PILE YARN ATTACHMENT FOR CARPET LOOMS

YARN FROM CREELS
YARN INDEXING RATCHET
YARN FEED ROLL
YARN HOOK SHIFTING CAM 89
YARN JUMBOE
JUTE HEDDLE CAM 75
COTTON HEDDLE CAM 67
COTTON HEDDLE CAM 54
YARN TUBE 68
YARN TUBE RAISING CAM 93
PICKING LATCH CAM 83
HEDDLE CAMS 65
YARN TUBE 95
YARN HOOK 54
YARN RATCHET CAM 32
YARN RATCHET CAM 29
COTTON HEDDLE CAM 48
COTTON HEDDLE CAM 50
INVENTORS
HERBERT P. SONTAG
HERMAN F. SALOMON
GERALD E. HERRNSTADT
BY Leech & Radue
ATTORNEYS
PILE YARN ATTACHMENT FOR CARPET LOOMS

Herbert P. Sontag, Sennett, Herman F. Salomon, Auburn, and Gerald E. Herrnstadt, Cornwell, N. Y., assignors to The Firth Carpet Company, Inc., New York, N. Y.

Application May 2, 1955, Serial No. 505,581

7 Claims. (Cl. 139—38)

The present invention relates to an attachment which is adapted to use with various types of looms for the purpose of making heavy pile fabrics such as carpets, rugs or the like.

One of the oldest known modes of rug making is that of hooking the face pile yarn manually, with an especially designed needle, through a previously woven backing such as burlap, duck or the like. In the present mechanical age this is a slow and tedious process. It requires that the backing be woven prior to the hooking of the face pile yarn into such backing materials, which must be stretched over a frame so as to enable the carpet maker to manually insert the pile face yarn back and forth through the backing with a hooking rug needle.

It is, therefore, a primary object of this invention to provide mechanism attachable to a power loom that will perform not only the functions of a manually operated hooking rug needle, but will also weave the backing material simultaneously in coordination with the hooking operation.

Furthermore, it is the object of this invention to provide mechanism which can be attached to a power loom for the weaving of pile fabrics independently of the apparatus for the weaving of the fabric base, but providing a coordinated continuous operation.

More specifically, it is an object of this invention to provide attachable mechanical units for inserting pile yarn into a flatly woven fabric base, and thereby adapting a loom which is otherwise not suited for fabrics other than flatly woven ones to manufacture of heavy pile fabric floor covering.

Still another object of this invention is to have one component of the attachable mechanism perform the function of a multitude of manually operated hooking rug needles, although differing substantially from the structure of manually operated needles.

A still further object of this invention is to provide banks of novel pile yarn feed tubes that can be attached to practically any ordinary loom utilizing yarn hooks or pile wires to convert it to a pile fabric loom without interfering with the usual draw-in through the heddle frames, or the motion of the frames as such.

These and other objects of this invention will be more fully understood from the following detailed description of a preferred embodiment, when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side elevational view of the working parts of a loom to which the mechanism of this invention has been attached; Fig. 2 is a similar side elevational view with the loom in the position of the second pick; Fig. 3 is also similar to Fig. 1, except that the loom is in the position of the third pick; Fig. 4 is also like Fig. 1 except that the loom is in the position of the fourth pick; Fig. 5 is a side elevation of a pile yarn feed tube attachment;
in combination with the novel pile yarn feed tube 46 in order to achieve the purposes of this invention. It is only in the first pick position shown in Fig. 1 that the pile yarn feed tube 46 is in a position of interference in the loom. Thus the face yarn is brought to the rear of the loom 59 carrying the open top reed 48. While a closed top type of reed may be employed, an open top reed is definitely preferred. With the closed top common type reed the shed opening is limited to a degree, but the weaver is confined to use of the warp thread pile yarn in the same warpspace wise at all times. This limitation is avoided by use of the open top reed 48 of Fig. 7.

A further attachment part is required to perform the function of making the pile, holding the same in place, and releasing the same, and then moving into position for the next loop of pile yarn. For this purpose there is provided a longitudinally pivoted hooking bar 52 with spaced hooks 54 attached thereto in the necessary pitch for holding or releasing the pile yarn at the times required.

To further clarify the operation of the loom attachment of this invention there is shown in Fig. 1 a combination of the warps and the pile yarn and the relation of the movement thereto in the first pick of a weave that may be made use of the invention, but is not itself a part thereof. As will be observed, the yarn frame or loom attachment 44 is at its lowestmost position while the rear heddle 32 and the front heddle 28 are up, with the middle heddle 29 remaining down.

In the second pick, which is shown in Fig. 2, the positions of the heddle frames are reversed, with the rear heddle 32 and the front heddle 28 being down, and the middle heddle 29 being up, and the yarn frame attachment 44 being half-way up. At the same time the hooks 54 are holding the loops previously made so that upward movement of said attachment cannot withdraw the yarn previously formed into piles.

In the third pick (Fig. 3) the pile yarn feed tube 46 remains in the same position as in the second pick, this position being half-way up its path of movement. The hooks 54 continue to hold the previous loops, and the heddle frames are reversing in such a manner that the rear heddle 32 is up, the middle heddle 29 is up, and the front heddle 28 is down.

In the fourth pick (Fig. 4), the rear heddle 32 and the middle heddle 29 are reversing their positions again and are both down, and the front heddle 28 also reversing itself is up in order for insertion of a jute filling shot. In this fourth pick, which may be regarded as the last pick of a cycle, the pile yarn feed tube 46 is in its most elevated position, which brings the yarn fed therefrom appreciably above the binder thread fed through the front heddle 28. This position is also above the open top reed 48. While the pile yarn is now held in its highest position by the feed tube 46, the hook bar 52 is moved in a direction to release the pile yarn it previously held, and slightly beyond the same in a laywise direction to the oncoming yarn, so that such yarn snaps into the hooks 54. By repeating the cycle back to the first pick (Fig. 1) in which the hooking bar 52 that holds the hooks 54 returns to its lower position while the pile yarn feed tube 46 moves to its lowestmost position, the new row of pile is formed.

Therefore, the cycle of operation involves a three-level movement, namely, the fully elevated position of Fig. 4 necessary for the hooks 54 to grasp the pile yarn, the fully down position of Fig. 1 required to dispose a filling shot above the pile yarn feed and integrate the pile yarn with the base weave, and the position of intermediate elevation of Figs. 2 and 3, required to satisfy the base weave requirements without interference from the pile yarn.

The essential operation of the mechanism of this invention as explained with references to Figs. 1, 2, 3 and 4 combines a three-level up and down movement of the loom attachment assembly 44 in cooperative relation with a common flat weave loom operation. The details of the pile yarn feed tube 46 are most clearly shown in Figs. 5 and 6. Each tube 46 has an upwardly extending bracket 60 secured to the front side of the upper end portion thereof and being of strip formation of lesser thickness than the tube itself. The several tubes 46 are individually joined with a movable support 62 for up and down movement together as illustrated in Figs. 1 to 4.

The yarn feed tubes 46, all of which are alike, are of flattened elliptical cross-section as shown in Fig. 7. Each includes an upstanding mounting bracket 69 secured to its upper end portion at one side and being of flat strip formation of lesser thickness than the narrower side of the tube to which it is connected. These mounting brackets or strips 60 are secured in parallel relation and alignment to a movable support 62 for up and down movement together as indicated by the sequential positions of Figs. 1 to 4. The upper end of the tube 46 is formed with a lip or bevelled mouth 64, and the lower end portion 66 thereof is curved outwardly so as to be generally coplanar with the bracket 60 and the main body of the tube itself and to present a gently curved yarn guiding passageway opening on the bracket side of the tube that is substantially parallel to the vertical straight side of the tube. A generally triangular, bladed end piece 68 is secured to and depends from the lower surface of the curved end portion 66 adjacent the lower end opening of the tube 46. The end piece has a straight edge beneath the discharge end of the tube 46, and is reduced to a relatively dull horizontal edge 70 at its lowermost extremity. The purpose of the elliptical cross-section and the bladed end piece 68 is to facilitate insertion of the lower end portion of the feed tube 46 between the warp ends passing through the heddles 28, 29 and 32. The pile yarn, which may be quite bulky, smoothly enters the feed tube 46 through the lipped mouth 64 and is conformed generally to the elliptical cross-section before passing out through opening at the lower end portion thereof. Thus each tube 46 of itself performs the function of a manually operated rug hooking needle as used in the hand hooking rug process.

Figs. 8, 9 and 10 show in detail the loom mechanisms for operating the pile yarn feed roller 40, the heddles 28, 29 and 32, the yarn hooks 54, and the yarn feed tubes 46 in accordance with the purposes of this invention. Accordingly, only the loom devices pertinent to these operations will be referred to. In Fig. 8 there is shown a yarn ratchet cam 75 operating a connected linkage and mechanism designated generally for controlling the pile yarn feed to the yarn feed tubes 46. A yarn hook operating cam 79 actuating a linkage designated generally as 81 produces the required motion of the yarn hooks 54 in the requisite sequence. A commonly driven set of heddle cams 83, 85, and 87 are connected with heddles 28, 29, and 32, respectively, to perform the four pick cycle that has been described in detail. A yarn hook shifting cam operating a linkage 91 is shown in Fig. 10 as well as Fig. 8. A yarn tube raising cam 93 coupled with linkage and mechanism 95 for performing this function is shown in Figs. 8 and 9.

The adaptability of the principles of this invention to a loom in which pile wires are used instead of hooks, reference will now be made to the modified combination illustrated by Figs. 11, 12, 13 and 14. In this instance the novel pile yarn feed tubes of this invention operate without the cooperation of hook bar or hooks, which are replaced by conventional pile wires having a pile yarn fed therewith and thereunder.

While the loom of Figs. 11, 12, 13 and 14 with its modified combination embodying a set of pile wires 100 in place of a hook bar also requires a cycle of four picks, the pile yarn feed tube 46 has a somewhat different co-
2,760,520

5 operating action. As seen in Fig. 11, in the first pick of the cycle the pile yarn feed tube 46 is all the way above the open top reed 48, the stuffer warp from beam 20, and the binder warp yarn from beam 22, and lies above one of the pile wires 100 about to create the pile in the following pick. In the first pick the rear and middle heddle frames 32 and 29 are up and the front heddle frame 28 is down. In Fig. 12 showing the second pick, the rear and middle heddle frames 32 and 29 are down and the front heddle frame 28 is up. In this second pick the pile yarn feed tube 46 has fed the pile yarn in between the open spaces of the open end reed 48 and a jute thread is inserted above the pile yarn, while a pile wire 100, which in the first pick was ready to be inserted, has been introduced under the pile yarn. In the third pick shown in Fig. 13 a pile wire 100, which in the first pick was ready to be inserted, will create a pile formation PF in the same manner as the outermost pile wire 100 did originally. So too in Fig. 13 the pile yarn feed tube 46 moves up again above the open top reed 48 and the lay 50, and another pile wire 100 is positioned for insertion in the following pick. In this third pick the rear heddle 32 and the front heddle 28 are up while the middle heddle 29 is down. Fig. 14 shows the last one of the four picks required to complete a cycle, and has the pile yarn feed tube 46 being in the same down position as it was in Fig. 12, the only variance being that the middle heddle 29 is up and the front heddle 28 as well as the rear heddle 32 are down. This set of pile wires 100 is operated in the usual sequential manner for the purpose.

Although a preferred embodiment and certain modifications of this invention have been described in detail, it will be understood that various changes can be made in details of construction and arrangement of parts, without departing from the inventive principles and the scope of the appended claims.

Having thus described our invention, what we claim as novel and desire to secure by Letters Patent of the United States is:

1. In a loom for weaving pile fabrics, the combination comprising a lay having an open top reed, a unit of pile yarn feed tubes in back of the reed, a hook bar unit carrying a plurality of hooks positioned in front of the reed, and means raising and lowering the feed tube unit and swinging the hook bar until back and forth in cyclic relation to form and insert pile yarn loops in backing material woven by the loom.

2. The combination of claim 1 in which the pile yarn feed tubes are of flattened oval cross-section with their flat sides parallel and have outwardly curved lower ends directed toward the lay.

3. The combination of claim 1 in which the reed has spaced hairpin reed dents having their ends secured in the lay.

4. In a loom for weaving pile fabrics, the combination comprising a lay having an open top reed, a unit of pile yarn feed tubes in back of the reed, a set of pile wires positioned in front of the reed, and means raising and lowering the feed tube unit and inserting and withdrawing the pile wires in coordinate relation to feed the pile yarn ends from the feed tube unit over and under the pile wires and insert the pile yarn in the backing material woven by the loom.

5. In a loom for weaving pile fabrics, the combination comprising a lay having an open top reed, a unit of pile yarn feed tubes in back of the reed, pile raising means positioned in front of the reed, and means raising and lowering the feed tube unit and inserting and withdrawing the pile raising means in coordinate relation to form and insert the pile yarn as loops in the backing material woven by the loom.

6. A carpet loom attachment for inserting pile yarn loops in a backing as woven, said attachment comprising a vertically movable support, and a plurality of pile yarn feed tubes depending in parallel from the movable support, each of said feed tubes being of flattened oval cross-section and having a lipped mouth at its upper end, an outwardly curved lower end portion, and a bladed end piece depending from the curved end portion for aiding in inserting the feed tube between warp ends.

7. A pile yarn feed tube for carpet looms, said tube having a flattened oval cross-section, a lipped mouth at its upper end, an outwardly curved lower end portion, and a bladed end piece depending from the lower end portion and having a straight edge positioned beneath the extremity of the lower end portion of the tube and terminating in a reduced edge.

References Cited in the file of this patent

UNITED STATES PATENTS

2,610,652   Parker  .................. Sept. 16, 1952
2,638,934   Parker  .................. May 19, 1953
2,710,028   White  .................. June 7, 1955
2,715,918   Eisler et al.  ............. Aug. 23, 1955