

Sept. 11, 1934.

M. B. STONE ET AL

1,973,582

FRAME

Filed Dec. 8, 1932

3 Sheets-Sheet 1

Fig. 1.

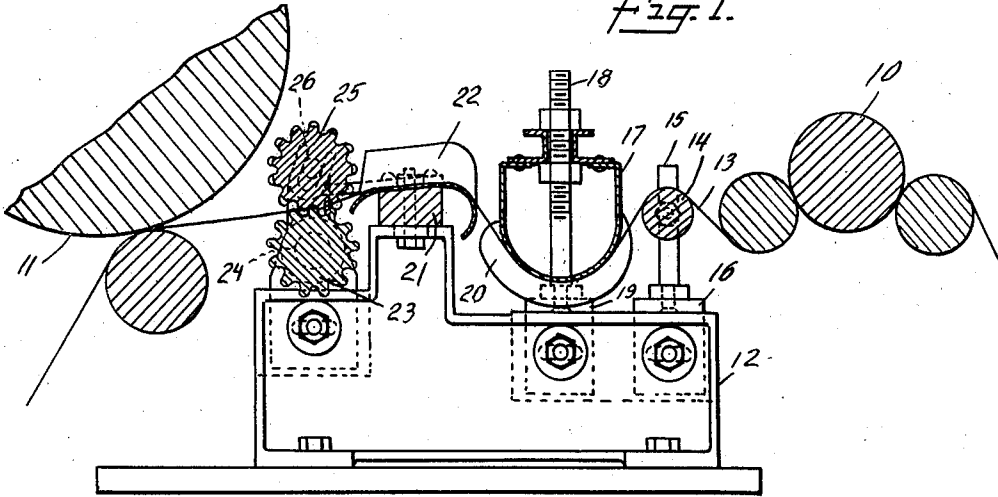
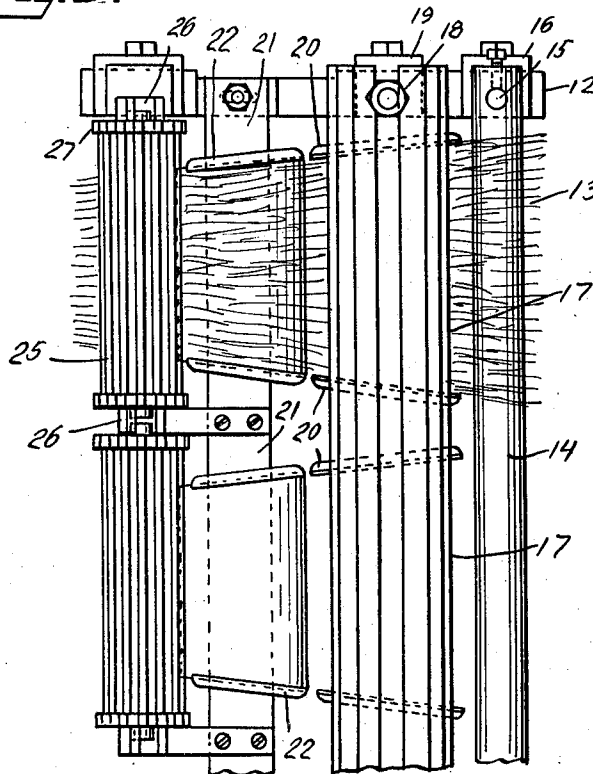


Fig. 2.



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Fig. 4.

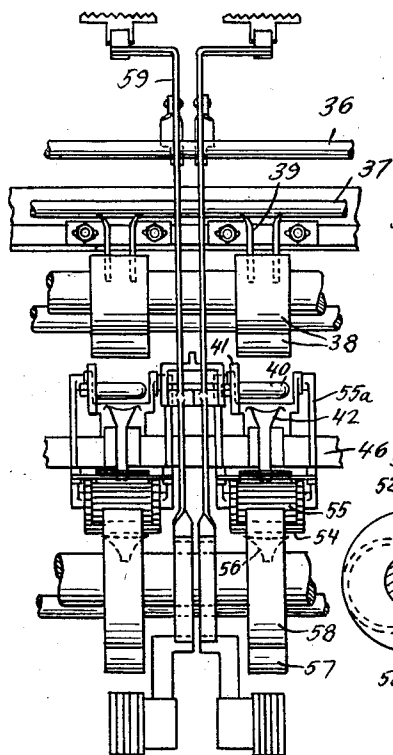


Fig. 3.

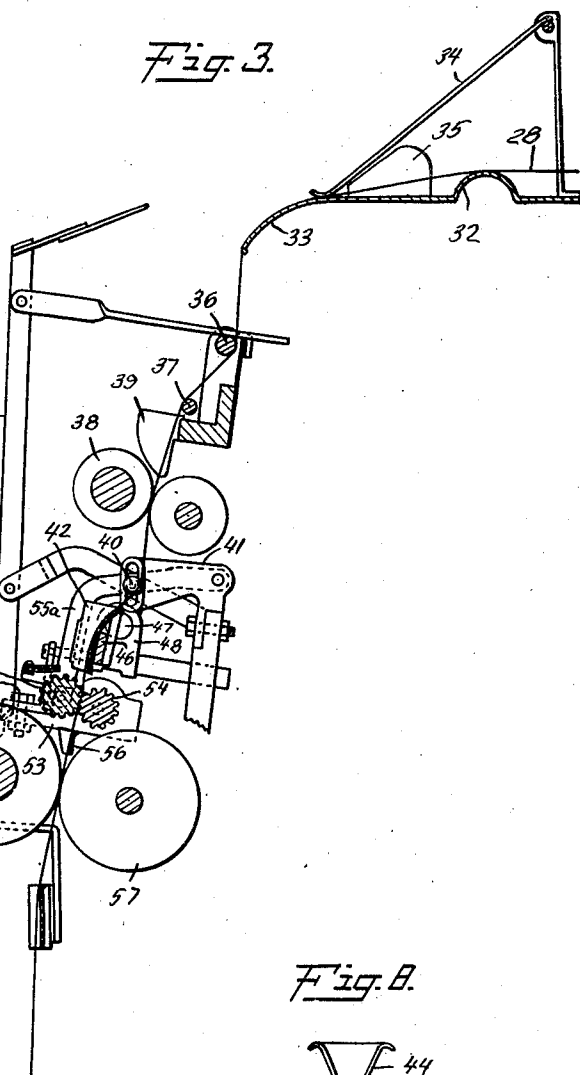
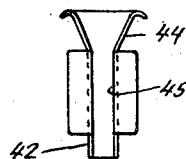


Fig. B.



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Fig. 5.

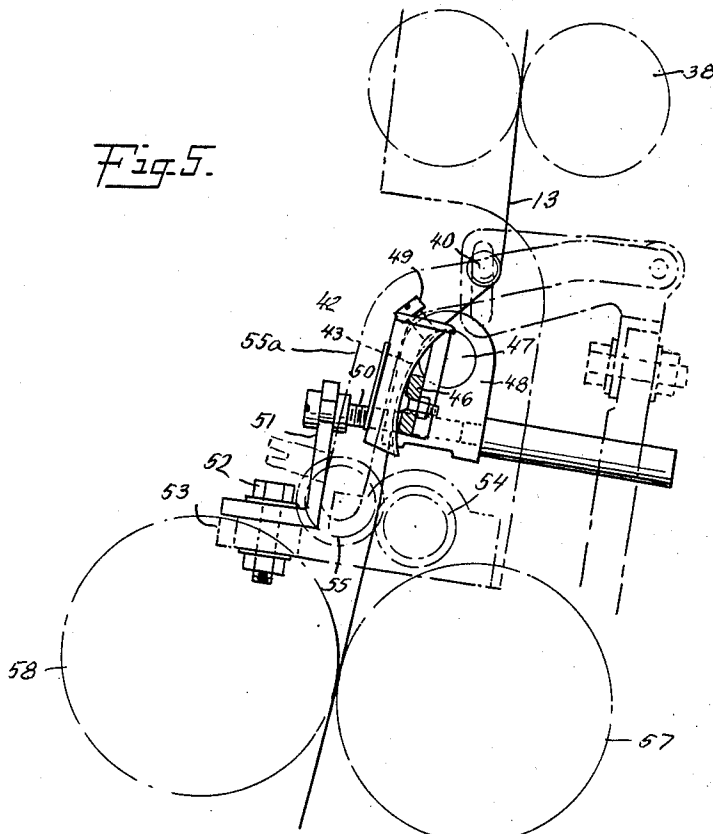


Fig. 6.

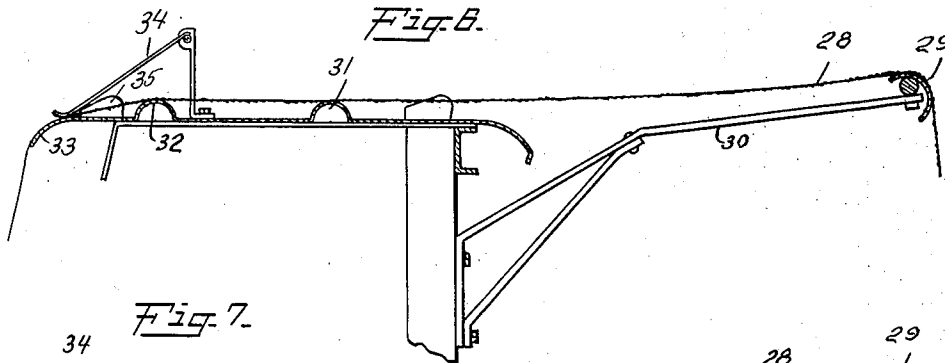
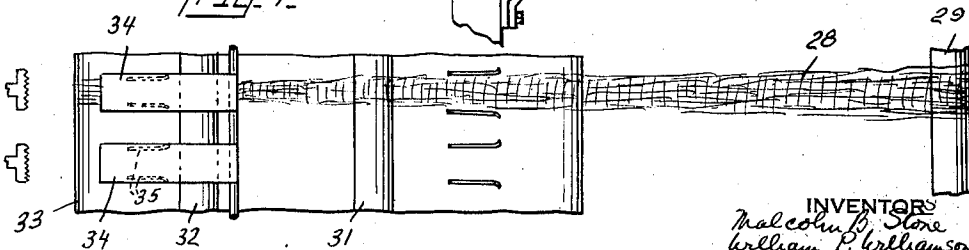


Fig. 7.



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UNITED STATES PATENT OFFICE

1,973,582

FRAME

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Application December 8, 1932, Serial No. 646,266

12 Claims. (Cl. 19—130)

This invention relates to the drawing of fibres in the manufacture of yarn and is concerned more particularly with a novel apparatus for controlling and restraining the fibres in that part of a fibrous strand undergoing draft, for example, in drawing, roving, or spinning frames. The apparatus of the invention is specially adapted for use in the manufacture of yarns from long fibres such, for example, as those of the bast variety including jute, hemp, and flax. According, for purposes of explanation, embodiments of the invention suitable for use in spinning and drawing frames for jute will be illustrated and described in detail, though it is to be understood that the utility of the invention is not limited to that particular fibre.

In the drawing and roving frames heretofore used in connection with the manufacture of jute yarn, gill bars have been customarily employed to support that portion of the sliver undergoing draft between the retaining and drawing rolls, which have a space between their nips greater than the average length of the fibres, these gill bars carrying gill pins which extend into and through the sliver and serve to hold back and restrain fibres in the sliver which are not nipped by the drawing rolls. If it were not for the pins, the fibres nipped by the drawing rolls would carry forward with them by entanglement other fibres not nipped by the drawing rolls, and since the advance of fibres not nipped by those which are nipped is not at a uniform rate, the failure to restrain fibres not nipped would result in the production of a drawn strand which is not level and which contains thick and thin spots. Although gill bars are widely employed for the purpose mentioned, the gill mechanism is objectionable because it represents a heavy item of expense in the construction of the frame and is costly to operate and maintain, and there is a definite limit to the speed at which the bars may be operated by their screws, frames equipped with the bars thus having a relatively limited rate of production.

In our co-pending applications, Serial No. 545,725, filed June 20, 1931, and Serial No. 624,744, filed July 26, 1932, we have illustrated and disclosed novel apparatus for drawing and spinning which includes new devices for controlling the fibres in that portion of a strand undergoing draft, and the present invention represents a further development in such apparatus utilizing certain features of the apparatus heretofore disclosed but departing therefrom in various respects. The new apparatus of this invention constitutes

an improvement on the apparatus which we have previously devised in the respect that it is simpler and cheaper to construct and produces equally satisfactory yarn.

Our co-pending application, Serial No. 624,744, discloses devices for controlling the fibres in that portion of a strand undergoing draft and suitable for use in drawing, roving, and spinning frames. These devices comprise a plurality of rotary slip draft devices, each of which includes a bottom roll beneath the strand which is mounted for rotation on a fixed axis, and a top roll which rests upon the strand and is free to move up and down with variations in the thickness of the strand, means being provided for positively driving both rolls at the same surface speed. Each slip draft device performs two functions, one function being to retain fibres which are not nipped by the drawing rolls and prevent them being carried forward by entanglement with fibres which are nipped by the drawing rolls, and the other function being to positively feed the fibres forward to the drawing rolls. In a drawing frame as many as four of the rotary slip draft devices may be employed between the retaining and drawing rolls, while in a spinning frame, it is usually sufficient to use two such devices.

While apparatus which includes a plurality of rotary slip draft devices of the construction described has proven entirely satisfactory, we have found that the apparatus can be simplified by substituting another and novel type of control means for all of the rotary slip draft devices except the one directly in front of the drawing rolls. The new control devices which we use impose frictional drag upon the strand and are adjustable so that the amount of drag thus applied can be varied. In addition, they control the spreading of the strand at the point where the drag is applied, confining the strand laterally so that it cannot thin out at the edges and thus develop spots of varying thickness.

In a drawing frame, two or more such devices may be employed, the devices acting alternately on the sliver from opposite directions. Associated with these devices is a rotary slip draft device of the type disclosed in our copending applications, and preferably there is also employed a bar or rod which engages the sliver and imposes drag upon it but without confining it laterally.

In a spinning frame, the device for imposing drag on the strand in some respects resembles the breast-plates heretofore used in these frames but differs therefrom in that it is provided with a channel through which the strand passes and

by which drag is imposed upon the strand and it is confined laterally. In the spinning frame, a rotary slip draft device is used immediately in front of the drawing rolls for both controlling the fibres and feeding them at a regular rate.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which

Fig. 1 is a view in longitudinal section through one form of the control apparatus used in a drawing frame;

Fig. 2 is a plan view of the apparatus shown in Figure 1;

Fig. 3 is a vertical transverse section through the apparatus employed in a spinning frame;

Fig. 4 is an elevational view of the apparatus shown in Fig. 3;

Fig. 5 is a view similar to Fig. 3 showing the control apparatus on an enlarged scale and with parts of the spinning frame omitted;

Fig. 6 is a view in vertical transverse section showing means for guiding sliver to the retaining rolls of the spinning frame;

Fig. 7 is a plan view of the apparatus shown in Figure 6; and

Fig. 8 is a view in front elevation of a conductor member shown in Figures 3 and 5.

Referring now to the drawings, the drawing frame illustrated in Figure 1 comprises the usual retaining rolls generally designated 10 and drawing rolls generally designated 11, these rolls being of standard construction and illustrated only conventionally. Mounted on stands 12 on the frame between the drawing and retaining rolls is the new apparatus for controlling the fibres in that portion of the sliver undergoing draft and this apparatus includes a plurality of devices for imposing frictional drag upon the sliver and a rotary slip draft device.

In the form of construction shown, the sliver 13 leaving the retaining rolls passes up and over a bar 14 mounted for vertical adjustment on rods 15 secured in brackets 16 which are adjustably mounted on the stands, the bar being upwardly offset from the straight line path between the retaining rolls and the drawing rolls so that drag is imposed on the sliver. Beyond the bar 14 in the direction of movement of the sliver, the latter passes beneath and in contact with a conductor member 17 adjustably mounted on screws 18 attached to brackets 19 secured to the stands 12. The conductor member is vertically adjustable on its screws and the brackets are horizontally adjusted on the stand so that the position of the conductor can be varied in two directions. The conductor is preferably made of metal and its surface in contact with the sliver is curved with a radius of curvature considerably greater than the radius of the bar 14. The member is also provided with a pair of wings 20 for each end of sliver, these wings extending out from the curved surface of the member and being convergent in the direction of sliver movement. The spacing of the wings depends on the size of the sliver being treated and the purpose of the wings is to confine the sliver against spreading laterally and also to impose drag upon the edges of the sliver.

Passing from beneath the conductor 17, the sliver passes over the surface of a bar 21 mounted for horizontal adjustment on stands 12 and provided with separate conductors 22, one for each end of sliver. The conductors 22 are preferably of metal and they are of channel section with their side walls converging in the direction of

sliver movement as shown more clearly in Figure 2. The side walls of each conductor are properly spaced to engage the edges of the sliver and confine it laterally against spreading. From the conductor 22, the sliver passes through the rotary slip draft device.

This device comprises a roll 23 formed as a boss on a shaft 24 mounted for rotation in bearings attached to the stands 12. Disposed above each of the rolls 23 is a floating roll 25, the ends of the spindle of this roll being movable in slots in brackets 26 attached to the bar 21. A separate roll 25 is provided for each end of sliver and the roll presses down upon the sliver of its own weight and is free to move up and down in accordance with variations in the thickness of the sliver. The shaft 24 carrying rolls 23 is driven in any suitable manner and each roll 23 has gear teeth at its ends which mesh with similar gear teeth 27 on the ends of each roll 25. The gear teeth are so formed that the floating rolls 25 are positively driven at the same surface speed as rolls 23 at all times, regardless of the rising and falling of the rolls 25 by reason of variations in the thickness of the sliver. Both upper and lower rolls are fluted for best results, although it is possible to produce yarn satisfactory for some purposes, when scratched or smooth rolls are used. If desired, a conductor (not shown) may be provided between the slip draft rolls and the drawing rolls to direct the sliver properly to the drawing rolls.

In a drawing frame constructed as described, the control of the fibres in that part of the sliver undergoing draft is effected by three different means. The bar 14 forces the sliver out of the straight line path between the retaining rolls and the drawing rolls and thus imposes frictional drag upon the sliver, which tends to restrain the fibres and produce an even feed. The sliver then passes under the member 17 and over the bar 21 provided with conductors 22, and these elements acting on the sliver from opposite sides impose further drag upon the sliver and at the same time confine it laterally against spreading. When the sliver spreads out under pressure and in contact with a surface, for example, of the member 17, the sliver becomes thin at the edges but not uniformly so, with the result that the final product has thick and thin spots. The means consisting of the wings on the member 17 and the side walls of the conductors 22 prevent such spreading of the sliver as would result in the presence of thin and thick spots and the side walls in contact with the edges of the sliver also impose further drag upon it.

The slip draft device performs the functions previously described of restraining fibres not nipped by the drawing rolls and insuring a uniform feed of these fibres. In order that the fibres may be fed properly, the rolls of the slip draft device are rotated at a surface speed slightly in excess of the surface speed of the retaining rolls. For example, the surface speed of the slip draft rolls may bear the relation of 112 to 100 to the surface speed of the retaining rolls.

In Figures 3 to 7, inclusive, there is illustrated the application of the new control apparatus to a spinning frame. This spinning frame may be used to carry out the method of sliver spinning disclosed in our application, Serial No. 545,725, or it may be used for spinning rove, the spinning of sliver being preferred because of the economies effected.

Assuming that the apparatus is used in sliver spinning, the sliver 28 to be spun is drawn from a supply, for instance, a can, and passes up over a conductor 29 mounted on a bracket 30 at the top of the frame. The sliver is then led over the top of the frame contacting with guide members 31, 32 having curved surfaces, and then passes over a guide member 33 terminating in a downwardly curved lip. In the process described in the co-pending application above-identified, the sliver when reduced to rove size is crimped in order that it may be collected in cans and supplied to the spinning frame from the cans. When such crimped sliver is fed to the spinning frame, it is desirable to provide means to take the crimp out of the sliver so that a regular feed of the fibres may be obtained, the crimping being irregular in character. To remove the crimp, the frame is provided with spring fingers 34, one for each end of sliver, and each finger presses its sliver down against the guide member 33 so that the end is drawn beneath the finger under tension by the action of the retaining rolls of the frame. The finger tends to flatten the sliver and remove the crimp and also prevents the sliver from feeding irregularly, and a conductor 35 is provided to prevent the sliver from slipping out from beneath its finger.

From the guide member 33 the sliver passes into engagement with a bar 36 and then engages a bar 37 at the other side thereof, these bars being slightly offset from the normal path of travel of the sliver to the retaining rolls 38, so as to restrain and tension the sliver to a slight degree. Between the bar 37 and the retaining rolls, the sliver passes through a conductor 39 which directs the sliver properly to the rolls.

The retaining rolls are of standard construction and illustrated only conventionally. Beyond these rolls, the sliver engages a bar 40 mounted for vertical adjustment in a slot in the bracket 41 secured to the frame in any convenient manner, and then passes through a conductor 42 of channel section somewhat resembling a trumpet but being open along one side so that it can be readily threaded. The bottom surface of the conductor 42 is curved as indicated at 43 so that the sliver remains in contact with the surface throughout substantially the entire length of the latter. The conductor has a funnel shaped entrance end 44 and side walls 45 which lie sufficiently close together to engage the edges of the sliver. The sliver passing through the trumpet member is thus in contact with three surfaces, a substantial amount of drag is imposed on the sliver, and spreading of the sliver with consequent thinning at the edges is prevented.

The trumpet shaped conductors 42 for the individual ends are mounted on a bar 46 provided at its ends with pins 47 entering openings in brackets 48, the pins being held in adjusted angular position in the brackets by set screws 49. The brackets are mounted on adjustment screws 50 passing through brackets 51 attached adjustably by bolts 52 to convenient parts 53 of the frame and with this arrangement, the bar 46 may be shifted laterally to vary the position of the conductors 42 and may also be swung angularly to vary the extent of the contact of the sliver with the curved surfaces in the bottom of the conductors.

From its conductor, each end passes to the slip draft device including positively driven roll 54 on a fixed axis and roll 55 mounted in swinging arms 55a. There is one pair of such rolls for

each sliver end so that the floating roll moves toward and away from the fixed roll in accordance only with variations in the end on which the device is acting. The rolls are connected by gear teeth so that they rotate at the same surface speed and the construction is in general the same as that disclosed in our co-pending application, Serial No. 624,744, and need not be described in detail.

The spinning frame illustrated is provided with mechanism for preventing the sliver from feeding to the retaining rolls in the event that the end breaks, this mechanism being disclosed in detail in the co-pending Williamson application, Serial No. 587,741, filed January 20, 1932. Briefly, the mechanism includes an arm 59 for each end mounted to swing on a horizontal axis and provided at one end with an element which contacts with the end issuing from the drawing rolls. At its other end, the arm is provided with a member adapted to engage the sliver passing off the guide 33. When the end breaks, the arm swings and the member at its upper end engages the sliver and holds it so that the sliver is pulled apart by the action of the retaining rolls.

In the spinning frame described the strand is forced out of its normal path between the drawing and retaining rolls by the bar 40 and the conductor 42 acting on the strand from opposite sides. These parts thus impose frictional drag upon the strand, the amount of the drag being controlled by varying the position of the parts relative to the strand. The control of the fibres in the strand is thus exercised both by the parts which impose the frictional drag upon it and by the slip draft rolls which, in addition to controlling the fibres, positively feed them to the drawing rolls. Spinning frames as heretofore constructed have commonly been provided with a breastplate between the retaining rolls and the drawing rolls and this breastplate is positioned so as to force the sliver out of its direct path from the retaining rolls to the drawing rolls. The drag imposed upon the strand by the breastplate and the twist in the strand are depended on in such frames to control the fibres. The bar 46 of the new apparatus with its trumpet shaped conductors 42 performs all the functions of the old breastplate but in addition confines the strand laterally so as to prevent it from stretching. The bar 46 with the conductors may thus be considered as a channeled breastplate.

The new control devices have been described in forms suitable for use in both drawing and spinning frames and they may also be used in roving frames. In any application of the devices, the same principles are involved; that is, the fibres in that part of a fibrous strand undergoing draft are controlled in part by means which apply frictional drag upon the strand and confine it laterally against spreading with consequent development of thin places and in part by rotary slip draft devices which not only restrain the fibres and prevent feeding by entanglement but also insure a uniform feed to the drawing rolls. It will be apparent that since the sliver treated in different frames has different widths, the spacing of the walls of the conductors will be varied appropriately. In the spinning frame, the trumpet conductor has side walls which are separated only a fraction of an inch while in the drawing frames, the spacing of the walls of the conductor 22 and the wings on the conductor member 17 is substantially greater. The number of devices

for imposing frictional drag on the strand will also depend on the size of the strand being treated.

What we claim:

1. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft, comprising a pair of members having surfaces engaging said strand from opposite sides at points spaced along its path of travel, said members putting drag upon the strand, and a pair of control rolls between the last of said members and the drawing rolls said control rolls including a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, and means for positively driving said fixed and floating rolls at the same surface speed.

2. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft, comprising a pair of members having surfaces engaging said strand from opposite sides to put drag upon it, and means on opposite sides of each surface for limiting the spreading of said strand, and a pair of control rolls between the last of said members and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, and means for positively driving said fixed and floating rolls at the same surface speed.

3. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft, comprising a pair of conductors engaging the strand from opposite sides and mounted to force said strand out of its normal path from said retaining rolls to said drawing rolls, said conductors putting drag upon the strand, and a pair of control rolls between the last of said members and the drawing rolls, said rolls including a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, and means for positively driving said fixed and floating rolls at the same surface speed.

4. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft, comprising a pair of conductors engaging said strand from opposite sides and mounted to force said strand out of its normal path of travel between said retaining rolls and drawing rolls, said conductors having side walls convergent in the direction of movement of the strand and limiting the spreading thereof, and a pair of control rolls between the last of said members and the drawing rolls, said rolls includ-

ing a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, and means for positively driving said fixed and floating rolls at the same surface speed.

5. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft, comprising a pair of members having surfaces engaging said strand from opposite sides at points spaced along its path of travel, said members putting drag upon the strand, and a pair of control rolls between the last of said members and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, means for driving said fixed roll, and a connection between said rolls for driving said floating roll at the same surface speed as said fixed roll.

6. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft comprising a breastplate engaging said strand between said retaining rolls and drawing rolls, said breastplate including a channel through which said strand passes, and side walls on opposite sides of said channel, said breastplate being mounted to force said strand out of its normal path between said retaining and drawing rolls and said side walls limiting the spreading of said strand, and a pair of control rolls between said breastplate and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, a floating roll engaging said strand from the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, and means for positively driving said fixed and floating rolls at the same surface speed, said control rolls feeding fibres to the drawing rolls to be nipped thereby.

7. In a frame for treating fibrous strands, the combination of retaining rolls for said strand, drawing rolls for the strand, and means for controlling the fibres in that portion of the strand undergoing draft comprising a breastplate engaging the strand between said drawing and retaining rolls, said breast plate having an open channel with side walls of substantially greater height than the thickness of said strand, and a mounting for said breastplate supporting the latter with the bottom of its channel displaced from the normal path of the strand between the drawing and retaining rolls, whereby said breastplate places drag upon the strand, said side walls being sufficiently close together to prevent substantial spreading of said strand resulting from the application of the drag, and a pair of control rolls between said breastplate and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, a floating roll engaging said strand from

the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, and means for positively driving said fixed and floating rolls at the same surface speed, said control rolls feeding fibres to the drawing rolls to be nipped thereby.

8. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that portion of the strand undergoing draft comprising a breastplate lying between said retaining and drawing rolls and adjustable toward and away from said strand, a conductor mounted on said breastplate and engaging said strand, said conductor having the form of an open channel through which said strand moves in contact with the bottom thereof, and side walls confining said strand and limiting the spreading thereof, and a pair of control rolls between said breastplate and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, a floating roll engaging said strand from the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, and means for positively driving said fixed and floating rolls at the same surface speed, said control rolls feeding fibres to the drawing rolls to be nipped thereby.

9. In apparatus for drawing fibres for the manufacture of yarn, the combination of retaining rolls for a fibrous strand, drawing rolls for said strand, said retaining and drawing rolls gripping the strand tightly to prevent slippage of the fibres and having their nips spaced a distance greater than the average length of the fibres, and means for controlling the fibres in that portion of the strand undergoing draft between the nips of said rolls, said means including a trumpet member engaging the strand, said member being open along one side and imposing drag upon the strand while confining it laterally, and a pair of control rolls between said trumpet member and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, a floating roll engaging said strand from the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, and means for positively driving said fixed and floating rolls at the same surface speed, said control rolls feeding fibres to the drawing rolls to be nipped thereby.

10. In apparatus for drawing fibres for the manufacture of yarn, the combination of retaining rolls for a fibrous strand, drawing rolls for said strand, said retaining and drawing rolls gripping the strand tightly to prevent slippage of the fibres and having their nips spaced a distance greater than the average length of the fibres, and means for controlling the fibres in that portion of the strand undergoing draft between the nips of said rolls, said means including a pair of members disposed at spaced points along the strand, said members engaging the strand from opposite sides and forcing it from its normal path of travel from the retaining rolls to the drawing rolls, each member having means confining the strand laterally.

11. In apparatus for drawing fibres for the manufacture of yarn, the combination of retaining rolls for a fibrous strand, drawing rolls for said strand, said retaining and drawing rolls gripping the strand tightly to prevent slippage of the fibres and having their nips spaced a distance greater than the average length of the fibres, and means for controlling the fibres in that portion of the strand undergoing draft between the nips of said rolls, said means including a pair of stationary members disposed at spaced points along the strand, said members engaging the strand from opposite sides and imposing frictional drag upon the strand while confining it laterally, both said members forcing said strand out of its normal path of travel from the retaining rolls to the drawing rolls.

12. In a frame for treating fibrous strands, the combination of retaining rolls for a strand, drawing rolls for said strand, and means for controlling the fibres in that part of the strand undergoing draft comprising a pair of members having surfaces engaging said strand from opposite sides at points spaced along its path of travel, said members placing drag upon said strand and at least one of said members having means for confining said strand against lateral spreading, and a pair of control rolls between the last of said members and the drawing rolls, said control rolls including a fixed roll engaging the strand from one side, and a floating roll engaging said strand on the other side and pressing it against the fixed roll with sufficient pressure to control the plucking effect of fast moving fibres in the strand nipped by the drawing rolls, said control rolls feeding fibres to the drawing rolls to be nipped thereby, and means for positively driving said fixed and floating rolls at the same surface speed.

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