

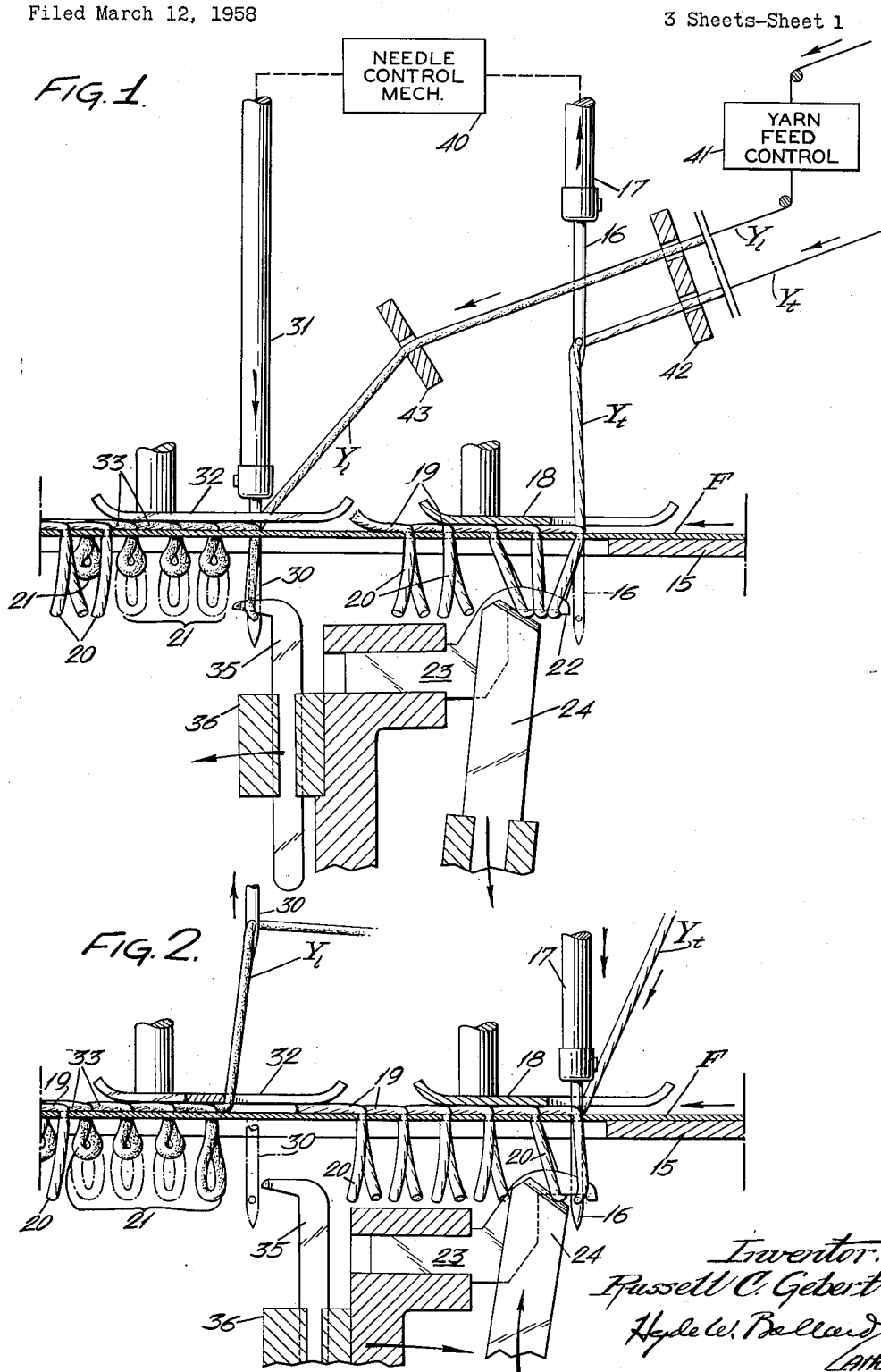
March 20, 1962

R. C. GEBERT

3,025,807

TUFTING APPARATUS

Filed March 12, 1958



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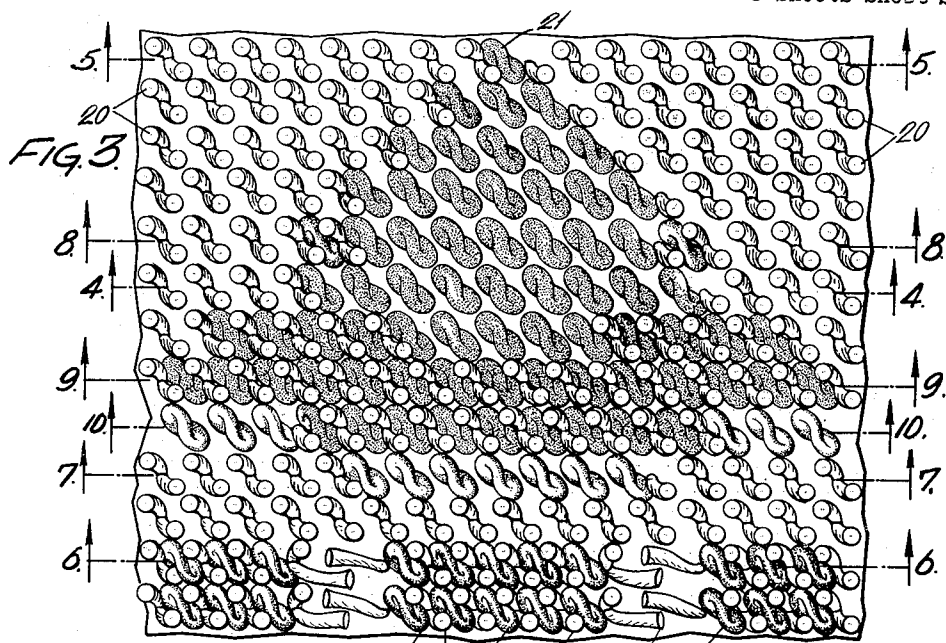
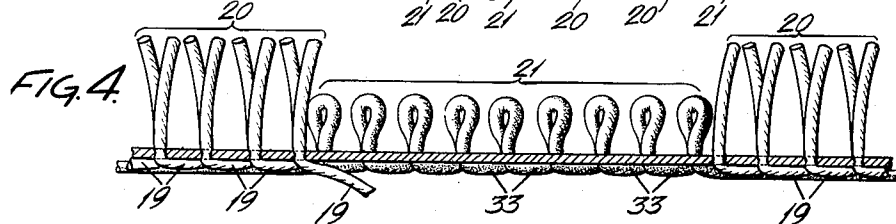
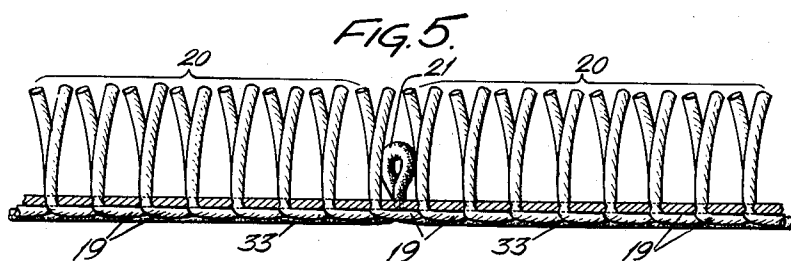
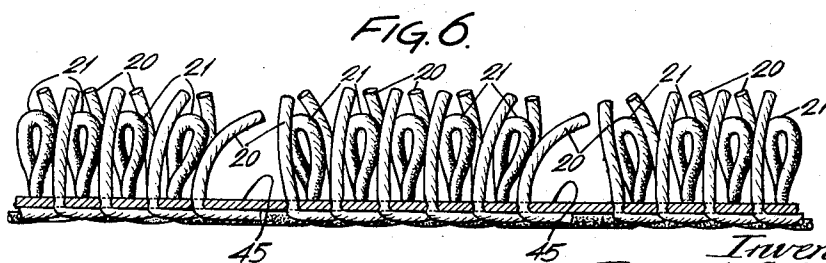
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TUFTING APPARATUS

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3 Sheets-Sheet 2



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FIG. 7.

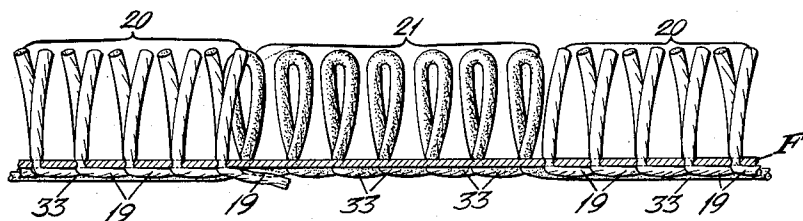


FIG. 8.

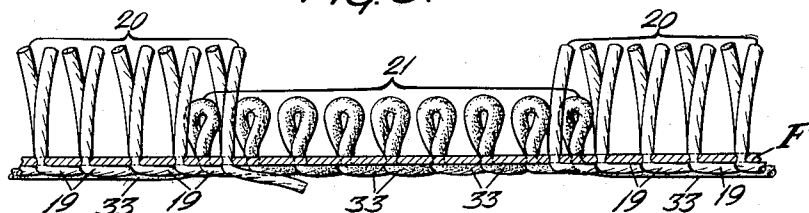


FIG. 9.

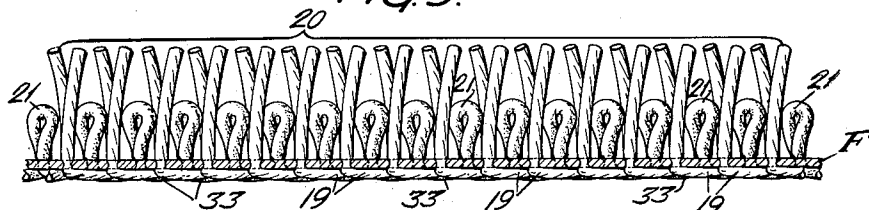
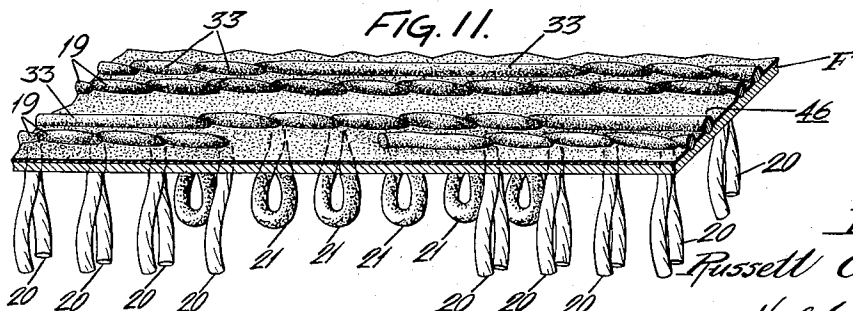


FIG. 10.



FIG. 11.



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TUFTING APPARATUS

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7 Claims. (Cl. 112-79)

This invention relates to an apparatus for simultaneously and/or selectively producing cut and uncut pile in a tufted pile fabric such as a floor covering.

Since the introduction and increased acceptance of tufted rugs and carpets, efforts have been made to produce such a fabric having both cut and uncut pile without the necessity of passing the fabric through a tufting machine more than once. Because the loopers for producing uncut pile are differently shaped and face in the opposite direction than the loopers for producing the cut pile, no easy solution for this problem has been proposed. Tufted fabrics having cut and uncut pile but all produced with non-cutting loopers are disclosed and claimed in co-pending Thomas T. Janney and Adolph Klein application Serial No. 497,534, now Patent No. 2,876,525, and co-pending Henry F. Nowicki application Serial No. 639,042, now Patent No. 2,884,680, which are illustrative of the development of the above desired fabric and method. It may be pointed out that while there are some advantages in a shearing operation to produce cut tufts in accordance with the teaching of the above applications, there are at least two very serious disadvantages; namely, the cost involved in running the fabric through an entirely separate apparatus which in turn requires maintenance, extra handling, etc.; second, there is a substantial waste in the expensive pile yarns since all the yarn which is sheared from the fabric is a total loss. The present invention completely overcomes these two disadvantages.

The present invention contemplates a dual tufting machine having two closely spaced needle bars which control series of tufting needles. These needles cooperate with individual loopers which are mounted on a common rockshaft, but the loopers for one series of needles are referred to as non-cutting loopers since the bills thereof point in the direction in which the ground fabric travels. The other series of cutting loopers point in the opposite direction and cooperate with the second series of needles to cut the pile loops engaged on these cutting loopers by means of knives or blades in the usual manner.

If all the needles operate to form pile projections, it will be obvious that the fabric produced will contain loops and tufts evenly distributed over the entire area of the fabric. The present invention has for its primary object, however, the ability to selectively control the areas of loops and cut tufts so that desirably a high cut pile is interspersed in accordance with a pattern with loop pile of controllable height loops. In order to accomplish this result, I utilize a device commonly referred to as a skip-stitch attachment to retract or throw out of operation any one or more single needles on either needle bar or any group of adjacent needles on either needle bar. Preferably, aligned needles on the needle bars will not simultaneously be thrown out of operation by the skip-stitch attachment, but where it is desired to produce a carved effect in a tufted fabric by creating a thin pattern line of voids, both of the pile forming control devices may be operated simultaneously to achieve this result. The needles forming the cut and uncut pile may be staggered or in alignment. Furthermore, it may be desired to use more than one needle bar for producing either or both the cut or uncut pile. It is to be pointed out that the skip-stitch attachments as well as the attachments for controlling the height of the loop pile in accordance with

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the pattern are well known and form no part of the present invention. Reference may be had to the following patents for a showing of such devices: United States Patent Nos. 1,984,332; 2,346,467; 2,782,741; and 2,782,905; and British Patent No. 780,370.

A primary object of the invention, therefore, is to provide a tufting machine capable of simultaneously and/or selectively producing both cut and/or uncut pile.

A further object of the invention is to provide in a tufting machine for producing simultaneously cut and uncut pile, means for controlling the height of the pile projections in accordance with a predetermined pattern.

A further object of the invention is to provide a dual tufting machine for simultaneously producing cut and uncut pile having two sets of loopers operated from the same rockshaft.

A further object of the invention is to provide in a pile tufting machine two closely spaced needle bars and a series of cut pile loopers cooperating with one of said needle bars and a series of loop pile loopers mounted on the same rockshaft cooperating with the other of said needle bars.

Further objects will be apparent from the specification and drawings in which:

FIGURE 1 is a schematic sectional detail of a portion of a tufting machine constructed in accordance with the present invention,

FIGURE 2 shows a portion of the structure of FIGURE 1 but with the needle bars in a moved position,

FIGURE 3 is a top view of a tufted pile fabric showing some of the variations and pile combinations possible with the apparatus of FIGURES 1 and 2,

FIGURES 4-10 are warwise longitudinal sections taken along the respective section planes shown in FIGURE 3, and

FIGURE 11 is a perspective of a fabric constructed in accordance with the present invention in which the needles of the two needle bars for forming cut and uncut pile respectively are not in exact alignment, so that rows of cut and uncut pile are stitched into the ground fabric in close side-by-side relation. Also, FIGURE 11 shows the completed fabric after backsizing to hold down and retain ends of cut pile protruding from the back of the ground fabric.

In accordance with standard tufting practice, a woven ground fabric F is fed across a throat or throat plate 15 to a zone in which the fabric F is penetrated transversely across its length by a series of tufting needles 16, 16 selectively held in needle carriers 17, 17 and actuated by a connecting rod and crankshaft mechanism, not shown. A presser foot 18 serves to hold down the pile stitches 19 which are on the reverse side of ground fabric F. On the opposite side, pile projections are formed by the tufting needles. Some projections are cut to form tufts 20 whereas others remain uncut as loops 21. The pile projections to be cut are inserted by needles 16 and engaged by the bills 22 of each cutting looper 23. Oscillating knives 24 slide against the sides of cutting loopers 23, 23 to sever each loop as it reaches the bottom or back of the bills 22, 22.

A series of spaced needles 30, 30 is similarly oscillated up and down by means of individual needle carriers 31 actuated and controlled by well-known mechanism. A second presser foot 32 is operative to hold down and retain yarn and/or stitches 33, 33 for the loop pile ends on the bottom of the ground fabric F. It will be noted that the pile projections or loops 21, 21 produced by needles 30 are held by means of non-cutting loopers 35, 35 which are mounted in oscillating bracket 36 connected to a rockshaft, not shown. It will be understood that

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oscillation of bracket 36 actuates both sets of loopers 23 and 35 to produce simultaneously a finished fabric.

Any of the needles 30 or 16 may be held in a retracted or elevated position to prevent forming pile projections with the selected needles. Such a control mechanism is indicated at 40 and forms no part of the present invention, but the use of a device of this sort to selectively complement the operation of cut pile and loop pile tufting needle bars is believed to be new. Examples of such skip-stitch control devices are described in one or more of the following patents: No. 1,972,265; No. 1,984,330; No. 1,984,332; No. 2,171,825; No. 2,311,802; No. 2,346,467; No. 2,359,050; No. 2,411,883; No. 2,589,340; No. 2,595,355; No. 2,768,593.

The yarn Y_L supplied to the needles 30 for the uncut pile is fed from a source such as a creel, not shown, through a yarn feed or tension pattern attachment 41, thence through guides 42 and 43 to needles 30. Examples of such feed or tension devices for controlling yarn can be found in the following patents: No. 1,766,805; No. 1,972,265; No. 2,449,529; No. 2,875,714; No. 2,876,183; No. 2,876,441; British No. 735,019. The other yarns Y_T which form tufts 20, 20 are fed directly from the yarn source through guide 42 to the needles 16. Ordinarily the variable tension or feed device is not used for controlling the cut pile yarn Y_T . However, in some cases it may be desired to control the tension of both the cut and uncut yarns by means of a pattern attachment as well as the skip-stitch attachment.

It will be seen that as the fabric F moves along the throat 15, loops formed by needles 16 and loopers 23 will be transformed into pile tufts or projections 20. The skip-stitch attachment connected to needles 16 may be so controlled to cause an interruption in the production of complete rows of cut tufts. Whenever this occurs, it will ordinarily be desired to automatically operate complementary pile loop forming needles 30 to fill in these voids with loop pile projections 21. Preferably the complementary voids provided by the skip-stitch attachments will provide aligned rows of stitches. The loop pile in the ground areas will ordinarily be lower in height than the cut pile. However, this will depend upon the designer's choice and a tufting machine in accordance with the invention may be controlled to provide any desired loop or cut pile height.

FIGURE 3 represents in a single piece of fabric some of the typical pattern formations that can be accomplished according to the apparatus and method of the present invention. For example, the cut tufts 20 may be of uniform height with the low or ground areas formed of low loops as shown in FIGURE 4. The length of the low loop area may be long or short and may be as small as only one loop which is shown in FIGURE 5. The loops pile yarn not used to form pile projections or loops 21 is carried dead on the back of the fabric at 33. Alternatively, both the needles carrying the loop yarn Y_L and the tuft yarn Y_T may be simultaneously disconnected from the needle bar to provide pattern voids 45 as shown in FIGURE 6. Furthermore, intermediate height loops 21 may be interspersed with the cut tufts 20 in the pile areas. High loops may be formed in any selected area in order to provide the uniform height fabric or selected or random cut and uncut pile. Such an effect is shown in FIGURE 7. Another feature of the invention is the ability to accent the border areas of the ground pile by providing limited overlap of the cut and uncut yarns at the border. This effect as shown in FIGURE 8 has the additional advantage of eliminating the possibility of undesirable voids in the ground pile due to any stretching of the fabric between the needle bars and, also, the necessity for precise timing of the skip-stitch attachment for the cut and uncut needles is thereby eliminated.

If desired, the complete fabric or selected areas thereof may be provided with cut and uncut pile at the same time. The relative height of the cut and uncut may be low and

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the stitches in each row may be superimposed or side by side. FIGURE 9 illustrates such a fabric in which the low loops 21 are stitched in closely spaced side-by-side relation to the cut tufts 20. This figure is indicated as a section of FIGURE 3 at 9—9. The showing of FIGURE 9, however, incorporates a slight variation in that the rows of cut and uncut pile are staggered rather than aligned. FIGURE 10 shows a further variation in which the pattern areas are formed with combined cut tufts 20 and low loops 21, whereas the major portion of the fabric may have loops 21.

In order to secure the yarn Y_L which runs dead on the back of the fabric when one or more of the needles 30 are held out of operation and, also, to secure the protruding ends of the cut pile yarn Y_T on the back of the fabric, I apply a resilient or other backing substance 46 to the ground fabric which may take the form of a latex backing or a relatively thick foam rubber pad applied thereto. This procedure adequately binds all the yarn to the back of the fabric thus preventing its being snagged or pulled through when in use.

It will thus be understood that the present invention contemplates a highly versatile tufting machine for producing pile fabrics which may be automatically controlled in one pass of the ground fabric through the machine to provide any desired pattern effect in the pile. This pattern effect is achieved by controlling the height of uncut pile projections in any area as well as the presence or absence of any type of pile in the area.

Having thus described my invention, I claim:

1. In unitary apparatus for simultaneously producing cut and uncut tufted pile projections on a backing fabric, the sub-combination which comprises a throat plate across which the backing fabric is adapted to be fed, a first reciprocating needle bar, at least one pile yarn needle carried in said first needle bar and positioned to carry a pile yarn through the backing fabric and the throat plate, means for selectively interrupting the reciprocation of said needle, a second reciprocating needle bar in closely spaced relationship laterally to said first needle bar in the direction of the path of travel of said backing fabric, at least one pile yarn needle carried in said second needle bar and positioned in substantially longitudinal alignment with at least one pile yarn needle carried in said first needle bar in the direction of travel of said backing fabric to carry a pile yarn through the backing fabric and throat plate, means for selectively interrupting the reciprocation of said needle, first looper means oscillatable in timed relationship to the first needle bar and including a looper bill to engage the pile yarn after penetration of the backing fabric by the needle of said first needle bar, a knife cooperating with said first looper means to cut the yarn carried by the needle of said first needle bar, and second looper means oscillatable in timed relation to the second needle bar and including a looper bill to engage the pile yarn after penetration of the backing fabric by the needle of the second needle bar and to release same without cutting it, said first and second looper means being in substantially vertical alignment with their respective needles with the yarn engaging bills of said first and second looper means facing in opposite directions to one another and being laterally spaced from one another in the direction of the path of travel of said backing fabric.

2. Apparatus in accordance with claim 1 having means for feeding yarn to at least one of said needles in accordance with a predetermined pattern to control the height of pile projections formed by said needle.

3. Apparatus in accordance with claim 1 in which both loopers are mounted on a common bracket.

4. In unitary apparatus for simultaneously producing cut and uncut tufted pile projections on a backing fabric, the sub-combination which comprises a throat plate across which the backing fabric is adapted to be fed, a first reciprocating needle bar, a plurality of pile yarn needles

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carried in said first needle bar and positioned to carry a pile yarn through the backing fabric and the throat plate, means for selectively interrupting the reciprocation of said needles, a second reciprocating needle bar in closely spaced relationship laterally to said first needle bar in the direction of the path of travel of said backing fabric, a plurality of pile yarn needles carried in said needle bar and positioned in substantially longitudinal alignment with at least one pile yarn needle carried in said first needle bar in the direction of travel of said backing fabric to carry a pile yarn through the backing fabric and throat plate, means for selectively interrupting the reciprocation of said needles, a first series of looper means oscillatable in timed relationship to the first needle bar, each of said loopers including a looper bill to engage the pile yarn after penetration of the backing fabric by the needles of said first needle bar, a series of knives cooperating with said first series of looper means to cut the yarn carried by the needles of said first needle bar, and a second series of looper means oscillatable in timed relation to the second needle bar, each of said loopers including a looper bill to engage the pile yarn after penetration of the backing fabric by the needles of the second needle bar and to release same without cutting it, said first and second series of looper means being in substantially vertical alignment with their respective needles with the yarn engaging bills of said first and second series of looper means facing in opposite directions and being laterally spaced from one another in the direction of the path of travel of said backing fabric.

5. Apparatus in accordance with claim 2 in which all of the needles on the first and second needle bars are in longitudinal alignment with one another in the direction of travel of the backing fabric.

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6. Apparatus in accordance with claim 2 in which the needles in the first and second needle bars are transversely offset with respect to each other.

7. Apparatus in accordance with claim 2 having means for feeding yarn to at least one of said needles in accordance with a predetermined pattern to control the height of pile projections formed by said needle.

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