Oct. 9, 1951 B. KAHN 2,570,348

DEVICE FOR MAKING PILE FABRICS

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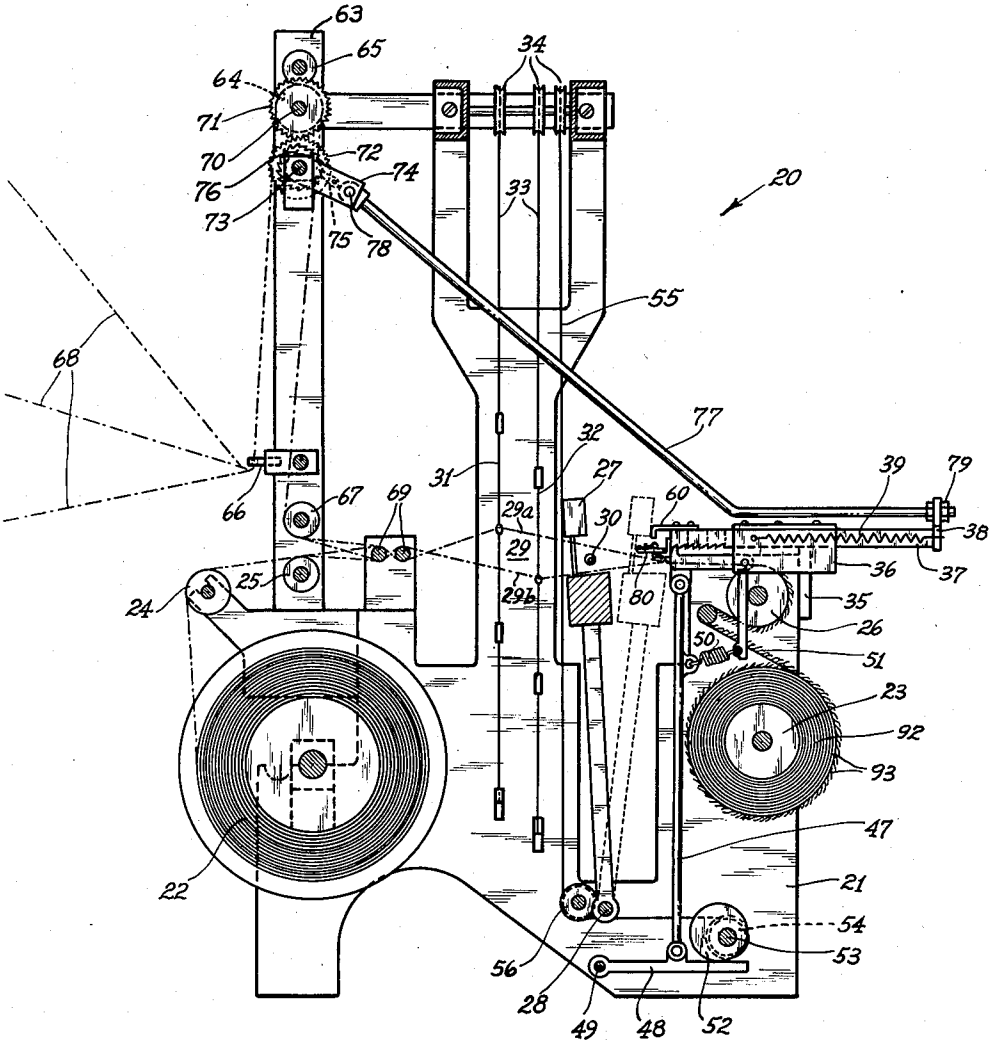



FIG. 1

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DEVICE FOR MAKING PILE FABRICS

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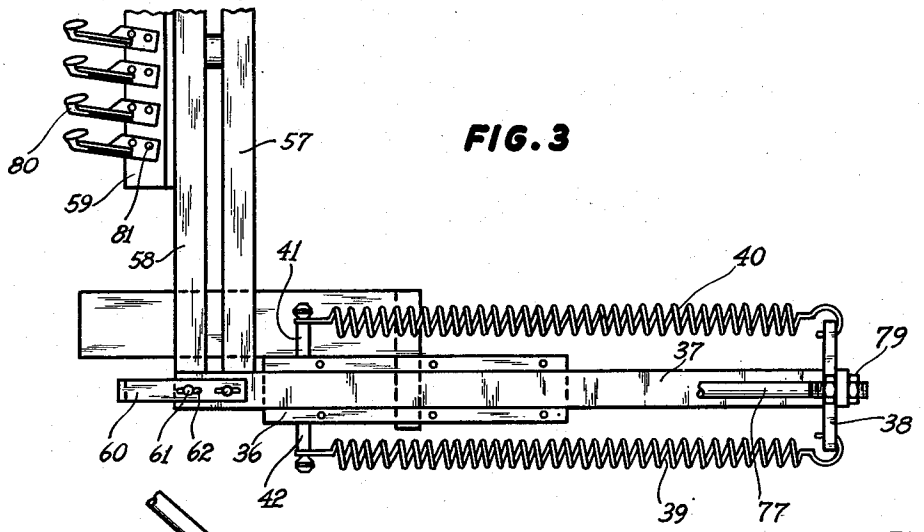



FIG. 3

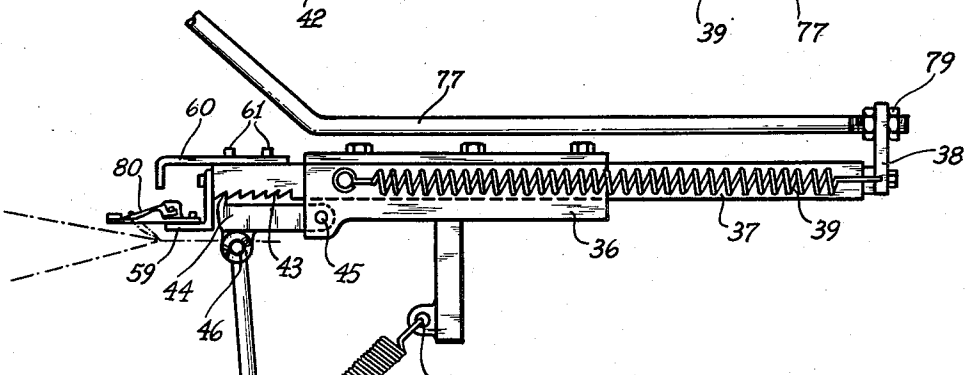



FIG. 2

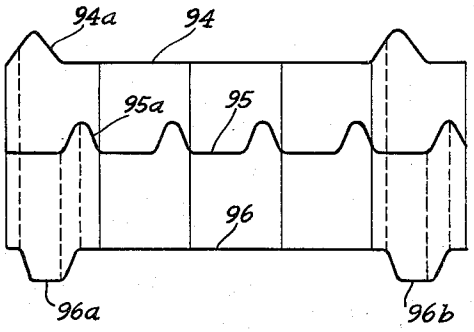
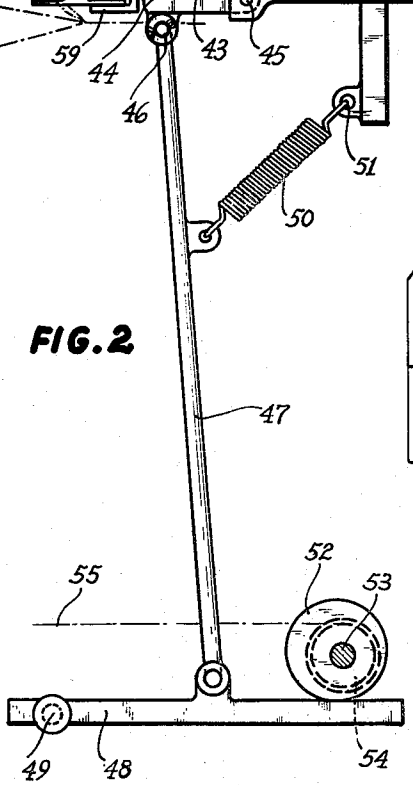



FIG. 11




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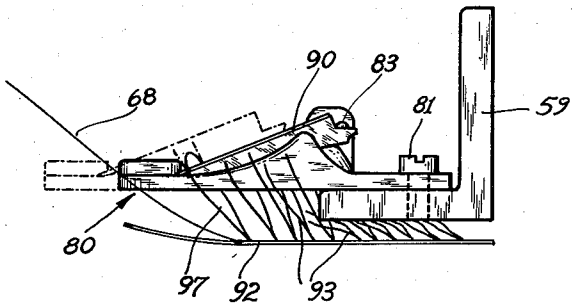
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FIG. 4



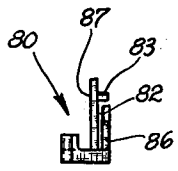




FIG. 8

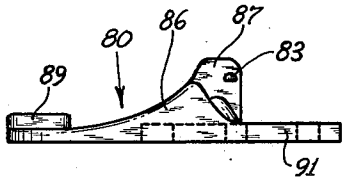



FIG. 5

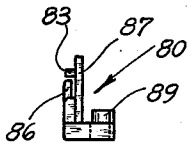



FIG. 9

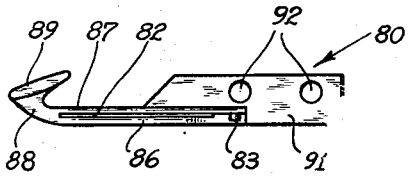



FIG. 7

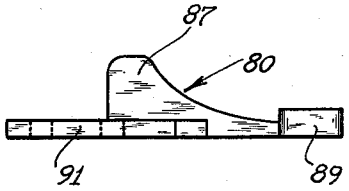



FIG. 6

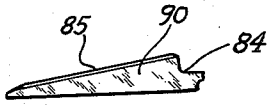



FIG. 10

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Patented Oct. 9, 1951 2,570,348

# UNITED STATES PATENT OFFICE

2,570,348

## DEVICE FOR MAKING PILE FABRICS

Benjamin Kahn, Gadsden, Ala.

Application September 3, 1949, Serial No. 114,005

4 Claims. (Cl. 139—38)

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The present invention relates to a device for making tufted fabrics by forming a series of loops on the fabric and cutting open the ends of the loops, whereby tufts are formed.

An object of my invention is to provide, in or for a machine adapted to form loops on a fabric, means for making the loops and cutting each loop immediately after it has been formed.

Another object of this invention is to provide means for making a tufted fabric in which all tufts are of uniform length and appearance.

A further object of the present invention is to provide means for making a tufted fabric in which each tuft consists of one or more pairs of strands of substantially equal length.

Still another object of the invention is to provide, in a machine of the character set forth above, reciprocating means for forming one set of loops and cutting the ends of another set of loops, previously formed, in the same working stroke, thereby reducing to a minimum the number of motions required and materially simplifying the mechanism involved.

Still another object of the present invention is to provide, in a machine of the described character, means for cutting the formed loops which are constructed to first tension the loops and then sever the latter with a smooth cutting action.

Yet a further object of the instant invention is to provide loop cutting means particularly adapted for use with a machine of the character disclosed in my co-pending application Serial No. 104,705 filed July 14, 1949.

The above and other objects of my invention will become apparent from the following description, taken in connection with the accompanying drawing which shows the invention applied to a machine as described in my above-identified co-pending application.

In the drawing:

Fig. 1 is a side elevation, in section, of the machine referred to, showing as much thereof as is necessary for an understanding of the present invention;

Fig. 2 shows part of the mechanism of Fig. 1 on a larger scale;

Fig. 3 is a top view of the mechanism shown in Fig. 2;

Fig. 4 shows, on a still larger scale, the looping and cutting means according to the present invention, illustrating its mode of operation;

Fig. 5 is a side elevation of the looping and cutting means, drawn to the same scale as Fig. 4;

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Fig. 6 is another elevation of the looping and cutting means of Fig. 5, showing the reverse side thereof;

Fig. 7 is a top view of the looping and cutting means;

Fig. 8 is a front view of the looping and cutting means;

Fig. 9 is a rear view of the looping and cutting means;

Fig. 10 shows the detachable blade portion of the looping and cutting means; and

Fig. 11 is a timing diagram used in explaining the mode of operation of the machine shown in Fig. 1.

Referring to Fig. 1, there is shown a machine or loom 20 having many of the elements of a conventional loom, including a frame 21, a warp beam 22, a take-up roll 23, guide rollers 24, 25, a toothed feed roller 26, and a lay 27 pivoted at 28. A shed 29 is formed by warp threads 29*a*, 29*b* supplied by the beam 22, the position of a weft thread or filling within the shed being indicated at 30.

The upper and lower warp threads 29*a*, 29*b*, coming from the beam 22, pass around guide rollers 24, 25 and thence through the heddles of harnesses 31, 32, respectively, these harnesses being controlled in conventional manner by means of wires 33 which pass around rollers 34 to respective harness levers (not shown).

The reciprocating movement of the lay 27 about its pivot 28, the advance of the feed roller 23, the formation of the shed 29 and the insertion of a filling 30 are all effected by means of a suitable power source in a coordinated manner which is well understood in the art and, therefore, has not been further illustrated.

Secured to the frame 21 adjacent the ends of the breast beam 35 are a pair of slide boxes or guides 36 within which move a pair of slides 37, as more clearly seen in Figs. 2 and 3. The rear end of each slide 37 carries a bracket 38 to the arms of which are anchored a pair of contracting springs 39, 40 having their other ends attached to pins 41, 42 projecting from the box 36. The tendency of these springs is to maintain the slide 37 in a forward position in which the bracket 38 abuts the end of box 36. The slides 37 are provided at the underside of their forward extremities with sawteeth 43 co-operating with a dog 44, the latter being pivoted at 45 to the box 36. The dog 44 has a lug 46 engaged by the upper end of an actuating rod 47 the lower end of which is pivoted to a lever 48 rotatably held in the frame 21 by a stud 49. A spring 50,

anchored to the frame 21 at 51, tends to maintain the rod 47 in a raised position and, thereby, to hold the dog 44 engaged with one of the teeth 43 after the slide 37, in a manner subsequently described, has been displaced toward the rear against the actions of springs 39, 40.

The rods 47 are adapted to be periodically displaced against the action of springs 50 by means of cams 52 mounted on a shaft 53, these cams co-operating with levers 48. Motion is imparted to the shaft 53 by means of a cylinder or pulley 54 having the end of a control wire 55 wrapped around it, this wire passing around a guide roller 56 as well as one of the rollers 34 to a respective harness lever associated therewith.

The slides 37 support a pair of parallel beams 57, 58 the forward one of which, beam 58, carries a hook bar 59; the slides further carry lugs 60 forming an abutment for the lay 27, the position of these lugs on their slides being adjustable by means of screws 61 passing through slots 62.

Rising from the front end of the machine 20 are a pair of uprights 63 (only one shown) forming an extension of the frame 21. These uprights support a feed roller 64, a co-operating presser roller 65, a guide plate 66 and a deflecting roller 67. Guide plate 66 is provided with a series of apertures through which pass respective threads 68, a running parallel with the warp threads taken from the beam 22. The threads 68, which may be somewhat heavier than the warp threads and which are supplied by separate spools or the like, not shown, enter between the feed roller 64 and the presser roller 65, thence pass around the deflecting roller 67 and, after passage of the guide rails 69, enter certain of the heddles of one of both harnesses 31, 32, depending upon the pattern of tufts to be formed.

Mounted on the shaft 70 of feed roller 64 is a gear 71 which meshes with another gear 72 mounted on a stud shaft 73. A plate 74, loosely pivoted on the stud shaft 73, carries a pawl 75 which is pivotally held thereon for engagement with the teeth of a ratchet 76, likewise mounted on a stud shaft 73, against which it is forced by means of a suitable spring (not shown).

A bent rod 77 is pivoted to the plate 74 at 78 and has its other extremity fixed by a nut 79 to an upstanding projection of the bracket 38 shown in Figs. 2 and 3. It will be seen that rearward displacement of the slide 37, into the position shown in Fig. 1, will swing the plate 74 counterclockwise about the stud shaft 73, thereby imparting a similar movement to the ratchet 76 and to the gear 72, this in turn resulting in a clockwise rotation of gear 71 and roller 64. The latter is thereby actuated to advance the threads 68 so as to provide sufficient slack for the formation of loops as subsequently described.

The hook bar 59 carries a row of hooks 80, designed in accordance with the present invention to act as looping and cutting devices. Referring to Figs. 4 through 10, in which the details of construction of these hooks are shown with greater clarity, each hook 80 is secured to the bar 59 by means of a screw 81 and carries a blade 90 detachably inserted into a longitudinal slot or channel 82 thereof, a projection 83 serving to hold the blade 90 in place by engaging a shoulder 84 formed at the rear of the blade. It will be understood that the resilient blade may be bent sideways so as to clear the projection 83, for the purpose of insertion into or withdrawal from the slot 82, the edge 85 of the blade facing upwards when the latter is in position on the hook or holder 80. Edge 85 then projects above the concave crests of a pair of fins 86, 87 which between them form the slot 82 and at the front end of the hook merge into the neck portion 88, the latter terminating in a bill portion 89 which rises above the portion 88 and is inclined toward the slot 82, as clearly seen in Fig. 7; it will be seen that the projection 83 is formed at the rear of fin 87.

The shank portion 91 of the hook 80 is provided with a pair of holes 92 through which pass the screws 81, serving to secure the hook to the bar 59. As seen in Fig. 3, the hooks 80 are mounted on the hook bar 59 at such an angle that the blades 90 are disposed in vertical planes inclined laterally toward the direction of movement of the bar and that the bill portions 89 are oppositely inclined thereto.

The operation of the machine 20 will now be described with particular reference to Figs. 1 and 4 and to the timing diagram of Fig. 11.

The warp and weft threads 29, 30 are woven into a fabric 92 in the ordinary manner, the lay 27 oscillating about its pivot 28 after each traverse of the shuttle (not shown). During such oscillations the lay 27 strikes the lug 60 but, since the slides 37 are held in their rearward (rightmost) position, no movement of the slides and of the hook bar 59 results from this contact. The special threads 68, from which the tufts 93 are to be formed, are woven into the fabric 92 along with the regular warp threads 29.

At regular intervals, for example after every fourth traverse of the shuttle, the cams 52 are actuated over their operating wire 55 to depress the levers 48, thereby disengaging the dogs 44 from the teeth 43 of slides 37, enabling the springs 39, 40 to displace these slides into the forward position thereof. Graph 94 in Fig. 11 illustrates the movement of control wire 55, graph 95 the reciprocations of lay 27 and graph 96 the oscillations of the slides 37.

It will be seen from Fig. 11 that the wire (graph 94) and, with it, the elements 52, 47 and 48 move once after every fourth cycle of operation of the lay 27 (graph 95), as do the slides 37 and hook bar 59 (graph 96), the movement of the hook bar starting somewhere along the leading edge of the hump 94*a* which represents the displacement of the elements controlled by the cam 52. The trailing edge of hump 96*a*, representing the movement of the hook bar, coincides with the leading edge of the next succeeding hump 95*a*, representing the movement of the lay 27, owing to the fact that the return movement of the hook bar is effected by the lay pushing against the lug 60 while swinging from its full-line or forward to its dotted-line or rearward position.

The forward position of the hooks 80, represented by the crest of hump 96*a*, is illustrated in dot-dash lines in Fig. 4. In this position the bill portion 89 of each hook 80, having cammed aside a respective thread 68 which at this moment parallels the upper warp threads 29*a* of Fig. 1, engages the thread 68 and draws it toward the right during its return movement, this portion of the thread being formed into a loop 97 during the next oscillation of the lay. It will be understood that the fillings or weft threads 30 serve to anchor the loop 97 firmly in the fabric 92 during the following traverses of the shuttle; at the same time the feed roller 26 advances the fabric, thereby displacing the loops 97 rearwardly along the neck portions 88 of the hooks.

During the next forward movement of the hook

bar, indicated at 96b in Fig. 11, the formed loop 97 rides on the cutting edge 85, and, by reason of the lateral inclination of the edge relative to the direction of movement of the carriage, the loop is tensioned progressively and finally cut in two, thereby converting it into a tuft 93. Because of the tensioning effect of the lateral inclination of the blade, the slope of the cutting edge thereof may be gradual to provide a smooth cutting action. During the same movement the bill portion 89 engages a further portion of its associated thread 68, whereupon the process of forming a loop is repeated in the manner previously described.

It will be readily seen that the machine described may be used for making tufts consisting of more than one strand, by drawing two or more threads 68 through the same heddle for simultaneous engagement by a hook 80, so that a plurality of loops are formed by each hook during one stroke and are cut by its blade 90 during the next stroke. The tufts 93 may be distributed over the fabric 92 in any desired pattern by suitably choosing the heddles holding the threads 68 and by operating the corresponding harnesses in suitable manner. It should also be understood that the tuft forming means of the present invention may be used in combination with machines or looms other than the one specifically described and that the hook or tufting device itself may be modified in various ways without departing from the spirit and scope of the invention as defined in the objects and in the appended claims.

I claim:

1. In a loom, in combination, a reciprocating support, a set of hooks on said support, said hooks including hook bodies each having a laterally extending bill portion on one end adapted to engage threads respectively aligned therewith, weaving mechanism for making a fabric, means including said hooks and said weaving mechanism for forming portions of certain of said threads into loops during each reciprocation of said support and for anchoring said loops to the fabric, and a cutting edge on each of said hooks sloped upwardly relative to said hook body in back of said bill portion thereof and lying in a vertical plane inclined laterally relative to the direction of reciprocation of said support so as to tension the loop as the latter moves along the cutting edge away from the bill portion and for cutting the tensioned loop during such movement, thus permitting the use of a cutting edge having a gradual upward slope relative to the hook body.



2. In a loom, the combination according to claim 1, wherein said bill portions are disposed in vertical planes inclined laterally relative to said direction of reciprocation in directions of inclination opposite to that of the related cutting edges.

3. In a loom, the combination according to claim 1, wherein said bill portions extend upwardly substantially above the leading ends of the related cutting edges to direct the formed loops onto said cutting edges.

4. In a loom, the combination according to claim 1, wherein each of said hook bodies is formed with a longitudinal groove opening upwardly along its length and to one side at its rear end, the related cutting edge being formed on a resilient blade received in said groove, a fixed lateral projection extending into said groove from the side opposite to said side opening of the latter, and a shoulder formed on the rear end of said resilient blade for engagement under said projection to hold the blade in the groove so that the rear end of the blade may be flexed laterally into the side opening of the groove to clear said projection during insertion and removal of the blade.

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