

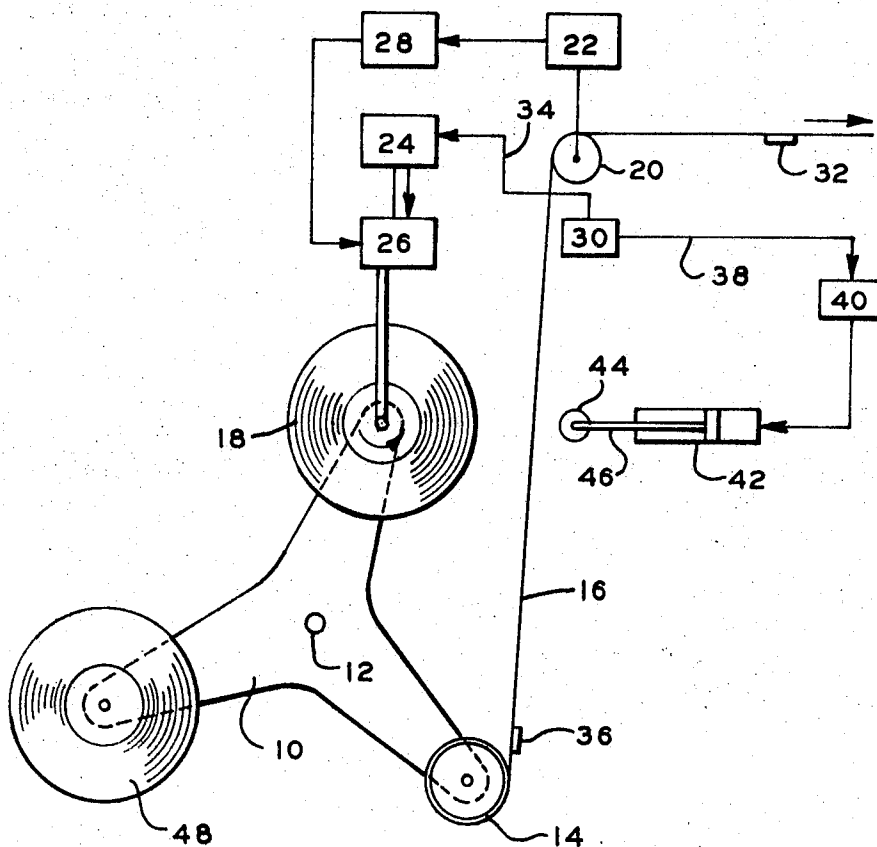
March 2, 1971

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3,567,534

AUTOMATIC WEB SPLICING SYSTEM AND METHOD

Filed Oct. 23, 1968



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3,567,534

AUTOMATIC WEB SPLICING SYSTEM AND METHOD

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Filed Oct. 23, 1968, Ser. No. 769,946

Claims priority, application Japan, Nov. 6, 1967,
42/70,957

Int. Cl. G01p 3/00

U.S. Cl. 156—64

9 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for splicing the trailing end of a first moving web or strip to the leading end of a second strip by providing an index mark on the first strip a predetermined distance in advance of the trailing end and moving the trailing and leading ends into sealing engagement at the proper time in response to the sensing of such mark. The second strip is preferably provided in coil form and the coil is caused to rotate at a speed dependent on the speed of travel of the first strip and the radius of the coil, whereby the trailing and leading ends are moving at substantially the same speed when brought into engagement with one another.

This invention relates to a novel method and system for splicing the trailing end of a moving web or strip to the leading end of a second strip provided in coil form and, more specifically, to a method and system for effecting such splicing without interrupting the speed of movement of the strip while remaining relatively simple and inexpensive in manufacture. Although the invention is suitable for use in a wide variety of applications involving moving webs and strips of flexible material, it is especially useful in connection with newspaper printing rotary presses and roto-gravure presses.

In operations involving moving webs the materials are commonly supplied in roll or coil form initially. It is often desirable when one coil has been completely unwound to splice the trailing end to another coil of the same material so that the process may be continued without interruption. It is possible, of course, to temporarily stop or sufficiently lower the speed of travel of the strip so that the splicing operation may be carried out manually, but this is often undesirable since it may lead to difficulties or ineconomies in the process being carried out on the strip. A number of methods have been devised for effecting automatic splicing of the trailing end of one strip to the leading end of another. For example, the length of strip remaining may be calculated from apparatus which senses the rotational velocity and computes the decreasing coil diameter and hence the length of strip left on the coil. According to another method, the length of strip that has been paid out is measured and the remaining length calculated by knowing the initial total length. Such methods are quite expensive to implement, however, and do not consistently provide the necessary accuracy.

A principle object of the present invention is to provide a method and system for splicing the trailing end of one coil of a traveling web to the leading end of a second coil in a completely automatic manner without interruption of the speed at which the web is traveling in a simple and efficient manner.

An additional object is to provide a method for splicing together the trailing and leading ends of two strips of material during longitudinal movement thereof without regard to line speed by utilizing an index mark placed on the first strip a predetermined distance in advance of the trailing end thereof.

A further object is to provide a web splicing system

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which includes means for rotating a coil containing a strip of material having a leading end to be spliced to the trailing end of a traveling web in such a way that the peripheral speed of the coil matches the line speed of a traveling web, and means for effecting movement of the trailing and leading ends into sealing engagement in response to mechanism which senses an index mark near the trailing end.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

The single figure is a diagrammatic illustration showing the operation of the method and system of the invention.

Three-armed support stand 10 is mounted for rotation upon center pivot 12 and includes means for holding coils of wound strip material on each of its three arms. As shown, a first roll 14 of moving strip material 16 is supported on one of the arms and a new roll 18 is supported on another. Web 16 is engaged at some point in its travel and driven at some desired speed over idler roll 20 as it unwinds from coil 14. Speed sensing means, indicated diagrammatically by block 22, are provided to generate a signal in accordance with the speed of rotation of idler roll 20, and hence the line speed of web 16. Sensing means 22 may comprise, for example, a conventional tachometer generator. Suitable drive means, such as an electric motor, indicated by reference numeral 24 are provided to impart rotation to coil 18. Suitable speed control means, indicated by block 26, are provided between motor 24 and coil 18 so that the speed of rotation of the latter is governed in accordance with the speed of travel of web 16 and the diameter of coil 18. The reference numeral 28 denotes suitable circuitry for combining the output signal of sensing means 22 and a pre-programmed signal commensurate with the diameter of roll 18. The speed-governing mechanism 26 is responsive to the output of circuit means 28 in such a way that the speed of movement of a point on the periphery of coil 18 is substantially equal to the line speed of web 16.

Suitable indexing means are provided on web 16 at preselected points, prior to the winding thereof on coil 14. The indexing means may comprise any means which is applied to, cut from, etc., web 16 so as to be distinguishable from the remainder of the web by sensing means 30. The sensing means is of any suitable, conventional type compatible with the indexing means associated with web 16. For example, sensing means 30 may be of the type adapted to generate an electrical output pulse or other signal in response to actuation by magnetic, photo-electric, mechanical, or other means. Since coil 18 must be rotating at the proper speed in the previously described manner only at such times as web 16 is brought into contact therewith, a first indexing means 32 is provided on web 16 to cause sensing means 30 to generate a signal, operative through line 34, to turn on motor 24. In response to the sensing of a second indexing mark 36, sensor 30 provides an output signal through line 38 to controller 40. The latter actuates cylinder 42 to cause forward movement of pusher roll 44 rotatably mounted on the end of piston rod 46. Roll 44 contacts web 16 near the trailing end thereof and pushes the latter into contact with the periphery of coil 18. A suitable sealing means, such as a pressure sensitive adhesive, is provided on the trailing end of web 16 or the leading end of the web on coil 18,

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or both, so that the two-strips are joined by the mutual contact. The actuating means for moving the ends of the two webs into engagement may take many forms other than that illustrated, of course, other examples being spring loaded or solenoid operated plungers. Also, means could be provided for rotating support stand 10 to bring coil 18 into engagement with web 16, with a suitable back-up roll provided for the latter, rather than the reverse.

Since the leading end of the web on coil 18 will be moving at substantially the same speed as the trailing end of web 16, as previously described, there will be no sudden change in the load on the system, and hence no appreciable change in line speed. Once the splice has been effected and the web from coil 18 is drawn through the line by the same means previously driving web 16, motor 24 and speed control means 26 therefore may be disconnected from the coupling through which rotation is imparted to coil 18. Support stand 10 may then be rotated so that coil 18 will occupy the position previously occupied by coil 14. Coil 48, the diameter of which has been previously measured and programmed as a constant input to circuit means 28, will then be in position to be rotated by motor 24 when the first indexing means on the web from coil 18 passes sensing means 30. The previously described process will then be repeated when the web from coil 18 is exhausted.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained. Since certain changes may be made in carrying out the above method and in the construction set forth without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An automatic web splicing system for effecting sealing engagement of the trailing end of a first moving strip to the leading end of a second strip, initially stored in coil form, thereby forming a continuous moving strip, said system comprising:

- (a) first means for sensing the speed of travel of said first strip;
- (b) second means, responsive to said first means, for rotating said coil at a speed such that the periphery thereof is moving at substantially said speed of travel of said first strip;
- (c) third means for sensing a position on said first strip a predetermined distance in advance of said trailing end; and
- (d) fourth means operable in response to a signal from said third means upon sensing of said position to cause movement of said trailing and leading edges into sealing engagement with one another.

2. The invention according to claim 1 wherein said first strip passes over and effects rotation of a roller and said first means comprises apparatus effective to develop a first output signal commensurate with the speed of rotation of said roller.

3. The invention according to claim 1 wherein said second means includes apparatus adapted to receive as inputs said first output signal and a value commensurate

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with the radius of said coil and to provide, in accordance therewith, a second output signal effective to rotate said coil at said aforementioned speed.

4. The invention according to claim 1 wherein said third means comprise sensing means positioned in proximity to the path of movement of said first strip and effective to generate a signal in response to passage thereby of indexing means associated with said strip.

5. The method of splicing the trailing end of a first longitudinally traveling strip to the leading end of a second strip initially stored in coiled form, said method comprising:

- (a) measuring the speed at which said first strip is traveling;
- (b) rotating the coil of said second strip so that the periphery thereof is moving at substantially said speed of travel of said first strip;
- (c) providing primary indexing means on said first strip a predetermined distance in advance of said trailing end;
- (d) moving said trailing and leading ends into contact with one another in response to said primary indexing means moving past a predetermined station; and
- (e) effecting sealing engagement of said trailing and leading ends upon contact thereof.

6. The method according to claim 5 wherein said first strip passes over and effects rotation of a roller, and the speed of travel of said first strip is measured by measuring the speed of rotation of said roller.

7. The method according to claim 5 wherein means effective to generate a signal in response to proximity of said primary indexing means are placed at said predetermined station and said trailing and leading ends are moved into contact in response to said signal.

8. The invention according to claim 7 and further including providing secondary indexing means on said first strip a predetermined distance in advance of said first indexing means and initiating rotation of said coil in response to sensing of said secondary indexing means.

9. The invention according to claim 8 wherein said secondary indexing means are sensed by said signal generating means and said rotation is initiated in response to a signal generated thereby.

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U.S. Cl. X.R.

156—157, 351, 361, 364, 378, 543