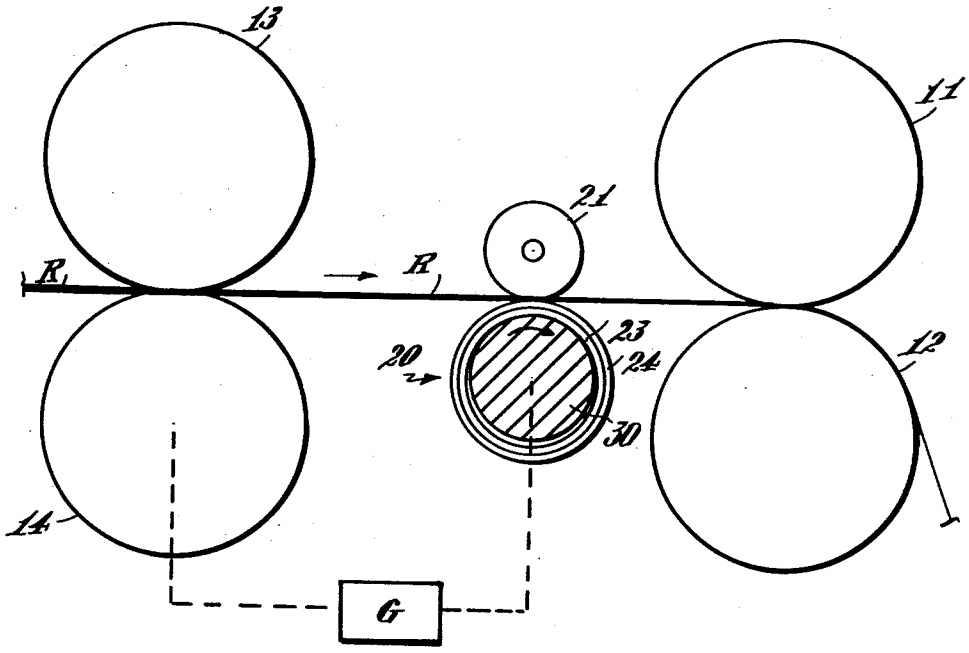
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TEXTILE DRAFTING

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TEXTILE DRAFTING

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This invention relates to textile drafting and particularly to drafting which involves a slip draft. Slip drafting is typified by use within the drafting zone of a pair of carrier elements, such as rolls or aprons whose moving surfaces have nipping engagement with the roving at a point less than a fiber length from the front of the draft zone and which do not positively grip the roving at this point of nipping engagement but allow fibers to be slipped forwardly relative to these nipping surfaces and relative to other fibers of the roving at this point of nipping engagement.

The invention is particularly concerned with driving such slip draft carrier elements, or more specially with driving one of a pair of such elements since, in many cases, the lower element can well drive the upper element by a friction as usual.

A slip draft carrier element such as a carrier roll can be driven in the same manner as a positively-gripping middle roll, namely by geared connections which establish a fixed ratio between surface speeds of the middle and rear lower rolls. A positively-gripping middle roll is typically set so that its point of grip is more than a fiber length behind the nip of the front rolls and more than a fiber length in front of the nip of the rear rolls, so that there are in effect two separate draft zones which are set apart by the nip of the positively-gripping middle rolls.

The present invention involves the thought that in slip drafting the intermediate carrier element should be driven differently from the conventional manner of drive of intermediate rolls generally. The surface speed of the carrier element is a more critical factor than is the surface speed of a positively-gripping middle roll. If the latter is driven slightly faster than might be considered an optimum speed for performing a "break draft," it merely causes a different distribution of the total draft as between the two zones. On the other hand, in the case of a slip draft carrier element, because its loading is only such as will allow fibers to be readily slipped past it, and because many of the fibers engaged at any time thereby are simultaneously positively gripped by the rear rolls, the carrier element will, if driven too fast, slip forwardly relatively to the roving. This will tend to disarrange the fibers. If the slip draft carrier element is driven too slowly, so that it does not sufficiently urge the roving forward, the carrier mechanism will not be fully effective to minimize the wave-like yarn variations which are thought to be triggered by front rolls of drafting apparatus grabbing a greater or lesser than average number of fibers.

Thus it appears that the ideal condition would be for the slip draft carrier element to be driven at a speed which will cause it to conform to the speed of those fibers at the carrier element that are still gripped by the back rolls, exert a forward pull on the roving to feed it and also tension it, and of course not grip fibers positively. The invention aims to drive the slip draft carrier element in such a manner that it is self-adjusting as to speed.

It will be seen that the roving will offer resistance to the pulling section of the slip draft carrier element. A conventional positive drive of the carrier element could overcome such resistance and result in forward slip of

the carrier element relative to the roving. Such conventional positive drive of the carrier element is avoided by the present invention. There is provided a driving means tending to drive the carrier element at a surface speed which is substantially higher than the surface speed of those fibers that have not yet been gripped by the drafting means at the front of the draft zone but are still under the control of the feeding means at the rear of the draft zone, and there is interposed between this driving means and the carrier element a force-limiting connection which limits the force transmitted from the driving means to the carrier element and accordingly the extent to which the carrier element can pull on the roving, thereby preventing the surface of the carrier element from slipping forwardly relative to the roving at the point of nipping engagement.

This force-limiting connection is preferably in the form of a connection which limits the torque transmitted from one rotary member to another rotary member. Most simply the force-limiting connection comprises frictionally engaging driving and driven members, the coefficient of friction between these being such that the driving member will slip continually relative to the driven member.

The drawing is a diagrammatic view in the nature of a cross sectional view showing particularly the drafting zone of a spinning frame embodying the invention.

In the drawing there are shown usual top and bottom front rolls **11** and **12** which constitute drafting means and top and bottom rear rolls **13** and **14** which constitute feeding means for the roving R. The upper front and rear rolls **11** and **13** are forcefully loaded in usual manner so that the roving is positively gripped, and the lower rolls **12** and **14** are positively driven in usual manner at a ratio of speeds such as to provide the desired draft between front and rear rolls. The setting or space between the nips of the front and rear rolls will normally be slightly in excess of the maximum fiber length. The rear or feed rolls **13** and **14** are a means for controlling the rate of entry of the roving into the rear of the draft zone, and other forms of such controlling means can be substituted, for example the single feed roll operating with snubbing action on the roving as disclosed in my United States patent application Serial No. 90,062, filed February 17, 1961.

The amount of draft may of course be widely varied. Merely for example a draft of sixteen may be cited as typical. This is mentioned only as an aid in visualizing the condition of the roving as it progresses through the draft zone.

A lower carrier element, indicated generally at **20**, underlies the roving which is undergoing drafting, and the roving is lightly pressed against the carrier element by an upper carrier roll diagrammatically indicated at **21**. The upper carrier roll **21** may be conventional.

The lower carrier element **20** comprises a tube or ring having an interior portion **23** of nylon or other material having a low coefficient of friction relative to steel, and an exterior portion **24**, fast to the interior portion, the exterior portion preferably being of one of the various materials which are commonly used for resisting slippage of rolls relative to roving, a typical such material being cork.

A steel roll **30** within the nylon tubular portion **23** and a little smaller than the interior diameter thereof is continually driven and frictionally drives the ring **23**, **24** which in turn urges the roving R forwardly. The roll **30** may be driven through gearing G of conventional nature at a speed fixed relative to the speed of the front and rear rolls **12** and **14**. The speed selected for the roll **30** will be such as to tend to move the outer surface of

the carrier element **20** at a surface speed substantially higher than the speed of the fibers engaged thereby that have not, as yet, been gripped by the front rolls but are still under the control of the rear rolls. The lower carrier element **20** continually pulls forward on the roving and rotates the upper carrier roll **21**, but because the steel roll **30** continually slips forwardly relative to the carrier element **20**, the external surface speed of the carrier element corresponds to the speed of those fibers nipped thereby which are still controlled by the rear rolls.

The roll **30** most conveniently is a long shaft, serving a number of drafting units of the frame, individual rings **23**, **24** being provided thereon for the individual rovings.

The pull of the ring upon the roving will be relatively constant regardless of the speed. However, this pull may be governed in several ways, such as, for instance, applying frictional braking to the ring or the upper carrier roll, or using the ring to drive an apron which in turn engages the roving, any of which will use up some of the limited force transmitted between the steel roll **30** and the nylon ring **23** and leave less force available for transmission to the roving, or, on the other hand, increasing the axial extent of the ring along the roll **30** to give more frictional contact between roll and ring and increase the amount of force transmitted, or providing two or more pairs of the carrier elements acting on the roving in succession and each contributing a pull thereto.

While for universality of design it is convenient to choose materials of different frictional characteristics for the interior and exterior surfaces of the carrier element **20**, there will be situations where the desired conditions of non-slip relative to the roving and continual slip relative to the drive shaft **30** can be secured through use of the same material, for example nylon, for both the inside and outside surfaces of the element **20**, the element **20** in such case being simply a ring formed of nylon. In this connection, it may be noted that the interior and exterior surfaces of element **20** are in frictional engagement with materials which themselves may differ as to frictional characteristics. Thus the steel of shaft **30** may inherently slip more easily than does the roving.

The use of a carrier element having interior and exterior surfaces of the same material, for instance nylon, is facilitated by having a rather marked difference between the interior and exterior diameters of the carrier element. In this way, the force of the roving, tending to limit the rotation of the tubular carrier element **20** is

exerted at a relatively large diameter and the force of the drive shaft **30**, tending to rotate the element is exerted at a relatively small diameter. If these diameters bear the relation of, for example, 4 to 3, then any 3 grams of force applied by the roving and tending to limit rotation of the element **20** could only be overcome by 4 grams of force applied by the shaft, tending to turn the element **20**. This relation favors continual slippage of the tubular element **20** relative to the shaft rather than relative to the roving.

I claim:

1. A slip draft apparatus of the kind including roving feeding means controlling the rate of entry of roving into the rear of a drafting zone and drafting means gripping the roving at the front of the drafting zone and intermediate carrier mechanism comprising opposed carrier elements having moving surfaces in nipping engagement with the roving and allowing fibers of the roving to be slipped forward relative to said nipping surfaces and to other fibers of the roving thereat, characterized by driving mechanism comprising means tending to drive one of said carrier elements at a substantially higher surface speed than that of fibers nipped thereby and still controlled by the feeding means, and a force-limiting connection between said driving means and said one driven carrier element for limiting the driving force transmitted from the driving means to said one driven carrier element for preventing the surface of said one driven carrier element from slipping forwardly relative to the roving, the other said carrier element being driven frictionally through its participation in said nipping engagement.

2. A slip draft apparatus as claimed in claim 1 in which the force-limiting connection includes the driving means and said one driven carrier element frictionally engaging and continually slipping with each other as the roving resists movement of the driven carrier element.

3. A slip draft apparatus as claimed in claim 1 in which the driving means and said one driven carrier element comprise a drive shaft and a tubular element loosely surrounding the drive shaft.

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