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DEVICE FOR DRIVING A GROUP OF ROLLERS

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Fig. 1

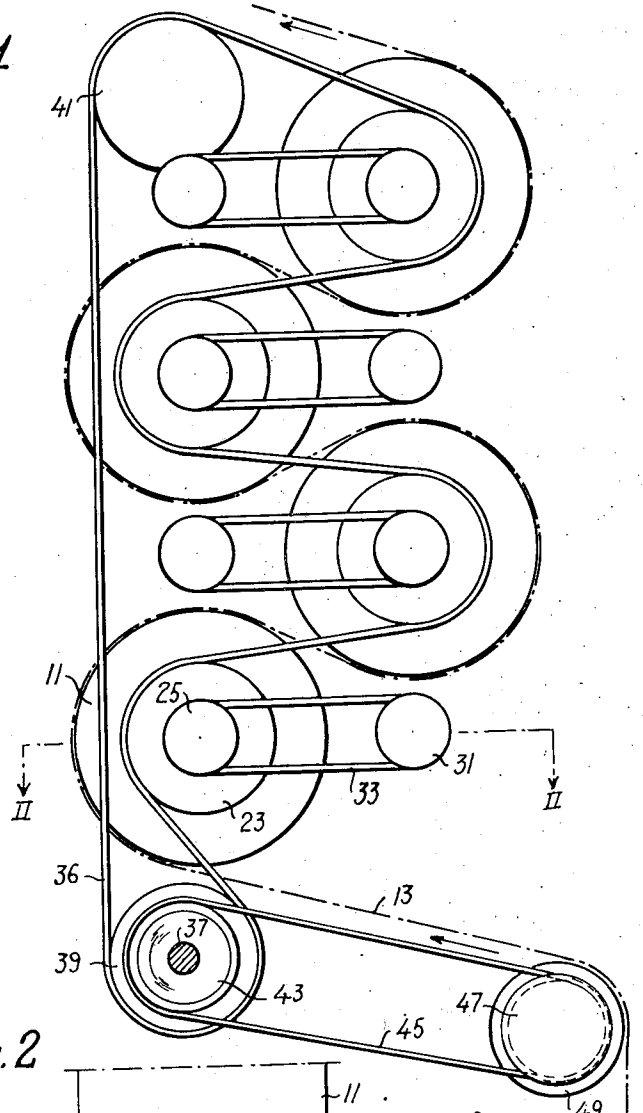
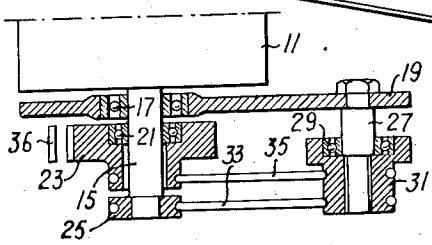


Fig. 2



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DEVICE FOR DRIVING A GROUP OF ROLLERS

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The present invention relates to a device for driving a group of rollers and more particularly for such rollers which are arranged in staggered formation and are adapted for drying a web of material, such as a textile web.

As the material web is dried in such an arrangement, as it runs over said rollers, its length is changed, usually being shortened due to shrinkage. Therefore the drying rollers must be driven at different peripheral speeds, otherwise the web would be subjected to detrimental stretching stresses. It would be preferable if the drying rollers could be made to act upon the web with equal forces, but this would require very complicated driving means.

The object of this invention is to provide a simple driving device in which the drive for all the rollers is derived from one and the same driving shaft and which is of such a design that the rollers can assume different speeds corresponding to a change of length of the web and act upon the web with conveying forces, the differences of which are too small to cause any noticeable stretch of the web between successive rollers.

According to the present invention then, in a device for driving a group of rollers arranged in staggered formation and adapted for drying a web of material, particularly a textile material, the shaft of each of the rollers carries a first pulley freely rotatable thereon and a second pulley rigidly attached to said shaft, a belt or chain driven by a primary driving shaft being led in an undulatory path around the first-mentioned pulleys of all the rollers, and for each roller the first-mentioned pulley being coupled to the second-mentioned pulley by way of two parallel belts connected one to each of said pulleys and also to a common freely rotating pulley, at least one of said belts being elastically tensible, so that the pulley rigidly attached to the roller shaft is driven, relatively to the speed of the rotatable, primarily driven pulley, with a lag dependant upon the driving moment of the roller.

A textile drying plant, to which the invention is particularly applicable, will be described in greater detail hereinbelow by way of example with reference to the accompanying diagrammatic drawing, in which:

Fig. 1 is a side view, and

Fig. 2 is a vertical sectional view taken along the line II—II of Fig. 1.

The drying plant shown in the drawing consists primarily of a number of horizontally arranged drying rollers **11**, which are located close to each other in two rows one above the other, the rollers of one row being positioned opposite the gaps between the rollers of the second row. A textile web **13** which is to be dried is drawn in an undulatory path around said rollers in such a manner that the greater part of their peripheries is covered by the web (see Fig. 1).

The drying rollers **11** each consist of a hollow cylindrical drum filled with steam. Rollers **11** are carried on shafts **15** which by means of ball races **17** are journalled

in a member **19** of the framework of the machine. One of the shafts **15** (the counterpart of that shown in Fig. 2 of the drawing) is bored and serves as an inlet for steam supplied to the interior of the roller and for discharging the condensate therefrom. Said shaft cooperates with a stationary stuffing box whereby the steam within the drying roller can be maintained at the required pressure. The opposite shaft **15** (i.e. that shown in Fig. 2) is used for driving the roller. By means of a ball race **21** a shouldered pulley **23** is rotatably mounted on shaft **15**, a second pulley **25** being thereafter rigidly mounted on said shaft **15**. Attached to the framework a short distance from the ball race **17** carried therein is a stub shaft **27** on which a double pulley **31** is rotatably mounted by means of a ball race **29**. A drive belt **33** extends between the pulleys **25** and **31**, the latter preferably being grooved in order to guide the belt. A second drive belt **35** parallel to the first-mentioned belt, extends between the pulleys **23** and **31** and is guided by grooves formed in the peripheries of said pulleys.

Over a large circumferential portion of the pulley **23** runs a driving belt **36** which receives its drive from a pulley **39** attached to a primary driving shaft **37**. The belt **36** follows an undulatory path over one face of each of the freely rotating shouldered pulleys **23** of all the drying rollers **11** and over a reversing pulley **41**. Keyed to the shaft **37** is a rope pulley **43** of variable diameter which, by means of a rope **45**, drives a rope pulley **47**. This latter pulley is rigidly attached to a roller **49** which drives the textile web without slipping.

One or both of the belts **33** and **35**, are elastically tensible and consist e.g. of a helically coiled spring or a rubber band. In operation, one run of the or each belt is stretched more than the other run, which results in the speed ratio of the pulleys becoming somewhat smaller than a value corresponding to the comparative diameters of the grooves of the pulleys coupled by the belt. The drive imparted to the pulley **23** by the belt **36** is transferred by means of the belt **35** to the pulley **31** and is thereafter transferred by means of the belt **33** from said last-mentioned pulley onwardly to the pulley **25** mounted on the shaft of the associated drying roller **11**. Due to the elasticity of the belts a certain lag is present in this drive transmission, so that the shaft **15** is driven at a rotational speed somewhat lower than that of the pulley **23**. The magnitude of this decrease is dependent upon the unsymmetrical stretch of the belts, which in its turn is dependent upon the moment required for turning the drying roller. Said moment is composed of the friction present in the journalling of the drying roller, in the sealing faces of the stuffing box for the steam supply, and of the force exerted upon the textile web by the roller for moving the same. Said first-mentioned frictional moment causes a certain loading even when the drying rollers run idle, i.e. when the textile web is not yet applied over the same. Therefore, a certain lag is always present irrespective of the forces caused by the textile web itself. For a proper operation of the device it is important that this braking moment is held at a comparatively low level, above all by a proper design of the stuffing box. Expressed in kilogrammetres said braking moment should not be allowed to exceed 0.2 times the diameter of the roller expressed in metres. The belts should be made so elastic that said braking moment causes a stretching thereof which gives a lag of the fixed pulley **25** relative to the freely rotatable pulley **23** of the order of 10 percent. If both of the belts **33** and **35** are tensible, this condition corresponds to approximately 3% additional elongation of one run of each belt, whereas the elongation must be approximately 10% if merely one of the belts is tensible. The friction of the journalling and stuffing

boxes of the various rollers should be arranged to be as equal as possible.

With the described driving means the rollers will be driven with the same peripheral speed when running idle. In operation, when the textile web is threaded through the drying device and is susceptible to shrinkage, the peripheral speeds of the drying rollers **11** will be different and the torque feeding the web or possibly braking the same will vary according to said length changes. With the above-mentioned values of the belt stretch the speed variation of the rollers in comparison to the idling speed will correspond to a comparatively low pull on the web. This is of great value as it is desired that the shrinkage forces should not be counteracted. Furthermore it will be observed that the friction of the journals and the stuffing boxes of the drying rollers should be as constant as possible in all positions of the rollers, so that it does not vary periodically during each revolution. A certain variation must be tolerated, but it has been proved necessary for satisfactory operation that said variation of the moment is held lower than half the driving moment required for feeding the textile web.

If the web is elongated during drying, the additional stretching of the driving run of the belts over the idling value is decreased to a greater extent the farther forward the rollers are situated in the feed direction of the web. Therefore the rollers will rotate gradually quicker and the force acting upon the web will gradually decrease.

The rope pulley **43** is so adjusted that the peripheral speed of the roller **49** corresponds to, or is somewhat lower than the speed that the elastically driven rollers try to impart to the web. This means that the part of the web lying between the roller **49** and the first drying roller **11** is held stretched with a very low tension.

The above-described embodiment may be modified as to its details. For instance the belt **35** may be replaced by a chain running over chain wheels carried by the pulley **23**. The double pulley **31** may be replaced by two separate pulleys fixed together and cooperating each with a separate belt **33** or **35**, respectively.

I claim:

1. In a device for driving a group of rollers adapted for drying a web of textile material, a primary driving shaft, a shaft drivingly connected to each of said rollers, a first pulley freely rotatable on the shaft of each of said rollers, a flexible motion-transmitting means driven by said primary shaft and led around each of said first pulleys, a second pulley rigidly attached to each of said roller shafts, and means comprising an idler pulley means and elastically tensible belts trained around said idler pulley for coupling each of said first pulleys to the second pulley of the same roller shaft, the axis of said idler pulley means being disposed laterally offset from said roller shafts.

2. In a device for driving a group of drying rollers, a shaft drivingly connected to each of said rollers, a first pulley freely rotatable on the shaft of each of said rollers, means for coupling said first pulleys together for uniform rotation, a second pulley rigidly attached to each of said roller shafts, a freely rotatable third pulley means, disposed on an axis laterally offset from said roller shafts, and two parallel belts connecting said third pulley means to the first pulley and the second pulley of the same roller shaft, at least one of said belts being elastically tensible, whereby the pulley rigidly attached to the roller shaft is driven, relatively to the speed of the freely rotatable pulley, with a lag dependant upon the driving moment of the roller.

3. In a device for driving a group of drying rollers arranged in staggered formation, a primary driving shaft, a shaft drivingly connected to each of said rollers, a first pulley freely rotatable on the shaft of each of said rollers, a belt driven by said primary driving shaft and being led in an undulatory path around said pulleys of all the rollers, a second pulley rigidly attached to each of said roller shafts, a third freely rotatable double pulley for each of said rollers and laterally offset therefrom, and elastically tensible belts connecting each of said third pulleys to a separate first pulley and also to the said second pulleys arranged on the same roller shaft as said last-mentioned first pulley.

4. In a textile web drying machine, a plurality of steam-heated drying rollers, each of said rollers having a shaft extending therefrom and drivingly engaged thereto a first pulley and a second pulley arranged on each of said shafts, said first pulley being rigidly attached to said shaft and said second pulley being freely rotatable thereon, a primary driving shaft, a belt driven by said primary shaft and being led around said second pulley of all the rollers, a common freely rotatable pulley associated with each of said first and said second pulleys, two parallel belts connected one to each of said first and second pulleys and also to said common freely rotating pulley associated therewith, at least one of said belts being elastically tensible and allowing a lag of the first pulley relatively to the second pulley on their respective roller shaft, of the order of 10 percent due to friction of the idling roller.

5. Structure of the character described comprising: a roller a shaft drivingly connected thereto, said roller and shaft adapted to be used for drying a web of material, such as a textile web; a first pulley arranged for rotation on said shaft; a second pulley drivingly connected to said shaft, means for driving said first pulley; means for drivingly connecting said first pulley to said second pulley, said last-named means including a third pulley means and a belt trained around each of said first and second pulleys and said third pulley means, at least one of said belts being elastically tensible and operating to effect driving of said second pulley at a speed slower than the speed of said first pulley.

6. The structure defined in claim 5 further comprising: bearing means and a stuffing box for mounting said shaft, and means for supplying steam to and discharging condensate from said drying roller through said shaft, with said elastic belt being adapted to be stretched, due to the friction of said bearing means and said stuffing box, to such a degree that said second pulley lags said first pulley by approximately 10 percent.

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