Aug. 12, 1958 S. L. ABBOTT 2,846,730

TEXTILE DRAFTING

Filed Jan. 26, 1953

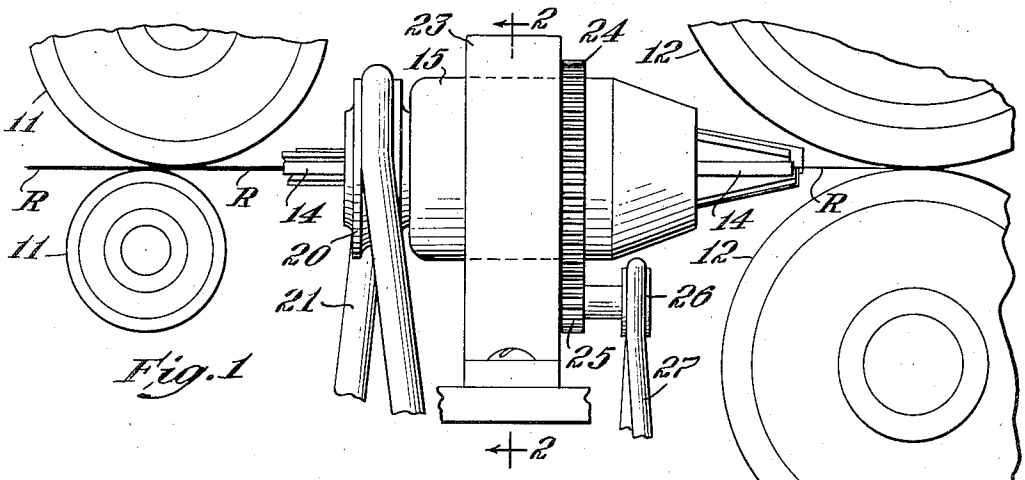


Fig. 1

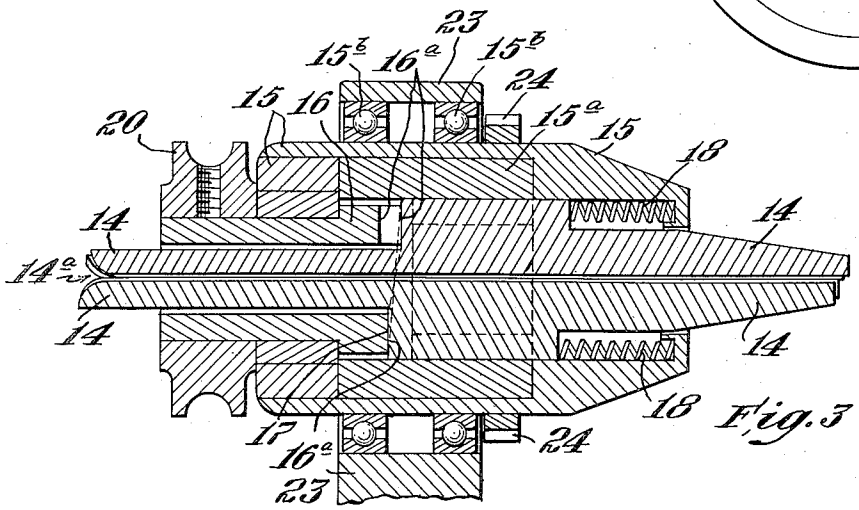


Fig. 3

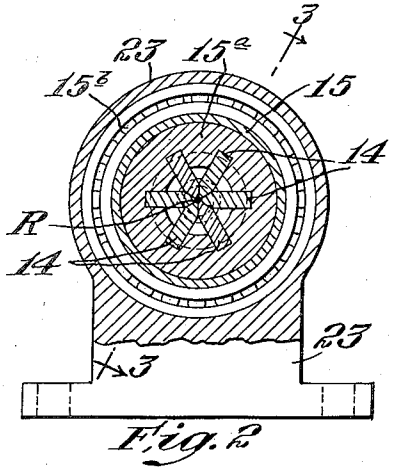


Fig. 2

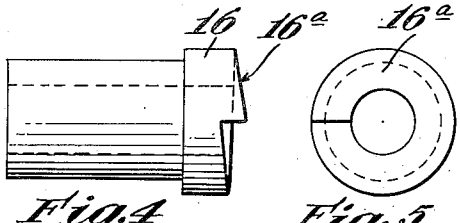


Fig. 4

Fig. 5

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TEXTILE DRAFTING

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Application January 26, 1953, Serial No. 333,202

8 Claims. (Cl. 19—130)

This invention relates to provision of improved conditions, as to twist, both within a large part of a drafting zone where a roving is confined or gripped frictionally while being fed forwardly, and also in the attenuated roving nipped by the front rolls. The invention in its preferred form involves use of apparatus claimed in my application Serial No. 36,131, filed June 30, 1948, for Textile Drafting, Patent No. 2,626,431, dated January 27, 1953.

The amount of twist given to roving is relatively slight, as compared to the twist given to yarn. Although more twist would make a stronger roving, the practice is to limit the twist to values that will not interfere with the drafting in spinning. For example, considering the rear part of the drafting zone in usual spinning procedure, if the fibers of the roving were here in too highly twisted a state their rear end portions would be too tightly bound with surrounding fibers to permit of even drafting.

Accordingly, to give an example, in the drafting of roving to make a worsted yarn in the regions of 40's worsted count, by a single draft of 18, the roving entering the drafting zone will have a twist of about 1.5 turns per inch. This roving, to result in yarn in the region of 40's (worsted count) yarn, will weigh about 5.4 grains per yard, so that a draft of 18 will bring it down to the region of .3 grains per yard at the nip of the front rolls. All these figures are approximate and are cited for the purpose of explanation.

In the very front end of the drafting zone the roving tapers down and approaches the fineness of weight of the desired yarn. At the nip of the front rolls it is greatly attenuated from its entering bulk, proportionate to the draft. Being finer, and hence longer per unit weight or bulk, its twist is less in turns per inch. Assuming a draft of 18, a single piece of roving having an initial twist of 1.5 turns per inch would be converted by a draft of 18 into a bundle of fibers having a twist of less than 0.1 turn per inch. More draft would still further reduce the twist. Such slight twist clearly does not very definitely hold the fibers against splitting off from the bundle which emerges from the front rolls at the front end of the drafting zone. Of course, the principle of ring spinning is that the rotation of the traveler will wrap the fibers together by sending twist upward (i. e. backward) to those emerging from the front rolls. Yet, as a practical matter, it seems that the forming yarn, emerging from the nip of the front rolls, is in a critical condition. If then and there it does not have twist sufficient to hold its fibers together, its fibers will be split apart and it will tend to break.

These considerations make me want to have the roving reach the nip of the front rolls with sufficient twist so that the fibers will not split apart.

In ordinary systems of drafting, the residual twist in the fibers of the attenuated roving at the nip of the front rolls would tend to be increased if the twist in the original undrafted roving were increased. But there is

a limit to such expedient because highly twisted roving becomes increasingly difficult to draft in an even manner.

Accordingly a principal object of the present invention is to employ a roving that would ordinarily be considered too highly twisted, but nevertheless to provide an optimum condition of the roving in the region where it is subjected to confinement and draft, and to obtain a more satisfactory condition of the attenuated roving at the nip of the front rolls, particularly with long drafts.

Other objects and advantages of the invention will be apparent from its specification and drawings in which the invention is explained by a description of a preferred example thereof.

In the accompanying drawings,

Fig. 1 is a side elevation of the drafting zone of one unit of a spinning frame employing the present invention, and involving structure claimed in my said application Serial No. 36,131;

Fig. 2 is a vertical sectional view on the line **2—2** of Fig. 1;

Fig. 3 is a longitudinal sectional view taken radially on the line **3—3** of Fig. 2;

Fig. 4 is an elevation of a rotary actuating cam of the apparatus; and

Fig. 5 is a face view of the cam of Fig. 4.

In the drawings, the textile roving R is shown as entering the nip between the pair of rear rolls **11—11** and passing from left to right through the drafting zone from whence it emerges at the front rolls **12—12**. Throughout most of the drafting zone the roving is confined by a plurality of longitudinally extending elements **14** which cooperate to define a passage for the roving between their opposed surfaces.

The elements **14** are shown as held in a mounting comprising a two-part outer shell **15** and an inner guide block **15***a*, and the elements **14** overhang such mounting at both ends. In order to extend well into the space between the arcuate paths of the front drafting rolls **12—12**, the elements **14** may be tapered at their forward portions as shown in Figs. 1 and 3. At their rear ends into which the roving is initially fed in threading up the apparatus, the inner or roving-engaging surfaces of these elements may be flared to form between them a mouth **14***a* for easy reception of the roving.

A preferable arrangement of the longitudinally extending elements **14** is shown in Figs. 2 and 3, in which they are shown as circularly disposed around a longitudinal axis and beveled at their inner portions so as to interfit together as a group and provide narrow inwardly-facing edge surfaces which jointly define a longitudinal axial passage of appropriate diameter to engage and confine the roving. The inner guide block **15***a* is appropriately grooved to receive the elements **14** so that they slide upon each other and in the guide block with an easy sliding fit.

As indicated above, the elements **14** are reciprocable forward and backwardly and may advantageously have a very short stroke of motion, which stroke may for instance be one-quarter inch.

The elements **14** are moved forwardly and backwardly in out-of-phase relation, to facilitate the forward progress of the confined roving. It will be apparent that at any one time those elements which are moving forwardly at least as fast as the roving will not exert any rearward drag upon the strand, and that there will accordingly be less friction opposing the forward progress of the roving than if the group of elements were stationary, and the forward progress of the roving will be facilitated by this reduction in friction. Further, to the extent that forwardly-moving elements move forward faster than the roving, they will exert a forward feeding action on the

roving, more or less offsetting or overcoming the frictional drag exerted by the other momentarily rearwardly-moving or stationary element or elements, thus further facilitating the forward progress of the roving.

By having the forwardly-moving area of the roving-engaging surfaces predominate over the simultaneously rearwardly-moving area of such surfaces, as in the preferred from of the invention, the roving-engaging elements can be caused to advance the roving through the passage between these members, thus providing a definite forward feed of the confined roving.

Thus each element is shown as driven in a cycle comprising relatively slow forward motion and relatively rapid backward motion, the cycles of the several elements being displaced with respect to each other by less-than-cyclic time intervals.

There may, for instance, never be more than a single such element moving backwardly while two or more (in the present case, five) of these elements are moving forwardly.

A preferred and simple form of mechanism for imparting the desired motion to the roving-engaging elements includes a rotary cam **16** having a cam face **16***a* (Fig. 4) engageable with shoulders **17** on the several roving-engaging elements to force them forwardly to the right in Fig. 3. As shown in Figs. 4 and 5, the cam face **16***a* may for example have an even rate of rise occupying substantially its circular extent, followed by a sharp drop. The several roving-engaging elements **14** are shown as held against the face of the cam by coil springs **18** so that they return to rearward or starting position at each revolution of the cam.

The cam **16** may be continuously driven as for instance by a pulley **20** and a belt **21** connected to move in timed relation to the drafting elements such as the front rolls **12—12**. The speed at which the cam should be driven will of course depend upon the forward speed of the roving through the apparatus.

As usual in drafting, as the front ends of individual fibers of the roving reach the nip of the front rolls **12—12**, they are gripped thereby and drawn forward faster than the other fibers of the roving which are not gripped by the front rolls. Accordingly as is well known in drafting there must not be an excessive amount of twist in the roving, because an excessive amount of twist will bind the fibers which are to be drawn forward too tightly to the remaining fibers, and so interfere with even drafting.

It will be observed that the frictional engagement of the elements **14** with the roving opposes rotation of the roving relative to this group of elements, and tends to maintain the twist constant in passing from the rear to the front of the group of elements **14**. As indicated above a conventional roving weighing about 5.4 grains per yard would have about 1.5 turns per inch twist. Double that amount of twist, i. e. 3 turns per inch, would interfere with even drafting of that roving in usual procedures involving pressure-confinement of the roving undergoing draft.

Yet, as an example of the present invention, I may start with such a highly twisted roving R having say 3 turns per inch and weighing 5.4 grains per yard, and deliver this to the rear rolls **11—11**. Then before the roving comes into the confinement of the elements **14**, the roving is subjected to untwisting in the space between rolls **11—11** and elements **14**, to a point where it is capable of satisfactory even drafting. This is accomplished by rotating the group of elements **14** around the axis of the roving in a direction counter to the twist of the original roving. This rotation may for example be such as will remove 1½ turns per inch twist from the roving, so that instead of having the excessive 3 turns per inch as it did in entering the rolls **11—11**, the roving as confined by the elements **14** will have the standard 1½ turns per inch.

As shown, the mounting **15** in which the elements **14** slide is itself mounted in bearings **15***b*, **15***b* in the supporting standard **23** and provided with driving mechanism shown as comprising a gear **24** fast on the mounting **15**, a driving pinion **25** meshing with the gear, a pulley **26** connected to drive the pinion, and a driving belt **27** for the pulley.

Since the elements **14** are rotated around the roving axis to the same angular extent in their front ends as in their rear ends, the front ends will exert twisting action on the roving between them and the front rolls equal to but opposite from the untwisting action at the rear ends of elements **14**. Thus the effect will be to feed twist into the forward length of roving between the front ends of elements **14** and the nip of the front rolls **12—12**.

But it should not be concluded that the original 3 turns per inch twist persists through any substantial distance forwardly of the elements **14**. The roving at this stage is approaching the condition of attenuation of the final yarn and is rapidly becoming much thinner and hence much longer per unit length. Twist fed into such a section of roving depreciates, so to speak, in terms of turns per inch, in proportion to the draft, so that with a draft of substantial amount, say a draft of 18, only a relatively light twist is present in the attenuated roving passing through the nip of the front rolls. Yet it will be seen that by means of the present invention this twist at the nip of the front rolls, though light, may be perhaps twice as large as might be obtained at that point in more usual procedures.

Of course in any usual system of drafting employing twisted roving there will be some residual remnant of this twist left in the attenuated roving. But by the present invention I am enabled to increase this to a much more effective value.

It can be seen in analyzing usual drafting systems employing high drafts that the low value of the residual twist in the roving at the nip of the front rolls is a limitation on the amount of draft that is practicable to use. Decrease in this residual twist, as the draft increases, promotes splitting of the roving at the front rolls.

Although the drafting zone of the illustrated apparatus may be referred to as the space between the nip of the rear rolls **11—11** and the nip of the front rolls **12—12** so that the roving may be said to enter the drafting zone where it is nipped by the rear rolls **11—11**, in usual operation of the apparatus this space between the nips of the two pairs of rolls will be somewhat longer than the longest fiber of the roving, so that slippage of a fiber past its neighbors will not begin until somewhat to the right of the nip of rolls **11—11**. Thus in the usual case, such slippage of fibers will not begin before the roving becomes confined by the elements **14**.

Although in the illustrated apparatus the group of elements **14** confine the roving under pressure throughout substantially their entire lengths, and this is preferred in that it improves the forward feeding of the roving and control over its fibers, nevertheless, as far as the untwisting of the roving and subsequent feeding forward of twist is concerned, the more significant feature of the confining action of the elements **14** is that they confine the roving under pressure at at least the rear end and the front end of a length of the roving, which length is spaced somewhat from both the rear and the front ends of the drafting zone.

The front end of the length of confined roving is shown in the illustrated apparatus as being approximately no more distant from the front of the drafting zone than what may be called a shortest-fiber-length. By "shortest-fiber-length" is meant the length of the shortest fibers that are allowed to remain, other than accidentally, in the material of the roving. In worsted manufacture it is the practice to remove fibers shorter than about ¾ inch or 1 inch in length in operations previous to forming the roving, so the confinement of the roving is accordingly

shown as extending forwardly at least approximately to within such distance from the front of the drafting zone. (Fig. 1 of the original Patent Office drawings is substantially full size.) The portion of the roving to which twist is imparted at the front of the drafting zone will therefore contain practically no floating fibers, that is, fibers that are not being confined by pressure either by the elements **14** or by the front rolls **12**, or both by the elements **14** and by the front rolls **12**.

I claim:

1. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone at at least the front and rear ends of a length of roving spaced from the front and rear of the drafting zone, subjecting both the rear and front ends of the so confined length of roving to rotation around its axis in the same direction at both said ends and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving betwen the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

2. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone at at least the front and rear ends of a length of roving extending through the major part of the drafting zone and spaced from the front and rear of the drafting zone, subjecting both the rear and front ends of the so confined length of roving to rotation around its axis in the same direction at both said ends and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

3. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone through a length of roving spaced from the front and rear of the drafting zone, subjecting the so confined length of roving to rotation around its axis in the same direction throughout and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

4. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone through a length of roving spaced from the front and rear of the drafting zone, subjecting the so confined length of roving to frictional forward feed, and simultaneously to rotation around its axis in the same direction throughout and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attentuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

5. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone at at least the front and rear ends of a length of roving spaced from the front and rear of the drafting zone, the front end of such confined length being no more distant than approximately a shortest-fiber-length from the front of the drafting zone, subjecting both the rear and front ends of the so confined length of roving to rotation around its axis in the same direction at both said ends and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

6. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone at at least the front and rear ends of a length of roving extending through the major part of the drafting zone and spaced from the front and rear of the drafting zone, the front end of such confined length being no more distant than approximately a shortest-fiber-length from the front of the drafting zone, subjecting both the rear and front ends of the so confined length of roving to rotation around its axis in the same direction at both said ends and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

7. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone through a length of roving spaced from the front and rear of the drafting zone, the front end of such confined length being no more distant than approximately a shortest-fiber-length from the front of the drafting zone, subjecting the so confined length of roving to rotation around its axis in the same direction throughout and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

8. Process of textile drafting of the type in which the roving is confined under pressure in the drafting zone, the process comprising causing a roving to enter the rear entrance to the drafting zone in a condition of excessive twist such as would materially interfere with drafting under pressure confinement at that degree of twist, confining the roving under pressure within the drafting zone through a length of roving spaced from the front and rear of the drafting zone, the front end of such confined length being no more distant than approximately a shortest-fiber-length from the front of the drafting zone, subjecting the so confined length of roving to frictional forward feed, and simultaneously to rotation around its axis in the same direction throughout and counter to the twist of the roving approaching the drafting zone and in such amount as to reduce the twist of the roving entering the confined length to a value satisfactory for drafting within said confined length and materially below the twist of the roving approaching the drafting zone, and simultaneously feeding into the forward length of attenuating roving between the front end of said confined length and the front end of the drafting zone twist derived from such reduction from said condition of excessive twist to said satisfactory value of twist entering the confined length.

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