

June 10, 1958

P. W. JACOBSEN

2,838,253

ROLL UNWINDING CONTROL SYSTEM

Filed May 10, 1955

4 Sheets-Sheet 1

Fig. 1

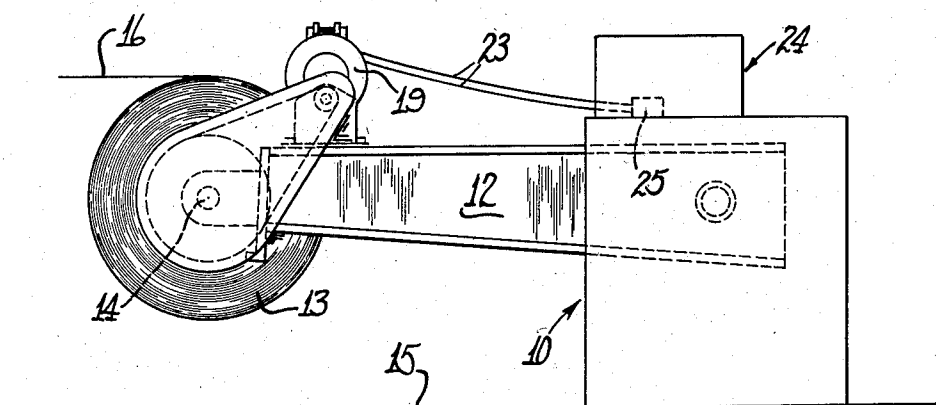
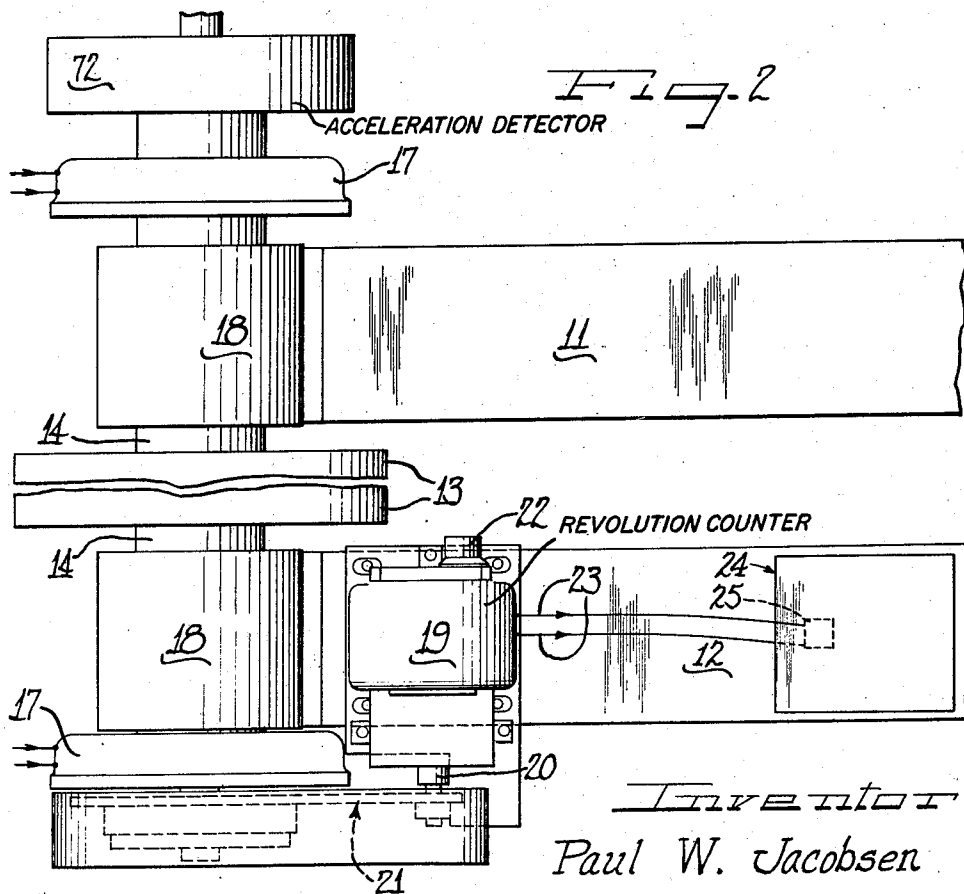


Fig. 2



Inventor
Paul W. Jacobsen

By *Still, Sherman, Meroni, Tracy & Simpson* Attys

June 10, 1958

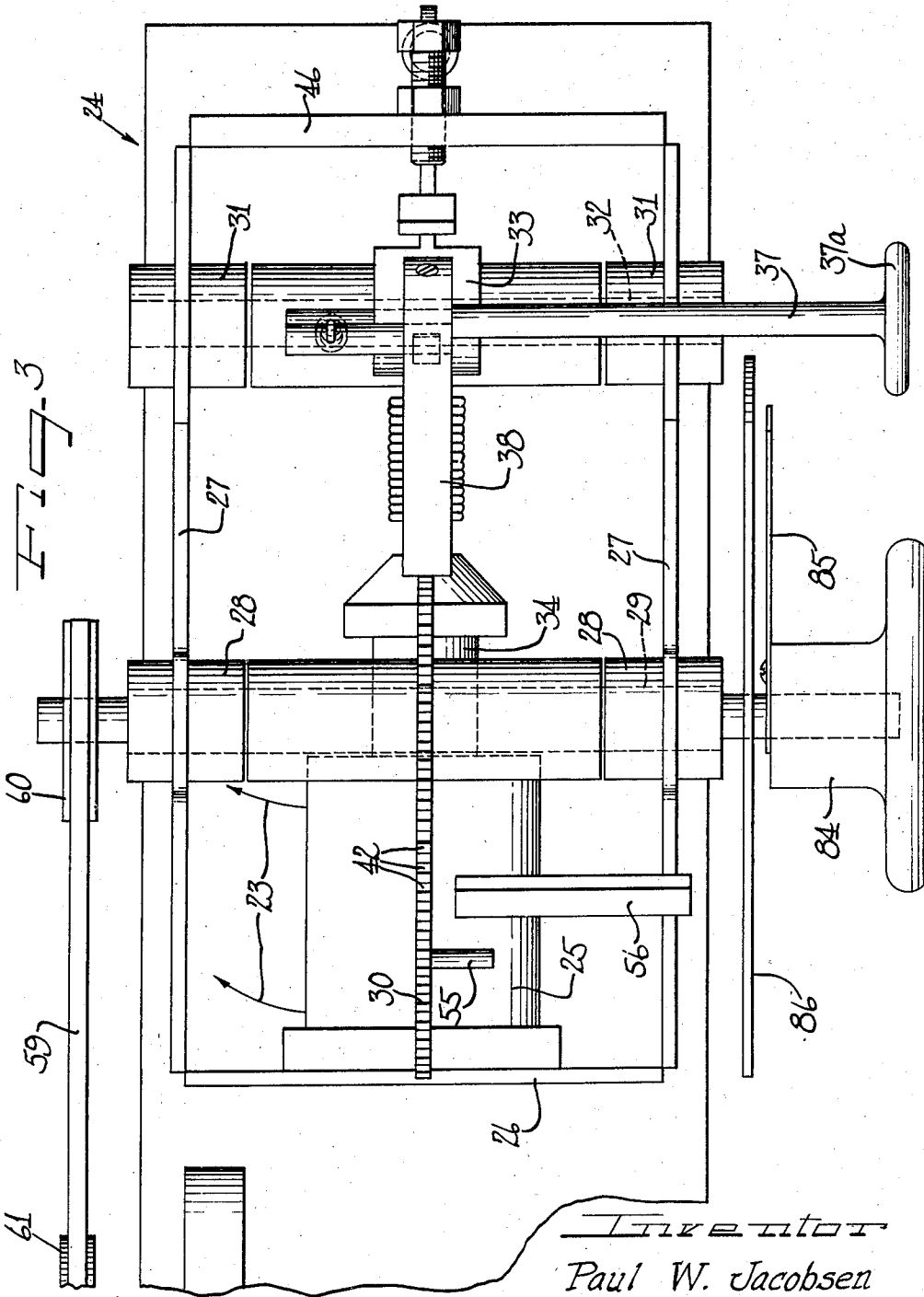
P. W. JACOBSEN.

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4 Sheets-Sheet 2



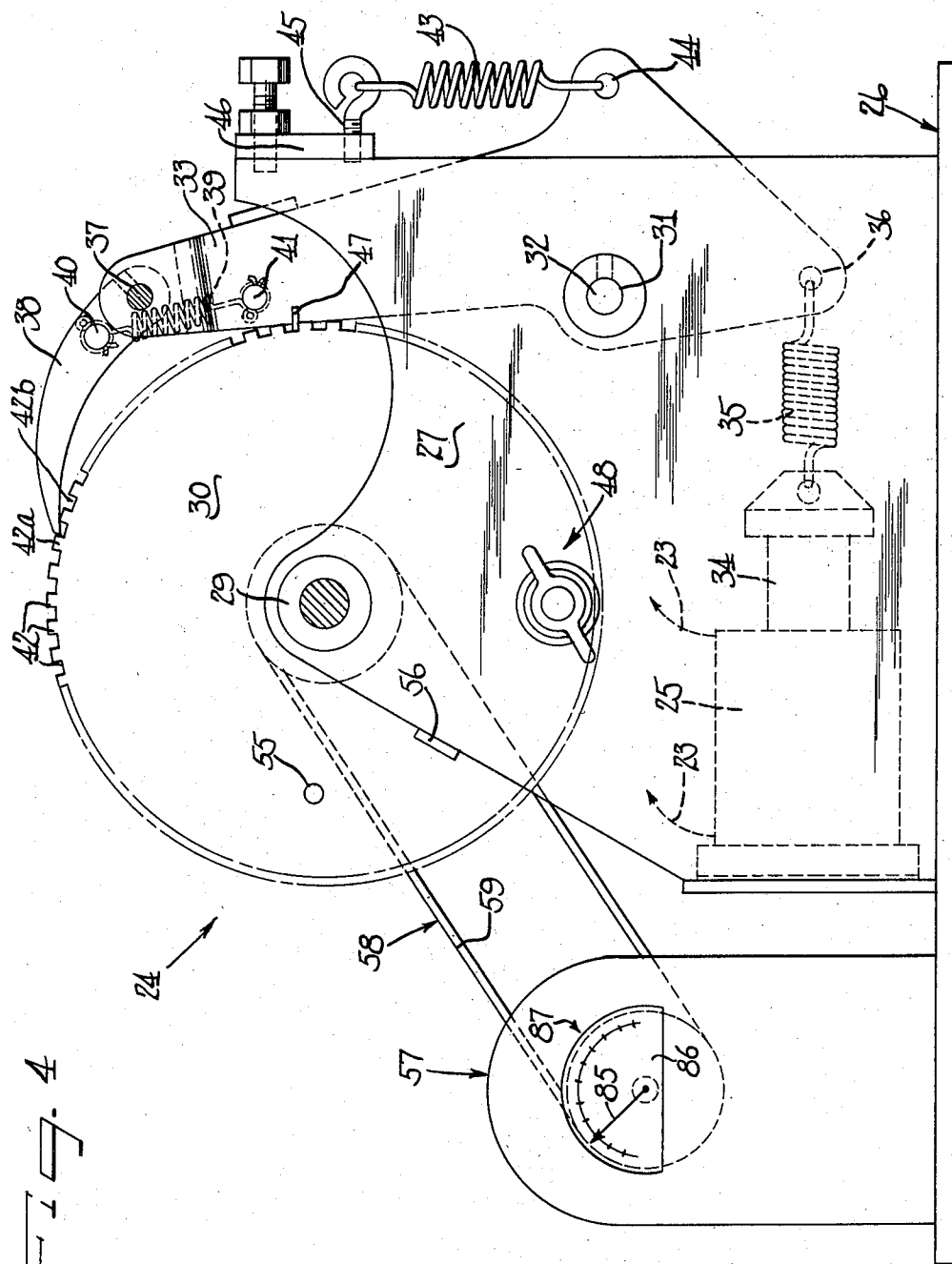
Inventor
Paul W. Jacobsen

Still, Sherman, Meroni, Gross & Livingston Attys

Filed May 10, 1955

ROLL UNWINDING CONTROL SYSTEM

4 Sheets-Sheet 3



Inventor
Paul W. Jacobsen

By Hill, Sherman, Meroni, Gross & Simpson Attys

June 10, 1958

P. W. JACOBSEN

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ROLL UNWINDING CONTROL SYSTEM

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4 Sheets-Sheet 4

Fig. 5

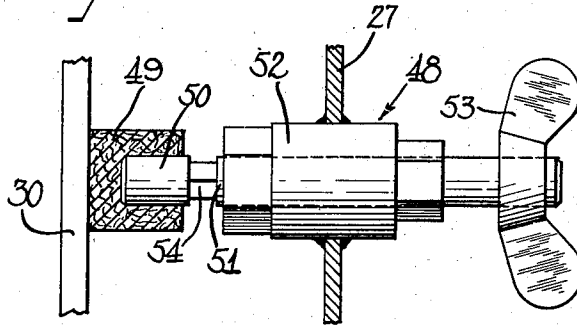
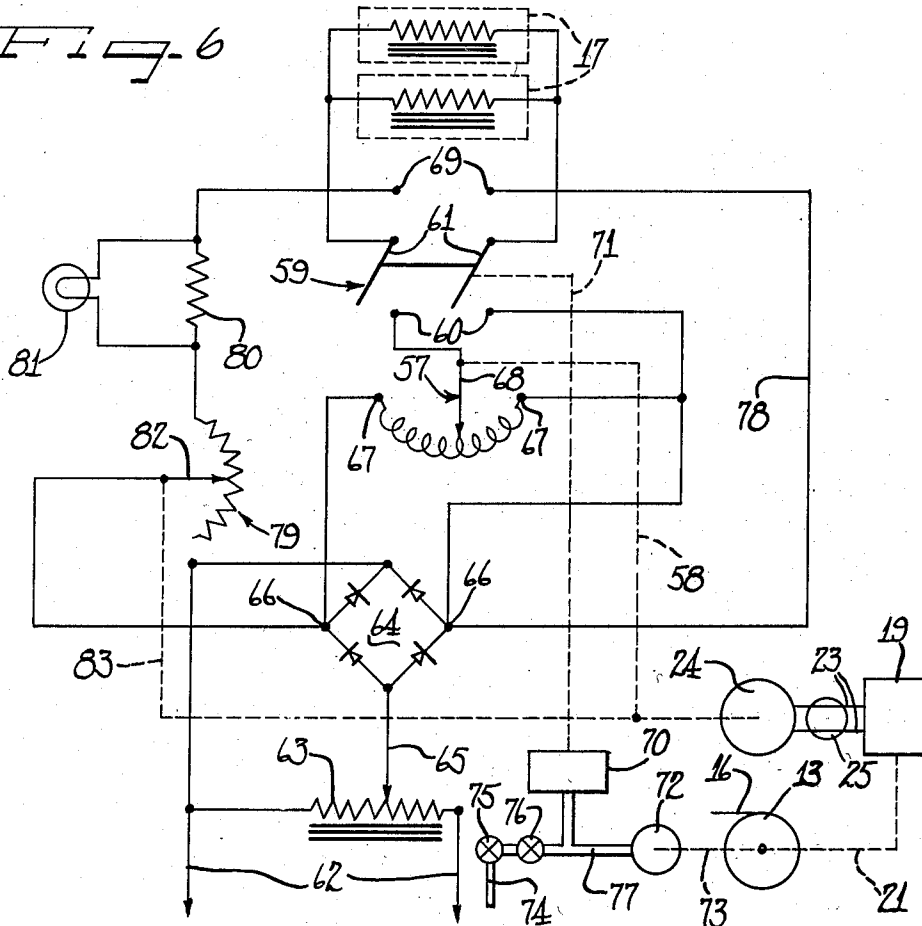


Fig. 6



Inventor
Paul W. Jacobsen

By *Will, Sherman, Merri, Brown & King* Attorneys

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2,838,253

ROLL UNWINDING CONTROL SYSTEM

Paul W. Jacobsen, Kiel, Wis., assignor to H. G. Weber & Company, Kiel, Wis., a corporation of Wisconsin

Application May 10, 1955, Serial No. 507,306

9 Claims. (Cl. 242—75.47)

The present invention relates to a roll unwinding control system, and more particularly to a system for controlling the tension on a roll as the same is unwinding.

In roll stands for unwinding rolls of sheet material such as, for example, paper, it has been found highly desirable to apply braking forces to the roll, as the roll rotates, in order to tension the sheet material as the roll is unwound. The tension force or braking force applied to the roll is a function of several factors including not only the basis weight and character of the sheet material but also the web width thereof. For example, if the basis weight of the sheet material is such that it should be tensioned with a force of two pounds per lineal inch of web width, then a 50-inch web width roll should be tensioned with a force of 100 pounds and the brake load applied to the roll should be set at such values as to apply a 100 pound-tension load to the sheet material being unwound from the roll.

The brakes used to tension the rolls, however, are preferably of a type applying brake forces to the shaft or axis of the roll. When utilizing this type of brake, it has been found that a factor of importance in controlling the brakes is the roll radius and, therefore, the torque on the roll and the moment of tension force applied to the sheet material at the radial extremity of the roll. Under these circumstances it will be readily observed that in order to maintain a relatively constant tension on the sheet material it is necessary to reset the brakes in accordance with the changing roll radius and moment.

Heretofore, the brakes have been reset either periodically by hand or continuously by a follower arm which rides on the outer periphery of the roll. In the case of the use of a follower arm, the arm will control the brake setting either mechanically or electrically through mechanical coupling to a potentiometer or rheostat or the like, in the event that the brakes are electrical brakes, reducing the electrical energization thereof as the roll unwinds toward the stump roll position or condition thereof.

While the manual resetting method is obviously insufficient for the purpose, unreliable, and expensive in that it requires the constant attention of an operator, the roll follower arm technique also has numerous faults and objections. One of the causes of dissatisfaction with the follower arm type brake control lies in the fact that the follower arm must have an end element which actually rides on the roll itself; and with many types of sheet material such as coated material, it is injurious to the material and therefore unsatisfactory to have any element ride on a small region of the sheet.

More important causes for the undesirability of the follower arm type of control lay in the relative inflexibility of the control and its inadaptability to certain utilizations of a roll stand. For example, as the stump roll position is approached, it may be more desirable to decrease the braking force on the roll at a greater rate than the "straight line rate" available with the use

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of a follower arm. This increase in the rate of removal of the braking force setting of the brakes as the roll approaches the stump roll position is desirable since the brakes themselves may have a tendency to counteract any such decrease as the speed of rotation of the roll becomes relatively high, and further since the frictional forces present become relatively high as the speed of rotation of the roll or roll shaft becomes relatively high.

As an example of the inflexibility of the follower arm type of control for the brakes, when utilizing a roll having a relatively great web width and a relatively small diameter, it may be necessary to apply a relatively great braking and tension force. Since the follower arm describes only a predetermined arc and would have very little movement with a relatively small diameter roll, it has been found that the small range of control with the small range of movement of the arm is unsatisfactory as a control on tension of the roll. Additionally, the small range of movement of the arm requires the utilization of auxiliary energization control for the brake in order to apply the required tension force.

In general, the follower arm type of control is thus quite unsatisfactory for general use for the roll stand and at best has only limited utilization for control of the brake and tension force of a single size and basis weight of roll sheet material in a single installation and is without the desired flexibility for general use.

All of these difficulties are overcome in control systems employing the principles of the present invention in that a control system embodying the principles of this invention is a highly versatile control operable in a single installation to be utilized with any roll substantially irrespective of its basis weight or size.

Roll brake control systems embodying the principles of this invention employ the usual roll stand brakes and control potentiometer or rheostat and further utilize a revolution counting mechanism in conjunction with an actuator mechanism to be energized by the revolution counter to move the actuator and thereby the rheostat through a series of controlled brake unloading steps, one step after each selected number of revolutions of the roll as the sheet material is unwound therefrom.

Since the number of revolutions per actuation step may be controlled by varying the setting of the revolution counter, there is substantially complete versatility in the system and the system will operate continuously and automatically whereby there is no need for the continuous attention of a machine operator. Further, this system completely obviates any need for a roll-contacting element since the revolution counter may be actuated and driven from the roll shaft or the rotating element of the brake whereby the undesirable characteristics of a follower on the roll itself are also completely obviated.

Still further, since the brake setting is the primary controlling setting for the system at the initiation of operation, the above described difficulties of the use of a follower arm in conjunction with the use of a roll which has a relatively small diameter but a relatively wide web width are also completely overcome.

It is, therefore, an important object and feature of the present invention to provide a new and improved control system for the brakes of a roll stand to control the unwinding of sheet material from a roll on the stand.

Another object and feature of this invention is to provide a new and improved roll stand brake control system operative through the utilization of revolution counting and stepped brake unloading for the brakes of the roll stand.

Yet another object of the present invention is to provide a new and improved roll stand brake control system

wherein rotation of the roll is sensed to control the brake mechanism for the roll as the sheet material is unwound from the roll.

Still another important object and feature of this invention is to provide a new and improved brake control system for a roll stand to control the unwinding of sheet material from a roll on the roll stand by unloading the brakes in successive steps determined by a selection of the number of revolutions of the roll per step of brake unloading.

Yet another object of the present invention is to provide a new and improved roll unwinding control mechanism wherein revolution counting means generates electric pulses for actuating a ratchet mechanism which in turn drives a rheostat controlling the brakes on the roll stand.

Another object and feature of this invention is to provide a new and improved roll stand brake control system with means provided thereon to indicate operation and/or failure of the brakes and/or with starting control means to substantially remove the braking force during starting operation or restarting operation after a web brake and to reduce starting braking force progressively as the roll unwinds to facilitate restarting operation in the event that the roll web breaks or tears.

Still other objects, features and advantages of the present invention will become readily apparent to those skilled in the art and others, from the following detailed description of the present invention and an embodiment thereof, from the claims, and from the accompanying drawings in which each and every detail shown and illustrated is fully and completely disclosed as a part of this specification, in which like reference numerals refer to like parts, and in which:

Figure 1 is a side elevational view of a roll stand having a control system thereon embodying the principles of the present invention;

Figure 2 is a fragmental illustration of the arms of the roll stand with a part of the control system of the present invention shown thereon;

Figure 3 is a plan view of the ratchet drive mechanism of the system of this invention;

Figure 4 is an elevational view of the ratchet drive shown in Figure 3;

Figure 5 is a fragmental view of the ratchet wheel retarding mechanism; and

Figure 6 is a schematic illustration of the system of this invention.

As shown on the drawings:

In Figures 1 and 2 there is illustrated a roll stand 10 which is a mechanism having a pair of arms 11 and 12 operative to rotatably or revolvingly support a roll 13 of sheet material such as, for example, paper, to be unwound. In some roll stands the roll 13 is supported on a center shaft or on some other rotatable device 14 at the ends of the arms 11 and 12. The roll is then supported off of the floor 15 by the arms so that the sheet material 16 may be pulled from the roll 13 by such mechanism as a sheet processing mechanism which may process the sheet material or act upon the same as in bag-forming or wrapping or the like.

As discussed hereinabove, it is highly desirable to apply braking forces to the roll 13 to tension the sheet material being unwound from the roll as the roll revolves. For this purpose, brake mechanisms 17, which may be electrically energized and variably controllable brakes such as those available from the Warner Electric Brake & Clutch Co. of Beloit, Wisconsin, are mounted on the roll stand at the extremities of the arms 11 and 12 outwardly from shaft bearings 18 and on the shaft or roll support mechanisms 14.

As will be hereinafter described, these brakes are variably controllable and are controlled through varying the electrical energy supplied thereto by controlling rheostats or a rheostat connected between the brakes and the source of electrical energy.

Also, as described hereinabove, the control system utilizes revolution counting means whereby the brakes may be unloaded in a step-by-step manner, each step being taken after a selected number of revolutions of the roll as the roll is revolved by pulling the sheet material 16 from the roll 13. For this purpose, one of the brakes 17, such as the brake on the arm 12, is belt and pulley or gear and chain coupled to a revolution and rotation-sensing device 19 such as a Cyclo-Monitor revolution counter available from the Counter and Control Corporation, of Milwaukee, Wisconsin. This device is operative to generate an electrical pulse of energy or to close the circuit to a source of electrical energy after each group of a selected number of revolutions of the shaft 20 thereof which is driven by the gear and chain coupling assembly 21 which couples the shaft 20 to the brake 17 or to the shaft or roll support mechanisms 14. The selected number of revolutions between pulses or switch closings of the revolution counter may be set by manually setting control dials such as the dial 22 on the revolution counter 19, and on available models of Cyclo-Monitor, the number of revolutions may be selected at any number from 1 to 10,000, or any 100th fraction of a revolution.

This revolution counter 19 is, in accordance with the principles of this invention, mounted on the arm 12 for convenient coupling through the coupling device 21 to the roll to count the revolutions of the roll and transmit electrical pulses over output leads 23 to a ratchet mechanism 24 best viewed in Figures 3 and 4. The leads 23 from the revolution counter 19 are connected to a solenoid 25 mounted on a base plate assembly 26 of the ratchet mechanism 24 which may be remote from the roll stand 10 and in a control cabinet therefor. The base plate assembly 26 has a pair of upstanding side walls 27 carrying journal bearings 28 for the shaft 29 of a ratchet wheel 30 and journal bearings 31 for the axis shaft or pin 32 of a rocker arm or lever 33. The solenoid 25 has an armature 34 which is coupled by a spring 35 to one end 36 of the rocker arm or lever 33 which is pivotable about the axis or center line of the shaft 32 in bearing 31.

At the opposite end of the rocker arm or lever 33 from the end 36 where the spring 35 is attached, there is pivoted to the arm, as at 37, a pawl 38 which is biased by a spring 39 coupled to the pawl at 40 and to the rocker arm at 41, to engage teeth 42 on the ratchet wheel 30. An additional biasing spring 43 tensioned between the rocker arm 33 on a third leg 44 thereof and a bracket 45 on a rear wall 46 of the base assembly 26 biases the rocker arm 33 counterclockwise as viewed in Figure 4 toward the ratchet wheel 30 with a greater force than that applied by the spring 35 when the solenoid 25 is deenergized. The spring 35, of course, has a greater strength than the spring 43 so that when the solenoid 25 is energized through a pulse provided thereto through the leads 23 from the revolution counter 19, retraction of the armature 34 will cause the rocker arm 33 to rotate or pivot about the axis of the pin or shaft 32 in a counterclockwise direction against the force of the spring 43 whereby the pawl 38 will move from engagement with a tooth 42a to engagement with a tooth 42b on the ratchet wheel 30. At the conclusion of the pulse from the revolution counter 19, the solenoid will be deenergized whereby the spring 43 will rock the arm 33 in a counterclockwise direction thus moving the ratchet wheel one tooth width step in a counterclockwise direction.

To prevent overrunning of the ratchet wheel, the rocker arm 33 carries a stop dog pin 47 which moves into the space between two adjacent teeth when the rocker arm 33 is permitted to return to its normal position by deenergization of the solenoid 25. To prevent the ratchet wheel from rotating in a clockwise direction, as viewed in Figure 4, when the rocker arm 33 is rocked clockwise by energization of the solenoid 25, the mechanism is provided with a friction brake indicated generally at 48

which is equipped with a felt-like brake pad 49 pressed against the wheel 30, see Figure 5. The adjustable friction pad 49 is adjustably held against the wheel 30 by being mounted on the inner end 50 of a threaded spindle 51 threaded through a threaded mounting 52 secured to the wall 27 of the base 26 immediately below the journal 29 for the ratchet wheel shaft. On the outer end of the spindle 51 means is provided for rotating the spindle, such means being a wing nut 53 or the like secured thereto so that the pad may be conveniently moved axially for adjusting the friction and braking force thereof on the wheel 30. Another means of adjusting the axial position of the brake pad is provided by a squared region 54 immediately outward from the inner end 50 of the spindle 51.

Thus, as illustrated and described, the ratchet wheel 30 will be moved in a counterclockwise direction as viewed in Figure 4 one step at a time by the ratchet operating mechanism. This step by step actuation will continue through continued rotation of the roll 13 until the end of the roll is reached, or until the ratchet wheel is stopped by movement thereof through the desired number of steps therefor, as hereinafter described. At the end of the desired number of steps of the cycle the ratchet wheel will stop by virtue of the engagement of a stop pin 55 (Figures 3 and 4) secured to the wheel 30 and projecting outwardly therefrom parallel to the axis of the wheel and engaging a stop bar 56 secured to the wall 27 of the base 26 and projecting inwardly therefrom. Upon engagement of the stop pin 55 with the stop bar 56, the pawl 38 will no longer be able to drive the wheel 30 and the crank arm 33 will be held in its clockwise rotated position (as viewed in Figure 4) when the solenoid 25 has been energized since the pawl 38 will engage a further tooth. Upon deenergization of the solenoid 25 under these conditions movement of the armature 34 may be taken up by the spring 35 without damage to any of the parts of the mechanism.

The step by step actuation of the ratchet mechanism 24 is utilized, in accordance with the principles of this invention, to step by step move the control rheostat 57 in progressive incremental steps for progressive incremental unloading or deenergization of the brakes 17. This is accomplished through a mechanical coupling 58 between the rheostat and the ratchet mechanism and includes, as an example, a belt 59 running on pulleys 60 and 61 respectively connected to the ratchet wheel shaft and a shaft on the rheostat 57 for respective corotation therewith.

Thus, as the roll unwinds whereby there is diminished torque loading on the brakes, the revolution counter 19 will periodically energize the solenoid in the ratchet mechanism to incrementally drive the rheostat 57 and thereby reduce the loading or unload the magnetic actuated brakes 17. For a better understanding of the operation of the electrical system involved, attention is invited to Figure 6 where the electrical system for the entire system and mechanism is schematically illustrated. There, it is seen that the roll 13 drives the revolution counter 19 through its mechanical coupling 21 therewith. Electrical leads 23 connect the revolution counter 19 to the ratchet mechanism 24 for periodic pulsed energization of the ratchet mechanism 24. The ratchet mechanism 24 is then mechanically coupled to the rheostat 57 through a mechanical coupling 58 therebetween and the brakes 17 are connected across the rheostat 57 when a control switch 59 is appropriately closed to terminals 60 leading from the rheostat 57. The arms 61 of the double pole, double throw switch 59 are connected to the magnetic brakes 17.

Energization for the system is available from leads 62 connected to any appropriately available source of electrical energy and further connected across a variable transformer 63. A full wave rectifier 64 is connected across the output of the variable transformer 63 by being

connected to one of the leads 62 and to the variable adjustment arm 65 of the variable transformer 63. The output of the full wave rectifier 64 is taken from terminals 66 thereof and connected to the opposite ends 67 of the rheostat 57. One end 67 is then connected to one of the terminals 60 of the double throw switch 59, while the other terminal 60 of the double pole double throw switch is connected to the rotatable control arm 68 of the rheostat 57.

The double pole, double throw switch 59 is controllably moved between a running position where it is connected with the terminals 60 and a starting or breakdown position where it will be connected to a second set of terminals 69. This movement and control of the double pole, double throw switch 59 is effected through a pneumatic pressure-sensing mechanism 70 connected thereto through a mechanical coupling 71 and actuated by air pressure downstream from a pneumatic acceleration detector 72 which is also driven by the roll 13 as by being mounted on the roll shaft or a brake shaft for one of the brakes 17 as indicated in Figure 6 by the mechanical coupling broken line 73 and as shown in Figure 2 as being mounted adjacent to one of the brakes 17. The acceleration detector is supplied with air pressure from any convenient source of pressurized air connected thereto through an inlet pipe or tube 74 and a pair of valves 75 and 76, the switch actuator 70 being connected to the air line 77 between the second valve 76 and the acceleration detector 72. The first valve 75 is a pressure-reducing valve, while the second valve 76 is a needle valve through which air flows at a lesser rate than it escapes from the acceleration detector 72 whereby air in the line 77 will fluctuate in accordance with the rate of air escape from the acceleration detector as disclosed in detail in my co-pending application for patent entitled "Acceleration Detector and Control System," U. S. Ser. No. 508,454, filed May 16, 1955.

During starting operations, the acceleration detector will cause pressure in the line 77 to drop whereby the pressure-sensitive pneumatic actuator 70 will cause the switch 59 to close the switch arms 61 with the terminals 69. In this position of the switch 59, the brakes 17 will be energized through an electrical starting circuit which includes a connection 78 between one of the terminals 66 of the full wave rectifier 64 and the one of the terminals 69 and which further includes connection from the other terminal 66 to a starting control rheostat 79 and a series impedance 80 connected to the other terminal 69. A starting indicator such as a light 81 is connected across the series impedance 80, and will remain energized during the starting portion of the operating cycle. The starting rheostat is illustrated here as an open end rheostat with electrical connection thereto through the arm 82 thereof which, in the embodiment of the invention illustrated and described here, is also connected to the stepped ratchet drive 24 as indicated by the broken mechanical coupling line 83. This coupling between the rheostat 78 and the ratchet drive 24 is provided so that in the event of a breakdown, the operator of the mechanism need only close the master switch (not shown) to place the entire system back into operation. Under starting conditions, it is preferred to have the brakes controllably energized rather than completely deenergized, yet varying basis weights and web widths of rolls require differing starting tensions in applying differing torques to the brakes so that the varying starting control rheostat 82 may be adjustably set at the beginning of a roll operation whereafter its position will be diminished as the roll depletes. By so reducing the position of the starting rheostat 82, compensation is provided for the reduced roll as the roll unwinds, and in the event of a breakdown or a breaking of the web from the roll, the starting rheostat will be in a new adjusted position which will be proper for restarting the system after a breakdown without any further readjustment.

To set the system into operation such factors as the basis weight of the sheet material of the roll, the roll diameter, the web width (which is the roll axial dimension), should be known whereby there is thus also known such factors as the tension which should be applied to the sheet material as it is pulled from the roll, and the number of wraps of the sheet material forming the roll. With the roll in place on the machine 10, the system is prepared for energization and operation by retracting the pawl 38 from the ratchet wheel, this being accomplished by partially clockwise rotating the pivot shaft 37 for the pawl 38 through manipulation of the handle 37a thereon and further manipulating the handle 37a to move the crank arm 33 in a clockwise direction as viewed in Figure 4, thus moving the stop dog 47 away from the ratchet wheel 30 as well as moving the pawl 38 out of engagement with the teeth of the ratchet wheel and the spring 39 for the pawl 38 holding the pawl 38 in its clockwise position through a toggle action, whereby the ratchet wheel 30 and the rheostats 57 and 79 are free to be rotated to an adjusted selected position. A control handle 84 carrying a pointer 85 cooperating with a fixed dial 86 having indicia markings thereon corresponding to the teeth 42 on the ratchet wheel 30, may then be freely rotated to rotate the pulley 60 and thereby the control arm 69 of the primary control rheostat 57 and the control arm 82 of the starting rheostat 79 until a proper torque for the brakes 17 is indicated on the dial 87 on the rheostat 57 as illustrated in Figure 4. Should the starting rheostat be then set at a position different from a proper starting brake load position, it may then be individually adjusted. Then, the pawl and crank arm of the ratchet mechanism are then set back to their operating position as shown in Figures 3 and 4 of the drawings. At this time, the dial 86 is read at the position of the pointer 85 indicating the number of steps through which the system will operate to unload the brakes and by the use of an appropriately set up chart, or by dividing the number of steps into the number of wraps on the roll, the number of revolutions of the roll per step is readily determined for setting the revolution counter pulse generator 19 by manipulating the control dial 22 thereon. Should the number of steps be undesirably low due to the small torque setting of the control rheostat, such as may be the case when unwinding a low tensile strength web of a small diameter roll, the system may be adjusted for a greater number of steps and a reduction in the input energization by readjusting the ratchet and properly adjusting the variable transformer 63 at the input to the system. In any event, once the number of steps is determined satisfactorily and the number of revolutions per brake unloading step is found, then the revolution counter pulse generator is set as described so that it will generate a pulse after each selected number of revolutions of the roll.

The system is then set into operation by closing a master switch which starts the mechanism pulling the sheet material from the roll and the roll accelerates until it reaches its proper operating feed speed. During the starting operation the acceleration detector will cause the pressure-actuated, double pole, double throw switch to be closed in its starting position whereby the torque-sensing brakes 17 will be energized through the starting circuit of the starting rheostat, etc. Once the roll reaches its proper operating speed the acceleration detector will cause the double pole, double throw pressure differential actuated switch to close in its normal operating position and the brakes will then be energized through the primary control rheostat. Upon each successive group of the selected number of steps, the rotation counter pulse generator will generate a pulse to move the ratchet wheel of the ratchet mechanism 24 a single step and reduce the rheostat settings by the selected increment, thereby reducing the torque settings of the brake in accordance with the reduced diameter of the roll.

The cyclic operation of the revolution counter pulse generator and the ratchet mechanism continues during the revolution and depletion of the roll until the stump roll position is reached and the roll is unwound, or until the operation of the ratchet is stopped by engagement of the stop pin with the stop bar. While under normal operating conditions the conclusion of ratchet operation and the conclusion of roll unwinding will be substantially concurrent, the system of this invention permits substantial variation in that it permits conclusion of the operation of the ratchet mechanism prior to unwinding of the roll to compensate for increased friction and drag on the roll as the roll increases speed as the diameter of the roll approaches the stump roll diameter. This may be accomplished by setting the revolution counter to pulse at a slightly greater rate than the rate described above, or by setting the ratchet mechanism to a slightly lesser number of steps than that described above. Also, the system of this invention permits varying the rate of brake unloading from a linear equal stepped rate through the utilization of a ratchet wheel having teeth of unequal dimensions in accordance with characteristics of the roll and the brake and the mechanism, or in accordance with desired varied unloading rates for the brakes.

Since the starting rheostat is connected to the ratchet mechanism, it will also have a reduced position and in the event of a breakdown of the pulling mechanism or in the event of a web break, restarting may be effected after the trouble is repaired by merely reclosing the main switch. The starting rheostat will have already been moved to a precise starting control position for the reduced diameter roll.

It will be observed that numerous variations and modifications may be made without departing from the true spirit and scope of the novel concepts and principles of this invention and it is, therefore, intended to cover all such modifications and variations as fall within the true spirit and scope of the novel concepts and principles of this invention.

I claim as my invention:

1. In a system to control tension in sheet material unwinding from a roll thereof revolvingly supported on a roll stand, means driven by said roll as it revolves to sense the revolutions of the roll and generate an electrical pulse after each successive group of a selected number of revolutions of the roll, a pawl and ratchet mechanism, a solenoid connected to said means to be energized thereby periodically to step drive said mechanism, electrically controlled brakes for said roll to variably impede revolution of the roll and tension in the sheet material, a rheostat connected to said brakes to control energization thereof, and means connecting said rheostat to said pawl and ratchet mechanism whereby the energization of the brakes is changed after each successive group of the selected number of revolutions of the roll.

2. In a system to control tension in sheet material unwinding from a roll thereof revolvingly supported on a roll stand, a brake on said roll stand to impede revolving of said roll and to tension the sheet material unwinding therefrom, electrical pulse generating means on said roll stand operating to generate pulses as a function of the revolutions of the roll, means coupling said pulse generating means to said roll to drive the same, a rheostat connected to said brake to control the same, a ratchet drive coupled to said rheostat, and means connecting said pulse generating means and said ratchet drive together whereby revolutions of said roll automatically controls the brake impeding rotation thereof.

3. In a system to control unwinding a roll of sheet material from a roll stand rotatably supporting the roll, means driven by the roll as the roll is unwound to generate electrical pulses as a function of revolution of the roll, brake means on the roll stand to impede revolution of the roll and tension the sheet material as it is unwound from the roll, control means for said brake means, and

means energized by the first means to actuate said control means.

4. In a system to control unwinding a roll of sheet material from a roll stand, means to tension the sheet material pulled from the roll while the roll is revolving and being unwound, means actuated by revolving movement of the roll to generate an electrical pulse, and means energized by the electrical pulse generating means to control the tension means.

5. In a system to control unwinding a roll of paper or the like from a roll stand, means actuated by revolving movement of the roll to generate an electrical pulse, means operative to brake the roll and means energized by the electrical pulse generating means to control the brake means.

6. In a system to control tension in sheet material unwinding from a roll thereof revolvingly supported on a roll stand, brake means for said roll to variably impede rotation thereof and tension in sheet material unwinding from the roll, a starting system controlling the brake means during starting operations, a control system controlling the brake means during running operations, and means to automatically switch the brake means from the starting control system to the running control system when the unwinding of the roll reaches running conditions.

7. In a system to control tension in sheet material unwinding from a roll thereof revolvingly supported on a roll stand, a revolution counter generator on the roll

stand driven by the roll as the roll rotates, a step-by-step operated mechanism connected to the revolution counter generator for step-by-step actuation, brake means for the roll, a starting operation control for the brake means, a running operation control for the brake means, and means connecting the step-by-step mechanism to both of said controls.

8. In a system to control tension in sheet material unwinding from a roller thereof revolvingly supported on a roll stand, a revolution counter generator on the roll stand driven by the roll as the roll rotates, a step-by-step operated mechanism connected to the revolution counter generator for step-by-step actuation, brake means for the roll, a control for said brake means, and means connecting the step-by-step operated mechanism to said control.

9. A control system to control braking force applied to a revolving element comprising brakes connected to the revolving element, means driven by the brakes to generate electrical pulses, means controlling said brakes, and means energized by the electrical pulse generating means operably connected to the brake control means to actuate the same.

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