March 12, 1957 R. S. MacCAFFRAY, JR 2,784,689

FORMATION OF HIGH AND LOW LOOPS BY NEEDLING

Filed Sept. 2, 1953

Fig. 1.

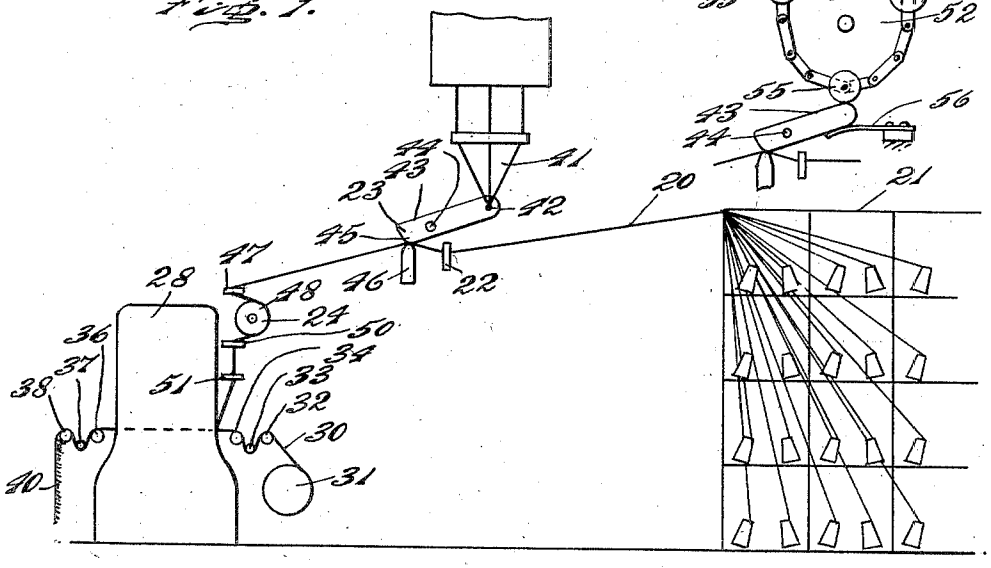


Fig. 2.

Fig. 3.

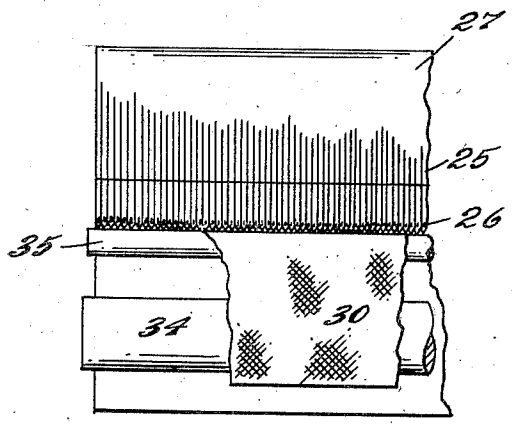
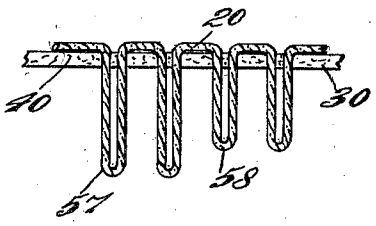


Fig. 4.



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FORMATION OF HIGH AND LOW LOOPS BY NEEDLING

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2 Claims. (Cl. 112—79)

The present invention relates to the production of needled pile fabrics which have high and low loops selectively or according to a pattern.

A purpose of the invention is to provide a simple and effective control of the height of loops in needled pile fabric.

A further purpose is to selectively clamp certain pile yarn ends and release other pile yarn ends passing to a gang of needles in order to form loops of different lengths.

A further purpose is to cause the clamped pile yarn ends to slip with respect to the released pile yarn ends on the yarn feed roll or other feeder.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which my invention may appear selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a diagrammatic side elevation of a needling machine to which the invention has been applied.

Figure 2 is a fragmentary view similar to Figure 1 showing a variation.

Figure 3 is a fragmentary enlarged front view of the needles and fabric feed.

Figure 4 is a fragmentary enlarged longitudinal section of a needled fabric produced according to the invention.

In the drawings like numerals refer to like parts throughout.

Extensive use is being made of pile fabrics made by punching, stitching or needling to force pile yarn through a backing. For the purposes of the present patent application, this procedure is being described as "needling," since the pile yarn end is carried through the backing to form the pile by one of a gang of needles having eyes near the point, the yarn being carried through the eyes.

Efforts have been made in the production of pile fabrics to obtain textured effects by creating pile having different heights in the same transverse row of pile. In the case of needling, this has involved the use of rather complex equipment. By the present invention it is possible to control the height of the pile of an individual pile end by means which are simple, and at the same time reliable and convenient.

In accordance with the invention, each pile end is selectively individually clamped at a position between the source of the pile yarn and the gang of needles. By clamping one end and releasing another end during the reciprocation of the needles, the clamped end will form a relatively low pile loop and the free end will form a relatively high pile loop.

The yarn ends are advanced by a feed, preferably a roll, on which they are capable of slipping. By applying the clamping between the source of pile yarn and the feed, the yarn end which is clamped is caused to slip over the feed, so that it does not advance the same distance as a pile yarn end which is free during the same advance of the feed.

A plurality of pile yarn ends **20**, one for each needle in the gang of needles, are withdrawn from a source of yarn **21**, here shown as a creel, and passed through yarn guides **22** individual to the various ends and then through a series of clamps **23**, one for each yarn end, and then over a yarn feed **24**, desirably common to all yarn ends, to a gang of needles **25** having eyes **26** near their points through which the respective yarn ends pass. The needles are supported on a needle bar **27** of any well known character and reciprocating up and down in a needling machine **28**.

The backing **30**, suitably a fabric such as burlap, Osnaburg, or the like, is fed over a roll **31** over suitably driven feed rolls **32**, **33** and **34**, across a support **35** in front of the gang of needles, and after receiving the pile, is progressed through suitably driven feed rolls **36**, **37** and **38** to a wind-up mechanism, not shown, which receives the finished fabric **40**. Each of the clamps **23** is controlled by a pattern control, which in Figure 1 constitutes a jacquard mechanism **41** which individually raises or lowers the ends **42** of clamping levers **43**, all of which have common free pivots on a shaft **44**. The clamping levers have clamping ends **45** which in their clamping position engage against a clamping bar **46** over which the pile yarn ends **20** all pass.

The feed **24** conveniently consists of yarn guides **47** individual to each yarn end, and feed roll **48** which is intermittently driven in the direction to progress all of the yarn ends forward, and around which all the yarn ends are carried for substantially a half turn, and yarn guides **50** and **51** which are individual to each yarn end and carry the yarn to the respective needle.

While the construction of Figure 1 shows a jacquard, any suitable pattern control may be employed. Figure 2 shows a dobby **52** consisting of a pattern chain **53** carried over suitable sprockets **54** (only one is shown) and having projections **55** of different sizes, the larger of which depress and release the clamp lever **43**, and the smaller of which permit the clamp lever to remain clamped under the action of leaf spring **56**. The dobby, as well known, advances step by step so as to hold the clamping of a pile yarn end which is to be clamped during the time that the needle reciprocation occurs.

In operation of the device of the invention, the jacquard or dobby operates to release certain clamps and hold the other clamps in tightened position, as in Figure 1. Thus across the entire width of the machine at this particular step of operation, certain pile yarn ends **20** are held by the clamps, and others are free. At this stage the feed roll **48** advances one step, as well known in the art, and those yarn ends which are free correspondingly advance to their needles, and in the following forward stroke of the needles these yarn ends are relatively under lower tension, and do not appreciably rob from the next preceding loops, leaving them as high pile loops. Those pile yarn ends which are clamped, however, slip during the forward feed, and do not advance fully forward, so that at the needles they are under higher tension, and rob yarn from preceding loops, forming lower loops **58**. This action occurs even though the loops being formed are held by hooks (not shown) as well known in the art. Thus in the finished fabric, when the loops are upwardly directed, the fabric will have a textured effect of high and low loops in the same transverse row.

By the cutting of the jacquard cards or the mounting of the projections on the dobby chain, any desired sequence of high and low loops can be obtained on any particular pile yarn end, and low loops on one end can be

placed beside other low loops or high loops on adjoining ends, as the taste of the designer may dictate.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the process and machine shown, and I therefore claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A yarn feeding apparatus for feeding a plurality of yarns to a tufting machine having a plurality of needles adapted to be simultaneously operated, said yarn feeding apparatus adapted to be positioned in feeding relation to said tufting machine and including means adapted to advance the yarns to said plurality of needles, and individually operable means for clamping the individual yarns to arrest the advance of the clamped yarns by said yarn advancing means during the operation of said advancing means and for releasing selected yarns during at least part of the operation of said advancing means.

2. A yarn feeding apparatus of claim 1, in which the means adapted to advance the yarns comprises roll means over which individual yarns can slip.

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