June 1, 1943. O. C. ROESEN 2,320,657

WEB ROLL SPLICING METHOD AND APPARATUS

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Fig. 1,

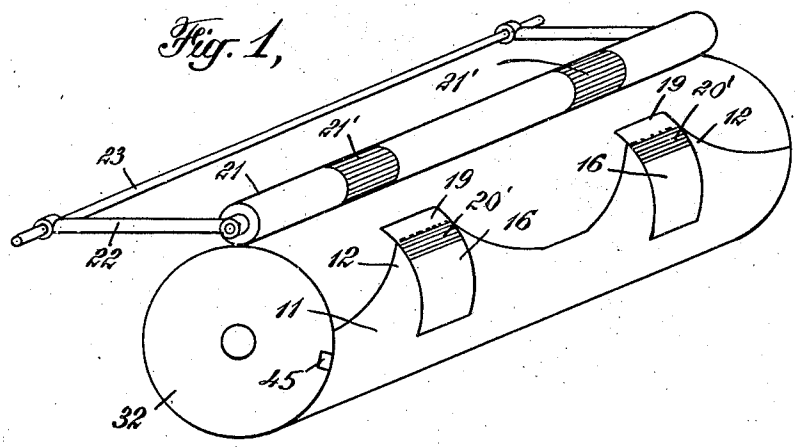


Fig. 2,

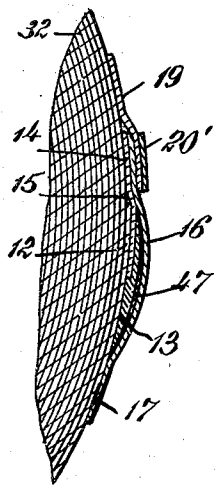


Fig. 3,

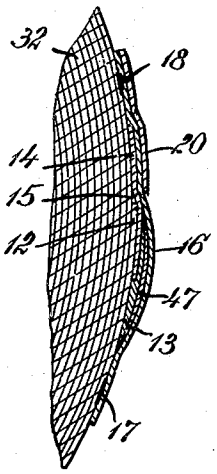


Fig. 4,

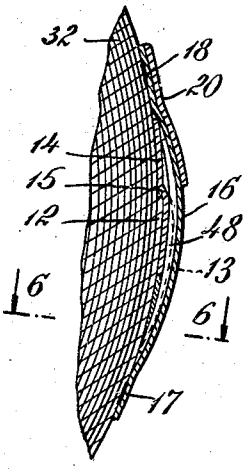


Fig. 5,

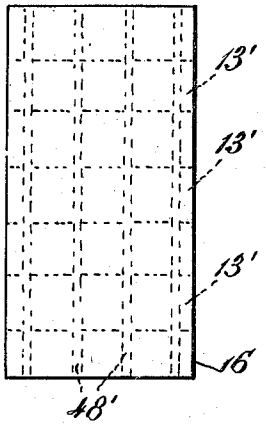


Fig. 9,

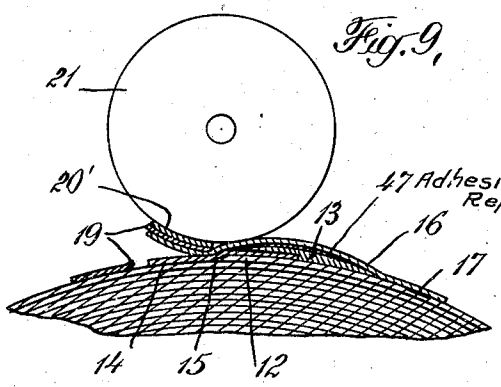
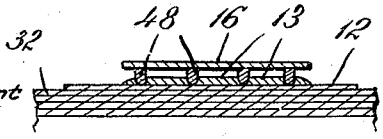


Fig. 6,



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Fig. 7,

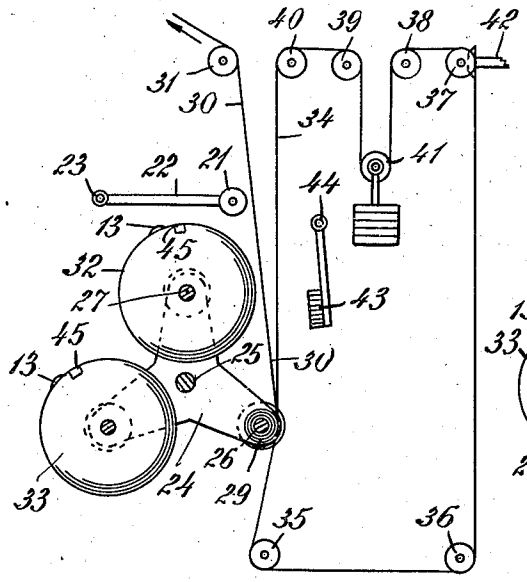


Fig. 8,

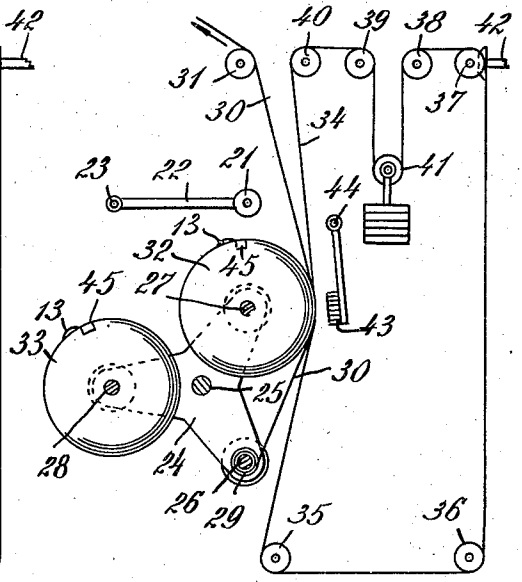


Fig. 10,

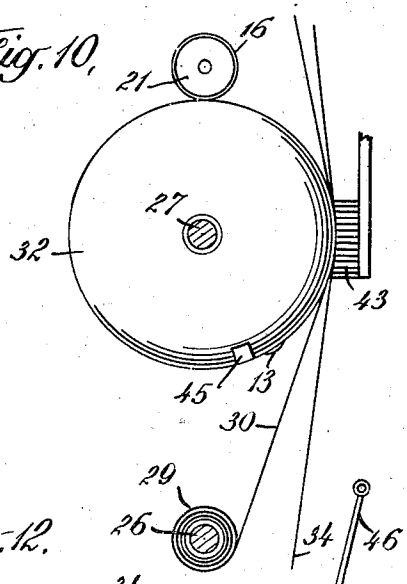


Fig. 11,

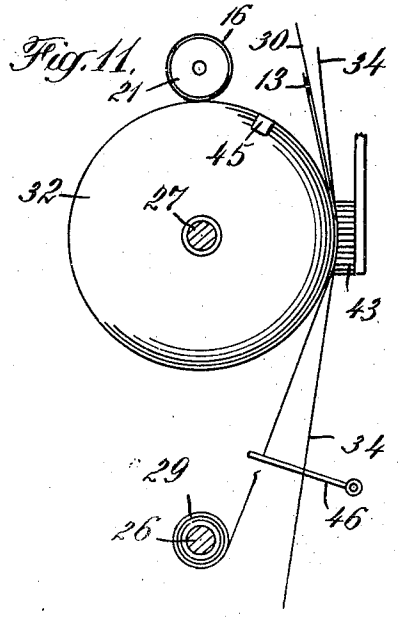
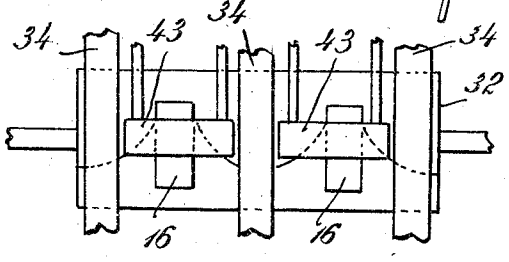


Fig. 12.



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UNITED STATES PATENT OFFICE

2,320,657

WEB ROLL SPLICING METHOD AND APPARATUS

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Application August 6, 1941, Serial No. 405,630

14 Claims. (Cl. 242—58)

This invention relates to the replacement of webs fed to printing presses and other web-consuming apparatus. It particularly concerns the operation of splicing the leading end of the web on a new or replacement roll to the web running to a press or other apparatus from a roll that is nearly depleted.

The paper web fed to a printing press is supplied in large rolls which must be replaced during the press operation and without stopping the press or reducing its speed. Since the running web travels at a very high speed, it is essential that prior to splicing the new roll be accelerated until its cylindrical surface attains or approximates the velocity of the running web to which it is spliced. Because of the high web speed and the inherent weakness of the web, the splicing operation is quite critical and has in the past been a source of frequent breakage of the web with consequent reduction in the output of the press.

This application is a continuation in part of my copending application Serial No. 403,514, filed July 22, 1941, now abandoned.

The present invention contemplates an improved method of and apparatus for splicing a web from a new roll to a rapidly moving web from an expiring roll. More particularly the improved method involves accelerating the new roll by direct contact between its surface and the running web while preventing contact between the running web and the tacky adhesive at the leading end of the new web by means of protective shields carried on the new roll, and thereafter removing the shields to permit the splicing contact when the new roll has been accelerated to the desired speed.

The invention will be described in detail in connection with an embodiment thereof involving the replacement of rolls of paper web fed to a printing press, but it should be understood that the invention is not limited to such application but is useful in any operation involving replacement of the roll from which a running web is continuously fed to any apparatus.

In describing the invention in detail, reference will be made to the accompanying drawings, in which;

Fig. 1 is a perspective view of a new web roll prepared for web replacement according to the invention, together with a shield removal roller;

Fig. 2 is a diagrammatic sectional view of the web roll, showing one arrangement of parts for both shielding the leading web end adhesive and securing the leading end to the roll surface;

Fig. 3 is a sectional view similar to Fig. 2 showing a modified arrangement of the leading web end adhesive shield;

Fig. 4 is a sectional view similar to Fig. 2 showing modified means for decreasing adhesion between the web end and the shield;

Fig. 5 is a plan view of a ribbed shield as shown in Fig. 4 with the adhesive-bearing area of the web point indicated;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 4 and viewed in the direction of the arrows;

Fig. 7 is a diagrammatic side elevation of a web roll reel and tension belts for use in practicing the invention, the parts being in the position in which the web is running from one roll before replacement thereof is required;

Fig. 8 is an elevation similar to Fig. 6 showing the reel in the position it occupies while the new roll is being accelerated to running web speed;

Fig. 9 is an enlarged sectional view of the web roll surface and the shield removal roller with the shield partly removed;

Figs. 10 and 11 are respectively similar elevations showing the new or replacement roll and the running web just before and just after the splice is made;

Fig. 12 is a front view of the new roll with the running web omitted to show the tension belts and brushes in relation to the new roll.

In accordance with the invention, the leading or outer end 11 of the new roll 32 is provided with one or more areas carrying a tacky paste or adhesive such as the rosin glue known in this art, and this glue is covered by one or more removable shields. Referring particularly to Figs. 1 to 4, the leading end 11 of the web is shown cut or torn to present a plurality of points 12 as is customary, and the outer surface of the web end at each point is coated with a layer of tacky adhesive 13 which may comprise rosin glue or an equivalent tacky and strong adhesive. These adhesive-bearing point areas are best shown in Figs. 2 to 4.

The leading end of the web is removably secured to the roll surface by any suitable known means. In the disclosed embodiment, frangible gummed tabs 14 are used for this purpose, but a weak adhesive or grease, sticking the leading ends of the points 12 to the surface of the next course of the web on the roll, may be substituted in accordance with known practice. The opposite end of the tabs 14 illustrated are respectively stuck to the outer surfaces of the leading ends of the points 12 and to the surface

of the next course of web on the roll, and a weakened portion such as a line of perforations 15 separates the tab ends so that they tear along this line and release the points and the leading end of the web when it is spliced to a running web and pulled away from the roll. Frangible tabs of this type are described in detail in Wood Patent No. 1,996,497.

A removable adhesive shield 16 is secured to the roll surface over each layer of tacky adhesive 13. These shields may be formed of ordinary paper or of moisture-resistance paper, cloth or other material that will resist penetration by the tacky adhesive 13 and thus present a non-tacky outer surface. The rearward end of each shield 16 is removably secured to the leading end 11 of the web rearwardly of the adhesive 13 on the point 12 by suitable means such as a weak adhesive or grease indicated at 17, and the forward ends of the shields may be similarly removably secured to the web roll surface just in advance of the ends of the points 12, as indicated at 18 in Figs. 3 and 4. Instead of the weak adhesive securement 18, the forward edges of the shields 16 may be removably attached to the roll surface by frangible tabs 19 as shown in Figs. 1 and 2. The tabs 19 may be similar to or identical with the tabs 14 used to secure the web end points 12 to the roll as explained above.

The outer surface of each shield 16 is provided with a layer of special adhesive 20 at or closely adjacent to its leading edge. This layer adheres directly to the shield where, as illustrated in Figs. 3 and 4, the shield is removably secured to the roll surface by weak adhesive. When frangible tabs 19 are used for this purpose, the special adhesive layer adheres to the outer surface of the rearward end of each tab and may extend laterally onto the adjacent surface of the shield if the tab is narrower than the shield. Such an arrangement of the adhesive layer on the tab is shown at 20' in Figs. 1 and 2. In either arrangement, the special adhesive is secured directly or indirectly to the outer surface of the leading end of the web.

The special adhesive 20 used, which will be hereinafter referred to as a self-sticking adhesive, is applied to the web or to the web and tab end in fluid form and tenaciously adheres thereto, and thereafter the exposed surface of the applied layer can be rapidly dried to a point where such surface will not adhere to an uncoated web surface pressed against it, but adhere tenaciously to a similar dried exposed adhesive surface. Thus the self-sticking adhesive is one which adheres to the web when applied, and when dried its surface coheres to a like or similar adhesive surface but does not adhere to an uncoated web surface.

An adhesive suitable for the purpose described may comprise any one of a number of known non-vulcanizing rubber cements. In general, these cements comprise raw unvulcanized rubber, usually subjected to a small amount of hot milling, dissolved in a suitable solvent. Solvents employed in such cements include gasoline, benzene, ethylene dichloride, carbon tetrachloride, varnish maker's and painter's naphtha, and a special rubber solvent comprising a petroleum distillate having an initial boiling point of from about 120° to 180° F. and an end point of from about 250° to 288° F. The amount of rubber in such cements runs up to 8% or 10%, and known solvent diluents such as isopropanol, ethanol, butanol, amyl acetate, butyl acetate, acetone, or methyl ethyl ketone are sometimes added. A commercial rubber cement suitable for the described purpose is available on the market under the trade name "Best-Test White Rubber Paper Cement" and is made by the Union Rubber and Asbestos Company of Trenton, New Jersey. Although the above described rubber cements are suitable self-sticking adhesives, it should be understood that the use of similar adhesives having this self-sticking property is not precluded.

In order to remove the shields 16 and expose the tacky adhesive 13, a shield removal roller 21, lying parallel to the roll 32, is provided. This roller 21 is preferably of considerably smaller diameter than the roll 32 and is suitably mounted to rotate about its axis and to move substantially parallel to its axis toward and away from the cylindrical roll surface. The roller 21 may be rotatably carried between arms 22 engaging a shaft 23 parallel to the axes of the roller 21 and roll 32, as shown in Figs. 1, 7 and 8. The roller 21 may be driven from the press or other web-consuming apparatus by any suitable means and preferably through a clutch, the drive being arranged to propel the roller at such speed that its surface velocity is the same as or closely approximates that of the web on the surface of the new roll. It should be understood that the roller 21 may be moved into and out of cylindrical contact with the web roll by any suitable power-operated or manual means, and that this movement may be manually effected or controlled, or may be governed by automatic controllers. The roller 21 carries a plurality of circumferentially extending layers 21' of the above described self-sticking adhesive which has been dried so that it adheres to a similar surface of a self-sticking adhesive layer but does not adhere to an uncoated web surface. The self-sticking adhesive layers 21' are alined with the web point shields 16, as shown in Fig. 1.

In order to insure that the shields 16 will be readily removable from the leading end points 12 of the web despite the presence of the layer 13 of tacky adhesive between these parts, it may be necessary or desirable to provide means for producing less adhesion between the tacky adhesive 13 and the shields 16 than that between this adhesive and the web. This may be accomplished by coating the under surface of each shield 16 with a layer of wax or similar adhesive-repellent material, or by interposing a layer of waxed paper or the like between the shield and the tacky adhesive. Both of these expedients have been illustrated in Figs. 2 and 3 where 47 represents the adhesive repellent. The adhesive repellent 47 preferably terminates short of the edges of the shields where they are secured to the web by the weak adhesive 17 and 18. As an alternative to the adhesive repellent 47, each shield may be provided with ribs 48 on the under surface thereof which act to hold such surface of the shield out of contact with the tacky adhesive layer 13 as illustrated in Figs. 4, 5 and 6. The ribs 48 may be corrugations or protrusions formed integral with the shields or may comprise a series of threads, cords or other elongated elements, preferably secured to the shields. They may terminate short of the shield ends as illustrated in Fig. 4, or may be co-extensive therewith as shown at 48' in Fig. 5. When the ribs 48 or 48' are used, the tacky adhesive may be applied to the web end points 12 in spaced transverse strips as indicated at 13' in Fig. 5. This reduces the area of contact between the ribs and the adhesive far below that between the adhesive and the web,

and so positively insures that the shield may be removed without lifting the web points from the roll surface.

The operation of splicing a web in accordance with the invention has been illustrated in Figs. 7 through 12. In these figures I have illustrated a conventional three-roll reel at 24. As shown in Fig. 7, the reel 24, which turns about a central axis 25, carries three spindles 26, 27 and 28. The spindle 26 is shown carrying a roll 29, from which the running web 30 passes over an idler roller 31 and to the press or other web-consuming equipment, not shown. New rolls 32 and 33 are shown mounted respectively on the spindles 27 and 28. The rolls 32 and 33 here illustrated have been prepared for splicing as described in detail above.

A set of tension belts 34 extends parallel to the roll surfaces around the idler rollers 35, 36, 37, 38, 39 and 40, and a weighted or otherwise biased idler 41 maintains these belts at the desired tension. Separate weighted idlers may be used for the different belts 34 if desired. The belts 34 are preferably driven at a speed substantially equal to that of the running web 30 by suitable means such as a shaft 42 connected to the press or other web-consuming apparatus. The belts 34 are preferably of the narrow type, spaced apart transversely of the web as shown in Fig. 12, and brushes 43 of known construction, supported by suitable means to swing about the pivot 44 and arranged to engage the web 30 between the belts 34 opposite the new roll 32, are preferably provided.

When it becomes necessary to replace the web running from an expiring roll such as 29 with that from a new roll, the reel 24 is first rotated clockwise from the position shown in Fig. 7 to that of Fig. 8, where the cylindrical surface of the new roll 32 engages the surface of the running web 30 and presses this web between the roll surface and the belts 24. The rapidly moving web 30 quickly accelerates the new roll 32 to a speed such that its surface velocity equals or approximates the velocity of the running web 30. During this roll acceleration, the layers 20 or 20' of self-sticking adhesive on the shields 16 repeatedly contact the running web, but since, as described above, this adhesive is dried to a point at which it does not adhere to uncoated web surfaces, neither the acceleration of the new roll, the normal running of the web 30 or the position of the shields 16 are in any way altered. The shield removal roller 21 is held up out of contact with the cylindrical surface of the new roll 32 during the acceleration thereof, and during the web roll acceleration period, the roller 21 may be accelerated to the same surface velocity as that of the new roll, though this is not essential.

After the new roll 32 has attained the proper speed, and while its cylindrical surface continues to rotate in contact with the running web 30 or during the acceleration period, the brushes 43 are lowered to apply pressure to the running web and thus press it firmly against the new roll surface. As illustrated in Fig. 12, the belts 34 engage the web between the end points 12 and so do not press against the adhesive shields 16. When the expiring roll 29 has been so far depleted that the splice should be made, the operator lowers the shield removal roller 21 into contact with the surface of the new roll 32. The roller 21 preferably contacts the new roll surface at such a time that it does not immediately engage the shields 16. This may be readily accomplished by watching the roll 32, the leading web end 11 of which may be marked by a "flag" or side tab 45 (Figs. 1 and 7), and dropping the roller 21 just as the marker passes the uppermost position.

After the roller 21 is lowered, it rotates on the surface of the new roll until the self-sticking adhesive layers 21 thereon respectively engage the similar layers 20 or 20' on the outer leading surfaces of the shields 16. This contact produces tenacious coherence between the two self-sticking adhesive layers, and, as a result, the shields 16 are stripped from the surface of the roll 32 and wound around the roller 21 (see Fig. 9), the tabs 19 and weak adhesive parting from the roll surface. The tacky adhesive areas 13 on the web end points 12 are thus exposed, as indicated in Fig. 10. As the roll 32 continues to turn, the tacky end areas 13 come in contact with the running web 30 and the splice is made. The running web 30 pulls the new web end away from the new roll 32, breaking the tabs 14 or equivalent web end holding means, and the web from the new roll runs to the press. Immediately after the splice is thus made, the web from the old roll may be severed by suitable known means such as a knife 46 as shown in Fig. 11.

The new roll 32 then becomes the running roll, and the reel 24 may be further rotated clockwise to increase the wrap of the straps 34 about its surface during its run as may be required. The brushes 43 and the shield removal roller 21 are retracted after the splice is made and the shields 16 stripped from the new roll 32 are removed from the roller 21 to prepare it for the next splicing operation.

It should be understood that the above described splicing operation is not limited to the use of a conventional three-roll reel, but is equally applicable to a two-roll reel, a roll stand or any other roll-carrying mechanism capable of bringing a new roll close to a web running from an expiring roll.

The method of the invention effectively splices the web from a new roll to the running web without any reduction in web speed and without the use of any special roll accelerating means. This avoids the necessity of correlating the diameter of each new roll to the web speed and adjusting a spindle drive accelerating mechanism accordingly, and eliminates the use of speed-up belts movable into engagement with each new roll in turn.

In the above described embodiment of the invention, the tacky adhesive areas and their protective shields have been described as applied directly to the end of a continuous web wound into a conventional roll. This manner of preparing the roll is generally preferable, but the invention in its broader aspects is not limited thereto. Thus the leading end of each new web roll may comprise a web section previously prepared and spliced thereto by the press room operators when each new roll is placed on the reel or other roll-carrying mounting.

I claim:

1. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring roll, the steps of applying a layer of tacky adhesive to the outer surface of the web on the new roll substantially at its leading end, removably securing a flexible shield over such tacky adhesive layer, applying to the outer surface of said shield a layer of self-sticking adhesive, drying the exposed surface of said self-sticking adhesive layer to a point where it will not adhere

to an uncoated web but will adhere to a similar self-sticking adhesive layer surface, contacting the cylindrical surface of the new roll with the surface of the running web whereby the new roll is accelerated to a surface velocity substantially equaling the velocity of the running web, and pressing against the rotating cylindrical surface of the new roll a continuous movable surface carrying a layer of self-sticking adhesive dried sufficiently to avoid adherence to the uncoated web but capable of tenaciously adhering to the adhesive layer on said shield whereby said shield adheres to said surface and is removed from said new roll thereby and said tacky adhesive layer is exposed for splicing contact with the running web.

2. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring roll, the steps of applying a layer of tacky adhesive to the outer surface of the web on the new roll substantially at its leading end, removably securing a flexible shield over such tacky adhesive layer, applying to the outer surface of said shield a layer of self-sticking adhesive, drying the exposed surface of said self-sticking adhesive layer to a point where it will not adhere to an uncoated web but will adhere to a similar self-sticking adhesive layer surface, contacting the cylindrical surface of the new roll with the surface of the running web whereby the new roll is accelerated to a surface velocity substantially equaling the velocity of the running web, and pressing against the rotating cylindrical surface of the new roll at a point spaced from the running web a rotatable cylindrical surface carrying a layer of self-sticking adhesive dried sufficiently to avoid adherence to the uncoated web but capable of tenaciously adhering to the adhesive layer on said shield whereby said shield adheres to said surface and is removed from said new roll thereby and said tacky adhesive layer is exposed for splicing contact with the running web.

3. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring web roll, the steps of removably securing the leading end of the web on the new roll to the new roll surface, applying a layer of tacky adhesive to the outer surface of the web on the new roll substantially at its leading end, removably securing a flexible shield substantially impervious to said tacky adhesive over such layer, applying to the outer surface of said shield adjacent its leading end a layer of self-sticking adhesive, drying the exposed surface of said self-sticking adhesive layer to a point where it will not adhere to an uncoated web but will adhere to a similar self-sticking adhesive layer surface, contacting the cylindrical surface of the new roll with the surface of the running web whereby the new roll is accelerated to a surface velocity substantially equaling the velocity of the running web, and pressing against the rotating cylindrical surface of the new roll at a point spaced from the running web the cylindrical surface of a rotatable roller carrying a layer of self-sticking adhesive dried sufficiently to avoid adhesion to the uncoated web but capable of tenaciously adhering to the adhesive layer on said shield, whereby said shield adheres to said roller surface and is removed from the new roll thereby and said tacky adhesive layer is exposed for splicing contact with the running web.

4. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring web roll, the steps of removably securing the leading end of the web on the new roll to the new roll surface, applying a layer of tacky adhesive to the outer surface of the web on the new roll substantially at its leading end, removably securing a flexible shield substantially impervious to said tacky adhesive over such layer, applying to the outer surface of said shield adjacent its leading end a layer of self-sticking adhesive, drying the exposed surface of said self-sticking adhesive layer to a point where it will not adhere to an uncoated web but will adhere to a similar self-sticking adhesive layer surface, contacting the cylindrical surface of the new roll with the surface of the running web whereby the new roll is accelerated to a surface velocity substantially equaling the velocity of the running web, pressing against the rotating cylindrical surface of the new roll at a point spaced from the running web the cylindrical surface of a rotatable roller carrying a layer of self-sticking adhesive dried sufficiently to avoid adhesion to the uncoated web but capable of tenaciously adhering to the adhesive layer on said shield, whereby said shield adheres to said roller surface and is removed from the new roll thereby and said tacky adhesive layer is exposed for splicing contact with the running web, continuing the contact between said new roll surface and the running web until the leading end of said new roll web engages said running web and is spliced thereto, and severing the web running from the expiring web roll.

5. A web roll arranged for making a high speed splice comprising a substantially cylindrical roll wound from a continuous web having a leading outer end, a layer of tacky adhesive on the outer surface of said web adjacent its leading end, a flexible shield removably secured to said roll over said tacky adhesive layer, and a layer of self-sticking adhesive adhering to the outer surface of said shield and having an exposed surface capable of tenaciously adhering to a similar adhesive layer surface but incapable of adhering to an uncoated web surface.

6. A web roll arranged for making a high speed splice comprising a substantially cylindrical roll wound from a continuous web having a leading outer end, means for removably securing said leading end to the web roll surface, a layer of tacky adhesive on the outer surface of said web adjacent its leading end, a flexible shield of sheet material substantially impervious to said tacky adhesive removably secured to said roll over said tacky adhesive layer, means for preventing substantial adhesion between said tacky adhesive layer and said shield, and a layer of self-sticking adhesive adhering to the outer surface of said shield and having an exposed surface capable of tenaciously adhering to a similar adhesive layer surface but incapable of adhering to an uncoated web surface.

7. A web roll arranged for making a high speed splice comprising a substantially cylindrical roll wound from a continuous web having a leading outer end, a layer of tacky adhesive on the outer surface of said web adjacent its leading end, a flexible shield of sheet material substantially impervious to said tacky adhesive covering said tacky adhesive layer, separable means for removably securing said shield to the surface of said web roll adjacent its edges and beyond said tacky adhesive layer and a layer of self-sticking adhesive adhering to the outer surface of said shield and having an exposed surface capable of tenaciously adhering to a similar adhesive layer sur-

face but incapable of adhering to an uncoated web surface.

8. A web roll arranged for making a high speed splice comprising a substantially cylindrical roll wound from a continuous web having a leading outer end with at least one forwardly extending point thereon, a layer of tacky adhesive on the outer surface of said web point adjacent its leading edge, a flexible shield removably secured to said roll over said tacky adhesive layer, means for preventing substantial adhesion between said tacky adhesive layer and said shield, and a layer of self-sticking adhesive adhering to the outer surface of said shield and having an exposed surface capable of tenaciously adhering to a similar adhesive layer surface but incapable of adhering to an uncoated web surface.

9. A web roll arranged for making a high speed splice comprising a substantially cylindrical roll wound from a continuous web having a leading outer end with a plurality of forwardly extending points thereon, separable means secured to said roll and said points for removably securing the leading end of the web to the web roll surface, a layer of tacky adhesive on the outer surface of said web roll points adjacent their leading edges, a flexible shield substantially impervious to said tacky adhesive removably secured to said roll over each of said tacky adhesive layers, and a layer of self-sticking adhesive adhering to the outer surface of each of said shields and having an exposed surface capable of tenaciously adhering to a similar adhesive layer surface but incapable of adhering to an uncoated web surface.

10. A leading web end for a web roll arranged for making a high speed splice comprising a layer of tacky adhesive on the outer surface of the web end, means for removably securing the web end to the roll surface, a shield removably secured over said tacky adhesive layer, and a layer of adhesive on the exposed outer surface of said shield adjacent the leading end thereof.

11. A leading web end for a web roll arranged for making a high speed splice comprising a layer of tacky adhesive on the outer surface of the web end, means for removably securing the web end to the roll surface, a shield removably secured over said tacky adhesive layer, a layer of adhesive repellent between said shield and said tacky adhesive layer, and a layer of adhesive on the outer surface of said shield adjacent the leading end thereof.

12. A leading web end for a web roll arranged for making a high speed splice comprising a layer of tacky adhesive on the outer surface of the web end, a shield of flexible sheet material substantially impervious to said tacky adhesive removably secured over said tacky adhesive layer, and a layer of self-sticking adhesive adhering to the outer surface of said shield adjacent its leading edge and having an exposed surface capable of tenaciously adhering to a similar adhesive layer surface but incapable of adhering to an uncoated web surface.

13. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring web roll, the steps of applying a tacky adhesive to the outer surface of the leading end of the web on the new roll, covering said tacky adhesive with a removable shield, accelerating the new web roll by contact with the running web, and applying a roller to the surface of the new web roll to strip the shield therefrom.

14. In a method of splicing the leading end of a web on a new web roll to a web running from an expiring web roll, the steps of applying a tacky adhesive to the outer surface of the leading end of the web on the new roll, covering said tacky adhesive with a removable shield carrying a self-sticking adhesive on its outer surface, accelerating the new web roll by contact with the running web and applying a roller coated with a self-sticking adhesive to the surface of the new web roll to strip the shield therefrom.

OSCAR C. ROESEN.

CERTIFICATE OF CORRECTION.

Patent No. 2,320,657. June 1, 1943.

OSCAR C. ROESEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 53, for "end" read --ends--; page 2, first column, line 53, after the word "but" insert --will--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of July, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)