

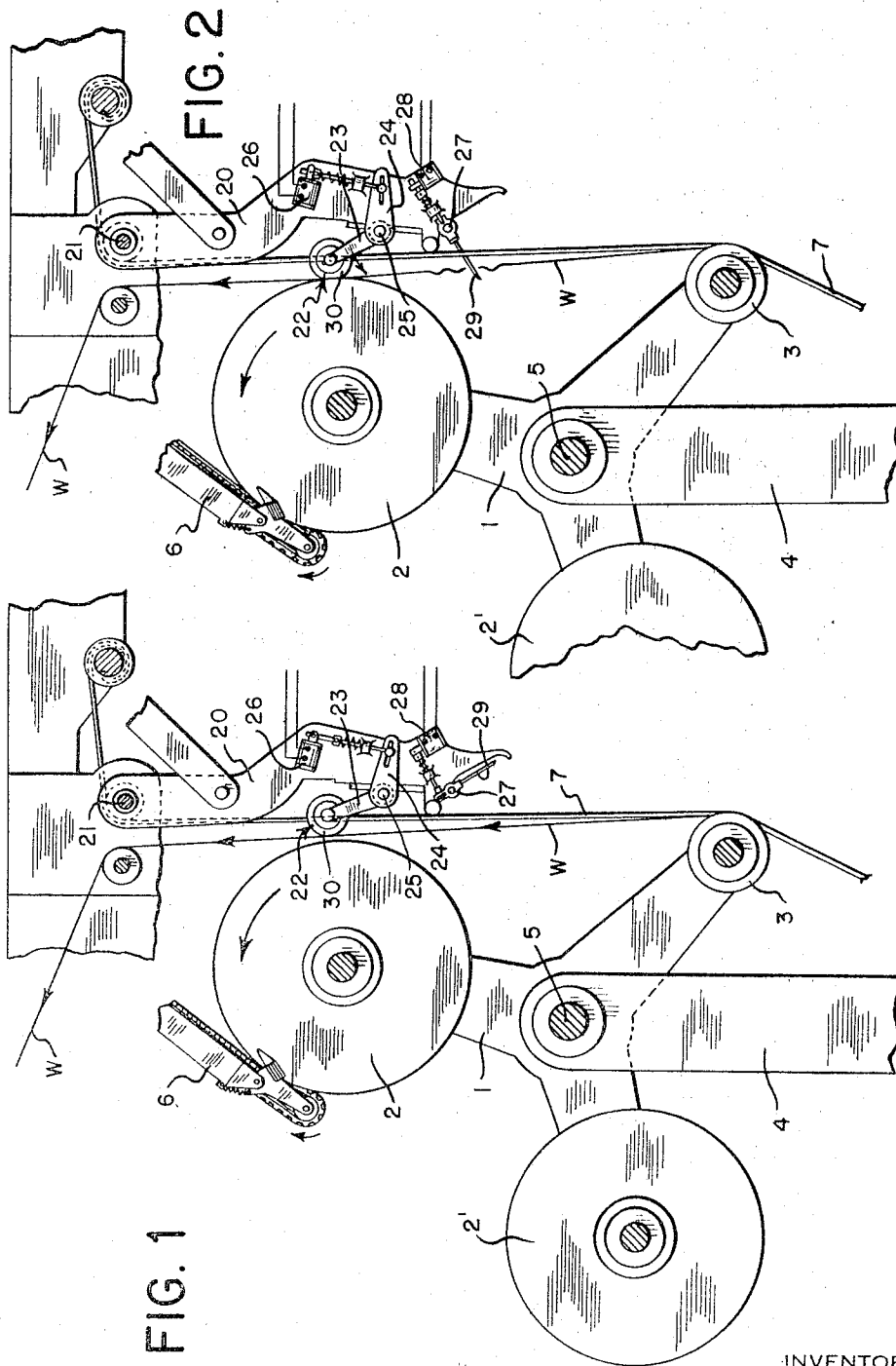
March 14, 1967

A. C. DEGUTIS
WEB SPLICING DEVICE

3,309,035

Filed Dec. 1, 1964

2 Sheets-Sheet 1



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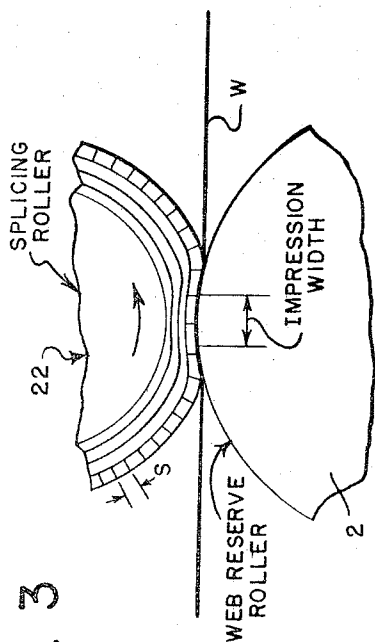


FIG. 3

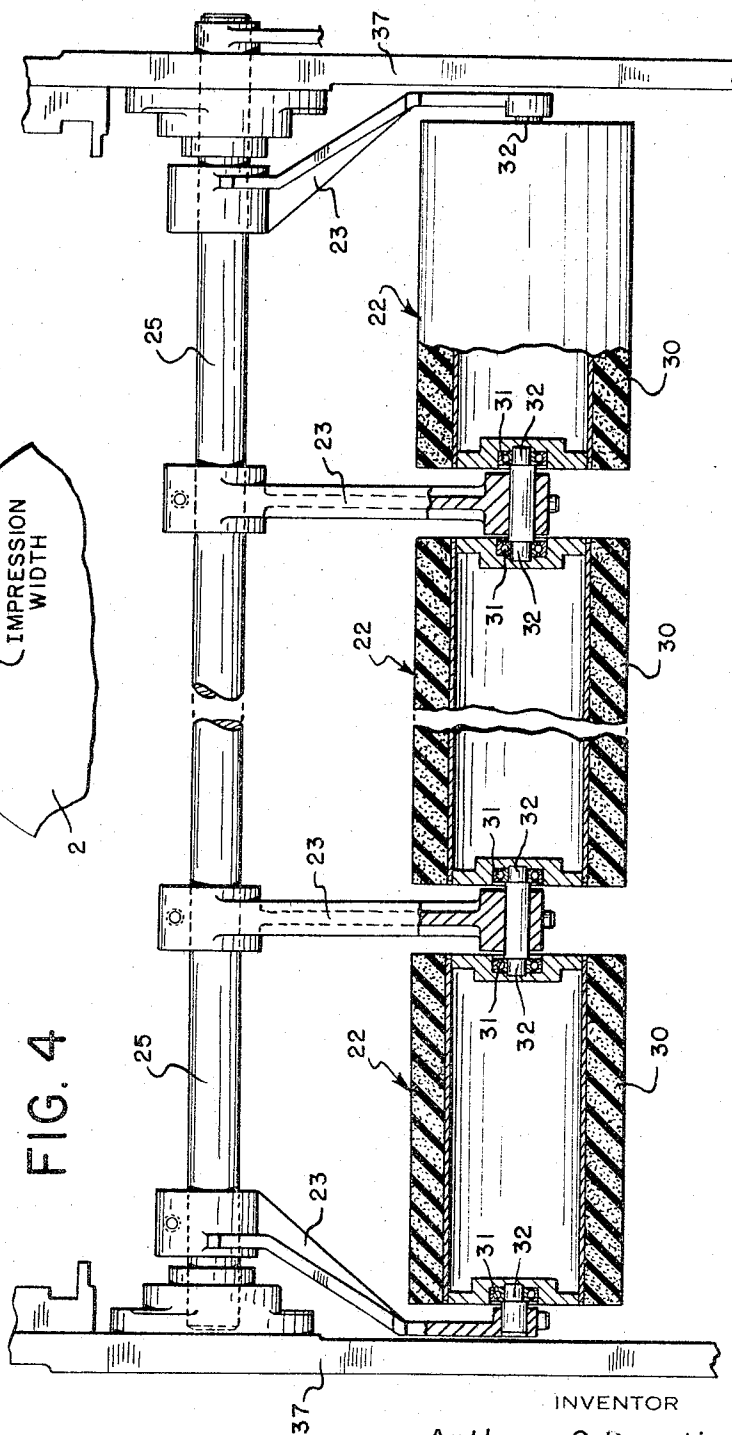


FIG. 4

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3,309,035

WEB SPLICING DEVICE

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Filed Dec. 1, 1964, Ser. No. 415,023

5 Claims. (Cl. 242—58.1)

This invention relates to a web splicing device and more particularly to a web splicing roller by which a moving web may be moved into contact with a rotating web reserve roll in order that the moving web may be spliced to the web of the reserve roll.

Conventional web splicing devices usually comprise a rotating web supply roll from which a running web moves to a web consuming device, such as a printing press. Web reserve rolls are carried on a reel in turn positioned adjacent the running web and the web on the reserve roll has an adhesive portion on one side facing the running web. When a splice is to be made, the reserve roll is rotated until its peripheral speed equals substantially the linear speed of the running web and the running web and the adhesive portion are pressed together so that a splice is made while at substantially the same time the running web is severed by a cutting knife at a point between the splice and the expired supply roll.

The pressing together of the running web and the adhesive portion may be accomplished by either rotating the reel so that the adhesive portion is moved towards and engages with the running web or by moving the running web towards the adhesive portion so that it engages therewith. Where the reel is moved, a hard rubber back-up roller is used to provide a backing surface against which the running web may be pressed by the outer adhesive surface of the supply roll. This means of splicing, however, is used only in a relatively slow speed splicing device and is not suitable for high speed splicing such as required when high speed newspaper printing presses are used.

The other alternative utilizes paster brushes by which the running web is pressed against the adhesive portion to make the splice. Tension belts are commonly used in such splicing devices which engage with the outer periphery of the supply roll in order that proper tension may be maintained in the running web to minimize the possibility of web breakage. These tension belts extend along the running web such that it is necessary that the paster brushes which extend across the length of the web have interrupted portions through which the tension belts may extend.

Numerous difficulties arise from using paster brushes to force the moving web into contact with the reserve roll. Wrinkles may be caused in the web by wandering or lateral movement of the web into the slots or spacing in the brushes into which the tension belts fit. Such wrinkles may be carried into the press and so result in faulty printing. Further, the use of paster brushes often results in an uneven application of pasting force when the moving web is brought into contact with the adhesive portion. This is particularly true when the reserve roll is out of round because of handling or being irregularly wound. Thus, one end of the roll may be higher than the other end such that when the paster brushes move the running web onto the reserve roll, the brushes may exert an excessive force on the high end of the roll and not enough force on the low end of the roll to effectuate a good splice. The excessive pressure exerted by the paster brush on the high end results in change of tension in the running web because of increased dragging action of the brush on the web.

A further difficulty arising from use of paster brushes

is that the frictional drag exerted on the running web by the paster brushes will vary according to the location of the pivot point about which the brushes pivot to engage the running web. If the pivot point is located above the brushes, then there is a tendency for the brushes to bounce away from the running web so reducing the pressure of the running web on the reserve roll, whereas if the pivot point is below the brushes, there is a tendency for the brushes to be pulled in the direction of the running web toward the reserve roll so increasing pressure of the running web on the reserve roll.

The spacing between the paster arm on which the paster brushes are mounted when it is in position for splicing and the reserve roll also affect the force with which the brushes engage the running web. This has been compensated for previously by precisely locating the reserve roll in reference to the paster arm which is difficult to do because of varying diameters of the reserve rolls.

Still another factor affecting the frictional drag of the paster brushes on the running web is the texture of the web surface with a rough surface increasing the frictional drag. As pointed out earlier, varying frictional drag will in turn vary the tension in the running web.

It is an object of my invention to overcome some of the aforementioned difficulties inherent when paster brushes are used and to provide for a splicing roller which is particularly effective with high speed splicing devices and which will provide a uniform application of pressure across the width of the running web in order to effectuate a strong splice regardless of web surface texture, reserve roll diameter or pivot position of the splicing roller. Broadly, the invention contemplates substituting a splicing roller for the conventional paster brushes wherein the roller has a cover comprising a material having the characteristic that force per unit area transmitted by the material will be constant regardless of the compressive force applied to it. The splicing roller is used in a web splicing device which has a web running from a supply roll which may be pressed into contact with adhesive containing on a portion of the surface of the web of a reserve roll positioned adjacent the running web. The splicing roller is adapted to be brought into light engagement with the running web prior to splicing so that the roller is rotated by the moving web such that any dragging action on the web is minimized. In addition, means are provided for moving the splicing roller so that it may press the running web into firm engagement with the adhesive portion when the splice is to be made.

A plurality of the splicing rollers which are axially spaced are used in order that the spacing between the rollers may accommodate tension belts which engage the outer periphery of the supply roller and by which tension in the moving web is maintained. The spacing between the rolls forms a slot similar to the slot between adjacent paster brushes. However, it has been found that the use of the roller with the cover reduces any tendency of the web to wander into the slot as is the case when paster brushes are used.

Referring to the drawings in which a preferred embodiment of my invention is illustrated,

FIG. 1 is a diagrammatic cross-sectional view of a web splicing device constructed according to the invention shown prior to splicing;

FIG. 2 is a view similar to FIG. 1 showing the device at the moment of splicing;

FIG. 3 is a schematic view of a splicing roller constructed according to the invention contacting a reserve roll; and

FIG. 4 is a cross-sectional view of splicing rollers constructed according to the invention mounted onto a paster arm.

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Referring to the drawings in greater detail and in particular to FIG. 1, the web splicing device illustrated has a reel 1 having mounted thereon web reserve rolls 2 and 2' and a web supply roll 3 from which a running web W extends to a web using machine, such as a press, not shown. Reel 1 is mounted on a standard 4 and has means not shown for rotating it about shaft 5. Web roll accelerating means 6 are provided in order that reserve roll 2 may be rotated prior to splicing so that its peripheral speed equals substantially the linear speed of the running web.

Tension is maintained in the running web by means of tension belts 7 which engage the outer periphery of the supply roll 3 and which are regulated by means not shown whereby a braking force may be exerted on the supply roll in order to impart tension into the running web. A plurality of such belts are used and extend across the width of the supply roll.

A paster arm 20 is rotatably mounted about a shaft 21 and in turn carries splicing rollers 22 and cutting knives 29. Splicing rollers 22 are rotatably mounted on an arm 23 of a bell crank 24 which is adapted to be rotated about shaft 25 when actuated by a solenoid 26. Solenoid 26 in turn is energized upon completion of a circuit when the diameter of the roll 3 nears a point where little web remains on the roll. Such circuitry and means for completing the circuit is conventional and may be of the type disclosed in Patent 3,100,604.

The cutting knives 29 are mounted to be pivoted about shaft 27 by means of solenoid 28 which may be energized by completion of a circuit in the same manner as is the solenoid 26.

Each roller 22 has a cover 30 thereon which comprises a resilient material having the characteristic that the force per unit area transmitted by the material when brought in contact with an opposing surface will be constant regardless of the amount of compression force applied on the material up to a limit where the material is compressed to a solid. I have found that a polyurethane foam material has such a characteristic and preferably the covers are made of this material. An advantage of using this type cover is that when the splicing roller and cover and running web are brought into engagement with an out of round reserve roll wherein the roll may have bumps or have one end higher than the other, the cover will bear on the running web and roll along its complete length with an equal force per unit area. That is to say, if there is a bump in the roll which bears on the middle part of the cover, the pressure between the cover and the bump will be the same as on either side of the bump. Also, if the cover and splicing roller and running web are brought into engagement with a roll having one end higher than the other, the pressure between the cover and the roll will be constant along the length of the cover.

This uniformity of pressure with which the cover bears on the roll insures that there will be a minimum of irregularity of tension in the web running from the reserve roll immediately after splicing caused by any undue dragging force on the web because of uneven pressure application of the roller on the web. Further, the use of the particular material in the cover allows uniform application of pressure on the adhesive portions of the web of the reserve roll such that a good splice is insured along the complete surface of the adhesive portion.

The use of the particular material of the cover also imparts a wiping or brushing action to the running web and onto the adhesive portion of the web reserve roll as can best be explained by reference to FIG. 3. Assuming that the cover of the splicing roller is divided around its periphery into equal segments S, it is seen that when the cover is brought into firm engagement with the relatively non-resilient reserve roll, that there is an elastic elongation of the cover of the splicing roller in the nip area between the roll and cover. The effect of this is to make the relative rotary speeds between the web reserve roll

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and the cover on the splicing roller different with increasing pressure between the cover and the rolls decreasing the relative rotary speed of the cover. This is because that while the cover may be deformed by pressure, the volume of the cover will remain substantially constant. Thus when pressure is applied by the splicing roller on to the reserve roll, the thickness of the cover in the nip is decreased and the distance S between the equal segments in the nip area will increase. With the reserve roll rotating, the same number of segments must pass a fixed point in a given time interval such that the velocity of the surface of the cover at any point is proportional to the distance between the marks defining the segments in the vicinity of the nip or inversely proportional to the thickness of the cover in the vicinity of the nip. The driving motion to the cover and splicing roller is imparted by the surface of the web supply roll to the cover in the nip area, where the cover is compressed by pressure and its surface is stretched in the running direction of the web W. Therefore, the free surface of the cover, that is, the surface away from the nip, moves at a lower velocity than the surface of the web supply roll so that a rubbing action is imparted between the adhesive portion and the running web so improving the splice in the same manner as the seal of an envelope is made by rubbing with the finger.

Reference is made to FIG. 4 which illustrates in greater detail the splicing rollers and the way in which they are mounted in a web splicing device. A plurality of the rollers 22, each having the cover of the polyurethane foam material 30, are mounted axially in spaced relation wherein the spacing between adjacent rollers is slightly greater than that of the tension belt used with the device. Each roller has ball bearing means 31 therein which in turn are journaled onto shafts 32 so that the rollers may be easily rotated when brought into light engagement with a running web. The use of the ball bearings minimizes any drag imparted on the moving web and so minimizes change in tension in the web and eliminates any change in drag because of varying texture of the web surface. The shafts 32 in turn are carried by arms 23 mounted on shaft 25 in turn rotatably carried by the side frames 37 of the paster arm.

While three such rollers are shown in FIG. 4, it is apparent that any number of rollers may be used so long as the rollers extend over the complete width of the running web and so long as provision is made to accommodate the tension belts engage with the supply roll.

When a splice is to be made, the web accelerating drive means 6 and paster arm 20 are brought into the position as shown in FIG. 1 such that the web accelerating drive means 6 may accelerate the roll 2 up to a speed where its peripheral speed substantially equals the linear speed of the running web W. At the same time the cover 30 of the roller 22 is brought into light engagement with the web W such that the roller is rotated by the web. When the splice is to be actually made, solenoid 26 is energized causing the bell crank 24 to rotate towards the web to move the web W firmly against the outer periphery of the roller 2. The web of the roller 2 has on its surface facing the running web adhesive portions such as illustrated in Patent 3,100,604, such that when the running web is pressed against the roll 2 by the splicing rollers 22, the running web will adhere to the web of the reserve roll 2 to make a splice. At practically the same instant, the solenoid 28 is energized in order that the severing knives 29 will sever the web W from the expired supply roll 3 which is then quickly braked to a stop by the tension belts.

The paster arm 20 and reel accelerating roll means 6 are then moved upwardly out of the path of the reel 1, and the reel 1 is then rotated in a clockwise direction to bring the new roll 2' into the position shown in FIG. 1 where the tension belts may contact its outer periphery. The expired roll 3 is then removed and replaced by a fresh roll.

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While I have described a preferred embodiment of my invention, it is apparent that changes could be made and still come within the scope of the invention as defined in the appended claims. For example, because the splicing roller is rotatably driven by the running web, the placement of the pivot about which the roller pivots to move the running web into engagement with the supply roll may be changed from that shown in the drawings without affecting web tension.

I claim:

1. In a web splicing apparatus for splicing a web from a web reserve roll onto a moving web running from a web supply roll and wherein the web of said reserve roll has adhesive on a portion of the surface thereof which is adapted to adhere to a surface of the moving web when the moving web is pressed against the web of the supply roll, a splicing roller, and means for moving said splicing roller relative to said moving web so that said moving web may be pressed against the adhesive surface of the web on the outer periphery of the reserve roll; the improvement comprising having said roller covered with a yieldable material having a characteristic that force per unit area transmitted by the material when subjected to a compressive force is constant regardless of the compressive force applied to the material.

2. A web splicing apparatus according to claim 1 wherein said material is a polyurethane foam.

3. A web splicing apparatus for splicing a web from a web reserve roll onto a moving web running from a web supply roll wherein a portion of the surface of the web of the reserve roll has adhesive thereon, said apparatus comprising means for rotating said reserve roll so that

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its peripheral speed is substantially equal to the linear speed of the moving web, at least one movable web splicing roller adjacent said running web, a yieldable cover on said roller having a characteristic that force per unit area transmitted by the cover when subjected to a compression force is constant regardless of the compression force applied to the cover, means for moving said roller to a position whereby said cover will press said running web into splicing contact with the adhesive portion of the web on the reserve roll, and means for cutting the running web between the point of splice and the supply roll; said cover comprising a polyurethane foam material.

4. A web splicing apparatus according to claim 3 having in addition tension belts contacting part of the outer periphery of said supply roll whereby tension in said running web is regulated, and a plurality of spaced splicing rollers with the space between adjacent rollers being greater than the width of each said belt.

5. A web splicing apparatus according to claim 4 having in addition a movable paster arm carrying said roller and means for moving said paster arm to a position where the cover of said roller lightly engages said running web so that movement of the running web rotates said roller.

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