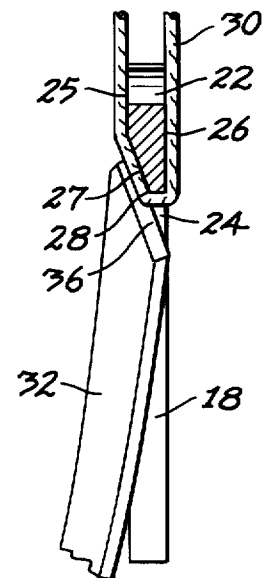


Fig. 3

LOOPER APPARATUS FOR TUFTING UNIFORM CUT PILE

BACKGROUND OF THE INVENTION

This invention relates to a tufting machine, and more particularly to a cut pile looper mechanism for a tufting machine.

Traditionally, cut pile has been produced in tufting machines by a reciprocable looper or hook engaging and holding a loop of yarn carried through a base fabric by a reciprocable needle, and a reciprocable knife cooperating with one side of the loop to cut the loop of yarn into two separate strands. As the knife reciprocates along and against one side of the looper, the yarn loop is cut on one side of the hook to form two unequal cut pile strands or ends. Such cutting is referred to in the industry as a "J-CUT", because the long strand is J-shaped. Many manufacturers of cut pile fabrics, particularly carpets, have found the conventional J-CUT pile to be objectionable because of the unequal height of the pairs of strands in each cut loop, which presents an uneven pile surface.

The above problem has been remedied by looper mechanisms disclosed in the following prior U.S. patents, in each of which applicant is a co-inventor:

U.S. Pat. No. 3,662,697 - May 16, 1972

U.S. Pat. No. 3,730,115 - May 1, 1973

U.S. Pat. No. 3,735,715 - May 29, 1973

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a looper mechanism including a looper element or hook of unique design, and a knife member for cutting the loop yarns formed on the looper element evenly and substantially in the center thereof to form cut strands or yarn ends in each loop of equal height.

This invention contemplates a looper mechanism for a multiple-needle tufting machine incorporating, for each needle, a looper element or hook having an elongated bill longer than the conventional cut pile hook bill, and a knife member having a blade or knife edge shorter than the bill of the looper element. The knife member is mounted to move reciprocally relative to the looper element so that the knife edge is in continuous engagement with one face of the bill only, and produces a scissors action with the lower cutting edge of the bill in order to cut the yarn loops.

In the preferred modification of the invention, the face of the bill engaging the knife edge has a lower slanting or angular plane surface terminating in a cutting edge so that the cutting edge of the bill lies substantially midway between the planes of the opposite faces of the bill. Thus, when the loop is cut by the knife edge cooperating with the medially located cutting edge of the hook bill, the loop will be cut in half so that the cut pile strands are practically equal in length.

The knife member used to cooperate with the novel looper element may be a conventional tufting knife.

Also, the knife edge is set at a slight lateral angle to the planes of the faces of the bill. Because of the angular relationship between the knife member and the looper element and because the knife edge is constantly in practically point contact with the lower cutting edge of the bill, the wear between the knife member and the looper element is considerably reduced compared with a conventional knife member and

looper element. Moreover, the cooperative reciprocal movement between the knife edge and the cutting edge produces self-sharpening action for both edges.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary sectional elevation of a portion of a multiple-needle tufting machine incorporating this invention, disclosing the looper mechanism in a cutting position;

FIG. 2 is a fragmentary view similar to FIG. 1 disclosing the looper mechanism in its non-cutting, or loop forming, position;

FIG. 3 is an enlarged section taken along the line 3-3 of FIG. 2;

FIG. 4 is an enlarged fragmentary section taken along the line 4-4 of FIG. 2; and

FIG. 5 is a view similar to FIG. 3, disclosing a modified form of looper element.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in more detail, FIG. 1 discloses a typical needle bar 10 supporting a plurality of needles 11 (only one of which is shown in the drawings) disposed in a row transversely of the tufting machine. The needles 11 are adapted to be reciprocally moved between their lower position disclosed in FIG. 2 and their upper position disclosed in FIG. 1 by a push rod 12 driven by conventional means, not shown.

Supported upon a needle plate 13 for movement longitudinally from front to rear, in the direction of the arrow, through the tufting machine, is a base fabric 15. Each needle 11 carries a yarn 16 through the base fabric 15 upon each stroke of the needle 11.

The looper mechanism made in accordance with this invention includes a plurality of looper elements or cut pile hooks 18 mounted transversely of the tufting machine, upon the same gauge as the needles 11, in a hook bar 19. The hook bar 19 is supported upon the hook shaft, not shown, for reciprocal movement, by means, not shown, in a conventional manner.

The looper element or cut pile hook 18 includes a long bill 22 having a free end 23, and a throat 24 opposite the free end 23. The bill 22 has opposite side faces 25 and 26 preferably planar and parallel to each other.

In the preferred form of the invention, the lower portion of the side face 25 is beveled or angled to form an angular plane surface 27 terminating at its lower edge in a cutting edge 28. The angular plane surface 27 typically forms an acute dihedral angle with the plane of the side face 25 of approximately 20°. The cutting edge 28 preferably is substantially straight, extends substantially the length of the bill 22, and is approximately equidistant between the parallel side faces 25 and 26.

The looper mechanism made in accordance with this invention also includes a knife member in the form of a conventional tufting knife 32 mounted in knife block or holder 33 which is fixed to the transverse knife shaft 34. The knife shaft 34 is adapted to be reciprocated in synchronism with the hook bar 19, by means, not shown, in a conventional manner. The knife 32 is reciprocated between its non-cutting position disclosed in FIG. 2, and its cutting position disclosed in FIG. 1. The knife 32 is flexed, as best disclosed in FIG. 3, so that its straight angular knife edge or blade 36 is tensioned in continuous engagement with the side face 25 or the angular lower surface 27. The knife edge 36 is preferably

disposed at an angle to the cutting edge 28 to provide a close-fitting scissors action in cutting the yarn loop 30.

It will be particularly noted in FIGS. 1 and 2, that the knife edge 36 is always in continuous engagement either with the sloping surface 27 or the side face 25, and never engages the side face of the hook 18 behind or to the left of the throat 24, as in a conventional cut pile looper mechanism.

As best disclosed in FIG. 4, the knife 32 is also positioned so that the knife edge 36 is at a slight angle to the bill 22, converging forward toward the free end 23, preferably at approximately an 8° angle.

It will also be noted in FIG. 2, that even in its lowermost position, the knife edge 36 never disengages the bill 22. The knife edge 36 continuously is in engagement with either the sloping surface 27 or the side face 25.

In FIG. 5, a modification of the looper mechanism is disclosed in which a conventional cut pile hook 40 is employed with the conventional tufting knife 32. However, the knife 32 continuously engages the side face 45 of the bill 42 of the conventional cut pile hook 40, and never touches the side surface 50 behind the throat 44. Also preferably, the tufting knife 32 is disposed at substantially the same lateral angle of approximately 8° as the knife 32 in FIG. 4. The knife 32 in the looper mechanism disclosed in FIG. 5 cuts the loop 30 almost in the center, even though the cutting edge 48 is not located equidistant between the opposed side surfaces of the bill 42. The knife edge 36 cuts the loop 30 more nearly in the center than the conventional tufting knife 32 would cut against a conventional tufting hook, because of the slight angle of the cutting edge 36 riding continuously against and somewhat beneath the cutting edge 48. Such equalized cutting of the loop strands would not be possible if the tufting knife 32 is riding against the side surface 50 of the hook throat.

In the operation of the invention disclosed in FIGS. 1 - 4, the mechanism for reciprocating the push rod 12, hook bar 18 and knife shaft 34, and for moving the base fabric 15 in the direction of the arrow, are the same as in any conventional tufting machine. Thus, in FIG. 2, the needle 11 has been moved to its lowermost position for carrying the yarn 16 through the base fabric 15, and the cut pile hook 18 and tufting knife 32 have been moved to their forwardmost position. In the forwardmost position, the bill 22 of the hook 18 has been extended across the needle 11 to catch, engage and hold a loop of yarn 30. The loops 30 are progressively moved toward the throat 24 of the hook 18, for each reciprocal movement of the hook bar 19, of course, in the forwardmost position, the knife 32, although engaging the sloping surface 27 of the bill 22, is in its lowermost, non-cutting position.

In the other extreme or rearmost reciprocal position, as best disclosed in FIG. 1, each needle 11 is elevated above the base fabric 15, the cut pile hook 18 reciprocates rearward holding the spread loops 30 upon the bill 22, as the base fabric 15 moves forward. Knife 32 also reciprocates rearward, but moves upward relative to the cut pile hook 18, causing the knife edge 36 to move upward over the beveled or sloping surface 17. Since the knife edge 36 declines forward, the converging action of the angular knife edge 36 and cutting edge 28 move progressively forward trapping and shearing the loops 30 along their center portions to form cut pile strands 37 of equal length.

The looper mechanism disclosed in FIG. 5 functions in the same manner as that disclosed in FIGS. 1 - 4, with the exception that the knife edge 36 shears the loop very slightly off-center because of the absence of the sloping surface 27.

What is claimed is:

1. In a tufting machine having means for stitching a yarn through a base fabric to form loops, a looper mechanism comprising:

- a. a looper element for receiving and holding each yarn loop,
- b. said looper element having an elongated bill with opposite faces and a lower cutting edge,
- c. a knife member having a knife edge having a length less than the length of said cutting edge, and
- d. means mounting said knife member for reciprocal movement relative to said looper element so that said knife edge continuously, and only, engages one face of said bill, and said knife edge cooperates only with said cutting edge to cut said yarn loop to form cut pile strand of substantially equal length.

2. The invention according to claim 1 to which said one face has a lower plane angular surface converging downward toward said opposite face and terminating in said cutting edge.

3. The invention according to claim 2 in which said opposite faces of said looper element are plane and parallel, said cutting edge lying substantially equidistant between the planes of said opposite faces.

4. The invention according to claim 3 in which said angular surface forms a dihedral angle of approximately 20° with the planes of said opposite faces.

5. The invention according to claim 4 in which said knife edge is disposed at an angle to said cutting edge having a lateral component of approximately 8° to the plane of said one face.

6. The invention according to claim 1 in which said knife edge is disposed at an angle to said cutting edge to provide a reciprocable scissors action for cutting said yarn.

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