

Dec. 30, 1952

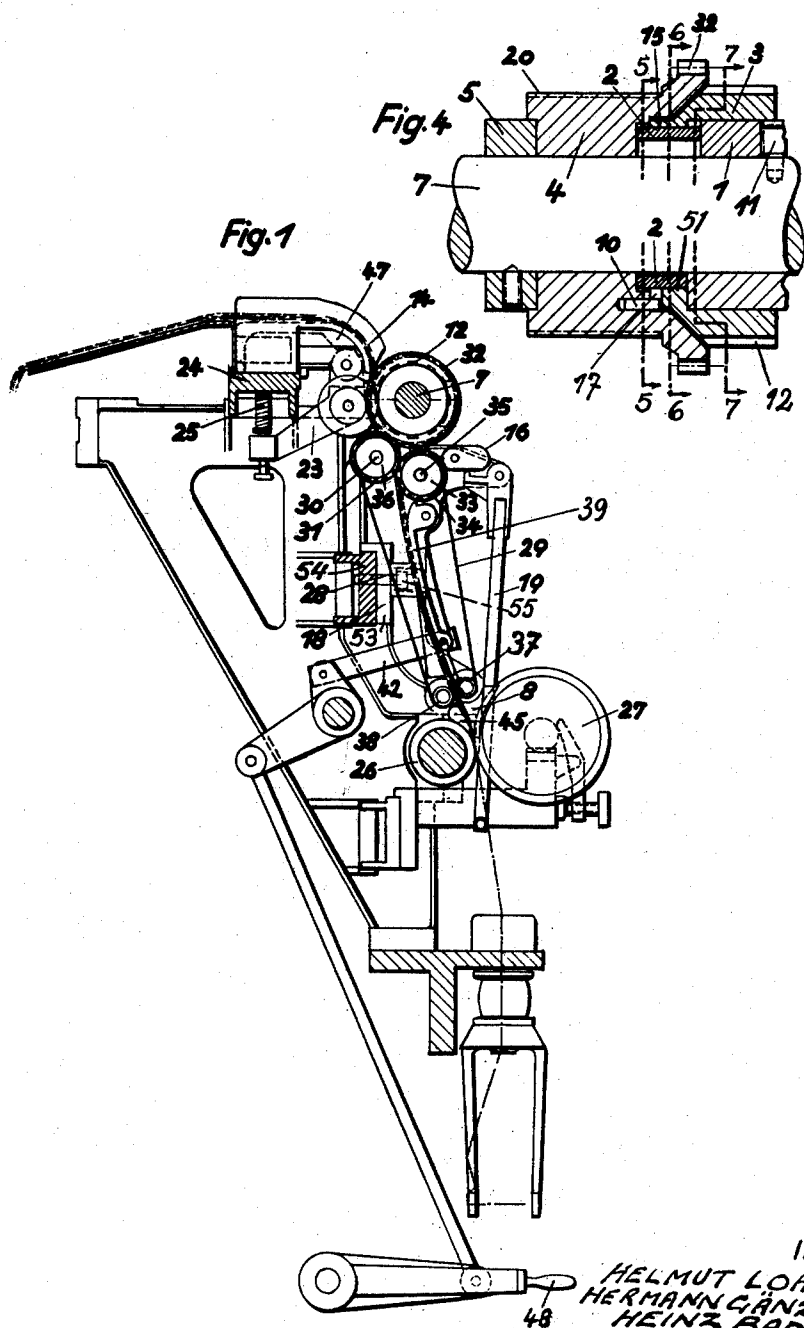
H. LOHFERT ET AL

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DRAWING MECHANISM FOR SPINNING MACHINES

Filed May 5, 1950

3 Sheets-Sheet 1



Inventors
HELMUT LOHFERT
HERMANN GÄNIGKE &
HEINZ SADE
by
Hames, Dickey, & Piere

Attorneys

Dec. 30, 1952

H. LOHFERT ET AL

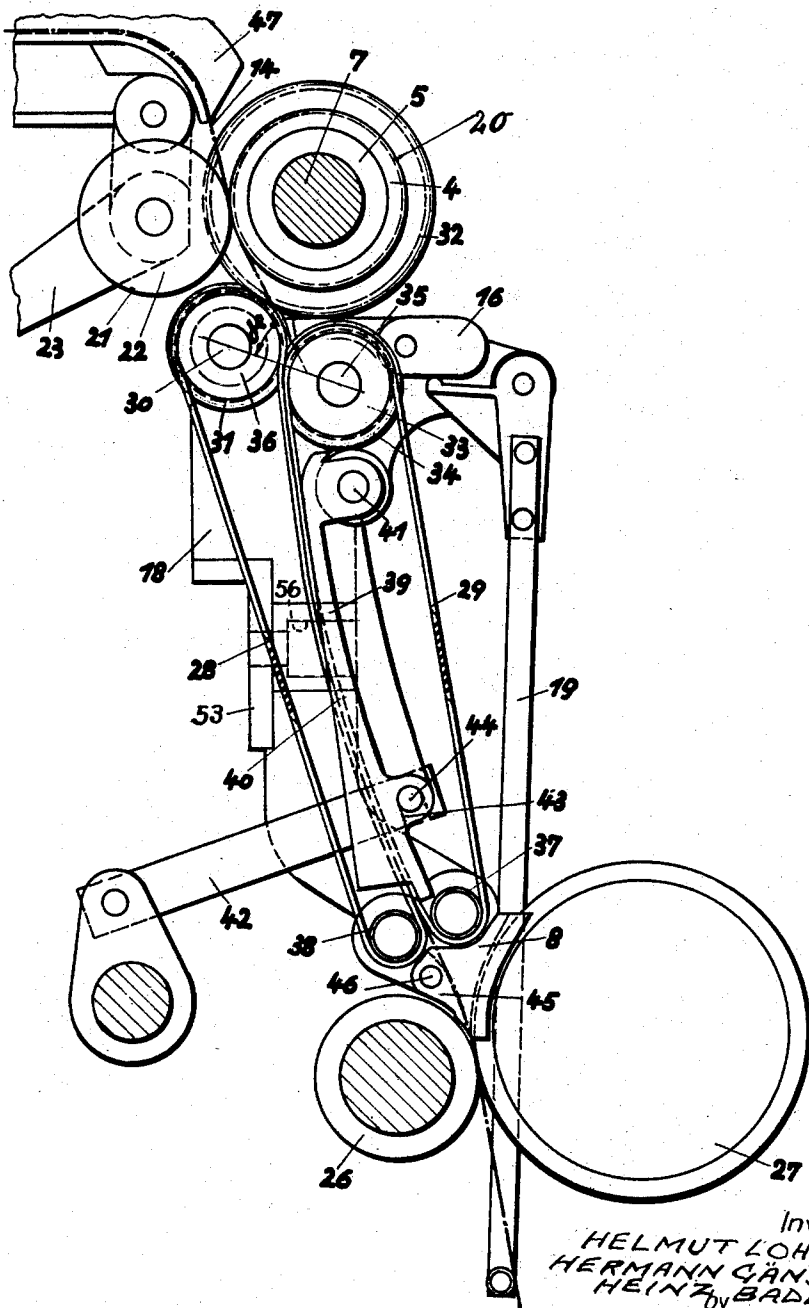
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Fig. 2



Inventors
HELMUT LOHFERT
HERMANN GÄNSICKE &
HEINZ BADE

*Hans Rieck &
Pierce*

Attorneys

Dec. 30, 1952

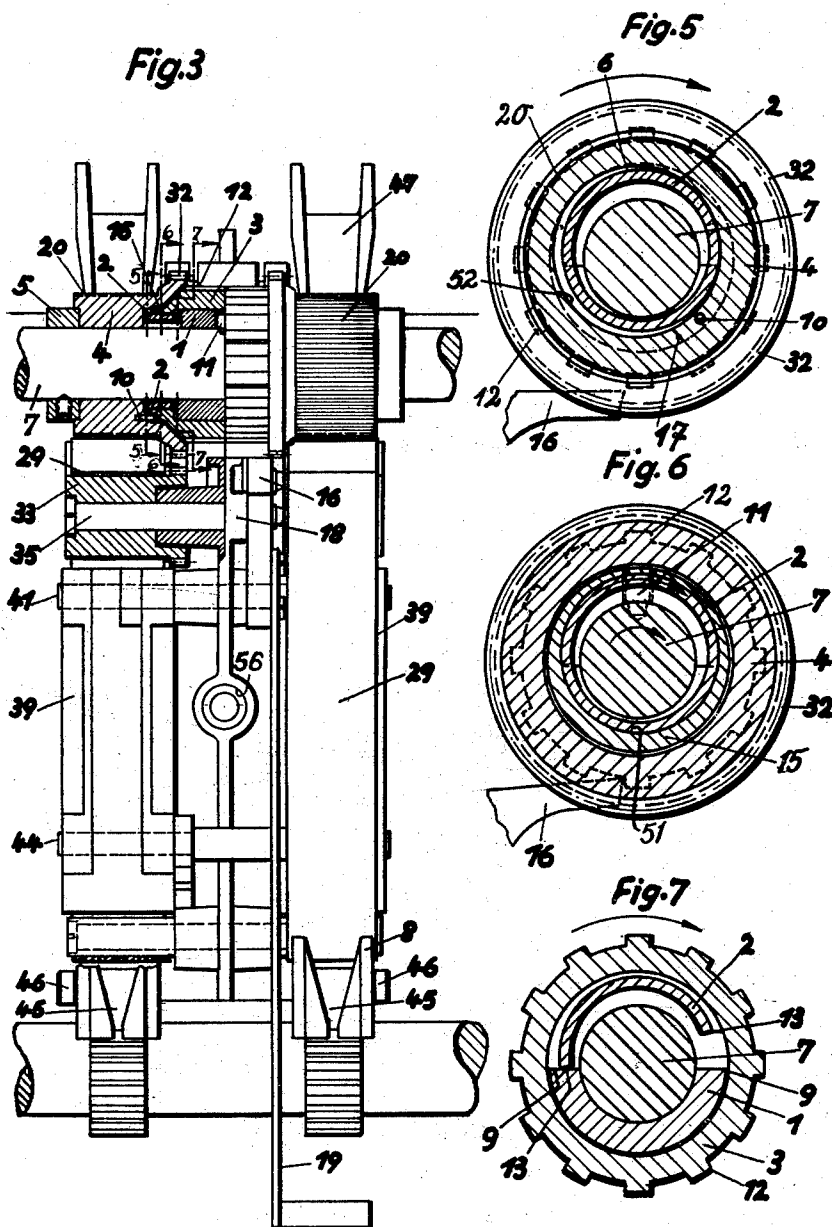
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Inventors
HELMUT LOHFERT
HERMAN GÄNSICKER
HEINZ BRÄDE
by

Hans Dickey
Attorney

UNITED STATES PATENT OFFICE

2,623,346

DRAWING MECHANISM FOR SPINNING MACHINES

Helmut Lohfert, Hamburg-Blankenese, Hermann Gänsicke, Hamburg-Fuhlsbüttel, and Heinz Bade, Hamburg, Germany; Henriette Karoline Else Gänsicke, Kurt Hermann Hans Gänsicke, and Werner Alfred Paul Gänsicke, sole heirs of said Hermann Gänsicke, deceased

Application May 5, 1950, Serial No. 160,264
In Germany January 16, 1950

15 Claims. (Cl. 57—36)

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This invention relates to spinning machines and more particularly to the fine spinning of particularly long leaf fibers, such as jute.

In the spinning of bast fibers or long leaf fibers, the fiber band before it is spun by the fine spinning machine into a finished thread is given a third drawing whereby it is stretched and doubled, and is then taken to a roving frame in which the fiber band is again stretched and drawn, after which it is twisted together into a loose rove and wound on bobbins. The necessity of winding this rove on bobbins is a serious defect which ordinarily cannot be overcome, and the roving frame itself, as well as the necessity of a third drawing operation, present further disadvantages in cost of equipment and operation.

It has been proposed, as in the so-called gill spinning machines, to spin the finished article direct from the band emerging from the last drawing machine without the interposition of a roving frame. In this mechanism, a positively driven pin-drawing device is incorporated whose pin bar simultaneously draws and supports the fiber band. This machine has a disadvantage of being unable to receive, without additional complications, an automatic stopping device controlled by thread breakage.

Although a spinning frame for long bast fibers usually is provided with a supporting plate between the feed and delivery rollers, it is impossible to provide such a machine with a positively driven drawing device since the rove is given a twist in the roving frame. It is known to provide a drawing device in a spinning frame comprising a series of stationary brake members which divert the fiber band in waves transverse to their direction of movement. In this manner, a spinning frame can be provided with a stopping device operative on thread breakage since this supporting device would not impair the operation of such a stopping device. However, this arrangement enables only limited drawing of the band, and cannot avoid a third drawing operation in the manufacture of a light weight band. Furthermore, a light weight band, such as must be used in such an arrangement, has such small strength that additional measures, such as curling the fiber band, must be provided to strengthen the band.

It is an object of the present invention to overcome the above described disadvantages of heretofore known mechanisms by providing a fine spinning arrangement by which all thread sizes met in practice can be manufactured without the use of a roving frame and without employing a third drawing operation.

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It is another object to provide such a mechanism, comprising a stopping device operable on thread breakage and a drawing device arranged between the feed rollers and delivery rollers, the drawing device being positively driven through the feed rollers so that the feed rollers and drawing device will be simultaneously halted upon thread breakage, thereby obviating the loss of any material.

It is also an object to provide a mechanism as described above in which the drawing device extends a distance substantially equal to the distance between the feed and delivery rollers, and is positively driven throughout its entire length, so that it is possible to stretch the thread a relatively large amount without difficulty.

It is another object to provide a mechanism of the above character in which it is possible to feed to the spinning frame a fiber band of comparatively light weight and yet to manufacture thread of normal strength and even fine thread. In this manner, sufficient strength of the fiber band is insured so that no additional measures need be taken to avoid breakage, and the roving and third drawing operations may be dispensed with. In certain circumstances, the drawing device of this invention could be further provided with additional pressure delivery rollers so that the doubling operating during the last drawing may also be omitted.

It is also an object to provide a drawing device of the above character, which is in the form of a pair of endless bands in adjacent relation and between which the fiber band is held and supported, one of this pair of bands being positively driven by the driven feed roller.

It is a further object to provide a drawing device of the above character which further embodies a pressure applying element adjacent the endless bands, by which the pressure application point is adjustable in the direction of movement of the fiber band.

It is another object to provide a mechanism of the above character, in which the elements of the drawing device are all mounted on a common frame which is detachable from the main frame of the machine, thus affording ready removal of the drawing device from the machine. In association with this object, it is within the contemplation of this invention to provide a driving mechanism for the drawing device comprising toothed wheels or gears which only need be separated in order to detach the drawing device.

It is a further object of the invention to provide a mechanism in which the drawing device cooperates with a highly efficient releasable coupling

device for the driven feed roller, this coupling device operating in such a manner that the driven feed roller is positively braked upon thread breakage in addition to being released from engagement with the drive shaft.

Further improvements and desirable developments of the inventive idea are illustrated in the accompanying drawings in which an embodiment of the invention is shown in simplified form. In the drawings,

Fig. 1 shows in section those parts of a spinning frame constructed in accordance with the invention which are necessary for an understanding thereof.

Fig. 2 shows part of Fig. 1 on a large scale.

Fig. 3 shows a view of part of the machine of Fig. 1, in which in the left-hand portion the main parts of the embodiment are shown in section.

Fig. 4 shows a part of the left-hand upper part of Fig. 3 on a larger scale in order better to illustrate the coupling there shown.

Fig. 5 shows a cross-section along line 5—5 of Figs. 3 and 4 of the engaged coupling on the same scale as Fig. 4.

Fig. 6 shows a cross-section along line 6—6 of Figs. 3 and 4 of the disengaged coupling on the same scale as Fig. 4, and

Fig. 7 shows a cross-section along line 7—7 of Figs. 3 and 4 which shows in particular how the eccentric ring of the coupling is driven.

The invention comprises, in general, a drawing device which is arranged on a fine spinning machine having a pair of feed rollers and a pair of delivery rollers, and in which the driven feed roller is provided with a coupling having a stopping device operated on thread breakage. The particular nature of this coupling is not critical, although a preferred coupling is described in detail, and is such as that described in copending application No. 157,558, filed April 22, 1950, in the name of Heinz Bade. The drawing device is arranged between feed rollers and delivery rollers, and is of such length as to extend between these pairs of rollers. The drawing device preferably comprises a pair of endless belts or bands which are positively driven from the driven feed roller, the fiber band passing between these endless belts. The drawing device further comprises a pressure applying element preferably in the form of an elongated shoe pressed against the back of one of the endless belts, and this shoe has means for adjusting the pressure point on the fiber band along its path of movement.

In the embodiment two drawing mechanisms are arranged together as a pair as may be understood from Figs. 3 and 4. The drawing mechanisms are mirror images of one another so that it is sufficient for a description of the invention to consider one drawing mechanism.

On a common driving shaft 7 is arranged a coupling which will be further described later and which comprises among other components a detent ring 3 which is mounted so as to rotate freely on the concentric bearing surface of a driving ring 1 which is, in turn, secured to the shaft 7, for instance by means of a pin 11. The driven feed roller is indicated by 4 and is controlled by the detent ring 3 as will be further described later so that when the detent ring is held, the connection between the driving shaft 7 and the feed roller 4 is disengaged while on rotation of the detent ring, that is to say when it is not held the connection between the driving

shaft 7 and the feed roller 4 is restored. For this purpose the detent ring 3 is provided with a number of detents or projections 12 equally spaced about its periphery which co-operate with the end of a locking pawl 16 pivotally mounted on the frame 18 of a drawing device and operated by means of a thread feeler 19 which is likewise pivotally mounted on the frame of the drawing device. The frame 18 is detachably secured to the pedestal 24 of the machine by means of inter-fitting portions 53 and 54 on the frame 18 and pedestal 24 respectively. A bolt 55 disposed in a recess 56 on frame 18 serves to secure portions 53 and 54 together.

The driven feed roller 4 is provided at its periphery with fluting 20 which co-operates with fluting 21 provided on the pressure roller 22. The rollers 4 and 22 act together as a pair of feed rollers, the roller 22 being rotatably mounted on a bell-crank lever 23 of which one arm is pivotally mounted in the pedestal 24 of the machine while the other arm is supported against the pedestal by means of a spring 25. The pressure roller 22 is thus spring pressed against the driven roller 4. A pair of delivery rollers 26, 27 is also mounted in known manner on the machine pedestal and is driven at a higher speed than the feed rollers 4, 22 in order to draw the band.

The drawing mechanism is mounted on a common frame 18 which can be separately detached from the main machine frame. A belt drawing device is mounted on a frame 18 (Figs. 1, 2 and 3) between the feed and delivery rollers and comprises essentially two endless bands 28, 29 which in this embodiment are made of rubber and may be rippled in a transverse direction. The entry roller 36 of the rotating band 28 is rotatably mounted on a spindle 30 secured to the frame 18 and is provided with a spur gear 31 which engages with a corresponding spur gear 32 provided on the feed roller 4. The spur gear 31 also engages with a spur gear 34 provided on a roller 33. The roller 33 serves as the entry roller for the endless band 29 and is rotatably mounted on a spindle 35 also secured to the frame 18. This belt drawing device permits on the one hand a high delay with best efficiency and on the other hand a high rate of operation of the fine spinning machine.

Both rollers 33 and 36 are mounted adjacent the pair of feed rollers 4, 22 in such a manner that the line joining the axes of the two spindles 30 and 35 makes with the incoming band of fibers an angle γ which is less than 90° . Since the rotating bands of the belt drawing device are not in engagement at this point, this provides security against gripping the fibers so that neither of the feed rollers of the belt drawing device need be flexibly mounted. The distance between the two axes 30 and 35 is so chosen that, taking into account the thickness of the rotating bands 28, 29, a small clearance is still left between these bands at the narrowest point between the two rollers 33 and 36. Both endless bands 28, 29 are in addition taken over two rollers 37, 38 which are also mounted on the frame 18. These rollers are made comparatively small to enable them to be mounted as near as possible to the delivery rollers 26, 27.

A pressure applying device is associated with the inner surface of the rotating band 29 for the purpose of applying pressure to the fiber band and thus gripping it between the endless belts. This device in the example comprises a shoe 39 having a curved surface 50 which is

pivotally mounted upon a pin 41 parallel to the axes of the spindles 30, 35. The pin 41 is also secured to the frame 18 of the drawing device. The shoe 39 is adjusted by hand through a lever 42 which engages with a bearing 43 open on one side by means of a pin 44 which is itself secured to the shoe. In this manner, the installation and dismantling of the shoe is simplified since only the lever must be rotated to free the shoe pin. By operation of this lever 42 by means of the handle 48 the point at which the rotating bands 28, 29 are pressed together by the curved surface 40 of the shoe 39 can be varied as determined by the length of the fibers being worked at that moment. In general it will be understood that such a handle 48 is provided in common to all the drawing mechanisms of a machine.

Also secured to the frame 18 of the drawing device is a delivery guide 45 which in the example is pivotally mounted on a spindle 46. In the example it is provided with lateral horns or shields 8 which extend between the delivery roller 27 and that part of the band 29 which passes round the roller 27 and are arranged to protect the fingers of the operator when for example after a thread breakage, the end of the thread is again fed through. A band guide 47 is provided on the pedestal 24 of the machine in advance of the pair of feed rollers 4, 22. The shoe 39 and also the delivery guide 45 and the band guide 47 are made by injection moulding from synthetic material, for instance a thermoplastic substance or artificial resin.

It is preferable that the thread feeler 19 together with those parts of the coupling which are affected by a thread breakage, and hence in the example the detent ring 3 shall be located on the service side of the machine and the pressure roller 22 on the opposite side. In this manner the ease of supervision of the machine is considerably increased.

As stated previously, the particular construction of the coupling and stopping device illustrated is not critical, although it is shown as a preferred mechanism for use to cooperate with the drawing device described. Each of the detent rings 3, which are mirror images of one another, is provided with an extension piece 15 which passes beyond the driving ring 1 and which is provided with an eccentric boring 51 as shown more particularly in Figs. 3, 4 and 6. This boring serves as a bearing for a rotating ring 2. This rotating ring, as more particularly shown in Figs. 3, 4, and 7 is provided with radial surfaces 13 extending towards the driving ring 1. Correspondingly the driving ring 1 is provided with approximately radially extending driving surfaces 9 so that the rotating ring 2 and the driving ring 1 are in engagement through these extension pieces. So long as one surface 13 engages with a surface 9 of the driving ring 1, the rotating ring 2 is driven constantly by the rotating shaft 7. It should be noted that a clearance is provided between the inner circumference of the rotating ring 2 and the shaft 7.

The other end of the rotating ring 2 extends into the eccentric boring 52 of the feed roller 4. The eccentricity of the boring of the feed roller 4 is in the example the same as the eccentricity of the eccentric mounting of the rotating ring 2 in the detent ring 3. The boring in the feed roller 4 is however, made a few millimetres, for example 2 mm. larger than the outer diameter of the rotating ring 2. With this example

of 2 mm. it is assumed that the eccentricity is about 3 mm.

The feed roller 4 is freely mounted on the driving shaft 7, and is secured in a longitudinal direction by a locking collar 5. Instead of a locking collar, a locking ring may, for example be used. In order to prevent as far as possible the ingress of dust and dirt into the interior of the coupling extension 15 of the detent ring 3 having a concentric outer surface engages in a corresponding concentric boring in the feed roller 4. The inner surface of this extension, as already explained in detail above, is formed eccentrically for the guiding and mounting of the rotating ring 2.

For engagement of the coupling the detent ring 3 is not held fast. It is therefore carried round by the moving driving shaft 7 through friction with the constantly rotating driving ring 1. The rotating or eccentrically mounted ring 2 is likewise positively driven by the shaft 7 through the engaging surfaces 9, 13. Since it is guided and supported by the eccentric boring in the detent ring 3 and this detent ring rotates constantly with the shaft 7, the eccentrically mounted ring is thus also revolved in a kind of crank motion about the axis of rotation of the driving shaft. Relative movement between the outer surfaces of the eccentric ring and the eccentric guiding surface of the detent ring 3 does not therefore take place. Since there is play between the eccentric boring of the feed roller 4 and the outer periphery of the eccentrically mounted ring 2, at the beginning of the engagement the eccentrically mounted ring slightly overruns the lagging feed roller in a direction opposite to the rotation of the driving shaft. Hence due to the narrow wedge-shaped crescent-space 6 between the eccentric boring of the feed roller 4 and the outer periphery of the eccentrically mounted ring 2, a wedging or locking action occurs which causes a rigid coupling between the feed roller and the eccentric ring. Since the latter constantly moves around the rotary axis of the driving shaft, the feed roller 4 is positively driven by this shaft.

When the coupling is to be disengaged, the detent ring is held fast by means of the catch 16 controlled by the thread feeler, thus preventing the detent ring moving further with the driving ring 1. The detent ring in this manner maintains the eccentricity of the eccentrically mounted ring in a particular radial position. Since however the eccentric ring is still driven by the shaft 7 through the engaging surfaces 9, 13 it now continues to rotate about its eccentric axis the position of which with relation to the axis of rotation of the shaft is fixed in a definite manner by the eccentric boring of the detent ring. This is rendered possible in that relative movement can take place between the engagement surfaces 9, 13 and that there is sufficient play between the eccentrically mounted ring 2 and on one hand the shaft and on the other hand the concentric boring of the detent ring 3.

Through this movement of the eccentrically mounted ring 2 around its eccentric axis, it follows that the locking action between it and the feed roller ceases since both parts are immediately separated from one another whereby the feed roller moves slightly in the direction of rotation. This movement is aided by friction between it and the driving shaft on which it is actually mounted. The driving connection between the eccentrically mounted ring and the

feed roller is thus interrupted and the coupling is disconnected.

There is now the risk in some circumstances that with the coupling disconnected the feed roller moves further in the direction of rotation since it is, for example, acted upon due to friction by the shaft 7. In due course there occurs a further wedging action between the eccentrically mounted ring still rotating about its eccentric axis and the feed roller. The two parts are thereby firmly connected together so that the feed roller will tend to carry round the eccentrically mounted ring about the rotary axis of the driving shaft. This however would lead to breakage since the position of eccentricity of the eccentrically mounted ring is in fact determined in a definite manner by the detent ring. In order to obviate this danger, means are provided to limit further rotation of the feed roller from the coupling position. In the embodiment a pin 10 fixed to the feed roller serves for this purpose, the pin engaging with suitable play in a notch 17 provided in the detent ring 3 (Figs. 3, 4 and 5).

What we claim is:

1. In a machine for the fine spinning of long leaf fibers, of the type having feed rollers, and delivery rollers, an automatic stopping device for the driven feed roller upon breaking of the thread, the combination with such machine of a drawing device disposed between said feed rollers and delivery rollers, said device extending substantially the distance between the feed rollers and delivery rollers and supporting the thread during its drawing engagement with the thread, and driving means for said drawing device, said driving means being actuated by the driven feed roller.

2. The combination according to claim 1, said stopping device being provided with braking means for the driven feed roller, said braking means being operative to prevent movement of the driven feed roller when the stopping device is actuated by thread breakage.

3. In a mechanism for the spinning of long leaf fibers, a pair of feed rollers, a pair of delivery rollers, means for operatively driving one of said feed rollers, a coupling between said driving means and said driven feed roller, stopping means actuated by thread breakage for actuating said coupling to disconnect said driving means from said driven feed roller, a drawing device for the thread extending substantially the distance between said feed rollers and said delivery rollers, and a positive driving connection between said driven feed roller and said drawing device, whereby said drawing device will be halted upon disconnection of said coupling.

4. In a mechanism for the fine spinning of long leaf fibers of the type having a pair of feed rollers and a pair of delivery rollers, a drawing device comprising a pair of endless belts extending substantially the distance between said feed rollers and delivery rollers, said belts having facing portions adapted to receive the thread therebetween and driving means for said belts, said driving means comprising a roller supporting one of said belts, and a driving connection between one of said feed rollers and said belt roller.

5. The combination according to claim 4 further provided with a roller supporting the other of said belts, the line connecting the axes of the two belt rollers making an acute angle with the thread.

6. The combination according to claim 4, said belts being fabricated of stretchable material.

7. In a mechanism for the spinning of fibers, a drawing device comprising a pair of endless belts adapted to engage said fiber therebetween, and a pressure applying device engageable with one of said belts, said pressure applying device comprising an elongated shoe having a fixed pivotal axis at one end and a curved surface engageable with said one belt, and means for adjusting the pivotal position of said shoe, whereby the point of pressure application of said shoe may be adjusted in the direction of movement of the fiber.

8. In a mechanism for the spinning of fibers, a drawing device for the fiber band comprising a pair of endless belts adapted to hold the fiber band therebetween, means for positively driving said belts, a roller for supporting each of said belts, and a pressure applying device comprising a shoe with a curved surface engageable with one of said belts so as to urge said belt against the fiber band, a fixed pivotal support for said shoe, the axis of said pivot being parallel to the axes of said belt supporting rollers, and means for adjustably holding the shoe in a predetermined pivotal position.

9. The combination according to claim 8, said adjusting means comprising a manually operable lever and a pin and open bearing connecting said lever to said shoe, whereby the lever may be readily disconnected from the shoe.

10. In a spinning machine, a pair of feed rollers, one of said feed rollers being positively driven, a pair of delivery rollers, a drawing device extending between said feed rollers and said delivery rollers, means for positively driving said drawing device from said driven feed roller, driving means for said driven feed roller, a coupling device connecting said driven feed roller to said driving means, said coupling device comprising a detent ring rotatably mounted on said driving means and normally rotating therewith, an eccentrically mounted ring supported by said detent ring in eccentric relation with said driving means, said eccentrically mounted ring being engageable with said driven feed roller to positively drive the same, and means for preventing rotation of said detent ring with said driving means, whereby the driving engagement of said eccentrically mounted ring with said driven feed roller is interrupted.

11. In a spinning machine, a pair of feed rollers, a pair of delivery rollers, a drawing device extending between said feed rollers and said delivery rollers, said drawing device comprising a pair of endless belts adapted to receive the fiber band therebetween, rollers for supporting said endless belts, driving means for one of said feed rollers, gear driving means between said driven feed roller and one of said belt supporting rollers and gear driving means between said belt supporting rollers.

12. The combination according to claim 11 further provided with a coupling device for stopping movement of said driven feed roller, said coupling device comprising a detent ring rotatably mounted on said driving means and normally rotatable therewith, an eccentrically mounted ring supported by said detent ring in eccentric relation with said driving means, said eccentrically mounted ring being engageable with said driven feed roller to positively drive the same, and means operated on thread breakage for preventing rotation of said detent ring, whereby positive driving of said driven feed roller is interrupted.

13. The combination according to claim 12 further provided with means for braking said driven feed roller upon said coupling being disconnected.

14. In a spinning mechanism, a drawing device comprising a pair of endless belts adapted to receive a fiber band therebetween, a pair of rollers for supporting said belts, a pressure applying device engageable with one of said belts for adjustably applying pressure to said fiber band, gear driving means for said belt rollers, a common frame for said belt rollers and said pressure applying device detachable from the main frame of the machine, a second pair of rollers for supporting said belts, and a delivery guide adjacent said rollers, said guide having a plurality of lateral horns for protecting the fingers of the operator.

15. The combination according to claim 14, said pressure applying device and said guiding device being fabricated of synthetic molded material.

HELMUT LOHFERT.
HERMANN GÄNSICKE.
HEINZ BADE.

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