July 12, 1938. J. E. MOORE 2,123,635

PRODUCING HAIRY RAYON YARNS

Filed Nov. 13, 1937

Fig. 1,

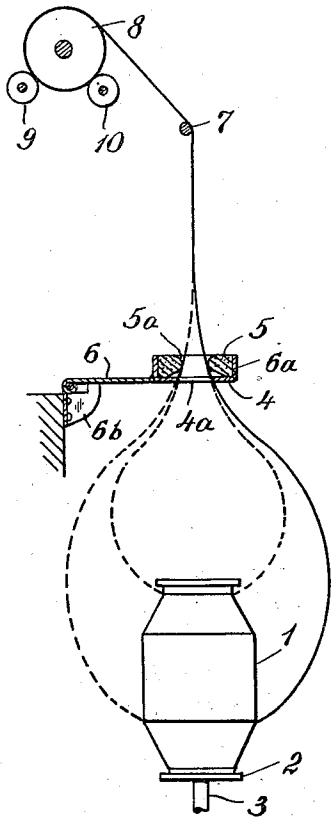


Fig. 2,

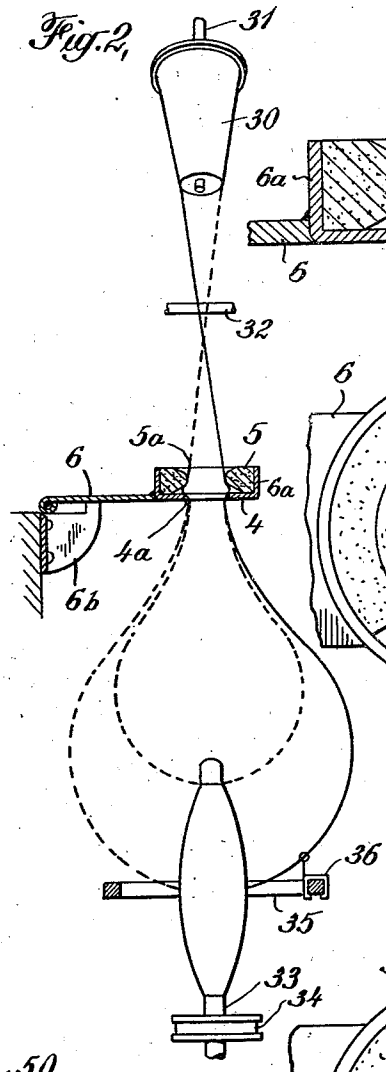


Fig. 3,

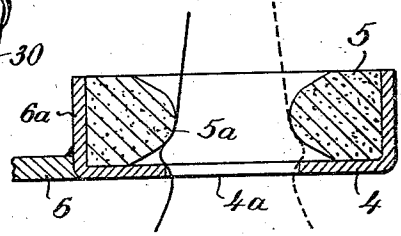


Fig. 4,

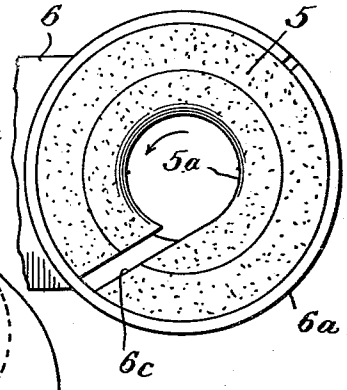


Fig. 5,

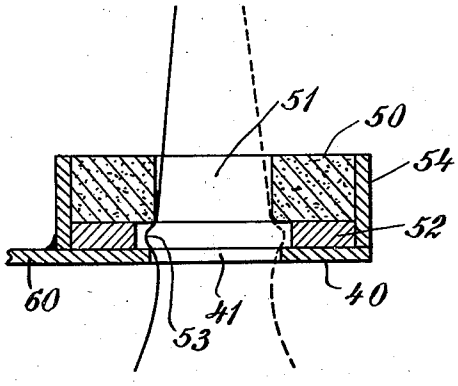
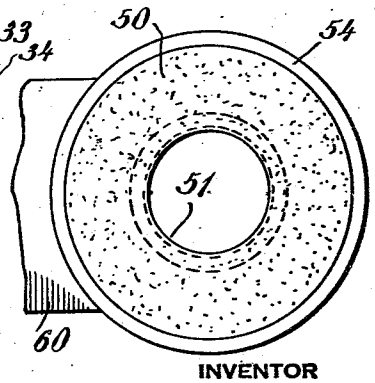


Fig. 6,



INVENTOR
James E. Moore
BY
Pennie, Davis, Marvin and Edmonds
ATTORNEYS

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2,123,635

PRODUCING HAIRY RAYON YARNS

James E. Moore, Rome, Ga., assignor to Tubize Chatillon Corporation, New York, N. Y., a corporation of Delaware

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5 Claims. (Cl. 117—21)

This invention relates to the production of hairy yarns and is concerned particularly with imparting uniform pubescence to yarns composed of continuous filaments, for example, rayon yarns.

It has been proposed heretofore to produce hairiness on rayon yarns and the like during the twisting operation. In my co-pending application Serial No. 93,385, filed July 30th, 1936, (United States Patent 2,099,215, to be granted November 16th, 1937), I have described and claimed a method for producing uniform pubescence on continuous filament yarn which comprises moving the yarn rapidly along an axis at a substantially uniform rate while rotating the yarn about the axis to describe a surface of rotation (two fixed orbits of rotation of the yarn on said surface being maintained so that the surface is of substantially constant size and shape between the orbits) and cutting partially through successive lengths of yarn at substantially equal intervals as the lengths pass through the surface of rotation between the orbits. The present invention relates to improved apparatus for use in the aforementioned method and comprises a first ring having a smooth interior guiding surface and a second ring having a rough interior cutting surface, the rings being disposed substantially parallel to and co-axial with each other with the smooth interior guiding surface of the first ring spaced a relatively small distance from the rough interior cutting surface of the second ring. The smooth interior guiding surface and the rough interior cutting surface of the respective rings establish the fixed orbits which maintain the surface of rotation of substantially constant size and shape as the yarn is drawn through the rings in a loose condition and while it is being rotated.

The rough interior cutting surface within the second ring cuts or abrades the exterior filaments of the yarn as the yarn is rotated within the rings and thus establishes the required pubescence.

My invention will be thoroughly understood in the light of the following detailed description taken in conjunction with the accompanying figures, in which:

Fig. 1 shows the application of my invention to an upstroke twister;

Fig. 2 illustrates the application of my invention to a ring twister;

Fig. 3 is an elevation, partly in section, of a cutting mechanism embodying my invention;

Fig. 4 is a plan of the apparatus of Fig. 3;

Fig. 5 is an elevation, partly in section, of a modified form of the cutting mechanism of my invention; and

Fig. 6 is a plan of the apparatus of Fig. 5.

In the upstroke twister illustrated in Fig. 1, a spirally wound cake 1 of untwisted yarn having continuous filaments is disposed upon a bobbin 2 mounted on a rotatable spindle 3. The untwisted yarn balloons out from the cake, passes over a guide 7 and is wound on a rotating take-up cylinder 8 disposed on two rotating rollers 9, 10. Located co-axially with the shaft and the bobbin and between the bobbin and the guide is a presently preferred form of the cutting mechanism of my invention (illustrated in greater detail in Figs. 3 and 4). It comprises a lower horizontally disposed ring 4 having a smooth-walled circular aperture 4a disposed concentrically with the axis of the bobbin and the bobbin shaft. Concentric with the lower ring and immediately above it is a second ring 5 having a rough interior surface 5a.

The upper ring is preferably made of rough material such as carborundum and its inner diameter preferably should be about the same as the inner diameter of the lower ring. In the modification shown in Figs. 1, 2, 3 and 4, the inner portion of the upper ring is rounded in cross-section so that there is a gap between the smooth guiding surface on the lower ring and the rough cutting and guiding surface on the upper ring.

A horizontal holder 6 is fastened to the lower ring and has a recess or cup on its upper surface, preferably circular in plan, in which the upper ring fits. The recess is preferably provided by fastening an annular member 6a to the top of the lower ring. The support 6 may be hinged at the end remote from the rings and supported on a bracket 6b.

The operation of the mechanism illustrated in Fig. 1 is as follows:

The yarn balloons off the cake, passes up through the rings 4 and 5 over the guide 7 and is wound on the cylinder 8. The shape of the balloon as it is unwound from the cake changes. However, a secondary balloon of substantially constant size and parallel shape is described by the yarn as it passes through the two rings. The rotating yarn impinges against the cutting surface in the upper ring, but the angle of contact between the cutting surface and the yarn remains substantially constant, so that the outer filaments of the yarn are abraded or cut in a uniform manner. Uniform hairiness coupled with uniform tensile strength of the yarn is thus assured. If it is desired to reduce the number of filaments cut at each pass, another upper ring of carborun-

dum or the like and having a greater inner diameter may be substituted so that, in effect, the cutting edge is moved out from the axis of the two rings. When smooth yarn is desired, the cutting ring 5 may be withdrawn completely from the path of the yarn. More filaments may be cut by employing a cutting edge of greater length or width so that the yarn remains in contact with the edge for a longer time at each pass. More filaments at each pass will be cut if the cutting edge is placed closer to the axis of the rings.

The means for producing hairy effects on continuous filament rayon yarns in Fig. 2 is the same as that in Fig. 1, except that the cutting mechanism of my invention is applied to a ring twister. In this case the yarn cake 30 is held on an immovable spindle 31. The untwisted yarn is pulled off the cake at one end and is bent over a guide bar 32 and passes through the two rings 5 and 4. The cut yarn is then wound on a vertical spindle 33 which is rotated at high speed by means of the belt-driven whorl 34. Around the spindle is a circular horizontal track 35, around which is slidable a ring twister guide or traveller 36 through which the yarn passes. The track remains horizontal and concentrically disposed around the spindle, but is moved slowly up and down by a means (not shown), so that the yarn is wound uniformly along the length of the rotating spindle. The ring twister naturally rolls rapidly around the track and imparts a twist to the yarn.

After the yarn passes over the guide bar 32 it begins to balloon. It describes a small parallel-shaped surface of substantially constant size and shape in passing through the rings 5 and 4, and then describes a large and constantly varying balloon in passing from the ring 4 to the rotating spindle.

The operation of the cutter of my invention as applied to a ring twister as in Fig. 2, is exactly the same as when it is disposed on upstroke twister (Fig. 1), except that the yarn passes first through the rough ring and then through the smooth one. The shape and size of the secondary balloon between the rings 5 and 4 are substantially constant. The rough surface of the ring 5, therefore, makes cuts of uniform depth at uniform intervals along the length of the yarn provided, of course, that the yarn passes through the rings at a substantially uniform rate.

Referring now to Figs. 3 and 4, which show an enlargement of the cutting mechanism illustrated in Figs. 1 and 2, it will be seen that the lower ring 4 is formed integrally with the annular member 8a which defines the recess in which the upper ring 5 is disposed. It will also be seen that the upper ring rests on the lower ring and has a curved inner surface so that there is a small gap between the guiding surface of the lower ring and the guiding and cutting surface of the upper ring. Between the two surfaces centrifugal force causes a small balloon of substantially constant size and shape to develop.

The upper ring 5 may be made entirely of carborundum or other abrasive material, or it may have discontinuous inserts of abrasive material held in metal or "plastic".

If desired, and in order to facilitate changing the upper ring, it may be slotted, as shown in Fig. 4. The slot passes through the ring substantially parallel to its major axis and tangential to the inner circumference of the ring. The slot should be cut so that there will be no tendency for the rotating yarn to enter it, i. e., approaching the hole in the ring tangentially from the direction of rotation of the yarn. Such a slot, 6c, is shown in Fig. 4.

Figs. 5 and 6 show another modification of the cutting mechanism of my invention having a lower ring 40 with a smooth circular interior surface 41 and an upper ring 50 having a rough interior surface 51. The entire upper ring preferably is of carborundum and has a slightly smaller inner diameter than the lower ring. In section the upper ring is substantially rectangular so that it presents a lower edge to abrade the passing yarn. With this type of upper ring, however, it is necessary to provide an annular insert or shim 52 so that there may be a gap between upper and lower ring in which the balloon 53 of substantially constant size and shape can develop. As in the cutting mechanism of Figs. 3 and 4, the upper ring is disposed in a recess formed by an annular member 54 which is fastened on the lower ring, the whole assembly being in turn affixed to a support 60.

In the apparatus of Figs. 5 and 6, no slot is provided in the upper ring, so that the yarn must be threaded through it. This structure is preferable when fine yarn is being abraded and twisted, and it is desired to avoid the slight shock to the yarn which the presence of the slot makes inevitable.

I claim:

1. In an apparatus for producing hairy yarn in which yarn is drawn in a loose condition along an axis while it is rotated around the axis to describe a surface of rotation of substantially constant size and shape, at least two fixed orbits being maintained on a surface of rotation to assure the constancy of its size and shape, and a cutting means being disposed adjacent said surface to sever a portion of the filaments of the yarn, the improvement which comprises a first ring having a smooth interior guiding surface, a second ring having a rough interior cutting surface, said rings being disposed substantially parallel to and coaxial with each other with the smooth interior guiding surface of the first ring spaced a relatively small distance from the rough interior cutting surface of the second ring, and a recessed holder in which the second ring is disposed and on which the first ring is fastened.

2. Apparatus according to claim 1 in which the second ring is slotted to facilitate the placing of the yarn through it.

3. In an apparatus for producing hairy yarn in which the yarn is drawn in a loose condition along an axis while it is rotated around the axis to describe a surface of rotation of substantially constant size and shape, at least two fixed orbits being maintained on the surface of rotation to assure the constancy of its size and shape, and cutting means being disposed adjacent said surface to sever a portion of the filaments of the yarn, the improvement which comprises a first ring having a smooth interior guiding surface, and a second ring having a rough interior cutting surface, said rings being disposed substantially adjacent to and coaxial with each other and at least one of the rings having a rounded interior edge so that the rough interior cutting surface of the second ring is spaced from the smooth interior guiding surface of the first ring by a relatively small distance.

4. In apparatus for producing hairy yarn in which the yarn is drawn in a loose condition along an axis while it is rotated around the axis to describe a surface of rotation of substantially constant size and shape, at least two fixed orbits being maintained on the surface of rotation to assure the constancy of its size and shape, and cut-

ting means being disposed adjacent said surface to sever a portion of the filaments of the yarn, the improvement which comprises a first ring having a smooth interior guiding surface and a second ring made of abrasive material and having a rough interior continuous annular cutting surface, said rings being disposed substantially parallel to and coaxial with each other with the smooth interior guiding surface of the first ring spaced a relatively small distance from the rough interior cutting surface of the second ring.

5. Apparatus according to claim 4 provided with a recessed holder in which the second ring is disposed and to which the first ring is fastened, the holder being fastened to a support which is hinged at a point remote from the rings, whereby the holder may be swung out of the path along which the yarn is drawn.

JAMES E. MOORE.