

June 6, 1961

C. C. BERRY

2,986,867

METHOD OF IMPARTING DUAL TWIST TO YARN

Original Filed Nov. 3, 1955

3 Sheets-Sheet 1

Fig. 1.

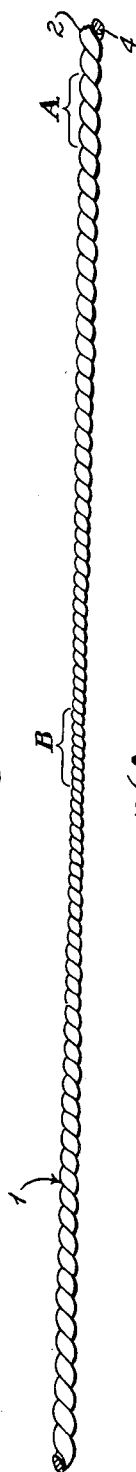


Fig. 2.

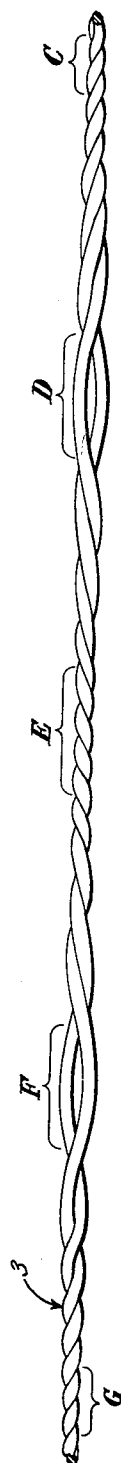


Fig. 3.

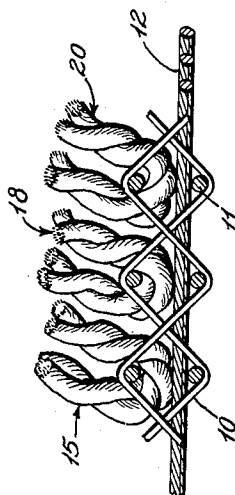
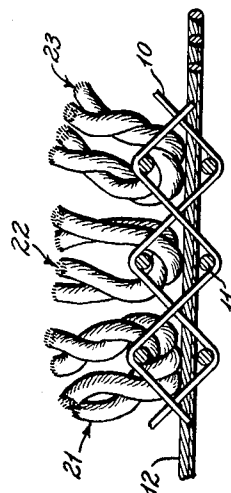


Fig. 4.



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Fig. 5.



Fig. 6.



Fig. 7.

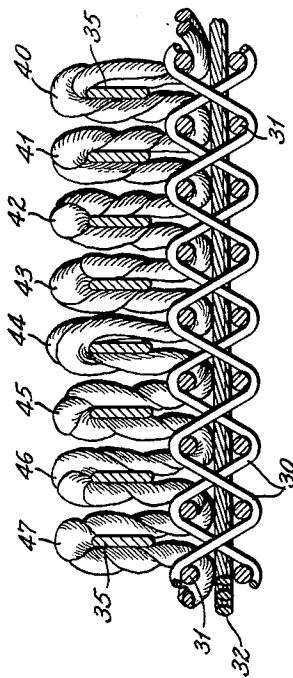
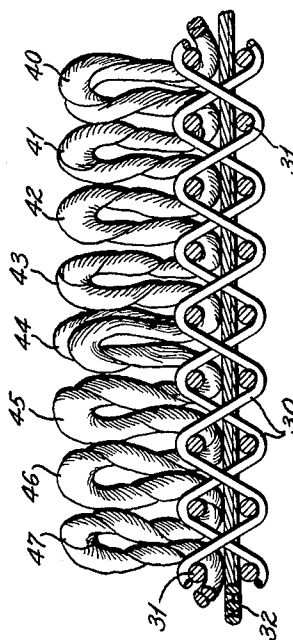


Fig. 8.



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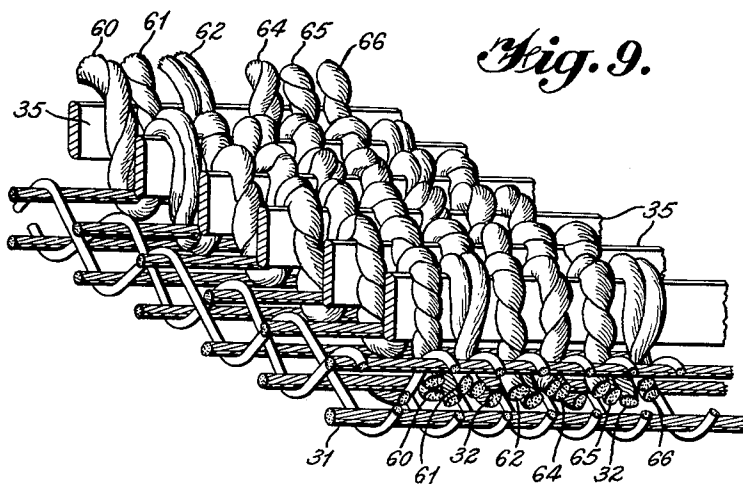
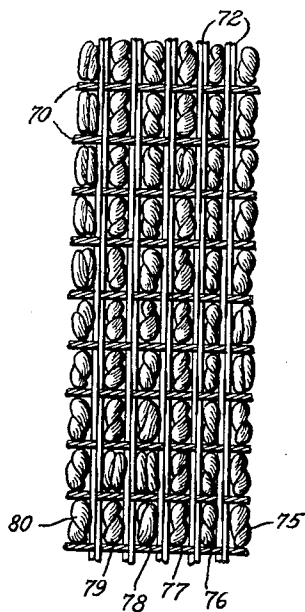


Fig. 10.



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METHOD OF IMPARTING DUAL TWIST TO YARN

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Original application Nov. 3, 1955, Ser. No. 544,764, now Patent No. 2,961,010, dated Nov. 22, 1960. Divided and this application Apr. 30, 1957, Ser. No. 656,050 3 Claims. (Cl. 57—156)

This invention relates to a new type of yarn for use in fabrics generally and more particularly to improvements in plied yarns especially adapted for use in carpeting, a primary and important feature of which is an intermittent, or spaced, back twisting of the yarn resulting in a more uniform, nonstreaked and random pile, whether or not the individual tufts of same are cut or uncut.

This application is a division of copending application Serial No. 544,764, filed November 3, 1955, now U.S. Patent No. 2,961,010.

As will be appreciated by those skilled in the art, there have been several basic and long-standing problems confronting the fabric industry, particularly with respect to carpeting, and which are directly caused by the method of manufacture. Here, reference is made to the conventional manner of twisting singles yarns as well as the plied yarns which are ultimately woven into heavy fabrics such as these. In the carpet industry, the major difficulties are resultant upon the tendency of either patterned or conventional cut pile velvet carpets to scuff upon disturbance of the pile in any direction other than the direction in which it normally tends to lie; furthermore, the natural tendency of the pile of such a fabric to be inclined in a given direction as the result of these known and conventional methods of manufacture creates the additional difficulty of matching carpeting when it is cut for placement in a given area; and, finally, and particularly with respect to what are known as "moresque" types of carpeting, the conventional methods of formation of pile carpeting often leads to production of a product which is inclined to "streak" or to form lines thereby detracting from the primary objective of this type of rug.

The underlying cause for this often observed behavior of carpeting of many types is found in the following set of conditions, generally indicated in the foregoing, and which commonly exist in ordinary and known methods of fabrication of not only the singles yarn which go into the making of the pile yarns, but also in the manner of twisting the pile yarns themselves. Ordinarily, both the singles and the plied yarns is twisted in a certain direction, i.e., all of the ply in a given fabric would be of a right-hand or a left-hand twist. In the vernacular of the industry, it could be either a so-called S twist or a Z twist, the former applying to a singles or a ply which is twisted from left to right and the latter, to a singles or a ply which is twisted a predetermined number of turns from the right to the left.

This unidirectional twisting of, for example, both the singles as well as the ply, has a direct effect upon the ultimate pile. Such causes the pile warp yarns, whether cut or uncut, to tend to turn, after weaving of the fabric, in a direction counter to the direction of the original twist. At least it may be said than when regular yarns are woven into carpet, the pile loops or tufts have a tendency to assume positions in somewhat parallel alignment and the resultant fabric has a definite or pronounced directional effect with quite often, consequent detrimental streaks. This tendency to lie in approximately parallel alignment is true of each individual plied yarn as well

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as of each individual singles in the fabric. In both cases, the tendency to twist in approximately the same direction will be exerted throughout the entire carpeting since, as has been stated, it may be assumed that the yarns which are commonly woven into the ultimate fabric have all been twisted in the same manner—either with a Z or an S ply twist.

With respect to the specific example of scuffing of a fabric, such as carpeting, it is to be appreciated that this unidirectional twisting of all of the plies thereof necessarily causes light reflection to a noticeable extent in a given direction. Such light reflection comes from the tendency of the tufts of the several pile warp yarns to lay in the same direction. If the tufts are disturbed through wear, or otherwise, so as to be positioned temporarily in a direction opposite to that to which they naturally tend to rest, then this is immediately noticeable by reflection of light in a different direction, making it appear that the carpeting is of one shade at the disturbed portion and another shade at the undisturbed portion thereof.

In addition to this inherent problem of scuffing incidental to methods used heretofore in making the ordinary type of carpeting, there is an additional problem residing in the fabrication of what is referred to in the trade as moresque carpeting. Here, the aim of the manufacturer is to produce a rug which is completely heterogeneous in its color characteristics. Such rugs are desirable for various reasons other than the mere artistic effect which they are intended to produce. Thus, if a rug or carpet is truly heterogeneous, it can be cut at any place and fitted with an adjacent cut piece of rug without fear of destroying the desired effect, providing however, that the surface of the fabric wherein there are no uniform streaks or patterned lines running through the pile. But, even if other precautions be taken to avoid streaking, the latter will occur in a substantial number of cases due to this same factor—unidirectional twisting of the singles and/or plied warp pile yarns uniformly throughout the carpeting. Here, again, if the warp pile yarns tend to lie in a certain direction as a result of unidirectional pretwisting of the yarns, then, even with respect to the so-called heterogeneous type of fabric, when the same is cut as necessary to fit in wall-to-wall fashion in a given space, adjacent pieces must be matched in the sense that the pile of such adjacent pieces must run or lie in the same direction. Otherwise, a noticeable contrast will be presented to the eye even though we are here dealing with what is designed to be a truly heterogeneous, unpatterned, multi-colored form of carpeting. Similarly, such uniformity in twist will tend to match-up adjacent pieces of pile warp yarns to form undesirable streaks or lines—a result antithetical to the purposes of so-called heterogeneous fabrics.

The instant invention obviates the substantial difficulties now existent in commercial fabric manufacture by two basic and fundamental procedures in the fabrication of a given weave. These two steps are as follows: firstly, the plied yarn that is to be used is initially twisted with either a Z or an S twist in a variable manner, i.e., a variable twist cycle is imparted to the ply which ranges from low to high twist or, stated in other words, one section of the ply will be twisted with a high number of turns, the adjacent section with a low number of turns and the succeeding high and low sections matching the number of turns respectively of the first cycle; and, secondly, such a plied yarn is then back twisted a predetermined number of turns which, generally speaking, is an amount greater than the low twist in the variable ply and smaller than the high twist of the variable ply. The result of this back twisting is to retain a certain number of turns in the same

direction of the high twist cycle, but to reverse the direction of twist of the ply at the low twist portions thereof. The plied yarn which is then to be used consists of three variable degrees of twist, for example, a Z twist, an S twist and a portion in between these two opposite twists of little or no twist.

As a consequence of this manner of preparing the yarn, the resulting pile, whether cut or uncut, of the woven fabric, whether it be carpeting or any of the other, known, lighter fabrics, will have a truly heterogeneous quality with respect to the direction of the pile lay; individual and adjacent tufts of such pile will all be differently disposed with respect to the vertical for certain of the tufts will be back twisted, certain of them will have a twist in the direction of the original variable turns, and others will have practically a zero twist and will tend to be positioned approximately vertically or upwardly without substantial lateral deflection.

It is also to be appreciated that this invention contemplates not only the variable twisting of certain plies and the back twisting thereof, but also use of the same procedure with respect to the singles which go into the making of each warp pile yarn. To obtain the most ideal heterogeneous quality in a given rug, it may be preferred to either have a ply made up of singles which are oppositely twisted or to employ a ply, the singles of which are variably twisted in opposite directions and then also back twisted. Back twisting, of course, would be more applicable to singles yarns of the continuous filament type or of relatively long staple fiber length. This is because if the individual filaments thereof are relatively short in length, back twisting of a singles yarn would render it unduly weak at the intermediate points of zero or of little twist. In any event, the possible combinations of the invention with respect to employing a variable twist yarn followed by back twisting thereof and including the concept of similar treatment of the singles yarn, are obviously most numerous and limited only by the skill and objectives of the operator in this industry.

From the foregoing, it may be concluded that a primary object of my invention is the provision of a plied yarn, for use particularly in the weaving of heavy fabrics such as carpeting, that is variably twisted and subsequently back twisted in such a fashion as to produce an ultimate weave that achieves near perfection with respect to the referred to heterogeneous quality. More particularly, this objective includes the concept of producing a yarn of two-ply or more where the ply twist varies from left-hand, open-hand or S to right-hand, cross-hand or Z twist, with a length of repeat of any distance.

It is a further object of the invention to produce a fabric which, by reason of the procedures outlined in the foregoing, eliminates possibility of regularity in the pile when the desired end product is purposely woven as an article of heterogeneous appearance, whereby the number of so-called "seconds" of carpeting of the moresque type containing streaking are subsequently reduced in number, if not entirely eliminated as a possibility.

Another object of the invention is the creation of a woven fabric which, because of the heterogeneous lie of the individual tufts, whether cut or uncut, eliminates the disadvantage of marking by scuffing or wear, facilitates application of such carpeting to a given floor space and consequently eliminates the pairing or matching of adjacent pieces of carpeting prior to securing them in place.

A further objective of the invention is the production of a fabric of the type hereinbefore generally described which can be made on conventional looms by the skilled worker in the art without alteration thereof and without expensive departure from commercial looming procedures already known in this art.

Another object of the invention is to produce a yarn that renders a different effect in cloth or fabric due to twist direction variations within itself and to produce a non-directional pile fabric using cut, round or serrated pile wires.

Finally, it is an object of the invention to provide a fabric, particularly a heavy fabric such as a carpet weave, which not only exhibits the desirable qualities referred to in the foregoing wherein a contrasting or heterogeneous effect is obtained, but also a carpeting which may include these qualities without impairment of the qualities of durability and wear found in typical rugs made by conventional methods.

Reference will now be made to the several drawings for a more particularized description of the invention. It is to be understood that these drawings must be considered as largely diagrammatic in nature. They are presented here, however, for illustrative purposes only and intended to express the preferred thinking as to the operative features of this invention.

In the drawings:

FIGURE 1 is a side view of a variably twisted plied yarn;

FIGURE 2 is a showing of the same variably twisted yarn as depicted in FIGURE 1 but illustrating its formation after back twisting thereof a predetermined number of turns;

FIGURE 3 is an elevation view, partially in section, illustrating the tendency of an ordinary and known type of pile containing three tufts, as here shown, to turn in the same direction as a result of the pretwisting of such plies prior to weaving of the fabric;

FIGURE 4 is a view similar to FIGURE 3 but indicating the behavior of the tufts of the pile warp yarns of this invention which individually, because of the method of pre-twisting thereof, turn in different directions with respect to each other;

FIGURE 5 is a representation of a variably twisted singles yarn, twisted with alternate high and low turns per inch throughout a definite cycle;

FIGURE 6 is an illustration of the yarn shown in FIGURE 5 but depicting the same after it has been back twisted a predetermined number of turns per inch;

FIGURE 7 is a warpwise view, partially in section, of a carpet weave containing the pile warp yarn of this invention with the pile wires in place;

FIGURE 8 is a view similar to FIGURE 7 but with the said pile wires withdrawn;

FIGURE 9 is a perspective view of the invention illustrating a number of pile warp yarns with the pile wires in place and showing also the effect of the back twisting of the yarn in the final product; and

FIGURE 10 is a top plan view of the yarn as it is shown in FIGURE 9, also illustrating the variations in direction of twist between the several uncut tufts herein illustrated.

In FIGURES 1 and 2 is found a representation of a two-ply yarn. In FIGURE 1 is shown a yarn which has been subjected to a variable twist or a twist which alternates from a high to a low number of turns, and consequently, also exhibits a variable diameter throughout its length. In FIGURE 2, this same yarn is shown as having been back twisted a predetermined number of turns so there are adjacent areas of said yarn in the order given; an area of high twist in one direction, an area of little or zero twist, followed by an adjacent area of twist which is the reverse of that of the first area. Again, it must be borne in mind that FIGURES 1 and 2, being largely diagrammatic in nature, are not drawn to scale and, hence, when reference is made to "turns per inch," or t.p.i., it is done for illustrative purposes only and with the object of fuller understanding of the invention.

Accordingly, in FIGURE 1, the variable twist yarn is generally indicated at 1. It is a two-ply yarn consisting of two singles yarns 2 and 4 and, as stated, it has been subjected to a twist which varies in degree from a low number of turns per inch to a high number of turns per inch. Thus, the two brackets A and B, respectively, designate the two extremes of this variation in the amount of twist.

For example, bracket A may be considered as designating

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a low twist area where the yarn is plied with three turns per inch and area B may be considered as an interval wherein the t.p.i. have increased to seven. In all of these alternate areas, the twist is, of course, in the same direction and, in the example herein illustrated and described, such twist is an S twist.

In this example, the yarn, by appropriate procedures well-known in the art, may now be back twisted a total of five t.p.i., or an amount which is greater than the number of turns of low twist, but less than the number of turns of high twist. In those areas of low twist where there are three t.p.i., this will result in a back twist of two t.p.i., or a Z twist of two turns, as indicated by the bracket C. Since the area in between A and B gradually and evenly increases in the number of turns from three to seven, there will be a space in that area where the number of turns per inch is five and when the yarn is back twisted in the amount indicated, this area will tend to have no twist at all as indicated by the bracket D. Further explanatory of the operation of back twisting in the areas of high twist or area B, since five turns of Z twist have been applied, this area will still retain as S twist of two t.p.i., as indicated by the bracket E of FIGURE 2. The area F is again an area of no twist and corresponds to that previous segment of the yarn that initially had an S twist of five t.p.i., and the area G is once again an area of Z twist or back twist of two t.p.i., corresponding to the area C, described above.

This combination may, of course, be followed with respect to different types of plies, whether they be two, three, five, seven, etc.; it also applies, within the will of the operator, to any type of twisted ply with respect to the number of turns that are initially applied to that ply. Thus, if the yarn is initially Z twisted in variable fashion from two to ten t.p.i. over any length cycle, an application of a back or S twist of six t.p.i. will result in a yarn varying from 4 t.p.i. Z twist to zero to 4 t.p.i. S twist, and so on. The length of the repeat is dependent on the original cycle length. The number of initial t.p.i. applied in the step of variably twisting the yarn is naturally dependent upon whether the yarn desired is to be hard or soft and upon its ultimate use in the end fabric product. It is to be understood that in the preferred form of the invention, the degree of differential between the low and high twist should be at least two turns.

It is to be understood that my invention is inclusive of not only the concept described above and dealing with the back twisting of a plied yarn which has been initially variably twisted, but also is applicable to the concept of including in a pile warp yarn, singles yarns which have also been variably twisted and then back twisted a predetermined amount. When applied to a singles yarn, the mechanics of the operation are parallel.

It is further to be appreciated that the back twisting, as described in the foregoing, may also be done in a variable manner. In such case, it is obvious that the back twisting must be accomplished in a cycle which falls within the range of the initial variable twisting.

Referring to FIGURE 5, a singles yarn, generally indicated at 6, has been twisted a varying number of turns throughout its length. Here, again, the representation here shown is diagrammatic and the turns per inch is not indicated to scale in such drawings. Assuming, however, that the bracketed area L is "low twisted" or contains three t.p.i., the middle area, bracketed at M, may have seven t.p.i. The turns per inch between areas L and M will, of course, gradually increase in the manner indicated in describing the two-ply yarn. The singles here shown in FIGURE 5 may be considered as being variably twisted through an 18" cycle which thus ranges from 3 S t.p.i. to 7 S t.p.i. The singles yarn also exhibits a variable diameter throughout its length.

If such singles yarn is now back twisted, it will take

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the form as represented in FIGURE 6 where the yarn is generally indicated at 8. It may be assumed, for purposes of illustration, that FIGURE 6 demonstrates the result of back twisting in the amount of five turns per inch Z twist. Thus, the area designated by the bracket N will have a Z twist of two turns and the area designated by the bracket P will have an S twist of two turns. Intermediate those spaces of the singles yarn which progress from S to Z twists are areas O and Q which are both representative of the yarn in its untwisted or neutral state, existing as a result of the twist on both sides of such space being in opposite directions.

The combination spoken of thus can be inclusive of the singles yarn shown in FIGURE 6 which by and of itself not only includes variable twisting but also back twisting. Thus, two of such singles may be used in a two-ply pile warp yarn. In the alternative, a variable twist singles can be used with one back twisted singles, or two variable twists having turns in opposite directions, can be employed. Other combinations are possible which will be apparent to those skilled in the art; however, it is evident that with the inclusion of two or more singles yarns twisted in the described manner in the combination of a plied yarn that is also variably twisted and back twisted, an even more heterogeneous quality must necessarily result, as an inherent factor, in the completed fabric or carpet.

In the embodiment of the invention to be further described with reference to the additional drawings herein, the individual twist of the separate singles yarns is not indicated. However, from the description thus far, it will be evident from the foregoing that these various types of variable and back twisted singles yarns can be employed in the two-ply yarns shown in FIGURES 3, 4 and 7 to 10, inclusive.

The brief description in the foregoing of the manner in which pile yarns will tend to assume positions in parallel alignment or face all in the same relative direction in conventional and present rug procedures is more particularly demonstrated in FIGURE 3. Here, it is to be understood that irrespective of the direction of the twist of the singles yarns, the warp pile yarns of previous manufacture are all of the same twist, i.e., either a Z twist or an S twist. In this figure, such a pile fabric yarn is shown as being of the S twist type. More characteristically, this twist would be uniform throughout the length of the yarn. For example, the yarn could be a rather loose one of three or four turns per inch or a relatively tight one of perhaps ten turns per inch, but, in any event, that same approximate number of turns per inch would prevail throughout the entire ply. Hence, when such a yarn is woven into a fabric, it will tend to untwist in a direction counter to that of the pretwisting operation.

In FIGURE 3, the pile is shown as being cut with the three tufts therein illustrated woven in the usual manner upon a ground weave consisting of the well-known binder or chain warps 10, supported upon and woven with the usual weft shots and stuffer warps 11 and 12, respectively. The three cut tufts are generally indicated at 15, 18 and 20, respectively. All of them, it will be noticed, are inclined towards the right and in somewhat parallel relationship and, hence, will tend to reflect light, with consequent shading of the rug, in a more or less definite direction. Such is bound to follow from a practice wherein the tufts are precluded, as in this illustration, from assuming random orientation with respect to each other.

In FIGURE 4, representing the improvement of my invention, the three tufts 21, 22 and 23 are illustrated as being oriented in random fashion. This is a consequence of the tufts representing the different portions of a plied yarn that has been variably twisted in one direction and back twisted so as to have intermediate spacings of, for example, S twist, Z twist and little or

zero twist. Hence, tuft 21 represents a portion of the two-ply yarn comprising this invention wherein both sides of the tuft or, perhaps more accurately, the entire tuft, may be considered as having a Z twist throughout. Because of the twist imparted to this one tuft 21 in one direction, it tends to assume a shape or inclination to the left or at least in variation with the position occupied by the adjacent tuft 22. The latter illustrates a tuft taken from a portion of the plied yarn wherein there is little, if any, twist. This being the case, there is no tendency for that tuft to untwist or assume any inclined position as the result of such untwisting. Hence, this particular pile tuft may be assumed to take the position as shown wherein the cut end portions thereof extend upwardly in a roughly vertical manner. Again, in contrast, the tuft 23 represents the third possible type of tuft in this random orientation of the separate tufts and is here indicated as coming from a portion of the yarn that is twisted with an S twist. The tendency of this tuft to revert to its former position forces it to a direction other than the vertical or, as here illustrated, slightly toward the right.

FIGURE 4 thus represents a primary feature contributed by this invention to this art—that concept of manufacture of fabrics, and particularly heavy fabrics such as carpeting, which provides for a different twist and consequent different positioning of adjacent cut or uncut pile yarns tufts. It is to be understood that reference to these figures is exemplary only and that there obviously will be, by the very manner of weaving the fabric, adjacent tufts which occasionally do face in the same direction or are both approximately upright, etc. However, in consideration of the entire fabric as a whole, it will be apparent that this novel manner of pretwisting and thereby preconditioning the pile warp yarns for ultimate heterogeneous orientation will enable achieving a product that does exhibit this desirable quality.

This function of the invention is also illustrated in the further figures, descriptive thereof, which will now be referred to.

The back twisting of a variable twisted yarn produces a result which is clearly further shown in FIGURE 7. Here, the binder warps are indicated at 30 and these, in usual fashion, are woven upon the weft shots 31. The usual type of stuffer warps 32 are positioned in known fashion in between such weft shots, all to form a ground fabric. The several tufts of the pile are retained by the binder warps and weft shots in a manner well understood in this art; and, in FIGURE 7, the pile wires are shown before removal thereof or before cutting of the individual tufts, if that is done.

Several tufts of the pile warp yarns, for purposes of clarity, are severally numbered from 40 to 47 in order that a better understanding of the random twisting of the individual tufts can be obtained. Viewing this figure, it is seen that the variable pretwisting of the ply, followed by a subsequent back twisting thereof in the manner described, results in certain of the pile tufts being twisted in one direction, others being untwisted, and still others being twisted in an opposite direction. Thus, tufts 40, 41, 42, and 43 are seen to have an S twist which may be considered to be from a greater to a lesser degree, respectively. The pile tuft 44, particularly at its top portion, has no twist whatsoever; and tufts 45, 46 and 47 are seen to have a reverse Z twist progressing, in this instance, from the lesser to the greater degree.

These same tufts are shown in Figure 8, but with the pile wires removed. It is seen that they retain their same incongruous form, i.e., progressing from S twist, to little or no twist, to Z twist, all in varying degrees. If cut, the natural variable twist of the tufts 40 to 47 will still be retained to a degree to accomplish the results which have hereinbefore been described. And, again, if each of the singles yarn used in this two-ply example are of variable twist and have been back twisted, the tendency of same

to turn in random fashion in different directions will additionally contribute to the heterogeneous effect desired. This same important facet of the invention—the random effects obtained by the piles of a fabric, particularly in carpeting—can further be appreciated by reference to FIGURES 9 and 10.

In FIGURE 9, a perspective view, the pile wires 35 are present. Six individual plied warp yarns are here shown as being positioned over the appropriate pile wires and are, as already described, woven with the binder warps, weft shots and stuffer warps of a basic type of ground fabric. These plies, all of which involve the plying of two or more singles in a variable manner with the subsequent step of back twisting, as in the procedures already described, are indicated as yarns 60 to 66, respectively. Beginning with yarn 60, it is seen that, at its terminal end, the back twisting has taken effect to leave this ply with a Z twist. The adjacent yarn 61 has an S twist, the next yarn 62 is without appreciable twist at all, yarn 64 is back twisted like yarn 60, and yarns 65 and 66 both demonstrate an S twist. The same observation is possible by viewing the near side of this figure where the several plies are uncut and surround the pile wires in the order named. Upon this side of the portion of the pile, the yarn 60 is in reverse position, having an S twist. It is now yarns 61 and 66 that are without appreciable twist; yarns 62 and 65 are S twisted and the yarn intermediate these two, yarn 64, is Z twisted.

It is to be further understood that the foregoing steps, described with particular reference to the pretwisting of such yarns as pile warp yarns, may be, and preferably are, followed by a procedure for setting the ply twist. This may be done after the twisting operations by steaming the yarn under tension under proper conditions of time, temperature or pressure, or by wet treatment, all well-known in the art. Such setting of the twist aids in materially reducing the amount of untwisting that will naturally occur after the weaving operation.

However, despite setting procedures such as this, or other setting procedures directed towards this same objective, there nevertheless have remained in the finished fabrics of known types a decided tendency of the pile warp yarns to untwist and consequently lay together in a uniform direction or in somewhat parallel relationship in the manner which has been referred to in the foregoing. My invention contemplates assurance of a heterogeneous quality and over-all textured effect in the final product, despite steps which may be included in known procedures for prevention of the untwisting of the singles yarns or the plied yarns.

It has been stated that the heterogeneous effect obtained by the instant invention will be observable and pronounced whether the pile tufts are cut or uncut. It is a matter of common knowledge that in certain grades of rugs where the pile is uncut, the tufts will lay in the same direction with a pronounced twist. This does not occur, however, with the yarn herein described, as can be observed by reference to FIGURE 10. In this figure, tufts are indicated as appearing in between roughly rectangular spacings formed by the usual binder warps 72 and weft shots 70. In view of the fact that each tuft has a somewhat different inherent twist than an adjacent tuft, each lie in different directions. The over-all textured effect created when a number of these differently disposed tufts are observed is indicated in FIGURE 10. Specifically, the bottom four pile tufts are indicated in this figure by numerals 75 to 80. Referring individually to these, it is seen that tufts 75, 77 and 79 appear to have a Z twist whereas tufts 76 and 80 are of an S twist. The near center tuft 78 has no appreciable twist at all. Upon cutting, each of these tufts would, as stated, retain this inherent propensity to twist in a direction different from that of the adjacent pile, some lying to the

right, some to the left, and others extending upwardly in near vertical fashion.

While the invention has been described with respect to a conventional velvet carpet weave, it is to be understood that the principles thereof are applicable to other fabrics, for example, flat weaves, tapestry, upholstery and other conventional fabric weaves. The invention is further applicable to other conventional carpet fabrics, such as Axminster, Wilton and tufted fabrics.

It is obvious that many modifications and variations may be made without departing from the essence of the invention as described in the foregoing. However, the invention is to be considered as limited only by the scope expressed in the appended claims.

Having thus described my invention, I claim:

1. The method of making a yarn which comprises the steps of twisting together a plurality of fibers in one direction in an amount varying between a relatively low twist and a relatively high twist, and thereafter twisting said fibers in a direction opposite to said one direction in an amount greater than said low twist and less than said high twist.

2. The method of making a composite plied yarn structure having a twist varying between a predetermined amount in one direction and a predetermined amount in the opposite direction throughout the length thereof which comprises the steps of ply-twisting together a plurality of singles yarn components in one direction in an amount

varying between a relatively low twist and a relatively high twist, setting the ply-twist, and thereafter twisting the plied components in a direction opposite to said one direction in an amount greater than said low twist and less than said high twist.

3. The method of making a composite plied yarn structure having a twist varying between a predetermined amount in one direction and a predetermined amount in the opposite direction throughout the length thereof which comprises the steps of ply-twisting together a plurality of singles yarn components in one direction in an amount varying between a relatively low twist and a relatively high twist, and thereafter twisting the plied components in a direction opposite to said one direction in an amount greater than said low twist and less than said high twist.

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