DRAWING FRAME FOR HIGH SPEED OPERATION

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Filed Dec. 22, 1965, Ser. No. 515,583
1 Claim. (Cl. 19--266)

ABSTRACT OF THE DISCLOSURE

A drafting apparatus having a condenser and a pair of magnetic condensing rollers between the delivery rollers and the calendar rollers wherein the top condensing roller is of a magnetized material and has larger diameter portions at the opposed ends and a smaller diameter portion between the larger diameter portions. The larger diameter portions are in contact with the bottom roller thereby forming a slight clearance between the small diameter portion of the top roller and the bottom roller whereby the material is condensed as it passes there-through.

The present invention relates to drawing frames for drawing textile yarns, and more particularly to such a drawing frame which is suitable for high speed operation.

As a result of the recent speed-up of textile machinery, the speed of sliver through drawing frames has been increased to above 300 m./min., which, in turn, makes it necessary to increase the capacity of the condenser. Consequently, the distance between the front rollers and the calendar rollers becomes longer. The thin film-like fleece delivered at high speed from the front rollers, which must be squeezed and formed into a sliver during its travel to the calendar rollers, tends to undulate or vibrate unstably due to the high speed and intense squeezing. Such vibration hinders the high speed operation of the drawing frames because it causes slivers to clog the trumpets and it also causes other troubles. Thus, there has been a serious problem in the high speed operation of drawing frames of how to guide slivers delivered from the front rollers to the calendar rollers and suppress the sliver vibration.

As a solution to this problem, there has heretofore been employed a special collector tube disposed between the front rollers and the calendar rollers. In such a conventional arrangement, however, there is excessive resistance to the travel of the fleeces and the fleeces are forced to change their direction of travel at the trumpets, resulting in various troubles such as the breakage of fleeces, an increase in the amount of fly generated, and the clogging of the trumpets by the slivers.

It is an object of this invention to eliminate the above-mentioned drawbacks encountered in high speed drawing operations by the arrangement according to the present invention wherein, in order to decrease the distance between the front rollers and calendar rollers, the nip point of the front rollers is disposed immediately above the nip point of the calendar rollers or thereabouts, and rotatable magnetic condensing rollers having a small clearance therebetween and a collector are disposed between the front rollers and calendar rollers, whereby the fleece from the front rollers is formed into a sliver as it is being squeezed in a stable condition as it passes through the condensing rollers.

The present invention will now be described in more detail with reference to a preferred embodiment thereof shown in the accompanying drawings, in which:

FIG. 1 is a side elevational view of a drawing frame incorporating an arrangement embodying the invention; and

FIG. 2 is a front view of magnetic condensing rollers to be used together with condensers and disposed between the front rollers and calendar rollers.

Referring to the figures, the apparatus comprises a roller beam 1, having a bracket 2 mounted thereon, and a top arm 3 fixed to and depending from the foremost end of the bracket. Pairs of top rollers 4, 4, and 4, and bottom rollers 5, 5, and 5, respectively, are disposed vertically or substantially vertically. The lowermost top roller 6 and lowermost bottom roller 7, respectively, are equivalent to the front rollers. Although not shown, the bottom rollers 5, 5, 5, and 7 are supported on the roller stand 2 and are positively rotated, and the top rollers 4, 4, 4, and 6 are loaded by spring means contained in the top arm 3 and are in contact with the bottom rollers.

A book 8 is mounted on the apparatus for catching the foremost end of the top arm 3. A condenser 9 is disposed immediately below the contact point between the front rollers 6 and 7. A pair of magnetic condensing rollers 10 consisting of a bottom roller 11 and a magnetic roller 12 rotating in contact with said bottom roller 11 are disposed immediately below the collector 9. As shown in FIG. 2, the magnetic roller 12 has larger diameter portions 13 at each end thereof and is loaded by the magnetic force exerted between the magnetic roller 12 and bottom roller 11. With the larger diameter portions in contact with the bottom roller 11, the magnetic roller 12 rotates under the positive action of the bottom roller 11 on the roller 12.

A clearance 15 of about 0.5 mm. is left between the smaller diameter portion 14 and the bottom roller 11. Further, the collector 9 and the magnetic condensing rollers 10 are positioned in a vertical line between the front rollers 6 and 7 and the calendar rollers 16. The calendar rollers are disposed in such a manner that the nip point b of said calendar rollers 16 is substantially directly below the nip point a of the front rollers 6 and 7.

A can 17 is positioned below the calendar rollers 16 and a ring gear 18 drives a guide tube 19, and mounted in a roller beam 20 integral with the roller beam. A plurality of parallel slivers 21, only the end one of which appears in FIG. 1, and which have been doubled are fed to the rollers 4, 4, 5, which are equivalent to the back rollers, and, while moving downwardly, they are drafted as they pass through the pairs of rollers 4, 4, 5, 5, 4, 4, 5, 5, and 5, and are formed into a thin film-like fleece, which comes out from between the front rollers 6 and 7. This fleece is passed into the clearance 15 between the magnetic condensing rollers 10 which are used together with the condenser 9 and which are magnetically loaded so that the roller 12 rotates in contact with the bottom roller 11.

The fleece is squeezed in the clearance 15 and enters a trumpet 24 in which it is formed into a sliver and guided into the calendar rollers 16. It is then passed through the guide tube 19 rotated by the roller gear 18 and into the can 17, in which the sliver is coiled due to the rotation of the tube gear relative to the can.

Generally, when the processing speed exceeds 300 m./min., it is difficult to form the fleece into sliver by squeezing the same, however small the distance between the front rollers and the calendar rollers may be. However, when the magnetic condensing rollers are used together with the condenser and disposed between the front rollers and calendar rollers, the present invention, drawing can be effected in a stable condition for the following reasons.

In the conventional condenser tube, the resistance to the movement of the fleece therethrough increases as the speed of processing increases. However, the magnetic condensing rollers according to the present invention rotate at the same peripheral speed as the calendar rollers and front rollers, so that there is no possibility of imparting
excessive resistance to the fleece. In addition, when the fleece is passed through a condenser tube when only draft rollers are used, it becomes necessary to provide a clearer for the condenser tube, the cleaning of which is troublesome and which makes the operation of the drawing frame inconvenient. Moreover, such cleaners cannot clean perfectly and often cause trouble. Because of the use of the magnetic condensing rollers, the provision of such objectionable cleaners is no longer necessary in the apparatus of the present invention.

Further, because it makes no difference in the condensation of the fleece whether or not the fleece is nipped, unlike when draft rollers are used, the magnetic condensing rollers have a clearance of 0.5 mm. between them so that they do not nip the fleece, but rather assist its advance.

If conventional condenser tubes are employed in this kind of drawing frame, it is difficult to install a perfectly automatic stop motion mechanism for stopping the machine when clogging of the trumpets occurs. However, the magnetic condensing rollers according to the invention will be rotated in the reverse direction whenever such clogging occurs, so that it is possible to utilize this reverse rotation to stop the machine when such reverse rotation of the magnetic condensing rollers occurs by providing contacts electrically connected to a stop motion mechanism.

In this invention, since the top roller of the magnetic condensing rollers alone can be easily forced away from the bottom roller, winding of fleece on the roller, should occur. Unless a magnetic system like one in this invention is employed, it is necessary, as in the top rollers of the known draft rollers, that a top roller corresponding to the top roller of the magnetic condensing rollers be mounted on the top arm. If such a top roller is mounted on the top arm, not only such roller but also the other top rollers have to be raised when winding up of fleece occurs. Further, in this invention, since the top roller is adapted to be magnetically mounted on the bottom roller, a complex mechanism for mounting such roller is not required at all, and hence the structure is simple and less expensive.

Further, in a horizontal type drawing frame, when the fleece is squeezed between the front rollers and the calender rollers, the fleece is disturbed and this becomes more pronounced as the rotational speed of the rollers increases because of the large distance between the front rollers and the calender rollers. Under these circumstances, the drawing operation should not be carried out unless the condenser tubes are arranged to form a Y-shaped figure which, however, results in an excess amount of longitudinal squeezing, i.e., squeezing parallel to the length of the rollers. Such a Y-shaped figure in which squeezing is carried out is not desirable since an irregular draft is imparted to both ends of the width of the fleece. In the case of the present invention, however, the fleece can be reasonably squeezed in the triangle defined by lines interconnecting the ends of the width of the fleece delivered from the front rollers and the opening of the trumpet, so that an improvement in the quality of yarn produced can be expected. Moreover, on account of the reasonable amount of squeezing coupled with the absence of excessive resistance to the movement of the fleece, less fly is generated.

In addition, due to the shape of a conventional condenser tube, the fleece, which contains air, is subjected to a sudden squeezing action for forming it into a sliver, so that the air flow which is produced by the squeezing action is disturbed. Further, when the fleece is squeezed by a trumpet, a large amount of air remains in the resulting sliver and the degree of the squeeze can be too low, so that the maximum amount of the sliver collected in each can is less than if air were not left in the sliver. With the apparatus of the present invention, the above-mentioned drawbacks are eliminated, the fleece is not disturbed, and therefore the amount of sliver collected in each can is increased.

As previously mentioned, where the nip point of the front rollers is disposed at a position immediately above the nip point of the calender rollers or thereabouts and the magnetic condensing rollers, which have a slight clearance therebetween and which are rotatable, are used together with the condenser and disposed between the front rollers and calender rollers, the fleece is squeezed a reasonable amount by the magnetic condensing rollers used together with the condenser and is moved downwardly, so that however high the drawing speed may be, the fleece can be moved between the front rollers and calender rollers in a stable condition and without subjecting the fleece to excessive resistance and forcible bending at the trumpet, whereby the quality of yarn can be improved and the breakage and clogging of slivers can be avoided. Further, even if the capacity of the cans is increased, the distance between the front rollers and calender rollers is not made longer, and since the sliver, once it is condensed, is given no chance to entrain air to cause it to swell, and the amount of sliver received in each can is increased.

Besides the above-mentioned direct advantages, there are obtained many indirect advantages in that the fly generated between the front rollers and calender rollers can easily be sucked up by a front suction head (not shown); the operation of the front part and the stop motion mechanism can be easily carried out; the brackets for the calender rollers and the roller slide can be attached to the same stand thereby achieving a simplifying of the mechanism; the roller beam and the roller beam can be integrally constructed and thereby made rugged; the unstableness inherent in the conventional over-hanging type support for a tube gear is eliminated and the built-in gear wheels can be sealed; and the calender rollers and the draft part are disposed so close to each other that the second roller, for example, can be driven directly from the calender rollers, thereby reducing the number of the gear wheels required.

While the preferred form of the invention has been shown and described herein, it is to be understood that the same is not so limited but shall cover and include any and all modifications of the invention which fall within the purview of the appended claim.

We claim:

1. A drawing frame comprising:
   a plurality of pairs of draft rollers including a pair of front rollers,
   a pair of calender rollers disposed vertically below the front rollers,
   a condenser, and a pair of magnetic condensing rollers;
   said condenser and said magnetic condensing rollers being disposed between the front rollers and the calender rollers;
   the nip point of said front rollers being substantially vertically above the nip point of the calender rollers;
   the fleece-passage point of the condenser and the point of the closest approach of the magnetic condensing rollers to each other being substantially on a line between said nip points;
   said magnetic condensing rollers comprising:
   a bottom roller of a magnetic material, supported on a known roller stand and adapted to be positively driven at substantially the same speed as the front rollers and the calender rollers;
   and
   a top roller of a magnetic material and having larger diameter portions at the opposed ends and a smaller diameter portion between said larger diameter portions, said larger diameter portions being in contact with said bottom roller, and a slight clearance being present between said bottom roller and said top roller;
said larger diameter portions of said top rollers being magnetically attracted to said bottom roller, whereby said top roller is frictionally driven by said bottom roller.

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