

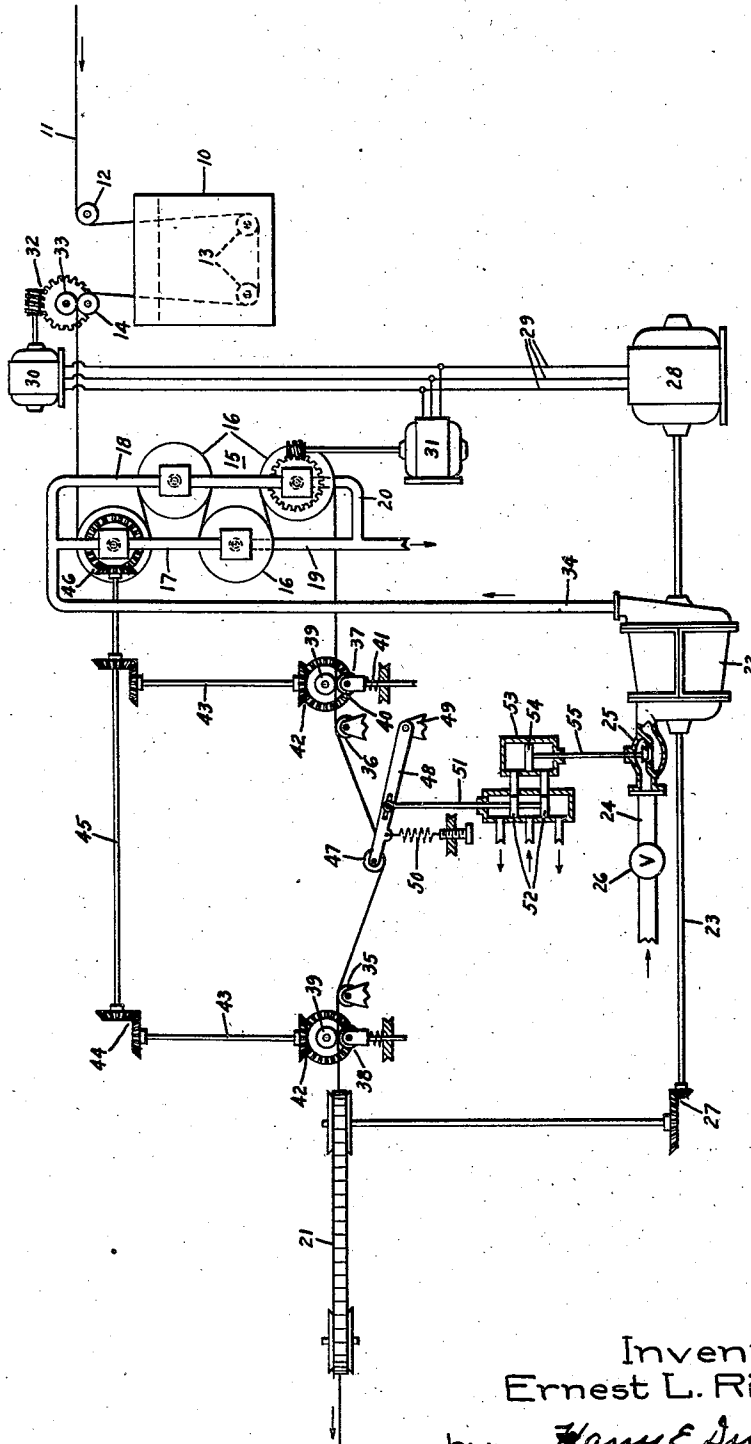
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TEXTILE AND PAPER MACHINE DRIVE

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TEXTILE AND PAPER MACHINE DRIVE

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The present invention relates to textile and paper mill drives, more specifically to the kind of drives for operating a plurality of sections of a paper or textile machine by means of separate motors. Such drives usually require a wide speed range of the individual sections and the maintenance of fixed speed ratios among the various sections. In a textile range, for instance, the fixed speed ratios between different sections must be maintained in order to prevent the paper or cloth from piling up or being unduly stretched.

An object of my invention is to provide an improved construction and arrangement of drives for paper machines, textile machines and like arrangements in which textile or other cellulose fabric or material passes successively through a number of separately driven sections during its process of manufacture.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

The single figure of the drawing illustrates by way of example a textile range embodying my invention.

The arrangement has a plurality of sections including a starching and a drying section. The starching section has a tank 10 for containing starching fluid through which a band or web 11 of textile material is conducted by means including rolls 12, 13 and 14. The band 11 after leaving the starching section is conducted through a drying section 15 which includes a number of dry-cans 16. A drying medium, such as steam, is conducted to the dry-cans by conduits 17, 18 connected to the front ends of the cans and discharged therefrom by conduits 19, 20 connected to the rear ends of the cans. After the textile material has been dried to a certain degree in the drying section it is conducted through a tender 21 to be stretched to its proper dimensions. The arrangement so far described is typical of any arrangement for processing textile material.

The drive for separately driving the various sections according to my invention comprises a driving machine, in the present instance, an elastic fluid turbine 22, which has a shaft 23 and an inlet conduit 24 with a valve 25 for controlling the flow of elastic fluid to the turbine and an emergency stop valve 26 ahead of the control 25 as regards the direction of flow of fluid therethrough. One section of the machine, in the present instance the tenter 21, is directly

mechanically driven from the turbine shaft 23 connected to the tenter by means including a reducing gearing 27. The other sections of the machine, in the present example the starching and drying sections, are indirectly driven from the turbine 22 through the intermediary of electrical motor generator means. In the present example a synchronous generator 28 is mechanically driven from the turbine shaft 23 and supplies electric energy to a line 29, the latter constituting a source of electric energy of variable frequency. Motors 30 and 31 for separately driving the starching and drying sections are connected to the line 29. The motor 30 drives the starching section by means including a worm gear 32 which has a worm connected to the shaft of the motor 30 and a gear mechanically connected to a roll 33 in cooperative relation with the aforementioned guide roll 14. The motor 31 drives the drying section by means of a worm gear including a worm connected to the shaft of the motor 31 and a gear connected to one of the dry-cans 16, the other dry-cans then being rotated due to their frictional contact with the textile material.

Thus, the drive mechanism includes a single prime mover only, preferably an elastic fluid turbine for driving one section, and generator motor means with a generator driven from the prime mover or turbine and the motors mechanically connected to separate sections for driving the latter at substantially fixed speed ratios. In case said motors are of the synchronous type they may receive their excitation from an external D. C. source but otherwise all of said motors receive substantially their entire input power from the generator. The use of an elastic fluid turbine for driving the main section has the advantage that the exhaust of such turbine may be used for drying textile or other material on its passage through the drying section or sections. In the present example the exhaust of the turbine 22 is conducted by an exhaust conduit 34 to the aforementioned conduits 17, 18 connected to the dry-cans 16. The motors 30, 31 for separately driving their different sections are preferably of the induction type to allow changing motor loads due to variable shrinkage of different grades of cloth to be absorbed and distributed through belt action of the cloth by slight changes in cloth tension between the different sections of the machine.

Experiments have shown that the physical properties, in particular the elasticity of cloth, paper or other fibrous material between succeed-

ing sections depends upon its moisture content. A band of textile or paper material being dried during the process of manufacture will sag when guided over two horizontally-spaced rolls and the sag depends upon its moisture content. In the case of textile the sag increases as said content increases and, vice-versa, the sag decreases as the moisture content decreases. The change in sag which is due to change in elasticity or elastic strength according to my invention is used to control the speed of the driving machine by changing the supply of operating fluid to the prime mover in response to changes in elasticity. To this end the arrangement, as shown in the drawing, includes two fixed rolls 35 and 36 over which the band of cloth 11 is guided on its path from the drying section 15 to the tenter 21. The material is guided to the roll 36 and removed from the roll 35 at fixed speeds in order to maintain constant linear speed of the material intermediate the rolls 35, 36. In the present instance I have provided a pair of nips 37 ahead of the roll 36 and another pair of nips 38 behind the roll 35 as regards the direction of travel of the band 11. Each nip includes a stationary roll 39 and a roll 40 adjustably supported and biased towards the roll 39 by means of a spring 41, the band 11 passing between the rolls 39, 40. Each of the rolls 39 is connected by beveled gears 42 to a shaft 43 driven through gearings 44 from a shaft 45, the latter being driven through a gearing 46 from one of the dry-cans 16. With the material positively guided and driven at a fixed speed between the rolls 35, 36, the sag of the material between said rolls is not affected by external conditions but depends only upon the elastic strength of the material. Therefore, the sag is a true measure of the moisture content.

The turbine governing mechanism for controlling the inlet valve 25 comprises, in addition to the aforementioned rolls 35, 36 and the means for positively driving a band of material at a fixed speed from the roll 36 to the roll 35, means connected to the valve 25 and responsive to variations of sag of the band of material between the rolls 35, 36. The sag responsive means includes a floating roll 47 pivotally connected to the end of a lever 48 and engaging the upper surface of the cloth or band of material. The right-hand end of the lever 48 is supported on a fulcrum 49. An intermediate point of the lever 48 is biased downward by means including an adjustable spring 50. Another point of the lever 48 is connected to a pilot valve stem 51 with heads 52 for controlling the flow of operating fluid to a double acting hydraulic motor 53 which has a piston 54 with a stem 55 connected to the valve 25. With this arrangement an increase in moisture content causing an increase in elastic strength of the material causes upward movement of the lever 48 due to such increased elastic strength and the consequent reduced sag of the band of material between the rolls 35, 36, thereby permitting supply of fluid under pressure to the upper side of the hydraulic motor piston 54 and discharge of fluid from the lower part of the cylinder 53. The piston 54 of the hydraulic motor then is moved downward and causes closing of the turbine inlet valve 55. This results in decreased speed of the turbine and accordingly lower frequency of the synchronous generator 28, resulting in reduced speed of the various sections and consequent decrease in elastic strength due to longer drying of the material on its passage over the dry-cans. The closing of the turbine

valve 25 also causes reduced flow of elastic fluid through the turbine to the drying rolls or cans 16. The reduced supply of heating fluid, however, does not offset the effect of the reduced speed of said rolls as regards the drying of the material.

Thus, by my invention a condition of the material being manufactured, in the example described above, the dryness or moisture content of a band of textile, is maintained substantially constant.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A textile drive arrangement for driving a plurality of sections including a tenter through which a continuous band of material passes during operation comprising an elastic fluid turbine, means for mechanically driving the tenter from the turbine, an electric generator driven by the turbine, and a plurality of motors electrically connected to the generator for separately driving the other sections at predetermined relative speeds to each other and to the tenter.

2. A textile drive arrangement for driving a plurality of sections including a tenter and a drying section for simultaneously acting upon different portions of a continuous band of textile material passing through the sections comprising an elastic fluid turbine having a shaft, means mechanically connecting the shaft to the tenter, means for conducting exhaust fluid from the turbine to the drying section, an electric generator mechanically driven from the turbine, and motor means connected to the generator for driving the drying and other sections.

3. A drive for textile, paper and like fibrous material processing machines including a tenter and drying rolls comprising an elastic fluid turbine having an inlet valve, means directly connecting the turbine to the tenter and means indirectly driving the drying rolls from the turbine, means for conducting heating fluid from the turbine to the drying rolls, and a governing mechanism for positioning the inlet valve comprising a hydraulic motor having a piston connected to the valve, a pilot valve for controlling the flow of operating fluid to the motor and means including a lever connected to the pilot valve and a floating roll supported on the lever for cooperation with the material to move the pilot valve in response to changes of elastic strength of the material to control the flow of elastic fluid to the turbine and to the drying rolls.

4. A textile drive including a drying section, a tenter, means including two horizontally spaced fixed rolls for guiding a band of textile material from the drying section to the tenter, means including an elastic fluid turbine having an inlet valve, means for directly driving the tenter from the turbine, means for indirectly driving the drying section from the turbine, means for conducting heating fluid from the turbine to the drying section, and means for detecting changes in the elastic strength of the material as it moves between said rolls and additional means actuated thereby for controlling the inlet valve.

5. A textile drive including a drying section having a plurality of rotatable drums, a tenter, means including two horizontally spaced fixed rolls for guiding a band of textile material from

the drying section to the tenter, means including an elastic fluid turbine with an inlet valve, means for directly driving the tenter from the turbine and other means for indirectly driving the drying section from the turbine, means including one of the drums to assure uniform linear speed of a band of material being manufactured on its path between said rolls, and a governing mechanism for controlling the inlet valve includ-

5 ing a fulcrumed lever, a floating roll connected to the lever for engaging a band of material on its path between said rolls, adjustable means biasing the floating roll towards such band of material, a control member connected to the lever and a motor controlled by the control member and connected to the valve.

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