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JUNE 22, 1943.
BY A. P. C.

G. NIKI
PROCESS FOR MANUFACTURING PILE
FABRIC SUCH AS CARPET
Filed Feb. 21, 1940

Serial No.
320,175
7 Sheets—Sheet 1

Fig. 1

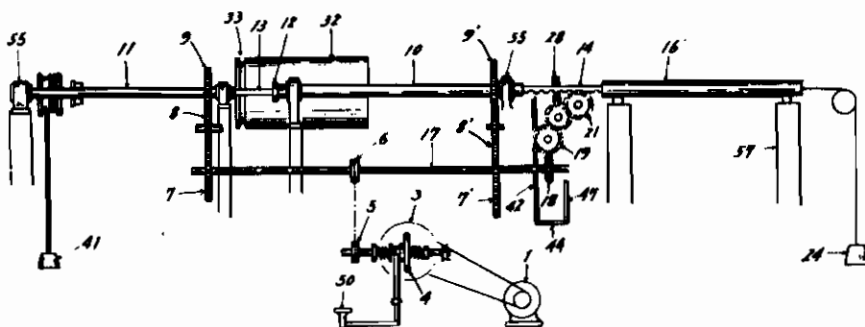
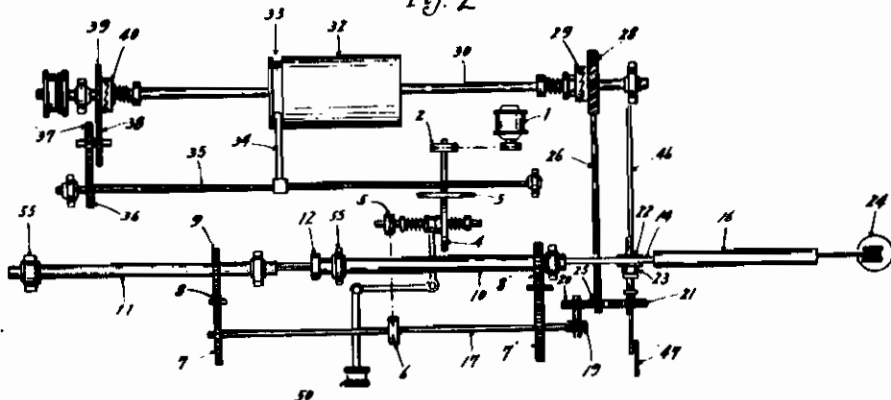


Fig. 2



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Fig. 3

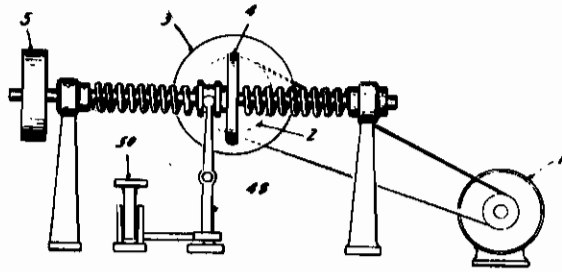
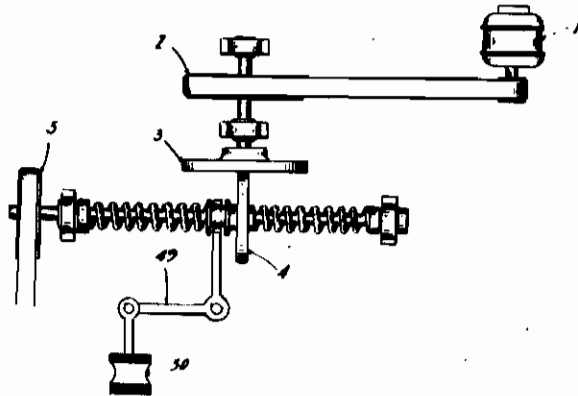


Fig. 4



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Fig. 7

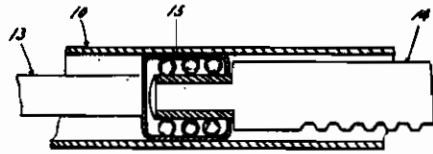


Fig. 6

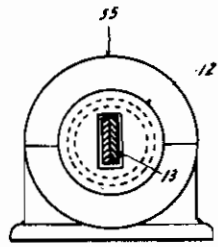
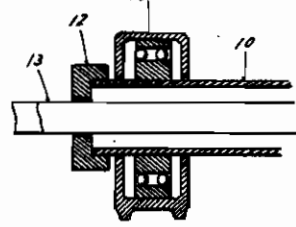


Fig. 5



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Fig. 8

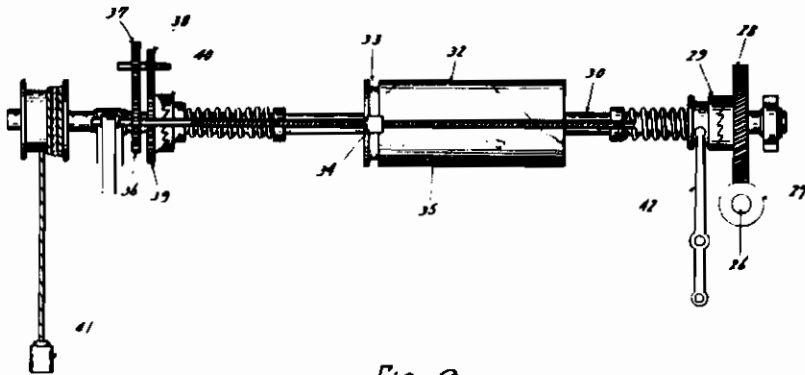
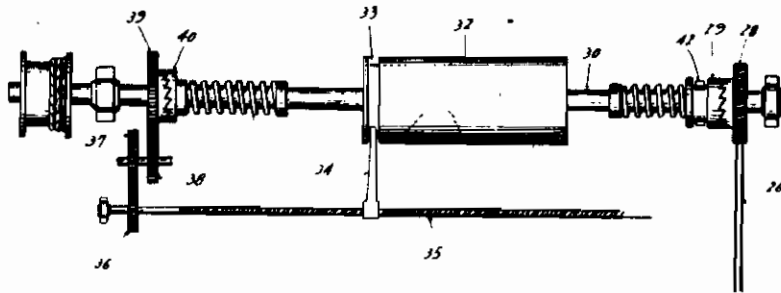


Fig. 9



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Fig. 10

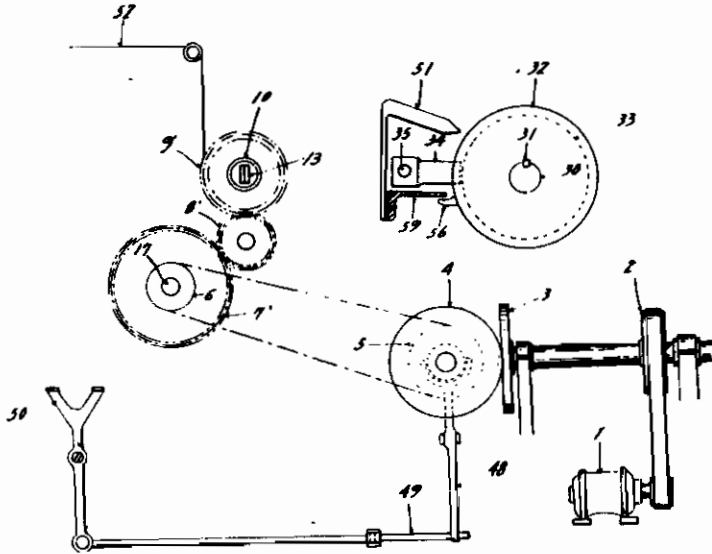


Fig. 17

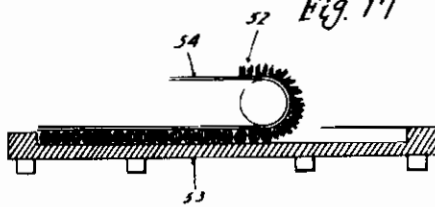
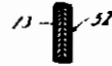


Fig. 13



Fig. 14



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Fig. 11

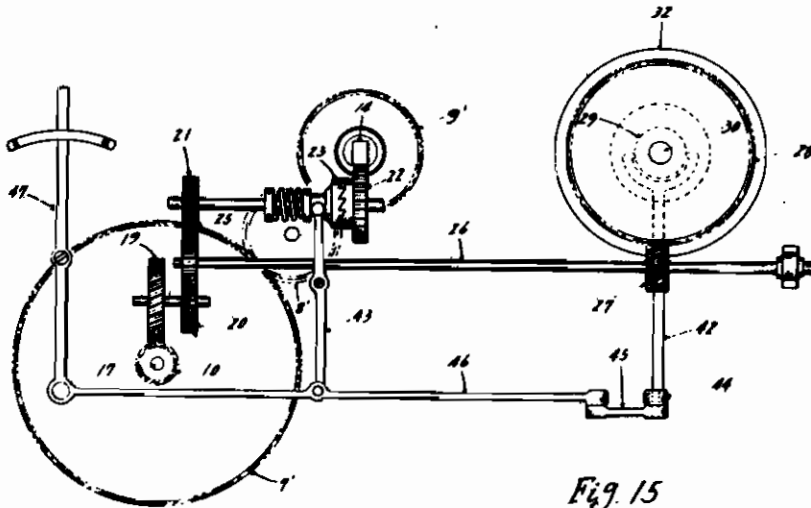
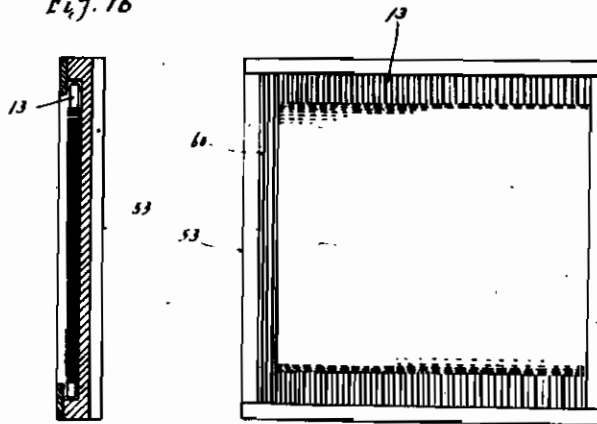


Fig. 16

Fig. 15



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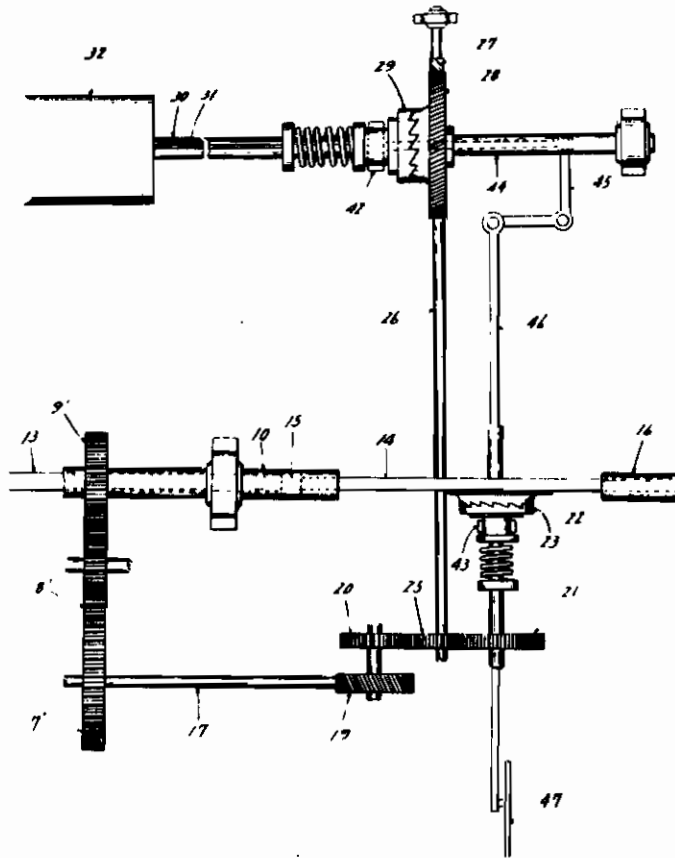
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Fig. 12



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ALIEN PROPERTY CUSTODIAN

PROCESS FOR MANUFACTURING PILE FABRIC SUCH AS CARPET

Genkichi Niki, Shibuyaku, Tokyo, Japan; vested
in the Alien Property Custodian

Application filed February 21, 1940

This invention relates to a process of manufacturing pile fabric such as carpet comprising rotating a cylinder on the periphery of which an original design is stuck, rotating simultaneously a holder tube in which one single bar or two bars joined together are inserted, so that said bars rotate together with said holder tube while the bars are moving forwards gradually through said holder tube, winding threads of one or more than one kind or color round said bars in order according to the patterns and colors of the original design in the file indicated by an indicator secured at a suitable place each time the original design on the cylinder completes one rotation, moving said cylinder forwards by one file in the same direction as the movement of the bars each time it completes one rotation, replacing said bars with others, and setting the bars on edges in parallel after the threads have been wound round the bars for the whole design, pasting a lining on the top surface of the bars around which the threads are wound, and cutting the threads around the bars along the center lines on the opposite surface of the bars; and it has for its object to obtain a process of manufacturing pile fabric, such as carpet, of any desired shapes and with a wide breadth and short roots of piles in an easy and efficient manner by using any reduced original designs and slender bars.

The accompanying drawings show an apparatus according to this invention. Fig. 1 is a front view of the apparatus, Fig. 2 a plan view of the same, Fig. 3 a front view of a friction clutch, Fig. 4 a plan view of the same, Fig. 5 a longitudinal section showing a mechanism for rotating bars round which threads are wound, Fig. 6 a cross section of the same, Fig. 7 a longitudinal section of a mechanism for moving a rack, Fig. 8 a front view of an apparatus for feeding and rotating a cylinder, Fig. 9 a plan view of the same, Fig. 10 a cross section of the apparatus on the line A—A in Fig. 2, Fig. 11 an end view showing a clutch and transmission mechanism for the bars and cylinder, Fig. 12 a plan view of the same, Fig. 13 a perspective view of the bars around which threads are wound, Fig. 14 a cross section of the same, Fig. 15 a plan view showing how the bars are set on edges in parallel and put in a frame, Fig. 16 a longitudinal section of the same, and Fig. 17 a sectional view showing how the bars on the top surface of which a lining is pasted, are raised from ends while the threads are cut on the opposite surface. In the drawings the same reference numerals show the same parts.

The features of the invention will be understood from the following description referring to the drawings.

Holder tubes 10, 11, 16 are arranged in a straight line with suitable spaces between them, the tubes 10 and 11 being mounted on bearings 55 rotatably and the tube 16 being supported by a support 57.

The tubes 10, 11 are connected to a shaft 17 through toothed wheels 7', 8', 8' and 7, 8, 8 respectively and thence to a motor. In the holder tube 10 are inserted two slender bars 13 joined together, on which threads are wound round, the left ends of the bars being inserted in the tube 11. On the end of the tube 10 is screwed a cap 12 having a rectangular hole through which the bars 13 pass, thereby enabling the latter to rotate together with the tubes 10, 11. In the tube 16 is inserted a rack 14 which is connected with the shaft 17 through toothed wheels 21, 25, 20 and a pinion on which a clutch is provided. On the end of the rack 14 a cap 15 is mounted rotatably and this portion is inserted in the tube 10 so that the rack moves forwards in a straight line without friction with the tube 10.

The right ends of the bars 13 are held by the cap 15 and the bars are pushed thereby to the left, thus enabling the threads to be wound in order round the bars between the tubes 10 and 11. At the right end of the rack 14 a weight 24 is hung so that the rack returns to its original position as soon as the clutch is disengaged.

32 is a cylinder on the periphery of which the original design is stuck. The cylinder is mounted slidably on a shaft 30 provided with a groove 31 for a wedge. The forked ends of a handle 34 secured on a screw rod 35 are fitted in a circular groove 33 provided along the periphery of an end portion of the cylinder. The cylinder is rotated through the shaft 30 and the mechanism mentioned below and can be also moved to the left by the handle 34.

At the right end of the shaft 30 are provided a clutch 29 and a worm wheel 28 engaging a worm 27 provided at the rear end of the shaft 26, and at the left end are provided a clutch 40 and a toothed wheel 39 connected with a screw rod 35 through toothed wheels 38, 37, 36, and also a weight 41 is hung.

The clutches 29 and 40 have teeth cut oppositely to each other, and the motive power is transmitted to the worm wheel 28 through the shaft 26 of the toothed wheel 25, and thus the shaft 30 is rotated. While the cylinder 32 is rotated, the clutch 40 races, and when the clutch

29 is disengaged and the shaft 30 is rotated reversely by the action of the weight 41, the cylinder makes also reverse rotation, a claw 56 engaging a stop 59, and thus the cylinder returns to its original position.

At the same time the clutch 40 operates also to rotate the screw rod 35 through the wheels 39, 38, 37, 36, when the cylinder is moved to the left by one file by the handle 34 and hence the position of the original design on the cylinder changes in conjunction with the indicator.

A motor 1 is connected with the shaft 17 through a belt 2, friction clutch 3, 4 and wheels 5, 6. The friction clutch is connected with a pedal 50 through levers 48, 49. By pedalling the pedal 50 the power is transmitted to the shaft 17 through the friction clutch, and the tubes 10 and 11 and the bars 13 are rotated through the shaft 17, toothed wheels 7, 8, 9 and 7', 8', 9', and the rack 14 is also acted upon through the worm 18, worm wheel 19, toothed wheels 20, 25, 21 and pinion 22, thereby moving the rack 14 forwards and feeding the bars to the tube 11, and rotating the cylinder through the shaft 30, shaft 29 of the wheel 25, worm 27 and worm wheel 28.

Thus, the threads of different colors corresponding to the patterns and colors of the original design on the cylinder are wound by one file round the bars between the tubes 10 and 11 as indicated by the indicator 51 during the operations above described.

44, 45, 46 are links connected with a handle 47, which links are connected with the clutches 23 and 29 respectively through levers 43 and 42.

Each time the threads of different colors corresponding to the colors and patterns in the file of the original design have been wound round the bars, the handle 47 is operated to disengage from the clutches 23 and 29, when the cylinder and rack return simultaneously to their original positions by the action of the weights 24, 41, and the cylinder is moved each time by one file by the handle 34. The bars are replaced with others through the left end of the tube 11.

To work the above apparatus, the portion of the bars near the left end is brought, in the first place, between the tubes 10, 11 and the cylinder is brought to a suitable position at the right portion of its shaft so that the first file on the left of the original design is indicated by the indicator 51.

Power is then transmitted to the shafts 17, 30 to rotate the bars and cylinder. The bars are rotated at such a high speed as about 1500 rotations per minute while they are moved forwards from the tube 10 so that the threads 52 are wound round the bars. The same operations are repeated for the second file and so on.

After the threads have been wound round the bars for the whole design, the bars are set on edges in parallel as shown in Figs. 15 and 16 so that the threads present the reverse design, and then placed in a frame 53 and tightened by inserting filling 60.

A lining 54 is pasted on the threads and it is subjected to drying. Then the upper portions of the frame are removed as shown in Fig. 17, and the threads on the opposite surface are cut by inserting a knife between two bars while the fabric is taken away. In this manner carpets of pile fabric with the same design as the original can be manufactured.

According to this invention, it is also possible to manufacture two sheets of carpet simultaneously by winding threads round each bar and setting up the bars in parallel in order, and pasting linings on the upper and lower surfaces of the threads around the bars, and cutting the threads along the middle lines.

The special effects produced by this invention are as follows:

1. It is possible to give each carpet any different design in a simple manner, in other words, the invention has advantages of both hand weaving and machine weaving;

2. It is possible to manufacture easily carpets of any shapes, such as square, round, triangular, hexagonal, etc.;

3. The bars are inserted in the holder tube so that they rotate together, and therefore the bars will not bend or be twisted, and it is possible also to manufacture carpets with a wide breadth and short roots of piles rapidly in a simple manner;

4. Reduced original designs may be used to manufacture carpets of large size;

5. The bars are inserted in the holder tube, and so noise is prevented during the rotation, and moreover workers may remain in the same seats during the operations. Consequently they can work longer without excess labor, and hence efficiency is increased.

GENKICHI NIKI.