

March 16, 1937.

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2,074,022

APPARATUS FOR SPINNING RAYON AND THE LIKE

Filed Oct. 5, 1935

3 Sheets-Sheet 1

Fig. 1,

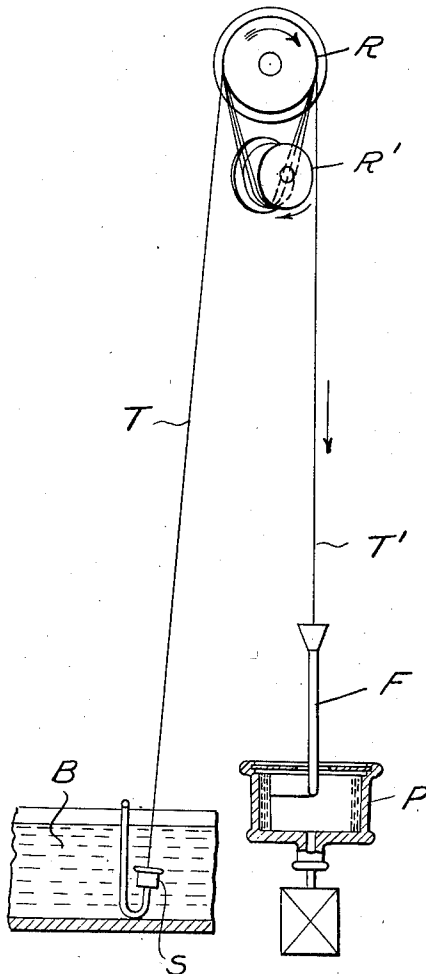
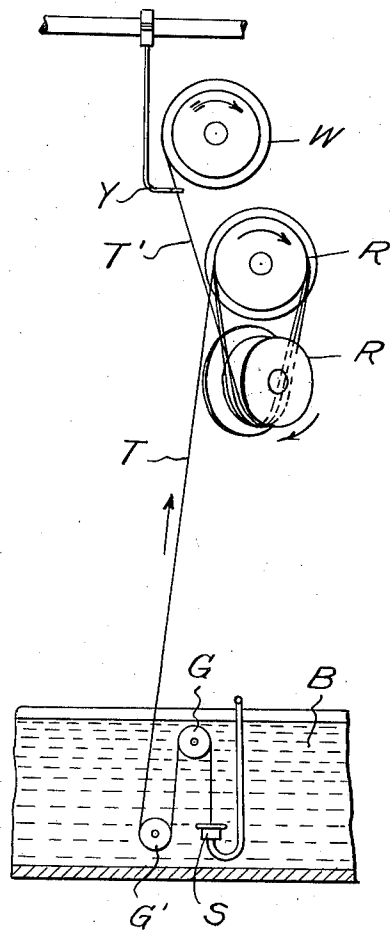


Fig. 2,



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3 Sheets-Sheet 2

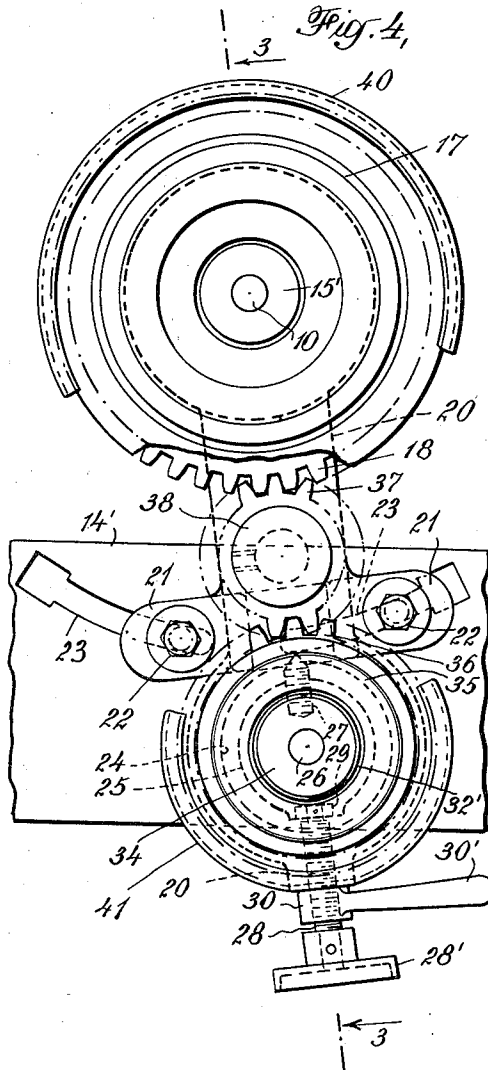
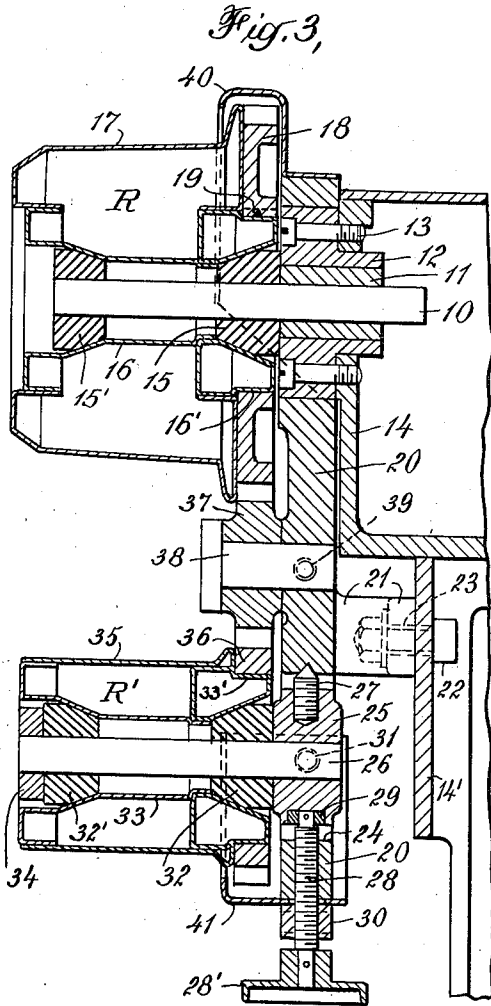
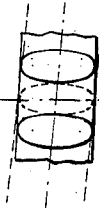


Fig. 7.



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3 Sheets-Sheet 3

Fig. 5,

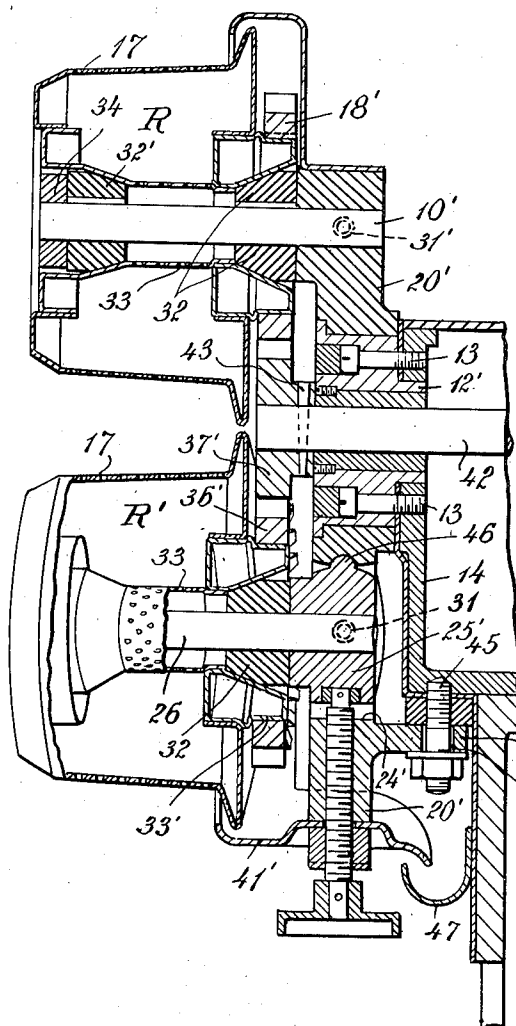
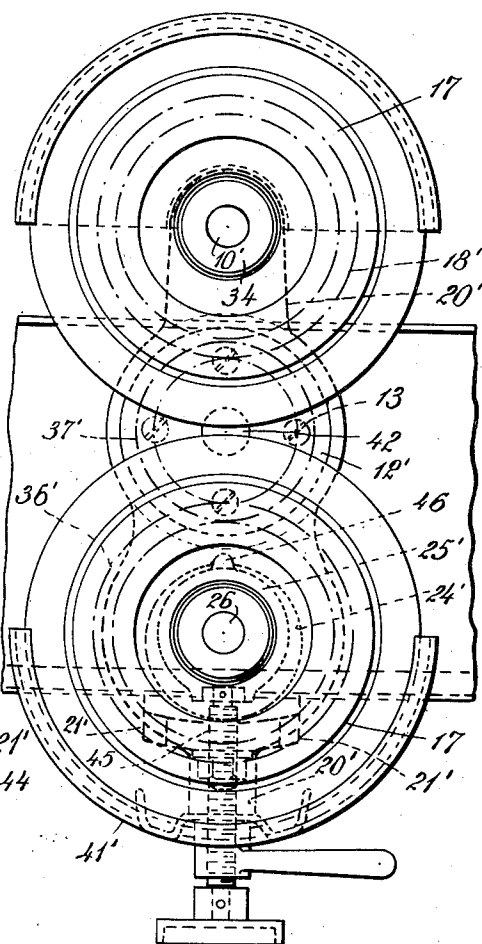


Fig. 6,



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APPARATUS FOR SPINNING RAYON AND
THE LIKE

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10 Claims. (Cl. 18—8)

This invention relates to spinning rayon and the like (artificial silk, artificial horsehair, artificial human hair, ribbons, casings, etc., hereinafter also referred to as thread), and has for its object the provision of an improved method of and apparatus for spinning such material. More particularly, the invention contemplates a spinning apparatus embodying an improved construction and arrangement of two power-driven godets about which the freshly coagulated thread is looped (preferably a number of times) in its passage from the spinnerette to the thread-collecting device. The invention especially aims to provide a simple gear train drive for the godets in combination with means for readily and conveniently adjusting the axes of rotation of the two godets with respect to one another, and for further adjusting the position of one or both of the godets with respect to the stationary support on which the complete mechanism is mounted.

In accordance with the method of the invention the thread is looped over two power-driven godets in its travel from the spinnerette to the collecting device under conditions which effectively prevent slipping of the thread in contact with the godets. A different tension is effected in the thread between the spinnerette and godets than between the godets and collecting device, and the method of the invention aims to prevent an equalization of these tensions.

In the manufacture of rayon and the like by the viscose, cellulose acetate, cuprammonium, etc. processes, the thread is under different tensions during the various steps of the spinning operation, varying in kind and magnitude with the various types of thread-collecting devices such as pots, reels, bobbins, rollers, etc.

In the pot spinning operation, the thread tensions vary and are different before and after the commonly used godet (power-driven drawing roller) positioned between the spinnerette and pot to such an extent that in many instances the moving thread slips over the godet surface, thereby disturbing the desirable uniformity of the spinning operation, which in turn impairs uniform qualities of the intermediate products (spin packages), their subsequent processing, and the finished semi-products (yarn, ribbons, etc.) or either of them, and finally of the various fabrics and products made therefrom. The tension difference between the thread portion before the godet and that after the godet is considerably increased when, for example, the revolutions of the pot and its diameter, or either of them, are increased above the present customary standards of

6,000 to 8,000 R. P. M. and 6 to 7 inches in diameter, respectively, as is the tendency in the pot spinning operation. The increased centrifugal force of the thread portion between the funnel mouth (thread guide) and the pot (collecting device) will then exert a corresponding enhanced tension force primarily upon the thread after the godet. However, the adhesional force of contact between the moving thread and godet surface is frequently overcome by the greater tension force, causing considerable slippage of the thread over the godet in an entirely uncontrollable way. The resulting detrimental influences of constant or irregular thread slippage upon uniformity of denier, dyeing, twist, etc. of threads spun under such uncontrollable conditions as well as the cutting damage to godet and guides by a passing and slipping thread, especially of pigmented type, are well known to those skilled in the art.

In spool spinning operations and the like, the practices of multi-filament spinning, high speed spinning and stretching, or either of them, (the latter being applied mostly between spinnerette and one or more intermediate godets, also between spinnerette and take-up spool) are primarily responsible for enhancing tension in the thread ahead of the godet, or ahead of the various types of collecting devices. Here, again, the increased tension force will cause slippage of the thread on the godet surface, but in the opposite direction than before, in case the surface adhesion force is too small. The resulting disturbances of extrusion, stretching, contracting and winding procedures will cause in this case quite similar damage to the properties of the yarn.

In both cases, these disturbances become naturally greater the higher the thread tension and the thread slippage over the godet surface. Apparently, it is essential to procure a secure grip of the thread passing over the godet in all such spinning operations in which the thread on its way from spinnerette to collecting device is subjected to considerable tension differences, and equalization of such tension differences must be prevented if the anticipated beneficial results are to be attained.

Various expedients have heretofore been suggested for increasing the adhesional friction force of the thread on the godet, with the view of preventing slippage of the thread over the godet surface. The adhesional friction force between godet and the thread must be greater than the maximum differential tension of both thread portions in order to secure a non-slipping grip of the thread on the godet. Since the differential ten-

sion force will be smaller or greater for different contemplated objectives, the corresponding measures provided to prevent thread slippage will be accordingly more or less drastic and effective.

For example, it has been suggested to use a pressure roller for the purpose of pressing the thread onto the godet, thereby preventing thread slippage. As the semi-coagulated filaments are in a highly plastic state, they are liable to be deformed to an undesired extent. Other suggestions require, for example, a lapping of the thread around an ordinary godet in as many loops as are required for overcoming slippage in practical operations, necessitating the application of looping guides in order to prevent tracking of the loops one upon the other. However, in practice, these looping guides do not always perform satisfactorily whether in the form of stationary rods, comb-like structures, etc., or in the form of a freely rotating disk or roller being driven by the thread itself passing over its surface. The thread cuts grooves in the guides and godet surface of ordinary hardness, and the hub friction of a freely rotating guide is frequently irregular and different from spin position to spin position under practical operating conditions, thereby increasing thread tension of irregular magnitude and impairing particularly yarn properties like denier, dyeing and smoothness of surface.

One of the objects of the present invention is to overcome the aforementioned difficulties, and to this end the invention contemplates an improved spinning operation in which thread slippage is effectively prevented for comparatively great thread tension differentials. In employing the apparatus of the invention, this is accomplished by two power-driven godets, obliquely positioned for obtaining and maintaining, both preceding and following the looping of the thread around the godets, a predetermined and optimum tension in each of the various steps of the spinning operation, irrespective of the magnitude and the irregularities in the thread tension in any one of the spinning steps, or either of them.

Another object of the invention is the provision of an improved means for adjusting the position of the two power-driven godets in relation to the extrusion and thread-collecting devices by a pendulum-like carrier for the purpose of attaining an unrestricted thread path onto and from the godets.

A further object of the invention is the provision of improved means for readily and conveniently adjusting one of the godets, by flexibly fastening the godet to the aforementioned pendulum-like carrier between pivoting screws or buttons, one of which is arranged for easy manipulation and free access thereto, thereby permitting the most sensitive adjustment of the feed of the thread loops on the godets during operation.

Still another object of the invention is the provision of improved means for driving the two godets, obliquely and adjustably positioned on an adjustable carrier, by means of a central silent gear having specially shaped teeth which mesh with those of the obliquely and adjustably positioned godet gear for the purpose of securing a flexible, slip-proof and silent drive of both godets, thereby permitting a definite predetermination of the number of loops required to prevent thread-slippage on the godet surfaces under all conditions of operation.

The novel and improved features of the appa-

ratus of the invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which

Fig. 1 is a diagrammatic front elevation of a pot spinning apparatus illustrating the salient principles of operation;

Fig. 2 is a similar diagrammatic front elevation of a spool-spinning apparatus;

Fig. 3 is a vertical section of a portion of a spinning apparatus embodying the invention;

Fig. 4 is a front elevation of the apparatus of Fig. 3;

Fig. 5 is a vertical section of a portion of a spinning apparatus embodying a preferred form of the invention;

Fig. 6 is a front elevation of the apparatus of Fig. 5; and

Fig. 7 is a diagrammatic showing of the specially shaped gear teeth permitting meshing when the gear axes are obliquely positioned, that is, not parallel.

Referring to the drawings, Fig. 1 illustrates in principle the manner in which (for example in the viscose pot-spinning operation) thread T, extruded from the spinnerette S into a spin bath B, is propelled by godets R and R' and fed forwardly on the godets by the obliquely positioned godet R' in as many loops as predetermined for securing a positive non-slipping adhesional grip on both godet surfaces, and is pulled, in passing winding funnel F, into the collecting and twisting pot P by the centrifugal force acting upon the thread portion passing between funnel mouth and thread cake. Ordinarily, thread portion T' is thereby placed under greater tension than thread portion T, said tension becoming the greater the larger the pot diameter and the higher the revolutions of the pot. As equalization of the tensions in the two different thread portions (T and T') is undesirable, effective separating means, such as the invention contemplates, have to be provided in order to prevent under all operating conditions tension equalization between spinnerette and pot.

Fig. 2 illustrates in principle another instance of complete separation of different thread tensions in the viscose spool spinning operation. Thread-portion T, after extrusion from spinnerette S into spin bath B, is pulled over two braking immersion guides G and G' by godets R and R' and is fed in as many loops or slings as desirable around both godets. Thread portion T' is propelled by take-up spool W and wound on it by winding guide Y with such a tension as is advantageous for yarn quality and efficient after-treatment of the yarn package on the spool. Thread portion T is under a greater tension the higher the take-up speed, the more filaments composing the thread and the greater the various retarding and braking forces (e. g. for stretching purposes, etc.) between spinnerette S and godet R. Since the tension in thread portion T' is relatively small, and since the tension of thread portion T increases under certain circumstances to a considerable extent, the tension of thread portion T will tend to equalize with that of thread portion T', until and unless sufficient additional godet surface is brought into action, as provided in this invention, in order to prevent equalization of the two greatly differing thread tensions. The intermediate step of slip-proof looping the thread around two godets for the purpose of delivering a thread portion under high tension to a subsequent processing step where the thread portion is under lower tension, and vice versa, is the

more essential as the difference in thread tensions becomes greater. The tendency in the various spinning processes lies in this direction. The number of loops required to prevent thread slippage is less when both godets are power-driven.

Referring to Figs. 3 and 4 of the drawings, a driving shaft 10 (connected with any suitable source of power) and its associated bearing sleeve 11 are mounted in a flanged hub 12 secured by bolts 13 to a stationary part 14 (e. g. drive box) of the spinning apparatus. A pair of spaced hub-members 15 and 15', of elastic or resilient material, are secured by pressure to the shaft 10. The hub or body member 16 of the upper godet R is secured to the members 15 and 15'. The mantle or exterior member 17 of the godet R is pressed onto the member 16. A gear 18 is mounted on a rearwardly extending hub 16' of the member 16, and is firmly secured in position by a projection 19 on the gear fitting in a corresponding notch in the hub 16'.

A pendulum-like carrier 20 is adjustably suspended from the flanged hub 12. Intermediate its ends, the carrier 20 has two projections 21 adapted to be adjustably secured to the lower wall 14' of the stationary support by bolts 22 registering with slots 23 in the wall. Adjustment of the carrier permits relative adjustment of the position of the two godets R and R', a matter of particular importance for undisturbed guide-free running on and off of the thread portions T and T' respectively, of Figs. 1 and 2.

The lower end of the carrier 20 has a circular hole 24 in which is adjustably positioned a holder 25 for the shaft 26 of the godet R'. Thus, the holder 25 is pivotally mounted in the hole 24 of the carrier 20 by an upper screw 27 and a lower screw 28. The lower screw 28 has an operating knob 28' at its lower end, and a serrated pressure plate 29 is secured to its upper end and fits in a corresponding recess in the holder 25. A lock-nut 30, having a handle 30', is threaded on the screw 28. The shaft 26 can thus be pivoted slightly around the axes of the screws 27 and 28 in a plane parallel to the axis of the driving shaft 10, thereby permitting setting of the axis of the shaft 26 slightly obliquely to the axis of the shaft 10 for a predetermined feed of the thread loops on both rotors. For the sake of clarity, this angular deviation of the axes of the shafts 10 and 26 is not indicated in Figs. 3 and 4. A most accurate oblique adjustment of shaft 26 during operation can be effected by manipulation of the lower screw 28 and lock-nut 30, both easily accessible to the operator for a slight loosening and tightening of the frictional engagement of the serrated pressure plate 29 when changing the feeding angle by simultaneously pivoting shaft 26 with the other hand to the desired extent.

The shaft 26 is rigidly secured to the holder 25 by a pin 31. Acid resistant and self-lubricating bearings 32 and 32' are secured to the hub or body member 33 of godet R'. The bearings are rotatably mounted on the shaft 26, the rotating unit being held on the shaft by an elastic ring 34 secured to the outer end of the shaft. The mantle 35 of the godet R' is pressed onto the member 33. A gear 36 is mounted on a rearwardly extending hub 33' of the member 33 and is securely held in position thereon.

A gear or pinion 37, freely rotating on a shaft 38 rigidly secured to the carrier 20 by a pin 39, meshes with the gears 18 and 36. The teeth of gear 36 and pinion 37 are shaped as indi-

cated in Fig. 7 on account of the oblique operating position of shaft 26 and the associated godet R'. The gears and pinion may advantageously be made of material insuring practically noiseless operation, such, for example, as medium soft rubber. The gear train composed of gears 18, 36 and 37 is driven by the driving shaft 10. All parts of the apparatus subject to wear and tear or manufacturing changes, such as gears, bearings, godet mantles, etc., are arranged for easy exchange and replacement.

Shields 40 and 41 are secured to the top and bottom, respectively, of the carrier 20 to protect the gears 18 and 36, respectively, and to diminish splashing of excess bath by godet rims and gears.

The godet mantle 35 is substantially cylindrical and of smaller diameter than the godet mantle 17. These mantles are exchangeable and either may be replaced with mantles of other desired configurations and dimensions at will. The front end of the mantle 17 is especially shaped for easily collecting and removing the waste yarn spun while the take-up spools are doffed.

Figs. 5 and 6 of the drawings show a modified, and in some respects a preferred, form of the invention. The gear train composed of gears 18', 37' and 36', is driven by a driving shaft 42 to which the gear or pinion 37' is secured by a pin 43. The pendulum-like carrier 20' is suspended from a flanged hub 12' attached to the stationary support 14 by bolts 13. Near its lower end, the carrier 20' has a projection 21' with a slot 44. A bolt 45 extending through the slot 44 secures the projection 21' (and the carrier 20') to the stationary support 14 in any desired adjusted position.

A shaft 10' (for godet R) is secured to the upper end of the carrier 20' by a pin 31'. Another shaft 26' (for godet R') is secured by a pin 31' to a holder 25' adjustably positioned in a hole 24' in the lower part of the carrier 20'. A projection 46 at the top of the holder 25', seated in a corresponding recess in the upper surface of the hole 24', serves as the upper pivot for effecting angular adjustment of the shafts 10' and 26'. Such angular displacement of the shaft 26' with respect to the shaft 10' is illustrated in Fig. 5, but not in Fig. 6. In Figs. 5 and 6 the godets R and R' are of the same configuration and dimensions. The hubs 33 and mantles 17 may be perforated as indicated.

Godets R and R' are secured to their respective shafts 10' and 26' in the same manner that godet R' is secured to shaft 26 in the apparatus of Figs. 3 and 4. The lower shield 41' is arranged to drain or discharge into a well 47 attached to the stationary support 14.

In other respects the apparatus of Figs. 5 and 6 is the same as that of Figs. 3 and 4 and corresponding parts are indicated by the same reference characters.

The operation of the apparatus will be understood from the foregoing description. Without departing from the spirit of the invention, the flexible gear drive may be replaced by any other suitable slip-proof driving mechanism, and the apparatus may be attached to the spinning machine in any suitable position or location.

I claim:

1. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft and adapted to be adjustably secured to said support, a pair of

godets at least one of which is mounted on said carrier, and means operatively connecting said shaft to said godets.

2. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft and adapted to be adjustably secured to said support, a pair of godets of which one is pivotally mounted on said carrier for adjusting its axis of rotation with respect to the axis of rotation of the other godet, and means operatively connecting said shaft to said godets.

3. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft and adapted to be adjustably secured to said support, said carrier having an opening in which is pivotally mounted a shaft holder, a godet rotatably carried on a shaft secured to said holder, a second godet, and means operatively connecting said driving shaft to said godets.

4. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft, a pair of godets at least one of which is mounted on said carrier, means for angularly adjusting the axis of rotation of one of said godets with respect to the axis of rotation of the other godet, and means operatively connecting said shaft to said godets.

5. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier pivotally suspended around said shaft, means for adjustably securing said carrier to said support, said carrier having an opening in which is pivotally mounted a shaft holder, means for adjustably securing said holder in the opening of said carrier, a godet rotatably carried on a shaft secured to said holder, a second godet, and means operatively connecting said driving shaft to said godets.

6. An apparatus for spinning rayon and the like comprising a stationary support, a driving

shaft rotatably carried by said support, a carrier suspended around said shaft and adapted to be adjustably secured to said support, a pair of godets mounted on said carrier on opposite sides of said shaft, and means operatively connecting said shaft to said godets.

7. An apparatus for spinning rayon and the like comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft and adapted to be adjustably secured to said support, a pair of godets mounted on said carrier on opposite sides of said shaft, means for angularly adjusting the axis of rotation of one of said godets with respect to the axis of rotation of the other godet, and means operatively connecting said shaft to said godets.

8. An apparatus for spinning rayon and the like, comprising a stationary support, a driving shaft rotatably carried by said support, a carrier suspended around said shaft, a pair of godets at least one of which is mounted on said carrier, means for moving said carrier with respect to said support and for securing the carrier to the support in adjusted position, and means operatively connecting said shaft to said godets.

9. An apparatus for spinning rayon and the like, comprising a stationary support, a shaft mounted on said support, a carrier suspended around said shaft, a pair of godets at least one of which is mounted on said carrier, means for angularly adjusting the axis of rotation of one of said godets with respect to the axis of rotation of the other godet, and means for driving said godets.

10. An apparatus for spinning rayon and the like, comprising a stationary support, a driving shaft rotatably carried by said support, a pivotally mounted carrier adapted to be adjustably secured to said support, a pair of godets mounted on said carrier on opposite sides of said shaft, means for angularly adjusting the axis of rotation of one of said godets with respect to the axis of rotation of the other godet, and means whereby said shaft drives said godets in unison.

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