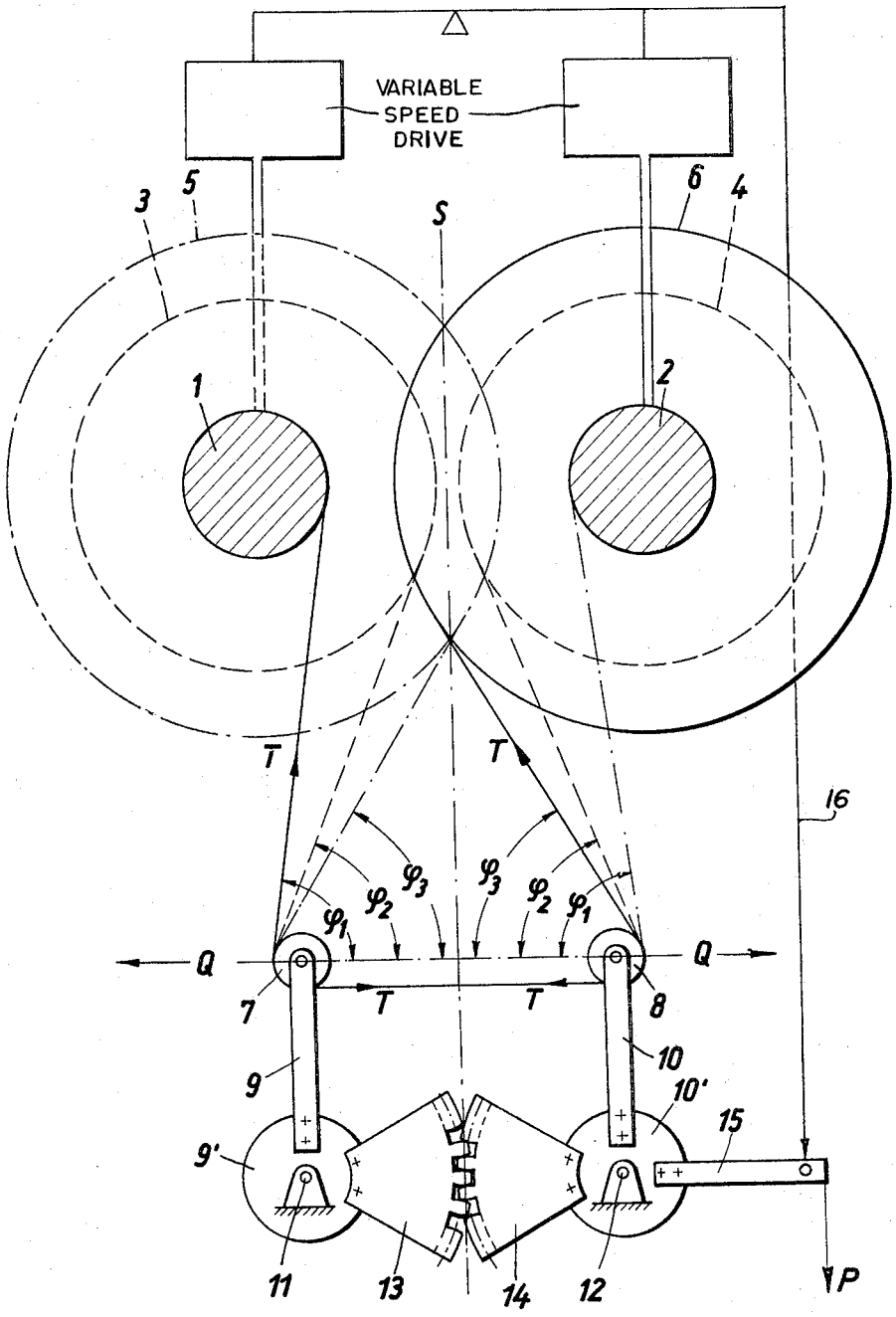
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COMPENSATING BIASING AND FEELER UNIT FOR WINDING MACHINES

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COMPENSATING BIASING AND FEELER UNIT FOR WINDING MACHINES

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This invention relates to an improvement in winding machines of the type used for winding long strips of textile material alternately from a first roll of material on a first winding roller onto a second winding roller to form a second roll of material and vice versa at a pre-adjusted tension and speed of the material, the two winding rollers being driven by infinitely variable speed drives which are adjustable in relation to the actual diameters of the rolls of material in dependence on the deviation from zero of the value of the time integral through the difference of the actual peripheral speeds of the rolls of material, and more specifically this invention relates to dyeing jiggers with rewinding gearings of the type known for example from German Patent 962,424.

In such dyeing jiggers, the strip of material between the two winding rollers is deflected by guide rollers and passes through a dyeing vat between these guide rollers. In the known forms of construction, the deviation from zero of the value of the time integral is measured by the difference between the peripheral speeds of the rolls of material by means of one of the guide rollers which serves as feeler means and for this purpose is designed as a pendulum roller or as a dancer roller and connected to the control device of the rewinding gearing.

In addition to its function as a measuring feeler for the control device, this pendulum or dancer roller also serves as a biasing device applying the desired tension to the strip of material.

The pertinent technology demands that the tension applied to the material remains constant through the entire winding process and is not affected by the continuously changing diameters of the two rolls of material.

To meet these requirements, generally a third guide roller is interpositioned between the pendulum or dancer roller and the adjacent winding roller in such a manner that the strips of material arriving at and departing from the pendulum or dancer roller are substantially parallel in relation to each other.

In some critical cases of the dyeing technique this third guide roller is inconvenient because there are materials which as a matter of principle should contact the guide rollers only with one of their surfaces.

It is the object of the present invention to eliminate this inconvenience and to provide a compensating biasing and feeler unit having only two guide rollers and yet ensuring constant material tension throughout the winding and rewinding process with the material contacting the guide rollers with one of its surfaces only.

To attain this object, the invention provides a compensating biasing and feeler unit for winding machines of the type specified at the outset, which comprises in combination biasing and feeler means consisting of a pair of movable guide rollers interpositioned in the path of movement of the material between said two winding rollers and arranged with their axes parallel to the axes of said winding rollers, supporting and gear means for said guide rollers to permit said guide rollers to move simultaneously toward or away from the plane of symmetry of said winding rollers and thus to move toward and away from each other, lever means connected with said supporting means

and subjected to a biasing force acting so as to move said guide rollers away from each other, and means connecting said guide rollers with said variable speed drives for said winding rollers and capable of transmitting to the latter for speed adjusting purposes any movement of said guide rollers true to the extent and direction of such movement.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawing, in which the only figure is a schematic representation of a compensating biasing and feeler unit according to the invention, illustrating also its mode of operation.

With reference now to the drawing, reference numerals 1 and 2 designate two winding rollers, whereas 3 and 4 indicate dash-lined rolls of material on the winding rollers 1 and 2 at that instant of the winding process at which both rolls of material have equal diameters. Maximum diameters attainable by the rolls of material on the winding rollers 1 and 2 are indicated by a dash-dotted circle 5 and a circle 6, in full line respectively. Hence, when the roll of material on the winding roller 1 has attained its maximum diameter 5, the diameter of the roll of material on the opposite winding roller 2 corresponds substantially to the diameter of this roller 2 itself and vice versa. Guide rollers 7 and 8 for the material are arranged with their axes parallel to the axes of the winding rollers 1 and 2 and are placed symmetrically in relation to a plane of symmetry S of the two winding rollers 1 and 2.

The guide rollers 7 and 8 are mounted on respective rocking arms 9 and 10 fixed at their free ends to respective shafts 9' and 10' which are rotatable about pivots 11 and 12 on stationary supports, which are arranged symmetrically in relation to the plane of symmetry S. Toothed segments 13 and 14 are secured to the shafts 9' and 10' for cooperation and are in meshing engagement with each other in the plane of symmetry S. Through the intermediary of a lever 15, a force P is capable of acting on the rocking arm 10, which force has the tendency of moving the guide roller 8 and through the intermediary of the toothed segments 13 and 14 also the guide roller 7 away from the plane of symmetry S in the directions indicated by arrows Q.

Through the intermediary of the lever 15 and appropriate connecting means 16, the pair of guide rollers 7 and 8, which are acting as material tensioning or biasing rollers due to the force P applied thereto, are connected with a speed control device of the winding roller drives.

The material stretched between the winding roller 1 and the guide roller 7 and between the guide roller 8 and the winding roller 2 forms continuously changing angles with the horizontal plane passing through the central longitudinal axes of the guide rollers 7 and 8, such as angles φ_1, φ_2 and φ_3, which correspond with three specific phases of the winding process.

For example:

(a) angles φ_1 and φ_3, respectively, are formed when the winding roller 1 is empty and the roll of material on the winding roller 2 has attained its maximum diameter 6;

(b) angles φ_2 and φ_2, respectively, are formed when both rolls of material have the same diameters, i.e., the equal diameters 3 and 4, and

(c) angles φ_3 and φ_1, respectively, are formed when the roll of material on the winding roller 1 has attained its maximum diameter 5 and the winding roller 2 is empty.

In this arrangement, which substantially corresponds with a form of realization currently adopted in practice, i.e. with the guide rollers disposed in a dyeing vat not

shown, the values for the angles φ_1, φ_2 and φ_3 are as follows:

$$\varphi_1=83°,\ \varphi_2=69°,\ \varphi_3=58°$$

and the corresponding cosine values are:

$$\cos\varphi_1=0.122,\ \cos\varphi_2=0.358,\ \cos\varphi_3=0.530$$

The convenience of arranging the pair of pendulum type guide rollers 7 and 8 according to the drawing results from the following considerations:

Under the action of the force P, the guide rollers 7 and 8 tend to move away from each other in the directions indicated by the arrows Q, thereby to apply a tension T to the material between the two winding rollers 1 and 2. The values of the tension T for the three winding phases (*a*), (*b*) and (*c*) are as follows:

Winding phase (*a*):

$$T_1+T_1\cos\varphi_1+T_1+T_1\cos\varphi_3=\text{constant}=C$$
$$T_1=C/(2+\cos\varphi_1+\cos\varphi_3)=C/2.652$$

and thus $T_1=C\cdot 0.377$

Winding phase (*b*):

$$T_2=C/(2+2\cos\varphi_2)=C/2.716=C\cdot 0.368$$

Winding phase (*c*):

This winding phase corresponds with winding phase (*a*) and thus $T_3=C\cdot 0.377$.

Comparing $T_1=T_3$ with T_2 results in

$$T_1=T_3=T_2\times 1.0244$$

i.e. the tension remains sufficiently constant, the tension fault amounting to about 2.5%.

The advantage of the arrangement proposed by the present invention over the known arrangements having only one independent pendulum or dancer roller will become readily apparent if it is assumed that the toothed segments 13 and 14 were missing and the pendulum type guide roller 7 were fixed.

In this case, the rewinding phases (*a*) and (*c*) will have to be compared.

(1) Winding phase (*a*):

$$T_1=C/(1+\cos\varphi_3)=C/1.530=C\cdot 0.61$$

(2) Winding phase (*c*):

$$T_3=C/(1+\cos\varphi_1)=C/1.122=C\cdot 0.89$$

The comparison between T_1 and T_3 results in

$$T_1=T_3\times 1.46$$

Consequently, in an arrangement having only one independent pendulum roller, the tension to which the material is subjected cannot be considered constant since the tension fault amounts to about 46%, i.e. approximately 18 times the tension fault resulting in the compensating biasing and feeler unit proposed by the invention.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

I claim:

1. In a device for winding a long strip of textile material from one roll to another the combination comprising a first roll and a second roll, said rolls being spaced apart from each other; means including a speed control to drive at least one of said rolls; and means positioned along the path of travel of said material strip to maintain a substantially constant tension on the material as it travels from one roll to the other and one roll decreases diameter and the other roll increases diameter, said means comprising a pair of guide rolls spaced apart from each other and equi-distant from a plane of symmetry which is an extension of the locus of said first and second rolls, separate mounting means for supporting each of said guide rolls, each of said mounting means being freely pivotable about its own stationary axis, each of said mounting means also being arranged symmetrically with regard to said plane of symmetry and each mounting means having thereon a pivoting means, said pivoting means being interengaged with each other such that movement of one pivoting means will cause corresponding movement in said other pivoting means, and means attached to one of said mounting means to cause pivotal movement of said mounting means about its stationary axis thereby causing movement of said pivoting means on said mounting means and corresponding movement of the other pivoting means and mounting means to move said guide rolls toward and away from each other.

2. Apparatus as defined in claim 1 wherein said last mentioned means has a force acting thereon which tends to move said guide rolls away from said plane of symmetry.

3. Apparatus as defined in claim 2 wherein said last mentioned means is connected to the speed control of the roll driving means so that the relative diameters of said first and second rolls and therefore the relative position of the guide rolls with regard to the plane of symmetry will control the speed at which the rolls are driven.

4. Apparatus as defined in claim 1 wherein the pivoting means on said mounting means comprises intermeshed toothed gear segments.

5. Apparatus as defined in claim 1 wherein said guide rolls are positioned below said first and second rolls and above said mounting means.

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