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MECHANICAL MOVEMENT

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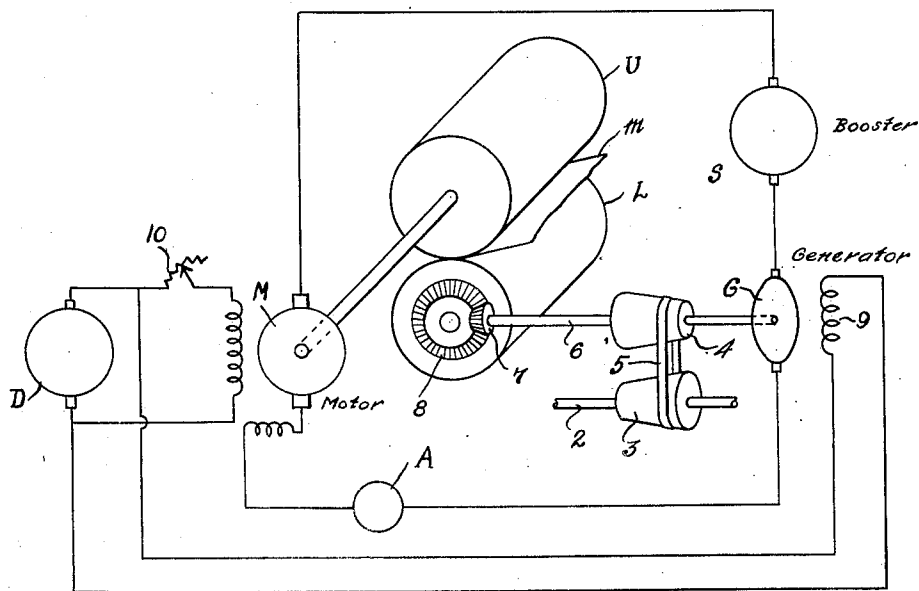


Fig. 1

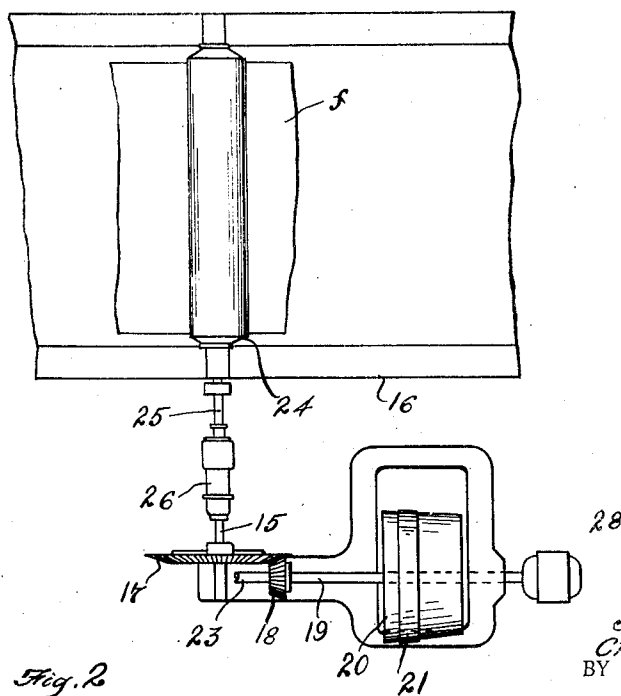


Fig. 2

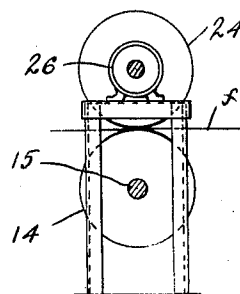


Fig. 3

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MECHANICAL MOVEMENT

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11 Claims. (Cl. 92—47)

Roll mechanism involving cooperating rolls, one positively driven, and the other frictionally driven by the first roll, either direct or through intermediary of material passing therebetween has long been known. The particular drawback in such instance however, is the requirement of sufficient pressure on the rolls to provide the frictional drag to turn the second roll, and even with this, there has been a lack of satisfactory results, besides undue punishment of equipment. Roll mechanism has also long been known in which rolls are connected by intergearing. Such mechanism is unsuited for application however, to conditions in which adjustability of torque on one roll as compared with the other is desired. In an effort to meet this situation, it has been proposed to apply various arrangements of differential gearing, but these fall short of the requirement, since when arranged for a certain division of torque no adjustment thereof can be made. In accordance with the present invention however, a mechanism now becomes possible in which the torque on a given roll can be varied as may be desired, and independently of speed, such mechanism being adaptable generally where cooperating rolls are desired to be driven with flexibility of torque application respectively.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:—

Fig. 1 is a semi-diagrammatic perspective view of a mechanism embodying the invention, electrical connections being shown; and Figs. 2 and 3 are fragmentary plan and elevational views of press roll structure in accordance with the invention.

In its general aspects, the invention contemplates cooperating rolls, and means for driving the respective rolls, including in part at least an electric drive with controllable torque application.

Referring more particularly to Fig. 1 of the drawing, there is shown cooperating rolls L, U, the roll L being driven from a line shaft 2 through the intermediary of adjustable control means, as cone pulleys 3, 4, and belt 5; the cone pulley 4 being on a counter-shaft 6 which carries a bevel pinion 7 meshing with bevel gear 8 on the roll shaft. Driven by the same source

of power, and at a convenient point of attachment, for instance on the shaft 6, is an electric generator G, of direct current type. Supplying the field winding 9 of such generator is a source of constant potential of convenient character, as for instance a direct current generator D. Driving the roll U is a direct current motor M, the armature thereof being in circuit with the armature of generator G. A shunt field winding in this motor is supplied by a suitable source of constant potential, conveniently for instance the same generator D which excites the field of generator G. A control rheostat 10 is desirably arranged in the field circuit of the motor M, and an ammeter A is desirable in the armature circuit. The roll L is driven at the desired speed and torque rate by its drive means, that is, the line-shaft 2 through cone pulleys 3, 4, belt 5, and gearing 7, 8. At the same time, the roll U is driven by its motor M, receiving its armature current from the generator G, and therefore being in step with the movement of the roll L. Such adjustment as may be desired for the torque of roll U may be had by the control rheostat 10. Material *m*, as a web or the like, passing between the rolls, may thus be subjected to such pressure as is desired, without imposing excessive deforming pressure thereon as heretofore occasioned in installations where one roll has to be driven frictionally by the other. At the same time, the peripheral speed of the rolls may be kept uniform, although the torque of one roll may be varied with respect to the other, if desired. Such mechanism is thus of general applicability where it is important to drive cooperating rolls in step, and yet be able to vary the torque applied to one roll as compared with the other, and instances are size presses on a paper machine, smoothing presses, couch rolls, press rolls, pasting rolls, etc.

In instances desired, an auxiliary source of constant potential may be provided in the armature circuit of motor M, in order that it may be insured ample voltage for immediate pick-up as the machine is started, instead of having to wait for the control generator G to attain its full speed and voltage. One convenient means for providing such auxiliary or starting voltage is an auxiliary or booster generator S driven independently of the main generator and contributing a voltage component.

A typical installation involving a first press roll on a paper-making machine is shown in Figs. 2 and 3, in which the lower roll 14 is carried by a shaft 15 mounted in the machine frame

16, the bevel gear 17 secured to the shaft being meshed in turn with a pinion 18 on shaft 19 which also carries cone pulley 20 with its belt 21 passing over the lower cone pulley on the main line shaft 23. The top roll 24 has its shaft 25 connected to a motor 26, which preferably is of gear-motor type, that is, including reducing gearing. Driven by the main shaft is a generator 28, whose armature is electrically connected with the armature of the motor 26, as indicated in the wiring diagram of Fig. 1. The shunt field windings of the motor 26 and generator 28 are supplied from a suitable source of constant potential, as indicated in the wiring diagram of Fig. 1. Again, a booster generator may be included in the armature circuit of the motor 26 and generator 28, as in the wiring diagram of Fig. 1. With such mechanism, the bottom roll is driven at desired rate from the line shaft through the cone pulleys and gearing. At the same time, the generator 28 is driven from the same source of power, and supplies the armature of motor 26 to drive the top roll, and the torque applied thereto by the motor 26 may be controlled as desired by its field control. Thus, the felt *f* carrying the web of formed paper may be subjected to such adjusted pressure between the rolls as best suffices to press out water, irrespective of any complications from necessity of frictional drive. Accordingly, whereas in press roll drive heretofore, relying upon friction for the top roll, serious deformation of the felt has resulted, and impairment of its function, with the present mechanism deformation is obviated, and with the surface speed of the top and bottom rolls uniform the torque of the top roll and the pressure applied can be adjusted more particularly with a view to effective pressing out of the water, and more water can be eliminated at the outset, with consequent important saving on subsequent drier requirement and steam-consumption.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

We therefore particularly point out and distinctly claim as our invention:—

1. A mechanical movement, comprising cooperating rolls subjecting sheet material to pressure therebetween, means for driving one of said rolls, a generator also driven with said means, and means for driving the other roll in step with the first-named roll, said means including a drive motor and a current supply connection to the motor from said generator.

2. A mechanical movement, comprising cooperating rolls subjecting sheet material to pressure therebetween, means for driving one of said rolls, a generator also driven with said means, means for driving the other roll in step with the first-named roll, said means including a drive motor and a current supply connection to the motor from said generator, and another source of constant potential connected in the armature circuit of said drive motor.

3. A mechanical movement, comprising cooperating rolls subjecting sheet material to pressure therebetween, means for driving one of said rolls, a generator also driven with said means and having armature and field circuits, means for driving the other roll in step with the first-named roll, said means including a drive motor having armature and field circuits, a connection

from said generator to the armature circuit of the motor, and an independent source of constant potential connected to the field circuit of said motor.

4. A mechanical movement, comprising bottom and top press rolls and felt therebetween of a paper-making machine, means for driving said bottom roll, a generator also driven with said means, and means for driving the top roll in step with the bottom roll, said means including a drive motor and a current supply connection to the motor from said generator.

5. A mechanical movement, comprising cooperating rolls subjecting sheet material to pressure therebetween, means for driving one of said rolls, a generator also driven with said means and having armature and field circuits, means for driving the other roll in step with the first-named roll, said means including a drive motor having armature and field circuits, a connection from said generator to the armature circuit of the motor, and an independent source of constant potential connected to the field circuit of said motor and the field circuit of said generator.

6. A mechanical movement, comprising bottom and top press rolls and felt therebetween of a paper-making machine, means for driving said bottom roll, a generator also driven with said means, means for driving the top roll in step with the bottom roll, said means including a drive motor, a current supply connection to the motor from said generator, and another source of constant potential connected in the armature circuit of said drive motor.

7. A mechanical movement, comprising cooperating rolls subjecting sheet material to pressure therebetween, means for driving one of said rolls, a generator also driven with said means and having armature and field circuits, means for driving the other roll in step with the first-named roll, said means including a drive motor having armature and field circuits, a connection from said generator to the armature circuit of the motor, another source of constant potential connected in the armature circuit of said drive motor, and an independent source of constant potential connected to the field circuit of said motor and the field circuit of said generator.

8. A mechanical movement, comprising bottom and top press rolls and felt therebetween of a paper-making machine, means for driving said bottom roll, a generator also driven with said means and having armature and field circuits, means for driving the top roll in step with the bottom roll, said means including a drive motor having armature and field circuits, a connection from said generator to the armature circuit of the motor, and an independent source of constant potential connected to the field circuit of said motor.

9. A mechanical movement, comprising bottom and top press rolls and felt therebetween of a paper-making machine, means for driving said bottom roll, a generator also driven with said means and having armature and field circuits, means for driving the top roll in step with the bottom roll, said means including a drive motor having armature and field circuits, a connection from said generator to the armature circuit of the motor, and an independent source of constant potential connected to the field circuit of said motor and the field circuit of said generator.

10. A system of control comprising, in combination, a bottom press roll and a top press roll, said rolls being parallelly disposed and adapted to operate on web material, variable
5 speed driving means for the bottom roll, a generator coupled to the bottom roll and adapted to generate a voltage proportional to the speed of the bottom roll, a motor connected to said generator and adapted to operate said upper
10 press roll, and a source of electric energy adapted to supply the energy losses of said generator and said motor.

11. In a system of control for controlling the

operation of a pair of rolls disposed in parallel relation and adapted to operate on web material passing between the rolls, in combination, a bottom roll, means for positively driving the bottom roll, a motor for positively driving the
5 top roll, and means for energizing said motor by a potential proportional to the speed of the bottom roll, whereby the speed of the top roll will have a definite relation to the speed of the
10 bottom roll.

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