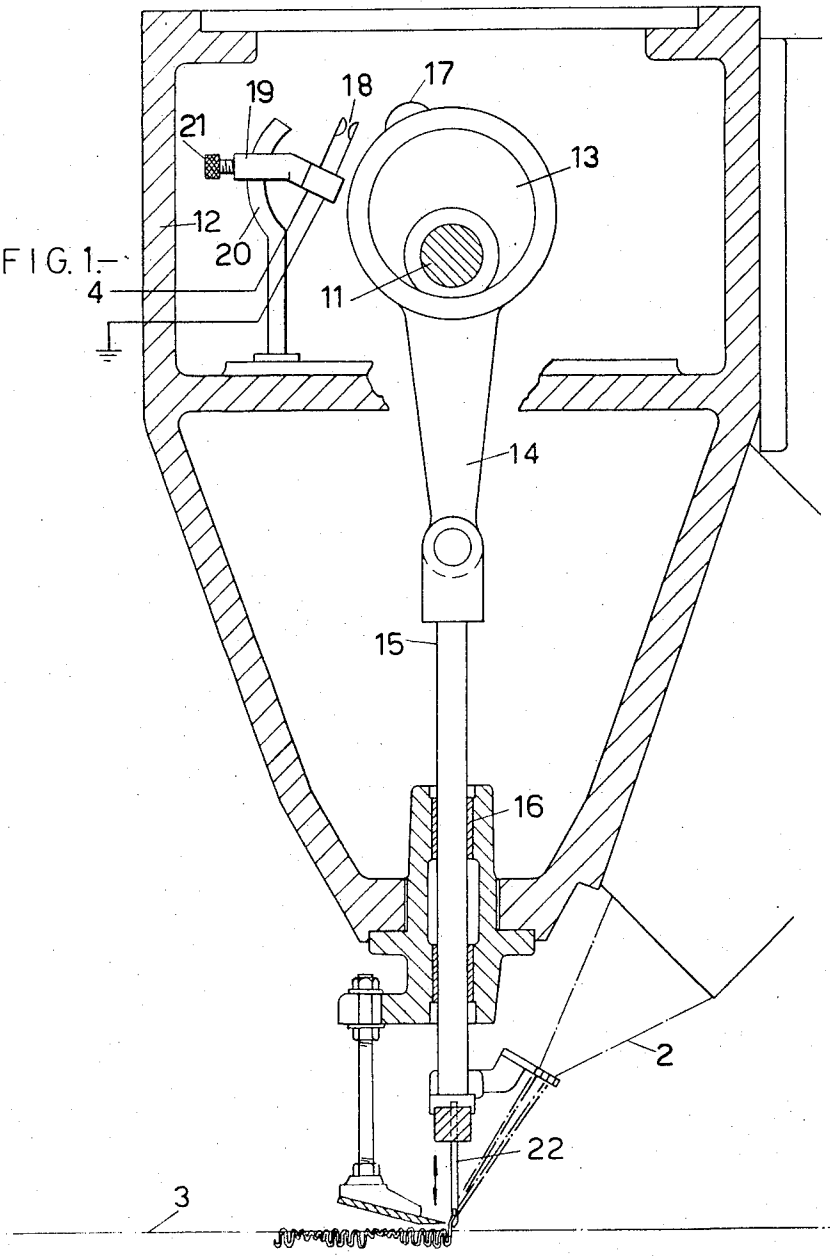
Feb. 6, 1968 R. ELLISON ET AL 3,367,294

TUFTING MACHINES PATTERN CONTROL ARRANGEMENT

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FIG. 1

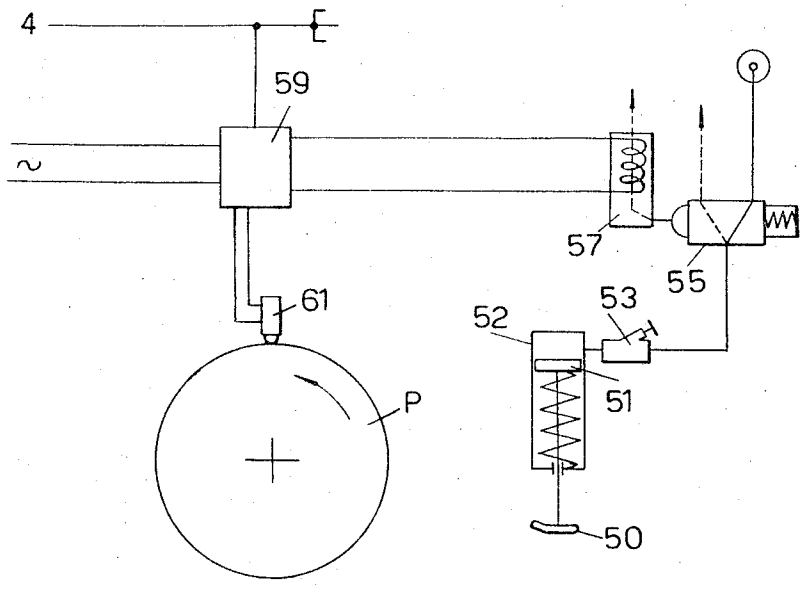


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-FIG. 2-

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United States Patent Office 3,367,294 Patented Feb. 6, 1968

3,367,294

TUFTING MACHINES PATTERN CONTROL ARRANGEMENT

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Filed Apr. 29, 1966, Ser. No. 546,226
1 Claim. (Cl. 112—79)

ABSTRACT OF THE DISCLOSURE

An improved pattern control for tufting machines of the type which is effective to cause pattern changes during tufting operation, the improvement being circuitry that correlates the occurrence of any pattern change to the loop-forming movements of the tufting needles and is effective to insure the completion of loops before a change in pattern is permitted.

The present invention concerns multiple needle tufting machines of the type use in making carpets or like fabrics, wherein a pattern is formed in the work by selectively commanding the formation of pile loops of normal or reduced height respectively, by means such as a pattern drum.

The object of the invention is to ensure a more faithful reproduction of the original design and greater consistency of appearance both as between one patterned piece and another and as between one pattern repeat and another repeat on the same piece.

According to the present invention the pile loop height changes to be executed are determined by pattern control means such as a pattern drum, and are synchronised by further means with the machine cycle to change the pattern being formed in the work at a predetermined phase of the movement of the needles.

In prior tufting machines, although the patterning element was driven at a speed related to the speed of the work advance, e.g. by driving a patterning cylinder from the main spindle of the tufting machine at a predetermined fraction of its speed, no attempt was made to correlate the precise instant of pattern changing to the momentary position of any needle, with the result that marginal conditions arose where a change of pattern occurred, possibly resulting in an incomplete reduction in loop length. The present invention, however, in precisely defining the change relative to the phase of loop formation, results in a much sharper reproduction of the design by accurately timing each and every pattern change.

Timing of pattern changes is effected by a cam rotated by the shaft driving the needles, the cam actuating contacts or a photo-electric or magnetic pick-up. This actuation applies an energising potential to all of the pattern controlling devices of the machine simultaneously, for a time sufficient for the needles to make one loop each. During the time between loop formations, the said control devices are rendered inactive, so that pattern movements relative to the pick-up devices are ineffective to operate the control devices.

Timing setting may be assisted by the provision of a stroboscopic illumination of one of the mechanical parts, e.g. the tufting needle bar, to define its position at the instant of pattern changing command.

Reference should now be made to the accompanying drawings in which:

FIGURE 1 shows a section of part of a tufting machine; and

FIGURE 2 is a schematic of the control mechanism for determining the length of loop formation.

The tufting machine itself is constructed upon a frame **12** which carries a needle bar **15** located in a bushing **16** for vertical reciprocation. Each machine consists of a large number of needles, and these needles **22** are reciprocated by means of a crank and eccentric **14, 13,** all the cranks and eccentrics being driven from a common shaft **11**. Each needle feeds a yarn **2** in a series of long or short loops into a backing fabric **3** which is fed constantly past the row of needles, the length of loops formed being determined electrically from a pattern.

The eccentric **13** carries a cam surface or switch-actuating projection **17** which during rotation makes contact with and closes a pair of contacts **18**. These contacts are carried by means of an adjustable clip **19** on a curved bracket **20** mounted on the frame of the machine, the position of the contacts relative to the cam being adjustable by means of the screw **21**.

The pattern effect of the needles is determined by means of a drum P, illustrated in FIGURE 2. This drum which is rotated at a rate proportional to the rate of feed of backing material past the needles, carries a pattern which is illuminated, there being a plurality of photo-cell pick-up devices **61** located near the pattern. Each photo-cell has an individual amplifier **59**, the output of which operates a relay **57**. This relay actuates a pneumatic valve **55** which via a regulator **53** applies air presure when the valve is opened to a cylinder **52** having a piston **51**. The latter carries a brake shoe **50** which acts on one or more yarns to restrict their loop length when the brake is applied. It therefore follows that control of individual loops or groups of loops can be effected from a pattern photo-electrically.

Since however the needle reciprocation is rapid and the movement of the pattern drum relative to the photo-cells is low, it may happen that a pattern change occurs under a photo-cell when the needles have executed a partial movement. This might cause the production of only partially completed loop lengths of either long or short lengths. By provision of the contacts **18**, which are connected to all the amplifiers **59** in parallel via the lead **4**, it can be ensured that no action by a photo-cell **61** can energise its amplifier **59** unless contacts **18** are closed. This ensures that the needles must be in the correct position for a brake change before such change is effected. In this way it can be ensured that all the loops, either of the long or short variety, are completed when a pattern change is commanded.

Although the invention has been described in connection with the use of contacts opeated mechanically from a cam, the said contacts may be replaced by a photo-cell or magnetic pick-up device, in which case the output of the said device would be connected to lead **4** via a suitable amplifier.

The means outlined above ensure that if a photo-cell changes its condition, i.e. from braking to nonbraking or vice versa, before the contacts **18** close, this change of condition is ineffective to operate the brake concerned, before a predetermined time. If however the contacts **18** close whilst a photo-cell is in a pattern-commanding condition, as when receiving light, the pattern changes which would ordinarily follow and which would ordinarily operate the brake associated with the photo-cell in question is prevented from occurring during mid-loop formation. To achieve this we incorporate a delay circuit in the amplifier **59** so that if the photo-cell **61** is, for example, receiving light from a portion of the pattern when the contacts **18** close, then the circuit of the amplifier **59** remains unaltered during the remainder of stitch formation, even though the pattern changes from light to dark meanwhile. As an alternative to this method, the amplifier **59** may be provided with a flip flop, the position of which is

determined in the main by the degree of photo-cell energisation. The condition of the flip flop however remains fore a predetermined time. If however the contacts 18 even if the condition of the photo-cell changes meanwhile.

Whilst our invention has been described with reference to a cam-operated contact, it is clear that the said cam could carry a light-reflecting spot or magnet, and that a signal derived for the spot or magnet could be used for synchronisation instead of one from a contact.

We claim:

1. In combination, a tufting machine for making a tufted material comprising tufting needles, a drive shaft means operatively arranged to actuate said tufting needles through loop-forming movement so as to normally form loops of a comparatively long length, loop-length control means including a brake shoe operatively effective to selectively restrict loop length so as to correspondingly selectively form loops of a short length, a pattern control including loop-length changing means operatively arranged to control the operation of said brake shoe to provide a predetermined pattern of said long and short loops in said tufted material, an energization circuit for said pattern control including a normally open switch operatively effective to correspondingly normally maintain said loop-length changing means of said pattern control ineffective, and switch-closing means arranged at a predetermined location on said drive shaft means for movement through a path effective to cause the closing of said normally open switch to thereby complete said energization circuit and operate said loop length changing means of said pattern control, said predetermined location of said switch-closing means being correlated to the loop-forming movement of said tufting needles so as to complete the formation of said loops preparatory to any change in length thereof.

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