

**Sept. 10, 1963**

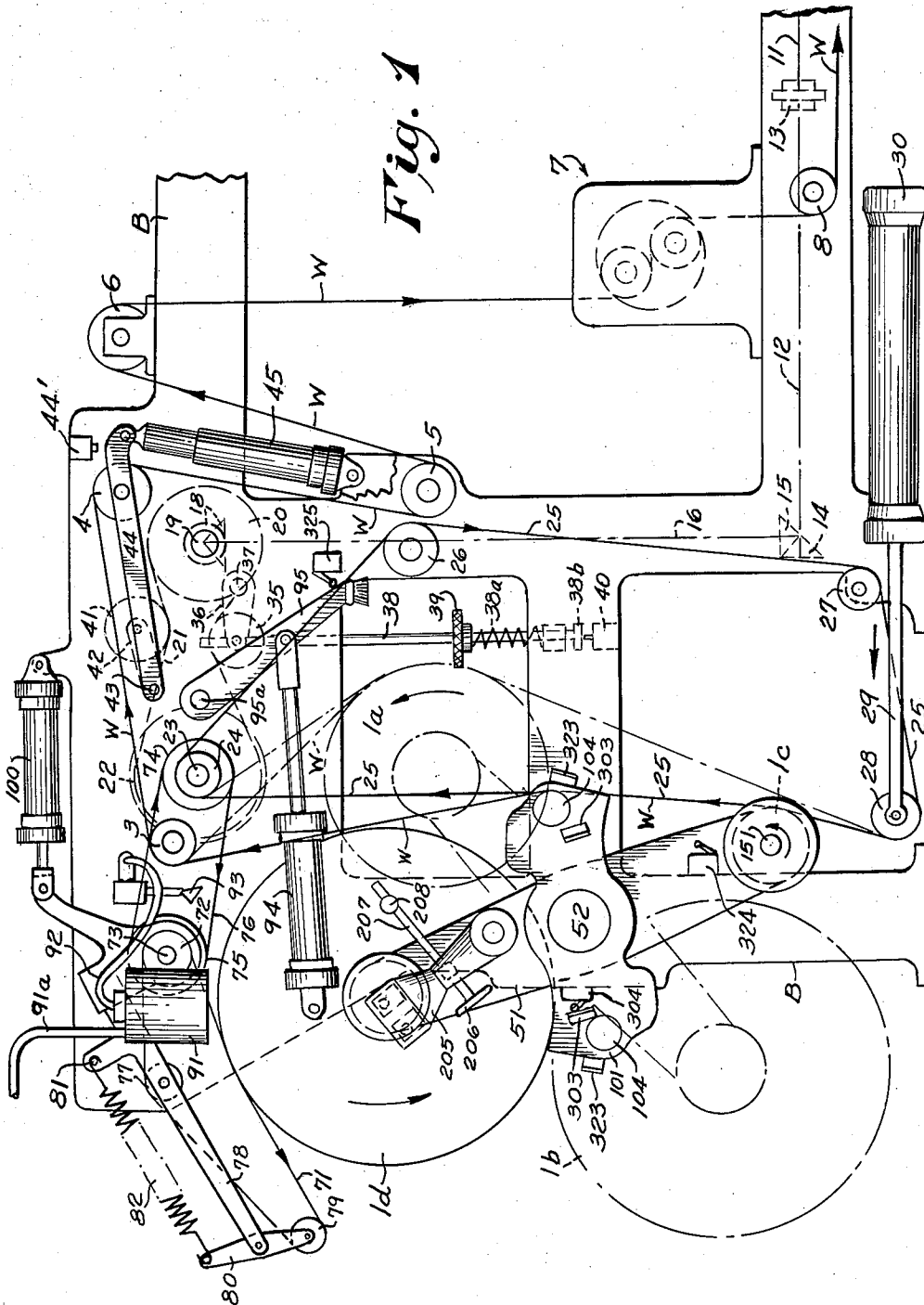
W. F. HUCK

**3,103,320**

## AUTOMATIC SPLICING ROLLSTAND

Filed Jan. 14, 1959

9 Sheets-Sheet 1



**Sept. 10, 1963**

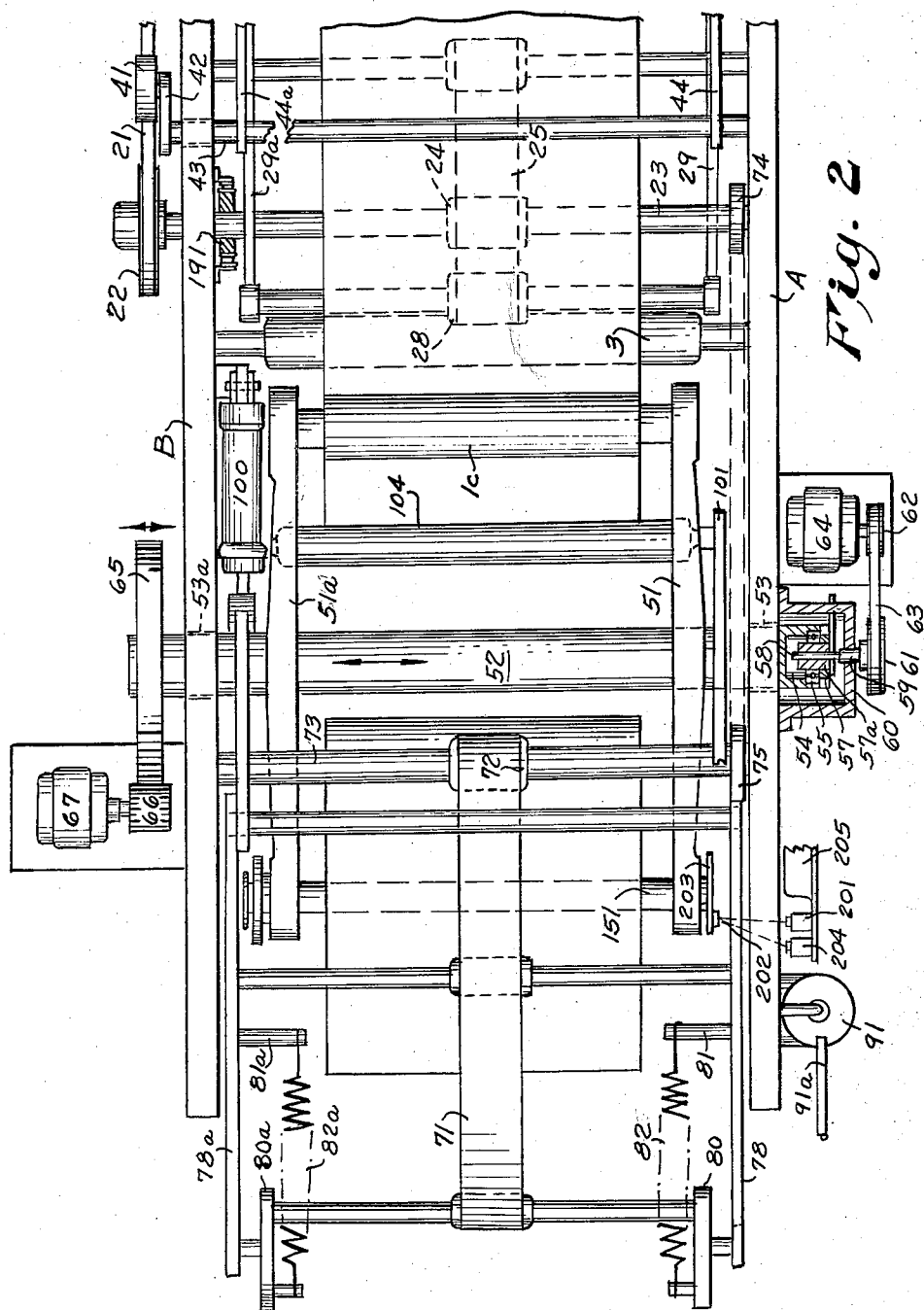
**W. F. HUCK**

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# AUTOMATIC SPLICING ROLLSTAND

Filed Jan. 14, 1959

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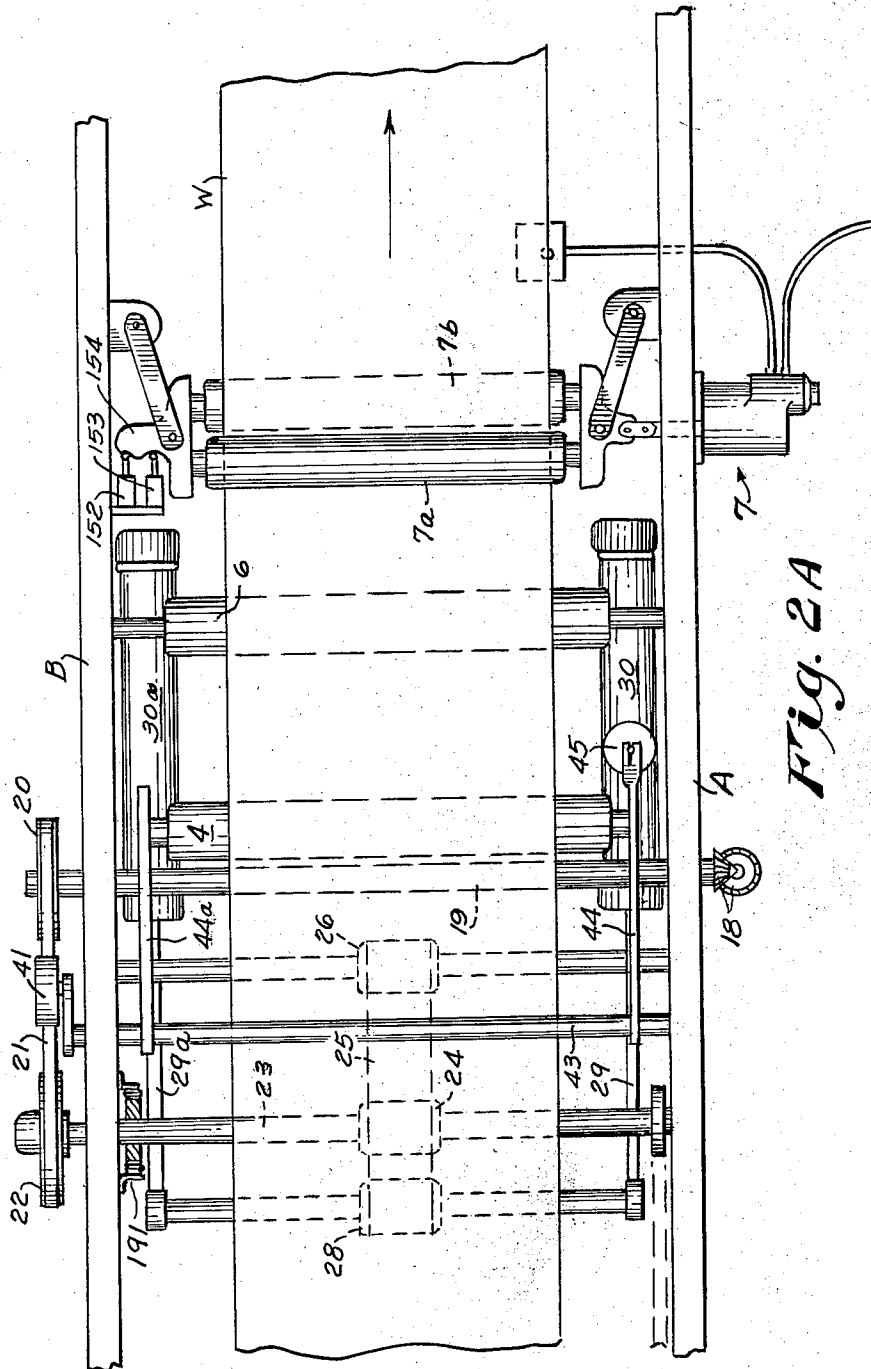
W. F. HUCK

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AUTOMATIC SPLICING ROLLSTAND

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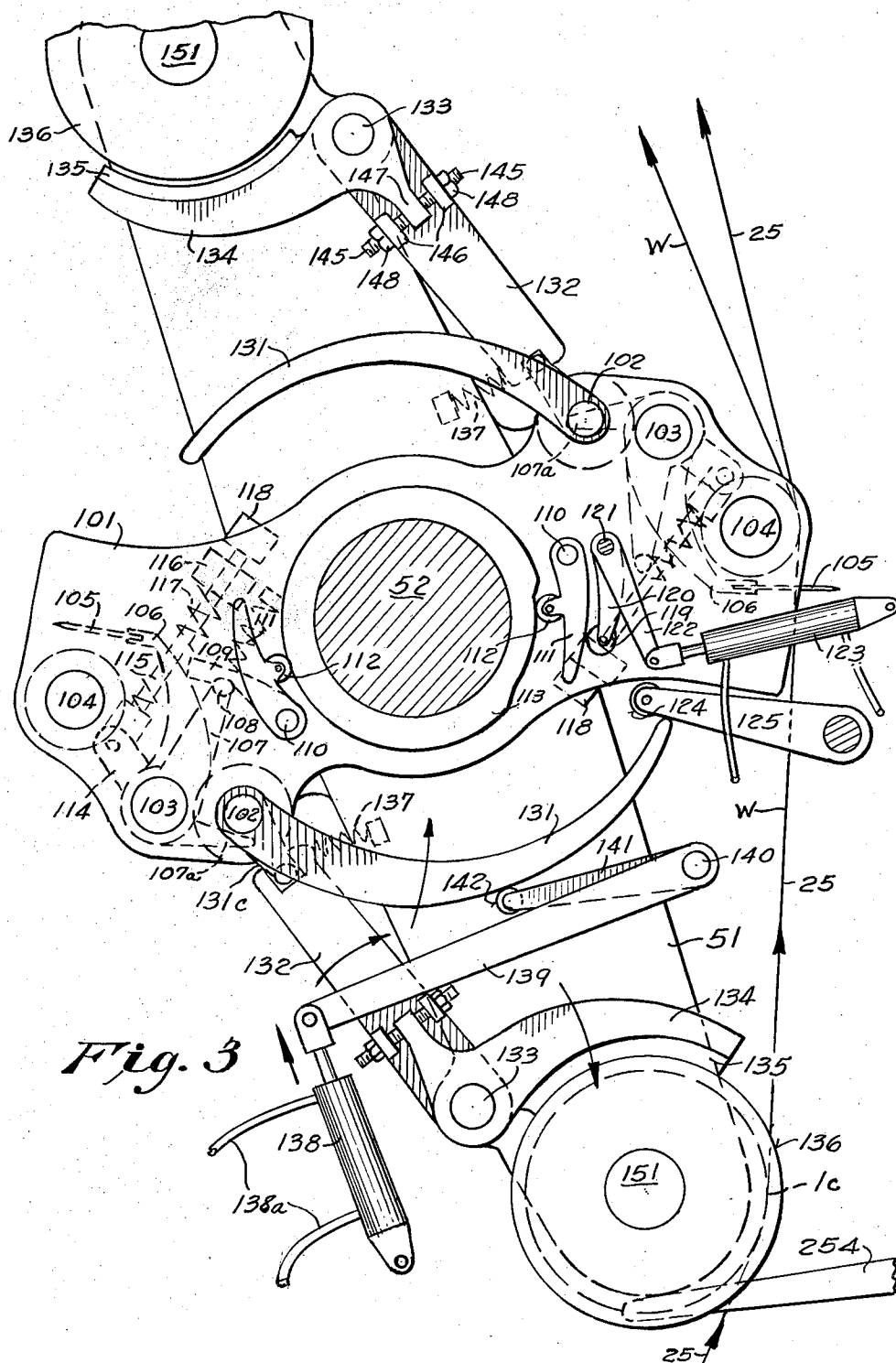
W. F. HUCK

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## AUTOMATIC SPLICING ROLLSTAND

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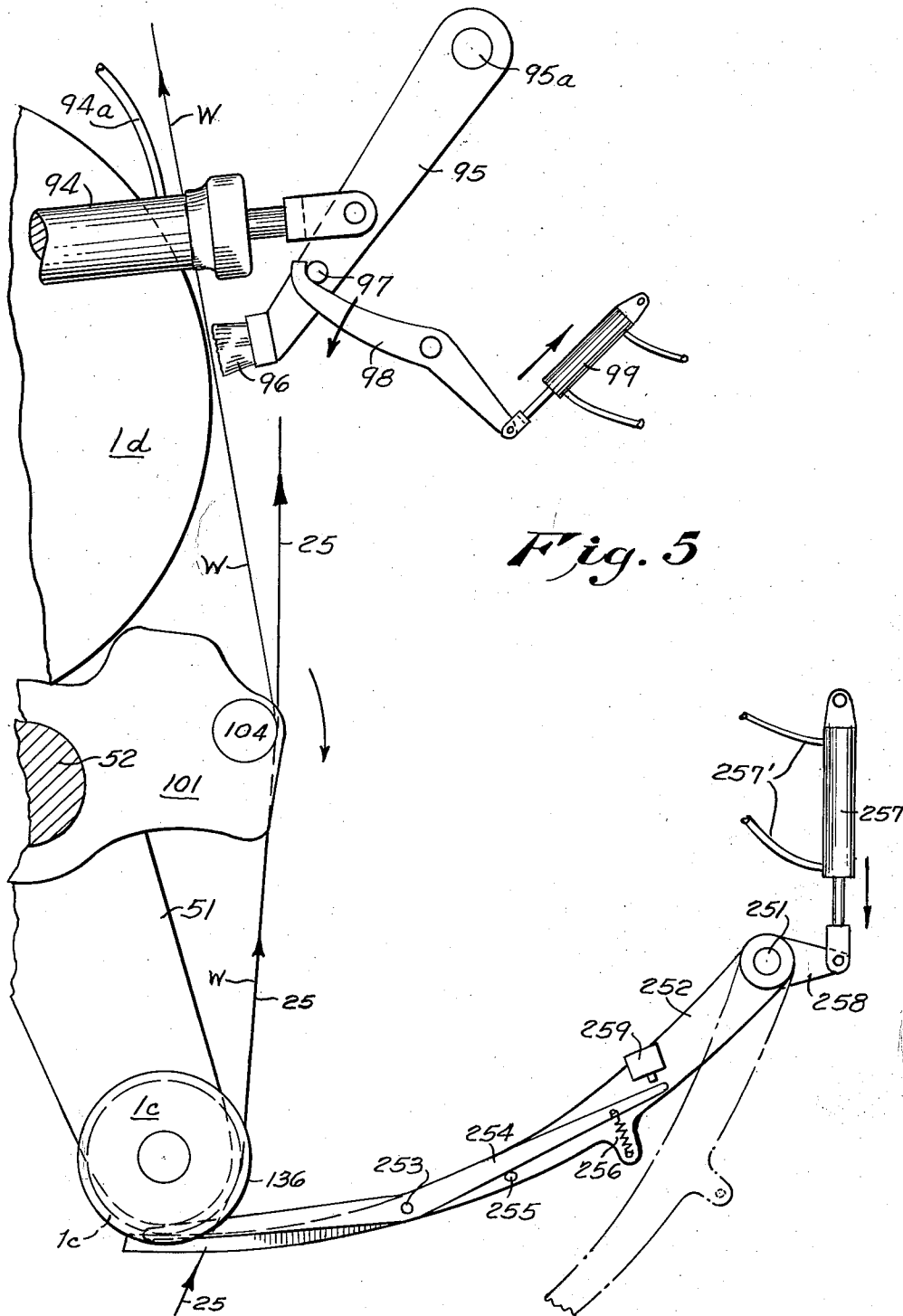
W. F. HUCK

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AUTOMATIC SPLICING ROLLSTAND

Filed Jan. 14, 1959

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**Sept. 10, 1963**

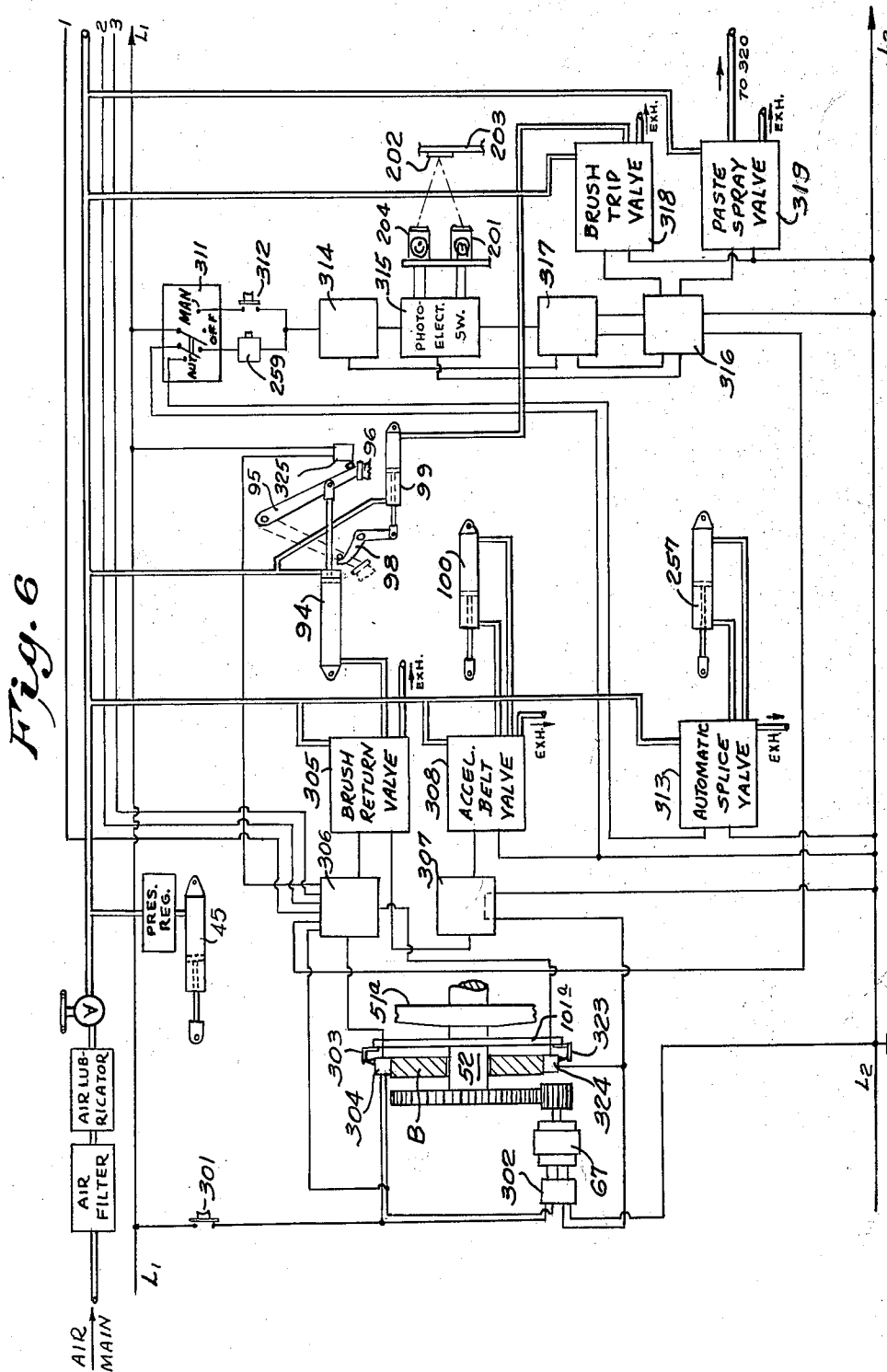
W. F. HUCK

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# AUTOMATIC SPLICING ROLLSTAND

Filed Jan. 14, 1959

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**Sept. 10, 1963**

W. F. HUCK

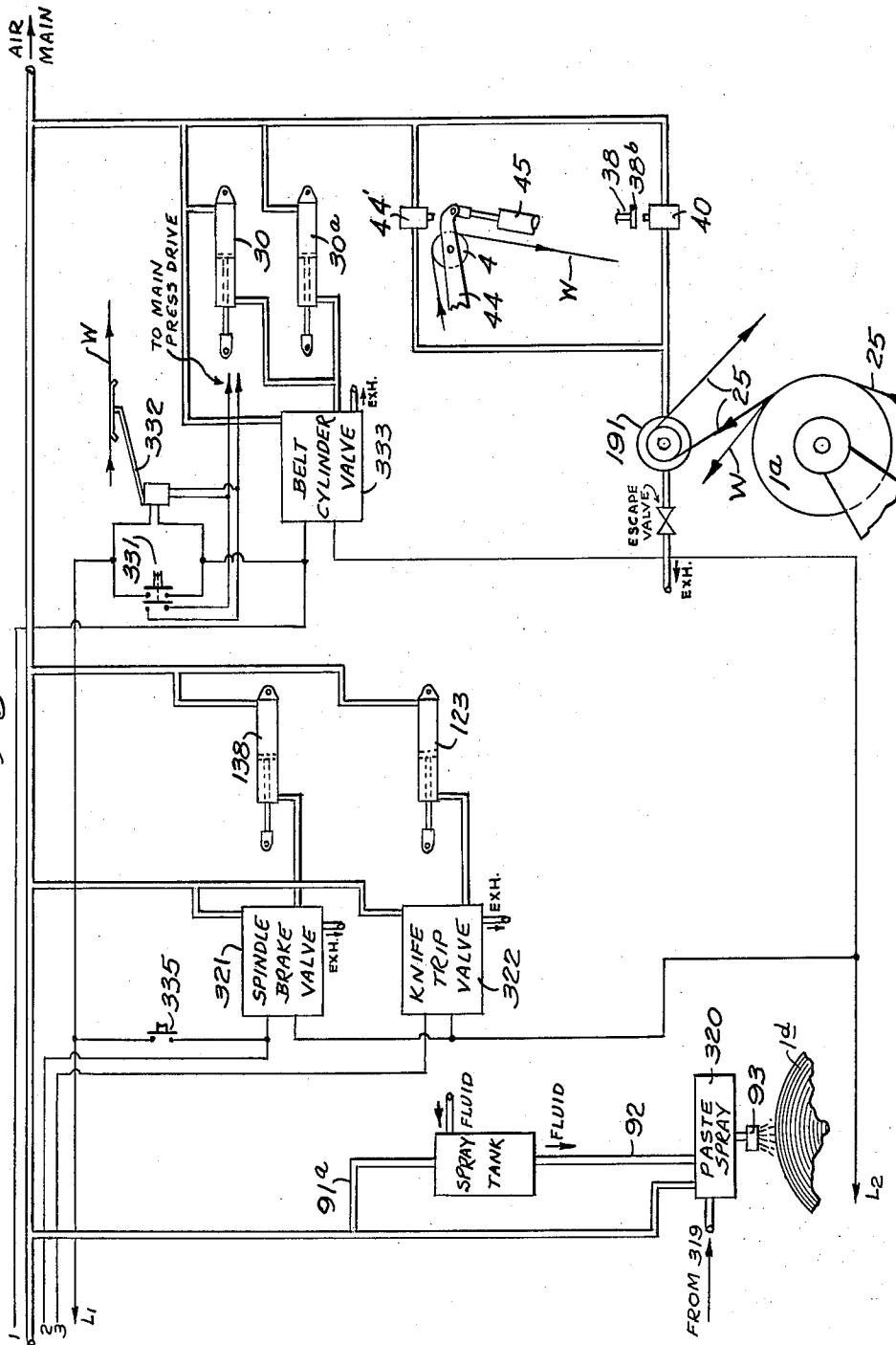
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## AUTOMATIC SPLICING ROLLSTAND

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Fig. 6A



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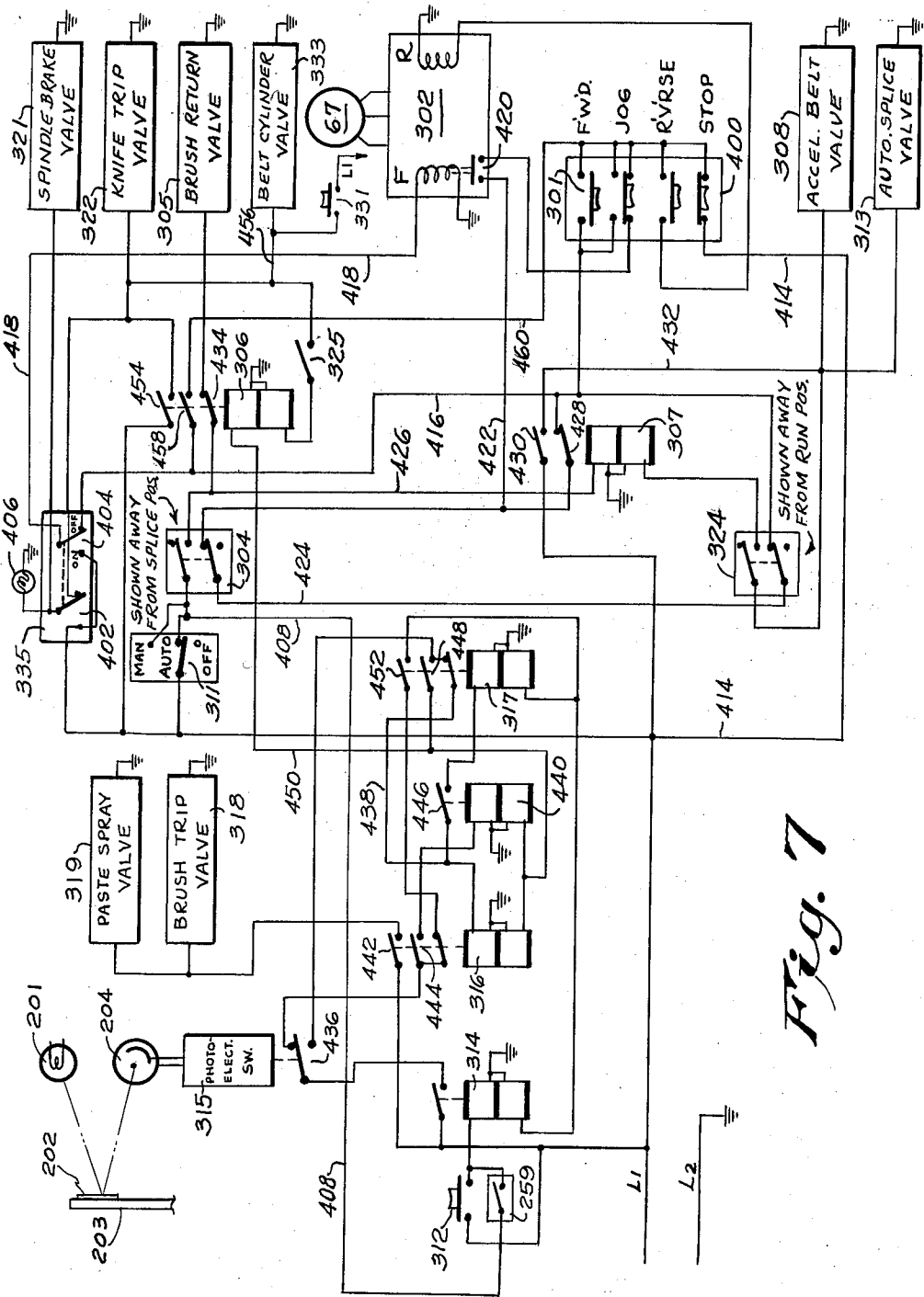
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## AUTOMATIC SPLICING ROLLSTAND

William F. Huck, Forest Hills, N.Y., assignor, by mesne assignments, to William F. Huck, doing business as Huck Company, New York, N.Y.

Filed Jan. 14, 1959, Ser. No. 786,843

15 Claims. (Cl. 242—58.3)

This invention relates to devices for the handling of continuous webs made of paper, cloth, felt, metal foil or the like, and more particularly to web handling devices which provide for the automatic splicing of the leading edge of a new web roll to the trailing edge of an expiring web roll. As used herein, the terms leading and trailing edges or ends of a web roll refer, of course, to the ends of the web material forming the rolls.

In many continuous web processing machines, as for example high speed printing presses and the like, the supply of a continuous web to the processing machines must be uninterrupted because of the expense and lost time when the processing machines are stopped to enable a new web supply roll to be brought into position for unwinding when the expiring web roll is almost depleted. For this reason, semi-automatic splicing devices of the "flying paster" type are now used to connect the expiring web to the leading edge of the web from a new supply roll without stopping the web processing machine. However, the automatic splicing devices now known in the art cause extensive waste of the web, due partly to the desire of the operator to avoid any interruption of the machine, and thus to initiate the splicing operation when a considerable amount of web material remains on the expiring roll. The current trend in the printing industry is to reduce the number of splices by making the rolls larger, but web speeds are also constantly on the increase as faster presses are designed.

The currently preferred method of driving the supply rolls is by variable speed belts operating under control of web tension, and contacting the surfaces of the rolls. For moderate roll sizes and press speeds, such controls can be designed so as to be fully satisfactory. When both of these factors increase, the increase in roll momentum is out of all proportion, and the installation costs and wear and tear of suitable controls become entirely unacceptable.

In prior art web handling devices having provision for automatic splicing of the leading edge of a new web roll to the trailing edge of an expiring web roll, the new web roll is brought up to the desired speed by means controlled separately from that of the web roll driving belts, which are controlled by the tension of the web itself. These separate controls are usually of the electrical type which operate by measuring the web speed first, then adjusting the new web roll drive so that the speed of the new web roll matches that of the expiring web. The new web roll drive is generally accomplished by means of a motor or drive mechanism that is completely separate from that of the web supply roll. This type of control has decided disadvantages. For example, it is difficult to match the speed of the new roll to that of the expiring web because the two drives are separate, only one being controlled by the tension of the web itself.

In high speed operation of web processing machinery having automatic web splicing provisions, it is also extremely important that the speed of the web and that of the new web supply roll be the same, and that tension control be continuously effected, because the web will not withstand any undue change in tension created by speed differences, without rupture of the web with consequent costly stoppages. Since the prior art devices which provide for automatic splicing depend upon the matching of speeds between two separate drives, without

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tension control during splicing, breakage of the web often occurs before the speed of the two drive means can be matched.

It is accordingly a main object of this invention to overcome the disadvantages of the prior art machines mentioned above, and especially to provide a continuous web handling machine capable of automatically splicing the leading edge of a new web roll to the trailing edge of an expiring web roll, in which the web supply roll can receive added emergency braking force when required. This will provide adequately for control of the roll during normal operations, with moderate belt tension which can be proportionally increased during the splicing and emergency stop periods.

It is another object of this invention to provide a web handling machine capable of automatically splicing the leading edge of a new web roll to the trailing edge of an expiring web roll, wherein the speed of the web from the new supply roll is synchronized exactly with the speed of the expiring web during the splicing operation.

It is still another object of this invention to provide a continuous web-handling machine capable of automatic splicing in which both the expiring supply roll and the new web roll to be spliced are driven by separate contact non-slip belts both of which firmly contact the roll surfaces and are actuated by the same variable speed controls and web tensioning device; before, during, and after the splicing operation. There is no slipping of these belts except during the initial acceleration of the replenishment roll.

Another object of this invention is to provide a web-handling machine capable of automatically splicing the leading edge of a new web supply roll to the trailing edge of an expiring web roll, in which provision is made to compensate automatically for the variation in splice timing involved when replacement supply rolls of different diameters are to be used. This results from the fact that the new roll is brought close to the travelling web just before the splicing contact is made, and the angular position of the leading edge of the new web, with reference to its roll axis, should be at the point of tangency at the instant of splicing contact, even though the roll is rotating at a substantial speed. The invention provides optical sensing means to make this correction automatically.

Another object of this invention is to prevent the expired web roll from rotating and spilling the remaining web, which object is accomplished by providing continuous accurate web tension control until the splice has been made, a separate moderate braking force to the expiring roll prior to splicing, a heavy braking force at the time the splice is made, and then disengaging the expiring web roll from the main drive mechanism.

Still a further object of this invention is to provide a web-handling machine, such as a rollstand, capable of automatically splicing the leading edge of a new web on a supply roll to the trailing edge of a web on an expiring web roll, wherein the web supply roll core bearings are automatically adjusted for wear during operation and rotation of the web supply roll.

An additional object of this invention is to provide a web-handling machine capable of automatically splicing the leading edge of a web on a new supply roll to the trailing edge of a web on an expiring web roll, wherein the speeds of both rolls are automatically synchronized before the splicing operation, and constant web tension control is maintained by the same device throughout the entire splicing operation as well as before and after the splicing operation.

The above and other objects and advantages of the invention will best be understood from the following de-

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tailed specification of a preferred embodiment thereof, taken in connection with the appended drawings, in which:

FIGURE 1 is a schematic side elevation of a rollstand incorporating the inventive features, the near side frame of the machine being removed for clarity.

FIGURES 2 and 2A together represent a developed plan view of the machine.

FIGURE 3 is a side elevation, to a larger scale than FIGURE 1, and with parts omitted for clarity, showing the web severing and braking features.

FIGURE 4 is a fragmentary developed plan view, also enlarged, of a portion of FIGURE 1, with parts in section, to illustrate features of the web roll mounting and control.

FIGURE 5 is an enlarged schematic side elevation showing the pasting parts in another position from FIGURE 1, and indicating the automatic means for sensing roll depletion to initiate the splicing operation.

FIGURES 6 and 6A together represent a simplified schematic diagram of the sequencing and control portions of the invention.

FIGURE 7 is a schematic wiring diagram showing the electrical connections to the control relays.

Although mention has been made above of the fact that this invention may be used with particular advantage in the handling of paper webs for processing through high speed printing presses, the invention is also of great utility for use with any web processing machinery in which operations of various types are performed upon a rapidly moving web made of paper, cloth, felt, metal foil or the like.

In the drawings, considerable simplification has been effected in order not to obscure the novel features with details of conventional parts well known to those skilled in the art. Also, developed views have been employed where these clarify the structure, and conventional symbols have been used for known components. In FIGURE 1, the two principal positions of the roll-holding spider assembly have been shown, but since the invention is principally concerned with splicing, the full line position shows the assembly ready for a splicing operation, while a chain line position is used to indicate the normal running condition of the machine.

Referring now to the drawings, and first to FIGURE 1 in particular, the web W is being unwound from a web supply roll 1a so that it passes upward to the left around a roller 3 and then travels to the right where the web passes over a floating roller 4. The web W then passes under an idler roller 5 from which the web travels over another idler roller 6 to head downwardly where it passes through a side register control unit as indicated generally by the reference numeral 7. The side register control unit 7 is of the type disclosed in Patent No. 2,779,591, issued January 29, 1957, to W. F. Huck. After leaving the side register control unit 7, the web W then travels downward under an idler roller 8 from which it leaves the web rollstand unit and enters the web processing machine.

The web rollstand, or web-handling machine, is powered from the main web processing machine drive as through a pair of transmission shafts 11 and 12 joined by a flexible coupling 13. The horizontal shaft 12 is connected to a vertical shaft 16 through a pair of bevel gears 14 and 15. The vertical transmission shaft 16 is connected by bevel gears 18 to a horizontal shaft 19 on which is mounted a V-belt pulley 20. The horizontal shaft 19 is mounted on suitable bearings between two vertical side frame members A and B as seen clearly in FIGURES 2 and 2A. The V-belt pulley 20 is mounted upon one end of the horizontal shaft 19 beyond the machine side frame member B. The V-belt pulley 20 is connected by means of a V-belt 21 to a variable speed pulley 22 of a type well known in the art, such as the one which is shown in U.S. Patent No. 2,812,666, issued

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November 12, 1957, to W. F. Huck. The variable speed pulley 22 is carried on one end of a horizontal drive shaft 23 mounted upon suitable bearings carried by the machine side frame members A and B. Mounted approximately midway upon the horizontal shaft 23 (see FIGURE 2) is a pulley 24 to drive an endless belt 25 which contacts the web roll 1a over a portion of its periphery to rotate the web roll. The endless drive belt 25 extends over a pair of idler pulleys 26, 27 and adjustable pulley 28. The adjustable pulley 28 is carried at each end by piston rods 29 and 29a (FIGURE 2) of fluid pressure cylinders 30 and 30a (FIGURE 2A) respectively. As shown in FIGURES 1 and 2A of the drawings, the two fluid pressure cylinders 30 and 30a are located within and at the lower portion of the side frame members A and B respectively. Each of the fluid pressure cylinders 30 and 30a is connected by suitable conduits to a controlled source of pressure fluid.

The effective length of the V-belt 21 may be adjusted by means of a movable idler pulley 35 which is carried at one end of a horizontal arm 36 pivotally mounted upon a horizontal stub shaft 37. The position of the pulley 35 is adjusted by rotating a vertically mounted, elongated threaded shaft 38 which shaft may be rotated by a handwheel 39. The shaft is threaded into a nut swiveled on arm 36. The elongated threaded rod 38 is supported by an adjustable spring 38a so positioned that upon downward movement of the threaded shaft 38, which is provided with a flattened and enlarged contact area 38b, a pneumatic brake control valve 40 may be actuated to apply an additional braking force to the drive shaft 23, by means of a pneumatic brake 191 mounted upon the upper portion of the side frame member B, as shown in FIGURE 2.

The V-belt 21 is arranged so that its effective length will also be varied in response to changes in the tension of the web W, by means of an adjustable idler roller 41 which is mounted at one end of a crank arm 42 pivotally secured to a horizontal shaft 43. Also mounted upon, and secured to, the horizontal shaft 43, at its respective ends, are the arms 44 and 44a (FIGURE 2A) which carry the floating roller 4 near one end thereof, as is illustrated in FIGURE 1. A pneumatic pressure cylinder 45 is connected at one end thereof to the arm 44, and at its other end to a projection extending from the side frame member A.

The fluid pressure cylinder 45 is supplied with fluid under pressure from a suitable source in such manner that the position of the cylinder piston connected to the end of the arm 44 may be controlled at all times. When fluid under pressure is introduced into the cylinder 45, the piston moves the arms 44 and 44a upward and counter-clockwise about the shaft 43. This upward force exerted against the arms 44 and 44a is in addition to the upward force exerted by the belt 21 against the pulley 41, both forces being balanced by the downward force exerted by the web W on the floating roller 4. This arrangement, in combination with the previously described variable speed drive, automatically compensates for any variations in the tension of the web W during normal operation. For example, an increase in the tension of the web W rotates the floating roller 4 and the arms 44 and 44a and shaft 43, clockwise. This movement results in a corresponding rotation of the idler roller 41 with shaft 43, thus reducing the effective length of the V-belt 21 which in turn reduces the effective engagement diameter of the belt 21 on the variable speed pulley 22. Since the V-belt 21 is travelling at a constant linear speed in proportion to the speed of the web W, this reduction in the effective diameter of the pulley 22 increases its rotational speed and the speed of the belt 25 and the web roll 1a, thus feeding the web W at a faster rate, which effectively reduces the tension of the web and thus compensates for any increase of the web tension above that originally set.

Similarly, when the tension in the web W decreases below the value desired, the effective length of the V-belt 21 increases, thereby increasing the effective diameter of the variable speed pulley 22 and decreasing its rotational speed. The resulting reduction in speed of the web W increases the web tension and thus restores the web tension to the value originally set.

It is emphasized that in all explanations and descriptions given herein as to the belt such as 25 which drive the expiring web roll, there is actually no driving force, but a retarding force which allows the web roll to rotate only rapidly enough to hold back the web until its tension is correctly balanced by the variable speed drive and the associated resilient balancing force, such as that of the fluid pressure cylinder 45, or even a spring on arm 44. The latter balancing force is adjustable to provide a means for adjusting the web tension by establishing a new force balance.

In FIGURE 1 the web roll 1a is shown in its normal running unwind position. The web roll 1a is carried between the ends of a pair of spider arms 51 and 51a (FIGURE 2) which are mounted at their centers on a rotatable horizontal shaft or spindle 52 supported between the side frame members A and B. The shaft 52 is supported on the side frame members A and B by means of sleeve bearings 53 and 53a respectively. As illustrated in FIGURES 2 and 4, the shaft or spindle 52 extends beyond the side frame members A and B. The forward end of the spindle 52 is hollow (see FIGURE 2), as designated by the reference numeral 54, to permit mounting therein a ball bearing 55. An end plate 57 serves to retain the ball bearing in place. The inner race of the ball bearing 55 journals a nut piece 57a which coacts with a screw 58 rotating in a sleeve bearing 59 located in the outer housing 60. The opposite end of the screw 58 serves as a mounting for a pulley 61 which is connected to a drive pulley 62 by means of a belt 63. A motor 64 on which the drive pulley 62 is mounted, rotates the screw 58 by means of the belt 63 just mentioned. The rotation of the screw 58 in the nut piece 57a moves the spindle 52 in the sleeve bearings 53 and 53a laterally between the side frame members A and B. The motor 64 is carried by a bracket extending from the side frame member A.

The main spindle 52 may also be rotated in the bearings 53 and 53a, by a gear 65 mounted on the far end of the spindle 52, which gear is rotated by a pinion 66 mounted on the shaft extension of a motor 67 carried by a bracket extending from the side frame member B; see FIGURE 2.

The spider arms 51 and 51a can be rotated by the gear drive just described into the splicing position shown in solid lines in FIGURE 1. In this position, the unwinding web roll 1c is at its minimum diameter, and a new web roll 1d has been raised from loading position 1b into contact with an accelerating belt 71 which is driven by a pulley 72 mounted upon a horizontal shaft 73 carried between the side frame members A and B. A pulley 74 mounted on the main drive shaft 23, and a pulley 75 mounted upon the shaft 73 are of the same pitch diameter and are connected by a non-slip drive belt or sprocket chain 76. The arrangement just described assures that the web drive belt 25 and the accelerating belt 71 will always have the same identical linear speed.

The accelerating belt 71 also passes around an idler pulley 77 mounted between a pair of pivot arms 78 and 78a, and a take-up pulley 79 located at the lower end of a pair of arms 80 and 80a mounted within the side frame members A and B, as illustrated in FIGURES 1 and 2. The upper ends of the arms 80 and 80a are connected to abutments 81 and 81a respectively, on the arms 78 and 78a, by means of a pair of springs 82 and 82a respectively. The springs 82 and 82a act as a take-up to maintain the accelerating belt 71 taut at all times.

A fluid pressure cylinder 100 connected to a source of fluid under pressure suitably controlled, applies the force

necessary to maintain adequate driving pressure between the accelerating belt 71 and the new web roll 1d, and also provides the means for disengaging the accelerating belt 71 from the web roll 1d, in a manner described later in this specification.

A reservoir tank 91 is mounted on the outside of the side frame member A to hold an adequate supply of liquid paste, or a liquid solvent used in combination with dry gum previously applied to the outside of the new web roll 1d. A fluid pressure line 91a supplies the pressure needed to force the liquid from the tank 91. If the liquid is to be sprayed, a flexible hose 92 connects the tank 91 to a spray gun 93 mounted between the side frame members A and B in close proximity to the web roll 1d. This feature or arrangement for spraying the liquid adhesive or solvent is not used when a non-soluble adhesive is being used, or when the rollstand is being used to rewind web material.

In splicing the expiring web W to the new web roll 1d, a pneumatic pressure cylinder 94, supplied with fluid pressure by line 94a, see FIGURE 5, serves to actuate an arm 95 which is pivotally mounted at one end thereof from a pivot shaft 95a. Located at the other end of the arm 95 is a paste pressure brush 96 normally out of contact with the web. The movement of the arm 95 is arranged to occur in two stages. At first the arm 95 moves in response to cylinder 94 from its normal operating or running position, shown in FIGURE 1, to the splicing position shown in FIGURE 5 where a projection 97 on the lower portion of the arm 95 is held by a hook 98. At the instant a web splice is to be made, the pressure in one side of the pneumatic pressure cylinder 99 is exhausted, and the remaining pressure in the cylinder 94 causes the brush 96 to be pressed against the expiring web W, which in turn is pressed against the surface of the new web roll 1d, which has already been prepared with either an adhesive spray, a solvent spray on a prepared adhesive, or a transverse pressure-sensitive adhesive strip near the exposed web end, as described. The web end is normally lightly adhered to the next inner layer, to prevent spilling prior to the splicing operation.

The web severing device used in this invention is shown in detail in FIGURE 3. A pair of plates 101 and 101a are fastened to the main spindle 52, lying respectively between the spider arms 51 and 51a and the corresponding side frames. The plates 101 and 101a are positioned approximately perpendicular to the spider arms 51 and 51a, as seen in FIGURE 3, and are connected to one another by means of a pair of cross shafts 102 and 103, and a pair of cut-off rollers 104. As shown in FIGURE 3, there are two identical severing devices, one at each extremity of the severing plate assembly. For ease in explanation, only one set of severing devices will be described, since the second set is identical and is illustrated in FIGURE 3. Two sets are needed since the opposite ends of the spider arms 51 alternate with one another in receiving the new and expiring rolls of web material. In FIGURE 3, a few of the parts have been omitted from one severing assembly for clarity, but these have then been shown in the other assembly.

The web is severed by means of a knife 105 fastened to an arm 106 which is pivotally mounted on the cross shaft 103. Also mounted on the cross shaft 103 is a latch arm 107 provided with a latch pin 108 at its end, which coacts with a latch hook 109 pivotally mounted upon a stub shaft 110. The stub shaft 110 also serves as a pivot for an arm 111 carrying a cam follower 112 which is actuated by a stationary cam 113 fastened to the side frame member A by bolts 113a, FIGURE 4. The knife arm 106 is provided with an extension 114 which serves as a pivot for a spring rod 115, the other end of which passes through a block 116. A compression spring 117 mounted on the spring rod 115 provides the operating force for the severing knife 105, the movement of which is limited by a stop 118 fastened to the end

of the spring rod 115. The cam follower 112 is kept in contact with the cam 113 by an auxiliary cam follower 119 mounted upon an arm 120 which is pivotally carried by a horizontal stub shaft 121 on frame A. The shaft 121 also carries an arm 122 to which is pivoted a fluid pressure cylinder 123 connected to a source of fluid under pressure, suitably controlled. The arm 106 which carries the knife 105 is restored to its inactive position by a roller 124 carried at the end of a stationary arm 125 contacting, as plate 101 rotates, a nose element 107a forming part of the latch arm 107, which pivots around the cross shaft 103; thereby allowing the latch hook 109 to once again engage the latch pin 108, and of course re-compressing spring 117.

The mechanism used to brake the expiring web roll 1c after the web W has been severed, in order to prevent wasteful rotation and spilling of the remaining web, is also illustrated in FIGURE 3 of the drawings. A curved tongue 131 mounted on the cross shaft 102, and having a stub extension 131c is designed to engage a fork arm 132 which is pivotally mounted about a stub shaft 133 carried by the spider arm 51. The stub shaft 133 also serves as the mount for a brake arm 134 which carries a brake shoe 135 for contact against a brake drum 136 (see also FIGURE 4), mounted upon the extension of roll shaft 151. A spring 137, acting against the tongue 131, holds the brake shoe 135 out of contact with the brake drum 136 during normal operation of the machine. To supply the braking force when necessary, there is provided a double-acting pneumatic brake cylinder 138 fed by pressure lines 138a. One end of the cylinder 138 is pivotally anchored to the side frame member, and the other end is pivotally connected to one end of an arm 139. The other end of the arm 139 is pivotally supported by a cross shaft 140. The cross shaft 140 also carries a follower arm 141 which is provided with a follower 142 at one end thereof. When the brake is to be applied, one side of the pneumatic brake cylinder 138, which is fed by the pressure fluid lines 138a, is exhausted, causing the arm 139 to pivot clockwise about the shaft 140, which also carries the follower arm 141 and the follower 142. The follower 142 operates against the curved tongue 131, which is also fastened to the cross shaft 102, and the stub extension 131c acting on the forked end of the fork arm 132 causes the brake shoe 135 to contact the brake drum 136 and thereby stop or retard the rotation of the expired web roll 1c.

The magnitude of the braking force may be varied by means of the set screw arrangement best illustrated at the upper part of FIGURE 3. A pair of set screws, designated 145, are mounted through abutments 146 formed on the fork arm 132, and bear against an extension 147 on the brake arm 134. The set screws may be locked in place by means of lock nuts 148. This adjustment provides a means for applying a slight braking force to the expiring web roll during the normal unwind period, to prevent any excess unwinding and subsequently, after the pressure in one side of the pressure cylinder 138 has been exhausted, applying the full braking force to stop the rotation of the expired roll 1c after the web has been severed. The adjustment can also be made to impart zero braking force, as for rewinding.

To facilitate easy replacement of a web roll (see FIG. 4), there are provided slotted disks 161, 161a on the roll shafts 151, 151a, each having a series of radial openings located about its periphery, to receive a lever rod 162 to aid in rotating the disks. The disk 161 has integral therewith a threaded hub portion which extends into a threaded opening 164 of the spider arm 51. Rotation of the disks 161 and 161a by means of the rod 162 causes the threaded hub portion of each disk to advance along the threaded wall openings 164, 164a of the spider arms 51 and 51a. The web roll is provided with the usual core tube 166 which contains cone pieces 165, 165a in the ends thereof. The movement of the threaded

hub portion of the disk 161 along the threaded portion 164 removes the end cone 165 from the core tube, so that an expired part or core may be replaced by a new roll 1d. The same applies to movement of the threaded portion of the disk 161a along threaded portion 164a to remove the cone 165a from the core tube 166.

To obviate the tendency of cone 165 to loosen because of the wear it causes on the core tube 166, a pre-loaded spring 167 is located within the hub of the disk 161 to provide axial follow-up pressure upon the cone 165. A hand wheel 168, connected to core shaft 151a, is provided to facilitate the manual rotation of the roll in order to position the leading edge of the web material thereon with respect to the roll core.

The new web roll 1d is thus supported by roll stub shafts 151 and 151a which rotate in bearings 169, 170 and 169a, 170a carried by the spider arms 51 and 51a respectively, as illustrated in FIGURE 4. These bearings are such as to reduce the friction of rotation of the new web roll 1d to a minimum. The spider arms 51 and 51a are removably laterally on the main spindle 52 by means of a pair of manually operated pinion gears, one being shown in FIGURE 4 as 181, meshing with an elongated rack 182 which extends the distance between the severing plates 161 and 161a. The rack 182 also serves as a key to fix the angular position of the spider arms 51 and 51a relative to the main spindle 52. Screw clamps 183 and 183a are provided to maintain the lateral position of the spider arms 51 and 51a after they have been moved to the desired position; e.g., for different web widths.

The timing of the spray and the paster brush operations with respect to the leading edge of the material on the new web roll 1d is controlled by a sensing device illustrated in FIGURES 1 and 2. This consists of a light source 201 for directing a beam of light upon a mirror 202 which is mounted at one radial position near the edge of a disk 203 carried on the extension of the roll shaft 151. The mirror 202 is adjusted, when the new roll is installed, so as to be located a predetermined distance ahead of the leading edge terminus of the material on roll 1d, to allow for the inherent lag in the operation of the controlled devices. The mirror 202 is positioned so that it reflects the light beam directly into a photoelectric cell 204, each time the leading edge on the roll is aligned with brush 96. Both the light source 201 and the photoelectric cell 204 are mounted upon a pivoted bracket 205 extending from side frame member A. The position of the bracket 205 is adjusted by means of a handwheel 206 (FIGURE 1) which rotates an adjusting screw 207 which engages a stationary nut 208. In the operation of the sensing means just described, after the accelerating belt 71 has brought the new web roll up to the desired speed, the electrical circuit to the light source, the photocell, and the associated relays is closed. During the following rotation of the web roll the reflected light from the mirror 202 is received by the photocell 204, which actuates a relay to initiate the splicing sequence in a manner that is described later in this specification.

As stated previously, the web W is maintained in accurate side register during the entire splicing operation by a control device known in the art, and described in U.S. Patent 2,779,591, issued January 29, 1957, to W. F. Huck. This device corrects for web side-register variations within a limited range. A coarse side-register control varies the lateral position of the web supply roll when the vernier adjustment reaches predetermined positions at the extremities of its operating range. When the side register rollers 7a and 7b swing laterally beyond the limited range of the side register detecting means, a cam 154 mounted on the end of those rollers (see FIGURE 2A) actuates one of two microswitches 152, 153 to close the power circuit to the reversible motor 64, FIGURE 2. The direction of rotation of the motor 64 is determined

by which of the two switches 152, 153 is actuated by the cam 154. When the motor 64 is energized, the pulley 61 is rotated by means of the drive pulley 62 and belt 63. This causes the screw 58 to move the feed nut 57 thus moving the spindle 52 laterally between the side frame members A and B. This operation may be performed intermittently by means of an electrical timer circuit so that the coarse side register control will just bring the web inside the operating range of the vernier side register adjustment just described, and will not over-compensate.

The splicing operation may be initiated manually when desired. However, it can also be initiated automatically, when the expiring roll reaches a certain small diameter. The mechanism for automatically initiating the splicing sequence in the cycle of operation of this machine is illustrated in detail in FIGURE 5 of the drawings. A horizontal shaft 251 extending from the side frame member A carries a bell crank arm having a long curved portion 252 and a short stub portion 258 in angular relation to the long curved portion 252. A pivot 253 extending from the long curved crank arm 252 serves to rotatably support a bent arm 254 in close operating proximity to the crank arm 252. The bent arm 254 is held in an inoperative position against a stop 255 carried by the crank arm 252 by means of a bias spring 256. A double acting fluid pressure cylinder 257 fed by fluid pressure lines 257', suitably controlled, is pivotally anchored at one end to the side frame member A. The piston rod of the fluid pressure cylinder 257 is connected to the free end of the short stub 258 of the bell crank arm 252, so that movement of the fluid pressure piston rod will rotate the curved bell crank arm 252 about the pivot shaft 251. An electrical switch 259 is suitably mounted upon the curved bell crank arm 252 for cooperation with one end of the bent arm 254 in a manner to be described.

The operation of this mechanism for initiating the splicing operation is as follows: As the spider arms 51 and 51a arrive at the splicing position, as shown in FIGURE 5, pressure is partially relieved in the lower portion of the fluid pressure cylinder 257 to cause the piston rod to move downwardly thereby rotating the short arm 258 about the shaft 251 to move the long curved bell crank arm 252 upwards until the end of the arm contacts the periphery of the unwinding stub supply roll 1c. The locations of arms 252 and 254 are indicated in FIGURE 5. As the stub supply roll 1c continues to unwind and is reduced in diameter, the bent arm 254 comes into contact with the lower end of spider arm 51, so that the bent arm pivots about the pin 253 to actuate the switch 259. As will be explained later, the actuation of the switch 259 initiates the splicing sequence, and also permits the fluid pressure supply to be connected to the lower portion of the fluid pressure cylinder 257, thus moving the arm 252 back to its inoperative position as illustrated in chain lines in FIGURE 5. In this position, the arm is out of the path of travel of the largest rolls to be carried by the spider arms, as when the rollstand is used for rewinding operations.

FIGURES 6 and 6A taken together constitute an operational diagram from which the sequence of operations can readily be followed, while FIGURE 7 details the wiring connections amongst the relays and air-control solenoid valves. The relays are of the so-called "latching" type, in which the contact combination is operated in one direction when one coil is energized, and remains in that position until restored to its former condition upon energization of a second coil. Referring now to FIGURES 6 and 6A, the operational sequence will be as follows.

#### Operational Sequence

(1) The press operator, after observing that a splicing operation will soon be necessary, depresses push button 301 which first supplies power to motor control starter 302 to energize main spindle motor 67, thereby rotating

spindle 52, carrying arms 51, 51a into splicing position, as shown in full lines in FIGURE 1.

(2) When splicing position is reached, abutment 303 on plate 101a depresses switch 304 (mounted on side frame member B), thereby stopping main spindle motor 67 and simultaneously supplying power to both brush return solenoid valve 305 and relay 307 through relay 306.

(3) Valve 305, when powered, exhausts one side of brush cylinder 94 causing arm 95 to move against hook 98 which is controlled by brush trip cylinder 99.

(4) Relay 307, when actuated, supplies power to accelerating belt solenoid valve 308 which, in turn, supplies air to one side of accelerating belt cylinder 100, thereby lowering constantly moving accelerating belt 71 (FIGURE 1) into contact with the new roll 1d. Since the accelerating belt 71 is driven by the non-slip belt 76 from the main drive shaft 23, which in turn drives the expiring web roll 1c, the periphery of the replacement web roll 1d is driven at the same linear speed as the expiring web roll, now in position 1c.

(5) The actual splicing sequence may be initiated by either one of two methods determined by selector switch 311:

(A) Manual actuation by the press operator's depression of the push button 312.

(B) Automatic actuation by the depression of switch 259 by means of bent arm 254 (FIGURE 5), responding to a pre-selected diameter of expiring roll 1c. If automatic actuation is to be used, relay 307, previously actuated, supplies power to automatic splice solenoid valve 313 which, in turn, supplies air to one side of automatic splice cylinder 257, thereby raising crank arm 252 (carrying bent arm 254) into contact with expiring roll 1c.

Either above method of actuation energizes relay 314, thereby closing the circuit to photoelectric control switch 315. During the subsequent rotation of disk 203, see also FIGURE 2, mirror 202 reflects light into photoelectric cell 204, thereby actuating control switch 315. As a result, power is supplied through relay 317 to actuate relay 316 and subsequently actuate the brush trip solenoid valve 318, which, in turn, actuates brush trip cylinder 99.

(6) Relay 316, when actuated, also supplies power to the paste spray solenoid valve 319 which, in turn, actuates a control valve within paste spray device 320 thereby (FIGURE 6A) creating a combined fluid-air spray which is directed by spray gun 93 at rotating replacement roll 1d.

(7) When photocell control switch 315 is returned to its non-actuated position (by the cessation of the light impulse from rotating mirror 202), it supplies power through relay 316 to actuate relay 317.

(8) When photocell control switch 315 is re-actuated after one revolution of mirror 202, power is supplied through relay 317 to deactivate relay 316 and subsequently activate relay 306.

(9) Deactivation of relay 316 stops the paste spray and returns the brush trip cylinder 99 to its non-actuated position.

(10) The activation of relay 306 simultaneously supplies power to the spindle brake solenoid valve 321, which exhausts one side of the spindle brake cylinder 138, causing a heavy braking force to be applied to expiring roll 1c by means of a brake shoe 135; see also FIGURE 3. This activation of relay 306 also supplies power to actuate knife strip solenoid valve 322 which exhausts one side of the knife trip cylinder 123, thereby triggering knife 105 and severing web W from expiring roll 1c by means of the mechanism previously described. In addition, this activation of relay 306 actuates belt cylinder solenoid valve 333; which subsequently exhausts one side of belt tension cylinders 30, 30a causing drive belt 25 (FIG. 1) to be forced tightly around belt drive pulley 24 on drive shaft 23. This action effectively overcomes any

tendency of drive belt 25, now frictionally sliding over braked roll 1c, to slow down or stop.

In addition, this activation of relay 306 actuates motor control starter 302, and subsequently main spindle motor 67, to rotate main spindle 52 from splicing position to running position. Furthermore, this activation of relay 306 also cuts off power to brush return solenoid valve 305 which subsequently resupplies air pressure to brush return cylinder 94, thereby withdrawing brush 96 to the retracted position shown in FIGURE 1 of the drawings.

(11) Upon the return of photocell control switch 315 to its non-actuated position once again, power is supplied through relays 316 (inactivated) and 317 (activated) to deactivate ("unlatch") both relay 314 and relay 317.

(12) When brush 96 returns to its retracted position, brush return switch 325 is depressed thereby deactivating relay 306 which, in turn, cuts off power to motor control starter 302. This action allows switch 324 to stop motor 67 in a manner to be subsequently described. Brush 96 must reach its retracted position before main spindle 52 reaches correct running location for the system to function properly.

(13) This deactivation of relay 306 also disconnects power from spindle brake solenoid valve 321 which subsequently resupplies air to spindle brake cylinder 138, thereby returning brake shoe 135 to its retracted position. Furthermore, this deactivation of relay 306 also disconnects power from knife trip solenoid valve 322 which then resupplies air to knife trip cylinder 123, thereby restoring the severing knife trip mechanism to its holding position in the manner previously described. In addition, this deactivation of relay 306 also disconnects power from belt cylinder solenoid valve 333, thereby resupplying air to the exhausted sides of belt tension cylinders 30, 30a and restoring the normal moderate belt tension.

(14) When main spindle 52 reaches the running position, abutment 323 on plate 101a depresses switch 324 mounted on side frame member B, thereby stopping main spindle motor 67 at the correct location. This depression of switch 324 also deactivates relay 307 and accelerating belt solenoid valve 308, thereby withdrawing air from the accelerating belt cylinder 100 and raising accelerating belt 71 to its retracted position. In addition, this deactivation of relay 307 also deactivates automatic splice solenoid valve 313 thereby withdrawing air from automatic splice cylinder 257 and subsequently lowering crank arm 252 (FIGURE 5) into its retracted position. This action completes the splicing cycle.

(15) When the red button (or emergency) stop circuit is actuated either by the depression of push button 331 by the press operator or by a web break which actuates the conventional break detector 332 while the press is running, power is supplied to the belt cylinder solenoid valve 333. This valve subsequently exhausts one side of belt tension cylinders 30, 30a, causing drive belt 25 to be forced tightly around pulley 24 on drive shaft 23, and the unwinding roll 1a. This action effectively prevents further movement of belt 25 by slippage caused by the large inertia effect of roll 1a.

(16) If the inertia of this roll is very large, it will continue to rotate after the press has stopped and will carry belt 25 along with it. The resulting rotation of pulley 24 on shaft 23, see FIGURE 1, while shaft 19 (positively connected to the main press drive) has stopped rotating, causes a tightening of V-belt 21 thereby actuating pneumatic control valve 40 in the manner previously described. This valve then supplies air to pneumatic brake 191, thereby applying a sufficiently large braking force to shaft 23 and belt 25 to entirely overcome the inertia effect of unwinding roll 1a. An alternate means for energizing brake 191 is shown in FIGURE 1. If the unwinding supply roll overruns, arm 44 will operate valve 44', supplying air to brake 191.

(17) For ease in loading new rolls, the press operator may depress push button 335, thereby manually actuating

the spindle brake circuit and applying brake shoe 135 to brake drum 136 to prevent undesirable rotation. In addition, this brake is electrically interlocked by the relay circuit previously described so that main spindle 52 cannot be rotated from the loading (running) position to the splicing position without releasing this spindle brake.

(18) Air pressure is directly supplied to the single acting pressure cylinder 45 in the manner shown in FIGURE 6, thereby effectively regulating tension in the web W as previously described.

### Electrical Circuits

In describing the electrical circuits for the control of the apparatus, reference will be made principally to FIGURE 7 of the drawings. All of the necessary connections are shown in this diagram, but will be described only where necessary to an understanding of the novel features of the apparatus. Control of spindle motor 67 is exercised from a conventional pushbutton station 400 including the usual "Forward," "Jog," "Reverse" and "Stop" momentary pushbuttons; the "Forward" button is switch 301 as previously described. A two-position non-momentary switch 335 enables the operator to energize the brake circuit whenever he wishes, and is shown in the brake "off" position. When in the brake on position, contacts 402 apply power direct from line L1 to the spindle brake solenoid valve 321, and contacts 404 open the forward drive coil of motor control 302; simultaneously, a warning light 406 is energized to remind the operator that the brake is in the set position. In the description which follows, this control will be in the brake "off" position as shown in FIGURE 7.

The "Auto-Off" switch 311 is shown in the "Auto" position in which it prepares the circuit to limit switch 304 and also energizes conductor 408 leading to the automatic splice control switch 259 in preparation for the operation of the latter by the expiring roll sensing mechanism of FIGURE 5, so that when switch 259 is operated, relay 314 will also be actuated. When "Auto-Off" switch 311 is in the off or manual position, the automatic feeler mechanism will not contact the expiring roll, and switch 259 will not initiate the splice sequence. In this case, the manual splice initiating pushbutton 312 will be used to actuate relay 314 at the desired time. In either situation, the actual timing of the splice operations, with respect to the position of the leading edge of the new roll, will be performed automatically at the proper times. In the following description, it will be assumed that the operator wishes for the automatic feeler mechanism to determine the precise time when the splice should be initiated, and therefore switch 311 will be closed in the "Auto" position, and the operator needs only to initiate the operation of spindle motor 67 to shift the mechanism from its running position to its splicing position, which he can do at any time after a new roll has been installed in position 1b of the rollstand.

Assuming that the operator is ready for a splice to be initiated at the proper time, he momentarily depresses pushbutton 301, which completes a circuit from L1 over conductor 414 and the normally closed "Stop" contacts of control station 400, switch 301, conductor 416, closed contacts 404 of brake switch 335, and conductor 418 to the "Forward" coil of motor control 302. Spindle motor 67 starts to rotate forward, and immediately moves spindle 52 and arms 101, 101a sufficiently to close the lower contacts of switch 324 as shown. Also, energization of the motor control coil closes the interlock contacts 420 in the motor control.

The momentary operation of switch 301 has thus started the motor rotation and has completed two separate holding circuits for the forward motor control coil. One of these two extends from L1 through the normally closed "Jog" contacts of switch 400, interlock contacts 420, conductor 422 and the normally closed contacts 428 of relay 307, to conductor 416. The other extends from conductor 422 through the lower contacts of switch 304,

conductor 424, the lower contacts of switch 324, and back to conductor 416. These two holding circuits are in parallel, and both are in series with the interlock contacts 420, and will thus be interrupted if the motor stops its forward rotation (as for example if the "Stop" button where to be pressed, or if brake switch 335 should be switched to brake "on" position).

When the spindle 52 reaches "Splice" position, both holding circuits as described above will be opened. One will be opened because the arrival of the motor spindle at "Splice" position operates switch 304, opening one holding circuit at the now-open lower contacts of that switch; the other is opened when the upper contacts of the same switch 304 energize the operate coil of relay 307 from L1, switch 311 and conductor 426, thus opening contacts 428 of the relay. The spindle motor therefore stops in the "Splice" position. However, the closure of contacts 430 of relay 307 has completed a circuit from L1 through these contacts and conductor 432 to the accelerating belt solenoid 308, bringing the accelerating belt into contact with the new full roll to bring it up to proper peripheral speed. The same circuit operates solenoid valve 313 and thus cylinder 257 (of FIGURE 5) to bring the expiring roll diameter sensing mechanism into position. Also, the energization of conductor 432 prepares a circuit to the release coil of relay 307, through the now-open upper contacts of switch 324; this will later be used when the motor spindle has moved the parts from "Splice" position to "Run" position.

Closure of the upper contacts of switch 304 has also completed a circuit through the normally closed contacts 434 of relay 306 to the brush return solenoid valve 305, exhausting one side of cylinder 94 and moving the brush against the hook 98.

The rollstand is now fully prepared to make a splice at the correct time. When the expiring roll becomes sufficiently depleted, switch 259 will be closed automatically by the sensing mechanism, and completes a circuit from line 408, described above, to the operate coil of relay 314. The contacts of relay 314 connect line L1 to the common blade of the contacts 436 of the photocell control device 315, shown in non-operated position. At some position of the rotating replacement roll, mirror 202 will reflect light from source 201 into photocell 204, operating control 315, and the lower contact of switch 436 will extend L1 via the normally-closed contacts of relay 317, and lead 438, to the actuating coil of relay 316.

The first pulse from switch 436 thus operates relay 316. Paste spray control valve 319 and brush trip control valve 318 operate due to the closure of contacts 442, and contacts 444 also close so that when the current pulse stops, switch 436 connects L1 (through the closed contacts of relay 314) to the operating coil of relay 440, which closes its contacts 446. The second pulse from switch 436 therefore passes over contacts 446, and operates relay 317; its normally closed contacts open, so the next and following pulses are not passed from switch 436 to lead 438.

However, since relay 317 operates during the second pulse from 436, the tail of that pulse does pass the now-closed contacts 448 thereof, and operates the release coils of relays 316 and 440. When relay 316 releases, paste spray and brush trip valves are deenergized. Also, closure of contacts 448 puts voltage over lead 450 to operate relay 306. Finally, after the end of the second pulse from 436, with the normally closed contacts of relay 316 again closed, the upper contacts of switch 436 apply voltage through said closed contacts of relay 316 to the now closed contacts 452 of relay 317, to restore both 317 and 314 to non-actuated condition.

Operation of relay 306 supplies power to spindle brake solenoid valve 321, braking the expiring roll. Its contacts 454 also actuate the knife trip solenoid valve 322 to sever the expiring web, and, over lead 456, energize the belt cylinder valve 333, to tighten drive belt 25 as already de-

scribed. Opening of contacts 434 operates valve 305 to restore the brush 95 to its FIGURE 1 position.

When contacts 458 of relay 306 close, voltage from the normally closed "Stop" contacts of station 400 is supplied over lead 460, the contacts 458, and contacts 404 of switch 335, to lead 418 and hence starts the spindle motor 67, which begins to rotate the spindle from "Splice" position forward to the "Run" position.

During the running of motor 67 just described, the full return of brush 95 to its FIGURE 1 position will operate switch 325 to release relay 306, opening its contacts 458. However, the initial movement of the spindle away from "Splice" position has closed the lower contacts of switch 304, completing a holding circuit for the motor, which may be traced from L1 to the normally closed "Stop" and "Jog" contacts of station 400, interlock contacts 420, lead 422, the closed lower contacts of switches 304 and 324, lead 416, contacts 404, and lead 418 to the motor control "Forward" coil. This circuit will be opened at switch 324 only when the spindle reaches "Run" position, and since relay 307 will also then be returned to non-operated condition (by energizing its release coil when upper contacts of switch 324 close), the motor 67 will stop with spindle 52 in "Run" position as shown in chain lines in FIGURE 1.

All of the relays have thus been restored to their released positions for normal operation of the rollstand, and in preparation for the next splicing operation.

What is claimed is:

1. In a continuous web supply machine, the combination comprising means for rotatably supporting an expiring web roll, means for rotatably supporting a new web supply roll, both of said support means being carried by a single pair of pivoted members, a first driving belt normally in contact with the surface of the expiring web roll to drive said expiring roll, a second drive belt movable to and from positions in which it may contact the surface of said new web supply roll for driving said new roll, said second drive belt being normally out of contact with the surface of said new web supply roll, means responsive to the diameter of said expiring web roll for automatically bringing said second drive belt into contact with the surface of said new web supply roll prior to the finish of said expiring web roll, and variable speed drive means for actuating each of said drive belts at the same linear speed, said variable speed drive means being responsive to changes in tension of the expiring web.

2. In a continuous web supply machine for automatically splicing the trailing edge of an expiring web roll to the leading edge of a new web supply roll, the combination comprising means for rotatably supporting an expiring web roll, means for rotatably supporting a new web supply roll, both of said support means being carried by a pair of pivoted members, means for rotating said pivoted members from a normal running position to a splicing position, a first non-slip drive belt normally in contact with the surface of said expiring web roll to drive said expiring roll, a second non-slip drive belt bodily movable for contact with the surface of said new web supply roll, for driving said new roll, said second drive belt being normally out of contact with the surface of said new web supply roll, variable speed drive means for actuating each of said drive belts at the same linear speed, said variable speed drive means being responsive to changes in tension of the expiring web, and control means for initiating the splicing operation by moving said second drive belt into contact with said new web supply roll, said control means including a sensing element contacting the periphery of said expiring web roll, to sense the diameter thereof.

3. In a continuous web supply machine for automatically splicing the trailing edge of an expiring web supply roll to the leading edge of a new web supply roll, the combination comprising means for rotatably supporting an expiring web roll, means for rotatably supporting a new web supply roll, both of said support means being carried

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by a pair of pivoted members, means for moving said pivoted members from a normal running position to a splicing position, a first drive belt normally in contact with the periphery of the expiring web roll to drive said expiring roll, a second drive belt movable into and out of contact with the periphery of said new web supply roll to drive said new roll, said second drive belt being normally out of contact with said new web supply roll, means for moving said second drive belt into contact with said new web supply roll, variable speed drive means for actuating both of said drive belts at the same linear speed, said variable speed drive means being responsive to changes in the tension of the web, and control means responsive to the diameter of the expiring web roll to move the expiring web into splicing contact with the new web roll.

4. In a continuous web supply machine for automatically splicing the trailing edge of an expiring web roll to the leading edge of a new web supply roll, the combination comprising means for rotatably supporting an expiring web roll, means for rotatably supporting a new web supply roll, means for moving both of said rolls simultaneously from a normal running position to a splicing position, a first drive belt normally in contact with the surface of the expiring web roll, to drive said expiring roll, a second drive belt for contact with the surface of said new web supply roll to drive said new roll, said second drive belt being normally out of contact with the surface of said new roll, means for bringing said second drive belt into contact with the surface of said new web roll after the latter reaches splicing position, variable speed drive means for driving both of said belt drive means at the same linear speed, control means responsive to the diameter of said expiring web roll to initiate the web splicing operation, brake means acting upon said expiring web roll, and means for applying said brake means lightly before said splicing operation and heavily after said splicing operation.

5. The apparatus as set forth in claim 4, further characterized by a web severing means for automatically severing the web from the expired roll after the expiring web has been spliced to the leading edge of the new web supply roll.

6. In an automatic rollstand for supplying web material from rolls thereof to a main web-handling apparatus, and of the type including rotatable support means for mounting at least two rolls of such web material for rotation about roll axes both spaced from the rotational axis of said support means, and power means for rotating said support means to bring such rolls sequentially to a splicing position at which the expiring end of a web on one roll passes adjacent the outer periphery of the web on the other roll for the making of a flying splice, the improvement which comprises: individual non-slip peripheral drive belts disposed to engage two such rolls simultaneously and common tension-responsive variable-speed drive means for driving said belts at identical speeds synchronized with the speed of said main web-handling apparatus to maintain constant tension in the web leaving said rollstand before, during and after such splicing operation, power means for controlling the engagement between the said other roll and its drive belt to accelerate said roll up to belt speed in preparation for a splicing operation, a web guide roller carried by said support means for maintaining the expiring web in contact with the respective drive belt regardless of reductions in diameter of the expiring roll, and means for controlling the path of the latter drive belt to thereby vary the force exerted on the expiring web roll.

7. An automatic rollstand in accordance with claim 6, including automatic variable-force braking means for emergency-stop control of the frictional force between each of said belts and its respective roll.

8. An automatic rollstand in accordance with 6, including pressure means for forcing the expiring web into splicing contact with the periphery of the other roll, and

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automatic web severing means energized automatically to sever the expiring web following energization of said pressure means.

9. An automatic rollstand in accordance with claim 8, including means responsive to the degree of depletion of the expiring web roll, for initiating the operation of said rotatable support means, said forcing means, and said severing means, in that sequence.

10. In a continuous web supply machine for automatically splicing the trailing edge of an expiring web supply roll to the leading edge of a new web supply roll, the combination comprising means for rotatably supporting an expiring web roll, means for rotatably supporting a new web supply roll, both of said support means being carried by a pair of pivoted members, means for moving said pivoted members from a normal running position to a splicing position, a first drive belt normally in contact with the periphery of the expiring web roll to drive said expiring roll, a second drive belt movable into and out of contact with the periphery of said new web supply roll to drive said new roll, said second drive belt being normally out of contact with said new web supply roll, means for moving said second drive belt into contact with said new web supply roll, variable speed drive means for actuating both of said drive belts at the same linear speed, said variable speed drive means being responsive to changes in the tension of the web, control means responsive to the diameter of the expiring web roll to move the expiring web into splicing contact with the new web roll, web severing means for severing the expiring web from the expiring web roll after completion of a splice, and brake means acting upon said expiring web roll when said web has been severed.

11. A splicing rollstand for delivering a web continuously under substantial constant tension from one web supply roll after another to a web processing machine that continuously propels the web, comprising

movable support means for carrying each roll stepwise to successive accelerating, running and expiring positions,

a driven belt having an extended flight to engage the periphery of the roll at both the running position and the expiring position,

a separate driven device to drive the periphery of a new roll at the accelerating position at the speed of the running web,

means for splicing the web unwinding from each roll, at the expiring position, to the web of the accelerated new roll,

first pressure applying means to hold said extended belt flight pressed continuously in non-slipping engagement with the periphery of each roll while the roll is at, and while it is carried between, the running position and the expiring position,

said belt being driven from the drive of the web processing machine through a coupling device which transiently varies the speed of said belt in response to, and in instantaneous correction of, variations of the tension of the running web,

said separate driven device comprising a second belt and means connecting the second belt with said coupling device for driving said second belt from said coupling device at a speed the same as and transiently variable with the speed of said first driven belt,

and second pressure applying means for holding a flight of said second belt continuously in non-slipping engagement with the periphery of the new roll during the splicing of the new roll and until the new roll has been carried toward running position into non-slipping peripheral engagement with said extended belt flight.

12. A splicing rollstand according to claim 11, said extended belt flight being trained over pulleys one of which is displaceable, said first pressure applying means

comprising a fluid pressure cylinder constantly biasing said displaceable pulley in a direction to hold the extended belt flight in non-slipping engagement as aforesaid with the roll delivering the web.

13. A splicing rollstand according to claim 12, further comprising means rendered operative when the splicing is effected for moving said support means to carry the new roll toward running position and the expired roll away from expiring position, for severing the web running from the expired roll, for braking abruptly the rotation of the expired roll, and for increasing the pressure applied to said displaceable pulley by said cylinder so as to keep said extended belt flight in non-slipping engagement with its driving pulley notwithstanding any resistance to its movement imposed by the braked roll.

14. A splicing rollstand according to claim 11, said second belt being trained over pulleys one of which is displaceable, said second pressure applying means comprising a fluid pressure cylinder operative to bias the displaceable pulley of said second belt in a direction to hold the second belt flight in non-slipping engagement with the new roll as aforesaid.

15. A splicing rollstand according to claim 14, said cylinder being operable to retract said second belt to an idle position away from the path of movement of a new roll to accelerating position.

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