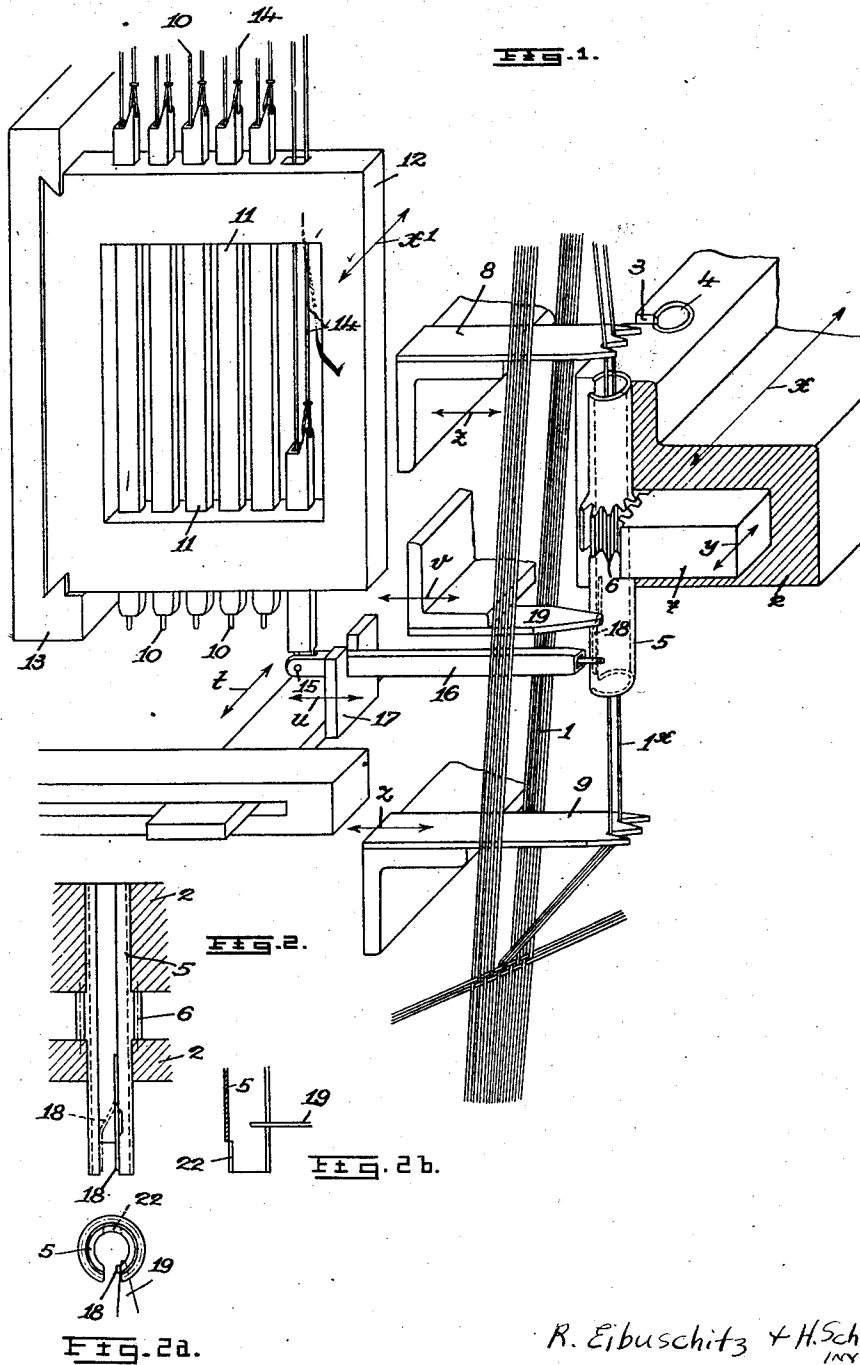


Dec. 8, 1931:

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 THREADS IN MANUFACTURING CARPETS
 Filed May 10, 1930

1,835,211

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 3.

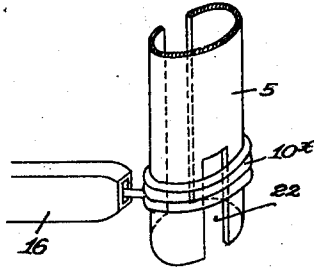


FIG. 4.

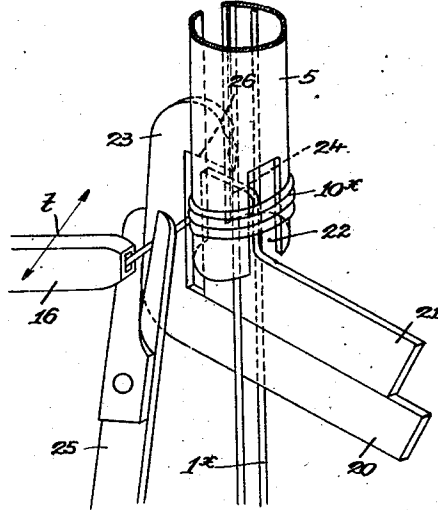


FIG. 6.

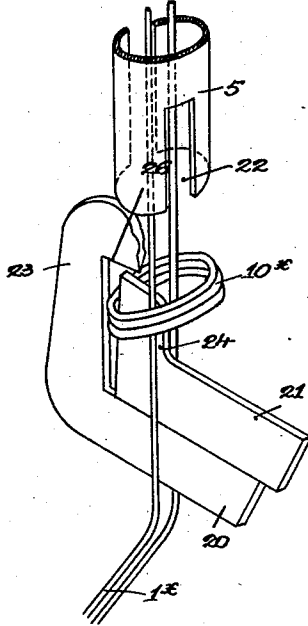


FIG. 5.

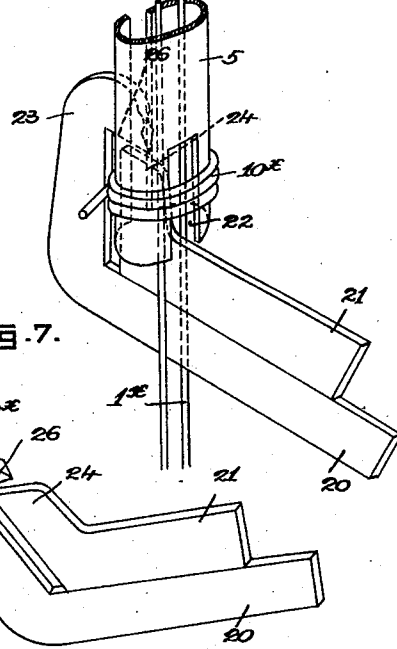
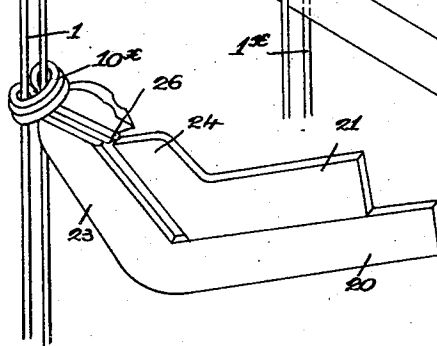


FIG. 7.



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PROCESS AND APPARATUS FOR KNOTTING PILE THREADS IN MANUFACTURING CARPETS

Application filed May 10, 1930, Serial No. 451,381, and in Czechoslovakia May 18, 1929.

This invention relates to a process for knotting the pile threads into the warp in the mechanical manufacture of carpets, and to apparatus for carrying out this process.

5 The invention consists in winding the pile thread that is to be knotted-in one or more times round a pair of warp threads displaced out of the plane of the warp and thereby forming a ring of pile thread, which is seized by a pair of nippers which pass in a known manner between the two displaced warp threads, whereupon the said ring is severed from the supply of pile thread, and the side of the ring that has been so seized is pulled 15 between the two displaced warp threads to form a Turkish knot at the end of the length of fabric so far woven, and is cut through at the point seized by a cutting edge on the head of the nippers.

20 In the practical carrying out of this process substantial advantages are obtained as compared with the processes and mechanical carpet knotting machines hitherto known. In the first place it may be emphasized that the exceedingly complicated composite knotting nippers hitherto employed, and the 25 equally complicated actuating mechanism thereof, becomes superfluous. The device for placing the ring of pile threads, which is converted into a loop by cutting, round the pairs of warp threads, is distinguished by great simplicity of construction and of drive.

30 A further advantage resides in the fact that the cutting of the finished carpet is effected much more simply and with less waste, since the halves of the cut rings stand out above the warp to a uniform length.

35 It is also possible to make the ring from one or more turns of the pile thread, and thus as it were to complete a larger area at the same time by knotting-in a tuft of threads. Moreover the length of pile left standing above the warp may be regulated at will in a 40 simple manner by suitably selecting the diameter of the rings of warp threads.

45 One constructional form of apparatus suitable for carrying out the process according to the invention is illustrated in the accompanying drawings, in which

Figure 1 shows the device as a whole, diagrammatically and in perspective, and

Figure 2 is a front view, Figure 2a a plan, and Figure 2b a longitudinal section of a winding bush.

Figures 3 to 7 show part of the apparatus in a succession of different positions.

55 The warp 1 is arranged in a vertical position. Behind the warp is located a rail 2, extending over the entire breadth of the fabric. In this rail are formed a series of vertical apertures 4, merging into slots 3 facing the warp. In the apertures 4 are rotatably supported winding bushes 5, each formed with a longitudinal slot extending 60 throughout its length. Each winding bush is also provided with an external ring of teeth forming a pinion 6, which leaves the longitudinal slot free. These pinions mesh with a rack 7, which is guided in the rail 2. 70

The arrangement may for example be such that a winding bush 5 stands opposite to every fourth pair of warp threads. In order therefore to operate upon the entire breadth of the warp, the rail 2 must be displaced by the 75 breadth of one pair of warp threads after each knotting operation, so that each winding bush passes from the first pair of warp threads to the second, and then to the third, and returns to its initial position after these 80 step-wise movements. In general, therefore, a movement mechanism must be provided, which moves the rail 2 in the direction of the arrow x transversely to the plane of the warp in the manner hereinbefore described. The 85 construction of such a mechanism is commonly known in this branch of the art and therefore need not be described. Similarly the rack 7 is reciprocated in the direction of the arrow y at every winding operation or knotting in, for the purpose of rotating the winding bushes 5. 90

95 In front of the warp are located spreaders or displacers 8 and 9, which, like the rail 2, receive a transverse displacement relative to the warp, and in addition to this a movement perpendicular to the warp in the direction of the arrows z , for the purpose of displacing the pair of warp threads 1* that are to be knotted next out of the plane of the 100

warp and introducing them into the winding bush 5 through the slot.

In this position of a pair of warp threads the pile thread is supplied to the winding bush, the ring of pile thread is formed, the ring thus formed is seized by the knotting nippers and the ring of pile thread is pulled away from the winding bush. For this purpose there serve the devices hereinafter described.

The pile threads 10 are guided by the bobbin creel through tubes 11. With each winding bush is associated such a number of tubular pile thread guides 11 standing side by side as corresponds to the number of differently coloured pile threads. The pile thread guides 11 are vertically guided in frames 12, which can be transversely displaced in a bracket 13 in the direction of the arrow w , like the rail 2. The pile thread guides 11 hang from neck cords 14, which are connected with the plates of a jacquard machine. The hooks of the jacquard machine keep the pile thread guides 11 constantly in a raised position, and that pile thread guide in which the warp thread to be knotted-in located, is always lowered.

In order to supply this pile thread to the winding bush, the lower portions 16 of the tubular guides 11 are hinged to the upper portions by pivot bolts 15, so that they rock towards the warp, as shown in the case of the outermost thread guide towards the right in Figure 1. The rocking of the portion 16 of the tubular guide towards the warp is effected by means of a forked gripper 17, which can be moved to and from the warp in the direction of the arrow u . In the case of the first movement, which takes place after a pair of warp threads 1^* has been displaced from the plane of the warp, the gripper 17 rocks the tubular element 16 through the gap formed in the warp so that the end of the pile thread lies between the edge of the longitudinal slot in the winding bush and a spring clip 18. The space necessary for this purpose has been provided by a separate spreader 19, which is moved to and from the direction of the arrow v , and which in the first part of its movement displaces the spring 18 from the edge of the slot, and in the second part of the movement has released the spring 18, to enable the latter to press the end of the pile thread against the edge of the slot.

The winding bushes 5 are now rotated by displacing the rack 7, whereby the pile thread is unwound from the bobbin and coiled round the winding bush 5, as shown in Figure 3. The number of turns of thread may be regulated, this being readily effected by altering the travel of the rack 7. The thickness of the knot to be tied is thereby at the same time determined. In any case, however, the longitudinal slot in the winding bush 5 must be located exactly in front of the displaced pair

of warp threads when the rack 7 comes to a standstill again.

After the winding of the pile thread round the winding bush, the part of the ring of thread 10^* located in the neighbourhood of the slot in the bush is nipped by the jaws 23, 24 of the nippers 20, 21. This is effected by moving the knotting nippers between the displaced warp threads underneath the winding bush 5, then pushing forward the member 20 of the nippers alone, and then raising both the members 20 and 21, so that the member 21, together with the jaw 24, enters the winding bush 5 through the short slot 22, and the jaws 23 and 24 of the nippers take up positions on the outside and inside respectively of the part of the thread ring 10^* extending across the longitudinal slot in the winding bush. The member 20 is thereupon pushed back again, whereby the thread ring is firmly nipped, in the longitudinal slot in the winding bush 5, between the jaws 23 and 24, as shown in Figure 4. In order to sever the ring of thread 10^* from the end of the pile thread projecting out of the lower portion 16 of the guide tube, and in doing so to leave as much thread projecting out of the lower part of the tube as will suffice to be engaged by the winding bush when the next operation occurs, the frame 12 is shifted a little towards the side so that the tubular element 16 takes up a position to one side of the winding bush, as shown in Figure 4. The thread located between the knotting nippers 20 and 21 and the guide element 16 is now cut through by moving forward a pile thread cutter 25.

Instead of shifting the entire frame 12 sideways in order to provide the cutting length of thread between the ring 10^* and the lower part 16 of the guide, the thread guides 11 may be rotatably supported in the frame 12, and the lateral movement of the part 16 may then be effected by shifting the forked gripper 17 in the direction of the arrow t in Figure 1.

The pile thread cutters 25, and the part 16 of the guide tube, now leave the region of the winding bush, and the coil of thread 10^* seized by the knotting nippers 20, 21, is located on the winding bush in the position shown in Figure 5. The thread ring 10^* is now pulled off the winding bush 5 by a relative movement of the winding bush and knotting nippers 20, 21 in relation to one another, as shown in Figure 6, and thereupon the knotting nippers return to their initial position, as shown in Figure 7. The part of the ring 10^* seized by the knotting nippers is now pulled by them between the two warp threads and thus formed into the Turkish knot, which is pulled tight at the edge of the fabric, and the point seized is cut in two by a head knife 26 on the nippers. A tuft of pile threads is thereby knotted into the warp

and the pair of warp threads returns into the plane of the warp after withdrawal of the spreaders 8 and 9, and the knotting operation is repeated stepwise at the next pairs of warp threads associated with each winding bush until a complete series of knots has been tied, whereupon the introduction of the weft is effected in a known manner.

What we claim is:—

1. A process for knotting the pile threads into the warp in the mechanical manufacture of carpets, comprising displacing a pair of warp threads out of the plane of the warp, winding the pile thread round the displaced pair of warp threads, passing a pair of nippers between the two displaced warp threads and seizing the pile thread wound round the warp threads with the nippers, severing the wound pile thread, drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two warp threads, and forming a Turkish knot, and cutting through the pile thread with a knife edge on the nippers.

2. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising means for displacing a pair of warp threads out of the plane of the warp, a slotted winding bush into which the displaced warp threads are introduced through the slot by the displacing means, means for gripping a pile thread in the slotted winding bush, means for rotating the slotted winding bush about its longitudinal axis to wind the gripped pile thread round it, a pair of nippers capable of being passed between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and means for cutting through the pile thread.

3. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising a rail slidable lengthwise of the loom, slotted winding bushes rotatably mounted in the rail, teeth on the outside of the winding bushes, means for displacing a pair of warp threads out of the plane of the warp, and introducing them into a slotted winding bush through the slot, means for gripping a pile thread in the slotted winding bush, a rack longitudinally slidable in the rail and meshing with the teeth on the winding bushes to rotate them about their longitudinal axes and thereby wind the gripped pile threads round them, a pair of nippers capable of being passed between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back

the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and means for cutting through the pile thread.

4. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising a rail slidable lengthwise of the loom, winding bushes rotatably mounted in the rail, each winding bush being formed with a longitudinal slot throughout its length and with a short longitudinal slot opposite to the said longitudinal slot, teeth on the outside of the winding bushes, means for displacing a pair of warp threads out of the plane of the warp, and introducing them into a slotted winding bush through the slot, means for gripping a pile thread in the slotted winding bush, a rack longitudinally slidable in the rail and meshing with the teeth on the winding bushes to rotate them about their longitudinal axes and thereby wind the gripped pile threads round them, a pair of nippers capable of being passed through the short longitudinal slot in each winding bush and between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and means for cutting through the pile thread.

5. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising means for displacing a pair of warp threads out of the plane of the warp, a slotted winding bush into which the displaced warp threads are introduced through the slot by the displacing means, means for gripping a pile thread in the slotted winding bush, means for rotating the slotted winding bush about its longitudinal axis to wind the gripped pile thread round it, a pair of nippers capable of being passed between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and a knife edge on the part of the nippers against which the pile thread bears in tying the Turkish knot, the knife edge being adapted to cut through the pile thread when the knot is pulled tight.

6. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising means for displacing a pair of warp threads out of the plane of the warp, a slotted winding bush into which the displaced warp threads are introduced through

the slot by the displacing means, mechanically actuated tubular pile-thread guides, the lower part of each of the said guides being hinged to the upper part, a guide rail movable transversely to the warp and adapted to bring the lower hinged parts of the pile-thread guides within reach of the winding bush, means for gripping a pile thread in the slotted winding bush, means for rotating the slotted winding bush about its longitudinal axis to wind the gripped pile thread round it, a pair of nippers capable of being passed between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and means for cutting through the pile thread.

7. Apparatus for knotting the pile threads into the warp in a mechanical carpet loom, comprising a rail slidable lengthwise of the loom, winding bushes rotatably mounted in the rail, each winding bush being formed with a longitudinal slot throughout its length and with a short longitudinal slot opposite to the said longitudinal slot, teeth on the outside of the winding bushes, means for displacing a pair of warp threads out of the plane of the warp, and introducing them into a slotted winding bush through the slot, mechanically actuated tubular pile-thread guides, the lower part of each of the said guides being hinged to the upper part, a guide rail movable transversely to the warp and adapted to bring the lower hinged parts of the pile-thread guides within reach of the winding bush, means for gripping a pile thread in the slotted winding bush, a rack longitudinally slidable in the rail and meshing with the teeth of the winding bushes to rotate them about their longitudinal axes and thereby wind the gripped pile threads round them, a pair of nippers capable of being passed through the short longitudinal slot in each winding bush and between the displaced warp threads and of seizing the coil of pile thread, means for severing the wound pile thread, means for drawing back the nippers from between the two warp threads and thereby pulling one side of the winding of pile thread through between the two displaced warp threads and forming a Turkish knot, and a knife edge on the part of the nippers against which the pile thread bears in tying the Turkish knot, the knife edge being adapted to cut through the pile thread when the knot is pulled tight.

In testimony whereof we have signed our names to this specification.