Jan. 6, 1953 F. P. GROAT 2,624,390

METHOD AND APPARATUS FOR MAKING PILE FABRICS

Filed Jan. 30, 1950 3 Sheets-Sheet 1

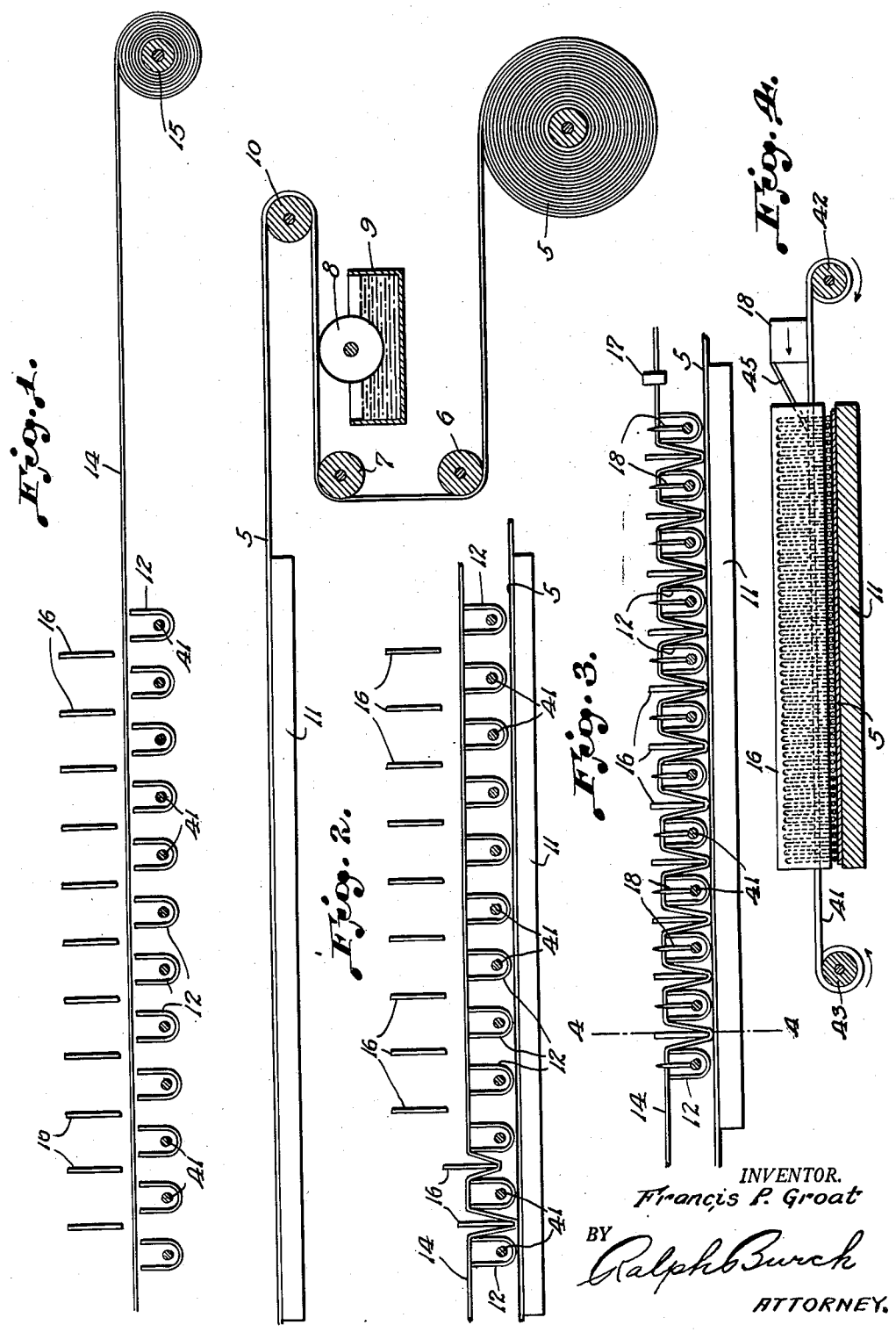

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Fig. 5.

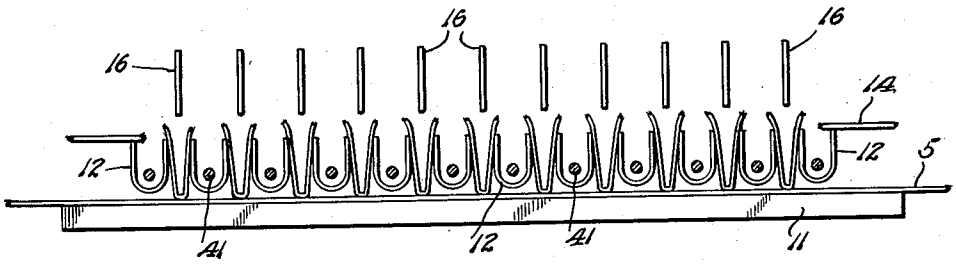

Fig. 6.

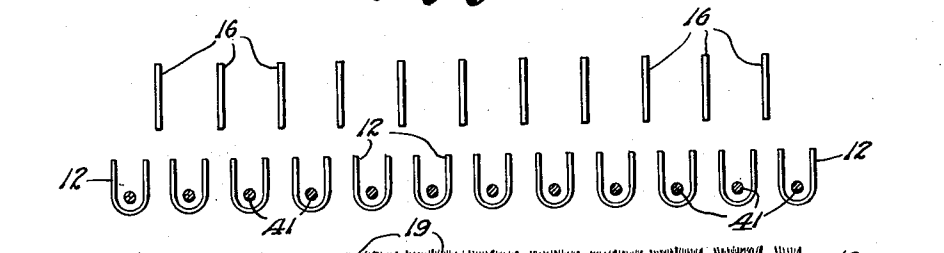

Fig. 7.

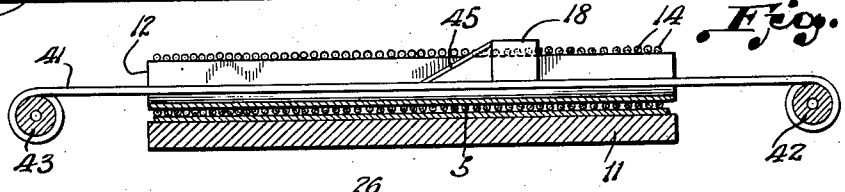

Fig. 8.

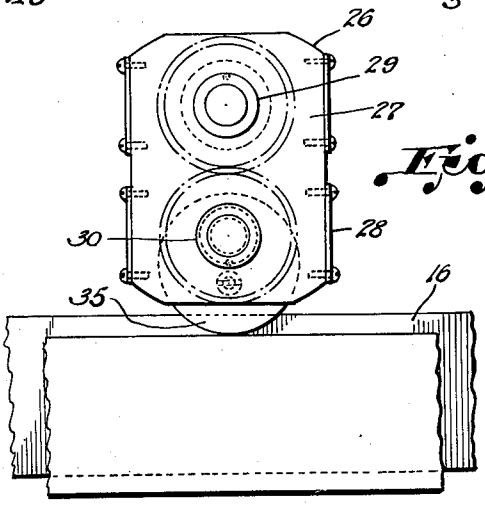

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Fig. 9.

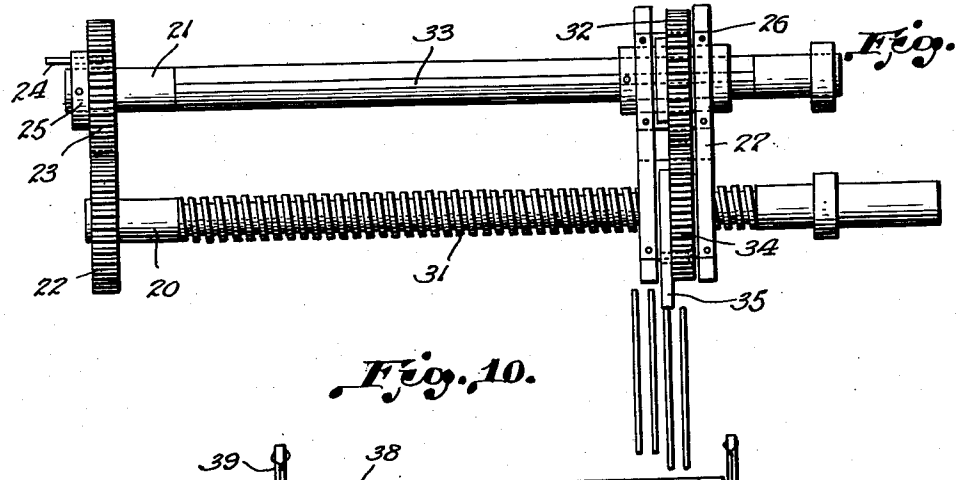


Fig. 10.

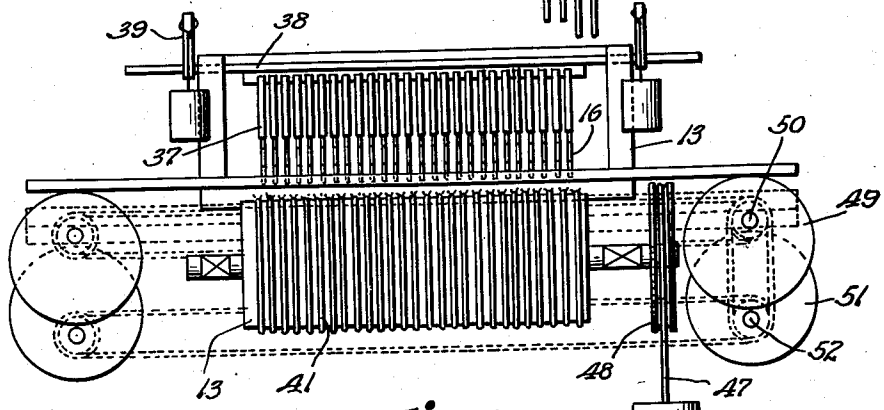
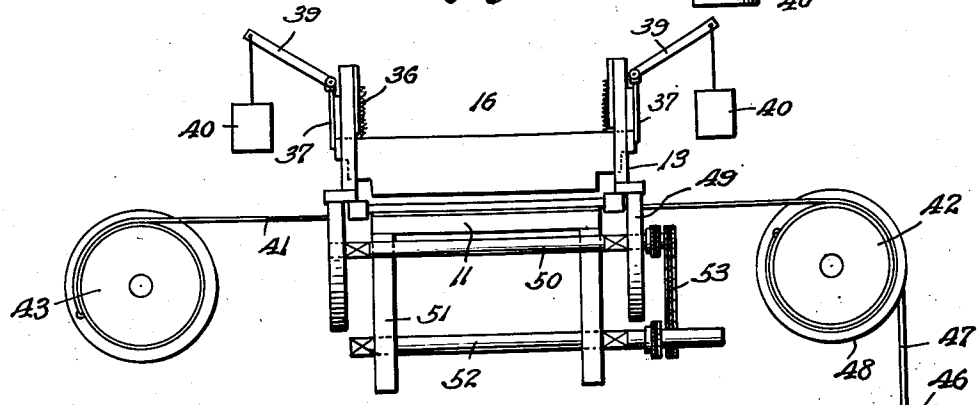


Fig. 11.



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METHOD AND APPARATUS FOR MAKING PILE FABRICS

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22 Claims. (Cl. 154—1.1)

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This invention relates to a method and apparatus for making pile fabrics and is particularly adapted for use in making carpets and rugs.

Heretofore, machines have been devised for making carpets and rugs by depressing portions of pile warps between spaced members to form loops and then securing the loops thus formed to a backing by an adhesive or cement coating, the loops being cut to produce pile tufts.

It is the primary object of the present invention to provide a method and apparatus for efficiently and economically producing tuft pile fabrics by extending a series of pile warps over a series of U-shape wires, depressing the portions of the pile warps between the wires to embed them in the adhesive coating of a fabric backing material extending beneath the wires and then moving cutters longitudinally of the U-shape wires to cut the portions of the pile warps stretched over the wires.

A further object of the invention resides in a method which comprises drawing a plurality of pile yarns over a series of spaced U-shape members disposed above an adhesive coated backing material, successively depressing portions of the pile yarns between the U-shape members to embed them in the adhesive coating of the backing material and then cutting the portions of the pile yarns stretched across the U-shape members while the depressed portions of the pile yarns are held embedded in the coating of the backing.

A further object of the invention resides in providing apparatus for carrying out the method which includes a table supporting the adhesive coated backing material, a grid of spaced U-shape members disposed above the table for supporting a series of pile yarns, the table and grid being mounted for vertical movement towards and from each other, a series of blades mounted above the grid and independently movable between the U-shape members for depressing portions of the pile yarns into the adhesive coating of the backing, mechanism for successively depressing the blades and cutters movable longitudinally in the channel of the U-shape members for cutting the portions of the pile yarns stretched across the U-shape members.

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

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

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Fig. 1 is a diagrammatic view showing generally the position of the backing material and pile yarns at the start of the process,

Fig. 2 is a diagrammatic view illustrating the manner of depressing portions of the pile yarns into contact with the backing,

Fig. 3 is a diagrammatic view showing the pile yarns in position for cutting the portions stretched over the U-shape members,

Fig. 4 is a section taken on line 4—4 of Fig. 3,

Fig. 5 is a diagrammatic view showing the cut pile yarns,

Fig. 6 is a diagrammatic view showing the position of the blades, pile wires and table after the pile yarns have been secured to the backing and cut to form tufts,

Fig. 7 is a longitudinal sectional view through one of the pile wires with the cutter in cutting position,

Fig. 8 is an end elevation view of the blade depressing mechanism,

Fig. 9 is a front elevation view of the blade depressing mechanism,

Fig. 10 is a front elevation view of the apparatus showing the mechanism for elevating and lowering the grid and table, and,

Fig. 11 is an end view of the mechanism shown in Fig. 10.

Referring to the drawings wherein for the purpose of illustration a preferred embodiment of the invention is shown, the numeral 5 denotes a roll of backing material which is trained around rolls 6 and 7, over an adhesive applying roll 8 mounted in a container 9 holding a supply of rubber latex or other suitable adhesive. After the adhesive coating is applied to the backing material, the material is trained around a roll 10 and extends horizontally across a plate or table 11 which is mounted for vertical movement. A series of U-shape pile wires 12 are disposed above table 11 being mounted in a vertical movable frame 13. A series of pile warps or yarns 14, wound on a beam 15, are drawn across the series of pile wires 12 and above the yarns at points intermediate the wires are mounted a series of independently movable blades 16. Table 11 with the backing material thereon and the pile wires 12 are moved towards each other to bring the wires into close proximity to the coating on the backing material. The blades 16 are then successively lowered, as shown in Fig. 2, which depresses portions of the pile yarns 14 between the pile wires 12 so they are embedded in the adhesive coating of the backing. After the series of blades have been lowered, as shown in Fig. 3, a

clamp 17 is applied to the series of yarns at the forward end of the table to hold them in position while the yarns stretched across the pile wires are cut by cutters 18 movable longitudinally of the U-shape wires. When the yarns have been cut the blades 16 are raised upwardly, as shown in Fig. 5 and then the frame 13, supporting the wires, and table 11 are moved apart, as shown in Fig. 6, so that the backing material and tufts 19 formed by cutting the yarns is free to be moved forward and bring the next section of the backing material beneath the wires.

The mechanism for successively depressing the blades 16 is shown in Figs. 8 and 9 and includes a pair of parallel shafts 20 and 21 mounted in vertical spaced relation on frame 13 above blades 16. The drive shaft 20 has a gear wheel 22 at one end in mesh with a gear wheel 23 on the end of shaft 21. Gear 23 is releasably connected to shaft 21 by a clutch pin 24 carried by a collar 25 fixed on the shaft 21. Movable along the shafts 20 and 21 is a cam housing 26 having parallel walls 27 connected in spaced relation by plates 28. The shafts extend through openings 29 and 30 in the walls 27, and the opening 30 has threaded engagement with the screw thread 31 of shaft 20 whereby rotation of the shaft 20 moves the cam housing longitudinally along the shafts. A gear wheel 32 disposed between the walls 27 is keyed on the shaft 21 in the keyway 33, and this gear is in mesh with gear wheel 34 loosely journaled on shaft 20 and attached to the face of gear 34 is an eccentrically mounted cam 35 which upon rotation of gear 34 engages the upper edge of a blade 16 and depresses the same. Rotation of drive shaft 20 moves the cam housing 26 longitudinally of the shafts 20 and 21 thus bringing the cam 35 into successive engagement with each of the blades 16 which are depressed by action of the cam. The blades 16 are normally held in raised position by coil springs 36 at each end thereof and to hold the blades in depressed position spring fingers 37 are provided for engagement with the upper edges of the blades. The fingers 37 depend from a rotatable bar 38 mounted on the front and rear of frame 13 and at each end of the bar are laterally extending arms 39 having weights 40 suspended therefrom. Under action of the weights the fingers are held against the ends of blades 16 and spring into engagement with the upper edge when the blades are depressed. After all the blades are depressed, the rotation of shaft 20 is reversed to return the cam housing 26 to its starting position. To release the blades, the fingers 37 are swung from engagement with the blades by rotating the bar 38, allowing springs 36 to raise the blades.

The yarn cutting mechanism is shown in Figs. 4 and 7 and includes a series of cables 41 attached at opposite ends to drums 42 and 43 mounted to the front and rear of the machine. There is one cable for each of the U-shape wires 12 which extend longitudinally of the wires in the channel thereof. Attached to each cable is a cutting blade 18 having an inclined cutting edge 45 adapted to engage and sever the yarns stretched across the wires 12 when the cutting blades are moved longitudinally of wires 12 by winding the cables 41 on drum 43. After severing all the yarns stretched across the wires 12, the cutting blades are returned to a starting position by winding the cables 41 on drum 42 which may be actuated by a weight 46 suspended by a cable 47 from pulley 48 attached to drum 42.

The mechanism for raising and lowering the frame 13 and table 11 is shown in Figs. 10 and 11 and includes pairs of cam wheels 49 eccentrically mounted on shafts 50 beneath each end of the frame 13. Similar cam wheels 51 are mounted on shafts 52 beneath the ends of table 11 and by suitable chain gearing 53 between the shafts 50 and 52 and the shafts at opposite ends of the machine, the cam wheels 49 are operated to lower frame 13 while cam wheels 51 are raising table 11 and vice versa.

From the foregoing it will be seen that with the backing material 5 extending across the table 11 and the pile yarns 14 extending across the wires 12, as shown in Fig. 1, the wires and table are moved vertically towards each other until the wires are in close proximity to the coating of the backing material, as shown in Fig. 2. With the wires and table in the position shown in Fig. 2, the blade depressing mechanism comes into operation and causes the blades 16 to be successively depressed. As the blades move downwardly between the wires, portions of the yarns 14 are depressed and embedded in the adhesive coating of the backing material. After all the blades have been depressed, as shown in Fig. 3, the clamp 17 is applied to the yarns prior to the cutting operation. The blades 16 are held in their depressed position by the spring fingers 37 during the cutting of the yarns. As the cables 41 are wound on the drum 43 the cutters 18 move longitudinally of the channels of wires 12 and the cutting edges 45 sever the portions of the yarns bridging the channel of the wires, as shown in Fig. 5. After the cutting operation the blades 16 are released and the wires and table are moved apart, as shown in Fig. 6, thus completing the formation of the pile tufts 19 which are secured to the backing by the adhesive coating. The fabric is then moved forward to bring the next section of the backing beneath the wires and the yarns 14 held by the clamp 17 are pulled across the wires and the process is repeated to complete the next tufted section of the fabric.

It is to be understood suitable mechanism may be provided for driving the blade depressing mechanism, cutters and the raising and lowering mechanism for the grid and table to carry out the steps of the process in proper sequence.

Having thus described my invention, I claim:

1. A process for producing a pile fabric comprising coating a backing material with adhesive, progressively depressing portions of pile yarns over loop forming wires and embedding the depressed portions in the coating of the backing material and cutting the portions of the pile yarns stretched over the loop forming wires while retaining the depressed portions of the yarns embedded in the coating.

2. A process for producing a pile fabric comprising coating a backing material with adhesive, extending a series of pile yarns longitudinally of and above the backing material, progressively depressing portions of said yarns in spaced relation and embedding the depressed portions in the coating of the backing material and cutting the portions of the pile yarns between the depressed portions while holding the depressed portions embedded in the coating.

3. A process for producing a pile fabric comprising coating a backing material with adhesive, extending a series of pile yarns longitudinally of and above the backing material, progressively depressing portions of said yarns at spaced intervals into contact with the coating of the backing

material while supporting the intermediate portions in elevated position to form loops and cutting the loops while the depressed portions are held in the coating.

4. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means for progressively depressing portions of the pile yarns between the wires of the grid into contact with the adhesive backing, and means for cutting the portions of the pile yarns stretched over the U-shape wires.

5. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means progressively depressing portions of the pile yarns between the wires of said grid into contact with the adhesive backing and means for cutting the portions of the pile yarns stretched over the wires.

6. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shaped wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means for progressively depressing portions of the pile yarns between the wires of said grid into contact with the adhesive backing and stretching the intermediate portions of the yarns over the wires, and means movable longitudinally of the wires for cutting the intermediate portions of the pile yarns.

7. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means for progressively depressing portions of the pile yarns between the wires of said grid into contact with the adhesive backing and cutters movable in the channel of the U-shape wires for cutting the portions of the pile yarns extending over the wires.

8. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, blades mounted above said grid movable to progressively depress portions of the pile yarns between the wires into contact with the adhesive backing, means for holding said blades depressed, and means for cutting the portions of the pile yarns extending over the wires.

9. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, a series of blades above said grid for depressing portions of the pile yarns between said wires into contact with said adhesive backing, means for progressively depressing said blades, and means for cutting the portions of pile yarns extending over the wires of the grid.

10. Apparatus for the production of pile fabrics comprising a grid element having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, a series of blades above said grid for depressing portions of the pile yarns between said wires into contact with said adhesive backing, means for progressively depressing said blades, means releasably holding said blades depressed, and means for cutting the portions of the pile yarns extending over the wires of said grid.

11. Apparatus for the production of pile fabrics comprising a grid having a series of spaced U-shape wires for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, a series of blades above said grid for depressing portions of the pile yarns between said wires into contact with said adhesive backing, means for progressively depressing said blades, and cutters movable longitudinally in the U-shape wires for cutting the portions of the pile yarns extending over the wires.

12. Apparatus for the production of pile fabrics comprising a grid having a series of spaced U-shape wires for supporting a series of pile yarns, a table for supporting an adhesive backing beneath said grid, means for moving said grid and table towards and from each other, means for progressively depressing portions of the pile yarns between the wires of said grid into contact with the adhesive backing, and means for cutting the portions of the pile yarns extending over the wires of said grid.

13. Apparatus for the production of pile fabrics comprising a grid having a series of loop forming wires arranged in spaced relation for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means for progressively depressing portions of said pile yarns between said wires into contact with the adhesive backing to form loop portions over the wires, and means for cutting the loop portions while on the wires.

14. Apparatus for the production of pile fabrics comprising a grid having a series of U-shape wires for supporting a series of pile yarns, a table beneath said grid for supporting an adhesive backing, means for moving said grid and table to and from each other, a series of blades above said grid intermediate the wires, means for progressively depressing said blades to depress portions of the pile yarns into contact with adhesive backing, releasable means for holding said blades depressed, cutters movable longitudinally in the U-shape wires, and means for moving said cutters to cut the portions of the pile yarns extending over the wires.

15. A process for producing a pile fabric comprising coating a backing material with adhesive, extending a series of pile yarns above and longitudinally of the coated backing, progressively depressing portions of the pile yarns over loop forming wires and embedding the depressed portions in the coating of the backing, and moving cutters longitudinally of the loop forming wires to sever the loops of the pile yarns formed thereon.

16. A process for producing a pile fabric comprising coating a backing material with adhesive, extending a series of pile yarns above and longitudinally of the coated backing, progressively depressing portions of the pile yarns and embedding the depressed portions in the coating of the backing, supporting the portions of the pile yarns intermediate the depressed portions in a raised horizontal plane and severing the raised portions of the pile yarns.

17. A process for producing a pile fabric comprising extending a series of pile yarns above an adhesively coated backing material, progressively depressing portions of the pile yarns in spaced relation into adhering contact with the adhesive coating of the backing material, supporting the portions of the pile yarns intermediate the depressed portions in a taut horizontal plane, and

severing the supported portions of the pile yarns.

18. A process for producing a pile fabric comprising extending a series of pile yarns above an adhesively coated backing material, progressively depressing portions of the pile yarns at spaced intervals into adhering contact with the adhesive coating of the backing material while maintaining the intermediate portions in a raised horizontal plane and then severing the intermediate portions.

19. Apparatus for the production of pile fabrics comprising a grid having a series of spaced loop forming members for supporting a series of pile yarns, means for supporting an adhesive backing beneath said grid, means for progressively depressing portions of the pile yarns between the loop forming members into adhering contact with the adhesive backing and stretching the intermediate portions of the pile yarns in spanning relation to the loop forming members beneath the same, and means for cutting the intermediate portions of the pile yarns.

20. Apparatus for the production of pile fabrics comprising a support for an adhesive backing, a series of spaced loop forming wires above said support for supporting a series of pile yarns, means for progressively depressing portions of the pile yarns into adhering contact with the adhesive backing and stretching the intermediate portions of the pile yarns in spanning relation to the loop forming wires supporting the same, and means for cutting the stretched portions of the pile yarns.

21. Apparatus for the production of pile fabrics comprising a support for an adhesive backing, spaced members for supporting a series of pile yarns above the adhesive backing in a horizontal plane, means for progressively depressing portions of the pile yarns into contact with the adhesive backing with the portions of the pile yarns between the depressed portions being stretched across the supporting members, and means for cutting the stretched portions of the pile yarns.

22. Apparatus for the production of pile fabrics comprising a support for an adhesive backing, spaced members for supporting a series of pile yarns above the adhesive backing, means for progressively depressing portions of the pile yarns into contact with the adhesive backing and stretching the intermediate portions of the yarns in spanning relation to the members supporting the same and cutters movable longitudinally of said supporting members for severing the intermediate portions of the yarns.

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