

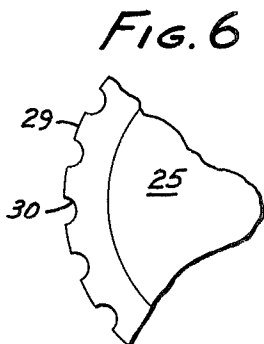
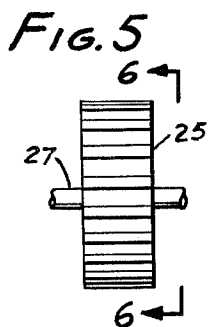
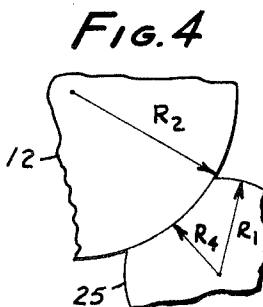
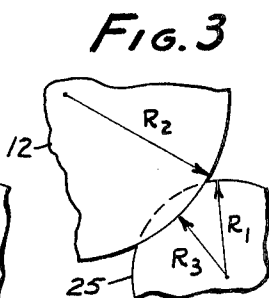
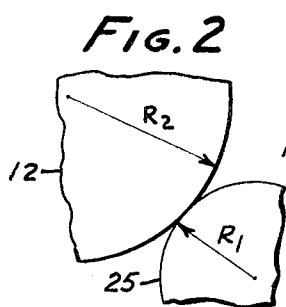
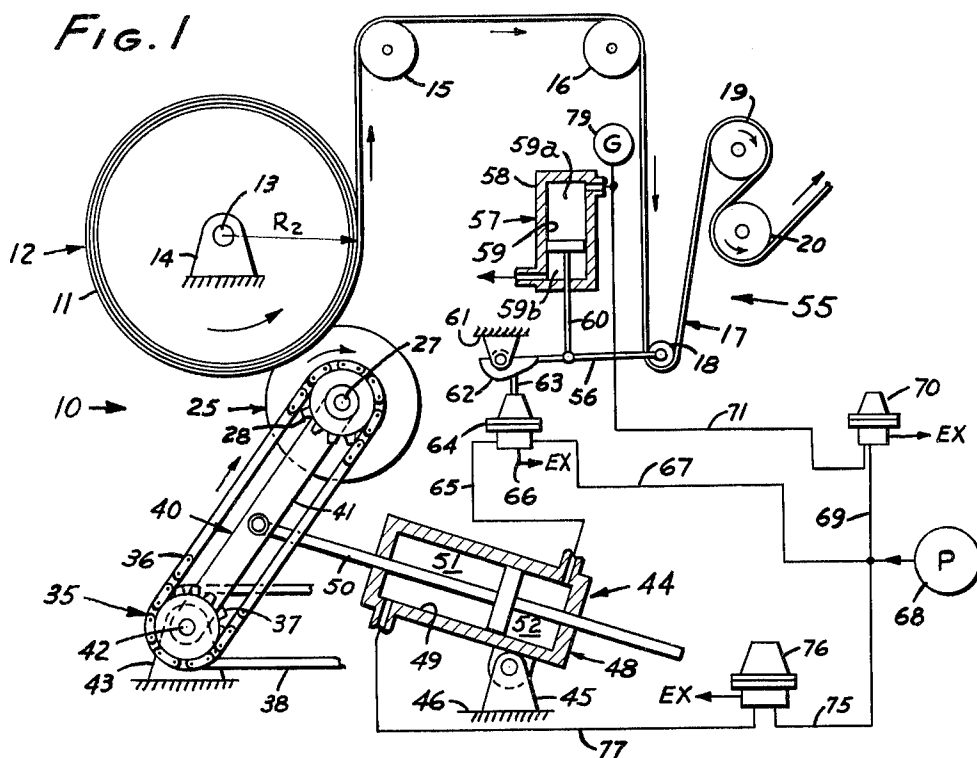
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ROLLSTAND DRIVE

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ROLLSTAND DRIVE

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8 Claims. (Cl. 242—75.1)

This invention relates to a rollstand drive. It is an object of this invention to provide a simple rollstand drive which dispenses elongated material such as a web of paper from a roll at a constant speed and constant tension, both the speed and tension being adjustable.

It is necessary to keep a close control over the velocity at which the material is fed out of a rollstand in order that tension between the roll and a point of demand such as a printing press not increase to the point where the web is broken or decrease to the point where the roll overruns the press and chokes it with slack material.

Because rolls of newsprint and the like are inherently somewhat out of round, and decrease in weight as the material is unwound, the maintenance of close speed and tension control is quite difficult. Numerous suggestions have been made as to means for providing these controls, and generally have involved complicated mechanisms, often including friction brakes and the like, which require constant adjustment and which inherently vary in their physical effects from moment to moment, which is undesirable.

It is an object of this invention to provide a rollstand drive which pays out the material from a roll at a sensibly constant feed and tension, but which still utilizes simple components which are readily adjustable even when the press is in operation.

A rollstand drive according to this invention is adapted to unwind the material from a journaled roll of material, and includes a flexible roller which has a normal radius when the roller is free of external unsymmetrical forces. The radius of this flexible roller is changeable by unsymmetrical forces exerted on the periphery thereof. Movable mounting means journals the flexible roller, and is adapted to move the roller toward and away from the roller material. Force means is connected to the mounting means and is adapted to move the mounting means toward the roll with a variable, controllable force. Drive means drives the roller at a constant angular velocity, and control means controls the force exerted by the force means and thereby adjusts the radius of the flexible roller where it is effective on driving the periphery of the roll of material. The peripheral surface speed of the roll is thereby closely controllable, and is a function of the effective radius of the flexible roller at its tangent point with the rod, which in turn is a function of the force exerted upon the flexible roller.

According to a preferred but optional feature of the invention, the mounting means comprises a pivoted arm, and the force means comprises a fluid motor adapted to pivot the mounting means and thereby the roller toward and away from the roll whereby to vary the effective radius of the flexible roller.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a side elevation partly in schematic, and partly in cross-section, notation showing the presently preferred embodiment of the invention;

FIGS. 2, 3 and 4 are schematic illustrations showing the effect of the variability of effective radius of the flexible roller upon the angular velocity of the roll of material;

FIG. 5 is a front view of a flexible roller suitable for use in the invention; and

FIG. 6 is a partial right-hand end view of FIG. 5 taken at line 6—6 of FIG. 5.

FIG. 1 illustrates the presently preferred embodiment of variable speed rollstand drive 10 according to the invention. The object of the invention is to pay off material 11 from roll 12, which roll may comprise various types of elongated material, a well-known example being a roll of newsprint. The identity and width of the material being paid off roll 12 is of no importance to the invention.

Roll 12 is mounted to a core shaft 13 which is rotatably supported in journal 14. Journal 14 is immovable, and is adapted to receive the core shaft so that roll 12 can turn thereon. Journal 14 is rigidly held in place by structure not shown.

Material 11 is led over idler rolls 15, 16 to a sensing loop 17, formed by dancer roller 18. It is thus led over a pair of infeed rollers 19, 20. The infeed rollers drive the material and exert the demand on the rollstand drive for material to feed a mechanism which is to treat the material, such as a printing press. The infeed rollers are generally driven directly by the press drive and are adapted to supply material at the rate demanded by the press or other mechanism. It is the object of this invention to provide material at the proper tension and speed to meet the demands of the mechanism which accomplishes the next operation, such as printing.

A flexible roller 25 is mounted to a shaft 27 to which a sprocket 28 is pinned for driving the same. The flexible roller is shown in more detail in FIGS. 5 and 6, and may be of any desired length and in the event that the web of material 11 is quite wide, there may be a plurality of these mounted to an extended shaft 27. The most convenient example is a pneumatic or semi-pneumatic tire as shown in FIGS. 5 and 6. Preferably it will be made of non-marking rubber with generally cylindrical peripheral sections 29 and axial grooves 30 which enable the sections 29 to flex and contract somewhat. The grooves are not essential—even a true cylindrical tire will work well in this device, but the "fingers" formed by the grooves appear to be somewhat superior in achieving a variable effective radius.

Drive means 35 comprises a chain 36 engaged to sprocket 28, sprocket 28 forming a portion of the drive means. Chain 36 is also engaged to drive sprocket 37 which in turn is driven by a chain 38 or other means, which is preferably connected to and driven by the machinery which exerts the demand on the system such as a printing press. Therefore, the drive means will turn the flexible roller at a constant angular velocity which is ordinarily directly proportional to the angular velocity of some part of the demanding mechanism.

Movable mounting means 40 comprises a pivoted arm 41 mounted by pin 42 to a pivot plate 43. The movable mounting means thereby is adapted to move the flexible roller toward and away from roll 12.

Force means 44 is interconnected between a pivot plate 45 mounted to base structure 46 and arm 41. The force means preferably comprises a fluid motor 48 which in its preferred embodiment comprises a cylinder 49 and a double-ended piston-rod combination 50 whereby a pair of cylinder chambers 51, 52 are formed. When pressure is increased in chamber 52, the tendency will be for the piston rod to move to the left in FIG. 1, and force the flexible roller more firmly against the roll. When the pressure is increased in chamber 51, the tendency is the reverse.

Control means 55 is provided for controlling the operation of the force means and derives its signal from the dancer roll through a support arm 56 (of which there will ordinarily be a pair supporting the roll, only one of which need be connected to the control system itself).

Bias means 57 comprises a fluid motor 58 which is preferably a cylinder 59 including a piston-rod combination 60, which rod is connected to the support arm. The piston divides the cylinder into chambers 59a and 59b. The support arm is attached to a pivot plate 61, which pivot plate is mounted to supporting structure. A cam 62 is also mounted to the support arm and is effective upon the actuating pin 63 of a bleed-type pressure regulator 64. This pressure regulator is of the type which tends to maintain an established pressure in its regulated conduit 65 (a "regulated conduit" being one which receives the pressure controlled by a regulator). The regulator is provided with an exhaust conduit 66 for exhausting fluid from the regulated conduit when pressure therein exceeds the selected pressure.

Supply conduit 67 derives its source of fluid under pressure from pump 68 which may conveniently include accumulators, not shown and other standard pneumatic equipment such as relief valves and the like. Pump 68 also supplies a pair of bias circuits, one of which includes conduit 69 which is directed to an adjustable bleed-type regulator 70 of the same general type as regulator 64, and the regulated conduit 71 is connected to chamber 59a of fluid motor 58. Chamber 59b of motor 58 is vented.

Conduit 75 connects still another adjustable bleed-type regulator 76 to the source of fluid under pressure, and regulated conduit 77 supplies chamber 51 of fluid motor 48. The bias circuits comprising regulated conduits 71 and 77 exert a constant force within their respective chambers. In the case of fluid motor 48, this bias pressure tends to retract the mounting means and to relieve pressure on roll 12. In fluid motor 58, this exerts a constant biasing pressure on the dancer roller which is opposed by tension in the sensing loop. The tension may be adjusted by changing the pressure derived from regulator 70, and thus varying the downward force on arm 56. Gauge 79, connected to conduit 71 may be calibrated to read in units of web tension.

As can be seen from an examination of FIG. 1, upward movement of the dancer roller permits cam 62 to allow actuating pin 63 to rise, because pin 63 is spring-loaded by conventional means common to regulators of this type. Lowering of the dancer roller, which occurs when there is too much slack in the dancer loop causes the cam to depress the actuating pin.

The object of the invention is to maintain tension and speed by keeping the length of the sensor loop at about the position shown, at which position the relationship between the flexible roller and the roll is about as shown in FIGS. 1 and 3. Should the mechanism demand paper at a greater rate, then tension will be increased in the sensing loop, and the dancer roll be raised. This means that the roll must be speeded up. Accordingly, the dancer roll will rise, as will the actuating pin. The effect of the pressure regulator 64 is to decrease the pressure in conduit 65 and chamber 52, permitting the flexible roller to move somewhat away from the roll. Were the demand to be less, or the roll to be overspeeding, then the sensor loop would slacken and lengthen somewhat, in which event the dancer roll would move downward, depressing the actuating pin in which event the effect would be to raise the pressure in conduit 65 and chamber 52, pressing the flexible roller more firmly against the roll. The bias pressure in chamber 51 assures retraction when needed.

The effects of the aforesaid movements are as follows. Consider first the situation shown in FIG. 2, which is a limiting situation where the unflexed effective radius R_1 of the flexible roller is shown tangent to an arbitrary radius R_2 of the roll. This is the "fastest" ratio between the radii. The surface speeds of the two will be the same, and their angular velocities will be inverse to their radii.

Assume now that the condition is as shown in FIG. 3, with the flexible roller pressed firmly against roll 12

so that an unsymmetrical force is exerted which causes the radius to be reduced at the tangent point (and in limited regions on each side), then the effective radius will become roughly that shown as R_3 , instead of R_1 . Surprisingly, there appears to be sufficient compensation within the material of these flexible rolls, particularly when they are grooved as in FIGS. 5 and 6, that it is the radius R_3 which determines the relative angular velocities between the roll and the flexible roller. While it is not an absolutely linear relationship, still it is sufficiently close, and definitely of such proportionality that the effect is as described herein.

Next assume that the flexible roll is forced still more firmly against roll 12, further reducing the effective tangential radius of the flexible roller to that shown in FIG. 4 as R_4 , R_4 being less than R_3 , in this case the ratio of effective radii will be different from either of the foregoing.

The angular velocity of roll 12 (keeping in mind that the angular velocity of the flexible roller is constant) is greater in FIG. 2 than in FIG. 3, which in turn is greater than that in FIG. 4. FIG. 3 therefore show a nominal equidistance point, with faster and slower speeds available on each side thereof. It will thereby be seen that by varying the force on the mounting means, an unsymmetrical force (the term "unsymmetrical force" being used in the sense of a force not being completely continuous around the rollers, but one which is opposed only by the shaft of the roller) changes the effective driving radius and with it the velocity of the driven roll. This device is simple, made of easily manufactured, and readily adjusted components, which have little wear, and which works well. A heavy roll on the order of 1400 pounds can be started up to full speed in a matter of only a few seconds, and the tension and the speed may thereafter be very closely regulated by this device.

Additional versatility of control is attainable by varying the pressure in the flexible roller when a pneumatic roller is used, because then the change in effective radius is proportional to an additional variable—the inflating pressure.

This invention is not to be limited by the embodiment shown in the drawings and described in the description which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

We claim:

1. In a rollstand drive adapted to drive a journaled roll of material for unwinding the material therefrom, a drive for the roll comprising: a flexible roller having a normal radius when it is free of external unsymmetrical forces, said radius being locally changeable by unsymmetrical forces exerted on the periphery thereof; movable mounting means journaling the flexible roller and adapted to move the flexible roller toward and away from the roll of material; force means connected to the mounting means adapted to move the mounting means toward the roll with a variable, controllable force; drive means driving the roller at a constant angular velocity; and control means controlling the force exerted by the force means in response to tension in the unwound material, whereby the angular velocity of the roll of material varies with the tangential radius of the flexible roller, which is a function of the force exerted by the force means.

2. Apparatus according to claim 1 in which the flexible roller is a pneumatic construction.

3. Apparatus according to claim 1 in which the control means comprises a dancer roll responsive to tension in a loop of unwound material, and in which the force means is controlled as a function of the position of the dancer roller.

4. Apparatus according to claim 1 in which the control means comprises a dancer roll responsive to tension in a loop of unwound material, a bleed-type pressure regulator, cam means operated by the dancer roll and

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effective to vary the pressure produced by the pressure regulator, the force means comprising a fluid motor actuated by the said pressure.

5. Apparatus according to claim 4 in which bias means forces the dancer roller against said loop of material. 5

6. Apparatus according to claim 5 in which the bias means comprises a fluid motor and an adjustable-pressure bleed-type regulator, the fluid motor tending to press the dancer roller against the loop.

7. Apparatus according to claim 6 in which the flexible 10 roller is a pneumatic construction.

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8. Apparatus according to claim 7 in which the peripheral surface of the flexible roller is axially grooved.

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