

Oct. 6, 1953

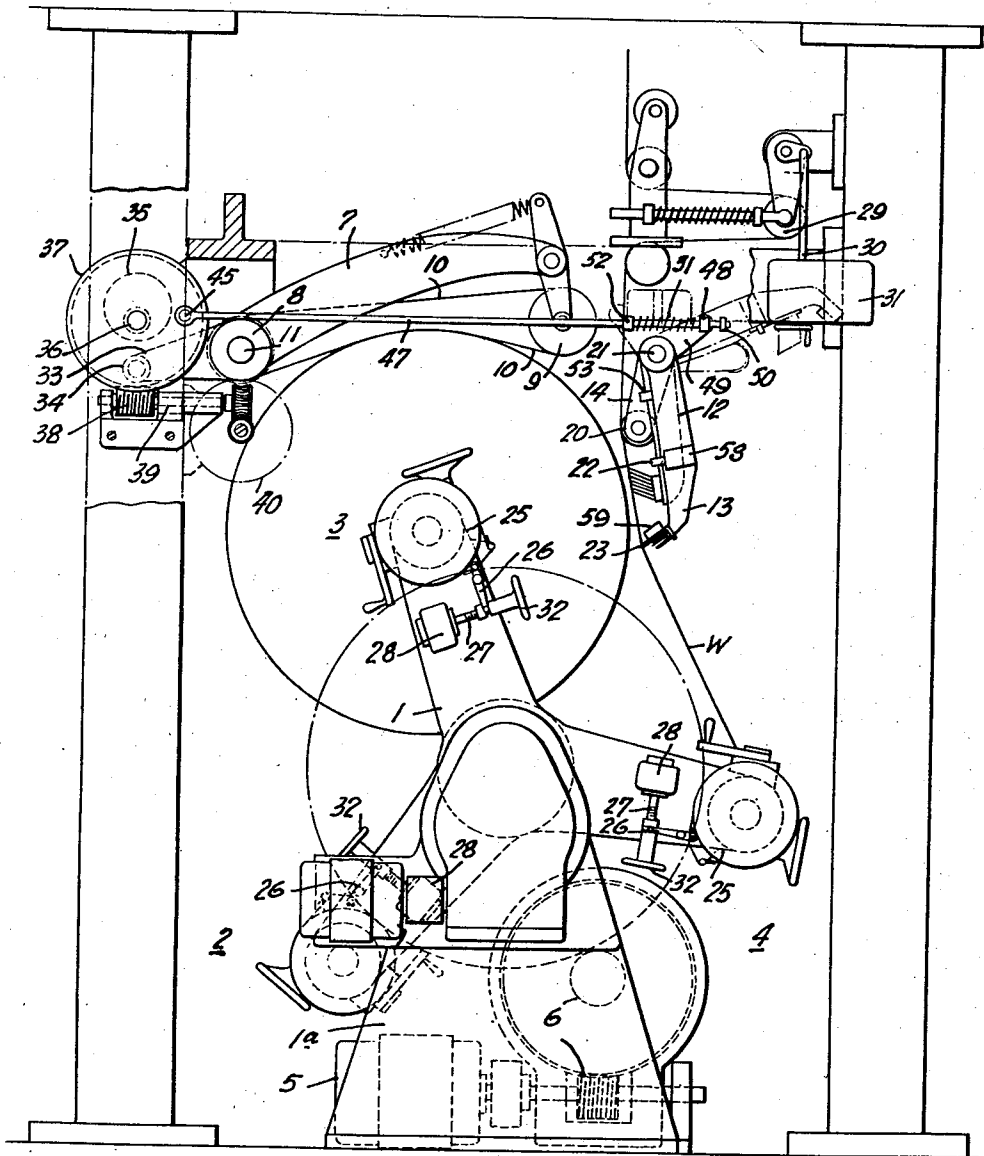
T. R. BENNETT
WEB-RENEWING MECHANISM

2,654,545

Filed March 13, 1950

3 Sheets-Sheet 1

FIG. 1.



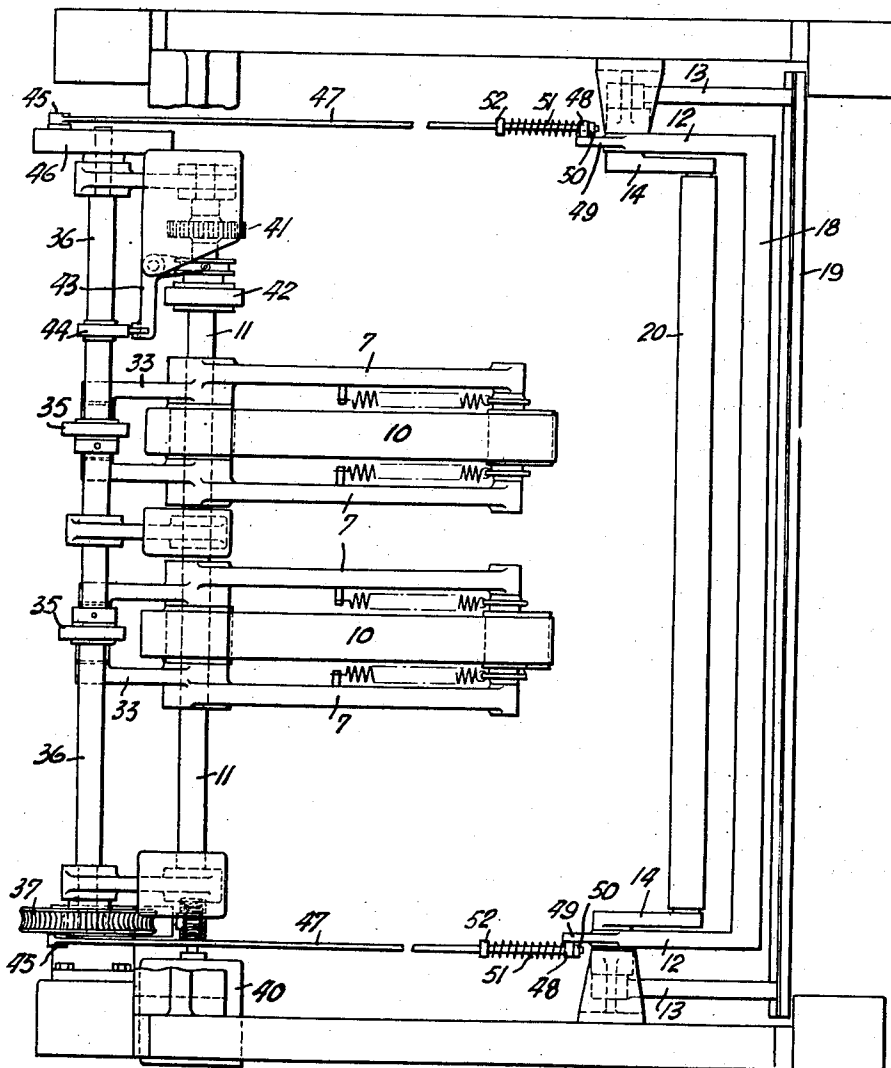
Inventor
Thomas R. Bennett
by Albert J. Horton
Attorney

Filed March 13, 1950

WEB-RENEWING MECHANISM

3 Sheets-Sheet 2

Fig. 2.



Inventor
Thomas R. Bennett
by Albert J. Horton
Attorney

Oct. 6, 1953

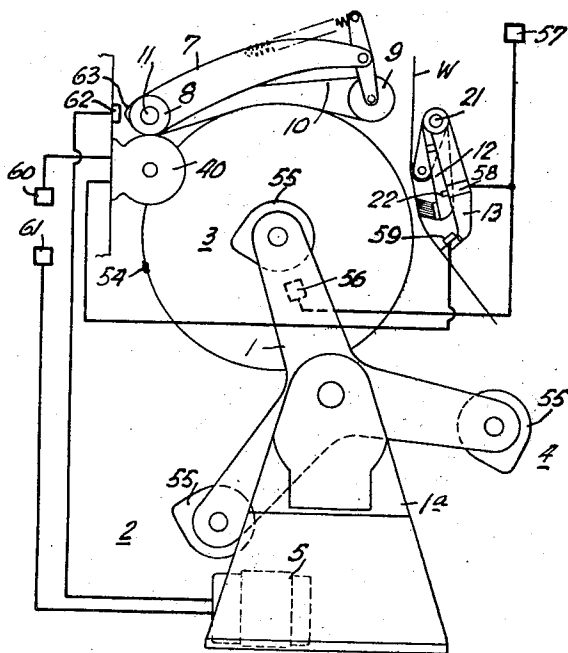
T. R. BENNETT
WEB-RENEWING MECHANISM

2,654,545

Filed March 13, 1950

3 Sheets-Sheet 3

Fig. 3.



Inventor
Thomas R. Bennett
by Albert J. Horton
Attorney.

UNITED STATES PATENT OFFICE

2,654,545

WEB-RENEWING MECHANISM

Thomas Richard Bennett, Kingsbury, London, England, assignor to R. Hoe & Co. Inc., New York, N. Y., a corporation of New York

Application March 13, 1950, Serial No. 149,244
In Great Britain March 14, 1949

3 Claims. (Cl. 242—58)

1

This invention relates to web-renewing mechanism for use in the supply of webs to web-consuming machines such as printing, wrapping and box making machines. The invention is concerned with that type of such mechanism wherein provision is made to enable the web-supply to be maintained without stopping the machine by arranging a replacement web-roll to be brought up to the speed of the web running to the machine and by causing the running web and the rotating replacement roll to engage and adhere to one another so that the web of the replacement roll commences to be drawn from the roll at which time the running (and now expiring) web is severed.

In this type of mechanism it is common to employ what are frequently termed three-arm roll stands having three roll positions, one for a running roll from which the web is drawn, a second for a replacement roll the web of which is joined as described to the web passing from the running roll, and the third for a freshly loaded roll, the various rolls successively being brought into replacement and running positions.

It is common in this type of mechanism to effect control of the tension of the web passing from the running roll to provide at each roll position a brake device to operate on the core of the various rolls, the various brake devices being rendered active only as the associated roll moves into replacement and running position.

Now the present invention is concerned with such an arrangement and it has for its object to provide a combination of parts which will provide a three arm roll stand arrangement which shall be capable of ready control.

According to the present invention there is provided in combination with such a three arm roll stand, a frame to carry a driven belt, the frame being movable to apply the belt to and to move it from the peripheral surface of a roll in the replacement position of the roll stand whereby that roll may be speeded up from rest to a peripheral surface speed equal or approximating to the speed at which the web is being drawn from the running roll. In addition the combination of parts includes an assembly comprising supports carrying a brush and a severing knife, the former to deflect the running web so as to contact the periphery of the replacement roll and to adhere to it through an adhesive (such as a rubber latex) which has been pre-applied to the end of the web of the replacement roll and the latter to sever the web passing from the running roll just after the two webs have adhered

2

to one another. The invention includes also mechanism whereby the brush and knife supports are moved automatically into and out of their operating position in synchronism with corresponding movements of the belt frame. Preferably this synchronous operation is effected by a single electric motor. With such an organization of parts, the replacement roll can be speeded up and the brush and knife set in readiness to effect the joint between the two webs and to sever the running web (which at this time also the expiring web) by the mere closing of the circuit of the single motor. This can be arranged for control by an operator who observes the reduction in diameter of the running roll as it becomes spent or it can be arranged for automatic control by a device which responds to the diameter of the running roll. Similarly, the actual operation of the brush and the knife which are synchronised with the movement of the belt frame into operative position can be determined by an operator but here again this operation could be rendered automatically in response to the reduction in the diameter of the running roll or by a time control which is set to be effective after the lapse of a predetermined time interval following the movement of the belt frame to operative (i. e. speed-up) position.

The invention may also provide means whereby the operation of the web-severing device automatically causes the reverse operation of the motor.

The invention is illustrated in the accompanying drawings in which Figure 1 is a side elevation, Figure 2 a plan view and Figure 3 a pictorial wiring diagram.

Referring to the drawings, 1 indicates a roll support which is mounted to rotate in a roll stand 1a. The support has three roll positions 2, 3, 4 which (in the position shown in the drawing) correspond to a loading position in which a fresh roll is placed in position on the support, a replacement position in which a fresh-roll is speeded up and its web joined to the running web W passing from an expiring roll in the position 4. The support is arranged to be moved angularly to carry its different roll positions successively through the operating positions referred to, and this is effected by an electric motor 5 operating through gearing 6.

Disposed above the roll in the renewing position 3 is a device to speed-up the roll from rest to the speed at which the running web W is being drawn on by the web-consuming machine. This device comprises frames 7 having pulleys 8, 9

3

about which are trained belts 10. The pulleys 8 are fast on a shaft 11 which is driven from the web-consuming machine and the frames 7 are arranged to be rocked about the shaft 11 to bring the belts 10 into and out of contact with the roll in replacement position 3 as shown in Figure 1.

Disposed at the side of the expiring web W from the roll in position 4 is a web-renewing mechanism: this mechanism comprises a brush frame 12, a knife frame 13 and a guide frame 14. The frames comprise side arms joined by stretchers 18 and 19 for the frames 12, 13 and by a stretcher 20 for the frame 14, this latter stretcher forming a guide for the web. The three frames are mounted to swing about or with stub shafts 21. The assembly is normally raised to the position shown in dotted lines in Figure 1 and in full lines in Figure 2. The knife frame 13 and the guide frame 14 are connected through the stub shafts 21 to rock together and the brush frame 12 is arranged to be latched by latches 22 to the knife frame 13 so as to move with it and, when the latch is released, to be capable of moving relatively to the knife frame 13. The knife frame is provided with a sheath 23 in which a knife is normally contained. When a web-renewing operation is to be effected, the assembly is swung to the position shown in Figure 1 in which position the knife sheath 23 and the guide 20 cause the expiring web W to take a fixed path to which the replacement roll in position 3 is adjusted by the motor 5 so as to bring the periphery of the replacement roll to a predetermined distance from the expiring web.

At the appropriate time, the speed-up belts 10 are lowered to engage and speed up the replacement roll to which adhesive has been applied. Then, also at an appropriate time the latches 22 are operated to free the brush frame 12 for swinging movement to press the expiring web W against the periphery of the now rotating replacement roll in position 3, and the expiring web is joined by the adhesive to the outer end of the web of the replacement roll and both webs pass on together. The knife in the sheath 23 is immediately projected from the sheath and the web W is thus severed, leaving the web from the replacement roll alone to be drawn forward.

The tension of the web drawn on by the machine is arranged for regulation by brakes 25 which operate on the plugs which support the rolls by the core; such a brake is provided for each roll position 2, 3, 4 of the support 1 and as shown, each brake comprises a brake band which is operated by a lever 26 itself under the control of a screw 27 coupled to an electric motor 28. The various motors are arranged to be connected in circuit with a tension control device by a commutator arrangement which places the motors under control while the roll positions are in and anywhere between the replacement and expiring positions 3 and 4. The tension control device comprises a spring loaded roller 29 which is free to move with change in the tension of the web and to cause its movement to operate through a link 30 on a switch mechanism in a control box 31. The brakes can be set by hand-wheels 32 to have a degree of braking independent of the control exercised by the motors 28.

The foregoing mechanism and its general operation is in itself well known and it is therefore believed to be unnecessary to give further details. The present invention is concerned with an arrangement by which the movement of the belt

4

frames 17 and the movement of the brush, knife and guide frames 12, 13, 14 can be synchronized and effected by a single electric motor.

To effect this, the belt frames 7 which are mounted to swing about the shaft 11, are extended by arms 33 having followers 34 to engage eccentrics 35 on a shaft 36. The shaft is provided with a worm wheel 37 engaged by a worm 38 on a spindle driven by a reversible electric motor 40. Energization of the motor in one sense causes the eccentrics 35 to move away from the followers 34 so that the belt frames 7 can swing by gravity to carry their belts 10 down into engagement with the surface of a roll in the replacement position 3. The degree of movement of the eccentrics is such that the belts engage the roll before the eccentrics complete their movement so that the eccentrics leave the followers 34 so permitting the belts to accommodate themselves to the roll. When the motor 40 is reversed, the eccentrics 35 move back into engagement with the followers and so rock the frames 7 to carry the belts away from the roll.

So that the belts 10 shall be stationary except when they are actually required for use, the movement of the frames 7 is utilized to connect and disconnect the pulleys 9 to and from the drive. This is effected by connecting the shaft 11 to the machine drive (as indicated a gear wheel 41) through a clutch 42. The clutch is moved "in" and "out" by a lever 43 which is operated by a cam 44 on the shaft 36. When this shaft 36 is operated by the motor 40 to lower the belts 10 the cam 44 allows the clutch to move "in" to transmit drive from the machine to the shaft 11 and hence to the belts 10 and vice versa.

Now, for the purpose of using the same motor 40 to raise and lower the frame assembly 12, 13, 14, the shaft 36 is fitted with crank pins 45 mounted to the worm wheel 37 at the one end of the shaft 36 and the other fitted on a disc 46 at the other end of the shaft. These two crank pins are connected each to one end of a rod 47 the other end of which is slidable in a guide block 48 on an extension 49 of the side arm 12 of the brush frame. Movement of the rods 47 in a direction corresponding to the raising of the assembly is limited by a stop 50 which engages the guide block 48; each rod is fitted with a spring 51 which is interposed between the block 48 and an abutment 52 on the rod.

When the shaft 36 is turned by the motor 40 to lower the belts 10, the crank-pins 45 at the same time move the rods 47 to the right as seen in Figure 1; this allows the frames 12, 13, 14 to lower by gravity from the out-of-use position shown in dotted lines in Figure 1 to the position of readiness shown in full lines. This position of readiness is determined by fixed stops 53 which engage the side arms 13 of the knife frame. This engagement occurs before the motor 40 has completed its operation so that during the remainder of its operation the rods 47 are slid through the guide blocks 48 and during this time the springs 51 are loaded so that the brush frame 12 is spring pressed against the releasable latches 22. When the latches are released, the brush frame 12 is freed to be swung forward by the springs 51 to deflect the web to make a joint between the expiring web W and the web of the roll which was speeded-up by the belts 10.

Not only do the springs 51 constitute the actuating means for the brush frame, but they also avoid any possibility of damage to the brush and knife frame assembly should they be inadvertently in their operative position when the roll

5

stand 1 is turned. In such an occurrence the springs 51 allow the frames to be, so to speak, pushed clear by an oncoming roll. The arrangement however enables the rods 47 when operated, to raise the brush and knife frames positively through the stops 50 on the rods.

In order to enable the belt arrangement to be adapted to handle web rolls of different lengths, the belt frames can be slidable axially (i. e. in a direction parallel with the roll axis) on its shaft 11.

As is known in this type of mechanism, the actual times at which the brush frame 12 is freed to deflect the web W is related to the position of the adhesive on the periphery of the replacement roll, the release of the brush being effected just after the adhesive area has passed the brush zone. Also the release of the brush frame is utilized in conjunction with the rotation of the replacement roll to allow the knife to be projected to sever the running (expiring) web W after the next complete rotation of the replacement roll to ensure that the running web and the replacement web have become joined before severance.

An indication is given in the wiring diagram of Figure 3 of the manner in which this is effected. The parts in this figure corresponding to those indicated in Figures 1 and 2 are indicated by the same reference numerals. In this figure the adhesive on the replacement roll is shown at 54, and at each of the roll positions 2, 3 and 4, is disposed an adjustable cam 55 which can be set to register radially with the adhesive on the roll in the corresponding position.

When the support 1 is turned by the motor 5 to bring a roll thereon into the replacement position 3, the corresponding cam 55 is brought into position to operate a switch 56 which in conjunction with a web-renewing "start" switch 57 controls the operation of a solenoid 58 to effect the release operation of the latch 22 and hence of the brush frame 12. The brush frame is thus released to press the expiring web W against the now speeded-up replacement roll in position 3 so that when the adhesive 54 contacts the web W it adheres thereto and the web is thereafter drawn from the replacement roll. The operation of the solenoid 58 sets the knife release mechanism for operation when the cam 55 next operates the switch 56 and the knife is then projected to sever the expiring web W. A combined brush and knife release mechanism is fully disclosed in Patent 2,182,760.

The present invention utilizes the release of the knife to close the circuit of the motor 40 to cause automatically the raising of the belt frame 7 and the brush and knife frames 12 and 13.

This can be effected by causing the knife to operate a spring biased switch 59 which is held in an open position when the knife is in the sheath 23, but is closed by the spring when the knife is projected. This switch is connected in the "reverse" circuit of the motor 40 the "forward" switch of which is indicated at 60; thus when the knife is projected, the switch 59 causes the motor 40 to raise the belt frames 7 and this operates through the rods 47 also to swing the brush, the knife and the guide frames 12, 13 and 14 to their inoperative position.

The switch 60 by which the parts are set in readiness for a web-renewing operation can be arranged for manual control or it can be operated by a device such as a photo-electric cell which causes the switch 60 to operate the motor

6

40 to lower the belt frames 7 when the roll from which the web W passes is reduced to a predetermined diameter. Similarly the web-renewing "start" switch 57 can be operator controlled or controlled by a device such as a photo-electric cell which causes the switch 57 to close the start circuit when that same roll reaches a predetermined diameter. Alternatively the switch 57 could be operated through a time control which becomes automatically effective to operate the switch 57 at a predetermined time interval after the closing of the belt-frame "lower" switch 60.

To prevent the possibility of causing the roll support 1 from being so turned by the motor 5 as to carry a roll into the belt and brush and knife frames 7, 12 and 13 while in their lowered position, the circuit of the motor 5 is controlled by a switch 61 which is interlocked with a switch 62 controlled by a cam 63 on the shaft 36. When this shaft 36 is in the position in which it holds various frames in their lowered position, the motor 5 is held from being energised to drive the roll support 1.

The centre of rotation of the roll stand 1 and the brush and knife frame structures 12, 13 are so arranged that in controlling the motor 5 to move the stand 1 to carry a roll from loading position 2 to replacement position 3 the centre of the replacement roll lies always to that side of the vertical center which is remote from the brush and knife arrangement when swung down to this operating position as shown in Figure 1. Such an arrangement facilitates the somewhat critical positioning of the roll stand to arrest it with the periphery of the replacement roll at a given distance from the web W passing from the running roll in its predetermined path over the sheath 23 and the guide 20. The preponderance of weight at the time when the replacement roll is to be moved from loading to replacement position is on the replacement roll side of the vertical centre and there is thus no difficulty due to over-run by reason of the weight distribution. This would enable a switch or a photo-cell responsive to the position of the periphery of the replacement roll to be employed satisfactorily to control the motor 5.

What I claim is:

1. A web renewing mechanism comprising a rotatable support for a plurality of web rolls, means to move the support to carry the rolls successively into web renewing position, with the periphery of a replacement roll adjacent a web passing from a running roll on the support, a driven belt speed-up device having a belt pulley secured to a first rotatably supported shaft and in combination, arms swingable on said first shaft, a second rotatably supported shaft having eccentrics secured thereon to swing the arms and move the speed-up device into and out of position to engage a roll in web renewing position, means to drive the speed-up device, including a rotatably driven clutch member, a cooperating clutch member on the said first shaft, and means on the said second shaft to effect engagement of the clutch members and thereby drive the said first shaft when the said second shaft is rotated to move the speed-up device into engagement with the roll in web renewing position.

2. Web renewing mechanism for a machine to which a web is fed, comprising a support rotatable to successively bring web rolls into a web renewing position with the periphery of a full roll adjacent a web running to the machine from a nearly spent roll, means to accelerate the full

roll to approximately the speed of the running web, means to reflect the running web and press it against the full roll, and means to sever the web from the spent roll, the said roll accelerating means including an endless belt driven by a first belt pulley secured to a first shaft, and in combination, arms swingable on the first shaft and rotatably supporting a second belt pulley, a motor driven shaft adjacent the first shaft and having eccentric members arranged to engage and swing the said arms and to operate a clutch connecting the first shaft with a rotating element of the machine.

3. Web renewing mechanism for a machine to which a web is fed, comprising a support rotatable to successively bring web rolls into a web renewing position, with the periphery of a full roll adjacent a web running to the machine from a nearly spent roll, means to accelerate the full roll to approximately the speed of the running web, swingable means to deflect the running web and press it against the full roll, and swingably supported means to sever the web from the spent roll, the said roll accelerating means including an endless belt driven by a first belt pulley secured to a first shaft, and in combination arms swingable on the first shaft and rotatably supporting a second belt pulley, a motor driven shaft adja-

cent the first shaft and having eccentric members arranged to engage and swing the said arms and an actuating member for a clutch operable to connect the first shaft with a rotating element of the machine to drive the belts, the web deflecting and severing means including crank pins carried by members rotated by the motor operated shaft, each with a connecting rod resiliently connected to swing the web deflecting and web severing means when the said arms are swung, whereby when the motor driven shaft is rotated the full roll will be accelerated and the web deflecting and web severing means moved to operating position.

THOMAS RICHARD BENNETT.

References Cited in the file of this patent
UNITED STATES PATENTS

Number	Name	Date
1,787,463	Wood	Jan. 6, 1931
1,843,469	Wood	Feb. 2, 1932
1,912,506	Wood	June 6, 1933
2,009,707	Scott	July 30, 1935
2,037,353	Tornberg	Apr. 14, 1936
2,182,760	Horton	Dec. 5, 1939
2,203,607	Wood	June 4, 1940
2,249,669	Robertson	July 15, 1941