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[56] **References Cited**
UNITED STATES PATENTS
 3,167,269 1/1965 Giles 242/58.4
 3,276,710 10/1966 Zernov et al. 242/59

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[54] **WEB DIRECTIONAL CONTROL APPARATUS FOR BUTT JOINT SPLICER**
12 Claims, 12 Drawing Figs.

[52] U.S. Cl. **242/58.4**
 [51] Int. Cl. **B65h 19/16**
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58.1, 58.2, 58.3, 58.5, 59; 156/502, 504-507

ABSTRACT: A web directional control apparatus for a universal butt joint splicer including a pair of nip rolls each having a directional belt assembly which is selectively movable to an operative position relative to a web roll to guide the leading edge of the new web into engagement with a running web passing between the nip rolls regardless of the direction of rotation of the new web roll. The nip rolls are mounted for movement with the corresponding directional belt assembly into engagement with the other nip roll.

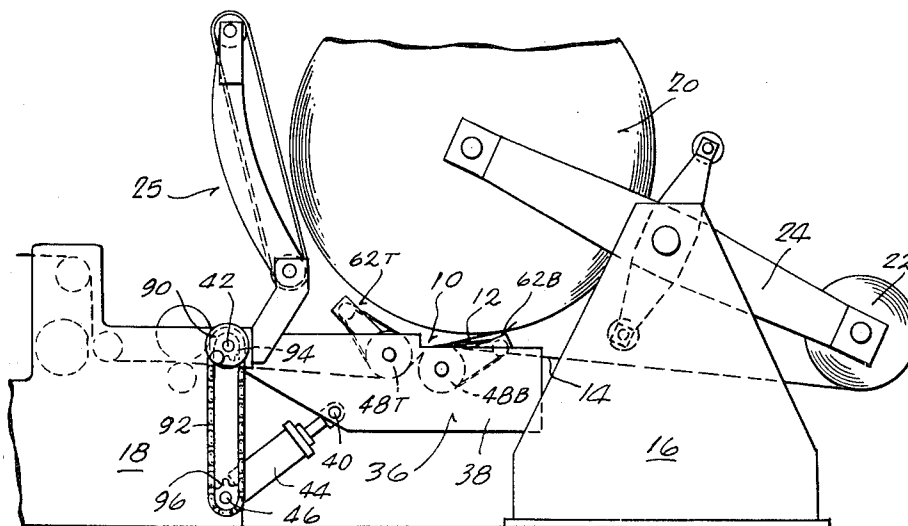
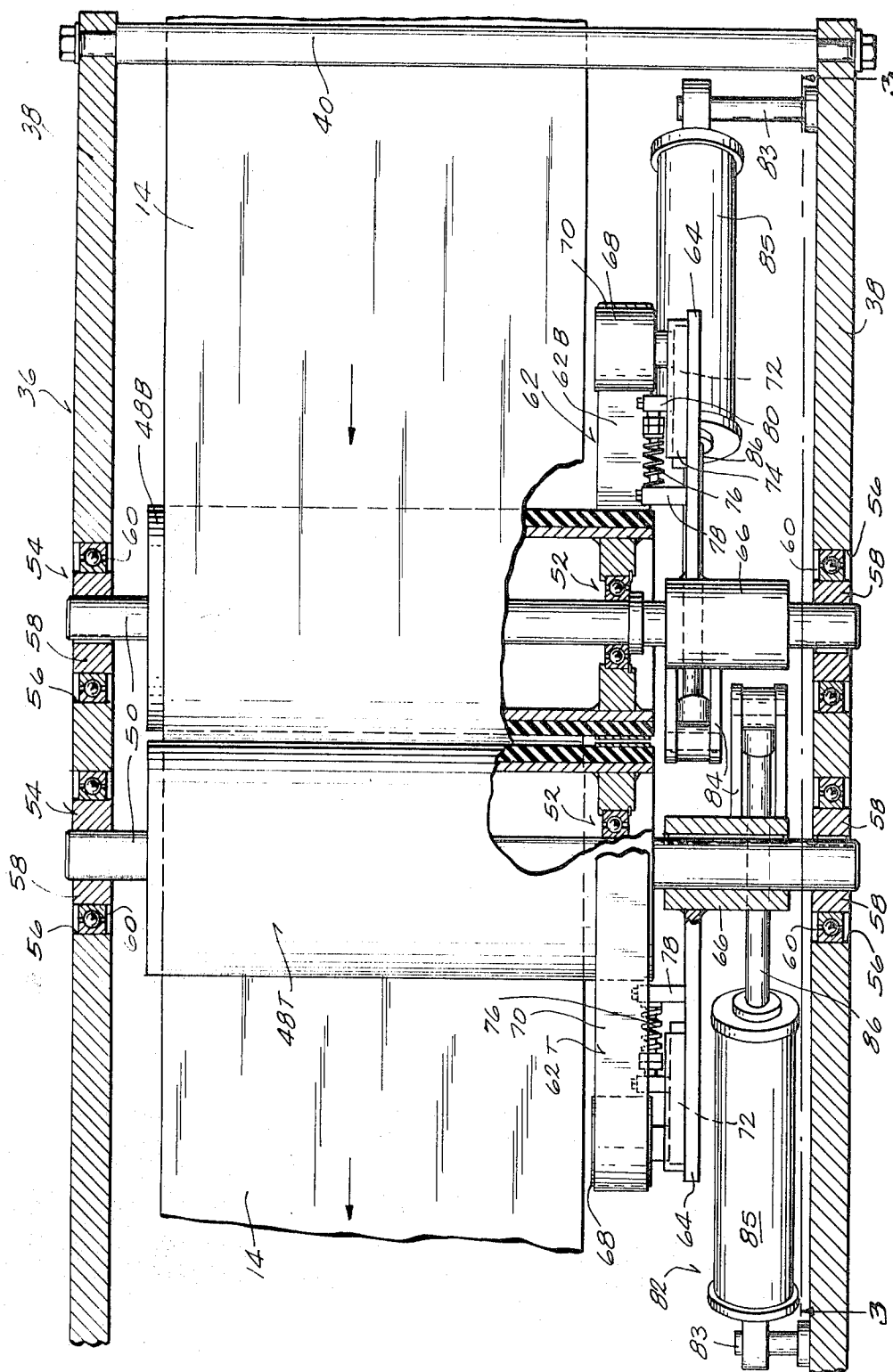


Fig. 2



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Fig. 9

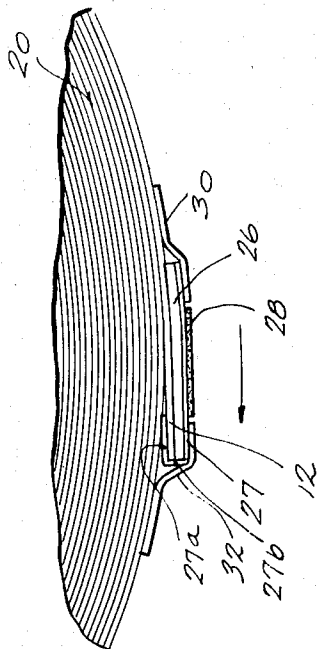


Fig. 11

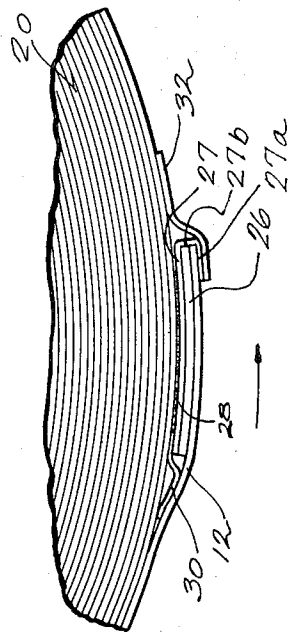


Fig. 10

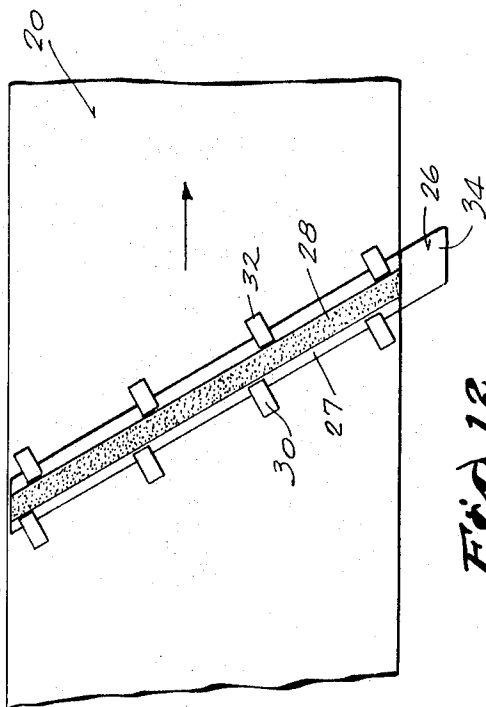
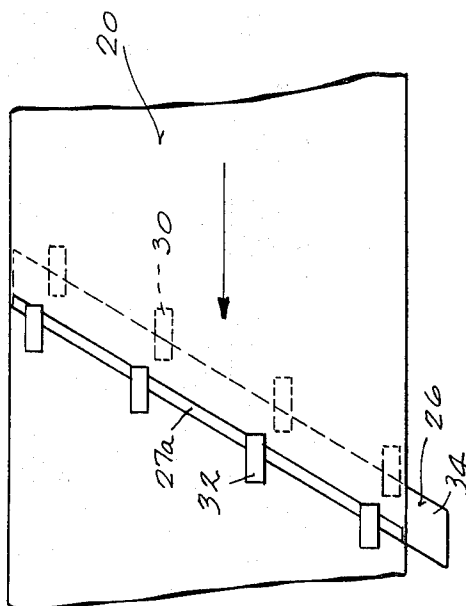


Fig. 12



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WEB DIRECTIONAL CONTROL APPARATUS FOR BUTT JOINT SPLICER

BACKGROUND OF THE INVENTION

Butt joint splicers of the type shown in Zernov et al. U.S. Pat. No. 3,276,710, issued Oct. 4, 1966, are limited to the forming of a butt joint splice between a new web roll which is rotated in the same direction as the running web. In many instances, it is desirable to reverse the direction of rotation of the new roll in order to place the outside surface of the new web on the top of the running web. In the present apparatus, this can only be done by shutting down the splicer while the new web is attached manually to the now stationary running web.

SUMMARY OF THE INVENTION

The directional belt control apparatus of this invention makes it possible to selectively attach a new web to a running web with either the top or bottom of the new web roll on the top of the expiring web. This apparatus includes a pair of endless directional belts each of which is trained around a nip roll and a pulley mounted on a plate pivotally connected to the nip roll. Each of the arms is selectively movable from an inoperative position to an operative position relative to the other arm to position one of the belts in a position to engage the outwardly projecting end of a knife mounted on the leading edge of the new web roll. The leading edge of the new web roll will follow the knife through the nip rolls where the new web is pressed against the running web.

A novel make-ready tape is used to attach the knife to the leading edge of the new web roll which can be adapted for connection to either side of the leading edge of the new web. This tape includes an adhesive surface on one side for securing the knife to the new web and an adhesive surface on the other side for securing the knife to the running web.

These and other objects will appear hereinafter when the following description is read in connection with the accompanying drawings.

THE DRAWINGS

FIG. 1 is a side view of a universal butt joint splicer arrangement.

FIG. 2 is a top view of the directional belt guide assembly partly broken away to show the eccentric mount for the nip roll.

FIG. 3 is a section view taken on line 3—3 of FIG. 2 showing the directional belt guides.

FIG. 4 is a view of one of the eccentric bearing mounts for the idler rolls.

FIG. 5 is a top view of the horizontal adjustment arrangement for the directional belt assembly.

FIG. 6 is a fragmentary view showing the horizontal adjustment arrangement of the lift cylinder.

FIG. 7 is a side view of the assembly showing the position of the web guide belts when the new roll is rotating clockwise.

FIG. 8 is a view similar to FIG. 7 showing the position of the web guide belts when the new roll is rotating counterclockwise.

FIG. 9 is an enlarged view of a portion of the new web roll showing the position of the knife and adhesive when the new roll is rotating clockwise.

FIG. 10 is a view of the top of a new web roll after make-ready.

FIG. 11 is a view of the new roll showing the position of the knife when rotating counterclockwise.

FIG. 12 is a top view of the new web roll after make-ready.

DESCRIPTION OF THE INVENTION

A universal butt joint splicer, of which the directional belt control apparatus 10 of this invention forms a part, is used to form a butt splice between a new web 12 and a running or expiring web 14. The butt joint splicer generally includes a tur-

nover roll stand 16, the directional belt control apparatus 10, and a tape-applying assembly 18. A new web roll 20 and an expiring web roll 22 are supported on a pair of arms 24 on the roll stand 16. The expiring web 14 from the expiring web roll 22 is threaded through the directional belt control apparatus 10 into the tape-applying assembly 18. The new web roll 20 is accelerated by a conventional roll accelerator 25 to a peripheral speed equal to the speed of the expiring or running web 14 prior to splicing the new web 12 into the expiring web 14. The directional belt control apparatus 10 is used to guide the new web 12 from the new web roll 20 into contact with the running web 14 regardless of the direction of rotation of the new web roll 20.

FIG. 9 THROUGH 12

Prior to securing the new web 12 to the running web 14, the new web roll 20 must be prepared for splicing by securing a knife 26 and an adhesive strip 28 to the leading edge of the new web 12. Referring to FIGS. 9 and 10 and assuming that the roll in FIG. 9 is rotating in a clockwise direction, (FIG. 10 is a top view of the roll 20 and is therefore shown moving left to right), the knife 26 is mounted on the outside surface of the new web 12. More particularly, the adhesive strip 28 is provided on a paper carrier 27 which is adhesively secured to the knife 26 with a portion 27a of the paper carrier extending beyond the edge of the knife. The edge of the knife 26 is aligned with leading edge of the new web 12 and the portion 27a of the carrier 27 which extends beyond the edge of the knife 26 is wrapped around the leading edge of the new web 12 and secured thereto. The trailing edge of the knife 26 is secured to the new web 12 by a number of adhesive strips 30. The knife 26 is thereby secured to the leading edge of the new web 12 with the adhesive strip 28 on the outside of the new web 12. The leading edge of the new web 12 is retained on the web roll 20 by means of a number of small adhesive strips 32. One end 34 of the knife 26 extends outwardly from the web roll 20 for a purpose to be described below.

If the new web roll 20 is rotating counterclockwise, as seen in FIGS. 11 and 12 (FIG. 12 is a top view of the roll 20 and is therefore shown moving right to left), the knife 26 is mounted on the inside surface of the new web 12. The leading edge of the knife 26 with the paper carrier 27 attached is placed on the inside of the new web 12 and aligned therewith. The outwardly extending portion 27a of the paper carrier 27 is wrapped around the leading edge of the new web 12 and secured thereto. The trailing edge of the knife 26 is secured to the inside of the new web 12 by a number of adhesive strips 30. The new web 12 is held onto the new web roll 20 by a number of small adhesive strips 32. One end 34 of the knife 26 extends outwardly from the new web roll 20. The adhesive strip 28 will be on the inside of the new web 12 in contact with the new web roll 20. If the web material is not sufficiently glossy to release the adhesive 28 readily, a release tape should be provided on the new roll in a position to engage the adhesive 28. The paper carrier 27 can be perforated at 27b along the front edge of the knife 26 to aid in releasing the knife 26 from the new web.

FIG. 2 THROUGH 4

In accordance with the invention, the directional belt control apparatus 10 is used to guide the new web 12 and the knife 26 with the adhesive strip 28 into engagement with the expiring web 14. The apparatus 10 includes a frame 36 formed by means of a pair of sidewalls or plates 38 which are interconnected by cross rods 40 and pivotally mounted on a threaded shaft 42 provided in the tape-applying apparatus 18. The frame 36 is pivoted between operative and inoperative positions with respect to the new web roll 20 by means of a pneumatic piston and cylinder assembly 44 which is connected to one of the cross rods 40 and to a threaded shaft 46 provided in the tape-applying apparatus 18. The threaded shafts 42 and 46 are used to horizontally adjust the position of the directional control apparatus as more clearly described below.

The new web 12 is pressed against the running web 14 by means of a pair of nip rolls 48T and 48B which are mounted to rotate freely on shafts 50 journaled in the frame 36. The nip rolls 48T and 48B are mounted on roller bearings 52 which are secured to the shafts 50 and to each end of the nip rolls 48. The running web 14 which is assumed to be moving from right to left in the drawing, passes over the right-hand nip roll 48B and under the left-hand nip roll 48T.

The nip rolls 48 are normally spaced apart to allow the running web 14 to move freely between the nip rolls and are closed to press the new web 12 against the expiring web 14 when the splice is made between the new web 12 and the running web 14. This is accomplished by means of eccentric bearings 54 which are secured to the shafts 50 and are positioned in apertures 56 provided in the sideplates 38. In this last regard, the eccentric bearings 54 each include an eccentric cam 58 which is secured to the shaft 50 as shown in FIGS. 2 and 4. The eccentric cam 58 is mounted in a roller bearing 60 which is positioned in the aperture 56 provided in the sideplate 38. When one or the other of the shafts 50 are rotated, the eccentric cam 58 will rotate in the bearing 60 moving the corresponding shaft 50 toward the other shaft 50 and bringing the attached nip roll into engagement with the other nip roll, as more specifically described hereinafter. Each of the nip rolls 48 is provided with an outer covering of resilient material as described in Zernov U.S. Pat. No. 3,276,710.

Means are provided for stripping the new web 12 from the new web roll 20 and directing the new web 12 into the space between the nip rolls 48. Such means is in the form of a directional belt assembly 62 mounted on each of the shafts 50. These assemblies are selectively movable to a position in the path of motion of the outwardly projecting end 34 of the knife 26. The directional belt assemblies 62T and 62B, as shown in FIGS. 2 and 3, each include a support plate 64 which is rigidly secured to a cylindrical member 66 keyed to the shaft 50 and a belt pulley 68 on the outer end of the plate 64. An endless belt 70 is wrapped around each of the nip rolls 48 and the corresponding pulley 68.

Means are provided for biasing the pulley 68 outwardly from the corresponding shaft 50 to maintain tension in the endless belt 70. Such means includes a plate 72 supported between a pair of guides 74 secured to the support plate 64 and a spring 76 positioned between a stop 78 secured to the plate 64 and a block 80 secured to the plate 72. The pulley 68 is pushed inwardly toward the shaft 50 and against the bias of the spring 76 when the endless belt 70 is mounted on the nip roll and the pulley. On release of the pulley 68, the belt 70 will be pulled firmly against the nip roll 48.

FIGS. 7 AND 8

The directional belt assemblies 62 are moved from the operative positions shown in FIG. 3 to one of the operative positions shown in FIGS. 7 and 8 by means of a pneumatic piston and cylinder assembly 82. More particularly, these assemblies 82 each include a piston rod 86 which is pivotally connected to a link 84 on member 66 by a pin 88 and a cylinder 85 connected to the sideplate 38 by a pin 83. The piston rod 86 is normally extended and is withdrawn to rotate the member 66 until the pulley 68 on the corresponding directional belt assembly 62 is moved into engagement with the opposite nip roll 48. This can be seen in FIG. 7 where the left-hand directional belt assembly 62T has been rotated into engagement with the right-hand nip roll 48B. The endless belt 70 on the assembly 62T will follow the contour of the right-hand nip roll 48B by moving the pulley 68 against the bias of the spring 76. Rotation of the directional belt assembly 62T will also rotate the corresponding shaft 50 and the eccentric cam 58, moving the left-hand nip roll 48T into engagement with the right-hand nip roll 48B. The directional belt assembly will then be in a position to engage the outwardly extending end 34 of the knife 26 to direct the leading edge of the new web 12 into engagement with the running web 14.

FIGS. 5 AND 6

The directional belt assemblies 62 are aligned with the edge of the new web roll 22 by means of the threaded shafts 42 and 46 which are used to support the directional belt control apparatus 10. More particularly, a handwheel 90 is secured to the outer end of the threaded shaft 42 which is journaled in apertures provided in the sideplates 38. The shafts 42 and 46 are interconnected by means of a chain 92 mounted on sprockets 94 and 96 provided on the ends of the shafts 42 and 46. The frame 36 is initially moved upward toward the new web roll 20 by means of the air cylinder 44. The handwheel 90 is rotated to rotate the shafts 42 and 46 and move the apparatus 10 until the belt assemblies 62 are aligned with the new web 12.

OPERATION

Initially, the new web roll 20 is prepared for splicing by attaching the knife 26 and the paper carrier 27 with the adhesive strip 28 to the new web 12. If the web roll is rotating clockwise as shown in FIG. 7, the knife is applied to the outside of the new web with the adhesive exposed. The directional belt assembly is aligned with the new web roll 20 by rotating the handwheel 90. The web roll 20 is accelerated to the speed of the expiring web 14 and the directional belt control apparatus moved upward to the operative position by actuating the cylinder 44. When the splice is to be made, the left-hand directional belt assembly 62T is rotated until the pulley 68 engages the nip roll 48B. The outwardly projecting end 34 of the knife will engage the belt 70 which will follow the belt 70 around the periphery of the right-hand nip roll 48B stripping the leading edge of the new web from the web roll 20. The adhesive material 28 on the knife 26 will be pressed tightly against the running web 14 securing the lead edge of the new web 12 to the running web 14 as they pass between the nip rolls 48T and 48B.

If the web roll is rotating counterclockwise, as shown in FIG. 8, the knife 26 is secured to the inside of the new web 12 with the adhesive 28 pressed against the new web roll 20. The directional belt control apparatus is lined up with the new web roll as described above and the right-hand directional belt assembly 62B rotated into engagement with the left-hand nip roll 48T. The outwardly projecting end 34 of the knife 26 will engage the belt 70 on the right-hand assembly 62B and will follow the periphery of the left-hand nip roll 48T stripping the lead edge and knife 26 off of the web roll 20. The adhesive strip 28 will be moved into engagement with the running web 14. The splice is completed by passing through the tape-applying device 18.

I claim:

1. A web directional control apparatus for directing a new web on a continuously rotating web roll into engagement with a running web from an expiring web roll, the new web having the end of a knife extending outwardly from one side of the lead edge, said apparatus comprising:

A frame including a pair of sideplates,
a pair of nip rolls mounted for rotary motion on said plates,
a directional belt assembly operatively associated with each of said nip rolls, each of said assemblies including a directional belt, and

means for selectively moving one or the other of said directional belt assemblies to a position to engage the outwardly extending end of the knife whereby the directional belt on said selected assembly will guide the knife and the lead edge of the new web into engagement with the running web.

2. The apparatus according to claim 1 including means for moving said apparatus to align said directional belt assemblies with the side of said new web.

3. The apparatus according to claim 1 including means for supporting said nip rolls for movement toward and away from each other, said supporting means being operatively connected to the corresponding directional belt assembly for movement towards each other on movement of a directional belt assembly to a position to engage said knife.

4. The apparatus according to claim 1 wherein each of the belt assemblies includes a support plate mounted for pivotal movement on said sideplates, a belt pulley mounted on each of said support plates, and an endless belt trained around said belt pulley and the corresponding nip roll.

5. In a universal butt splicer, having a roll stand for supporting a new web roll and an expiring web roll,

a roll accelerator positioned to continuously rotate the new web roll and a tape-applicator assembly for applying tape to the splice formed in the running web,

an apparatus for attaching the new web to the running web, the new web having a knife attached thereto and extending outward from one side thereof, said apparatus comprising;

a frame including a pair of sideplates pivotally mounted on said tape-applicating assembly,

a pair of nip rolls mounted for rotary motion on said sideplates,

a directional belt assembly operatively associated with each nip roll, and

means for selectively moving one or the other of said belt assemblies to a position to engage the outwardly extending end of said knife whereby the outwardly projecting end of the knife will be guided by the directional belt assembly into the nip rolls for engagement with the running web.

6. The butt splicer according to claim 5 wherein said apparatus includes means for moving said nip rolls towards each other,

said moving means being operatively associated with said belt assembly whereby the nip roll corresponding to the selected belt assembly is moved toward the other nip roll on movement of the selected belt assembly.

7. The butt splicer according to claim 6 wherein said moving means comprises an eccentric cam pivotally mounted in

said side plates and operatively connected to said nip rolls.

8. The butt splicer according to claim 5 wherein each of said directional belt assemblies includes a support plate, mounted for pivotal movement with said nip roll,

a belt pulley secured to the outer end of said support plate, and a directional belt mounted on said pulley and the corresponding one of said nip rolls.

9. The butt splicer according to claim 7 including means for biasing said belt pulley outwardly from said nip roll, whereby said belt on said selected assembly will assume the contour of the other nip roll.

10. A web control apparatus for a butt joint splicer having a new web roll mounted for connection to a running web, the new web roll having a knife with an adhesive strip thereon mounted on the leading edge of the new web and extending outward from the leading edge thereof, said apparatus comprising:

a frame having a pair of sideplates,

a pair of shafts mounted in said sideplates,

a nip roll mounted for rotary motion on each of said shafts,

a directional belt assembly mounted for pivotal movement on each of said shafts, each assembly including a belt trained around the corresponding nip roll,

and means for selectively moving one or the other of said assemblies to an operative position to engage the knife when the new web is to be attached to the running web.

11. The apparatus according to claim 10 including

means for moving said nip rolls toward each other on movement of the selected belt assembly to the operative position.

12. The apparatus according to claim 11 wherein each of said assemblies includes means for biasing said belts into tight engagement with said nip roll.

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