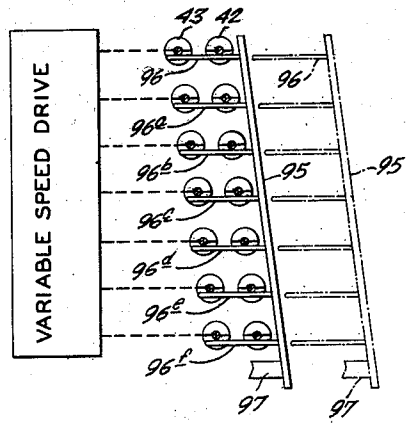
Sept. 17, 1963 E. B. BROADRICK ETAL 3,103,903

TUFTING MACHINE YARN FEEDING MEANS

Filed Jan. 25, 1960 3 Sheets-Sheet 1

FIG. 2.



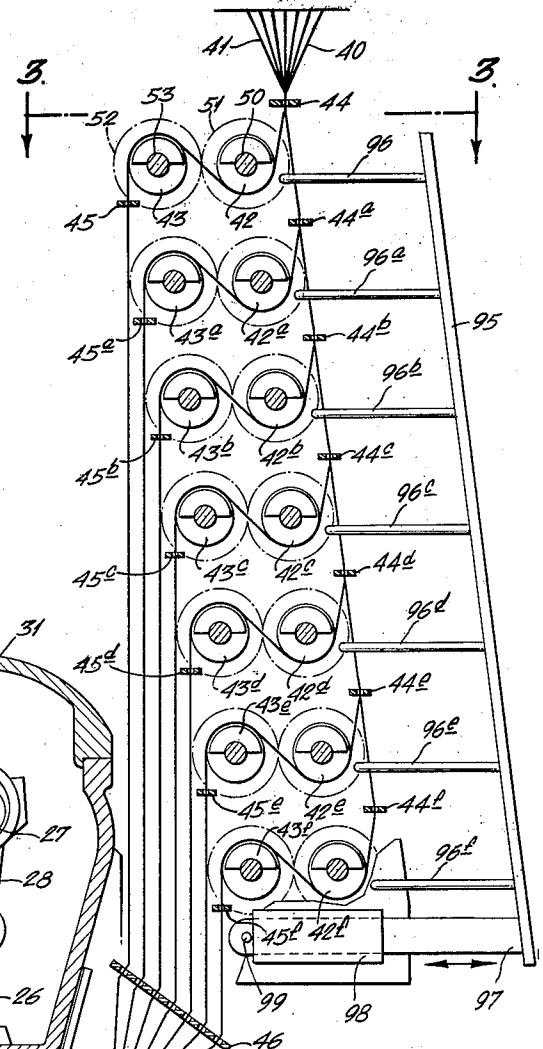
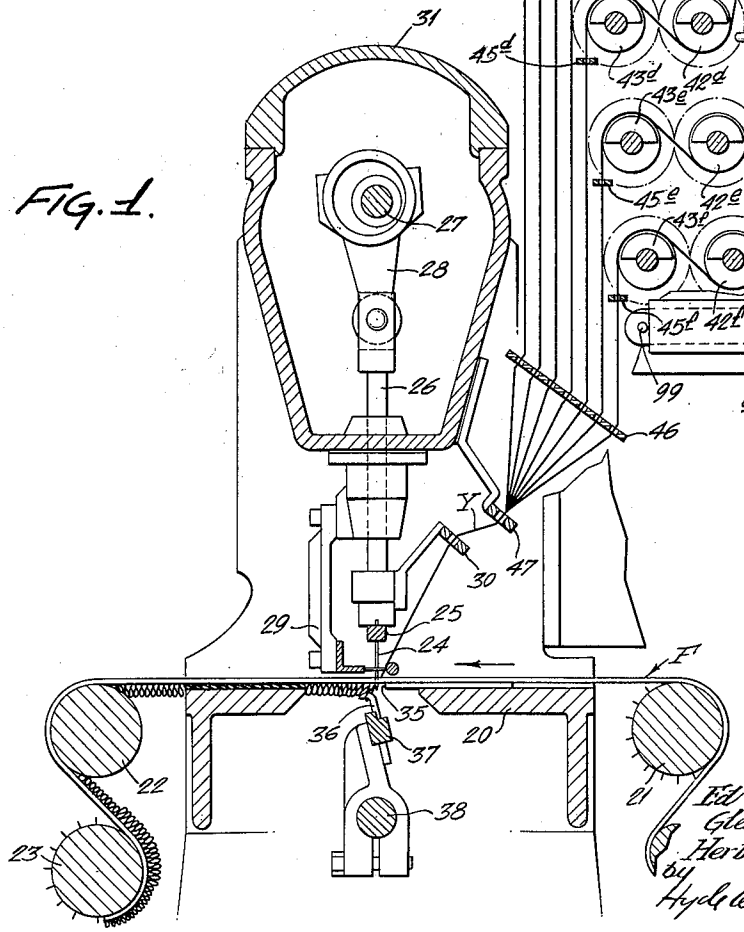


FIG. 1.



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TUFTING MACHINE YARN FEEDING MEANS

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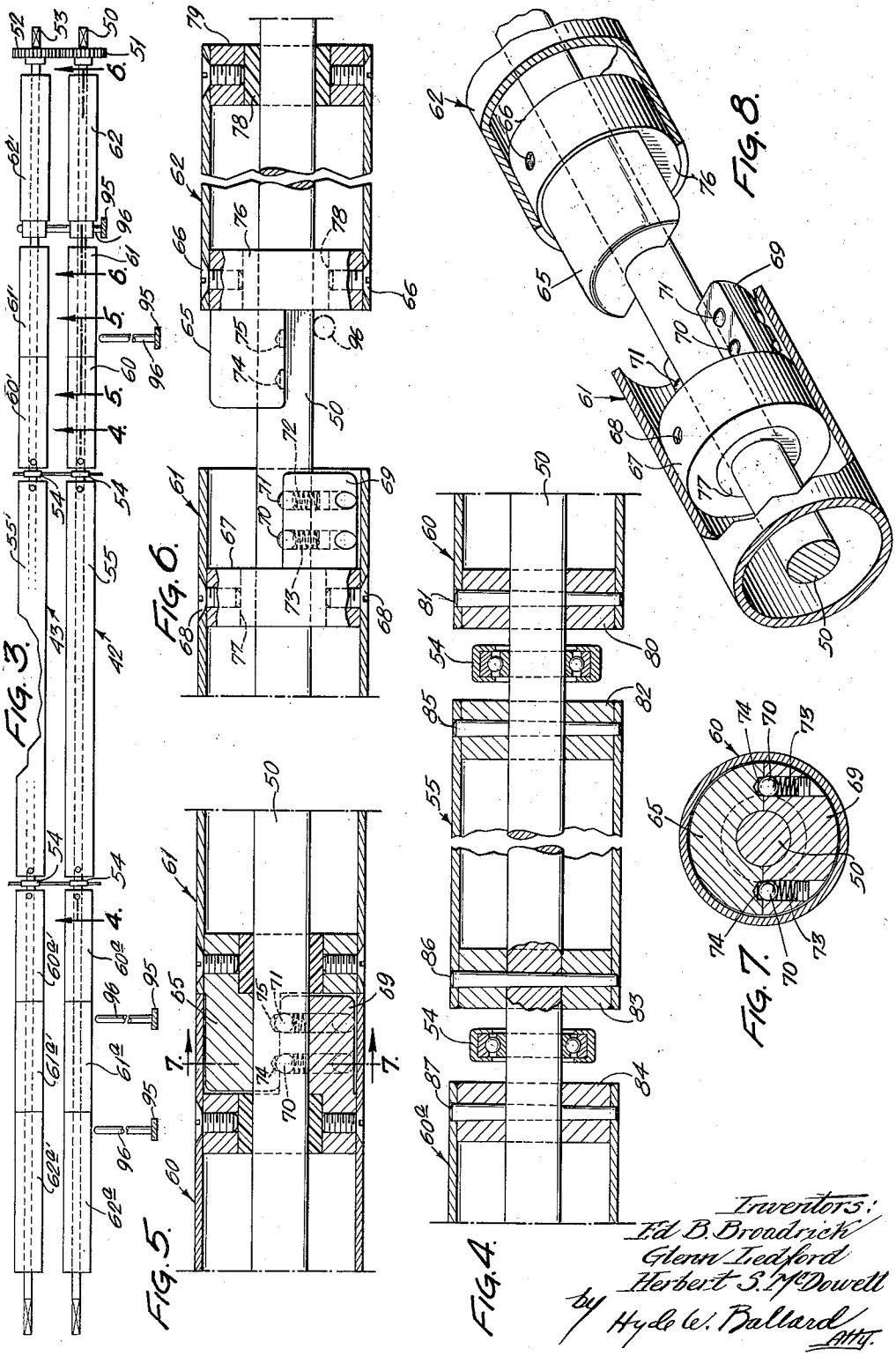


FIG. 3.

FIG. 6.

FIG. 8.

FIG. 5.

FIG. 4.

FIG. 7.

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TUFTING MACHINE YARN FEEDING MEANS

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FIG. 9.

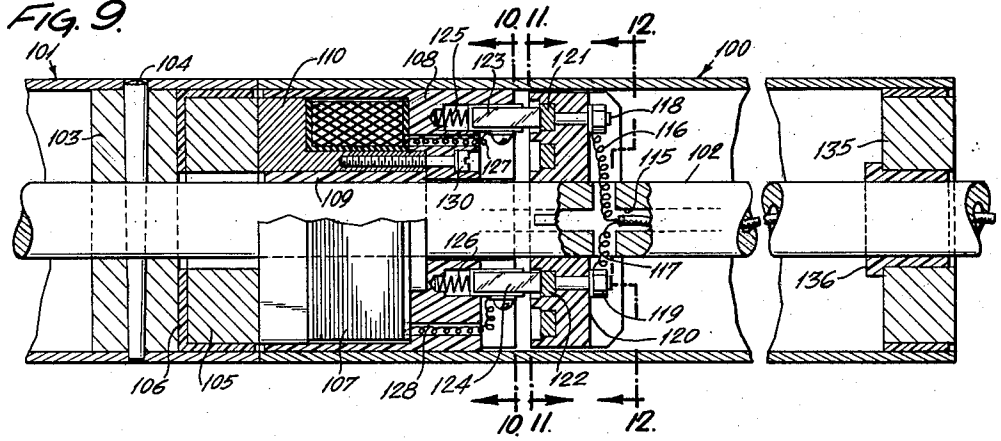


FIG. 10.

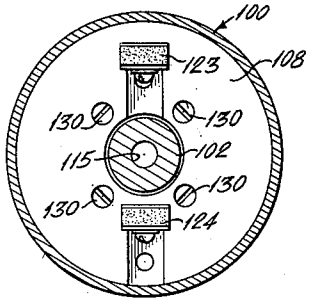


FIG. 11.

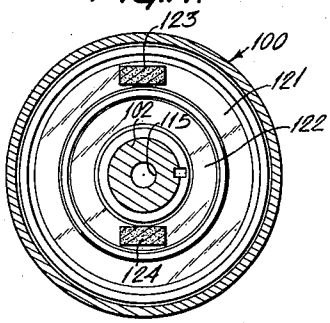


FIG. 12.

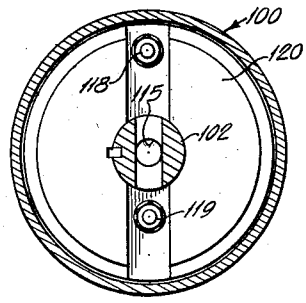


FIG. 13.

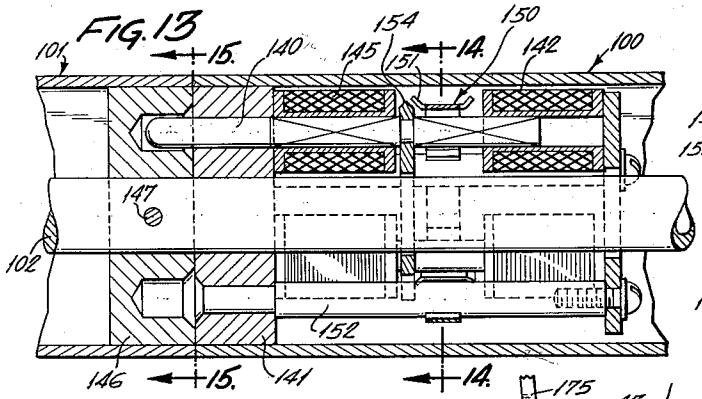


FIG. 14.

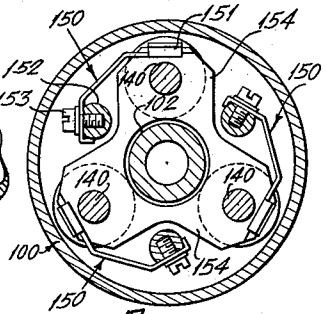


FIG. 15.

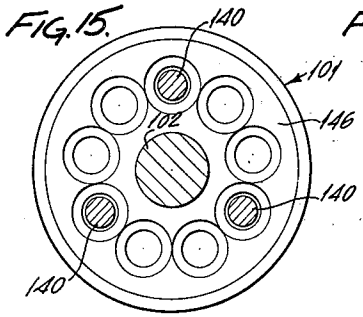


FIG. 17.

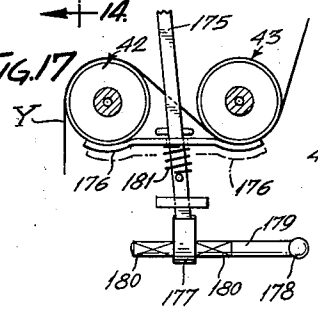
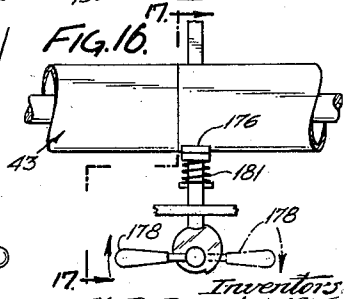


FIG. 16.



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3,103,903

TUFTING MACHINE YARN FEEDING MEANS

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Filed Jan. 25, 1960, Ser. No. 4,445
11 Claims. (Cl. 112—79)

This invention pertains to pattern attachments for pile fabric tufting machines and more particularly to a universal roller-type pattern attachment having disconnectable roller segments permitting use of the same attachment for various fabric widths.

In the carpet industry the customary widths for broad fabrics are 9′, 12′, 15′, and 18′. Where it is desired to produce a fabric having a sculptured pile surface, a well-known form of "pattern attachment" is used which produces this surface due to controlled feed and/or tension in the pile yarns. Such an attachment usually comprises a series of rollers mounted in banks in front of and over the tufting machine proper. Groups of yarns are fed over pairs of rollers, each pair of which has two or more speeds controlled by electrically operated clutches. A pattern chain or cylinder operates suitable electrical connections for energizing the electrical means to vary the relative feed of the yarns threaded around each pair of rollers. If a particular broad machine, say 15′ wide, is fully threaded and it should be desired to produce a narrower fabric on this machine only 9′ or 12′ wide, it is necessary to doff all of the unused pile yarn ends from the pattern attachment. This requires unthreading them from around 12 or 14 rollers.

The present invention contemplates the use of segmented rollers for the pattern attachment which may be disconnected either manually or electrically from the center section of each roller, thus permitting the unused yarn ends to remain on the stationary segments and thereby avoid the necessity for the unthreading and rethreading operation. In the preferred embodiment of the invention an outer disconnectable segment is placed on each of the roller shafts. This permits a reduction in width from approximately 15′ to 12′. A second disconnectable roller segment can then be, if desired, disconnected from the center section at each end so that the effective width is only 9′. Of course, the outer two or three segments on each roller can, if desired, be disconnected as a unit, thus directly changing from 18′ or 15′ to 9′ widths.

The invention also contemplates the use of suitable means for rotationally locking the disconnected segments so that even though the roller shafts are turning in the segments there will be no possibility that the unused segments will rotate with the consequent effect of tangling yarn ends on these segments.

A primary object of the invention, therefore, is to provide in a roller pattern attachment for a pile fabric tufting machine at least one disconnectable segment for the yarn feed pattern rollers.

A further object of the invention is to provide in a roller pattern attachment for a pile fabric tufting machine a plurality of axially movable segments on each end of each pattern roller and means for locking the segments together in driving relationship with the roller shaft.

A further object of the invention is to provide in apparatus of the type described, spring loaded detent means for retaining the disconnectable segments in an interlocked position.

A still further object of the invention is to provide electromagnetic means for retaining the segments in interlocked and driving position.

A still further object is to provide in apparatus of the type described means for retaining disconnected roller segments in a fixed position.

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

FIG. 1 is a schematic sectional view of a broad pile fabric tufting machine having a "seven roller" pattern attachment,

FIG. 2 is a schematic view of the pattern attachment of FIG. 1 showing the locking means for preventing rotation of disconnected roller segments,

FIG. 3 is a top view of a pair of pattern rollers as seen at 3—3 of FIG. 1,

FIG. 4 is an enlarged sectional detail as seen at 4—4 of FIG. 3,

FIG. 5 is an enlarged sectional detail as seen at 5—5 of FIG. 3,

FIG. 6 is an enlarged sectional detail as seen at 6—6 of FIG. 3,

FIG. 7 is a section as seen at 7—7 of FIG. 5,

FIG. 8 is a perspective of the connection of FIG. 6,

FIG. 9 is an enlarged sectional detail similar to FIG. 5 but showing electrical locking means for the disconnectable segments,

FIG. 10 is a section as seen at 10—10 of FIG. 9,

FIG. 11 is a section as seen at 11—11 of FIG. 9,

FIG. 12 is a section as seen at 12—12 of FIG. 9,

FIG. 13 is a view similar to FIG. 9 showing a modified form of locking device for the roller segments,

FIG. 14 is a section as seen at 14—14 of FIG. 13,

FIG. 15 is a section as seen at 15—15 of FIG. 13,

FIG. 16 is a schematic showing of a varied form of disconnected segment clamping device, and

FIG. 17 is a sectional view as seen at 17—17 of FIG. 16.

A pile fabric tufting machine of the type on which the present invention is utilized comprises a bed 20 over which a backing fabric F is fed from a pin feed roll 21 over roller 22 and around a pin take-up roll 23. A series of tufting needles 24 are secured in a needle bar 25 supported on rods 26, 26 and vertically oscillated from the crankshaft 27 through connecting rods 28. A presser foot assembly 29 is connected to the needlebar as is the usual thread jerker 30. The above crankshaft and its associated structure is enclosed and is journaled in an upper housing 31.

The needles 24 reciprocate to carry the pile yarn Y through the backing fabric F at the throat 35 of the tufting machine where a series of loopers 36 engage the yarns Y at each needle and thereby form the pile on the underside of fabric F. The present showing indicates a series of non-cutting loopers which are mounted in a looper bar 37 clamped to looper rockshaft 38 which oscillates to move the loopers into and out of the pile yarns Y.

The pile yarns Y are fed from a convenient source such as a creel, not shown, and are separated into groups 40 and 41. Each group is then threaded around a pair of pattern rollers 42 and 43. Depending upon the number of groups and the number of yarn ends, the pairs of rollers vary from a single pair to as many as seven pairs, such as shown in FIG. 1. Although there are actually 14 rollers in the pattern attachment, such an attachment is customarily referred to as a seven roller attachment indicating the number of pairs rather than the number of individual rollers. Each of the yarn sets 40 and 41 is carried through a yarn guide bar 44 in front of its associated roller pair and the yarn sets pass under each feed roller 42 and over the rear roller 43. From thence the yarns pass through a rear guide bar 45, stationary yarn guides 46 and 47, and then through the yarn jerker 30. Since each pair of rollers in the pattern attachment

shown in FIGS. 1 and 2 is identical to each other pair and they operate in the same manner, the additional rollers have been designated with suitable subscripts which also apply to the associated yarn guides.

Referring now more particularly to FIGS. 3–8, each of the rollers 42 and 43 is, in fact, a segmented roller having disconnectable sets of segments at each end. Since the construction of each roller is identical, it will be sufficient to describe the front roller 42 of the top pair but each roller in the lower pairs is similar. Front roller 42 is driven through its shaft 50 by the usual driving means, not shown. However, a driving interconnection between the rollers of each pair is provided through a pair of spur gears 51 and 52 mounted respectively on shaft 50 of roller 42 and shaft 53 of roller 43. Both rollers are preferably provided with two intermediate supporting bearings shown at 54, 54 in FIG. 3. Describing now particularly roller 42, the center segment 55 of roller 42 is permanently pinned or keyed to shaft 50. This segment 55 in a broad tufting machine is approximately 9′ in length or at least sufficiently more than 9′ to accommodate all of the pile yarns Y needed to produce a full 9′ width. Each end of roller 42 is provided with three individually disconnectable segments. The first segments, approximately 1½′ in length, are designated 60 and 60*a*, the second pair also approximately 1½′ in length, 61 and 61*a*, and the third pair which are desirably somewhat longer than 1½′ are designated 62 and 62*a*. The corresponding segments on roller 43 are designated with primed numerals in FIG. 3, but it will be understood as stated above that each of the rollers is identical.

Referring now to FIGS. 5–8, the disconnectable drive for the various segments comprises a cut-away portion which may be described as a half sector 65 secured in its corresponding segment, for example, segment 62, by means of screws or rivets 66, 66. The mating segment, for example, 61 (FIG. 8) comprises a collar 67 secured to segment 61 by means of screws or rivets 68, 68 and having a half sector 69 similar to half sector 65. Opposite faces of half sectors 65 and 69 are provided with spring loaded detents 70 and 71 biased in the sector by means of compression springs 72 and 73. The mating face of sector 65 is provided with small dimples or depressions 74 and 75 into which the detents 70 and 71 snap when the segments 61 and 62 are interlocked by means of axial movement on shaft 50. Either or both of the collars 67 and 76 may be provided with anti-friction bushings 77 and 78 if desired. Similar bushings are used with the plain collar 79 at the outboard ends of segments 62, 62′, 62*a*, and 62′*a*. The identical interlocking connection is employed between segments 61, 62; 60, 61; 60*a*, 61*a*; 61*a*, 62*a*; 62′*a*, 61′*a*; 61′*a*, 60′*a*; 60′, 61′; 61′, 62′ on each pair of rollers 42 and 43.

Segments 55, 60, 60*a*, 60′*a*, and 60′ are permanently secured to their respective shafts 50 and 53 as shown in FIG. 4. A plain collar 80 is pinned through the sleeve of segment 60 and shaft 50 by means of a taper pin 81. Similar bushings 82, 83, and 84 are used for segments 55 and 60*a* and are in turn anchored to shaft 50 by means of taper pins 85, 86, and 87.

In order to prevent rotation of all disconnected segments having yarn ends trained around such disconnected segments, we provide a movable framework assembly 95 (FIG. 2) which is slidable underneath each of the roller shafts to engage the flats of half sectors 65, 69, etc., thereby preventing undesired rotation of the disconnected segments. Each assembly is provided with a series of substantially horizontal bars or pins 96, 96 which contact the underside of shafts 50, 53 when moved into an operative or forward position as shown in FIG. 6. Three sets of pins 96 are shown in a retracted position in FIG. 3 whereas the fourth set has been displaced to engage segments 62′ and 62 to prevent rotation thereof. Ordinarily the outer segments are not only disengaged on each roller of a pair but also at each end of each roller

to provide an approximate reduction in the total width of the fabric of three feet. However, for purposes of illustration, FIGURE 3 at the left end shows rollers 42 and 43 completely interlocked as would be the case for full width operation, but at the right end the outermost segments 62 and 62′ have been disconnected and non-rotatably anchored by means of pins 96 the corresponding pins for each pair of rollers are identified with a letter exponent corresponding with the pairs of rollers with which they cooperate as seen in FIGURES 1 and 2. Each framework assembly 95 is supported on rails 97 slidable in sleeves 98 and provided with stop pins 99 (FIG. 1). Also, it will be understood that the corresponding segments on each of the pattern rollers 42 and 43 would normally be disconnected from top to bottom since the seven groups of yarns would in most patterns extend laterally the full width of the fabric. The pattern rollers illustrated herein have two disconnectable segments at each end thus providing a choice of three widths, namely, 9′, 12′, and 15′. For 18′ tufting machines it is only necessary to add another segment to each end of each roller. In any particular design it might be desirable to disconnect less than all of the corresponding segments of each roller in which event a somewhat modified means for retaining the individual segments would be utilized. An example of such modified locking means would be described more fully in conjunction with FIGS. 16 and 17.

Referring now to FIGS. 9–15, a modified form of disconnectable driving element for the various segments will be described. Here again it will be understood that the connection for only two segments is illustrated but that the identical device will be employed for each of the various separable segments. In FIGURE 9 a pattern roller segment 100 is shown drivingly connected with an adjacent segment 101, the latter of which is non-rotatably pinned to shaft 102 through collar 103 and taper pin 104. In the form of FIGURE 9, segment 101 is provided with an armature 105 of some magnetically permeable material locked in segment 101 by means of electrical insulating material 106. An electrical coil 107 is positioned in segment 100 and likewise is provided with suitable insulating bushings 108 and 109. When coil 107 is energized in a manner to be described later, the armature 105 and electromagnet 110 tightly grip each other to provide a driving connection between the segments 100 and 101.

The electrical connections for energizing and de-energizing coil 107 are carried through the hollow bore 115 of shaft 102 in the form of a pair of electrical leads 116 and 117 terminating at binding posts 118 and 119 mounted on a collar 120 which is fixed to shaft 102. The binding posts are electrically connected to two collector rings 121 and 122 mounted in the face of collar 120. A pair of spring loaded brushes 123, 124 are urged against the respective collector rings 121 and 122 by means of brush springs 125 and 126. Current flows from brush 123 to coil 107 through pigtail 127. Similarly, current from collector ring 122 is carried through brush 124, pigtail 128, to coil 107. The coil is maintained in position by means of the dielectric bushing 103 secured by four screws 130, 130. When coil 107 is de-energized, relative rotation of segment 100 on shaft 102 takes place without perceptible axial movement of the segment on the shaft. The opposite end of segment 100 is journaled for this purpose on a collar 135 mounted on an anti-friction bushing 136. Collar 120, however, turns with shaft 102 to prevent fouling of the electrical leads 116 and 117. As soon as the coil 107 is energized by the operator, segment 100 is drivingly connected with segment 101, thus permitting it to rotate as a unit with shaft 102 in the usual manner.

A further modified form is shown in FIG. 13 in which the segment 100 is drivingly connected to segment 101 by means of one or more magnetically displaceable keys or pins 140 which are moved axially in collar 141 by means of coils 142 and 145. When in locking position, as shown

at the top of FIG. 13, the pins **140** drivingly connect the collar **141** with collar **146** pinned to shaft **102** at **147**. When pins **140** are retracted due to energization of coils **142** and **145**, they are retained by means of three spring detents **150** which are provided with bent up ears **151** as seen in FIG. 13 and anchored to posts **152** by means of screws **153** (FIG. 14). The detents **150** operate against a spider **154** which mounts and guides the three pins **140**. Displacement of the detents by the beveled periphery of the spider serves to lock the three pins in either a driving or disconnected position so that it is only necessary to momentarily energize one of the coils **142** and **145** in order to lock or disconnect the segments **100** and **101**. Coil **142** when energized disconnects the segments since it pulls the pins to the right as seen in FIG. 13. To lock the segments the operator merely presses another switch which energizes momentarily coil **145**, thus shifting the pin assembly. It is therefore unnecessary to have either of the coils energized for a substantial length of time in order to retain the segments in either a driving or a disconnected position. With the electromagnet of FIGURE 9 such indefinite energization of coil **107** must take place regardless of whether the segments are connected or disconnected.

In order to retain the disconnected segments in a relatively stationary position regardless of whether they are of the mechanical or electrical variety, we provide a bracket **175** (FIG. 17) which extends between adjacent pairs of rollers **42** and **43**. The bottom of the bracket **45** has a spring loaded clamp **176** which can be urged into contact with the periphery of rollers **42** and **43** by means of a cam **177** controlled by lever **178**. Shaft **179** for the lever is desirably mounted in a pair of bearings **180**, **180** on any convenient structural framework member, not shown. Pivoting of lever **178** compresses spring **181** and urges plate **176** against the periphery of rollers **42** and **43** so that they remain stationary when their respective shafts rotate.

It will be understood that the locking means shown in FIGURES 1 and 17 are illustrative of several forms that can be desirably employed to retain disconnected segments in a relatively stationary condition should such procedure be necessary or desirable to prevent fouling of the unused yarns trained over the disconnected segments. Where the friction is extremely slight between the disconnected segments and their respective shafts, the drag of the yarn itself may be sufficient.

We have thus described an efficient improvement in pattern attachments for broad tufting machines commonly known as "yardage machines" in the industry which permits much greater flexibility in the manufacturing operation. It is no longer necessary for the manufacturer to have different width machines unless he can keep every machine operating at full capacity. With a far lesser number of machines the manufacturer is now able to quickly convert to one or more different widths, thus affecting a substantial saving in floor space required and capital investment.

Having thus described our invention, we claim:

1. A pattern attachment for use with a pile fabric tufting machine having a plurality of needles for inserting pile yarns through a backing fabric, comprising a series of yarn feeder main rollers over pairs of which a group of pile yarns is trained, at least one end segment roller on at least one end of each of said main rollers in axial alignment therewith, a shaft for each of said main rollers and its corresponding segment roller with each of said main rollers fixed to its shaft for rotation therewith, interconnecting drive means between the shafts of each pair of main rollers for positively driving same, and means for selectively and drivingly engaging each of said end segment rollers with its associated main roller.

2. Apparatus in accordance with claim 1, in which each end segment roller is axially slidable on its shaft into and out of rotational engagement with its corresponding main roller, each main roller and segment roller respectively having complementary half-sectors positioned therein for detachable interlocking engagement with one another.

3. Apparatus in accordance with claim 2, wherein the half-sector of each segment roller is provided with a spring loaded detent and each complementary half-sector of each main roller is provided with a depression complementary with said detent for retaining the complementary half-sectors in detachable relationship.

4. Apparatus in accordance with claim 1, including means for retaining the end segment roller, when in disconnected engagement from its corresponding main roller, in non-rotational relationship with its corresponding shaft.

5. Apparatus in accordance with claim 4, wherein the retaining means comprises a framework having a series of horizontally extending pins, said pins being movable into and out of engagement with said segment roller, when in a disconnected state, to prevent rotation of same with its associated shaft.

6. Apparatus in accordance with claim 1 in which the engaging means comprises an electromagnet, a coil for selectively energizing and de-energizing said electromagnet, and a magnetically permeable armature positioned to be locked to the magnet when the coil is energized.

7. Apparatus in accordance with claim 1 in which the engaging means comprises a plurality of pins axially movable with respect to the end segment, an electric coil for moving said pins from a drivingly engaged to a drivingly disengaged position, and spring loaded means for retaining the pins in either of said positions.

8. A pattern attachment for use with a pile fabric tufting machine having a plurality of needles for inserting pile yarns through a backing fabric, comprising a series of yarn feeder central rollers over pairs of which a group of pile yarns is trained, at least one end segment roller on each end of said central roller in axial alignment therewith, a shaft for each of said central rollers and its corresponding end segment rollers, with each of said main rollers fixed to its shaft for rotation therewith, interconnecting drive means between the shafts of each pair of feed rollers for positively driving same, detachable locking means between each end segment roller and its associated central roller for connecting one to the other in releasable engagement therewith, and means for retaining the end segment rollers, when in a disconnected state, in non-rotatable relationship.

9. In pile fabric tufting apparatus having a throat plate, means for feeding backing fabric across said throat plate, a plurality of oscillating needles for penetrating the fabric as it is fed over the throat plate, and a plurality of pairs of rollers for feeding pile yarn to said needles, the improvement of at least one disconnectable segment roller forming the terminal portion of at least one end of each of said feed rollers and being in axial alignment therewith, and means for selectively retaining said disconnectable segment rollers in a non-rotatable position when said disconnectable segment rollers are in a disconnected position with respect to said feed rollers.

10. In pile fabric tufting apparatus having a throat plate, means for feeding backing fabric across said throat plate, a plurality of oscillating needles for penetrating the fabric as it is fed over the throat plate, and a plurality of pairs of rollers for feeding pile yarn to said needles, the improvement of at least one disconnectable segment roller forming the terminal portion of at least one end of each of said feed rollers and being in axial alignment therewith, an electromagnet positioned in each of said segment rollers adjacent one end thereof, means for energizing and de-energizing said magnet, an armature in the end of each feed roller associated with its corresponding segment roller, and electrical connections from the coil through the segment rollers.

11. In pile fabric tufting apparatus having a throat plate, means for feeding backing fabric across said throat

plate, a plurality of oscillating needles for penetrating the fabric as it is fed over the throat plate, and a plurality of pairs of rollers for feeding pile yarn to said needles, the improvement of at least one disconnectable segment roller forming the terminal portion of at least one end of each of said feed rollers and being in axial alignment therewith, at least one slidable key member between each of said feed rollers and its associated disconnectable segment roller, a coil for axially sliding said key member into engagement to drivingly disconnect the roller and its associated disconnectable segment roller, a second coil for axially sliding the key member to disconnect the segment roller from its associated roller, and

retaining means for the key member to hold it in either engaged or disengaged position.

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