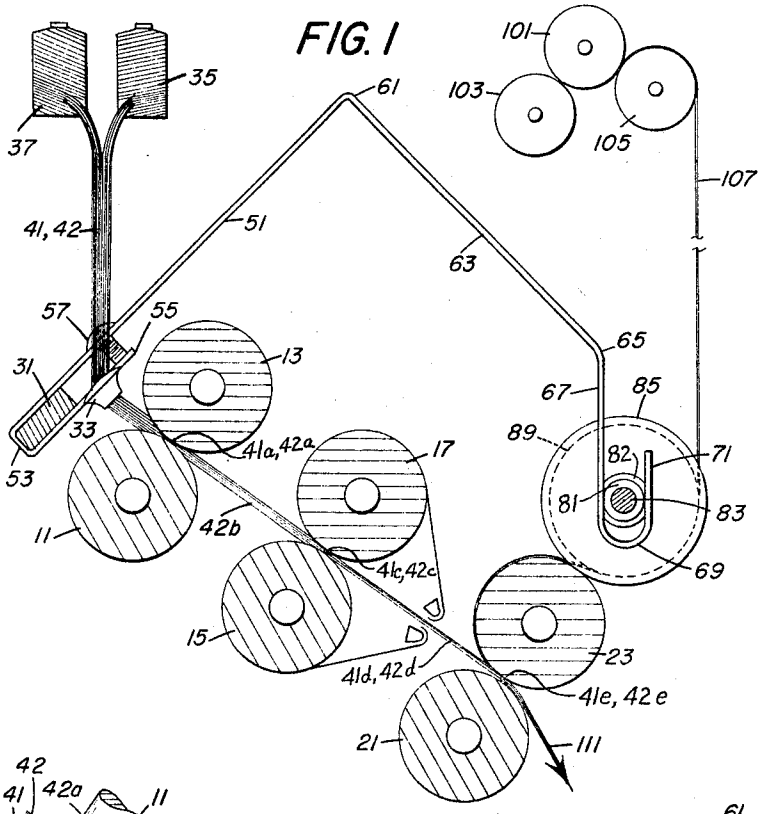
Nov. 22, 1966 R. L. CARROLL 3,286,449

STRETCH YARN FEEDER FOR SPINNING FRAMES

Filed March 27, 1964

FIG. 1



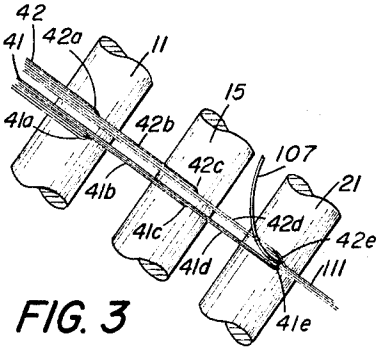


FIG. 3

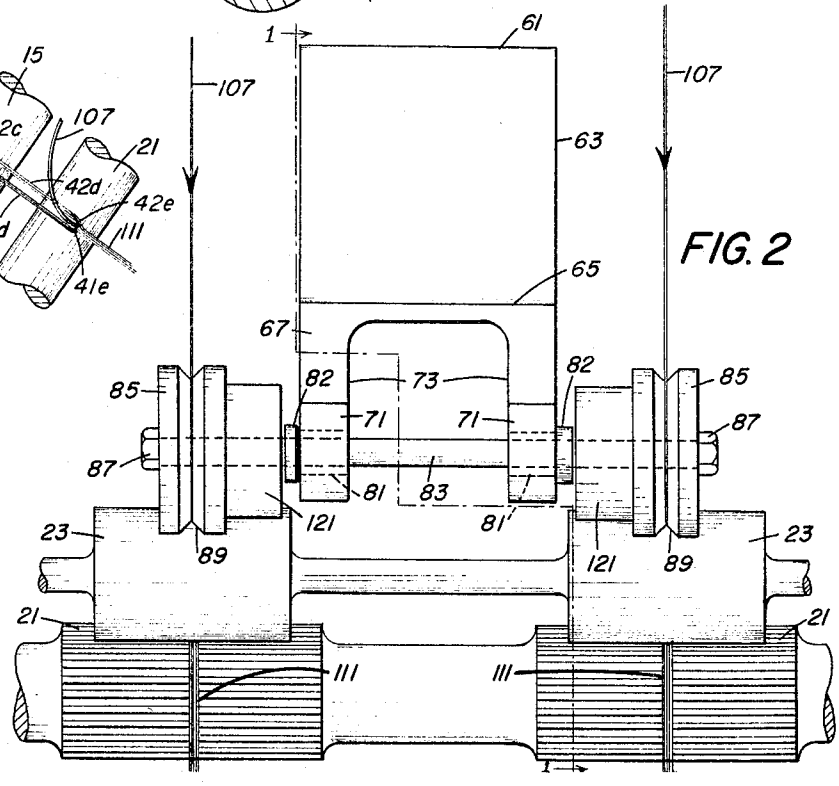


FIG. 2

United States Patent Office 3,286,449 Patented Nov. 22, 1966

3,286,449

STRETCH YARN FEEDER FOR SPINNING FRAMES

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Filed Mar. 27, 1964, Ser. No. 355,315
8 Claims. (Cl. 57—12)

This invention relates to textile machinery, and more particularly to the machine known as a spinning frame. Such machines are well known in the art, and need not be described in detail here. In such a machine, an intermediate stage of the yarn known as "roving" is run through sets of rolls known collectively as a "drafting system" which serve to stretch or draft the fiber array to make the yarn which issues from the drafting system much longer than the roving which enters the drafting system. The act of lengthening or drafting the fiber array also results in compressing it in a lateral or transverse direction, so that the yarn issuing from the drafting system is much longer but also much thinner than the roving which is fed into the drafting system. In the spinning frame, the yarn issuing from the drafting system is then spun or twisted, and is wound on a bobbin.

The drafting system is sometimes called the drafting assembly, and these two names may be used interchangeably.

If the yarn is to be appreciably resilient or stretchable in a longitudinal direction, such as yarn which is to be used for weaving into stretchable cloth or fabric, it is desirable to incorporate into the yarn a longitudinally stretchable strand of material. The best place to incorporate the longitudinally stretchable strand with the non-stretchable or at least less stretchable fibers, is in the drafting system or drafting assembly, so that the stretchable strand is fed into the remainder of the yarn in metered relation thereto, and is spun or twisted with the rest of the yarn, in going through that part of the spinning frame which follows immediately after the drafting system or drafting assembly.

Difficulties have been encountered, however, in feeding the stretchable yarn into the rest of the yarn at this point.

An object of the present invention is to provide an improved arrangement for feeding the stretchable yarn into the rest of the yarn, particularly at the last stage of the drafting system of the spinning frame.

Another object is the provision of stretch yarn feeding mechanism which is durable, trouble free, and easy to install on existing spinning frames.

A further object is the provision of stretch yarn feeding mechanism which will reliably meter the length of the stretch yarn or strand, in a constant relation to the length of yarn issuing from the drafting system.

These and other desirable objects may be attained in the manner disclosed as in illustrative embodiment of the invention in the following description and in the accompanying drawings forming a part thereof, in which:

FIG. 1 is a somewhat schematic vertical section through the essential parts of a typical drafting system of a kind known in the art, illustrating the present invention applied thereto;

FIG. 2 is a front view of the mechanism shown in FIG. 1, including the present invention; and

FIG. 3 is a schematic top plan view of the lower rolls of the drafting system, with the upper rolls and the feeding roll of the present invention removed, illustrating the relation of the roving yarn and the stretch yarn to each other.

Since a spinning frame is well known in the textile machinery art, it is believed unnecessary to show much of the construction of such a frame, and the present drawings illustrate only enough of the parts to make it clear to those

skilled in the art how the present invention fits onto and is used with a conventional spinning frame. The drafting system or assembly of the spinning frame comprises usually three sets of rolls, each set having a bottom roll and an upper roll. The rotary aixs of the various rolls is arranged horizontally, and each roll may be elongated to any desired extent in a horizontal direction, to accommodate the yarn at as many different points, spaced horizontally from each other, as may be desired.

In FIG. 1, there are illustrated the usual three sets of rolls, the first or rear set comprising the lower roll **11** and the upper roll **13**, the second set comprising the lower roll **15** and the upper roll **17**, the third or front set comprising the lower roll **21**, and the upper roll **23**. Only the front set of rolls **21** and **23** are shown in FIG. 2, the rear set and middle set being omitted for the sake of clarity. As usual, the lower rolls **11**, **15**, and **21** are metal rolls with fluted surfaces, and the upper rolls **13**, **17**, and **23** are provided with smooth rubber covered surfaces. The combination of the fluted metal rolls biting or nipping against the rubber coated rolls, gives the desired firm grip on the yarn to feed it obliquely forwardly and downwardly in the conventional manner customary in a spinning frame, and at the same time to "draft" it in order to lengthen the roving to the desired extent.

At the rear of the first or rearmost set of drafting rolls **11**, **13** is the conventional traverse bar **31**, carrying the guides **33** for the roving yarn as it comes down from the supply spools or bobbins, schematically indicated at **35** and **37**. In many or most cases, and especially when the final spun or twisted yarn is to contain a stretch strand, it is desirable to combine two separate strands of roving yarn, plus the single strand of stretch yarn, to form a single spun or twisted yarn. Hence two of the guides **33** are used, slightly separated laterally from each other, and two separate roving yarns come down side by side from the supply bobbins or spools **35** and **37**, passing through the two guides **33**, and then going obliquely forwardly and downwardly through the drafting system, in close side by side relationship. One of the roving yarns is shown schematically in FIG. 3 at **41**, and the other at **42**. As they enter the nip or bite of the first set of drafting rolls **11**, **13**, the pressure of these drafting rolls determines the rate of longitudinal feed of the roving yarns at this point. The position of the nip or bite of the rolls upon the roving yarns is shown schematically in FIG. 3 at **41***a* and **42***a*, respectively. From this point, the roving yarns continue onward as at **41***b* and **42***b* to the nip or bite **41***c* and **42***c* of the second set of drafting rolls **15** and **17**, which pull the roving yarn faster and thus lengthen or draft it, thereby reducing the diameter of the roving yarn, as plainly seen in FIG. 3. The roving yarns continue onward at **41***d* and **42***d* to the nip or bite **41***e*, **42***e* of the third or front set of drafting rolls **21** and **23**, which again pull the roving yarn faster than it is fed by the rolls **15**, **17**, thereby further lengthening or drafting the roving yarn fiber array, and again reducing its diameter. It is here at the nip **41***e*, **42***e* of the front rolls that the stretch yarn is preferably combined with the roving yarns, and it is also here directly after the nip of the front rolls that the two roving yarns are finally brought tight together and combined with the stretch yarn to pass onwardly as a unit to the spinning or twisting mechanism, so that the two roving yarns and the stretch yarn will be twisted or spun together to form a single yarn. This matter of combining the stretch yarn with the roving yarns is the difficult part of the operation, and it is to this matter that the present invention particularly relates.

In fully understanding the present invention, it is important to remember that in a conventional spinning machine, the traverse bar **31** continuously moves back and forth parallel to the direction of the axes of rotation of

the drafting rolls, carrying the roving yarn guides **33** with it, so that the roving yarns **41** and **42** do not constantly go through the drafting rolls at the same point, which would ultimately cause grooves to be worn in the peripheries of the rolls, but on the contrary the constant motion back and forth in a direction longitudinally of the rolls causes the yarn to move sideways constantly, first in one direction and then in the other, so that the wear on the rolls is spread evenly over the desired length of the rolls, possibly a fraction of an inch and possibly up to several inches, depending on the construction of the spinning machine.

According to the present invention, there is provided a bracket or holder which may be called a saddle, rigidly mounted on the traverse bar **31**. It consists preferably of a metal plate having a flat portion **51** in contact with the oblique upper edge of the traverse bar **31** and bent around the rear bottom edge of the traverse bar as at the portions **53** and **55**, the bracket being firmly clamped to the traverse bar by a screw **57** which tends to draw the end **55** toward the flat part **51**, thereby clamping the traverse bar between these two parts. From the traverse bar, the plate **51** extends obliquely upwardly and forwardly from the traverse bar, far enough to give adequate clearance to the drafting system and to allow plenty of space to get at the drafting system for adjustment, repairs, or cleaning. At **61** the bracket plate is bent through approximately a right angle, and thence extends obliquely downwardly and forwardly as at **63**, still far enough away from the drafting system to allow adequate space. At a point approximately directly above the drafting roll **23**, the bracket plate is bent again at **65** and extends downwardly at **67**, the bottom end of the plate being bent forwardly and upwardly again as at **69** to form a U-shaped socket terminating in the upwardly extending leg **71**. This lower part of the bracket plate, from approximately the bend **65** downwardly, may have its central part **73** cut away, if desired, as shown in FIG. 2, leaving merely the depending arms and U-shaped portions at the two lateral sides of the bracket plate, when viewed from the front as in FIG. 2. This cut-out **73** will allow more space for access to the drafting system when necessary, and will leave less of a solid wall which might undesirably catch or collect lint or dirt.

These U-shaped portions **67, 69, 71** form journals or bearings guiding the flanged nylon bushings **81** which are a tight press fit on the shaft **83**, the ends of which extend laterally beyond the edges of the bracket **51, 63, 67** and which carry metering rollers **85**, one on each end, rigidly held in place on the shaft by any suitable means such as the nuts **87**. Each of the metering rollers **85** has a peripheral or circumferential groove **89** sharply V-shaped in cross section, as well seen in FIG. 2.

The nylon bushings **81** are flanged as seen in FIG. 2, each bushing having a flange **82** of larger diameter than the rest of the bushing, at its outer end. Since the bushings themselves are a tight press fit on the shaft **83**, and the flanges **82** lie snugly against the outer lateral faces of the U-shaped portions **67, 71** of the bracket plate, it is seen that the shaft **83** cannot move longitudinally in the bracket. But it can rotate easily, the diameter of the bushings **81** being of such relation to the available space in the journals or bearings **67, 71** that the bushings may not only rotate easily in the bearings but may slide upwardly and downwardly therein. In this way, the lower part of each of the metering rollers **85** is allowed to rest on and be supported by the roll **23** of the drafting system. The U-shaped bend **69** of the bearing is sufficiently low down so that the bushing **81** does not bottom on the part **69**, but rather the full weight of the metering rolls rests on the drafting rolls **23**.

The metering rolls **85** are preferably made of hard wear-resistant ceramic material, preferably the kind of ceramic material sold under the trademark "Heanium." Ceramic material is found to be particularly efficient and useful for the metering rolls of the present invention, in

view of the special requirements for such rolls, and that they do not encourage buildup of static electricity as metal rolls do. It will be recalled that the traverse bar **31** is constantly moving back and forth in a direction parallel to the axes of rotation of the drafting rolls, and the bracket or saddle **51, 63, 67** moves with it, so that the shaft **83** and metering rolls **85** thereon must also move correspondingly back and forth, in the direction of the axis of rotation of the drafting roll **23** on which the metering rolls **85** rest. According to the present invention it is important that the metering rolls **85** be driven from the drafting roll **23**, so that the length of stretch yarn fed by the metering rolls is always properly synchronized with the length of roving yarn delivered by the drafting rolls **21, 23**. This means that the metering rolls **85** must be of a material which has a good coefficient of friction with the rubber coating on the drafting roll **23** and is not likely to slip thereon, in a rotational sense. At the same time, the rolls **85** do have to move axially on the drafting roll **23**, while in contact therewith, and hence the metering rolls should be of material which is not itself worn to an undesirable extent by the axial movement on the drafting rolls **23**, and which does not cause undesirable wear on the surface of the drafting rolls. Likewise, the metering rolls should be of material which is not easily nicked by accidental contact with other parts in a way which might form burrs or rough spots on the metering roll, which burrs or rough spots would tend to tear or otherwise damage the surface of the drafting rolls **23**, as the metering rolls slide axially on the drafting rolls. These rather special and severe requirements for the metering rolls are admirably met or satisfied by making the metering rolls of ceramic material as above mentioned.

It will be readily understood by those skilled in the art, and especially in view of the showing in FIG. 2, that successive drafting system rolls are usually spaced at short intervals along the same shaft, in the conventional spinning frame. Thus in the preferred construction, one bracket or saddle **51, 63, 67** is mounted on the traverse bar **31** in line with the space between two adjacent sets of drafting system rolls, spaced axially from each other on their respective shafts. In this way, one metering roll **85** at one end of the shaft **83** bears on one drafting roll **23**, and the other metering roll **85** at the other end of the same shaft **83** bears on the next adjacent drafting roll **23**, spaced along the same drafting roll shaft from the first drafting roll. Then, of course, for the next two drafting rolls, there is another bracket or saddle on the traverse bar, holding another shaft **83** with another pair of metering rolls **85** which make contact with the two spaced drafting rolls **23**. The same mechanism is repeated throughout the length of the entire spinning frame or spinning machine, assuming that it is desired to use a stretch yarn or stretch strand on all of the yarn spun on this particular spinning frame.

The stretch yarn or stretch strand may be of any desired kind known in the art, the details of the stretch yarn itself being unimportant for purposes of the present invention, which is concerned with the feeding and metering of the stretch yarn rather than with the exact composition thereof. Various kinds of stretch yarn are known in the textile art, those sold under the trade mark "Lyrca" pertain to certain stretch yarns with which the present invention may be used, but as above explained the invention is not limited to any particular kind of stretch yarn or strand. The stretch yarn, whatever its particular kind or composition, is supplied from a supply package indicated schematically at **101**, which may be in the form of a reel, spool, bobbin, or otherwise, supported for example on supporting rollers indicated schematically at **103** and **105**. The stretch yarn, indicated at **107**, comes down from the supply **101** and mechanism **103, 105**, and enters the groove **89** in the metering roll **85**, the metering roll being

so placed on the shaft **83** that the groove **89** thereof is directly in line with the space between the two roving yarns **41***d* and **42***d* just before these yarns enter the nip of the rolls **21** and **23**. The stretch yarn **107** is thus guided by the groove **89**, as it comes around the roll **85**, and transfers to the surface of the roll **23** and enters the space between the two roving yarns **41***d* and **42***d*, the three yarns coming together at the nip of the rolls **21**, **23**. They issue from these rolls **21**, **23** as a unit, shown schematically at **111**, and travel thence downwardly to the spinning or twisting mechanism of the spinning frame, where they are twisted or spun in the normal conventional manner, the details of which are not important for purposes of the present invention.

As already mentioned above, it is desired to have the metering rollers **85** driven in perfect synchronism with the rotation of the drafting rolls **23**, not only in order to feed measured lengths of stretch yarn with relation to the lengths of roving yarn, but also for the purpose of controlling the degree of tension or stretch in the stretch yarn at the time the stretch yarn is united with the roving yarn; and also to preclude the buildup of lint as occurs on a non-driven guide, as this buildup of lint would periodically enter the fiber array or roving and cause seconds or sub-quality finished yarn. The supply mechanism **101**, **103**, **105** of the stretch yarn convenionally has direct feed mechanism gearing the unwinding and downward feeding of the stretch yarn **107**, and this feed mechanism can be designed or adjusted to produce the desired lengthening or stretch of the stretch yarn, between the member **105** and the metering roll **85**, but to do this correctly it is essential that any slippage of the stretch yarn **107** circumferentially or peripherally on the metering roll **85** be constant, and it is essential that the metering roll does not slip in a circumferential direction on the drafting roll **23** which drives it.

As for possible slipping of the metering roll **85** on the drafting roll **23**, this is prevented by adding whatever weights may be necessary to the shaft **83**, to cause the rollers **85** to bear on the rolls **23** with sufficient weight to prevent slipping in a circumferential direction. Of course there must be slipping in an axial direction, as previously mentioned, and so the weight must not be too great or it would cause undesirable wear of either the metering roll **85** or the drafting roll **23** or both.

In the present preferred construction, thick disks of metal, such as steel, are placed on the shaft **83** at any convenient location, preferably just inside the respective metering rolls **85**, between them and the adjacent flanges **82** of the nylon bearing sleeves **81**. These weight disks **121** are of somewhat smaller diameter than the metering rolls **85**, as seen clearly in FIG. 2, so that they do not make contact with the drafting rolls **23** or other parts. They serve only as weights to make sure that there is a sufficiently heavy contact between the ceramic metering rolls **85** and the rubber covered drafting rolls **23**, to insure that the rotation of the drafting rolls will cause corresponding and non-slipping rotation of the metering rolls.

With this arrangement as above described, the stretch yarn **107** is metered and fed in constant relationship with the delivery speed of the drafting system, that is, the delivery speed of the roving yarn as delivered from the nip of the final drafting rolls **21**, **23**. The speed at which the stretch yarn reaches the metering roll **85** is not exactly the same as the peripheral speed of the roll **23**, because although the metering roll **85** is in contact with and has the same peripheral speed as the roll **23**, yet the stretch yarn is not on the periphery of the roll **85** but is in the groove **89** thereof. Hence there will be a differential in the delivery speed of the stretch yarn, as compared to the peripheral speed of the roll **23**, but nevertheless there will be a constant relationship between the two. This difference in speed is allowed for, in planning the degree of tension desired in the stretch yarn at the time it is combined with the roving yarn to make the final spun or twisted strand.

It will be readily understood that as the roving yarn moves back and forth over the faces of rolls of the drafting system, the stretch yarn metering roll or delivery roll **85** likewise moves back and forth with the roving yarn, because the bracket or saddle is mounted on the traverse bar. Thus the stretch yarn is always fed accurately into the desired relation to the roving yarn, notwithstanding the constant travel of the latter back and forth across the wide faces of the drafting rolls.

While this mechanism is particularly useful for feeding a stretch yarn into a roving yarn, it will be appreciated by those skilled in the art that its usefulness is not necessarily confined to stretch yarns. It may be used for feeding any strand or yarn, whether stretchable or not, which is to be combined with the roving yarn at the drafting system of a spinning frame.

It is seen from the foregoing disclosure that the objects and purposes of the invention are well fulfilled. It is to be understood that the foregoing disclosure is given by way of illustrative example only, rather than by way of limitation, and that without departing from the invention, the details may be varied within the scope of the appended claims.

What is claimed is:

1. A strand feeding device for feeding a strand to a drafting system of a spinning frame of the type having a series of drafting rolls rotating on axes, parallel to each other and having a traverse bar reciprocating in a direction parallel to said axes, said feeding device comprising:

(a) a bracket secured to said traverse bar and reciprocating therewith,

(b) a pair of U-shaped arms on said bracket, spaced from each other in the direction of reciprocation of the bracket and traverse bar, the U-shaped arms forming upwardly and downwardly extending bearing slots,

(c) a shaft extending in said direction of reciprocation,

(d) a pair of nylon bushings tightly engaged on said shaft and rotatable in said bearing slots of said bracket arms,

(e) said nylon bushings have flanges engaging edges of said bracket arms to restrict longitudinal movement of said shaft relative to said bracket, so that the reciprocating movements of said traverse bar and bracket will be imparted to said shaft,

(f) two metering rollers of ceramic material fixed to said shaft near opposite ends thereof, said metering rollers resting on certain of said drafting rolls at points spaced from each other in said direction of reciprocation,

(g) each metering roller having a circumferential groove of V-shaped cross section for receiving a strand and feeding such strand in accordance with the rotation of the metering roller and delivering such strand to the drafting roll on which the metering roller rests,

(h) the strand being delivered to the drafting roll at a location which varies in an axial direction, as a result of the reciprocation of the traverse bar, the bracket, the shaft, and the metering rollers, and

(i) metal weight disks on said shaft adjacent said metering rollers to add weight so that said metering rollers will press on the drafting rollers sufficiently firmly to insure that rotation of the drafting rolls will cause corresponding rotation of the metering rollers without substantial circumferential slipping notwithstanding that the metering rollers must slip in an axial direction on the drafting rolls as a result of said reciprocation,

(j) said metal weight disks being of smaller diameter than said metering rollers so that the weight disks

will be out of contact with the drafting rolls on which the metering rollers rest.

2. A strand feeding device for feeding a strand to a drafting system of a spinning frame of the type having a series of drafting rolls rotating on axes parallel to each other and having a traverse bar reciprocating in a direction parallel to said axes, said feeding device comprising a feeding and metering roller rotatably mounted in contact with one of said drafting rolls to be rotated by the rotation of the drafting roll, a circumferential groove in the periphery of said metering roller for receiving a strand at one point of the circumference of the roller and feeding such strand along part of the circumference of the roller and delivering the strand to the drafting roll with which the metering roller is in contact, and means controlled by the reciprocation of said traverse bar for reciprocating said metering roller in the direction of the axis of rotation of the drafting roll with which it is in contact while maintaining such contact, so that the strand groove in said metering roller will move back and forth across a working face portion of said drafting roll.

3. A strand feeding device for feeding a strand to a drafting system of a spinning frame of the type having a series of drafting rolls rotating on axes parallel to each other and having a traverse bar reciprocating in a direction parallel to said axes, said feeding device comprising a feeding and metering roller rotatably mounted in contact with one of said drafting rolls to be rotated by the rotation of the drafting roll, a circumferential groove in the periphery of said metering roller for receiving a strand at one point of the circumference of the roller and feeding such strand along part of the circumference of the roller and delivering the strand to the drafting roll with which the metering roller is in contact, a shaft on which said metering roller is mounted, said shaft being substantially parallel to the axes of rotation of said drafting rolls, a bracket connected to and reciprocating bodily with said traverse bar, said bracket being operatively connected to said shaft both to guide it and to impart to the shaft the reciprocating motion of said bracket, so that the strand groove in said metering roller will move back and forth across a working face portion of said drafting roll.

4. A construction as defined in claim 2, in which said feeding and metering roller is of ceramic material.

5. A construction as defined in claim 4, in which said circumferential groove is of V-shaped cross section to grip the strand therein relatively tightly so as to minimize slipping of such strand in a circumferential direction.

6. A construction as defined in claim 2, in which said circumferential groove is of V-shaped cross section to grip the strand therein relatively tightly so as to minimize slipping of such strand in a circumferential direction.

7. In a spinning frame, the combination with a drafting roll having two working face portions axially spaced from each other, and a traverse bar reciprocating in a direction parallel to the axis of rotation of said drafting roll, and yarn guides on said traverse bar for guiding yarn approaching said drafting roll so that the yarn will move back and forth across the working face portions of the drafting roll in accordance with the reciprocation of said traverse bar, of a bracket on said traverse bar approximately in alinement with the space between said two working face portions of said drafting roll, a metering roller shaft carried by said bracket for rotation therein and held against longitudinal movement relative thereto and capable of limited free movement in a general direction toward and away from said drafting roll, the axis of said shaft being parallel to the axis of said drafting roll, a pair of metering rollers secured to said shaft in position to rest on and make firm contact with the two spaced working face portions of said drafting roll, and a strand guiding and metering groove extending circumferentially around the periphery of each of said metering rollers, the parts being in such relation to each other that rotation of said drafting roll will rotate said metering rollers by contact therewith and strands supplied to the respective grooves in the respective metering rollers will be guided and fed thereby to the respective working faces of said drafting roll at points across the widths of said faces depending upon the momentary positions of said metering rollers on said working faces as determined by the reciprocation imparted to said metering roller shaft by the reciprocation of said bracket on said traverse bar.

8. A construction as defined in claim 7, characterized by the fact that each of said metering rollers is of ceramic material and that each of said strand guiding and metering grooves is of V-shaped angular cross section so as to grip the strand therein relatively tightly and minimize any circumferential slipping of the strand in the groove.

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