Oct. 31, 1961 M. B. PENMAN 3,006,296

YARN FEED AND CONTROL MECHANISM

Filed April 2, 1957 3 Sheets-Sheet 1

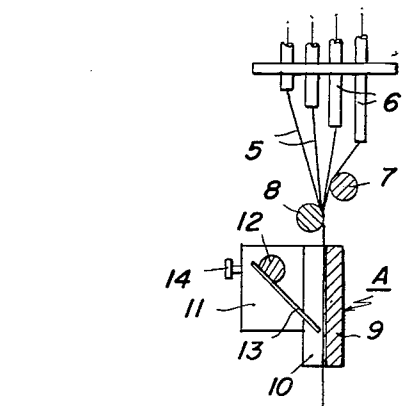


FIG. 1

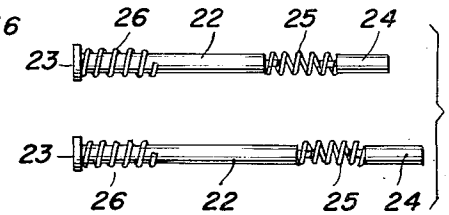


FIG. 7

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YARN FEED AND CONTROL MECHANISM

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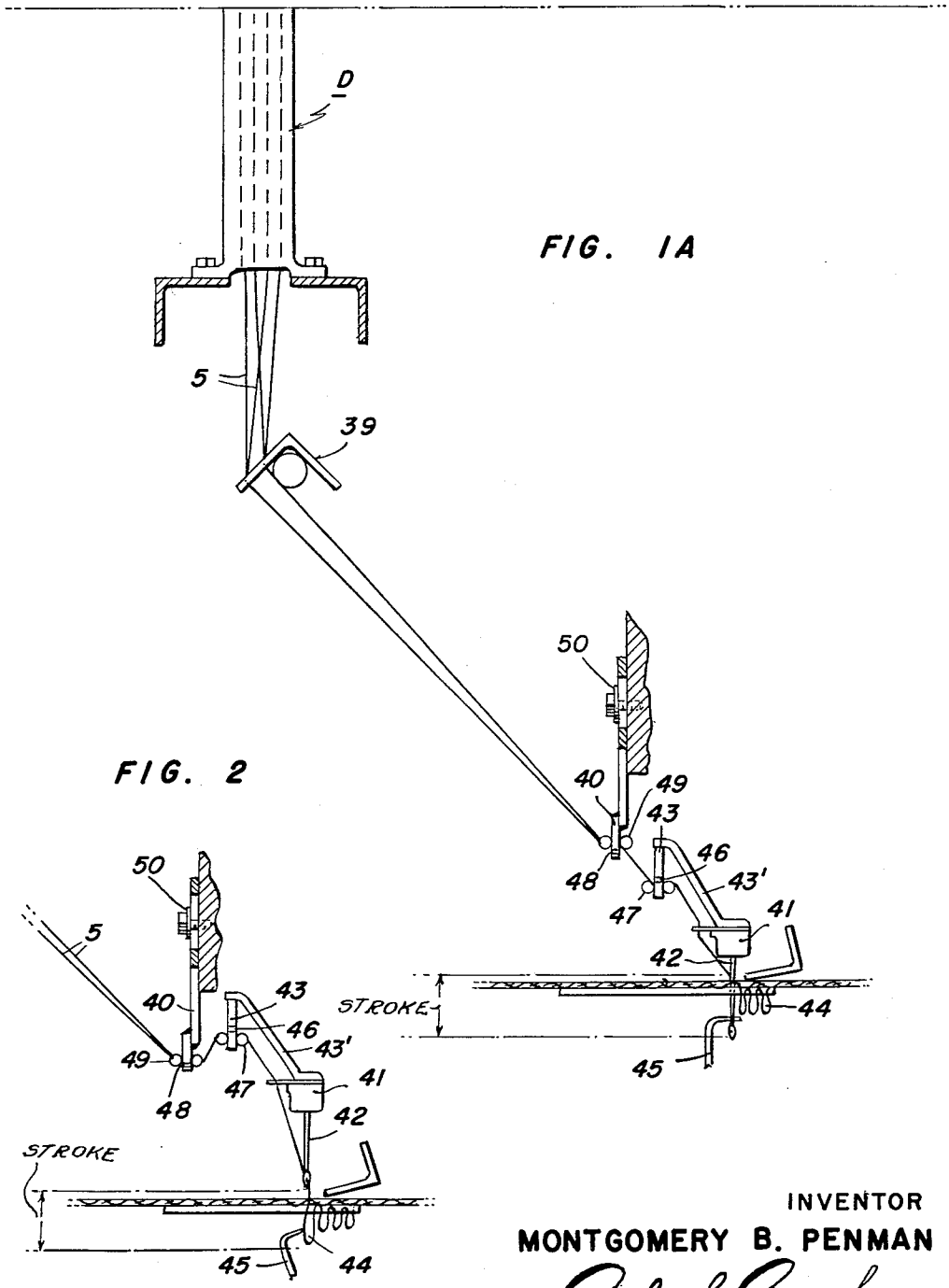


FIG. 1A

FIG. 2

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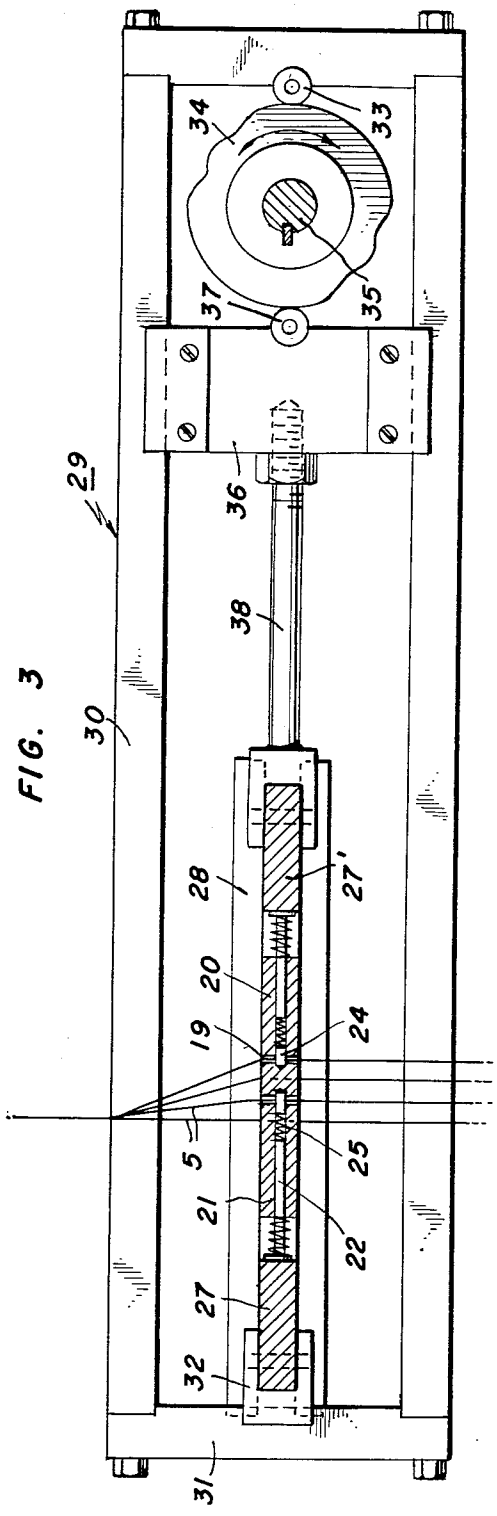


FIG. 3

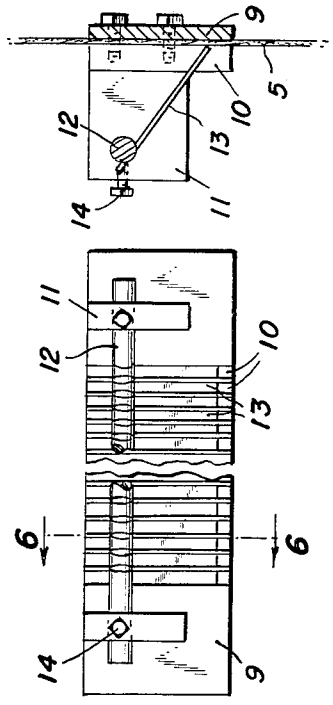


FIG. 6

FIG. 5

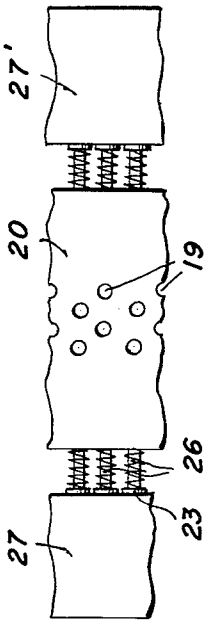


FIG. 4

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YARN FEED AND CONTROL MECHANISM

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4 Claims. (Cl. 112—79)

This invention relates to a yarn feed and control mechanism for multiple needle tufting machines.

It is an object of the invention to provide a yarn feed and control mechanism which will uniformly supply a pre-determined length of yarn to the needles of a tufting machine to form loops of uniform height in accordance with a pattern.

A further object of the invention is to provide a yarn locking mechanism between the source of yarn supply and the needles of a tufting machine for locking the yarns against movement towards or from the yarn supply during part of each cycle of operation of the machine.

Another object of the invention resides in providing a yarn control mechanism for producing tufted carpets having loops of different heights wherein each height of loops are uniform thus improving the appearance of the carpet.

Other objects and advantages of the invention will be apparent during the course of the following specification.

In the accompanying drawings, forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same,

FIGS. 1 and 1A schematically illustrate the yarn feed and control mechanism.

FIG. 2 is a view of the needle bar of the tufting machine in its uppermost position,

FIG. 3 is a cross sectional view of the lock mechanism,

FIG. 4 is a fragmentary plan view of the lock mechanism.

FIG. 5 is a fragmentary front elevational view of the yarn clamp,

FIG. 6 is a vertical sectional view taken on line 6—6 of FIG. 5, and,

FIG. 7 is a detail view of the plungers employed in the lock mechanism.

In the drawings, a schematic view of the yarn control and lock mechanism is shown in FIGS. 1 and 1A wherein a pair of yarn clamping members A and B are disposed in vertical spaced relation and intermediate the clamping members is a yarn feeding member C. Between the lower clamping member B and pattern control mechanism D is a yarn locking mechanism E. The yarns 5 from the creel tubes 6, above the clamping member A, are moved into parallel relation extending transversely of the machine by opposed guide rods 7 and 8, one rod being disposed in a plane slightly above the plane of the other rod. The yarn clamp A consists of a bar 9 having in one of its vertical faces a series of parallel vertical slots or grooves 10 adapted to receive the yarns 5, there being one slot for each yarn. Brackets 11 project outwardly from the grooved face of the bar 9 at its ends and rotatably mount a shaft 12 on which are mounted a series of spring fingers 13, there being one finger for each of the grooves. The fingers are of a width slightly less than the width of the grooves and extend downwardly from the shaft at an angle towards the grooved face of the bar 9. By rotating the shaft 12 the lower ends of the fingers are moved into pressing engagement with the yarns in the grooves and prevent upward movement of the yarns. The tension of the fingers on the yarns may be adjusted by rotating shaft 12 which is held in adjusted position by set screws 14 mounted in brackets 11.

The yarns after passing through clamp A are trained around one side of a guide rod 15 and then over the opposite side of oscillating feed rod 16 mounted in arms 17 extending from oscillating shaft 18 disposed on the side of the yarns opposite to that of feed rod 16. When the shaft 18 is oscillated to swing the feed rod 16 in the direction to pull on the yarns a pre-determined length of the yarns is drawn from the creel, not shown, below the clamp A. The clamp B which is disposed below shaft 18 is identical in construction to clamp A and serves to prevent any upward pull on the yarns when the feed rod draws the yarns from the creel.

After the yarns leave clamp B they pass through vertical apertures 19 in a fixed plate 20 of the yarn lock mechanism E. The apertures of plate 20 are arranged in staggered relation and in vertical alinement with the tubes of the pattern control mechanism D disclosed in applicant's prior application Serial No. 574,745 filed March 29, 1956, now Patent No. 2,971,722. The plate 20 is provided with a series of oppositely extending transverse bores 21, the inner ends of which intersect the vertical apertures 19. Plungers 22 are slidably mounted in the bores 21 having enlarged heads 23 at their outer ends beyond the edge of the plate 20. The inner ends of the plungers 22 have pins 24 connected thereto by coil springs 25 which under compression project the pins to intersect the apertures 19 and grip the yarns holding them against movement. Coil springs 26 mounted on the plungers between their heads and the edge of plate 20 normally move the plungers outwardly to retract the pins and release the yarns. The actuating means for the plungers 22 includes bars 27 and 27' disposed in the same horizontal plane as plate 20 and in parallel relation to the longitudinal edges of the plate. The ends of bars 27 and 27' are slidably mounted in U-shape cross bars 28 fixedly mounted on the frame of the machine. The inner edges of bars 27 and 27' are in contact with the heads 23 of plungers 22 and upon movement of the bars towards each other the plungers are moved inwardly compressing springs 25 and 26 to move the pins 24 into gripping engagement with the yarns and lock them against movement. A rectangular reciprocating frame 29, at each end of plate 20, straddles the plate and bars 27, 27'. The frame 29 includes longitudinal side bars 30 and end members 31. One of the end members 31 is connected by a U-shape bracket 32 to the bar 27 and the opposite end member mounts a roller 33 for engagement with the periphery of a cam wheel 34 mounted on a rotating shaft 35. A cross head 36 is slidably mounted on the side bars 30 of frame 29 and mounts a roller 37 for contacting engagement with the periphery of cam wheel 34. A connecting rod 38 connects the cross head to the bar 27' and upon rotation of the cam wheel 34 the frame 29 and connecting rod 38 are reciprocated in opposite directions to simultaneously move the bars 27, 27' to actuate the plungers 22 to lock and release the yarns during each cycle of operation of the yarn feeding mechanism.

After the yarns leave the pattern control mechanism they pass through a yarn guide bar 39 and extend downwardly in the direction of the needle bar 41. The needle bar supports a series of needles 42 arranged in a straight row across the machine and attached to the needle bar is a jumper bar 43 supported above and to the rear of the needle bar by arms 43'. The jumper bar extends longitudinally of the needle bar and is provided with a row of openings 46, one for each needle, through which the yarns extend. The yarns pass over guide rods 47 attached to opposite sides of the jumper bar. Adjacent to the jumper bar and between the jumper bar and guide bar 39 is an adjustable guide bar 40 which is adjustable vertically, as at 50, and has a row of openings 48 corresponding to the openings of the jumper bar through which the yarns extend and on opposite sides of the bar 40 are guide rods 49 under which the yarns pass. The

guide bar **40** is disposed parallel to the path of movement of the jumper bar and when the latter moves upwardly it carries the yarns past the lower end of the guide bar and thus pulls the yarns from the source of supply.

In operation, the needle bar on the down stroke causes the needles to penetrate the fabric and carry the yarns through the fabric to form loops **44** on the underside of the fabric which loops are engaged by the usual looper arms **45** to hold the loops on the up stroke of the needle bar. When the needle bar is in its uppermost position, as shown in FIG. 2, looper arms **44** are disengaged from the row of loops just formed, and yarn feed rod **16** is ready to pull a length of yarn from the supply creel. The cam wheel **34** of locking mechanism E is in locking position to lock the yarns when feed rod **16** starts to move and pattern control mechanism D is inoperative. As the needle bar starts on its downward movement it carries the supply of yarn provided by the previous cycle and feed rod starts to draw a length of yarn from the supply creel for the next cycle. The lock mechanism continues to hold the yarns and when the needle bar about reaches the point of penetrating the fabric, pattern control mechanism is operated to selectively hold the yarns in accordance with a pattern. The needle bar completes its downward stroke to form a row of loops of uniform height which are engaged and held by looper arms **45**. When the needle bar is at the bottom of its down stroke feed rod **16** has completed its forward motion and is ready to swing backward; lock mechanism is open at this point allowing the yarns to move freely through the apertures **19** of plate **20**. As the needle bar moves upwardly jumper bar **43** draws yarn from the supply created by the operation of feed rod **16** with the exception of those yarns held by the pattern control mechanism. Since the yarns held by the pattern control mechanism cannot be drawn down the upward movement of the jumper bar **43** will pull upwardly on the yarns being held by the pattern mechanism thereby robbing yarn from loops in the preceding row and thus reducing the height of those loops. The pattern attachment holds the selected yarns until just before the needle bar reaches the top of its upward stroke so the yarns are released before the loops from which yarn is robbed have not been completely pulled from the fabric. By varying the timing of the release of the yarns the height of the loops may be varied.

Having thus described my invention, I claim:

1. In a multiple needle tufting machine having a yarn supply, a bank of reciprocating needles operating to pass loops of yarn through a fabric, means for drawing a length of yarns from the yarn supply to provide a supply of slack yarns when the needles move to a loop forming position, a unidirectional clamp above and below said yarn drawing means for holding said yarns against movement in a direction towards said yarn supply but permitting free movement of the yarns in the opposite direction, a pattern control mechanism between the needles and yarn drawing means for selectively holding the yarns against movement, a yarn locking mechanism between the clamp below the yarn drawing means and said pattern mechanism operable independently of the pattern control mechanism and yarn drawing means to simultaneously hold all the yarns against movement when the needles move to a loop forming position and the yarn drawing means is operated to draw a length of yarns from the yarn supply, and means operating with the needles for drawing a length of yarns from yarns drawn

by said first drawing means not held by said pattern mechanism when said locking mechanism is operated to release the yarns and the needles return to a starting position.

2. In a multiple needle tufting machine having a yarn supply, a bank of reciprocating needles operating to pass loops of yarn through a fabric, means for drawing a length of yarns from the yarn supply to provide a supply of slack yarns when the needles move to a loop forming position, a pattern control mechanism between the needles and drawing means for selectively holding the yarns against movement, a plate disposed above the pattern control mechanism having longitudinal rows of spaced apertures extending vertically through the plate for passage of the yarns leading to the control mechanism, plungers on opposite sides of the rows of apertures slidably mounted in passages formed in said plate and extending from said apertures through the longitudinal edges of said plate with the outer ends of said plungers projecting beyond the edges of said plate, reciprocating means engaged with the outer ends of said plungers operable in unison to simultaneously move said plungers inwardly to clamp the yarns passing through the apertures between the inner ends of said plungers and wall of the apertures when said needles move to a loop forming position and said yarn drawing means is operated to draw a length of yarns from the yarn supply, and means operating with the needles for drawing a length of yarns from the supply of slack yarns not held by said pattern mechanism upon return of said needles to a starting position and release of said yarns by movement of said plungers.

3. In a multiple needle tufting machine as described in claim 2 wherein said reciprocating means comprises a pair of bars extending parallel to the edges of said plate for contacting engagement with the outer ends of said plungers, means mounting said bars for movement in unison towards and from the edges of said plate to simultaneously move said plungers into gripping engagement with the yarns pass through said apertures, and means for reciprocating said bars.

4. In a multiple needle tufting machine as described in claim 2 wherein said plungers have yieldable pins at their inner ends for gripping the yarns.

References Cited in the file of this patent

UNITED STATES PATENTS

1,452,633	Barnett	Apr. 24, 1923
1,863,049	Hermann	June 14, 1932
1,917,411	Weis	July 11, 1933
2,055,945	Reed	Sept. 29, 1936
2,318,080	Keen	May 4, 1943
2,578,242	Hamby	Dec. 11, 1951
2,652,017	Hohmann	Sept. 15, 1953
2,696,181	Lacey	Dec. 7, 1954
2,782,741	Smith	Feb. 26, 1957
2,782,905	Smith	Feb. 26, 1957
2,784,689	MacCaffray	Mar. 12, 1957
2,804,835	Janney et al.	Sept. 3, 1957
2,810,471	Shattuck	Oct. 22, 1957
2,811,244	MacCaffray	Oct. 29, 1957
2,842,079	Rice	July 8, 1958
2,873,705	Cobble et al.	Feb. 17, 1959
2,876,183	Parlin	Mar. 3, 1959
2,884,881	Oberholtzer	May 5, 1959
2,940,405	Parlin	June 14, 1960