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2,555,162

WEB WINDING AND UNWINDING CONTROL

Filed July 18, 1949

3 Sheets-Sheet 1

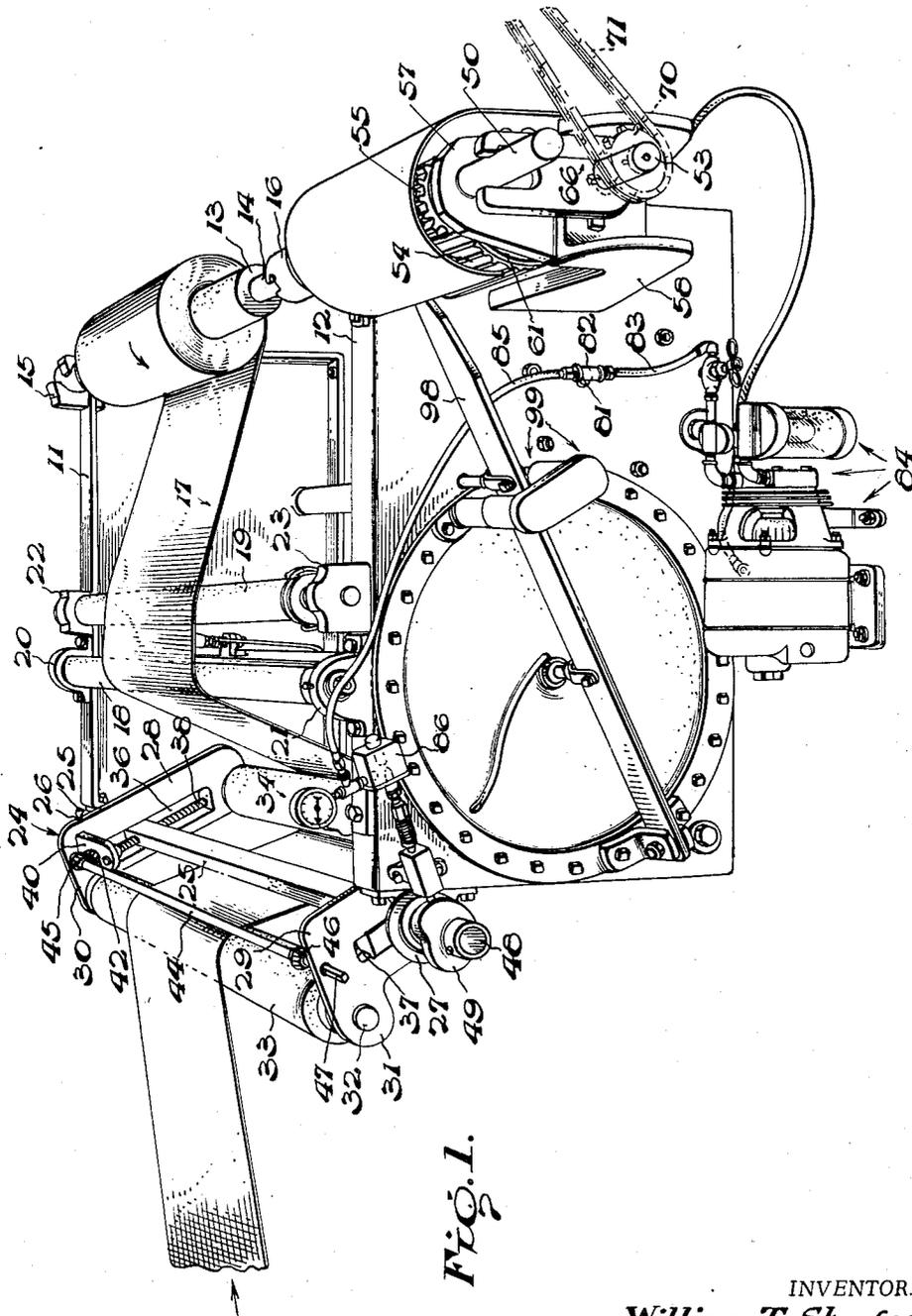


FIG. 1.

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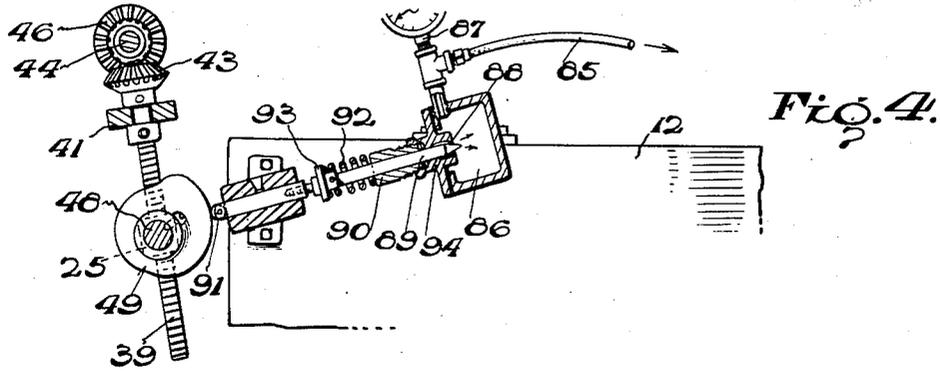


Fig. 4.

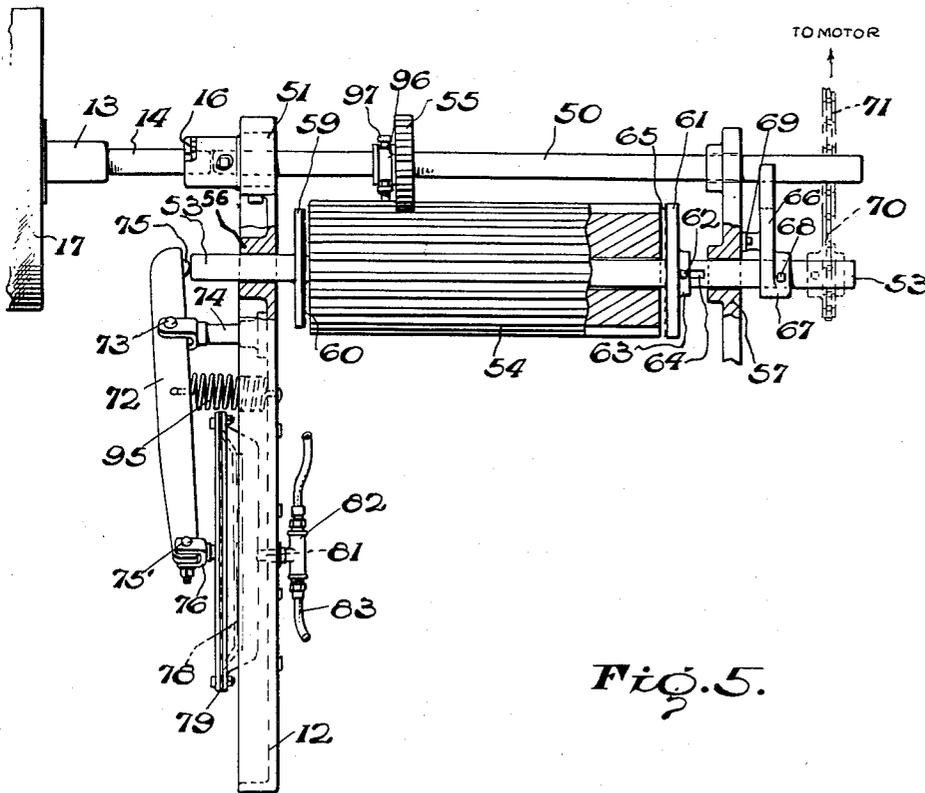


Fig. 5.

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WEB WINDING AND UNWINDING CONTROL

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8 Claims. (Cl. 242-75)

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This invention relates to machines for winding and unwinding sheets or webs of material, such as paper, cloth and other materials and is more particularly concerned with means for changing the speed of the roller upon which the material is being wound or from which it is being unwound to compensate for changes in the tension of the web.

An object of this invention is the provision of means for automatically controlling the speed of the web roller as the web is being either wound or unwound.

Another object of the invention is to provide such means which is positive in operation and which is sensitive in its response to changes in a predetermined web tension.

A further object is the provision of such means which are long wearing, inexpensive to operate and not likely to get out of order.

A still further object is the provision of a mechanism in combination with a web roller in a machine of the type mentioned which includes a combined braking and clutching unit associated with the roller and means for actuating the unit to an extent proportional to the stress in the web material.

A still further object is the provision of such means in combination with a web guiding device.

These and other objects and advantages of the invention will appear from the following description considered together with the accompanying drawing in which drawing:

Figure 1 is a perspective view of certain elements of a web winding machine in combination with an embodiment of this invention.

Figure 2 is a perspective view of a portion of the same machine from a different position.

Figure 3 is a cross sectional view of the diaphragm element of the embodiment together with the linkage system associated therewith.

Figure 4 is a schematic view, partly in section, of the needle valve and cam means for actuating it.

Figure 5 is a plan view of the braking and clutching unit and the diaphragm actuating linkage connected thereto.

Referring with more particularity to the drawing in which like numerals designate like parts the embodiment illustrated comprises a web winding and unwinding machine having suitable frame members 11 and 12 which carry a roller 13 on a shaft 14. Said shaft is mounted in suitable bearings 15 and 16 on said frame members. The roller is adapted to be rotated in either a clockwise or a counterclockwise direction in order

to wind or unwind a web of material, such as the paper web 17.

The web passes over idler rollers 18 and 19 in front of the roller 13. Said idler rollers are mounted in suitable bearings 20, 21 and 22, 23 on said frame members 11 and 12.

In front of the idler rollers there is mounted on the machine frame an oscillatable assembly 24 comprising a rock shaft 25 rotatably mounted in suitable bearings 26 and 27. The said assembly also comprises side plates 28 and 29 having forwardly offset portions 30 and 31 at the top in which the ends of a shaft 32 of a roller 33 is journaled. A second roller 34 has its shaft 35 journaled at the lower ends of the side plates 28 and 29. Longitudinal slots 36 and 37 in the plates 28 and 29 slidably engage the rock shaft 25 and is adjustable relative thereto by means of lead screws 38 and 39, which screws threadedly engage said rock shaft, substantially as shown.

The upper ends of the lead screws are journaled to inwardly projecting flanges or brackets 40 and 41 at the top of the slots 36 and 37. Said lead screws extend through said flanges to receive bevel gears 42 and 43 respectively. Above the said bevel gears a shaft 44 is rotatably mounted behind the roller 33 and is also journaled in the plates 28 and 29, substantially as shown. Said shaft 44 carries bevel gears 45 and 46 which mesh with the bevel gears 42 and 43, respectively. One end of the shaft 44 projects through its corresponding side plate, such as plate 29, and is shaped so as to engage a wrench or other suitable tool (not shown) for turning the shaft. As shown in Figure 1, the protruding end 47 of said shaft 44 is of a square cross section whereby it may be turned by a wrench either to the right or to the left thereby actuating the lead screws 38 and 39 through the bevel gears and raise or lower the entire assembly 24 relative to the rock shaft 25.

The rock shaft 25 has an extension 48 projecting from the outer side of the bearing 27, which extension is provided with a cam 49 the purpose of which will be explained more fully hereinafter.

The web 17 passes beneath the lower roller 34 and over the upper roller 33 on the forward side of the rock shaft 25 and of the shaft 44.

The shaft 14 of the roller 13 is connected to an extension shaft 50 supported in suitable bearings 51 and 52. Parallel to the extension shaft 50 is disposed a shaft 53 that carries an elongated gear 54. Said gear is rotatable and slidable on the shaft 53 and is in constant mesh with an-

other gear 55 on the extension shaft 50. The shaft 53 is carried in bearings 56 and 57, the latter bearing being supported by a bracket 58 attached to the frame member 12.

Between the bearing 56 and the elongated gear 54 there is fixed to the shaft 53 a plate 59 the inner face of which carries a friction facing 60 such as cork or other suitable material. On the opposite side of the shaft 53 between the bearing 57 and the gear 54 there is keyed to the shaft another plate 61, which is axially slidable on said shaft by means of a pin 62 through the collar 63 of the plate operating in a longitudinal groove 64 of the shaft 53. The collar 63 is adapted to abut the inner side of the bearing 57 as the shaft 53 moves to the right as viewed in Fig. 5. The plate 61 carries a similar friction facing material 65 on the inner side. The gear 54 is rotatably mounted on the shaft 53 so as to be both axially displaceable thereon and rotatable relative thereto. The entire shaft 53 is also axially displaceable in its bearings 56 and 57. By these means translation of the shaft 53 in the direction toward the bearing 57 will cause the sides of the gear 54 to come in frictional contact with the plate facings 60 and 65 and therefore effect a braking action when the gear 54 is being driven by the gear 55. When the roller 13 is rotating to unwind a roll of material the shaft 53 is held in a non-rotative position. This is accomplished by means of an arm 66 having a collar 67 at one end, said collar being removably disposed on the shaft 53. The other end of the arm 66 is bifurcated to straddle the extension shaft 50, as shown in Figure 1. The collar 67 is removably secured to the shaft by means of a set screw 68 or by other suitable means. An abutment 69 projects laterally from the arm 66 to contact the side of the bearing 57 or some other suitable fixed member. By these means the maximum spacing between the collar 63 and the inner side of the bearing may be adjusted for any given operation.

Should it be desired to wind material on the roller 13 instead of to unwind it, the arm 66 is removed from the shaft 53 and a sprocket 70 is substituted therefor to permit the application of power to the shaft from a motor (not shown) through a sprocket chain 71. However, other suitable power trains may be employed, the means shown being for illustrative purposes only. As the shaft 53 is rotatably driven it carries with it the plates 59 and 61. Lateral movement of the shaft will then cause said plates to frictionally engage the gear 54 and drive it to an extent dependent upon the pressure exerted by the axial displacement.

It may be seen, therefore, that the extent to which the roller 13 is forced to rotate by the application of power to the shaft 53 or permitted to rotate when power is not applied to the shaft 53 is a function of the lateral displacement of the shaft 53 causing, on the one hand, a clutching action between the plates 59 and 61 and the gear 54 and, on the other hand, a braking action between said plates and gear.

The control of the lateral movement of the shaft 53 is effected through a lever 72 which is pivoted at 73 to an arm 74 extending from the inner side of the frame member 12. One end of the lever 72 engages the inner end of the shaft 53 and a thrust bearing 75 is disposed therebetween. The other end of the lever 72 is pin-connected to an arm 76 which is attached to a laterally movable disc 77 that is secured to a

flexible diaphragm 78. The diaphragm and plate as a unit is disposed in spaced relation to a wall 79 and the edges of the diaphragm are hermetically attached to the wall. The space 80 between the diaphragm and the wall communicates with a short pipe 81, the outer end of which is connected to a T-joint 82. One side of the joint is connected by means of a tube 83 to a vacuum pump 84 and the other end is connected by tube 85 to a vacuum chamber 86 behind the cam 49. A vacuum gauge 87 is interposed between the tube 85 and the chamber 86.

The side of the vacuum chamber 86 facing the cam 49 is provided with a valve comprising a valve seat 88 and a valve stem 89. The latter is slidably disposed in a guide sleeve 90 and its outer end is connected to a cam follower, such as the roller 91 in contact with the periphery of the cam 49. A coil spring 92 is compressionally disposed between the sleeve 90 and an adjustable collar 93 secured to the valve stem 89 to urge the cam follower in contact with the cam. Accordingly, as the assembly 24 oscillates on the rock shaft 25, it turns the cam 49 relative to the cam follower 91 which thereby causes the valve stem to move relative to its seat 88 thereby causing more or less air to enter the vacuum chamber 86 through an aperture 94. This modifies the pressure on the diaphragm and causes it to move under the action of a spring 95 disposed between the lever 72 and the frame member 12. Said spring has a tension designed to yield under the pressure on the diaphragm developed by the vacuum pump.

Movement of the arm 72 results in a lateral displacement of the shaft 53 to effect a braking action or a clutching action, as the case may be, to the extent of the movement.

The degree of oscillation of the assembly 24 is a function of the tension on the web 17 and, therefore, the braking and clutching action referred to will be a function of such tension. By raising and lowering the assembly 24 on the lead screws 38 and 39 the point at which the assembly will move under any given web tension may be modified.

The shaft 14 and its extension 50 is also axially displaceable in its bearings and the collar of the gear 55 is provided with an annular peripheral groove 96 which is rotatably engaged with a yoke 97 at one end of a lever arm 98. Said lever arm is part of a web guiding unit 99 as shown and described in U. S. Patent No. 2,434,128, issued January 6, 1948.

I claim:

1. In a machine of the type described having a roller for carrying a web in rolled form, a first shaft secured to said roller, a first gear rotatable with said shaft, a second gear in meshed relation with said first gear, a second shaft supporting said second gear and rotatable relative thereto, bearings rotatably supporting said second shaft, said second shaft being also axially displaceable relative to said bearings, a friction plate secured to said second shaft on one side of the second gear, another friction plate keyed to said second shaft on the other side of said second gear adjacent one of said bearings so as to be rotatable with and axially slidable on said shaft and means for shifting said second gear axially in response to changes in tension in unrolled portions of said web, whereby changes in tension shift the second shaft and thereby cause the friction plate thereon to engage the gear and shift the latter into contact with the second friction plate.

2. In a machine of the type mentioned having

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a roller for carrying a web in rolled form, idler rollers for supporting unrolled portions of the web, friction means associated with said first mentioned roller, a frame for carrying said idler rollers, a rock shaft supporting said frame, means for adjusting said frame on said rock shaft, said frame being disposed so as to turn said rock shaft when tension changes in said unrolled web portions, a cam secured to said rock shaft, a valve actuatable by said cam, a linkage system for actuating said friction means, a vacuum system for actuating said linkage system and means controllable by said valve for modifying the action of said vacuum system.

3. In a machine of the type mentioned having a roller for carrying a web in rolled form, friction means associated with said roller, a rock shaft and means associated therewith for engaging unrolled portions of said web said means including a tiltable frame carried by the rock shaft, said means being responsive to changes in tension in said unrolled portions to cause said rock shaft to rotate, means for adjusting the position of said tiltable frame on the rocking shaft, means including a vacuum system for actuating said friction means, a valve for modifying said system and means associated with said rock shaft for actuating said valve.

4. In a machine of the type described having a roller for carrying a web in rolled form, a rock shaft, a tiltable frame secured to said rock shaft, idler rollers carried by said frame for supporting unrolled portions of the web, at least one idler roller being above the rock shaft and another idler roller being below said rock shaft, means for adjusting said frame on said rock shaft so as to vary the distance between the idler rollers and the rock shaft, a variable brake connected to said first mentioned roller and means for actuating said brake in accordance with movements of said rock shaft.

5. In a machine as defined by claim 4 in which the variable brake comprises an axially displaceable shaft, a gear rotatable on the shaft, a friction plate secured to the shaft on one side of said gear, another friction plate slidably keyed to the shaft on the other side of the gear and abutment means for said last mentioned plate on the side thereof opposite the gear whereby translation of the shaft axially in one direction causes said friction plates to engage and in the opposite direction to disengage the sides of the gear.

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6. In a machine as defined by claim 4 in which the variable brake comprises an axially displaceable shaft, a gear rotatable on the shaft, a friction plate secured to the shaft on one side of said gear, another friction plate slidably keyed to the shaft on the other side of the gear and abutment means for said last mentioned plate on the side thereof opposite the gear whereby translation of the shaft axially in one direction causes said friction plates to engage and in the opposite direction to disengage the sides of the gear, and means for limiting the axial translation of said shaft.

7. In a machine as defined by claim 4 in which the variable brake comprises an axially displaceable shaft, a gear rotatable on the shaft, a friction plate secured to the shaft on one side of said gear, another friction plate slidably keyed to the shaft on the other side of the gear and abutment means for said last mentioned plate on the side thereof opposite the gear whereby translation of the shaft axially in one direction causes said friction plates to engage and in the opposite direction to disengage the sides of the gear, and removable means for preventing rotation of said shaft.

8. In a machine as defined by claim 4 in which the variable brake comprises an axially displaceable shaft, a gear rotatable on the shaft, a friction plate secured to the shaft on one side of said gear, another friction plate slidably keyed to the shaft on the other side of the gear and abutment means for said last mentioned plate on the side thereof opposite the gear whereby translation of the shaft axially in one direction causes said friction plates to engage and in the opposite direction to disengage the sides of the gear, and means for connecting said shaft to a positive source of power.

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