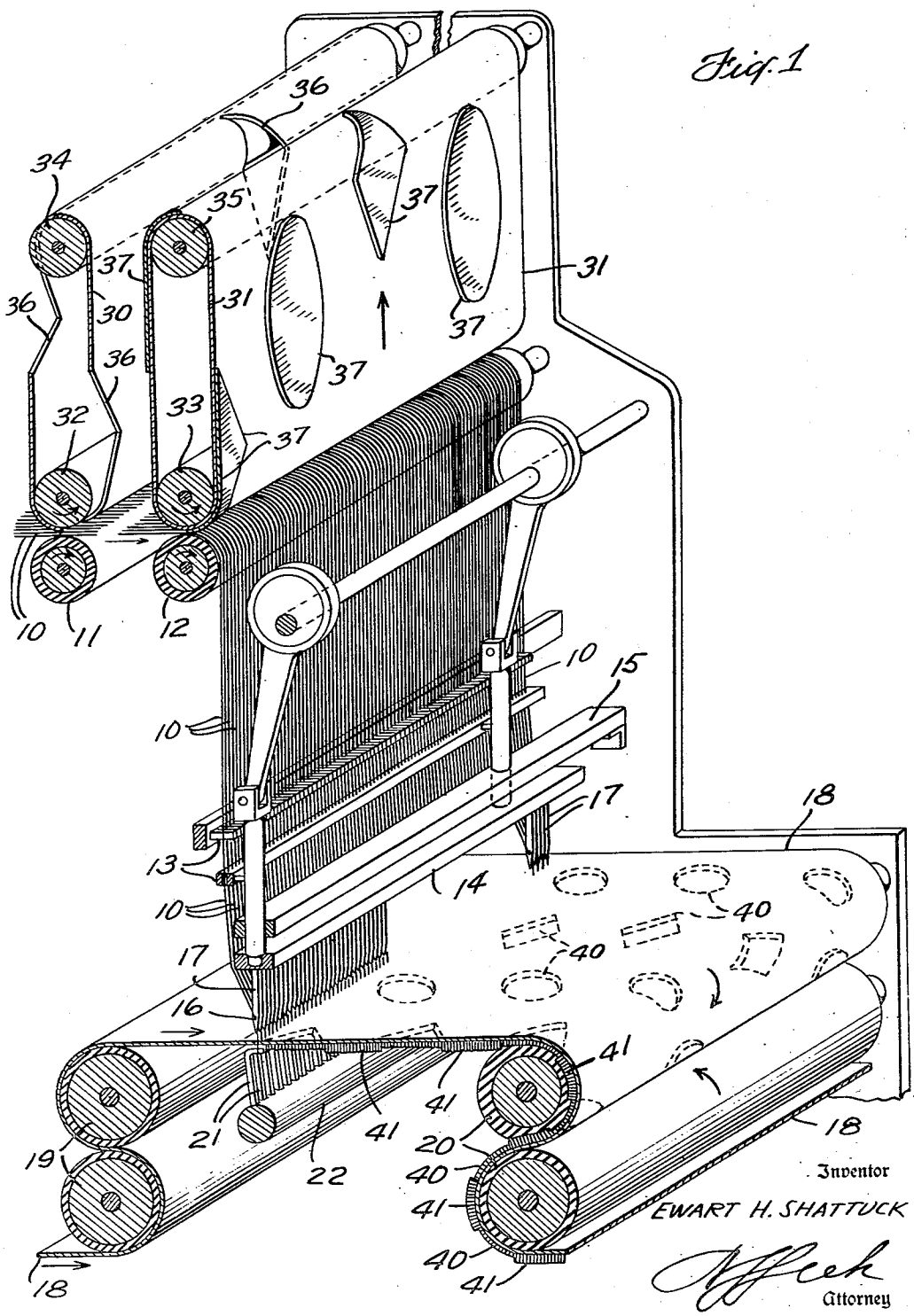
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TUFTING MACHINE

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Fig. 1



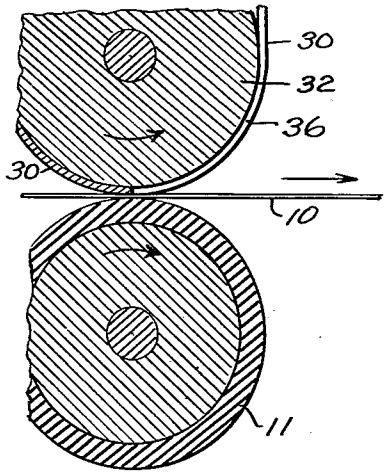
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TUFTING MACHINE

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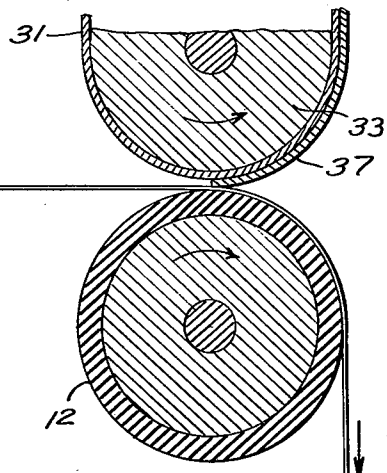


Fig. 2

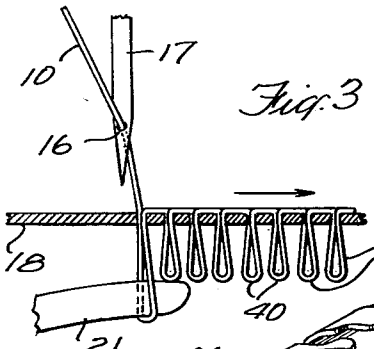


Fig. 3

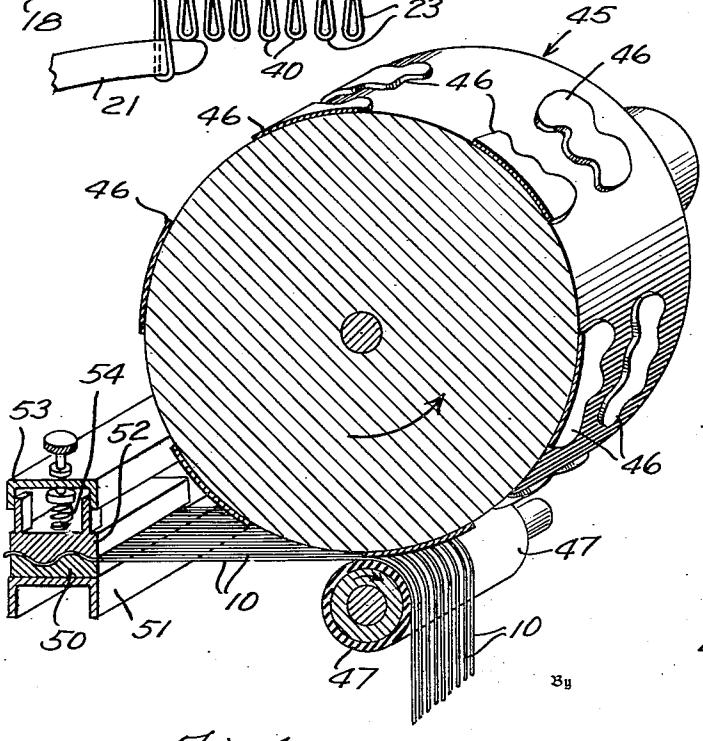
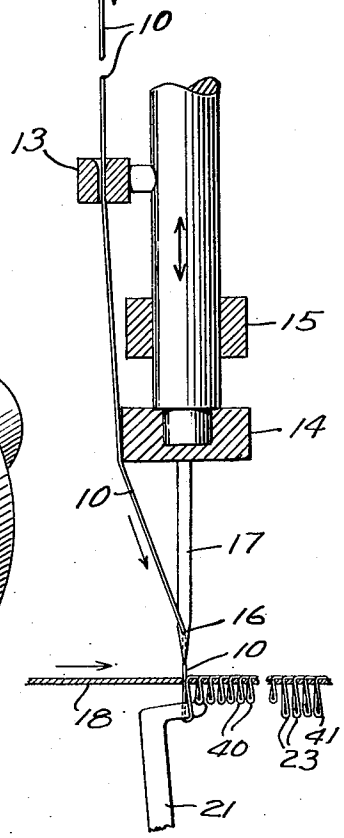


Fig. 4



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2,810,471

TUFTING MACHINE

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Application January 20, 1954, Serial No. 405,101

6 Claims. (Cl. 203—110)

This invention relates to needle tufting machines and has for an object to provide improved means for producing high and low pile loops in accordance with a selected pattern.

Another object is to provide mechanism of the above type in which the pattern may be easily changed.

Another object is to provide mechanism of the above type which is adapted to substantially unlimited pattern arrangements.

Another object is to provide a needle tufting machine having novel and improved details of construction and features of operation.

In needle tufting machines a variation in loop pile height is obtained by varying the tension of the pile ends in advance of the needle. A high tension causes the preceding loop to be pulled down during the next penetrating thrust of the needle, thus producing a low loop while a low tension allows the loop to remain at its original height, thus producing a high loop. Suitable variations in tension result in pile loops of correspondingly different heights.

Such variations in tension are produced by sets of squeeze rolls operating at different speeds or held under different pressures. When a plurality of sets of squeeze rolls are used, selected ends are run between the various squeeze rolls in accordance with the desired design. Variations in design are limited however by the number and control of the rolls.

In accordance with the present invention an endless pattern belt carrying a raised or depressed pattern is fed over one of a pair of squeeze rolls operating at a speed to produce a given tension. The ends are fed through a fixed tension device and then between the pattern belt and the cooperating squeeze roll.

In this arrangement with the fixed tension device producing a high tension and with the pattern belt operating at a speed to produce a low tension the ends will have a low tension when squeezed between a raised portion of the belt and the cooperating squeeze roll and will have a high tension when registering with a low or depressed portion of the belt. On the other hand, if the fixed tension device produces a low tension and the belt is driven at a speed to produce a high tension, the ends will have a high tension when squeezed between a raised portion of the pattern belt and the cooperating squeeze roll and will have a low tension at other times.

In another embodiment two pattern belts may be used with raised and depressed portions so disposed that an end is gripped by only one belt at a time. The two belts can be driven to produce different tensions so that a high loop is formed by the raised pattern of one belt and a lower pile loop is formed by the raised portions of the second belt.

The nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawings in which specific embodiments of the invention are set forth for purposes of illustration.

In the drawings:

Fig. 1 is a partial perspective view of a needle tufting machine embodying the invention;

Fig. 2 is a detail sectional view on a larger scale illustrating the essential features of the machine;

Fig. 3 is an enlarged detail view of the loop forming stage; and

Fig. 4 is a partial perspective view illustrating a further embodiment of the invention.

Referring to the drawings more in detail a plurality of ends **10** of pile yarn from a creel (not shown) are passed over squeeze rollers **11** and **12**, then through guides **13** on needle bars **14** and over guide bar **15** to the eyes **16** of needles **17** which are carried in the needle bar **14**. The needles **17** are mounted in a bank to pierce a fabric strip **18** which is fed and held tight between pairs of feed rolls **19** and **20**. Hooks **21** on a rod **22** are synchronized with the needle motion to engage the yarn on the underside of the fabric and hold the same in loops **23** when the needle is withdrawn.

The portions of the tufting machine thus far described are of standard construction, except for the duplication of squeeze rollers and only so much thereof has been shown as is necessary to an understanding of the present invention.

In the embodiment of Figs. 1 to 3 a pair of pattern belts **30** and **31** are passed around squeeze rolls **32** and **33** registering with squeeze rolls **11** and **12** respectively and around idler rolls **34** and **35** respectively. The pattern belt **30** is shown as having cut outs **36** but may be provided with depressed portions corresponding to the pattern design and the belt **31** is provided with corresponding raised portions **37**. The belt **31** grips the ends **10** only when a raised portion **37** contacts the yarn and the belt **30** grips the ends **10** at all times except when a cut out **36** or a depressed portion registers with the roll **11**.

The belts **30** and **31** are driven at different speeds to produce different tensions on the ends **10** depending upon whether the yarn is gripped by the belt **30** or by the belt **31**. If for example the belt **30** is driven slower than the belt **31** it will produce a greater tension on the yarn ends. Due to this greater tension the previously formed loop will be pulled down by the next needle thrust, producing a low loop as indicated by loops **40**. However, when the ends are gripped by the belt **31** a lesser tension is applied and the loops remain long as at **41**.

If the belt **31** applies an intermediate tension the loops are pulled down to a lesser extent to produce loops intermediate with loops **40** and **41** in length.

Three or more belts may be used if desired with patterns cut so that only one belt grips the yarn at a time. With the belts operating at different speeds loops of different lengths are formed.

In the embodiment of Fig. 4 the pattern belt is replaced by a pattern cylinder **45** having a raised design **46** and cooperating with a squeeze roll **47**. The yarn ends pass through a fixed tension device comprising lower bar **50** mounted on a bracket **51**, and upper bar **52** mounted to slide in a bracket **53** and held in pressure engagement with the yarns **10** by springs **54** (only one of which is shown), and the tension of which springs may be adjusted to vary the tension of the yarn.

In this embodiment if the fixed tension device produces a high tension and the cylinder **45** is driven at a speed to produce a low tension long loops will be formed when the yarns are gripped by the raised design **46** and low loops at other areas of the pattern. If the fixed tension device produces a lower tension and the cylinder **45** is driven to produce a high tension low loops will be formed when the yarn is gripped by the raised pattern **46** and high loops at other areas.

Obviously belts or cylinders may be used according

to the repeat length of the selected pattern and the pattern can be easily changed by changing the belt or cylinder.

Although specific embodiments have been shown for purposes of illustration it is to be understood that the invention may be applied to other uses as will be apparent to a person skilled in the art.

What is claimed is:

1. In a needle tufting machine having means including needles feeding yarn ends through a fabric backing to form pile loops, cooperating tension members including a pair of moving surfaces between which the yarn passes, one of said surfaces having raised pattern areas thereon to grip the yarn when in registration therewith, and having other depressed areas to release said yarn when in registration therewith, said surface being driven at a speed to change the tension on said yarn when gripped by said raised pattern areas so as to alter the pull down of the pile loops by the succeeding needle thrust.

2. A tufting machine as set forth in claim 1 in which the moving surface is a belt.

3. A tufting machine as set forth in claim 1 in which the moving surface is a cylinder.

4. In a needle tufting machine having means including needles feeding yarn ends through a fabric backing to form pile loops, at least two tension devices to selectively

grip said yarn ends in advance of said needles, one of said devices including an endless belt having depressed background areas and raised pattern areas thereon and a surface cooperating with said pattern areas to grip said yarn, said belt being driven at a speed to produce a tension different from that produced by said other tension device so as to alter the loop height in areas corresponding to said pattern areas.

5. A needle tufting machine as set forth in claim 4 in which said tension devices each include an endless belt with raised and depressed areas, the raised areas on one belt corresponding to depressed areas in the other belt, said belts being driven to produce different amounts of tension on said yarn.

6. A needle tufting device as set forth in claim 4 in which one of said tension devices is a fixed tension device and the pattern belt is driven to produce a tension different from that of said fixed tension device.

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