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[54] **METHOD AND APPARATUS FOR TUFTING MULTICOLORED PRODUCTS**

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[58] **Field of Search** ..... 112/79 A, 262, 266; 242/131, 131.1; 28/55.5, 55.6, 56

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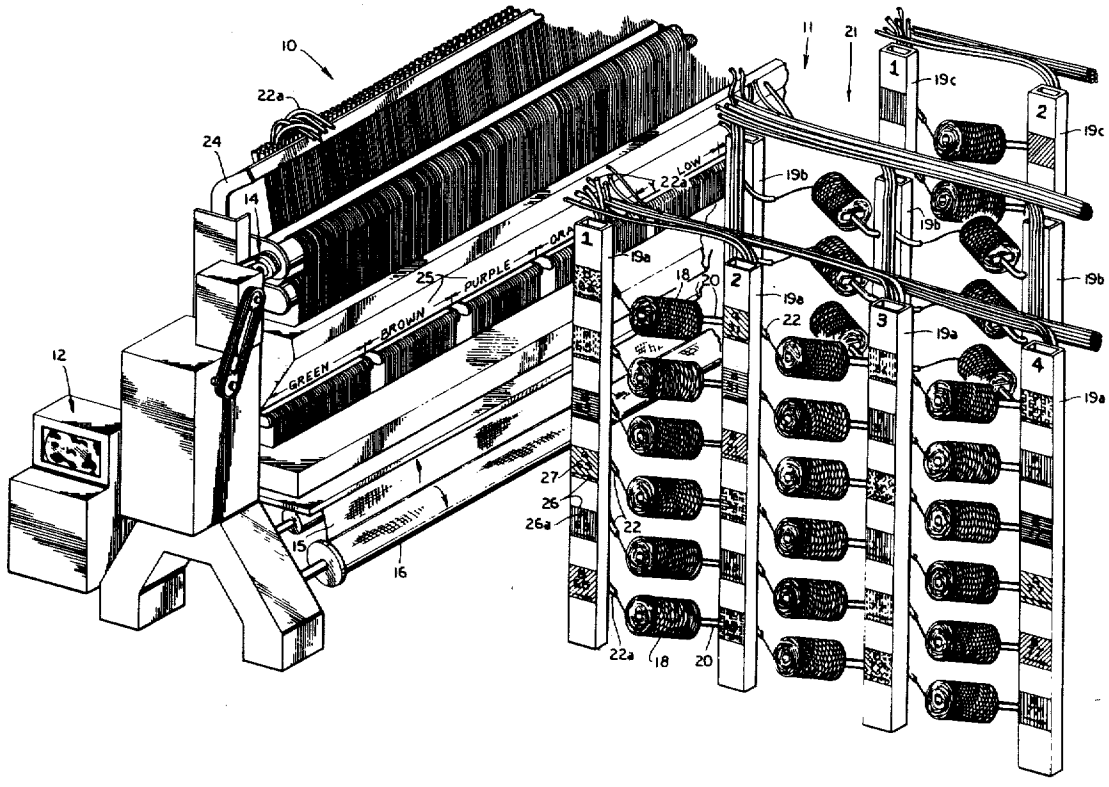
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[57] **ABSTRACT**

The creel of a carpet tufting machine is marked at each yarn spool support with a first indication which designates the section of needles of the tufting machine to which the yarn is fed and a second indication which designates the needle within the section to which the yarn is fed. The tufting machine is marked with an indication which designates the sections of needles within the machine. The yarn identity is transferred from a check paper carpet design to a creel guide sheet where the yarn spool supports in the creel are arranged in sequence, and the creel is supplied with yarn in accordance with the yarn identity from the creel guide sheet. When the yarn is fed from the creel to the tufting machine and the tufting machine is operated in a high-low loop pattern or in a high cut-low loop pattern, the carpet formed by the process will correspond to the check paper carpet design.

4 Claims, 3 Drawing Figures



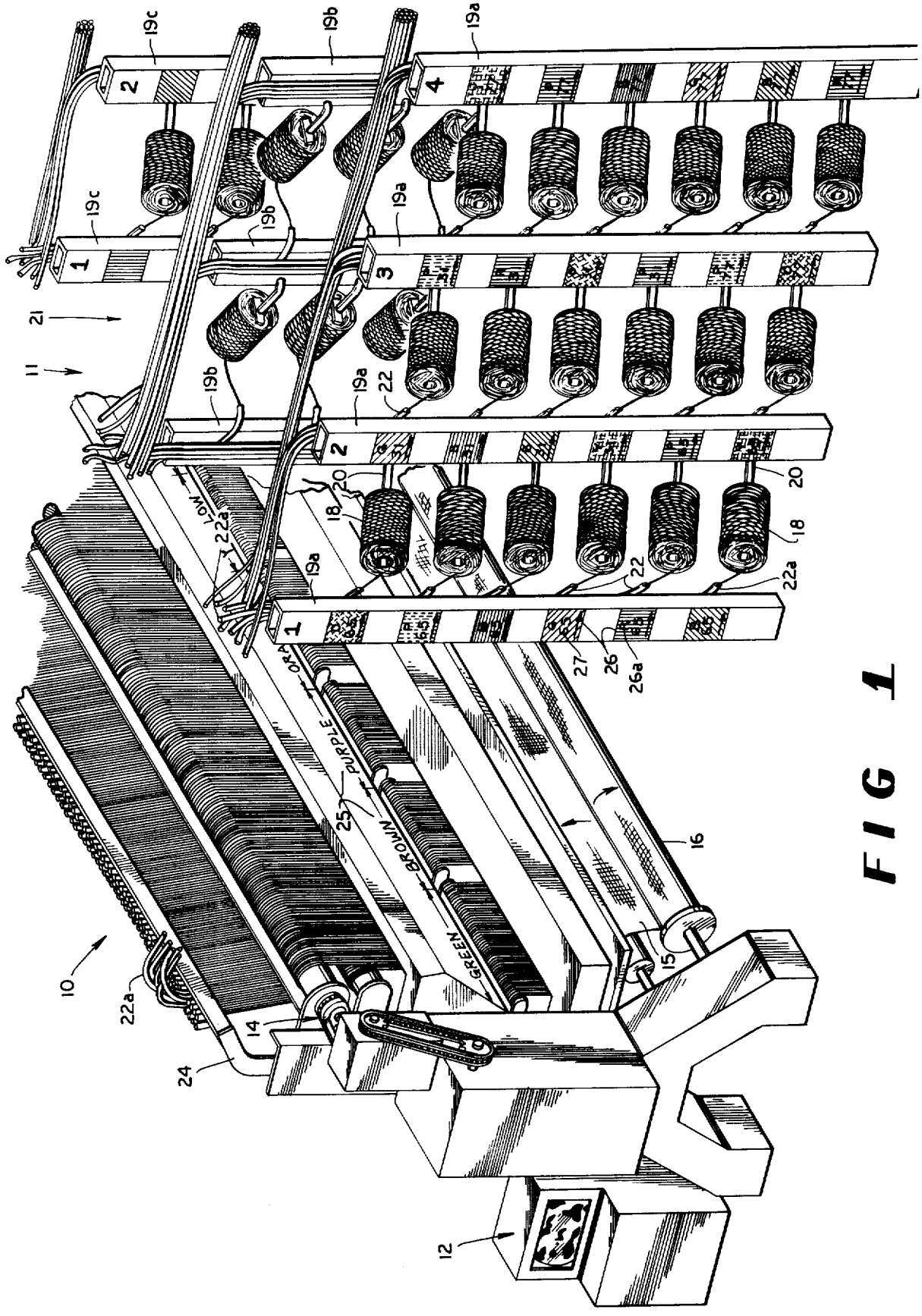
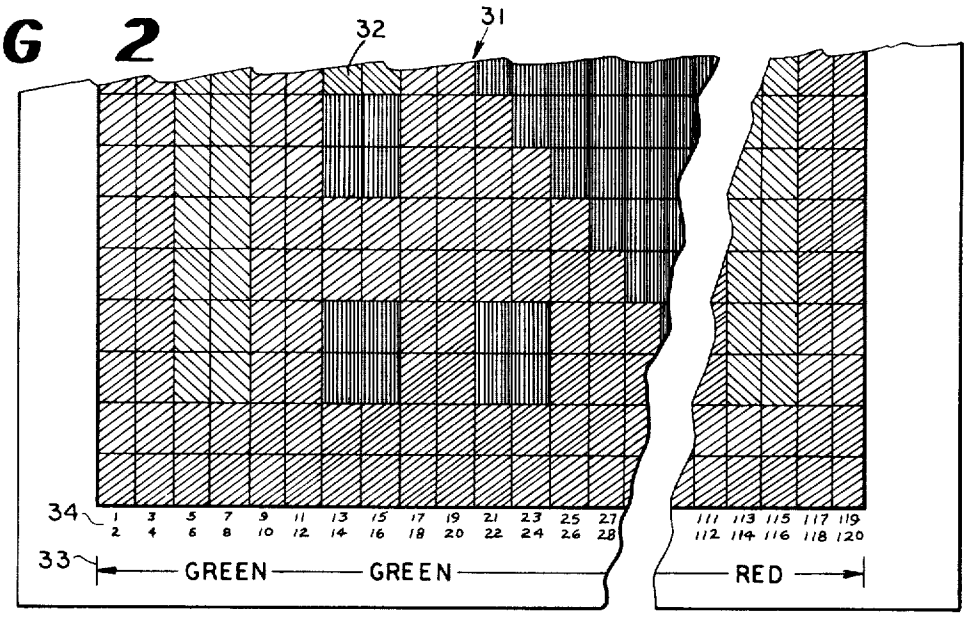

19c
19b
19a
2
4
1
3
21
11
22
20
18
22a
26
26a
27
ORANGE
PURPLE
BROWN
GREEN
25
16
15
14
24
10
12

FIG 1

FIG 2



36

COLOR SEQUENCE FOR LOOM #15
SECTION I - LOWER LEVEL

38	1.	65 - ORANGE	176	6.	59 - BROWN 176
		65 - PURPLE	176		59 - YELLOW 176
		65 - BLUE	176		59 - RED 176
39		65 - GREEN	19		59 - ORANGE 176
		65 - RED	19		59 - PINK 176
		65 - BROWN	19		59 - BLUE 176
					59 - GREEN 176
38	2.	31 - GREEN	19		
		31 - BLUE	176	7.	24 - BROWN 17
		31 - BROWN	19		67 - PINK 20
		31 - YELLOW	19		67 - BLUE 20
		65 - PINK	19		67 - GREEN 20
		65 - YELLOW	19		67 - ORANGE 20
	3.	31 - PURPLE	176	8.	7 - PURPLE
		31 - RED	19		67 - BROWN 20
		31 - ORANGE	19		67 - RED 20
		31 - PINK	19		67 - YELLOW 20
		77 - PURPLE	176		67 - PURPLE 20
		77 - ORANGE	176		
				9.	36 - ORANGE 17
	4.	77 - YELLOW	20		7 - RED
		77 - PINK	20		7 - ORA
		77 - BLUE	20		
		77 - GREEN			

40

FIG 3

METHOD AND APPARATUS FOR TUFTING MULTICOLORED PRODUCTS

BACKGROUND OF THE INVENTION

In forming tufted products, such as carpet, the color and pile height of the tufts of yarn in the product can be varied to create sculptured and varying colored surfaces in the product. Usually, color variations in a tufted product are formed by threading alternate needles of the tufting machine with different colors and by forming high treads or tufts with the yarns of the color that are to be exposed at the surface of the product and low threads with the yarns that are to be hidden, and then forming large exposed threads with the yarns which formed the previously lower hidden threads and lower threads with the yarns which formed the previously high exposed threads to reverse the color arrangement at the surface of the product.

The creels of most tufting machines are arranged so that one section of a creel supplies yarns to alternate ones of the needles of the tufting machine while the other section of the creel supplies yarns to the intermediate needles. When a carpet having two colors is to be formed, one yarn color is supplied to one section of the creel and the other yarn color is supplied to the other section of the creel, and the color of the product formed by the tufting machine is varied by selectively forming high or low threads in the product with alternate ones of the needles of the tufting machine. With this process, a tufted product can be created with virtually any two color design, and the product could include sections of either one of the two colors and sections with both colors. In addition, the high-low thread control of the tufting machine can form a sculptured surface, and by cutting the thread loops, a cut pile product can be formed.

While tufting machines are relatively versatile in that a multitude of tufted designs for carpets and other products can be achieved with most machines, substantial difficulty is encountered when more than two colors of yarn are to be formed in the tufted product and the colors of the product vary across the width of the product. It is difficult to supply selected ones of the yarn spool supports in the creel with spools having particular colors of yarns. The person supplying the spools of yarn to the creel must select the proper yarn and then find the exact spool support in the creel and place the spool on the spool support within the creel. Since a typical carpet tufting machine which forms a 15 foot wide carpet may have 1,200 needles, and since the creel usually has twice as many spool supports in order to support a spool for each needle and a standby spool for supplying yarn when the yarn is exhausted from the first spool, the process of supplying yarn to a creel for a tufting machine in order to make various multicolored tufted products is time consuming and onerous.

SUMMARY OF THE INVENTION

Briefly described, the present invention comprises a system for forming tufted products with multiple colors and designs in the products, wherein the creel of a tufting machine can be rapidly and expediently supplied with yarns of the proper color to form the product. The needles of the tufting machine are identified in sections of equal numbers of needles by a color designation, with the color designation of each section being different from all of the other color designations of the other

sections, and the yarn spool supports within the creel are identified with corresponding colors and with needle numbers to designate the section and the needle within the section of the tufting machine to which the yarn ends are to be fed. A creel guide sheet is provided which displays the spool supports in sequence within the creel and the color and number identification for the carpet is transferred from a check paper design to the creel guide sheet, and yarn spools are supplied to the creel in accordance with the creel guide.

Thus, it is an object of the present invention to provide a method and apparatus for expediently supplying a creel for a tufting machine with yarns of proper identification in order to enable the tufting machine to form a tufted product with multiple colors and designs.

Another object of this invention is to provide a system for expediently supplying the proper yarns to a creel of a tufting machine so that the tufting machine can form a tufted product, such as a tufted carpet, that has multiple colors in the carpet design.

Another object of this invention is to provide an inexpensive tufted product which has a plurality of colors in its design.

Other objects, features and advantages of the present invention will become apparent upon reading the following specification, when taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a partial perspective illustration of a tufting machine, its creel, and a pattern control attachment.

FIG. **2** is a partial illustration of a carpet check paper design.

FIG. **3** is a partial illustration of a creel guide sheet.

DESCRIPTION OF AN EMBODIMENT

Referring now in more detail to the drawing, FIG. **1** illustrates a tufting machine **10**, the tufting machine creel **11**, and a pattern control attachment **12** for the tufting machine. The tufting machine **10** is of conventional design and includes a clutch system **14** for controlling the yarn fed to the needles of the machine and a plurality of tufting needles (not shown) which are arranged in a row of needles across the tufting machine. A sheet **15** of backing material is fed from a supply **16** beneath the tufting needles, and the tufting needles are reciprocated to penetrate the moving sheet of backing material as the yarns are fed to the needles in the conventional manner to form a tufted product. A scroll pattern attachment or other similar pattern control device **12** is connected to tufting machine **10** and functions to control the amplitude of reciprocation of each tufting needle and the movements of associated elements in the tufting machine to form high and low tufts in the tufted product. The tufting machine and the pattern attachment are of conventional construction and are available on the market from various tufting machine manufacturers. Typical tufting machine equipment of this type is available from Tuftco of Chattanooga, Tenn. and the Singer Co., also of Chattanooga, Tenn.

Creel **11** is supplied with a plurality of spools of yarn **18**. The creel comprises a framework for supporting the yarn spools **18**, including a plurality of spaced upright support bars **19** arranged in rows. Support bars **19***a* are arranged in a row while support bars **19***b* form an adjacent row. A plurality of yarn spools **18** are sup-

ported between rows **19***a* and **19***b* on bobbin support means **20.** Isles **21** are formed throughout the creel between adjacent banks of spools. For example, an isle **21** is positioned between the rows of upright support bars **19***b* and **19***c*, and the workers that supply the creel with spools of yarn therefore have access in the aisles to each of the bobbin support means **20.**

A yarn transfer tube **22** extends from each spool support means in the creel to the tufting machine **10.** Each yarn transfer tube has one of its open ends located at the position of a yarn spool in the creel, and the tube then extends upwardly in the creel to a height that normally allows free passage of workers in the creel, then each tube turns toward the tufting machine **10.** For example, yarn transfer tube **22***a* has its yarn inlet opening positioned adjacent the lowest yarn spool **18** between the first and second upright support bars **19***a*, and the tube then extends upwardly adjacent its support bar to an elevation above the height of a normal worker, and then turns toward tufting machine **10.** Transfer tube **22***a* is then received in the tube clamp **24** at the upper portion of the tufting machine. The yarn end from tube **22***a* is then threaded down through clutch system **14** toward the proper needle in the tufting machine.

Needle section indicating means **25** are applied to the tufting machine. Each needle section indicating means comprises a method for identifying a section or group of needles in the row of tufting needles in the machine, and each indicating means is applied to an equal number of needles in the machine. For example, the needle section indicating means can comprise a color, and the color of each section will contrast with the colors of the other sections. In a typical 15-foot wide tufting machine, each section of needles will be 8¾ inches wide and include 120 needles. Of course, the sections can be of different widths, the numbers of needles in the section can vary, and the width of the tufting machine can vary. Moreover, while the colors in the drawing are written out, it will be understood that the colors can be painted directly on the machine, if desired. Moreover, the needle section indicating means can comprise other identifiable indicia, such as letters, numbers, etc. Each needle within a needle sectino is identifiable in sequence, counting from one end of a section toward the other end. The needle sequence can be readily marked with a number, or by merely counting from one end of the section of needles.

The spaced upright support bars **19** in creel **11** also have tufting needle section indicating means applied thereto at each spool support means. The section indicating means in the creel will correspond to the section indicating means applied to the tufting machine. For example, the first support bar is illustrated as having patches of paint **26** applied thereto at spaced vertical intervals which correspond to the spacing of the spool support means, so that a patch of paint **26** will be located at the position of each spool **18.** In addition, a number **27** is applied to the same location so that each spool **18** will have a color identification and a numerical identification. The color identification **26** will correspond to the colors applied to the tufting machine, and the number identification **27** will correspond to the needle position in a section of needles in the tufting machine. For example, the first upright support bar has patches of the colors orange, purple, blue, green, red and brown from top to bottom painted thereon at its spool positions and the number **65** applied to the patches of colors. These creel needle section and creel needle sequence indicating means show that yarn from the spools at these positions will be fed to the **65**th needles in each of the orange, purple blue, green, red and brown sections of tufting machine **10.** While in the embodiment illustrated the colors applied to the upright support bars in the creel are painted directly on the support bars, the drawing illustrates small letters to identify the colors.

When a carpet designer creates a carpet design, a check paper design **31** is created on a check paper or a graph-like paper that includes a matrix of squares which are to correspond with the rows of tufts formed by adjacent pairs of needles in a tufting machine. For example, the row **32** of rectangles corresponds to the stitches that will be formed along the length of a carpet by needles **13** and **14** in the green needle section of the tufting machine. If the colors to be tufted by needles **13** and **14** to form the row **32** are, for example, orange and white, one of the needles **13** or **14** in the green section of the turfting machine will be threaded with orange yarn while the other needle will be threaded with white yarn, and when orange is to appear in the design of the carpet, the needle having the orange yarn will form higher tufts than the needle having the white yarn, and when the colors are to be reversed and white is to appear in the carpet, the needles threaded with the white yarn will form higher tufts than the needle threaded with orange yarn. If both orange and white should appear in the row of tufts in the carpet represented by the row of rectangles **32,** then both needles will form tufts of equal heights. The carpet designer creates a colored design on the check paper with crayons, ink or other means, and the needle section numbers and the needle numbers within each section can be identified on the check paper, by appropriate legends **33** and **34** extending across the design. The designer will know the identity of the yarn to be used in the carpet and can identify the yarn on the check paper.

A creel guide **36** is provided for use in conjunction with a check paper design. The creel guide may comprise several sheets of paper which identify the particular loom or tufting machine and a particular section of the creel used to supply yarn to the tufting machine. Each creel guide sheet displays each spool support means in sequence, by displaying the number or position **38** of the upright support bars in the creel, and then at **39** the positions from top to bottom of the spool support means adjacent the upright. For example, it can be observed that the creel guide sheet **36** lists upright number **1** first and then the number and color designations at upright number **1,** which correspond to the appropriate needle section and needle number within each section of the tufting machine. The yarn identification is to be entered on creel guide sheet in a column **40** adjacent the color and numerical designation of the tufting machine needles. The designer enters the yarn designation in the column **40,** either by hand or possibly by a computer. The yarn designation may be a number, a letter, or a combination of numbers, letters and other identifying indicia.

When the creel guide sheets **36** have been completed by the carpet designer, the guide sheets are given to the workers that supply the spools of yarn to the creel. Since the creel guide sheet is organized so that the spool support means appear in sequence, the worker collects spools which have the proper yarn wound on

them and fills the spool support means in sequence throughout the creel. The yarn ends are taken from the spools and run through the yarn transfer tubes **22** for each spool with a blast of air, and when the yarn ends have reached the tufting machine, a worker threads the yarn through the clutch system **14** and other components of the tufting machine to the appropriate needles.

While creel **11** has been illustrated as having one yarn spool at each position adjacent a color and number designation in the creel, it will be understood that two yarn spool support means are provided at each position so that the yarn can be taken from one spool and standby spool is supported adjacent the primary spool and is available to supply yarn to the system when the yarn has been exhausted from the primary spool.

While this invention has been described in detail with particular reference to preferred embodiments thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinbefore and as defined in the appended claims.

We claim:

1. In a process of creeling a tufting machine of the type used to form high and low tuft carpet with color variations wherein a tufting machine needle section indication and a needle number indication is present adjacent each spool support means in the creel to designate the needle section and needle number of the tufting machine to which the yarn is moved from the spool supported by each spool support means, creating a check paper design with the colors to be present in the carpet indicated in the check paper design and with the check paper design including tufting machine needle section indications and needle number indications across the length of the design, transferring the color identification indications for each needle position of each needle section from the check paper design to a creel guide sheet having the spool support means of the creel indicated sequentially on the creel guide sheet and with a tufting machine needle section indication and a needle number indication associated with each spool support means indication, placing spools of yarn in the creel with the yarn of each spool corresponding to the yarn designation of the creel guide sheet, and moving the yarn ends from the spools in the creel to the tufting machine.

2. In a process of providing yarns to a continuous carpet tufting machine or the like wherein a carpet design is formed on check paper or the like with yarn identification and tufting machine needle identication shown on the check paper for the stitches that will be formed by the tufting machine in the carpet, the improvement comprising the steps of forming a creel guide with the spool supports in the creel displayed in sequence on the creel guide and with each of the spool supports displayed in the creel guide identified with an indication corresponding to the identification of a needle in the tufting machine to which the spool support supplies yarn and the yarn identification from the check paper entered at each spool support identification, placing spools of yarn in the creel at spool supports identified with an indication which corresponds to the spool support identification on the creel guide with the yarn placed at each spool support corresponding to the yarn identification on the creel guide, and extending the free end of the yarn from the spool at each spool support to a position at the tufting machine identified with an indication corresponding to a needle position in the tufting machine and to the identification of the spool support in the creel.

3. In a process of tufting carpet or the like which includes forming a carpet design on check paper or the like with yarn identification indicated for each needle in the tufting machine, the improvement comprising the steps of transferring the yarn identification from the check paper design to a creel guide which has the spool supports of the creel indicated in sequence and with the yarn identification entered at each spool support identification of the creel guide, placing spools of yarn on the spool supports in the creel which include an identification corresponding to the identification of a creel position in the creel guide with the yarn placed at each spool support corresponding to the yarn identification on the creel guide, feeding the free end of the yarn end from each spool to a position at the tufting machine that includes a needle identification which corresponds to the identification at the spool support in the creel, and threading the yarn ends through the needles of the tufting machine.

4. A product formed by the process of claim **1**.

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