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KNIFE MECHANISM FOR TUFTING MACHINES

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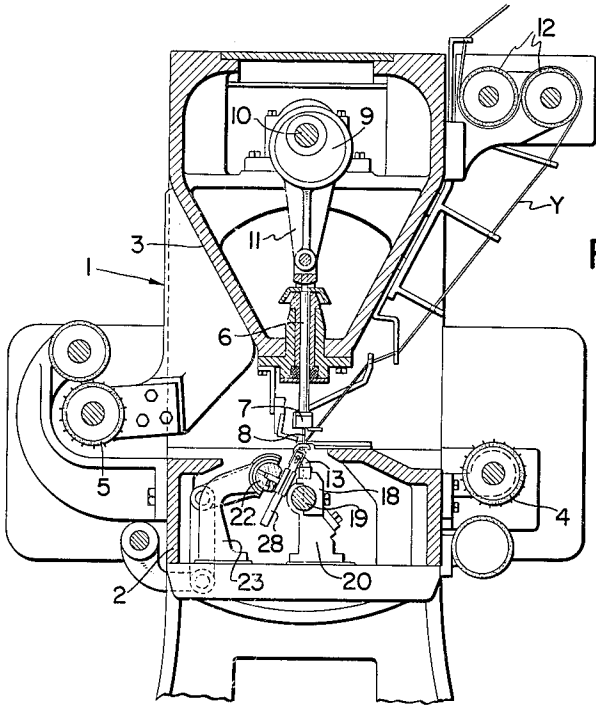

Fig. 1.

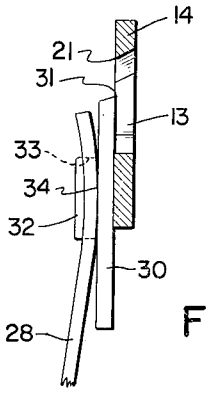

Fig. 3.

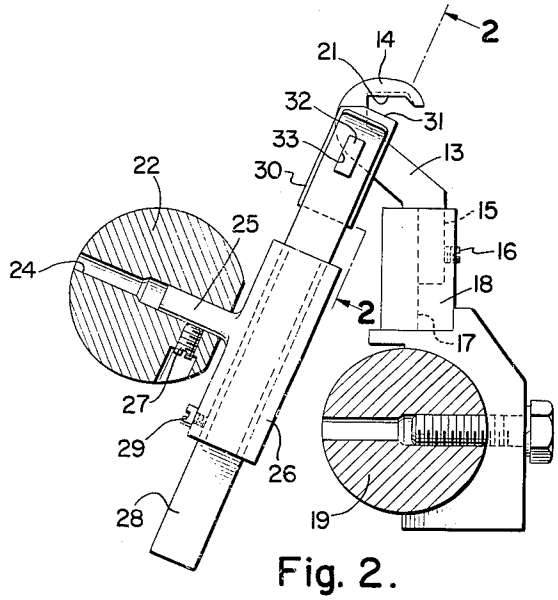

Fig. 2.

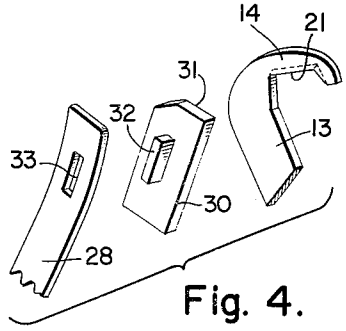

Fig. 4.

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KNIFE MECHANISM FOR TUFTING MACHINES

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The present invention relates to a knife mechanism for a tufting machine and particularly to a knife mechanism that is adapted for high speed operation.

In a conventional cut pile tufting machine there is provided a knife disposed on one face of the hook and having a cutting edge that cooperates with the edge at the underside of the loop seizing blade of the hook to sever the loops on the blade of the hook to form cut pile. In such a machine the knife is carried by an oscillating knife shaft that is parallel to the hook shaft, and the knife which is formed of spring steel, is arranged at a slight angle relative to the hook to insure cooperation between the cutting edges of the knife and hook. Upon operation of these machines, friction between the knife and hook generates a considerable amount of heat which limits the operating speed of the machine. When it is attempted to operate these machines at speeds in the neighborhood of 3,000 stitches per minute, the heat that it generated is so intense that the knife is destroyed within a few minutes.

Accordingly, it is an object of this invention to provide a knife mechanism that is capable of being operated successfully and continuously at high speeds, and at the same time, is simple and economical.

In accordance with this invention, the above objects have been attained by providing a knife that is disposed flat against the one side face of the hook, thereby eliminating pressure points which tend to localize the generation of heat and thereby hasten destruction of the knife. At the same time, the knife is maintained against the side of the hook with sufficient force to insure cooperation between the cutting edges to sever the loops.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

FIG. 1 is a transverse sectional view of a tufting machine embodying the present invention.

FIG. 2 is a detail sectional view of the hook and knife mechanisms of the machine of FIG. 2.

FIG. 3 is a fragmentary sectional view taken substantially on the line 3—3 of FIG. 2.

FIG. 4 is a fragmentary exploded view in perspective of the hook and knife elements.

With reference to the drawings, there is illustrated a tufting machine having a frame **1** including a bed **2** and a head **3** overhanging the same. A backing fabric is adapted to be fed across the bed **2** by feed rolls including a let-off roll **4** and the take-up roll **5**.

Mounted in the head **3** for endwise reciprocation is a push rod **6** carrying at its lower end a needle bar **7** which in turn carries the needle **8**. Endwise reciprocation is imparted to the rod **6** by an eccentric **9** on the main shaft **10** of the machine, which eccentric is embraced by the strap end of a link **11** that is pivotally connected at its lower end to the rod **6**. Yarn Y is fed to the needle **8** by yarn feed rolls **12**.

Cooperating with the needle **8** is a hook **13** having a loop seizing blade **14** that is adapted to enter loops of yarn presented by the needle. The hook **13** includes a mounting portion **15** that is secured by a set screw **16** in a slot **17** in a hook bar **18** that is carried by the hook shaft **19**. The hook shaft **19** is journaled in brackets **20** in the bed **2** and is adapted to be oscillated in timed relation to the reciprocation of the needle by drive connections (not shown) from the main shaft **10**.

The hook **13** is arranged in the machine with the blade **14** extending in the direction opposite to the direction of feed of the base fabric so that the loops thereon are moved toward the closed end of the blade to where they are severed against the cutting edge **21** at the underside of the blade by the knife mechanism.

The knife mechanism comprises a knife shaft **22** journaled in the bed **2** by brackets **23** and oscillated by connections (not shown) from the main shaft **10**. The knife shaft **22** is provided with a hole **24** that receives a stud **25** in a knife holder **26** and in which it is secured for endwise adjustment by a set screw **27**. The knife holder **26** is substantially C-shaped in cross section and receives a knife-carrying element **28** that is secured therein for endwise adjustment by a set screw **29**. Disposed between the end of the knife-carrying element **28** and the hook **13** is a short knife **30** having a cutting edge **31** that cooperates with the cutting edge **21** of the hook to sever the loops. The knife is coupled to the knife-carrying element **28** by a lug **32** on the face of the knife **30** which is received within a complemental aperture **33** in the knife-carrying element **28**. The knife is biased against the face of the hook **13** by the knife-carrying element **28** which is resilient, preferably of spring steel, and is disposed at a slight angle to or in other words leans toward the hook, the end of the knife-carrying element **28** being bent away from the hook so that there is substantially an arcuate portion of the element **28** opposite the knife and thus a line contact between the knife and knife-carrying element, as at **34**, FIG. 3. The line **34** is arranged substantially through the center of the lug **32**, which is disposed in the area opposite the face of the hook **13**. In this manner, the knife **30** is coupled to the knife-carrying element **28** and is oscillated therewith upon oscillation of the knife shaft **22** to impart loop severing actuation to the knife. At the same time, the knife is free to float relative to the knife-carrying element **28**, or in other words, to move about an axis normal to the hook so that under the bias of the knife-carrying element **28**, it will remain flat against the face of the hook. The cutting edges **31** and **21** are thereby maintained in cooperative relation and there are no pressure points which, upon relative movement of the hook and knife, would tend to overheat. Whatever heat is generated between the hook and knife is spread over a larger area and is more readily dissipated, thus holding the temperature of the elements to an acceptable level.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

Having thus described the nature of the invention, what I claim herein is:

1. In a tufting machine having an endwise-movable needle adapted to penetrate a backing fabric and to project a loop of yarn therethrough, a hook having a loop seizing blade adapted to enter a loop of yarn presented by said needle, and a knife mechanism cooperating with said hook to sever loops thereon to form cut pile, said knife mechanism comprising a knife disposed in abut-

ment with said hook, a knife-carrying element contacting said knife on the opposite side of said knife from said hook and biasing said knife in abutment with said hook, means coupling said knife to said knife-carrying element for imparting loop severing actuation to said knife upon actuation of said knife-carrying element and for floating relative to said knife-carrying element about an axis in a direction normal to the face of said hook to provide for seating of said knife flat upon the face of said hook.

2. In a tufting machine having an endwise movable needle adapted to penetrate a backing fabric and to project a loop of yarn therethrough, a hook having a loop seizing blade adapted to enter a loop of yarn presented by said needle, and a knife mechanism cooperating with said hook to sever loops thereon to form cut pile, said knife mechanism comprising a knife disposed in abutment with said hook, a knife-carrying element contacting said knife on the opposite side of said knife from said hook, said knife-carrying element being resilient and being arranged to bias said knife into abutment with said hook, means coupling said knife to said knife-carrying element for imparting loop severing actuation to said knife upon actuation of said knife-carrying element and for floating relative to said knife-carrying element about an axis in a direction normal to the face of said hook to provide for seating of said knife flat upon the face of said hook.

3. In a tufting machine in accordance with claim 2 wherein said knife-carrying element is inclined relative to said hook and the end thereof is bent away from said hook whereby said knife-carrying element engages said knife substantially along a line of contact.

4. In a tufting machine in accordance with claim 2 wherein said means for coupling said knife to said knife-carrying element comprises on said knife-carrying element and knife a lug and a complemental aperture for receiving said lug.

5. In a tufting machine in accordance with claim 4 wherein said lug is formed on said knife and said aperture is formed in said knife-carrying element.

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