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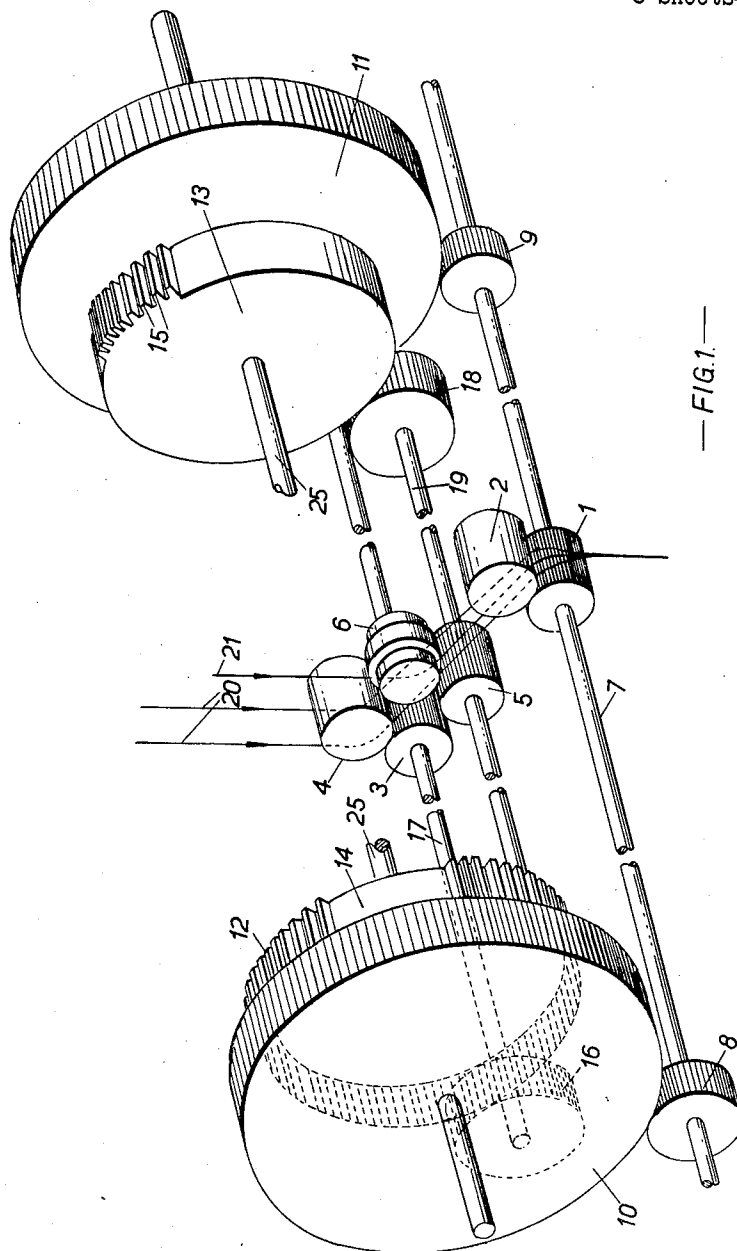
S. ROSCOE

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PROCESS FOR MAKING YARN OF VARYING COLOUR CHARACTER

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— FIG. 1 —

INVENTOR

SAMUEL ROSCOE

BY

Meedy Browne Schuyler Benedict

ATTORNEYS

May 22, 1962

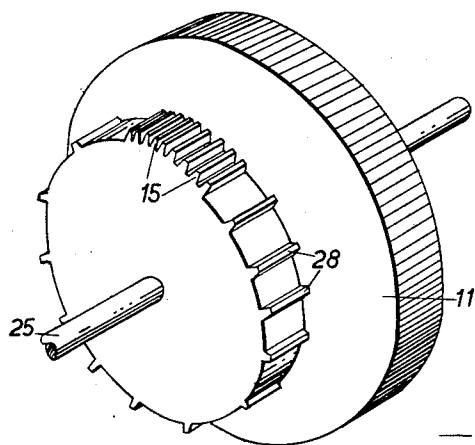
S. ROSCOE

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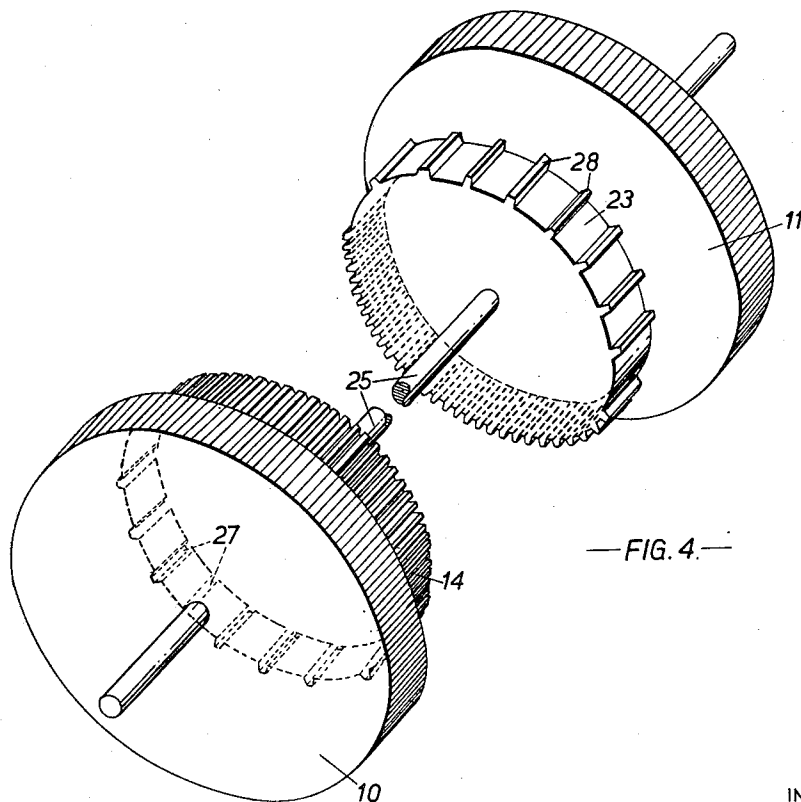
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—FIG. 2.—



—FIG. 4.—

INVENTOR
SAMUEL ROSCOE

BY

Meach, Broome, Schuyler & Bunnidge
ATTORNEYS

May 22, 1962

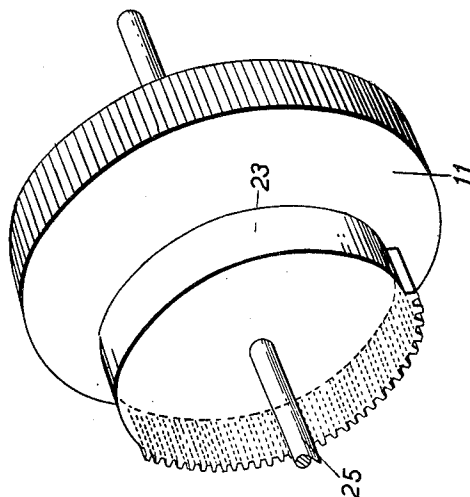
S. ROSCOE

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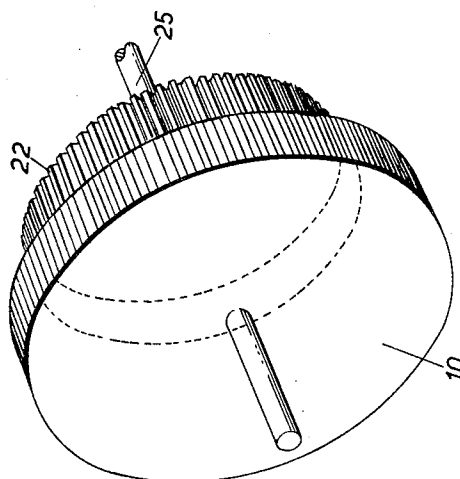
PROCESS FOR MAKING YARN OF VARYING COLOUR CHARACTER

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3 Sheets-Sheet 3



—FIG. 3.—



INVENTOR

SAMUEL ROSCOE

BY

Meady, Browne, Schuyler & Buechler

ATTORNEYS

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3,035,404

**PROCESS FOR MAKING YARN OF VARYING
COLOUR CHARACTER****Samuel Roscoe, Bolton, England, assignor to Hayeshaw
Limited, Manchester, England, a British company****Filed Feb. 21, 1958, Ser. No. 716,773****Claims priority, application Great Britain Apr. 2, 1957
5 Claims. (Cl. 57—156)**

The present invention relates to yarn made from staple fibres and in particular to carpet yarn of size six cotton count or coarser that is to say yarns of about 5000 yards or less to the pound. The principal object of the invention is to produce carpet yarn of longitudinally changing colour or colour mixture i.e. with longitudinally spaced cross-sections thereof in stretches of different colour or colour mixture containing different colours or different proportions thereof and to enable tufted carpets to be produced incorporating a coloured pattern.

Although the invention will be described primarily with the aid of technical terms common in cotton spinning it may be applied to yarns or rovings formed not only of cotton fibres but from other fibres such as wool or from man-made fibres such as rayon. Thus when reference is made herein to a roving (a term common in the cotton system of spinning) it is intended to include a top (which is the corresponding term in the wool system) and in so far as the context so admits technical terms common in the cotton system used herein are intended to include the corresponding technical terms used in the wool or other systems.

In the usual process of spinning yarn by the cotton system carded fibres are formed into slivers which are continuous strands of staple fibres. Such slivers are doubled and drawn and twisted to form rovings and finally yarns. Doubling, drawing (or drafting) and twisting are generally repeated two or three times to form finer rovings at each stage, the final drawing and twisting being the final spinning by which yarn is formed. During doubling and drawing two or more slivers or rovings are elongated to produce strands of fibres which are finer in thickness, and then these strands are twisted together to give the new rovings or yarn additional strength. The elongation of the rovings during drawing is effected by passing the rovings between pairs of nip rollers, the first pair of nip rollers being driven at a slower speed than the last pair of nip rollers. For example, the last pair of nip rollers in each drawing operation may be driven at a speed which is four times faster than the first pair of nip rollers. The twisting of the elongated strands formed from the rovings is effected after the drawing at each doubling and drawing stage. The degree of final twist is usually much greater than that applied in the earlier stages.

The present invention provides a method of making yarn of varying colour character along its length which comprises drafting and twisting yarn components, which may for example be slivers or rovings, of which at least one is of different colour character (i.e. of different colour or of different dyeing affinity) from the remainder and is fed into the drafting stage at higher and lower rates alternately so that different longitudinal portions of the yarn when formed will contain different proportions of said component, the rate of feed of the remainder being changed in timed relationship with changes in the rate of feed of said one component so as to keep the yarn when formed substantially uniform in cross section, that is to say not significantly less uniform in cross-section than the equivalent yarn without the varying colour character.

The lower rate of feed of said one component may be nil so that certain portions of the yarn will contain a nil proportion of said component. Thus at least two components of one character may be fed continuously into the

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drafting stage and at least one other component of different colour character may be fed intermittently into the drafting stage.

If desired at least one component of one colour character may be fed into the drafting alternately with at least one component of a different colour character (i.e. the said remainder) to produce a yarn which is alternately to one colour and then of the other along its length with intermediate mixtures of the two. Or again said remainder may be fed continuously but at a reduced rate during the feed of said one component at the higher rate and furthermore said one component may also be fed continuously but at a reduced rate during the feed of said remainder at the higher rate.

The invention thus results in the production of yarn of substantially uniform cross-section but of longitudinally varying colour character, i.e. of longitudinally varying colour or dyeing affinity from yarn components (e.g. slivers or rovings) of different colour character. For example, by feeding two red rovings continuously to the nip rollers and a blue roving intermittently to the nip rollers there may be produced a red yarn which contains patches of blue along its length, the rate of feed of the red rovings being reduced during the period when the blue roving is intermittently fed to the nip rollers to avoid any substantial change in the cross-section of the resulting yarn or roving. Or secondly, by feeding first only one red roving to the nip rollers and then only one blue roving to the nip rollers there may be produced a yarn which is alternately coloured red and blue along its length with a mixture of red and blue where the rovings are doubled. If desired, one roving, say red, may be fed continuously, and another, say blue, may be fed intermittently, the rate of feed of the red roving being considerably reduced during the feed of the blue whose rate of feed is also adjusted for the production of a yarn or roving of substantially uniform cross-section. Alternatively, both rovings may be fed continuously at varying rates.

Alternatively instead of differently coloured rovings it is possible to use rovings of different dyeing affinities, for example cellulosic fibres and wool, nylon or similar synthetic fibres made from polymerised materials, or cellulose acetate fibres. The resulting yarn or the product made from the yarn can then be dyed with different dyestuffs so that the cellulosic fibres dye one colour and the wool or cellulose acetate fibres dye another.

The present invention may be carried out at any convenient stage in the spinning process. Thus it may be carried out at the last drafting stage or at an earlier drawing stage.

A further feature of the present invention comprises the manufacture of textile fabrics or other textile products with a pattern which arises from the use in such manufacture of yarn of substantially uniform cross-section and of longitudinally varying colour and formed from yarn components of different colour character, i.e. of different colour or of different dyeing affinity. A particular feature of the present invention comprises the manufacture of carpets and rugs on a tufting machine with a longitudinally discontinuous pattern by feeding into the machine yarn as herein described. Warp tufted carpets or loop pile carpets produced on tufting machines have by virtue of the mode of manufacture been plain except that longitudinal stripes or a mottled appearance can be introduced. By means of the present invention longitudinally and transversely spaced spots, for example, can be produced in a tufted carpet, the longitudinal spacing of the spots being governed by the longitudinal spacing of colour changes in the yarn and the extent of the spots being governed by the extent of the colour changes in the yarn and by the number of such yarns which are fed adjacent and in phase with one another

into the carpet. The variety of longitudinally discontinuous patterns in carpets made according to the present invention may be increased by laterally displacing the carpet backing cloth at intervals during the tufting.

The invention includes the production of patterned textile goods or materials in other machines, e.g. in circular or flat knitting machines or in looms when the pattern is produced or effected by the use of yarn of longitudinally changing or varying colour or dyeing affinity as herein set forth.

A drafting frame for use in the manufacture of roving or yarn according to the present invention may comprise a pair of front nip rollers, a pair of back nip rollers, a second pair of back nip rollers and gearing between said front nip rollers and back nip rollers arranged to drive said back nip rollers at normal speeds less than the speed of said front nip rollers, but to allow the rotation of said first and second pairs of back nip rollers to be reduced below the normal speed or interrupted alternately.

The invention is further described by way of example by reference to the accompanying drawings in which:

FIG. 1 illustrates a frame for use in the manufacture of roving or yarn according to the present invention and FIGS. 2, 3 and 4 illustrate alternative gears for use in a frame as shown in FIG. 1.

The frame illustrated in FIG. 1 is provided with a pair of front nip rollers 1, 2, a pair of back nip rollers 3, 4 and a second pair of back nip rollers 5, 6. The front nip roller 1 is fixed to a shaft 7 to which are fixed small peripherally toothed driving pinions 8, 9 which respectively drive large peripherally toothed gear wheels 10, 11 fixed on a common shaft 25. Fixed respectively to the gear wheels 10, 11 are smaller gear wheels 12, 13 of which wheel 12 is toothed over most of its periphery except for a short gap 14 while wheel 13 is toothed over only a short arc 15 of its periphery which more or less corresponds in extent to the gap 14. The back rollers 3, 4 are driven from the wheel 12 through a peripherally toothed pinion 16 and shaft 17 while the back rollers 5, 6 are driven from the wheel 13 through a peripherally toothed pinion 18 and shaft 19. The peripheral toothings of the pinions 8, 9, 16, 18 and of the gear wheels 10, 11 is indicated diagrammatically by spaced parallel lines in FIG. 1, the form of the toothings on these pinions and gear wheels being as shown in more detail on the wheels 12, 13.

Two rovings 20 of one colour pass between the back nip rollers 3, 4 and are thus fed to the front nip rollers 1, 2 at a rate depending upon the gearing between shafts 7 and 17. A third roving 21 of different colour passes between the back nip rollers 5, 6 and is thus fed to the front nip rollers 1, 2 at a rate which depends upon the gearing between the shafts 7 and 19.

The roller 6 is constructed with a stepped surface so that roving 21 is nipped between the rollers 5 and 6 but both rovings 20 pass between the rollers 5, 6 without being nipped.

When the gap 14 of the wheel 12 reaches the pinion 16 rotation of the back nip rollers 3, 4 will temporarily cease but in so far as the extent of the gap 14 is insufficient to cause the rovings 20 to break between the front and back nip rollers the feed of the rovings 20 to the nip rollers 1, 2 may be said to be continuous but reduced temporarily while the nip rollers 3, 4 are stationary. On the other hand, the nip rollers 5, 6 will only be driven for short periods while the teeth in the arc 15 of wheel 13 are in engagement with the pinion 18 so that the feed of the roving 21 will be intermittent and the roving 21 will break between the front and back nip rollers between each rotational movement of the pinion 18. The resulting roving or yarn formed by twisting the rovings after they have been fed through nip rollers 1 and 2 will be chiefly of the colour of the rovings 20

with mixtures of the rovings 20 and 21 at longitudinally spaced intervals.

If desired the feed of the roving 21 may be rendered continuous and breakage of the roving 21 may be avoided by providing relatively widely spaced teeth over that part of the periphery of the wheel 13 which excludes the arc 15. FIG. 2 shows an alternative form of gear wheel 13 suitable for this purpose with widely spaced teeth 26 over that part of its periphery which excludes the arc 15.

The wheels 12 and 13 of FIG. 1 may be replaced by wheels 22 and 23 as shown in FIG. 3, each of which is toothed over approximately half of its circumference, the toothings on one being opposite to (i.e. 180° out of phase with) the toothings on the other to cause the nip rollers 3, 4 and 5, 6 to be rotated alternately. With such an arrangement the number of rovings fed by the back nip rollers 3, 4 and by the back nip rollers 5, 6 should preferably be the same since the resulting yarn or roving will comprise roving fed by the nip rollers 3, 4 followed longitudinally by roving fed by the nip rollers 5, 6 doubled thereto and then by roving fed by the rollers 3, 4 and so on.

If desired, the wheels 22, 23 may, as shown in FIG. 4, be provided with relatively widely spaced teeth 27, 28 over that half of their respective circumferences where toothings is completely absent in FIG. 3, whereby to achieve continuous feed of the rovings by each of the pairs of back nip rollers while reducing the rate of feed of each pair alternately.

Other arrangements of gears may be used to produce various forms of longitudinal changes of character in the yarn or roving to be made.

I claim:

1. A method of making carpet yarn of varying colour character along its length which comprises feeding into a drafting stage yarn components of which at least one is of different colour character from the remainder, said one component being fed into said drafting stage at higher and lower rates alternately so that different longitudinal portions of the product of said drafting stage will contain different proportions of said component, changing the rate of feed of the remainder of said components into said drafting stage in timed relationship with changes in the feed of said one component so that when the product of said drafting stage is finally twisted into yarn the cross-section of the yarn will be substantially uniform throughout its length.

2. A method according to claim 1 which comprises feeding said yarn components into the final drafting stage at higher and lower rates complementarily in timed relationship.

3. A method of making carpet yarn of varying colour character along its length which comprises feeding into a final drafting stage yarn components of which at least one is of different colour character from the remainder, said one component being fed into the final drafting stage intermittently so that different longitudinal portions of the product of said final drafting stage will contain a nil proportion of said component, changing the rate of feed of the remainder of said components into said final drafting stage in timed relationship with changes in the feed of said one component so that when the product of said final drafting stage is finally twisted into a yarn, the cross-section of the yarn will be substantially uniform throughout its length.

4. A method of making carpet yarn of varying colour character along its length which comprises feeding at least two yarn components of one colour character together into a final drafting stage continuously but at higher and lower rates alternately so that different longitudinal portions of the product of said final drafting stage will contain different proportions of said components, and feeding at least one other component of different colour character into the final drafting stage only when said first

mentioned components are being fed thereto at the lower rate so that when the product of said final drafting stage is finally twisted into yarn the cross-section of the yarn will be substantially uniform throughout its length.

5. A method of making carpet yarn of varying colour character along its length which comprises feeding at least one yarn component of one colour chaarcter continuously into a final drafting stage at higher and lower rates alternately so that different longitudinal portions of the product of said final drafting stage will contain different proportions of said component, and feeding at least one other yarn component of different colour character from the first continuously into said final drafting stage at lower and higher rates in timed relationship with changes in the rate of feed of said one component so that when the product of the final drafting stage is finally twisted into yarn the cross-section of the yarn will be substantially uniform throughout its length.

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