United States Patent [19]

Bylund

[11] **3,840,413**

[45] **Oct. 8, 1974**

[54] **METHOD OF MANUFACTURING A CUT PILE FABRIC**

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[22] Filed: **Jan. 27, 1972**

[21] Appl. No.: **221,301**

[52] **U.S. Cl.**..... **156/72,** 156/265, 156/298

[51] **Int. Cl.**.... **B32b 31/00,** B32b 5/02, D05c 17/02

[58] **Field of Search** 156/298, 72, 265, 256, 156/303, 63, 242, 246

[56] **References Cited**

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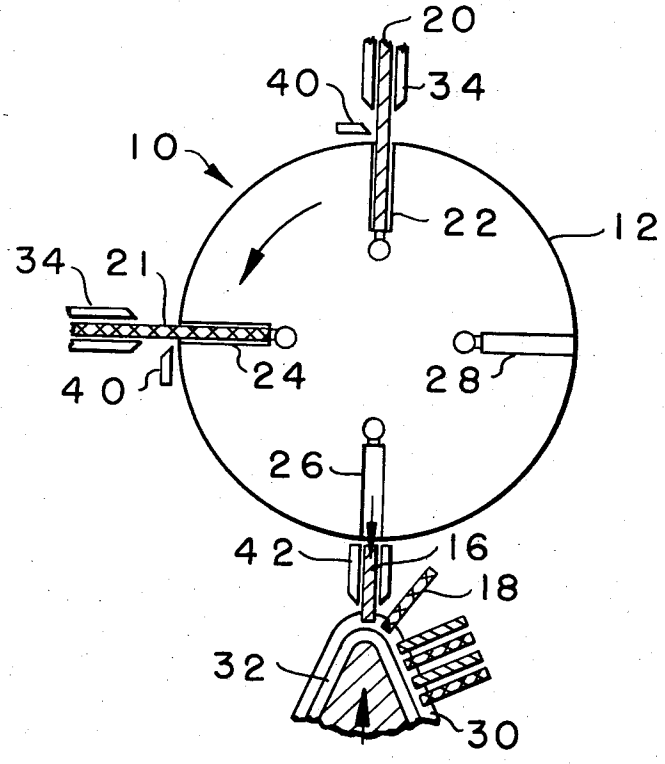
Assistant Examiner—Thomas E. Bokan
Attorney, Agent, or Firm—Earle R. Marden; H. William Petry

[57] **ABSTRACT**

A machine and process with colored yarn patterning capability to produce a bonded, cut pile carpet. A series of hollow needle bars are used to supply yarn to a rotary carrier which carries the individual cut fibers into a position where they are selectively ejected into the surface of an adhesive material.

2 Claims, 17 Drawing Figures



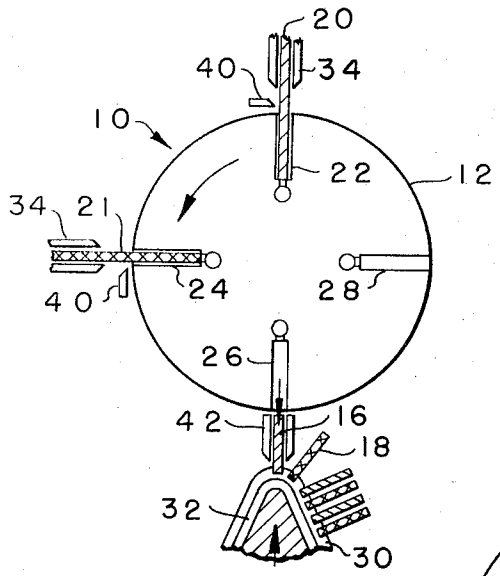


FIG. -1-

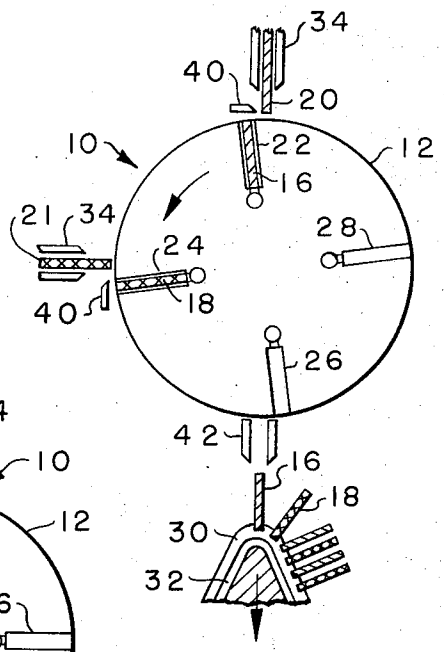


FIG. -2-

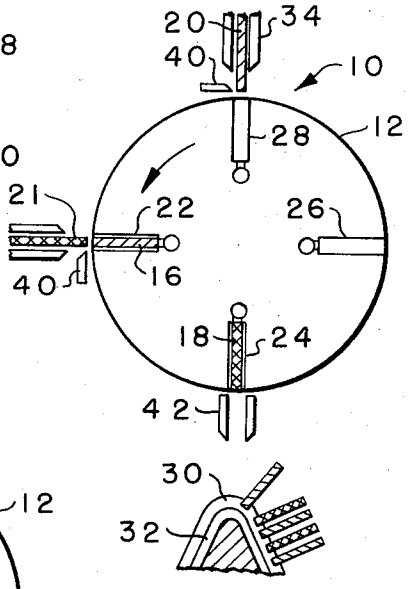


FIG. -3-

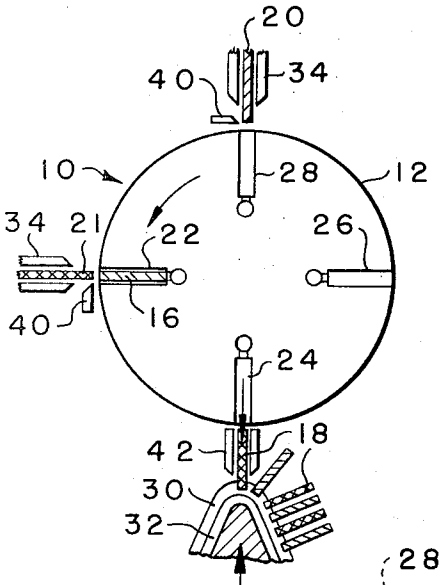


FIG. -4-

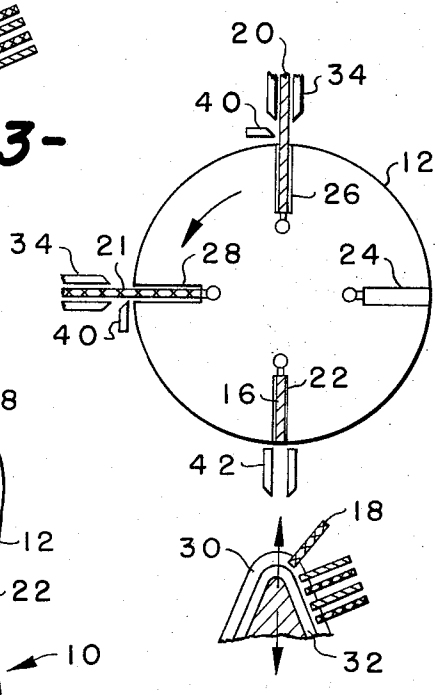


FIG. -5-

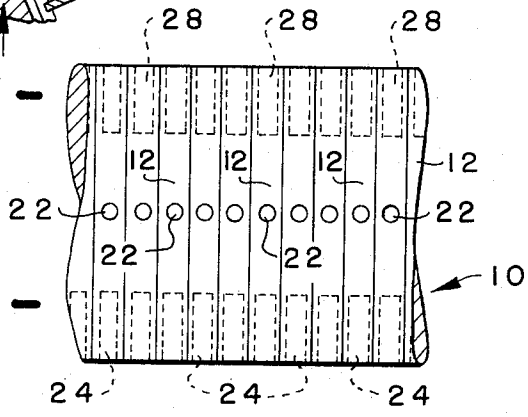


FIG. -6-

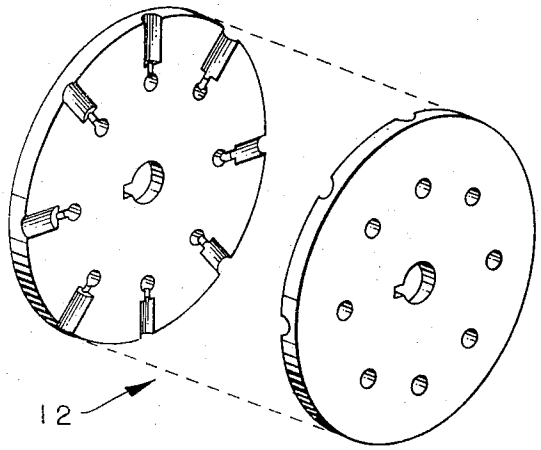


FIG.-7-

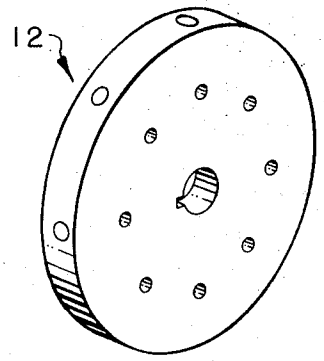


FIG.-8-

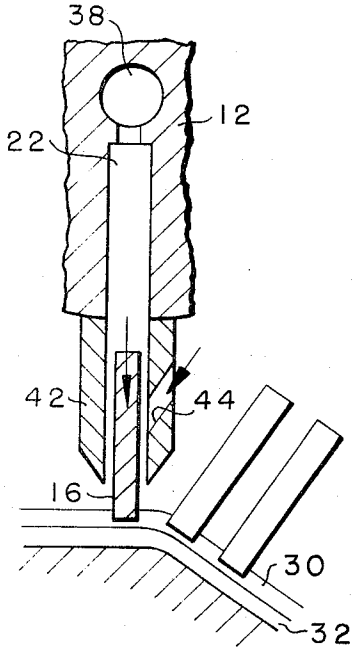


FIG.-9-

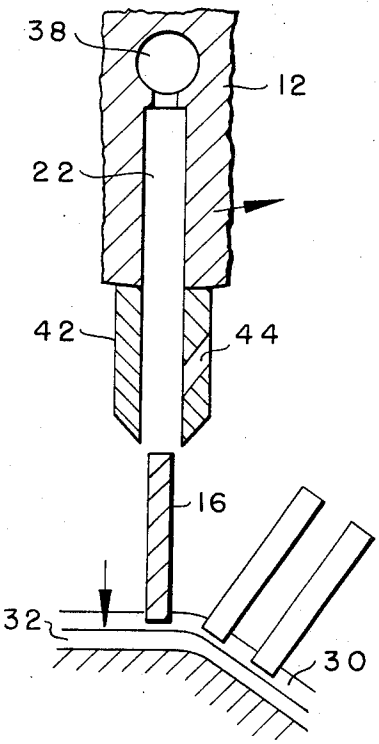


FIG.-10-

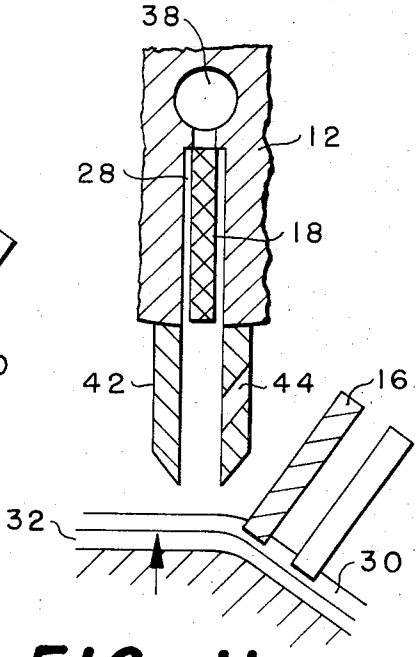


FIG.-11-

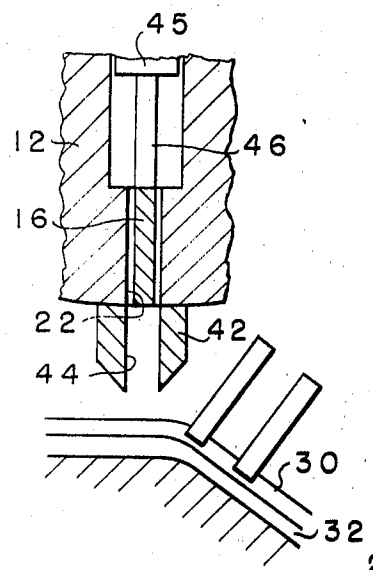


FIG.-12-

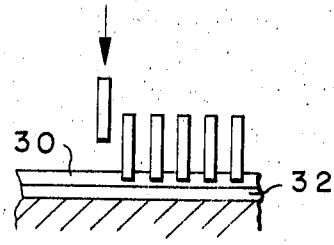


FIG.-14-

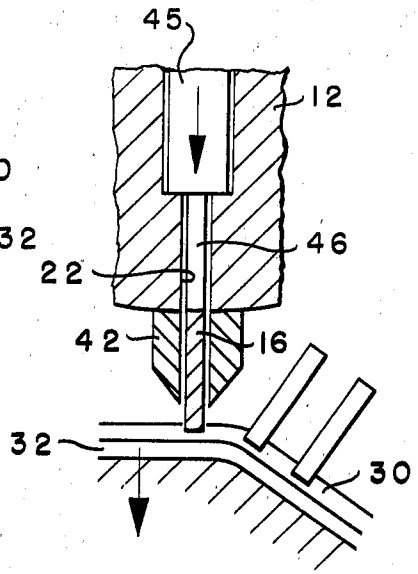


FIG.-13-

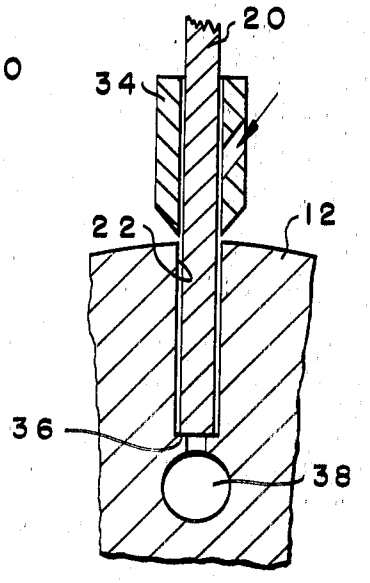


FIG.-17-

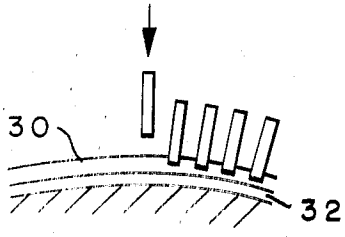


FIG.-15-

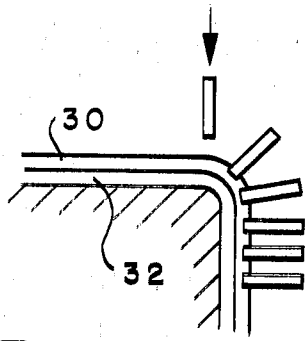


FIG.-16-

METHOD OF MANUFACTURING A CUT PILE FABRIC

Prior to this invention the carpet industry has attempted to develop a relatively simple machine to produce a bonded, cut pile carpet which has the appearance of an Axminster carpet.

Therefore, it is an object of this invention to produce a bonded, cut pile carpet by a machine and process which has colored yarn patterning capability.

Other objects and advantages of the invention will become clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings, in which:

FIGS. **1–5** represent schematically the basic concept of the invention;

FIG. **6** is a partial view of the yarn collector and distributor cylinder;

FIGS. **7** and **8** are schematic representations of two forms of the individual discs used in the yarn collector and distributor cylinder;

FIGS. **9–11** are blown-up views of the yarn collector and distributor cylinder to show the yarn ejection cycle;

FIGS. **12** and **13** show an alternative method of ejecting the yarn into the adhesive surface;

FIGS. **14–16** show various forms of the adhesive surface and;

FIG. **17** illustrates one type of yarn feed device.

Looking now to FIGS. **1–6,** the basic concepts of the invention will be explained. The yarn collector and distributor cylinder **10** consists of a plurality of discs **12** which have a plurality of radial openings therein to accommodate bits of yarn **16** and **18** cut off from the respective yarn supplies **20** and **21.** For the sake of illustration four radial holes **22, 24, 26** and **28** are shown in each of the discs **12.** The discs are secured together in any suitable manner to provide an elongated right circular cylinder which is mounted on a horizontal axis to supply bits of yarn **16** and **18** in a substantially perpendicular direction into the adhesive surface **30.**

The adhesive surface **30** can be applied to a backing material or, depending on the adhesive, can be applied directly to the conveying surface **32.** The particular adhesive could be liquid at the point of yarn insertion requiring heat or time to become a permanent bonding vehicle or could be a hot melt requiring only cooling. The adhesive surface **30** can be planar at the point of yarn insertion as shown in FIGS. **14** and **16** or can be curved at the point of insertion as shown in FIGS. **1–6** and **15.**

Looking at FIG. **17** a typical yarn feed is illustrated in that air is aspirated into the needle **34** to suck the yarn **20** into the radial opening **22** until it bottoms on the bottom **36** of the opening. If desired, the passage **38** can be vented to atmosphere to allow the yarn to be more readily fed into the opening **22.** In the desired form of the invention the length of the yarn **20** to be cut is determined by the depth of the opening **22** but other devices, such as a solenoid controlled stepping motor, can be used to deliver a desired length of yarn into the opening **22.** As shown in FIGS. **1–5** the yarn bits are cut from the yarn supplies **20** and **21** by a fixed knife blade **40,** or other suitable means such as a shear, band knife or sickle bar cutter, located adjacent the yarn supply so that it engages the yarn as the yarn distributor rotates to sever the bits from the yarn supply.

FIGS. **9–11** show the preferred yarn release and bit inserter device and FIGS. **12** and **13** show an alternative device. In FIGS. **9–11** when the cylinder **12** rotates to a position where one of the radial holes, such as **22,** is lined up with the hollow needle **42** and it is desired to insert the bit of yarn **16** into the adhesive layer **30,** the passage **38** is vented to atmosphere and air is aspirated into the needle **42** through opening **44** to insert the yarn bit **16** into the adhesive layer **30.** Then the conveying surface **32** is moved downward (FIG. **10**) so that the yarn bit **16** clears the bottom of the needle **42.** Then the conveying surface is moved downstream from the needle and upward for receipt of another row of yarn bits if the row of yarn is complete with the proper colors. At the same time the cylinder **12** has rotated counterclockwise to place another radial opening, such as **28,** into communication with the hollow needle **42.**

FIGS. **12** and **13** illustrate another type of yarn inserter which may be employed to implant yarn bits **16** into the adhesive layer **30.** The yarn inserter of FIGS. **12** and **13** is a mechanical type which uses a plunger **45** and plunger rod **46** to mechanically push the yarn bit **16** into the adhesive surface **30.** The plunger **46** can be actuated by any suitable means such as a cam, solenoid, etc.

It is understood that there are a series of yarn supply devices and yarn delivery devices lined up in a substantially parallel position to supply a multiplicity of yarn bits into the adhesive surface **30** at one time to produce a row of yarn bits.

FIGS. **1–5** represent schematically the operation of one disc of one cylinder **10.** For the sake of discussion, let us assume it is desired to provide a carpet with a two color yarn effect. The control of the yarn into and out of the radial opening, as well as the rotation of the cylinder **10,** is automatic and preselected to provide the desired effect in the finished product. If N represents the number of yarn colors required, the discs **12** will have $2N$ openings therein as indicated by the openings **22, 24, 26** and **28** since a two color yarn effect is desired. The number of openings in the disc **12** for any N is such that there will be N openings in a position to be fed yarn, $N-1$ openings empty or idle and one opening in a position to release yarn into the adhesive layer. The control is so selected that only one color yarn is released at any one time so each indexing rotation of the cylinder **10** is π/N radians. Thus the maximum number of indexes necessary for a given yarn color to become available at the release station at a given place in the pattern also will be N. To express it another way, if it is desired that all colors are to be placed in a single row in the adhesive the cylinder **10** will be rotated or indexed N times before the backing **32** is moved to make another row in the carpet.

As shown in FIGS. **1–5,** one color yarn is supplied only to openings **22** and **26** while the other color yarn is supplied to openings **24** and **28.** Looking now to FIG. **1** and assuming that the controls are programmed to do so, one color yarn **20** is being supplied to opening **22** while another color yarn **21** is being supplied to the opening **24.** At the same time, yarn bit **16** which has been cut from the yarn supply **20** is being released into the adhesive layer **30.** Then, as shown in FIG. **2,** the conveying surface **32** is moved downward so that the yarn bit **16** clears the needle **42** and the cylinder **10** starts to rotate to the position shown in FIG. **3.** As the

cylinder **10** rotates, yarn bits **16** and **18** will be severed from their respective yarn supplies **20** and **21** by the knives **40** appropriately located in the path of travel of the cylinder **10.** Then the cylinder **10** reaches the position shown in FIGS. **3** and **4.** When the cylinder reaches the position shown in FIG. **3,** the conveying surface **32** is moved upward so that the yarn bit **18** can be released into the adhesive surface **30** as shown in FIG. **4.** Since yarn bit **16** is located in opening **22** no yarn is supplied from yarn supply **21** and no yarn is supplied from yarn supply **20** into the opening **28.** Then, as shown in FIG. **5,** the conveying surface **32** is moved downward, indexed one space to receive another row of yarn bits and moved back up into yarn receiving position. At the same time, yarn supply **20** is supplying yarn into opening **26** and yarn supply **21** is supplying yarn into opening **28.** Then the procedure is repeated to provide another row of yarn bits.

In the above-described type of system a complicated array of actuating devices is necessary for each disc **12** since each disc has to have actuation at each of $N+1$ stations since there is selective release of only one color yarn at the release station, thereby requiring a number of actuation devices equal to $(N+1) \times$ number of discs **12** for the cylinder **10.** The schematic representation of FIG. **18** reduces this number to ($N \times$ number of discs $12+1$) since all the bottom holes release yarn on each index of the discs, thereby requiring only one release mechanism for all the discs in the cylinder **10.** Also the number of indexes of cylinder per row of yarn is reduced to one index per row.

As described, the herein-disclosed invention provides apparatus and methods which can be computer controlled for manufacturing bonded, cut pile carpets with colored yarn patterning capability.

Although I have described in detail the preferred embodiments of my invention, I contemplate that many changes may be made without departing from the scope or spirit of my invention and I desire to be limited only by the claims.

That which is claimed is:

1. A method of manufacturing a cut, pile fabric comprising the steps of: providing a supply of yarn having a first color, providing a supply of yarn of a second color at an angle to the supply of yarn having a first color, inserting yarn of said first color and said second color into a rotably mounted member, severing the inserted yarn from said yarn supplies, providing an adhesive adjacent said rotably mounted member, rotating said rotably mounted member and inserting said severed first color yarns into said adhesive at a predetermined time.

2. The method of claim **1** wherein one of said yarns is inserted in said adhesive and said rotating member is indexed to insert the second yarn into the adhesive.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,840,413 Dated October 8, 1974

Inventor(s) Don M. Bylund

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 25, after "10", delete "The schematic representation of".

Column 3, delete lines 26 through 28.

Column 4, delete lines 1 through 3.

Signed and Sealed this

Thirteenth Day of *December 1977*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

LUTRELLE F. PARKER
Acting Commissioner of Patents and Trademarks