April 30, 1963 W. POOL 3,087,685

YARN WINDING MACHINERY

Filed March 29, 1956

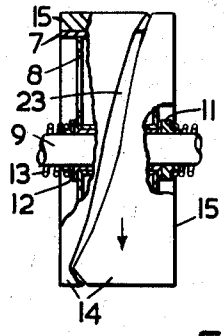


FIG. 1

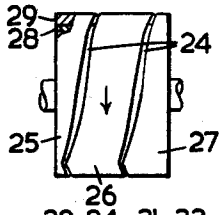


FIG. 3

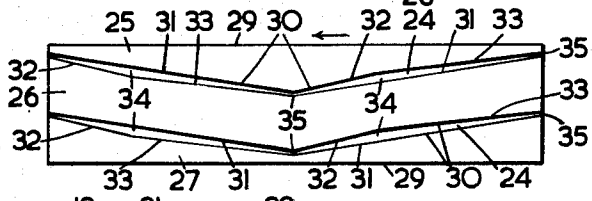


FIG. 4

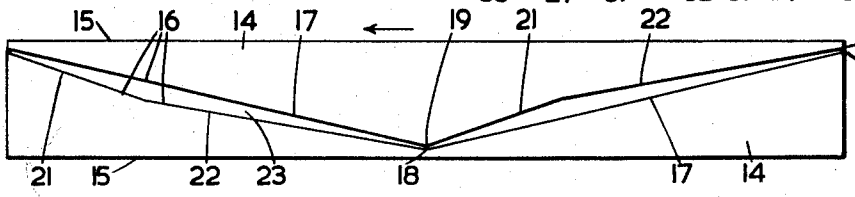


FIG. 2

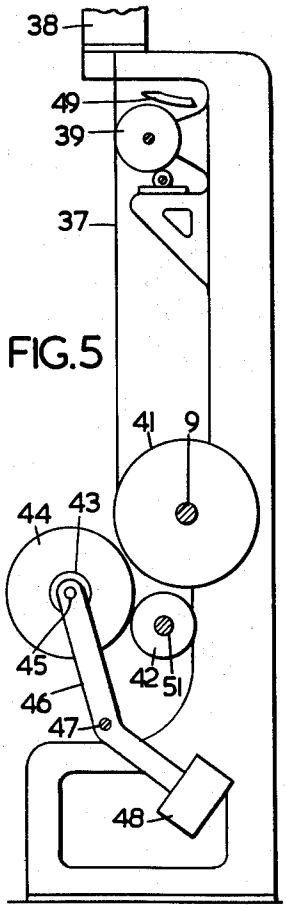


FIG. 5

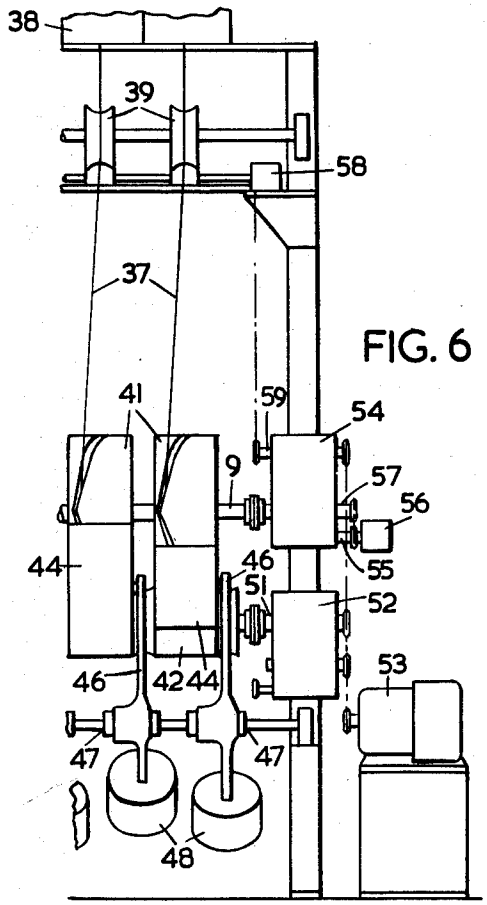


FIG. 6

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YARN WINDING MACHINERY

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5 Claims. (Cl. 242—43.2)

This invention relates to yarn winding machinery, and particularly to yarn winding machines of the type in which the yarn is traversed to-and-fro along the length of the package being wound by means of a grooved rotating traverse drum.

According to the present invention a traverse drum for use in a yarn winding machine of the kind referred to is formed with a groove extending from near one end of the drum towards the other end and back, and the gap between the leading and trailing edges of said groove is wide at the middle of its length along the axis of the drum and tapers to a narrow gap towards each end of the drum, the trailing edge having a varying helix angle for this purpose, while the leading edge has a helix angle which is preferably uniform and is in any case more nearly uniform than the trailing edge. The term groove denotes an elongated depression, the base of which is contiguous with the internal side walls thereof. By the "leading edge" of the groove is meant the edge formed between the surface of the drum and the internal side wall of the groove which faces the direction of rotation of the drum, while the "trailing edge" is the edge between the surface of the drum and the opposite side wall of the groove or slot. The leading edge of the part of the groove extending from one end of the drum towards the other is continuous with the trailing edge of the remaining part of the groove extending in the reverse direction.

The trailing edge of the groove, in the traverse drum according to the invention, can be formed in two parts with different but uniform helix angles, meeting on the centre line of the traverse. Since the trailing edge is the edge over which the yarn passes on its way from the drum to the package being wound, the movement of the yarn from the centre of the traverse to the end is slowed down while the movement from the end back to the centre again is correspondingly speeded up. This results in an even build-up of the package, a reduction in the inertia effect of the yarn as it reaches the end of the traverse and a quick reversal of traverse at the end, with little tendency for the package to build-up at the edges. Extremely high winding speeds can be obtained, especially if the traverse drum is carefully balanced and if the helix angles are kept low. Moreover, the wide gap at the centre of the traverse makes the drum self-threading, a yarn led directly from a source of supply over the drum to the package falling naturally into the wide gap at the centre of the traverse and running thereafter in the groove so as to be traversed to-and-fro along the length of the package. The narrow gap at the ends of the traverse on the other hand, gives close control of the yarn at the ends of the package so that a tendency for the yarn to turn at a point short of the end of the package, or to extend beyond and slip over the end of the package is eliminated.

The traverse drum of the present invention is of particular importance when it is to be used purely as a traverse drum and not (as is commonly done) for the purpose of driving the package by surface contact therewith. By driving the package independently of the traverse drum several important advantages are obtained. Less tension is required in the yarn to keep it running in the groove; a wider package can be produced with a drum of given diameter; and a relatively small angle of

contact between the yarn and the drum (e.g. of the order of 60°) can be employed. Furthermore, the package can be driven at a uniform peripheral speed while the traverse drum can be driven at a speed which can be systematically varied so as to avoid what is known as "ribbon formation," i.e. the piling up of the yarn, at certain phases in the winding of the package so that successive turns lie immediately over or very close to one another. Yet again, especially with twistless yarns or yarns of very low twist, a difference between the linear speed of the yarn and the surface speed of the traverse drum imposes a slight longitudinal drag on the yarn and helps to keep the filaments together. For this purpose the traverse drum may run either faster or slower than the linear speed of the yarn; the latter is to be preferred where wider packages, necessitating larger helix angles, are required.

The invention is also of importance in machines to be used as the take-up for artificial continuous filament yarns continuously with their production, when the yarns are entirely without twist and need to be taken up at a uniform linear speed. The uniform linear speed can be brought about by driving the package by surface contact with a driving drum separate from the traverse drum, the traverse drum being kept spaced from the surface of the package by a small gap, e.g. of the order of 1/10" or less.

The traverse drum can conveniently be constructed as a central drum, on the plain outer surface of which two separate track rings are mounted, having shaped edges which co-operate to form the traverse groove between them, each track ring providing a leading edge for one half of its periphery and a trailing edge for the other half. The track ring can be axially adjusted to give the required small gap at the traverse ends. The drum is preferably loosely mounted on its driving shaft, e.g. between two positioning collars that are spring-loaded towards one another so as to nip the hub of the drum, this arrangement enabling the drum to be stopped by hand or by means of a brake provided for the purpose, in the event of yarn lapping round it. Where the package is to be driven by a driving drum separate from the traverse drum, it can be mounted on a spindle carried in anti-friction bearings on a swinging or sliding arm, which is spring-loaded or weight-loaded so as to urge the surface of the package towards the driving drum, and is damped to prevent bouncing arising from slight irregularities in the shape to which the package is built. The spring-loading or weight-loading can easily be arranged so as to give a pressure between the package and the driving roll which increases slightly as the package builds up so as to give driving force which increases as the weight of the package increases, but not in proportion thereto.

By way of example, two forms of traverse drum in accordance with the present invention and the mode of their use in a cheese-winding machine employed as the yarn take-up in an apparatus for the production of continuous artificial filaments will now be described in greater detail with reference to the accompanying drawings in which,

FIGURE 1 is a front elevation and FIGURE 2 is a development of one form of traverse drum,

FIGURES 3 and 4 are similar views of another form, and

FIGURES 5 and 6 are a diagrammatic side elevation and front elevation of a machine employing such drums.

The first form of traverse drum shown in FIGURES 1 and 2 comprises a smooth cylinder 7 of a diameter of 12" and an axial length of 6", carried on a hub 8 mounted loose on a driving shaft 9 but nipped between a fixed

collar **11** and a slidable collar **12** urged axially by a spring **13**. On the surface of the smooth drum **7** are fitted two track rings **14**, of 12" internal diameter and 14" external diameter, each having one plane edge **15** which, subject to minor adjustment, coincides with an edge of the smooth cylinder **7**, while the other edge **16** is shaped. Round one half (180°) of the periphery of each track ring **14**, its shaped edge **16** is cut at **17** to a uniform helix angle (measured on the outside diameter) of 12°50'. The minimum axial dimension of each track ring, at **18**, is 7/16" and its maximum axial dimension, diametrically opposite at **19**, is 5½". The other half of the shaped edge of each track ring is cut at **21**, **22** to two helix angles, one (**21**) of 18°50' covering 60° of the periphery of the ring adjoining the point **19** and the other (**22**) of 9°40' covering the remaining 120° of the periphery and extending to the point **18**, i.e. substantially twice the angle covered by the part **21**. When both track rings **14** are fitted to the smooth-surfaced drum **7**, with the point **19** of one fitting the point **18** of the other, they form between them a groove **23** of a width varying from about 1/16" near the edges **15** of the composite drum to about 9/10" at the middle of the axial length of the drum. The composite drum is rotated in the direction indicated by the arrows so that the edges **17** are the leading edges of the groove **23** while the edges **21**, **22** are the trailing edges.

The second form of traverse drum, shown in FIGURES 3 and 4, is similar in general character to the first but smaller, having an outside diameter of 8¼", and is formed with two grooves **24** for winding two separate narrow cheese simultaneously side-by-side on a single cheese-support tube. For this purpose the drum has 3 separate track rings **25**, **26**, **27** of 8¼" external diameter mounted on a central plain drum **28** of 7" diameter. The outer track rings **25**, **27** each have one plane edge **29** and one shaped edge **30**, and are axially adjustable to provide the desired minimum gap in the two grooves **24**. The middle track ring **26** is shaped on both edges **30** to co-operate with the shaped edges **30** of the two outer track rings **25**, **27**. The shaped edges **30** of the track rings are cut to an angle of 8°45' over the parts **31** round 180° of the periphery of the drum, of 13° over the parts **32** round the adjoining 60° of periphery and of 6°35' over the parts **33** covering the remaining 120° of the periphery, giving a traverse width of 2" measured axially and a maximum grove width at **34** of ⅓" more than the minimum groove width at **35**.

The traverse drums described above can be used in a winding machine as shown in FIGURES 5 and 6 which is fitted immediately below a spinning metier for the production of threads **37** of continuous artificial filaments. Each thread **37** in the metier emerges vertically from the bottom of a spinning cabinet **38** and passes in contact with a roller **39** for applying an anti-static or other lubricant to the yarn. It then continues vertically downwards to engage tangentially with the traverse drum **41** of the invention which is mounted 3' below the cabinet **38**. Below and in front of the shaft **9** of the traverse drum **41** is mounted a package-driving roller **42** of 6" diameter, against which is pressed the surface of the package-support tube **43** or of the cheese **44** being wound thereon. The cheese is carried on a spindle **45** mounted in ball bearings on an arm **46**, pivoted at **47** in front of and below the traverse drum shaft **9**. The lever **46** continues downwards and rearwards past the pivot point **47**, at which point it is bent to an angle of 135°. It carries at its lower end a suitable weight **48**. Immediately above the finish-applying roll **39** is a suction duct **49** into which the filaments coming from the spinning metier **38** can be fed until they are thrown-on to the take-up device.

For the purpose of throwing-on, the filaments running into the suction duct **49** are drawn downwards past the traverse roller **41** and between the take-up spindle **45** and the driving roller **42**, the take-up spindle being swung back

on its take-up lever **46**. The lever **46** is then released so as to nip the yarn **37** between the package support **43** and the driving roller **42** and the yarn is drawn forward so that it begins to wind on the package support **43**. The yarn passing the traverse roller **41** automatically falls into the groove thereof in the neighbourhood of the widest part of the groove and is thereafter traversed to-and-fro along the length of the package support **43** to form the package **44**. As the package **44** grows, the lever **46** carrying it is swung back by the reaction between the surface of the package and its driving roll **42**. The angular disposition of the weight **48** at the lower end of the lever ensures that the pressure between the package **44** and the driving roll **42** is maintained as the size of the package increases. The surface of the package **44** remains slightly spaced from the traverse drum **41**, by a distance of 1/16" to 1/10" throughout the winding of the package.

The shaft **51** carrying the driving drum **42** is driven through an infinitely varying gear **52** from a motor **53** at the end of the machine, and the shaft **9** carrying the traverse drum **41** is driven through a second infinitely variable gear **54** from the first gear **52**. The setting of the first gear **52** remains constant throughout the winding operation but the setting shaft **55** of the second gear **54**, driving the traverse drum shaft **9**, is under the control of a ribbon breaker mechanism **56** of known construction which is driven from the output shaft **57** of the gear, and oscillates the setting shaft **55** slightly backwards and forwards so as to impose a slight alternate increase and decrease on the speed of the output shaft **57** and the shaft **9**. This prevents the traverse from falling into synchronism with the revolutions of the package and so prevents the formation and growth of ribboning. The finish-applying roll **39** is driven by a suitable reduction gear **58** from the input shaft **59** of the second infinitely variable gear **54**.

Having described my invention, what I desire to secure by Letters Patent is:

1. A traverse drum for use in a yarn-winding machine said drum being formed with a groove passing once around said drum while extending from one end of said drum towards the other end and back, the gap between the leading and trailing edges of said groove being wide at the middle of its length along the axis of said drum and tapering to a narrow gap towards each end of said drum, the trailing edge having a varying helix angle and the leading edge a more nearly uniform helix angle.

2. A drum according to claim 1 wherein the helix angle of the leading edge is uniform.

3. A drum according to claim 1 wherein the trailing edge is in two parts having different uniform helix angles and meeting on the centre line of the traverse.

4. A drum according to claim 3 wherein the angle of the periphery of the drum covered by one part is substantially twice the angle covered by the other part.

5. A drum according to claim 1 comprising a plain central drum having track rings with shaped edges mounted on the surface thereof and co-operating to form a traverse groove between said shaped edges.

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