May 13, 1952 W. C. WIEKING 2,596,189

METHOD FOR REPLACING WEB ROLLS IN PRINTING MACHINES

Filed Aug. 19, 1946 3 Sheets-Sheet 1

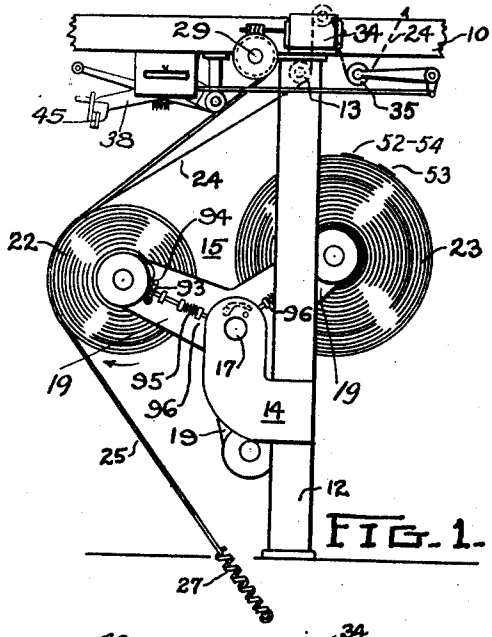


FIG. 1.

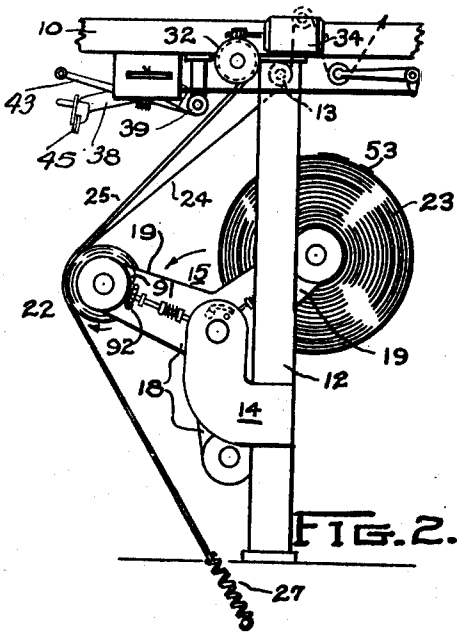


FIG. 2.

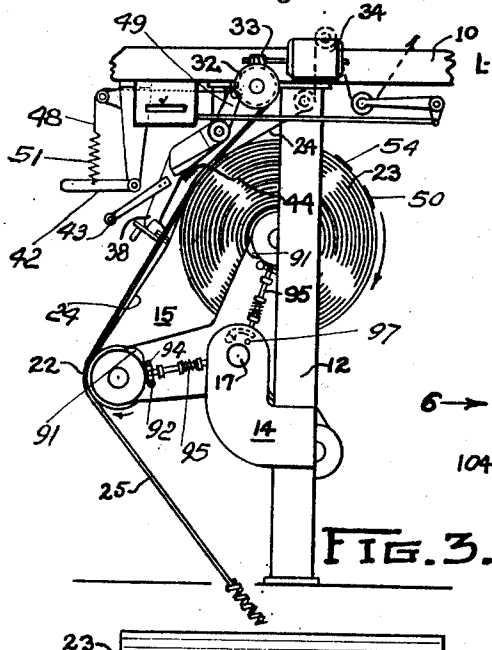


FIG. 3.

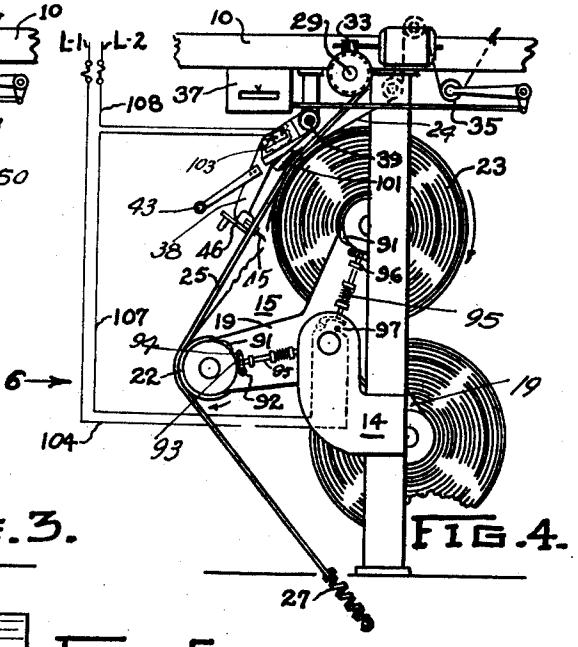


FIG. 4.

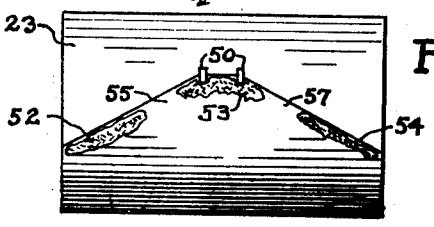


FIG. 5.

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May 13, 1952 W. C. WIEKING 2,596,189

METHOD FOR REPLACING WEB ROLLS IN PRINTING MACHINES

Filed Aug. 19, 1946 3 Sheets-Sheet 2

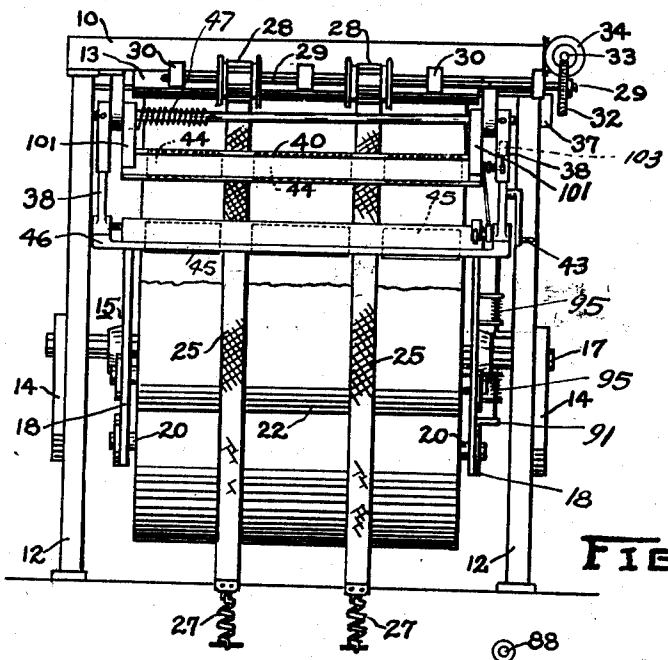


FIG. 6.

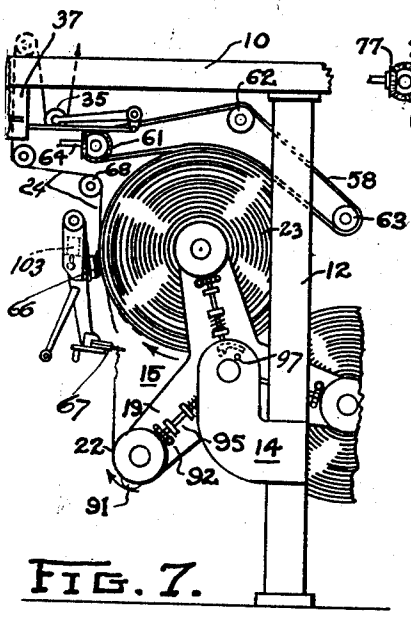


FIG. 7.

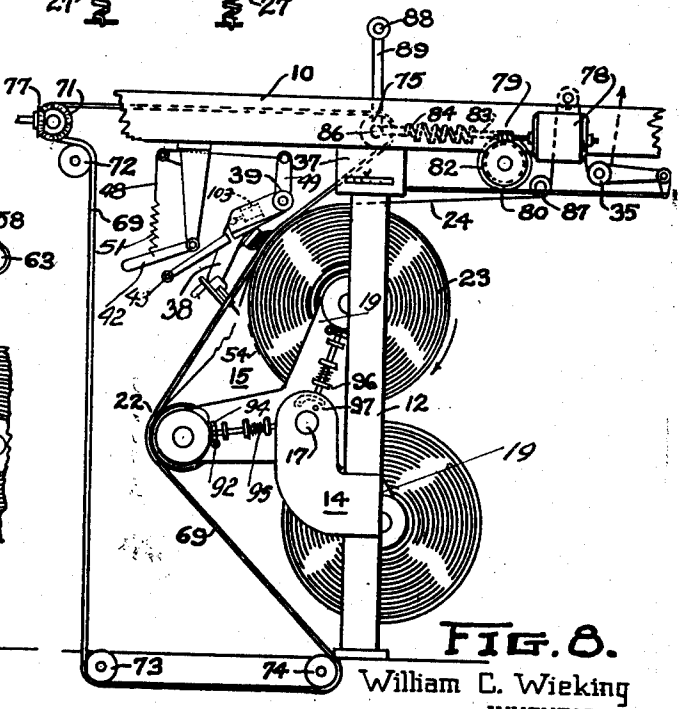


FIG. 8.

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METHOD FOR REPLACING WEB ROLLS IN PRINTING MACHINES

Filed Aug. 19, 1946 3 Sheets-Sheet 3

FIG. 9

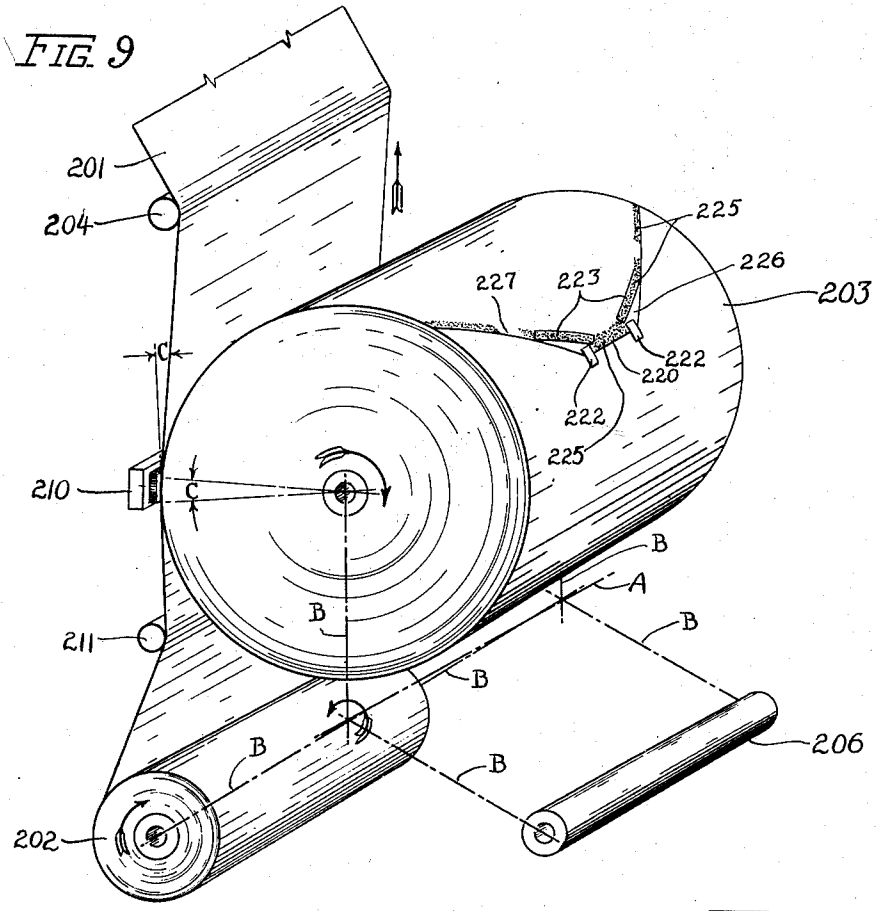


FIG. 10

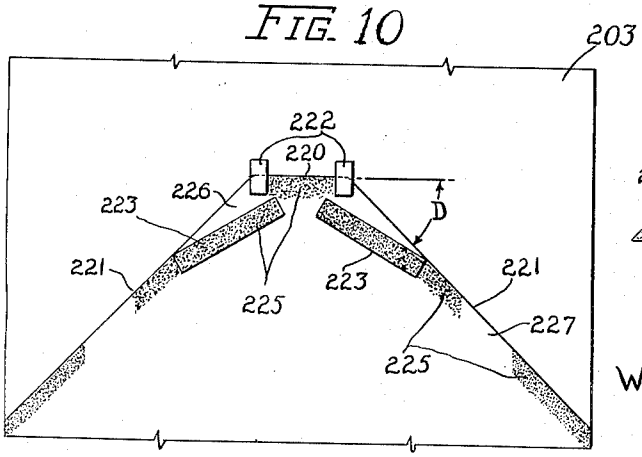
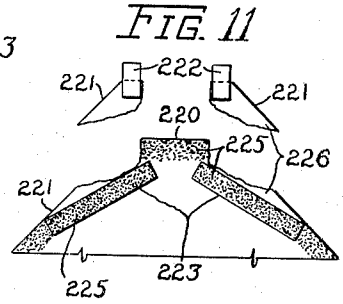


FIG. 11



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METHOD FOR REPLACING WEB ROLLS IN PRINTING MACHINES

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Application August 19, 1946, Serial No. 691,422

12 Claims. (Cl. 242—58)

1

This invention relates to a novel method for supplying paper to a web printing machine or other mechanism operating on a web drawn from a roll. More particularly, the invention relates to an improved method for joining the leading end of a web of a replacement roll to a web running from an expiring roll, the operation being effected without reducing the speed of the machine.

Web feeding devices in common use comprise a rollstand or reel, supporting a pair of spaced spiders each having a plurality of arms which carry chucks for the purpose of supporting rolls of paper. The reel is mounted for rotation and is so arranged that a replacement roll, carried by a pair of the chucks, can be moved to a position where the surface of the replacement roll is in close proximity to the web led from the expiring roll, and means are provided for pasting or splicing the leading end of the web of the replacement roll to the web led from the expiring roll and immediately thereafter severing the web of the latter.

It has been common practice to apply a slow drying adhesive to the leading end of the web of a replacement roll carried on a rotatable support that is turned to move the replacement roll into proximity with the running web, but heretofore care has been taken to avoid actual contact of the web and the replacement roll. The replacement roll was then rotated and accelerated to the speed of the running web by some mechanical device, and, at the proper time, the running web was deflected to and pressed against the replacement roll to engage the adhesive and make the splice.

It has been found that by employing the relatively simple mechanism and the method herein disclosed, rolls from which webs are fed to a high speed printing machine may be replaced while the machine is running at full speed.

An object of the invention is to provide a simplified and noval method for splicing a web end of a replacement roll to the web of an expiring roll from which a web is being fed to a machine running at high speed.

Referring to the accompanying drawings:

Figure 1 is an elevational showing one form of apparatus embodying the invention;

Figures 2, 3 and 4 are views similar to Figure 1, showing progressive steps in feeding a web from a roll and when the roll expires, replacing it with another;

Figure 5 is a face view of a replacement roll illustrating one manner of preparing the roll for splicing;

2

Figure 6 is an elevation of the apparatus shown in Figure 4, as seen in the direction of arrow 6 in Figure 4;

Figure 7 is an end view of a modified form of this apparatus;

Figure 8 is an end view of another modified form of the apparatus;

Figure 9 is a diagrammatic schematic view illustrating certain relationships between the elements utilized in practicing the invention, showing also the preferred form of web preparation;

Figure 10 is a development of the surface of the replacement roll of Figure 9 adjacent the leading edge of the web; and

Figure 11 is a diagrammatic view showing the separation of the leading edge of the web when the splice is effected.

The present invention is a continuation-in-part of my previous application, Serial No. 537,436, filed May 26, 1944 for Method and Means for Replacing Web Rolls in a Printing Machine, now abandoned.

Referring to Figures 1 to 4 and 6 of the drawings, frame members 10 of a printing machine are shown supported by vertical posts 12 which carry a web guide roller 13 and also brackets 14 that support a reel 15 having a rotatable main shaft 17 to which a pair of spaced rotatable spiders 18 having arms 19 are adjustably secured. Each pair of arms 19 carry a pair of chucks 20 for rotatably supporting a web roll. In Figure 1, the roll 22 is in the normal position for feeding its web to the machine and the roll 23 is in readiness to be moved into the feeding position.

In Figure 2, the roll 22 is shown somewhat reduced in diameter. When this roll is about to expire, a motor (not shown) will be operated to rotate the reel 15 in a counterclockwise direction to the position shown in Figure 3. The expiring roll 22 is thus lowered and a web 24 running from the expiring roll lightly engages the surface of the replacement roll 23.

On one of the spiders 18, each chuck 20 rotatably carries a cam member 91 (Figure 4), and each of the arms 19 carries a cam engaging roller 92 attached to one end of a lever 93 which is pivotally supported at 94 (Figure 1) on the arm. Intermediate each support 94 and roller 92, the levers 93 are connected to spring pressed rods 95, supported by brackets 96. When the roll 23 is in the splicing position as shown in Figures 3 and 4, one end of the rod 95, carried by the arm 19 supporting the replacement roll 23, engages a member of a switch 97 supported on the bracket 14 or other non-rotatable member, and each time the replacement roll 23 turns on its

axis, the cam 91 causes the rod 95 to close the switch 97, the function of which will be described hereinafter.

In order to maintain a proper tension on the web running to the machine, tension straps 25 are provided. These are each anchored at one end by springs 27 and at the other end are secured to take-up drums 28, mounted on a cross shaft 29 that is supported in bearings 30 and rotatable through a worm wheel 32 by a worm 33 carried on a shaft of a motor 34. Proper tension may be maintained on the straps by controlling the current supplied to the motor 34 in any suitable manner, as, for example, by means of a floating roller 35 supported in a loop in the web 24 and operating a controller 37.

As herein shown, separate brush and knife supporting arms 101 and 38 are pivotally supported in brackets 39 and are similar to the brush and knife arms shown in Patent 2,182,760. A brush support or beam 40 is secured to the arms 101, and a knife supporting member 46 is secured to the arms 38. Brushes 44 are secured to the beam or support 40, and knife members 45 are attached to the supporting member 46. The brushes and knife members are spaced along the support 40 and the member 46 respectively, so as to avoid the straps 25 when the arms 38 and 101 are lowered to the position shown in Figure 4. The brush arms 101 and the knife arms 38 are normally held in the relation to each other shown in Figure 3 by a spring 47 (Figure 6), and a latch similar to that shown in the patent and operated by a solenoid 103 normally locks the brush structure 101 to the knife structure 38. The brush and knife mechanism may thus be swung together by means of a handle 43 to move them from the position shown in Figure 2 to the position shown in Figure 3. Any suitable means, such as the arrangement shown in the patent mentioned, may be employed to firmly hold the knife structure in the raised position (Figure 2), and alternatively in the lowered position (Figure 3). An operating handle 42 is connected by a cable 48 to a member 49 formed as a part of the brush supporting structure 101, and a spring 51 is interposed between the cable and the handle, the arrangement being similar to that shown in the patent mentioned, and it will be understood that by a downward pull on the handle 42, a force will be exerted to swing the brush supporting structure toward the replacement web roll, but will be ineffective until the latch is released by energizing the solenoid 103. This is effected through a circuit extending from the line L-1, through a conductor 104, switch 97, conductor 107 to the solenoid 103, and thence through conductor 108 to line L-2. Thus the closing of the switch 97 will release the brush supporting structure 101 from the knife arms 38 allowing the parts to assume the position shown in Figure 4 if pressure is applied to the handle 42, but when the handle 42 is released, the spring 47 will swing the brush supporting structure back to the Figure 2 position where it will be locked by the latch.

A suitable method of preparing a replacement web roll for splicing is shown in Figure 5. With the roll supported in the reel 15, the leading end of the web is cut off about diametrically opposite the cam 91, in the form of an inverted V with the point removed, and is held to the body of the web roll by a pair of tabs 50. A coating of an adhesive is applied adjacent the leading edge of the web, as at 52, 53 and 54, but two areas, 55 and 57, are left uncoated, so that the uncoated areas will be

in alignment with the straps 25, and the brushes 44 will be aligned with the adhesive covered areas 52, 53 and 54. A latex base adhesive such as Bostik Cement Number 3602, manufactured by the B. & B. Chemical Company of Cambridge, Massachusetts, when applied to the web end as shown in Figure 5, is well suited to the requirements, and when the running web 24 is pressed lightly against it (as occurs when the relation of the rolls is as shown in Figure 3), the adhesive will not adhere to the running web, although the straps 25 will press the web 24 against the roll 23 with a force sufficient to accelerate it to substantially the speed of the web 24. However, when the brushes 44 press the web 24 against the replacement roll 23, the web end adheres to the running web and is carried into the machine.

Assuming the replacement roll has been prepared as shown in Figure 5, the method of operation of the embodiment of the invention as shown in Figures 1 to 4 and 6 is as follows: When the roll 22 decreases to the diameter shown in Figure 2, the reel 15 is rotated to the position shown in Figure 3. This brings the periphery of the replacement roll 23 into contact with the web 24 running from the expiring roll 22 and due to the pressure of the straps 25, the replacement roll is thereby rotated (and gradually accelerated to the speed of the web 24). The straps 25 do not press the web 24 against the adhesive covered areas of the roll 23, so its web end does not adhere to the web 24.

When nearly all of the web has been run off the expiring roll 22, the arms 38 and 101 are lowered to the position shown in Figure 3, and when it is desired to make the web splice, the handle 42 is pulled down and a force is exerted tending to swing the arms 101 downward. When the rotating of the roll 23 causes the cam 91 to close the switch 97, the solenoid 103 is energized and releases the brush arm 101 in the manner shown in Patent No. 2,182,760, and the brushes 44 then forcibly press the running web 24 against the replacement roll 23. The adhesive coated areas 52, 53 and 54 of the roll 23 and the running web are thus firmly pressed together and the adhesive becomes effective to hold them.

The leading end of the web of the replacement roll 23 is meanwhile broken away from the tabs 50 and carried by the web 24 into the printing machine. As soon as the splice is made, the knife blades 45 sever the web of the expired roll 22 from its core in a manner similar to that described in Patent No. 2,182,760. As the roll 23 continues feeding the web to the printing machine, the reel 15 is rotated counter-clockwise until the roll 23 reaches the position of the roll 22 in Figure 1.

The modified embodiment of the invention shown in Figure 7 is similar to that shown in Figures 1 to 4 and 6, except that driven endless belts 58, positioned above the replacement roll 23, are used to accelerate the roll to substantially the speed of the running web 24. These belts are supported on sheaves 61, 62 and 63 and are driven at a speed slightly below that of the running web by means of a shaft 64, connected to the machine in a manner well known in the art.

The pressure of the belts against the roll is controlled by the floating roller 35 acting through the controller 37 and a motor (not shown), and governs the tension of the web being fed to the printing machine in the manner shown in Patent 2,155,430. While this method of tension control is preferred, it is not essential to the invention

in its broader aspects and any suitable alternative method of tension control may be utilized where preferred.

It is also possible to bring the replacement roll up to a desired fraction of the speed of the running web and thereafter accelerate the roll by means of the running web, as in Figures 1 to 4 and 6.

In view of the fact that tension straps are not employed in the embodiment shown in Figure 7, a brush **66** and a knife **67** may be provided, that are continuous from one end of the web roll to the other. It will be noted that a roller **68**, shown in Figure 7, is positioned in such a manner that the running web **24** in passing from the expiring roll **22** to the roller **68** will contact the replacement roll **23**.

The operation of the embodiment shown in Figure 7 is generally similar to that previously described. As the expiring roll **22** nears exhaustion, the reel **15** is rotated counter-clockwise, and the belts **58** accelerate the replacement roll **23** to substantially the speed of the running web **24**, the rotation of the reel **15** being continued until the replacement roll **23** reaches the web splicing position, as shown. When the roll **22** is about to expire, the brush and knife supporting arms **101** and **38** are lowered to the postiion shown in Figure 7, thereby deflecting the running web against the roll **23**, and when a handle (not shown in Figure 7, but similar to the handle **42**) is operated, the running web **24** is firmly pressed against the periphery of the replacement roll. This causes the leading end of the replacement roll **23** to adhere to the web **24** and be led to the printing machine, and the old web is severed, all as hereinbefore described.

The modified embodiment of the invention shown in Figure 8 is similar to that shown in Figures 1 to 4 and 6, except that driven endless belts **69**, positioned at one side of the mechanism, are used to press the running web **24** against the replacement roll **23** and thereby accelerate it, and also to control the tension of the web. These belts pass over fixed pulleys **71**, **72**, **73** and **74** and also over a moveable pulley **75** and engage web roll **22**. The fixed pulley **71** is driven by a pair of cooperating bevel gears **77** so as to drive the belts at a speed slightly below that of the running web. A motor **78**, which may be under the control of any suitable mechanism, as, for example, the floating roll **35** and the controller **37**, acts through a worm **79** and a worm gear **80** to control the rotation of a drum **82** around which straps **83** are wound. A spring **84** is attached to the free end of each of these straps and the springs are connected to a shaft **86** on which the roller **75** is rotatably mounted. The shaft **86** is supported on swinging arms **89**, pivotally supported at **88**, and it will be understood that the springs **84** hold the belts **69** against the web rolls with a pressure that is regulated by the motor **78** under control of the floating roller **35**. It will be noted that the web **24** in passing from the expiring roll **22** to a roller **87** contacts the periphery of the replacement roll **23**.

The operation of the embodiment shown in Figure 8 is similar to that described in connection with Figures 1 to 6. As the expiring roll **22** becomes exhausted, the replacement roll **23** is rotated until it lightly engages the running web **24**, which is pressed against the replacement roll by the running belts **69**, and the replacement roll **23** is thus rotated and accelerated to the speed of the web. The brush and knife arms

101 and **38** are then lowered to the position shown in Figure 8, and when the handle **42** is operated, the running web **24** is firmly pressed against the adhesive covered portions **52**, **53**, **54** of the replacement roll **23**. The leading end of the replacement roll **23** is thus caused to adhere to the running web and be fed to the printing machine, and the old web is severed.

It will be noted that in the several embodiments of the invention herein shown, the web is not deflected when the brushes **44** and **66** are brought into engagement with it, because the web **24** is already in contact with the peripheral surface of the roll **23** and hence there is less possibility of breaking the web when making a splice, than when using equipment and methods heretofore employed in splicing webs running at high speed.

It has hitherto been thought that the replacement roll, when once it has been prepared with adhesive, must be kept out of contact with the running web until the precise moment of splicing, since, otherwise, the adhesive might be removed or a faulty or partial splice might be made. Accordingly, provision has been made for bringing the replacement roll close to, but not in contact with, the running web prior to the application of splicing pressure. The adhesive has also been protected by moveable or breakable shields. It has also been proposed to spray the adhesive upon the roll after bringing it up to speed or to activate a dry adhesive, as by spraying it with water or other solvent. I have discovered, however, that the adhesive prepared replacement roll may be brought into actual contact with the running web without removing the adhesive or making a splice or partial splice, and that by thereafter increasing the pressure, the splice may be made, with obvious advantages in simplicity and reliability of operation.

Adhesives which form a dry surface film or skin, while the body of the adhesive remains tacky, may be utilized. In such case, cohesion of the adhesive is high while its tendency to adhere to anything in contact with its surface will be low. Adhesives which remain tacky and do not form a dry surface film may also be used provided that their cohesion is high in relation to their speed of adhesion under light pressure.

As will be apparent, the method of the invention depends for its success upon the fact that the replacement roll and running web can be brought together without causing adhesion, and that adhesion may thereafter be caused by increasing pressure between these elements. The largest margin of safety will, accordingly, be produced if the initial pressure between the elements to be joined is as light as possible in relation to the splicing pressure.

In the embodiment of Figure 7, where the roll is brought up to speed prior to its coming into contact with the running web, less pressure between the replacement roll and the running web, before the splice is to be effected, will be necessary. In the embodiment of Figure 1, on the other hand, a greater pressure will ordinarily be necessary in order that the roll may be brought up to speed by the frictional contact of the running web therewith. The adhesives which may be employed will, therefore, depend, to some extent, upon which of the forms of the invention is practiced.

It will also be apparent to those skilled in the art that when the method of the invention is practiced, the tendency toward premature par-

tial or complete lifting of the leading edge of the web is increased. In conventional methods of splicing, there is a tendency, due to windage, for the leading edge of the web on the replacement roll to lift up prior to the time when the splicing pressure is applied. When the method of the invention is practiced, any tendency toward adhesion prior to the application of the splicing pressure will create an added tendency for the leading edge of the web to lift. In Figures 9, 10 and 11, there is shown schematically an improved method of web preparation which reduces the tendency for premature separation to a minimum and, at the same time, interferes as little as possible with the making of the splice, when the proper time comes. Figure 9 also illustrates certain quantitative relationships which have been found desirable for the best results.

In Figure 9, the machine elements discussed in connection with the previous figures have been omitted. The line A indicates the rotatable reel axis having spider arms extending as indicated by the lines B and adapted to carry three rolls or part rolls. The running web **201** is shown as being fed from an expiring roll **202** and the replacement roll **203** is in position for making a splice. The path of the running web **201** is determined by guide roller **204**, over which it passes on its way to the printing press and by other parts later referred to. The guide roller **204** will be positioned in a definite and predetermined location with relation to the reel. As will be understood, the replacement roll will have been loaded on to the reel in approximately the position occupied by the web roll core **206**, the running roll **202** occupying, at this time, approximately the position occupied by the replacement roll **203** in the figure, and the preparation of the leading edge of the web of the replacement roll and the application of adhesive thereto will take place with the reel in about this position, the reel being later rotated to bring the rolls into the position of Figure 9.

Prior to this rotating the reel, the roll **203** may be brought up to speed by means of belts such as shown in the Horton Patent No. 2,182,760, or in any other convenient way, so as to bring its periphery up to approximately the speed of the running web. This may be done, either in the position of the figure, or in any other convenient position of the reel. The reel rotation is stopped when the replacement roll has been rotated to a predetermined position where its periphery is opposite the brush **210**, as determined in any convenient manner or by any convenient mechanism. The specific mechanism for stopping the roll with the periphery in its desired position forms no part of the present invention and, accordingly, is not illustrated herein.

After the replacement roll has been brought to the desired position, with its edge properly positioned with respect to the frame of the press and the fixed guide roll **204**, the joining and cutting mechanism is brought into position with respect thereto. This mechanism is not shown in entirety, since it may be any of the usual types employed in presses of this character. However, it embodies in its structure a brush member **210** and a guide roll or other deflector member **211**. Deflector member **211** may be a knife sheath, if desired. The brush member, when the joining and cutting structure is properly positioned, is close to the surface of the running web and the periphery of the replacement roll, but preferably does not touch the same and, in any event, should not exert undue pressure thereon. The guide roll or deflector member **211** contacts the running web, and deflects the same against the replacement roll. With the mechanism so positioned, the machine is ready for the paste or splice to be made. The web is wrapped about the periphery of the rotating replacement roll through a small arc, indicated by angle C, which will normally extend about four or five inches around the roll periphery. In the preferred method, all sudden deflection of the runing web may be avoided, the reel being rotated slowly and the knife sheath or other deflector, if employed, being brought down slowly so as to produce the desired wrap of the running web on the replacement roll.

Selection of the respective positions of the periphery of the replacement roll **203**, guide roll **204** and deflector member **211** determines the wrap of the running web on the replacement roll **203**, allowing a running contact between the surface of the roll and the running web without sufficient pressure to cause the end of the replacement roll to adhere to the running web. The precise amount of wrap which is desirable varies according to specific conditions. Sufficient contact should be provided to prevent sudden deflection and strain on the running web when the brush **210** is operated and also to prevent the fluttering of the web which occurs over a reach or path of travel of such length as exists between the expiring roll **202** and guide roll **204**. However, an excessive angle of wrap will result in longitudinal wrinkling of the web and a tendency to premature separation of the web end from the replacement roll, and should also be avoided.

By thus providing for a predetermined degree of wrap and resulting control of the pressure between the runnnig web and the surface of the replacement roll, the use of belts or other mechanism for rotating the replacement roll may be dispensed with, if desired, there being sufficient friction between the two surfaces for the purpose. The amount of pressure of the running web upon the surface of the replacement roll is only a fraction of that which may conveniently be exerted by the brush to cause the adhesive portions of the replacement web to adhere to the running web. Under typical conditions, the pressure due to the web wrap may be of the order of one-tenth of that exerted by the brush, allowing considerable latitude in adjustment of the pressure between the running web and replacement roll surface, and in the choice of adhesives.

As mentioned above, when it is desired to make the web join or splice, the pressman operates the joining or cutting mechanism, causing the brush **210** to bear against the running web **201** and press it against the surface of the rotating replacement roll **203**. Such increased pressure causes the adhesive coated area of the end of the roll to adhere to the web and be drawn into the press. Immediately thereafter, a cutting knife or other means (not shown) is operated, severing the old running web from the expiring roll **202**. The joining and cutting mechanism, including the brush **210** and deflecting member **211**, are then withdrawn from the position illustrated.

The preparation of the replacement roll is illustrated in Figure 9 and more clearly in Figure 10 of the drawing. The end of the web is cut or torn to a truncated V-shape, the longitudinal or axially extending leading edge **220** being quite short with respect to the length of the roll **203**. The angular edges **221** are so cut or torn as to

form an angle, D, of approximately 45 degrees with the leading edge **220**.

Tabs **222**, having a gummed or adhesive lower surface, are placed over the edge **220** adjacent its corners or junctions with the angular edges **221**, adhering to the end of the web and to the body of the roll to hold the web end securely against the roll. By thus forming the web end, with the angular edges **221** receding from the points of attachment to the next lower course of the roll, possibility of the web end being lifted from the roll body by windage during rotation of the roll is minimized. Further, the short leading edge, attached at its two ends, is securely held against the body of the roll so that air will not catch under it and lift it during the rapid rotation of the roll.

Attached to the surface of the web end and positioned at an angle to the edge **220**, with their inner ends situated inwardly and below the ends of the tabs **222**, are reinforcing or tear directing strips **223**, which may be formed of gummed paper tape or other suitable material. The outer ends of these strips **223** extend backwardly to the diagonal edges **221**, leaving exposed roughly triangular areas **226** of the surface of the web end.

The adhesive coating **225** is applied to the surface of the leading end of the web between the tabs **222** and also to the surface of the reinforcing strips **223**, leaving the triangular areas **226**, extending from below the tabs **222** and between the strips **223** and diagonal edges **221**, free of such coating. The adhesive coating **225** may be extended along the diagonal edges **221** to the ends of the roll, but if a belt speed up mechanism is employed for rotating the roll, or tension straps are used, uncoated areas **227** are provided for contact of such belts with the roll surface, or to prevent the pressure of tension straps from causing the web of the running roll to adhere to the web end of the replacement roll prematurely.

When the splice is made, as previously described, the brush **210** is moved against the running web at its point of contact with the replacement roll **203**. The increased pressure created thereby causes the areas of the web end that are coated with the adhesive **225** to adhere firmly to the running web. These areas are thus lifted away from the next lower course of the roll **203** to which the web end is attached by the tabs **222**, causing a longitudinal rupture of the web end along the inner sides of the tabs **222**. The reinforcing strips **223** divert these ruptures toward the diagonal edges **221**, through the triangular areas **226**. The tabs **222** and severed portions of the web end adhere to the lower course of the roll **203** (see Figure 11) while the main body of the web end is drawn into the press along with the old running web **201**, which is immediately severed from the expiring roll **202**.

As before stated, a latex base adhesive, such as Bostik cement No. 3602, is preferred for the preparation of the replacement roll. A number of other adhesives may be utilized, however. For example, a permanently tacky adhesive such as utilized on "Scotch tape" or "Permacel" may be used. A certain length of time should be allowed after applying the adhesive before the splice is to be made. This time is not critical and coincides with the time normally elapsing between replacement roll preparation and the making of a splice. Where a surface drying adhesive is utilized, this permits the formation of a surface film thereon. With other types of adhesive containing a certain amount of excess solvent or volatile vehicle, the lapse of a short interval of time allows the adhesive to build up the required tackiness for effecting the splice. The desirable condition is that known in the trade as "finger tackiness," which will be produced in a few minutes and will last for hours. Tendency toward premature adhesion will be eliminated where the adhesive surface dries to form a non-adhesive surface film of sufficient strength not to break down under the initial pressure between the running web and replacement roll but which will break down upon the application of an increased pressure to effect the splice. With such an adhesive, the adhesiveness of the surface under light pressures will either be absent or will be small with relation to the cohesiveness of the adhesive mass itself. Adhesives which do not form a dry surface film may also be utilized. However, the cohesion of the adhesive with relation to its speed of adhesion, under light pressure, should be high. In such case, there may be some tendency for the running web to pick up the adhesive under the light pressure, but the slight relative and rapid movement of the surfaces allows insufficient time for the cohesion of the adhesive to be overcome.

Under a typical operating condition, with a running web tension of one pound per transverse lineal inch of web, and the running web wrapped for four or five inches around the replacement roll to produce an angle of wrap and web deflection of about seven and one-half degrees, a pressure of about .067 lbs. per square inch will be created between the running web and the replacement roll. It is, of course, necessary that adhesion should not occur under this deflection pressure, but should occur under the pressure of the brush which is used to effect the splice. Since this latter pressure may readily be .75 lbs. per square inch or even higher, it is apparent that a large margin of safety can be provided. Normal web operating tensions may vary somewhat, between usual limits of about one-half pound per transverse lineal inch to about one and one-half pounds, with corresponding deflection pressures of about .033 lbs. per square inch to .1 lbs. per square inch. Adhesives can readily be selected which will not adhere under such deflection pressures.

When the running web is utilized to bring the replacement roll up to speed, an angle of wrap will normally be selected so as to permit a certain amount of drag or slip, so that at the time when the splice is effected, the running web is moving at a slightly greater speed than the replacement roll. This slip further reduces the time during which any point of the adhesive coated area is in contact with any point of the web and thus reduces the tendency toward premature adhesion. Where the replacement roll is brought up to speed prior to bringing it into contact with the running web, it is preferred to bring it up to a speed slightly less than that of the running web, so that again a condition of slip between the surfaces is created and any tendency toward premature adhesion is reduced. While the embodiments described in connection with the drawing all have the common characteristic that the roll is brought up to speed by driving its periphery, either through belts or through the running web itself, it will be apparent that the roll may be brought up to speed in any other way desired and, in particular, may be brought up to a speed less than that at which it is desired to effect the splice, its acceleration being thereafter completed by its contact with the running web.

Where the peripheral speed of the replacement roll is considerably less than that of the running web, when the two are brought together, the drag of the roll aganst the web may increase the deflection pressure. However, as pointed out above, the margin of safety is large enough, so that premature adhesion may still be prevented. Moreover, under such conditions, the slip velocity is also a maximum, which compensates for the higher deflection pressure. Under difficult conditions, the adhesive may be modified slightly in the customary way by adding a small amount of solids, having the effect of reducing the tack to a safe value.

It is to be understood that the invention may be embodied and practiced in other specific forms without departing from the spirit or essential attributes thereof, and it is, therefore, desired that the described embodiments and methods be considered in all respects as illustrative and not restrictive, reference being had to the claims rather than to the description to indicate the scope of the invention.

What is claimed is:

1. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes applying to the leading end of the web of the replacement roll an adhesive which will not adhere to the paper of the running web when brought into contact therewith under deflection pressure but will adhere thereto under a higher pressure, bringing the periphery of the replacement roll and the adhesive thereon into engagement with the web running from the expiring roll under deflection pressure to rotate the replacement roll at substantially the speed of the running web, and then applying a higher pressure on the running web and against the replacement roll to produce adhesion and effect the splice.

2. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring roll into a printing machine, which includes coating an area of the leading end of the web of the replacement roll with an adhesive which will not adhere to the paper of the running web when brought into contact therewith under deflection pressure but will adhere thereto under a higher pressure, leaving another area of the leading end uncoated with the adhesive, bringing the periphery of the replacement roll and the adhesive thereon into engagement with the web running from the expiring roll, pressing the web of the expiring roll against the uncoated area on the replacement roll and rotating it at substantially the speed of the running web which meanwhile contacts the adhesive, and then pressing the running web against the adhesive coated area to produce adhesion and effect the splice.

3. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes coating an area on the leading end of the web of the replacement roll with an adhesive which will not adhere to the paper of the running web when brought into contact therewith under deflection pressure but will adhere under a higher pressure, leaving another such area uncoated, bringing the periphery of the replacement roll and the adhesive thereon into engagement with the web running from the expiring roll, pressing the web of the expiring roll against the uncoated area on the replacement roll to accelerate it to substantially the speed of the running web which meanwhile contacts the adhesive, and then increasing the pressure of the running web against the adhesive coated area to produce adhesion and effect the splice.

4. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes applying an adhesive that forms a dry film on its surface to the leading end of the web of the replacement roll, bringing the periphery of the replacement roll into engagement with the web running from the expiring roll and lightly pressing it thereagainst with the web running in contact with the adhesive, the adhesive being in condition to adhere to the paper of the running web under pressure and then applying additional pressure on the running web against the replacement roll, to activate the adhesive and effect the splice.

5. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes applying an adhesive that quickly forms a dry film on its surface to the leading end of the web of the replacement roll, bringing the periphery of the replacement roll into engagement with the web running from the expiring roll and lightly pressing it thereagainst to rotate the replacement roll at substantially the speed of the running web, and then applying additional pressure on the running web and against the replacement roll to break down the dry film on the adhesive and effect the splice.

6. A method of splicing a leading end of a web of a replacement web roll to a web carrying no adhesive and running from an expiring web roll into a printing machine, which includes applying an adhesive to the leading end of the web of the replacement roll and rotating it at substantially the speed of the running web, the said adhesive forming a surface sufficiently dry to prevent adhesion, bringing the periphery of the replacement roll into engagement with the running web from the expiring roll and rotating it therewith with the web running in contact with the adhesive, the adhesive being in condition to adhere to the paper of the running web under pressure until a web splice is to be made, and then forcibly pressing the running web against the replacement roll, to actuate the adhesive and effect the splice.

7. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring roll into a printing machine, which includes coating an area of the leading end of the web of the replacement roll with an adhesive that forms a dry film on its surface while another such area is left uncoated, bringing the periphery of the replacement roll into engagement with the web running from the expiring roll, pressing the web of the expiring roll against the uncoated area on the replacement roll and rotating it at substantially the speed of the running web which meanwhile contacts the adhesive, and then pressing the running web against the adhesive coated area to break down the film and effect the splice.

8. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes coating an area on the leading end of the web of the replacement roll with an adhesive that forms a dry film on its surface

while another such area is left uncoated, bringing the periphery of the replacement roll into engagement with the web running from the expiring roll, pressing the web of the expiring roll against the uncoated area on the replacement roll to accelerate it to substantially the speed of the running web which meanwhile contacts the adhesive, and then pressing the running web against the adhesive coated area to break down the film and effect the splice.

9. A method of splicing a leading end of a web of a replacement web roll to a web running from the expiring web roll into a printing machine, which includes coating an area on the leading end of the web of the replacement roll with an adhesive that forms a dry film on its surface while another such area is left uncoated, forming a film from the adhesive material on the exposed surface of the adhesive rotating the replacement roll at substantially the speed of the running web, bringing the periphery of the replacement roll and the adhesive thereon into engagement with the web running from the expiring roll, the adhesive being in condition to adhere to the paper of the running web under pressure and then pressing the running web against the adhesive coated area to effect the splice.

10. A method of splicing a leading end of a web of a replacement web roll to a web running from an expiring web roll into a printing machine, which includes applying adhesive to the leading end of the web of the replacement roll, forming a relatively non-adhesive surface from the adhesive to render the adhesive inactive under light pressure but active under a heavier pressure, bringing the periphery of the replacement roll into engagement with the web running from the expiring roll and lightly pressing it thereagainst, the adhesive being in condition to adhere to the paper of the running web under pressure, and then applying additional pressure on the running web and against the replacement roll, to activate the adhesive and effect the splice.

11. A method of splicing the web of a replacement roll to a web running from an expiring web roll, which includes providing the replacement roll with pressure activated adhesive on its outer web end, moving the replacement roll to bring it into contact with a web running from the expiring roll under pressure sufficient to rotate the replacement roll, the adhesive thereon meanwhile running in contact with the running web and the pressure being insufficient to activate the adhesive to secure the web of the replacement roll to the running web, the said adhesive being such as to secure the web of the replacement roll to the paper of the running web on additional pressure, and then applying the additional pressure required to activate the adhesive and secure the webs together for substituting the replacement roll for the expiring roll.

12. A method of splicing the web of a replacement roll to a web running from an expiring web roll, which includes providing the replacement roll with pressure activated adhesive on its outer web end, moving the replacement roll to bring it into contact with a web running from the expiring roll under pressure sufficient to rotate the replacement roll, the adhesive thereon meanwhile running in contact with the running web, and being of such nature that it will not secure the web of the replacement roll to the paper of the running web under such pressure, but on additional pressure, and bringing a pressing member against the running web to apply the additional pressure required to activate the adhesive, and secure the webs together, for substituting the replacement roll for the expiring roll.

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