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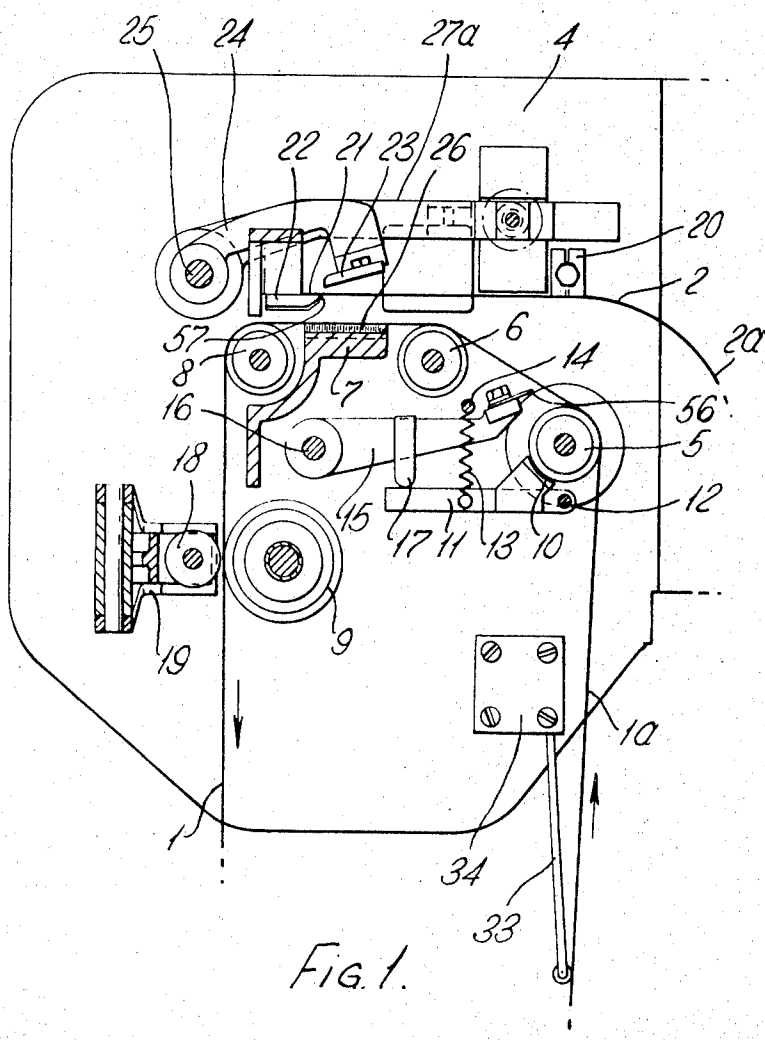
R. W. HARRIS ET AL

3,728,197

SPlicing APPARATUS FOR SPlicing THE ADHESIVE LEADING
END OF A WAITING WEB ONTO A RUNNING WEB

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2 Sheets-Sheet 1



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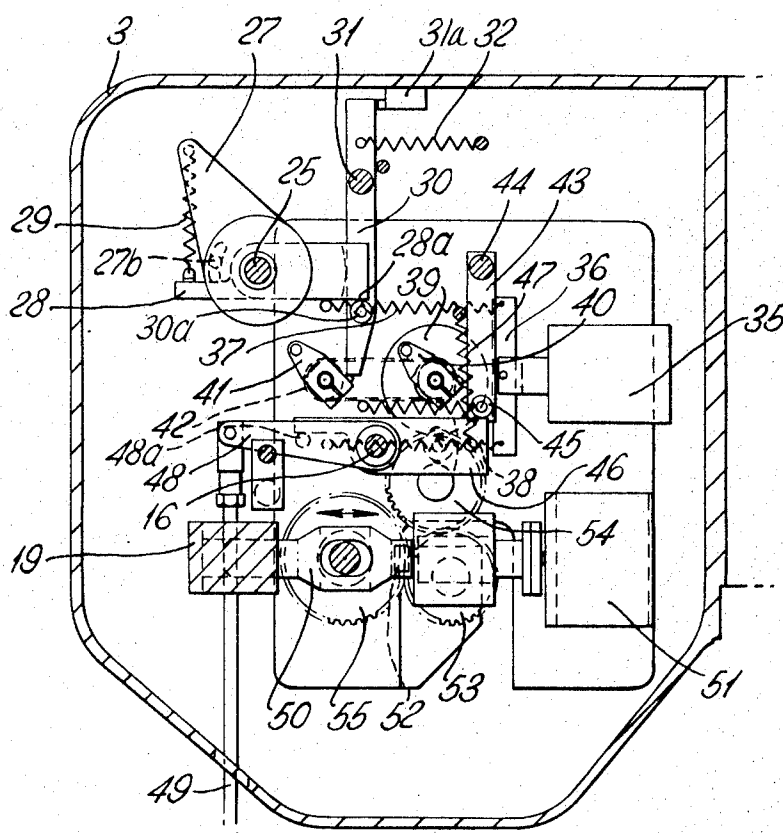


Fig. 2.

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SPLICING APPARATUS FOR SPLICING THE ADHESIVE LEADING END OF A WAITING WEB ONTO A RUNNING WEB

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10 Claims

ABSTRACT OF THE DISCLOSURE

A splicing arrangement in which a new wrapper web is spliced to a nearly-exhausted old web by means of adhesive tape, there being slack in the new web at the time of splicing, and when the splice has been made the old web is driven by driving rollers at a point downstream of the splicer faster than it is being consumed until the splice has passed the driving means and the slack in the new web is taken up, the driving at the higher speed then serving to accelerate the reel of the new web. When the reel has reached working speed the drive is discontinued.

The present invention relates to methods of splicing and splicing apparatus and is more particularly concerned with methods and apparatus for splicing together the trailing end of a running wrapper web and the leading end of a waiting wrapper web in order to provide a continuous supply of wrapper web to a wrapping machine.

According to the present invention there is provided a method of splicing the leading end of a waiting web to the trailing end of a running web being drawn from its reel at a first rate by tension applied to the web at a first location, comprising causing the leading end of the waiting web to adhere to the running web, and driving the waiting web at a second location upstream of the splice to drive the waiting web at a second and greater rate after the splice has been made to accelerate the reel to its running speed.

The splice may be made while there is slack in the waiting web between the splice and the reel of the waiting web and the drive at the second rate may be initially applied to the running web downstream of the splice so that the waiting web is slack until the splice has passed the location of the second drive.

The drive of the waiting web at the greater rate may be discontinued before the splice reaches the first location so that the splice then transmits the driving tension.

Further according to the invention there is provided splicing apparatus for splicing the leading end of a waiting web to the trailing end of a running web being drawn through the splicing apparatus at a first rate from a first location downstream thereof comprising splicing means to bring the leading end of the waiting web and the running web together to cause adhesion and driving means upstream of the first location and operable after the splice has been made to drive the waiting web at a second and greater rate.

The driving means may be downstream of the splicing means and may comprise two rollers between which the web passes, at least one thereof being a driven roller and at least one thereof being movable towards the other to sandwich the web therebetween.

How the invention may be carried out will now be described, by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is a front elevational view of one embodiment of the invention; and

FIG. 2 is a view taken in the same direction as FIG. 1

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but with the mounting plate removed in order to show the mechanisms behind the plate for operating those parts shown in FIG. 1.

The splicing apparatus illustrated is designed for incorporation in the wrapper feed to a wrapping machine and is designed to splice the trailing end of a running web of cellophane, which is being drawn into the wrapping machine, onto the leading end of a waiting web of cellophane wrapper. The running web is indicated by the reference numeral 1 and the waiting web by the reference numeral 2.

The apparatus has a casing 3 on which a plate 4 is mounted, the arrangement shown in FIG. 1 being on the front of the plate 4 and the arrangement shown in FIG. 2 being behind the plate 4.

The path of the running web 1 passes around a suction roller 5, over an idler roller 6, across a splicing platform 7, round a second idler roller 8 and past and in contact with the periphery of a driving roller 9.

The suction roller 5 has a brake associated with it. The brake comprises a friction member 10 mounted on an arm 11 which is pivotally mounted at 12 to the plate 4. A tension spring 13 interconnects the arm 11 and a fixed peg 14 on the plate 4 and acts to tend to rotate the arm 11 in a clockwise direction about the pivot 12 to apply the friction member 10 to the periphery of the suction roller 5 in order to brake it.

A cutting blade 56 is mounted on an arm 15 which is pivotally mounted at 16 to the plate 4. The arm 15 carries a stop 17 which abuts the free end of the arm 11 in order to inhibit the latter's rotation in a clockwise direction. When the arm 15 is rotated in a counterclockwise direction in order to cause the blade 56 to sever the running web 1, the rotation will also move the stop 17 and allow the spring 13 to act to rotate the arm 11 in a clockwise direction in order to apply the friction member 10 to the suction roller 5.

An idler roller 18 is associated with the driving roller 9. The idler roller 18 is carried by a mounting 19 which is movable towards and away from the driving roller 9, by the arrangement shown in FIG. 2, to be referred to later, in order to nip the running web between the idler roller 18 and the driving roller 9 and thus cause the running web 1 to be driven by the driving roller 9. The drive arrangement for the roller 9 is shown in FIG. 2 and is designed to drive the web 1 at a higher linear speed than it is drawn by the wrapping machine (not shown) which is positioned downstream of the driving roller 9. Thus, the driving roller 9 is operative to pull the web 2 off the waiting reel against the inertia of the latter, after the splice has been formed.

The leading end of the waiting web 2 is supported at a point short of its actual end by suction applied to a member 20 under which the waiting web passes. The actual end of the leading end of the web 2 has a length of adhesive material, e.g. adhesive tape 21, stuck to it, the free end of the tape 21 being in contact with a support 22.

A cutting blade 23 is mounted on an arm 24 which is secured on a shaft 25 which passes through the plate 4. The arm 24 is shown in a position in which the blade 23 is inoperative, the arm 24 being held in this position by an arrangement shown in FIG. 2 and described later.

In order to splice the waiting web 2 to the running web 1 suction is cut off from the member 20 and the arm 24 is pivoted in a clockwise direction to cause the blade 23 to sever the adhesive tape 21 against a stationary cutting edge 57 and carry the leading end of the waiting web 2 downwardly onto the portion of the running web 1 which passes over a splicing platform 7. The splicing platform 7 carries a piece of carpet 26, or the like resilient material having a pile or tufts or bristles, against which the

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blade 23 can press the two webs to splice them together. The pile of the carpet is leaning in the direction of movement of the web.

Simultaneously or immediately after the splice is made the arm 15 is rotated counterclockwise in order to cause the blade 56 to sever the running web 1. This movement of the arm 15 also applies the brake to the suction roller 5 which thus holds the waste end 1a. At the same time the idler roller 18 is moved to the right as viewed in FIG. 1 in order to nip the running web 1 between itself and the driving roller 9 in the manner described earlier.

In setting up the waiting web 2 a loop 2a is formed in the web between its leading end and the reel from which it is to be unwound. The purpose of this loop is to enable the splice to be drawn through the nip between the rollers 9 and 18 without tension being applied to it. After passing through this nip the splice will still not be subjected to tension because of the slack formed between the rollers 9, 18 and the wrapping machine drive. After the slack in the web 2 between these rollers 9, 18 and the reel is taken up and the reel has been brought up to speed, the drive of the idler roller 18 is discontinued by the roller 9 moving away from the drive roller 9 and the splice is subjected to the normal driving tension in the web 2. The drive of the rollers 9, 18 could be continued until the splice has passed into the wrapping machine so that the splice is not subjected even to the normal driving tension.

The mechanism for effecting the movements previously described with reference to FIG. 1 will now be described with reference to FIG. 2.

In FIG. 2 the same reference numerals have been used to indicate parts corresponding to those shown in FIG. 1.

An arm 27 which is pivoted about the shaft 25 is held fixed with respect to the plate 4 by a lever 27a (FIG. 1). A further arm 28 is secured in the shaft 225 and has one end connected to the arm 27 by a tension spring 29 and the other end has a cam surface 28a.

A detent arm 30 is pivoted at 31 to the plate 4 and one end of it is urged in a clockwise direction by a tension spring 32 against a stop 31a which is mounted on the casing 3. The other end of the arm 30 carries a roller 30a which abuts the cam surface 28a.

The splicing arm 24 (FIG. 1) is thus held in its operative position by the detent arm 30 against the action of the tension spring 29 which is tending to rotate the arm 28 in a clockwise direction about the shaft 25.

The arrangement for releasing the detent arm 30 will now be described.

A spring loaded sensor arm 33 (FIG. 1) is connected to an electrical switch 34 mounted on the plate 4. The free end of the sensor arm 33 is positioned to contact the running web 1 and the tension in the running web 1 is such as to hold the electrical switch 34 open. However, when the trailing end of the running web 1 passes the sensor arm 33 i.e. when the reel is exhausted, the tension drops and the spring loaded sensor arm 33 moves in a counterclockwise direction to close the switch 34.

Switch 34 is electrically connected to a solenoid 35 (FIG. 2) so that when the switch 34 is closed the solenoid 35 is energised.

The solenoid 35 has an actuating member 36 which is pulled by tension springs 37 and 38 to the left as viewed in FIG. 2. The springs 37 and 38 act to hold the actuating member 36 in contact with the periphery of one of two rotary members of a one-revolution clutch 39. A trip arm 40 is mounted coaxially with the clutch 39.

A second trip arm 41 is rotatably mounted on the casing 3 and is drivably connected by a notched or toothed band 42 to the clutch 39.

A detent arm 43 is pivotally mounted at 44 to the casing 3 and its free end carries a roller 45 which abuts the top right hand end of a pivotal arm 46.

The arm 46 is secured to the shaft 16 and urged to rotate in a counterclockwise direction by tension spring 47 but is prevented from doing so by the detent arm 43.

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Also mounted on the shaft 16 is a further arm 48 which is rotatable about the shaft 16 by means of a rod 49 (FIG. 2).

The mounting 19, on which the idler roller 18 (FIG. 1) is carried by a member 50 which is movable in the direction of the double headed arrow by means of a vaned rotary member 51 which is drivably connected to the member 50 by a snail cam 52. The rotary member 51 is driven by compressed air to bring the idler roller 18 into or out of driving engagement with the driving roller 9 for the purpose described above.

The manner in which the above mechanisms operate will now be described.

When the running web 1 runs out the sensor arm 33 moves counterclockwise in order to operate the switch 34. This in turn energises the solenoid 35 to cause the actuating member 36 to be moved to the right against the springs 37 and 38. This releases the clutch 40 and enables it to make one revolution. This rotary movement causes the trip arm 40 to strike the detent arm 43 and rotate it in a counterclockwise direction. This in turn brings the roller 45 carried by the detent arm 43 out of engagement with the arm 46 allowing the latter to rotate in a counterclockwise direction under the influence of the tension spring 47. This in turn causes rotation of the shaft 16 which results in rotation of the arm 15 (FIG. 1) in a counterclockwise direction to cause the knife 56 to sever the running web, as described earlier.

At the same time the rotation of the clutch 39 results in the second trip arm 41 being rotated in a clockwise direction by means of the drive band 42. This rotation of the trip arm 41 causes the latter to strike the detent arm 30 and pivot it in a counterclockwise direction about the pivot 31, against the action of the tension spring 32. This movement brings the roller 30a of the detent arm 30 out of contact with the cam surface 28a on the arm 28.

The tension spring 29 then acts to rotate the arm 28 in a clockwise direction and thus rotate the shaft 25. This in turn results in clockwise rotation of the splicing arm 24 to move the knife 23 into the splicing position.

At substantially the same time as the severing of the running web by the knife 56 is occurring and the splicing arm 24 is rotating to effect the splice, the vaned rotary member 51 is energised in order to cause the idler wheel 18 to move to the right, as viewed in FIG. 1, in order to nip the running web between itself and the drive roller 9 and thus cause the running web downstream of the driving roller 9 to remain relatively slack until the splice has entered the wrapping machine.

The drive for the various mechanisms described above is provided by an input gear 53 which meshes firstly with a gear 54 for driving the one revolution clutch 39 and secondly with a gear 55 for driving the roller 9.

After the splicing has occurred the reel of the web 2 is moved into the position previously occupied by the reel of the web 1, the scrap end of the latter having been removed. This can be done by having a support with two arms, the free ends of each of the arms being adapted to support a reel of wrapper web, one reel being in the position of the running web reel 1, the second reel being in the position of the waiting web 2. Thus when the running web has been exhausted and the waiting web 2 has been moved into the position previously occupied by the web 1 by rotation of the support, a further reel of wrapper web is loaded into the position previously occupied by the reel of the wrapper 2.

When a splice has been made the splicing arm 24 is restored to its inactive position by moving lever 27a in an anticlockwise direction, causing arm 27 to rotate in the same direction and to release the tension in spring 29. Upon further movement of the arm 27 a stop 27b mounted thereon engages the arm 28 and rotates it also in an anticlockwise direction. This causes the cam surface 28a to move upwards and allow the roller 30a of detent arm

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30 to snap back into position below it under the influence of the spring 32.

In a similar manner the arm 15 reset by moving the rod 49 upwards to rotate the arm 48 clockwise. A stop 48a mounted on the arm 48 engages arm 46 and causes it also to rotate clockwise, allowing the roller 45 of detent arm 43 to snap back into position above the top right hand end of arm 46 under the influence of spring 47.

It is contemplated that rotation of the reel support may provide automatic resetting of the cutting arm 15. Thus rod 49 could be operated by a cam mounted on the axis of the reel support to ensure that upon movement of the reel of waiting web 2 into the position of the running web 1 the cutting blade 56 is retracted to prevent damage to the new web.

What we claim as our invention and desire to secure by Letters Patent is:

1. In a splicing apparatus for splicing the adhesive leading end of a waiting web to the trailing end of a running web being drawn through the splicing apparatus at a first rate from a first location downstream thereof the improvement comprising splicing means to bring the leading end of the waiting web and the running web together to cause adhesion therebetween, driving means upstream of the splicing means for directly driving the waiting web at a second and greater rate and means for actuating said splicing means and said driving means in sequential order.

2. Splicing apparatus as claimed in claim 1 wherein the driving means is downstream of the splicing means.

3. Splicing apparatus as claimed in claim 1 wherein the driving means comprises two rollers between which the web passes, at least one thereof being a driven roller and means for moving at least one roller towards the other to sandwich the web therebetween.

4. Splicing apparatus for splicing the adhesive leading end of a waiting web onto a running web, comprising support means providing a length of slack in the waiting web, splicing means actuable to move said leading end into adhering contact with the running web, and a pair of rollers spaced downstream of the splicing means for accelerating the waiting web and including a drivable roller rotatable at a peripheral speed greater than the normal speed of the running web and an idler roller movable towards the driving roller upon actuation of the splicing means to engage the web therebetween, said support means defining such a length of slack relative to the downstream spacing of the rollers that after a splice is formed the

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splice passes through, and is consolidated in, the nip of the rollers before the slack is fully taken up, so that the rollers accelerate the waiting web without applying tension to the splice.

5. Splicing apparatus as claimed in claim 4 wherein the support means comprises a member having an opening connected to a source of suction for suspending the waiting web at an area spaced from said leading end, and means for cutting off suction to the opening upon actuation of the splicing means.

6. Splicing apparatus as claimed in claim 4 wherein the splicing means comprises a splicing platform against which the two webs are pressed, a pivoted splicing arm to press the webs against the platform and a support to which part of the adhesive leading end of the waiting web is held, the splicing arm carrying a knife which severs said part of the adhesive leading end as the splicing arm moves to perform the splice.

7. Splicing apparatus as claimed in claim 6 wherein the splicing platform is surfaced with tufted material with the pile leaning in the direction of movement of the web.

8. Splicing apparatus as claimed in claim 4 and comprising a tension sensor operable on the running web to sense tension therein and operable to actuate the splicing means when the trailing end of the running web passes the sensor.

9. Splicing apparatus as claimed in claim 8 wherein the sensor causes energisation of a solenoid which operates a single revolution clutch to operate the splicing means.

10. Splicing apparatus as claimed in claim 8 further comprising a cutting means to cut the running web between the splicing means and the sensor, the cutting means being operable by the single revolution clutch.

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