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T. R. BENNETT

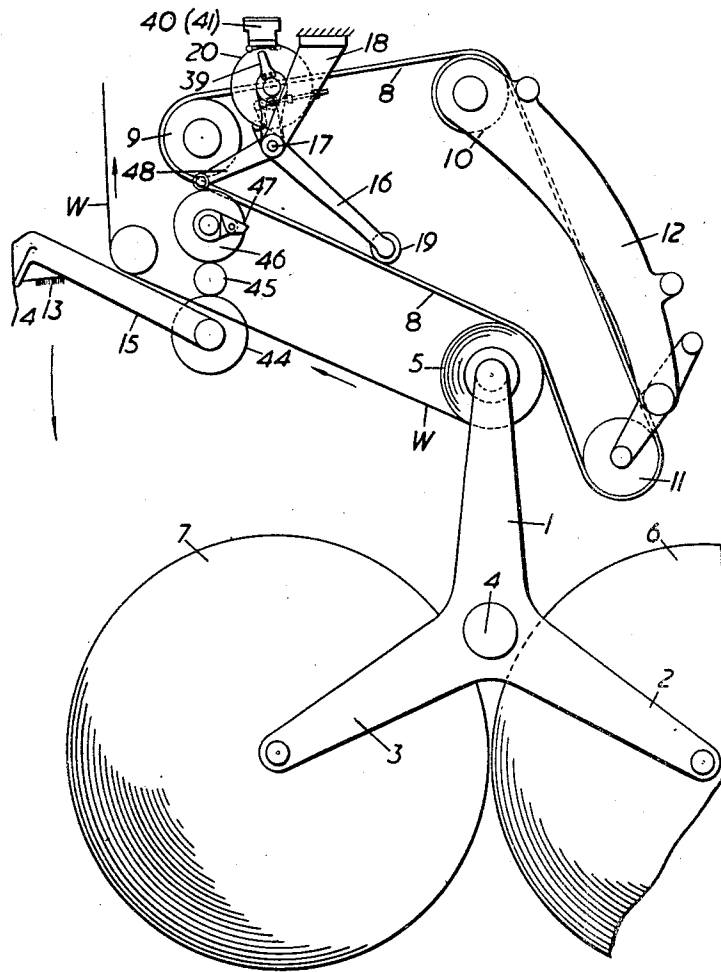
2,950,874

WEB-RENEWING MECHANISM

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4 Sheets-Sheet 1

FIG. 1.



Inventor:
Thomas Richard Bennett

By: Baldwin & Wright
Attorneys

Aug. 30, 1960

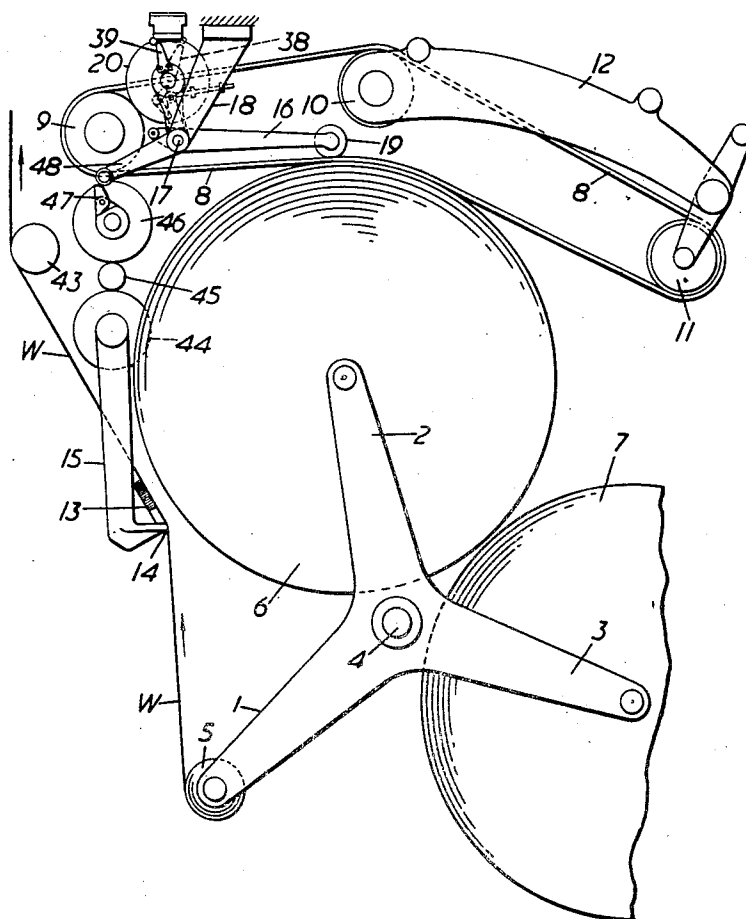
T. R. BENNETT
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4 Sheets-Sheet 2

FIG. 2.



Inventor:
Thomas Richard Bennett

By: *Baldwin & Wright*
Attorneys

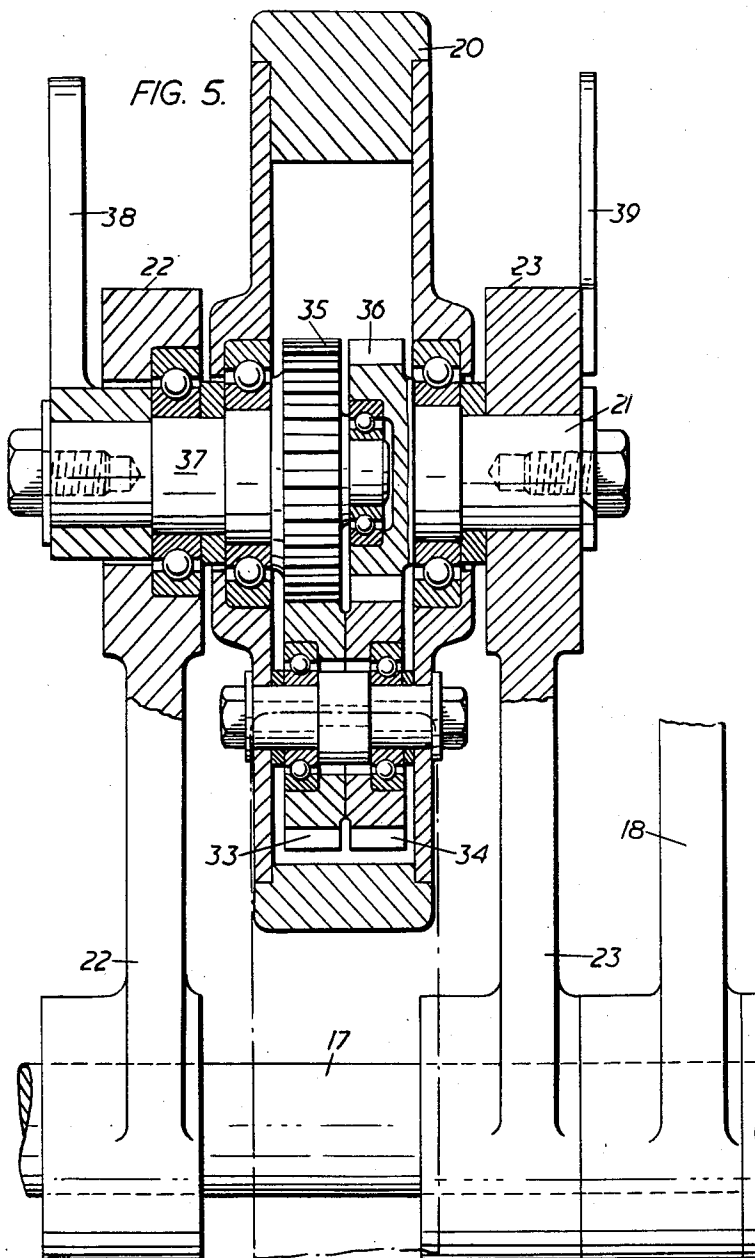
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Inventor:

Thomas Richard Bennett

By: Baldwin & Wright
Attorneys

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WEB-RENEWING MECHANISM

Thomas Richard Bennett, Kingsbury, London, England,
assignor to R. W. Crabtree & Sons Limited, Leeds,
England

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This invention relates to mechanism for effecting renewal of the supply of web material to web consuming machines such as printing machines. More particularly the invention is concerned with the kind of mechanism by which the renewing operation is effected automatically when the web supply from a web roll in use is nearing exhaustion. The renewing operation consists in transferring the web supply from the expiring roll to a replacement roll, which has been speeded up, by joining the web from the expiring roll to the web of the replacement roll so that the expiring web draws the replacement web from the replacement roll at which time the expiring web is cut.

It will be appreciated that the initiation of the automatic operation must depend on a response in one way or other to the change in the diameter of the running roll as the diameter decreases towards exhaustion due to the web material drawn from it. It is however not easy to obtain a control response from the running roll itself when it is nearing exhaustion for the distortion of the core section of the roll from the nominal cylindrical shape is frequently very marked. The difficulty is increased by the fact that at this time the running (expiring) roll is rotating at its greatest speed which, in the case of modern high speed printing machines, is considerable, so increasing the difficulty.

The main object of this invention is to provide an improved automatic web renewing method and mechanism which while depending on a response to change in diameter of the running roll will not require that response be taken from the roll when it is reduced to the core section.

According to the present invention, the automatic web renewing mechanism comprises a device which, when the running roll reaches a predetermined diameter, sets into action mechanism to respond to a value related to the actual length of web drawn from that time from the roll, the mechanism including means to set the web renewing operation into action when the value corresponds to a predetermined length of material has been drawn from the roll.

With such an arrangement the initial response to the reduction in diameter of the running roll can be made at a time when the roll diameter is well above the expiring diameter and is practically cylindrical so avoiding the difficulties which would arise in obtaining a response when the roll is nearing exhaustion due to ovality of the core and the high speed of rotation: the diameter at which the web-measuring mechanism would be set into action, coupled with the setting of the predetermined length of web which has to pass before the web-renewing operation is set into action, can readily be chosen to ensure that the diameter of the roll shall have run down to the minimum so avoiding waste of web material remaining on the roll after the renewing operation.

As the initial response is taken from the reduction of the running roll to a predetermined diameter, the control is independent of the initial diameter of the roll

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which diameter varies considerably for the same nominal size of roll. Moreover, as the renewing operation depends on the length of web drawn from the roll, it is independent of the speed of the web or more precisely of the speed of the web-consuming machine.

The web-length response mechanism would usually comprise say a roller which is normally inactive but which (when the roll reaches a predetermined diameter) is rendered active to be driven by the web or by some part which moves uniformly with the web. The rotation of the roller is used to advance what may be termed a counting device which after the predetermined count (corresponding to the predetermined length of the web) sets the renewing operation into action.

The response to the reduction of the diameter of the predetermined diameter can be used not only to set the web length response mechanism into action but also to set into action mechanism to prepare the replacement roll for the web renewing operation, and to time the renewing operation, the period between the response to actual roll diameter and the response to the passing of the predetermined length of web being available for this purpose.

The invention will now be described in one construction in the accompanying drawings in which Figure 1 is an end elevation of a three-armed roll stand with a web roll carried by one of the three sets of rolls in its normal running position. Figure 2 is a similar view but showing the roll stand moved to a position in readiness for a web-renewing operation. Figure 3 is a sectional elevation to a larger scale of the parts in the position shown in Figure 1, Figure 4 is a side elevation looking in the direction of the arrow IV in Figure 3, and Figure 5 is a sectional elevation to a larger scale of the "counter" part of the mechanism.

Referring to the drawings, the three-arm roll support, having pairs of arms 1, 2, 3, is mounted to turn about a supporting spindle 4. This support carries three rolls, 5, 6, 7, one, the roll 5, being that in use, another, the roll 6 being a replacement roll, and the third, the roll 7 being a freshly loaded roll.

The roll 5 in use is engaged at its periphery by endless belts 8 passing over pulleys 9, 10, 11 of which the pulley 11 is carried by a frame 12 which can swing about the axis of the pulley 10 while the pulley 9 is driven by the printing machine and normally exercises a small drag on the running roll to tension its web which is indicated at W. The belts are controlled as the degree of wrap about the roll to maintain a sensible constant tension in the web W. The belt frame 12 and therefore the belts can swing so as to follow the decrease in the diameter of the running roll 5.

The apparatus also has mechanism to prepare the parts for the renewing operation, i.e. to raise the belt frame 12, to turn the support 1, 2, 3 to bring the present stationary replacement roll 6 (already prepared with adhesive at its periphery) into a renewing position below the raised belts 8, to lower the belt frame to cause the belts 8 to engage and speed up the replacement roll 6 to a peripheral speed equal to the speed of the web W still running from the running roll 5 which has been moved from its normal running position of Figure 1 to its renewing position of Figure 2 so that its web W runs closely adjacent to replacement roll 6, and finally to move from an inoperative position to a ready position a renewing assembly comprising a brush 13 to deflect the running web W against the periphery of the replacement roll 6 and a knife 14 to sever the running web W, the brush and knife being carried by a swinging arm assembly 15.

Such web renewing mechanism is now well known and in common use, so that further detailed description is believed to be unnecessary. The purpose of this in-

vention is to provide means to place the operation of the renewing mechanism under automatic control governed by the deplenishing of the web supply on the running roll 5.

For that purpose, a response to the diameter of the running roll 5 while it is in running position is made by a lever 16 mounted on a rock shaft 17 in brackets 18, the lever having a roller 19 which engages the inner face of one of the endless belts 8 so that as the belt follows down the decreasing diameter of the running roll 5, the lever 16 swings.

When the roll 5 has reduced to a predetermined diameter, the lever 16 sets into action a device which does not depend on a measurement of roll diameter but on a measurement related to the actual amount of web W drawn from that time from the roll 5. The response of the lever 16 to the diameter of the roll prepares the web renewing mechanism for action but the action is not rendered active until a predetermined length of paper has passed from the reduced roll 5.

The device to make a measurement related to the length of web W which passes from the roll 5 is formed by a roller 20 which is rotatable on a spindle 21 carried between arms 22, 23 secured to the rock shaft 17. Thus the roller 20 can be swung into and out of peripheral engagement with a roller 24 on the spindle 25 of the driven belt roller 9. As the roller 9 is driven by the machine which draws the web W from the expiring roll 5, it follows that the periphery of the roller 9 moves through a linear distance which is directly related to the length of web drawn from the expiring roll 5. Since the roll 9 is driven by the same mechanism as that which draws the web from the expiring roll 5, the movement of the roll 9 in synchronism with the movement of the web determines the travelling of a pre-selected length of web, and this determination is used by this invention to set the web renewing operation into motion as will be described. The bracket or frame formed by the arms 22, 23 is normally engaged by a latch finger 27 which engages an arm 28 on the rock shaft 17 so as to hold the measuring roller 20 out of contact with the roller 24. The diameter response lever 16 has a trip arm 29 so disposed that when the lever 16 moves to a predetermined position consequent upon the running roll 5 reducing to a predetermined diameter, a striker 30 on the trip arm engages an arm 31 fast with the latch and releases it so permitting the measuring roller to engage and be driven by the roller 24, the roller 20 being pressed against the roller 24 by a spring 32.

The arm 23 which carries the measuring roller 20 has secured to it a first control arm 39. The measuring roller 20 is hollow and forms a rotating cage of an epicyclic gear having planet gears 33, 34; the gear 34 meshes with a sun gear 36 fast with the arm 23 and the gear 33 meshes with a gear 35 fast with a stub spindle 37.

This stub spindle has mounted on it a second control arm 38.

The arms 39, 38 are used to operate respectively switches 40, 41 which respectively prepare the renewing mechanism for operation and finally cause the renewing operation to be carried out.

The arm 39 operates its switch 40 as soon as the bracket carrying the measuring roller 20 is moved (consequent upon the roll 5 having reached a predetermined diameter) to bring the rollers 20, 24 into engagement. The arm 38, being driven at a lower speed, is caused to operate its switch 41 when the roller 20 has been turned through a predetermined number of revolutions corresponding to the passage of a predetermined length of web from the roll 5.

The operation of the switch 40 causes the support 1, 2, 3 to be turned to bring the replacement roll 6 into renewing position shown in Figure 2, as determined by a limit switch positioned to be engaged by the periphery of the replacement roll at the point which as the support

turns is approaching the running web W where it passes from the roll 5 now in the position shown in Figure 2. This limit switch is located to cause the support to come to rest in a renewing position with the periphery of the replacement roll 6 at a fixed distance from the running web W and by reason of this arrangement the fixed distance is independent of the diameter of the replacement roll 6.

The operation of the switch 40 also causes the belt frame 12 to be lowered, to effect the rotation of the replacement roll 6 and to cause the brush and knife arm assembly to be lowered from the out-of-use position shown in Figure 1 to the position of readiness shown in Figure 2.

The other switch 41 is operated by the arm 38 after the arm has moved through nearly 360°, this switch causing the brush 13 to deflect the web W into engagement with the now rotating replacement roll 6 to cause the running web to be joined by the adhesive to the web of that roll and to draw off that web and then to cause operation of the knife 14 to effect the severance of the running web W.

This second arm 38 is moved to switch-operating position after the measuring roller 20 has made a predetermined number of revolutions which in turn corresponds to a certain length of web.

Provision can be made whereby when the cutting knife 14 is operated to sever the running (and now the expiring) web W, the renewing assembly is moved back by power to its inoperative position. As shown, this is effected by gearing 44, 45, 46 connected to a source of power which is rendered active when the knife 14 operates. The movement of the arm assembly 15 is employed to operate a cam 47 on the gear 46 to engage an arm 48 fast with the arms 22, 23: the cam causes the measuring roller 20 to be moved clear of the roller 24 and to be held in inoperative position by its latch 27. The arm 38 is now in a position in readiness for a repetition of the cycle of operations when the new roll 6 has been reduced in diameter. A damping brake 49 is applied by the measuring roller 20 to prevent it from spinning by the inertia effect after the renewing switch has been actuated.

I claim:

1. Mechanism for automatically controlling the operation of web renewing apparatus for effecting transferring of a web drawn from one web roll about to be exhausted to a web drawn from a replacement web roll, said mechanism comprising a first device operable in response to reduction in the diameter of said one web roll to a predetermined diameter; a normally inactive second device operable, when active, in synchronism with the drawing of the web from said one web roll to determine the length of web drawn from said one web roll irrespective of the diameter of said one web roll when said second device is active; means operable in response to operation of said first device for rendering said second device active; and means operable in response to determination by said second device of travelling of a predetermined length of web following activation of said second device for setting the web renewing apparatus into operation.

2. Mechanism as set forth in claim 1 comprising a movably mounted frame; a belt; means including a pulley rotatably mounted on said frame for supporting said belt to engage said one web roll, the frame being movable to enable the belt to follow the reduction in diameter of said one web roll, said first device including a part engaging said belt, whereby said first device responds to movement of said belt and said frame caused by reduction in the diameter of said one web roll to said predetermined diameter for initiating operation of said second device.

3. Mechanism as set forth in claim 1 in which the web renewing apparatus comprises means settable into position in readiness for the web renewal operation, and in which the controlling mechanism includes means responsive to operation of said first device for effecting setting

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of said settable means in said readiness position; and means responsive to operation of said second device for effecting operation of the thus set web renewing means.

4. Mechanism as set forth in claim 3 including means responsive to returning of said web renewing means from readiness position to normal position for resetting said second device in its normal inactive position.

5. Mechanism as set forth in claim 1 in which said second device comprises a web length counter determining device including a component drivable in synchronism with the travelling of the web.

6. Mechanism as set forth in claim 5 in which said component normally is at rest in an inactive position, the means operable in response to operation of said first device being connected to said component for moving the latter to a second position in which it is drivable in synchronism with the travelling of the web.

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7. Mechanism as set forth in claim 5 in which said second device comprises a roller; a frame on which said roller is rotatably mounted; and means mounting said frame for movement from a normal position in which said roller is disconnected from the travelling web to a roller activating position in which said roller is drivingly connected to said web.

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