United States Patent [19]

Bossons et al.

[11] **3,741,079**

[45] **June 26, 1973**

[54] **WEB SPLICING METHODS**

[75] Inventors: **Walter Howard Bossons; Horst Lindstaedt,** both of Summerstown, London, England

[73] Assignee: **Masson Scott Thrissell Engineering Limited,** London, England

[22] Filed: **Oct. 13, 1970**

[21] Appl. No.: **80,336**

[30] **Foreign Application Priority Data**

Oct. 16, 1969 Great Britain 50,904/69

[52] **U.S. Cl.** **93/1.1,** 156/157, 156/253, 156/502, 242/58.1, 242/58.1

[51] **Int. Cl.** **B31f 5/02**

[58] **Field of Search** ..... 156/91, 92, 157, 156/250, 252, 502, 507, 253; 242/58.1, 58.4; 161/109–112, 114; 24/67 R; 93/1.1, 94 FC

[56] **References Cited**

UNITED STATES PATENTS

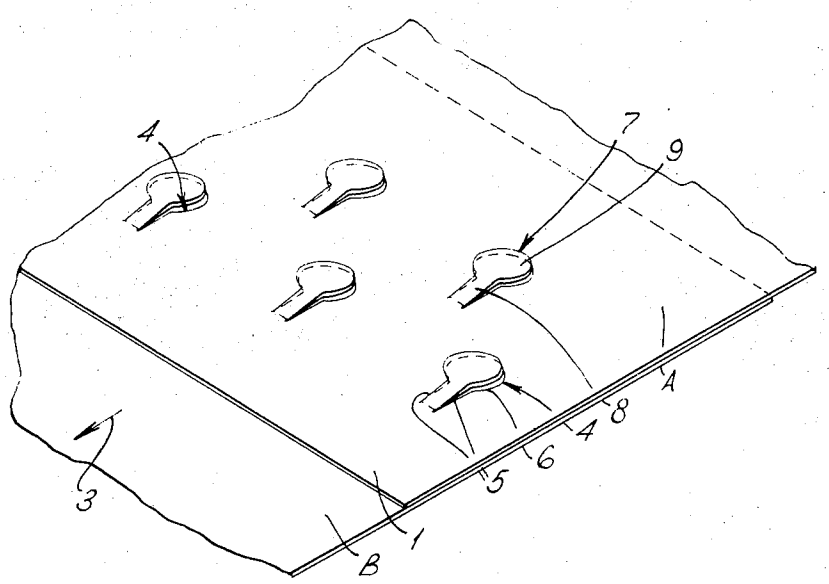
1,148,672	8/1915	Geesler	93/1.1
1,850,071	3/1932	Boyer	242/58.1
2,002,554	5/1935	Townley	93/1.1
2,083,538	6/1937	Affelder	93/94 FC
2,246,655	6/1941	Bacon	156/502 X
2,370,734	3/1945	Jost	161/110

Primary Examiner—Edward G. Whitby
Attorney—Lowry, Rinehart, Markva & Smith

[57] **ABSTRACT**

A method of splicing two webs of paper being fed in overlapping relationship in which slits are cut in both webs simultaneously to form identical superimposed tabs which are then bent in the same direction out of the plane of the webs, to interlock the webs.

4 Claims, 5 Drawing Figures



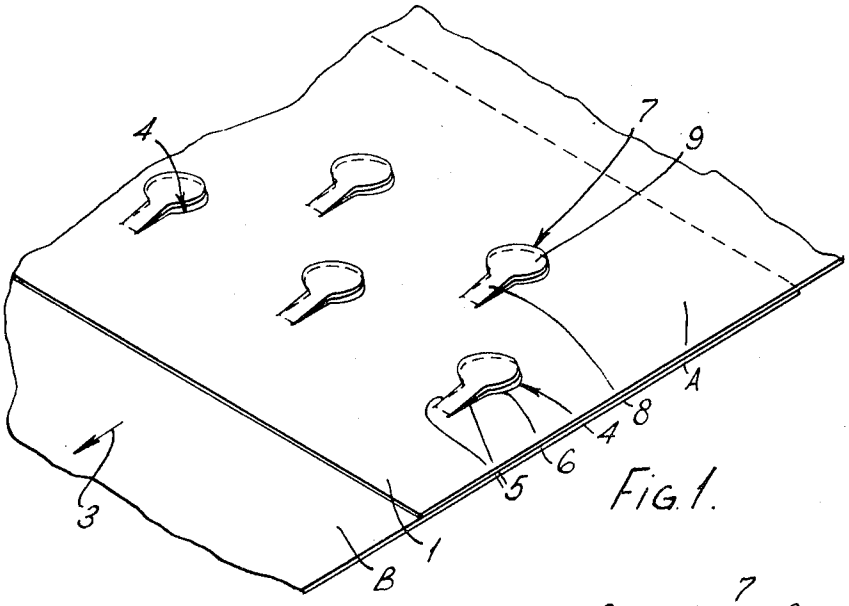


FIG. 1.

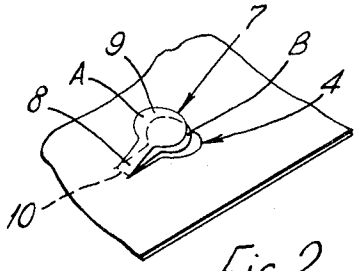


FIG. 2.

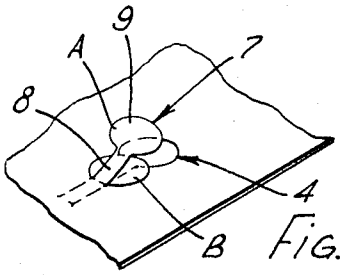


FIG. 3.

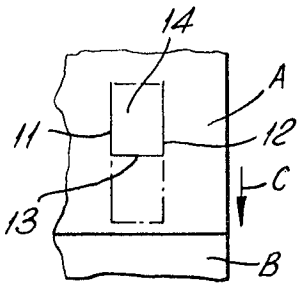


FIG. 4.

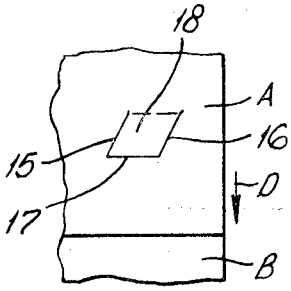


FIG. 5.

INVENTORS
WALTER HOWARD BOSSONS
and HORST LINDSTAEDT
BY: Markva, Smith + Kruger
ATTORNEYS

WEB SPLICING METHODS

This invention relates to the splicing of webs of paper, card or the like.

A variety of types of machine are fed with continuous webs of material such as paper or card, for example paper cutting machines which simply separate the continuous web into sheets of required size, and rotary printing machines. The web of material is supplied to the machine wound upon a reel, and as a reel becomes exhausted, it is common practice to splice the trailing end of the web to the leading end of a web from a new reel, as this avoids the necessity for re-threading the web through the machine which is often difficult. However, the splicing mechanisms hitherto used have required the two webs to be spliced to be stationary during the actual splicing operation. To avoid stopping the whole machine during the splicing operation, it is possible to provide a so-called web accumulator between the splicing mechanism and the machine proper, such accumulator serving to store sufficient length of web to allow the machine to continue running while feed of web into the accumulator is stopped to allow a splice to be made.

Many modern web-fed machines run at such high speeds (for example a paper-cutter may have a web speed of over 300 feet per minute) that the size and cost of the web accumulator is objectionable; such an accumulator may well be 10 feet long.

It is an object of the present invention to provide an improved method of splicing two webs together which permits a splice to be made while the webs are in motion.

According to the invention there is provided a method of splicing two webs of paper, card or the like during lengthwise travel of said webs, comprising the steps of feeding a leading end portion of one of said webs in overlapping relationship with a trailing end portion of the other of said webs, cutting slits in both the overlapping portions simultaneously at each of a plurality of positions to form at each position a pair of identical tabs one in each web, each of which remains attached to its web along a line extending substantially transversely of the web, bending all the tabs of both webs in the same direction so that all the tabs of one of said portions project through the other of said portions.

The method according to the invention may, depending on the shape of tab formed by the cutting operation comprise the additional step of advancing said trailing end portion relative to said leading end portion.

It will be appreciated that when the tabs are bent, the tab of the one portion is able to project through the other portion because the simultaneous bending of the tab of the latter portion leaves a space through which the tab of the one portion may pass.

The tabs may be of a simple shape, e.g. in the shape of a parallelogram, and if they are so formed that their attachment to their respective webs is at the rear of the tab, considered in relation to the direction of lengthwise travel of the web, they are bent so that the tabs of the trailing end portion project through the leading end portion.

In one example of the abovementioned shape of tab, the tabs are formed in the shape of rectangles, so that the two opposite sides of the tabs which are not connected to their respective webs are parallel to the direction of lengthwise travel of the webs, in which case when the trailing end portion is advanced relative to the leading end portion, the root (that is, the end of the tab still attached to the web) of each tab of the trailing end portion comes into engagement with the edge of the leading portion from which the leading end of the associated tab of said leading end portion has been cut.

In a further example the tabs are formed in the shape of rhomboids so that the two opposite sides of the tabs which are not connected to their respective webs are oblique to the direction of lengthwise travel of the webs. In both of the above examples the tabs remain attached to their respective webs along a line extending substantially transversely of the web.

Preferably, each of the tabs remains secured to its web at the leading end of the tab, and the tabs are wider at their free (trailing) ends than at their roots. For example, each tab may be substantially in the form of a circular disc at its free end, the circular disc being integral with a narrower straight-sided stem, connecting the disc to the root of the tab. With this form of tab, having is root leading as previously stated, when the tabs are bent the circular disc forming the head of each tab of the trailing end portion is caused to project through the leading end portion, immediately below the corresponding tab of the latter portion. Then when the trailing end portion is advanced relative to the leading end portion, the circular disc comprising the head of each tab of the trailing end portion slides between the stem of the corresponding tab of the leading end portion and the exposed surface of the leading end portion adjacent to the space from which the stem of its tab has been moved. It will be appreciated that the splice thus formed is not liable to disturbance by bending of the tabs as with the simplier form of splice mentioned earlier.

This latter form of tab is at present preferred, and to assist in a full understanding of the invention, a more detailed description of a splice employing tabs of this form will now be given, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of two webs being spliced by a method embodying the invention, immediately after the slits have been cut;

FIG. 2 shows a part of the webs of FIG. 1, after bending of the tabs;

FIG. 3 is a view similar to FIG. 2, but with the webs in the relative positions they occupy when the splicing operation is finished;

FIG. 4 shows a modified shape of tab; and

FIG. 5 shows a further modified shape of tab.

As seen in FIG. 1 a paper web A has been fed to a position where its leading end portion 1 is in overlapping relationship with a trailing edge portion of another paper web B. Both webs are being fed at constant speed in the direction indicated by arrow 3, it being understood that the web B is feeding into a consuming machine (not shown) such as a paper cutter or a printing machine, and that it is required to join the web A to the web B so that the web A supplies the said machine as soon as the web B is exhausted.

As a first step in joining or splicing the two webs, slits 4 are cut through the overlapping end portions of said webs, and FIG. 1 illustrates the webs after such cutting has been effected. It will be seen that the slits 4 are each of a form similar to that of a keyhole, that is, each slit 4 comprises two parallel straight portions 5 connected by an arcuate portion 6. The webs are not how-

ever cut between the ends of the straight portions **5** of the slits **4** which are remote from the arcuate portions **6**, and thus each slit defines a tab **7** comprising a substantially rectangular stem **8** and a larger head **9** which is approximately a circular disc in shape — more exactly, the head is in the form of a major segment of a circle.

After the slits **4** have been cut at a plurality of positions in the overlapping end portions of the two webs, the cuts being made simultaneously through the two webs at each position, so that at each position there are in fact two identical tabs **7**, one in the web A and one in the web B, these tabs are bent out of the plane of their respective webs to a position as shown in FIG. **2**, that is, both tabs of each pair are bent in the same direction, so that the tab of each pair which is part of the web B extends through the hole in the web A created by the bending of the tab **7** of the latter web. The angle to which said tabs are bent must be sufficient for the head of each tab of the web B to be completely through the web A. Each tab bends about the uncut paper at the root of the tab, that is, between the ends of the straight portions **5** of the slits, as indicated by dashed line **10** (FIG. **2**).

As soon as the bending of the tabs has been completed, the web B is advanced slightly relative to the web A — obviously this can be done either by momentarily slowing the feed of the web A or by momentarily accelerating the web B — and this change in the relative positions of the two webs brings each pair of tabs to the relative positions shown in FIG. **3**. It will be seen from FIG. **3** that the advance of the web B relative to the web A has caused the tab **7** of the web B to move so that its head **9** is below the stem **8** of the corresponding tab of web A, and so long as there is some tension to keep the two webs in this relative position, the head of each tab of the web B is engaged between the stem of the corresponding tab of web A and the upper surface of the web A in the neighborhood of the tab. A form of splice has therefore been made between the two webs and as the web B continues to feed into the consuming machine (not shown) the web A will be drawn after it.

It will be appreciated that all the operations described can be performed without alteration of the speed at which the web B is feeding into the consuming machine (not shown). Furthermore, upon considering the relative positions of the parts as shown in FIG. **3**, it will be seen that normal feeding of the joined webs will not disturb the splice, for example, when the overlapped portions of the webs pass between feed rollers (not shown) the only effect will be to press each tab **7** of the web A down upon the head of the corresponding tab of the web B, so that in fact the engagement of each tab of the web B between the corresponding tab of web A and the upper surface of the latter web will be more secure.

Referring now to FIG. **4**, the webs A and B are arranged, as in FIG. **1**, in overlapping relationship, and being fed in the direction of arrow C. In this construction slits **11**, **12**, **13** are cut through the overlapping portions of the webs A, B, (the slits **11**, **12** being parallel to the lengthwise travel of the webs) to define rectangular tabs **14** (only the tab in web A being visible in FIG. **4**) which are bent out of the plane of their respective webs, as described in relation to tabs **7** of FIGS. **1**, **2** and **3**. The web B is then advanced relative to the web A so that the tab **14** formed in web B takes up the position shown in chain-dot line, at which time the root of the tab **14** in web B will abut the edge of that part of web A formed by the slit **13**.

Referring now to FIG. **5** the webs A, B, being fed in the direction of arrow D, are arranged as described with reference to FIG. **4** but in this construction the opposite side slits **15** and **16** are inclined to the direction of lengthwise travel of the web to define with the slit **17** rhomboidal tabs **18** (only the tab in web A being visible in FIG. **5**) which are bent out of the plane of their respective webs in the way described previously. In this construciton, because of the angle of the slits **15**, **16** there is no need for any relative movement to take place between the webs A, B in order to obtain the interlocking necessary to effect a splice between the webs A, B.

It will be seen that the method of the invention constitutes a simple but effective way of splicing two webs of paper or like material, which can be performed with the webs in motion, and thus there is no need to stop any associated machine when a splice is made nor need any form of accumulator or other reservoir be provided to permit continuous operation of an associated machine while the splice is being made. No splicing medium (e.g. adhesive tape) is required by the method of the invention, which moreover may be applied without difficulty to the splicing of two webs of different widths.

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

1. In a method of splicing two elongated webs of paper, card or the like during lengthwise travel of said webs, comprising the steps of feeding a leading end portion of one of said webs into overlapping relationship with a trailing end portion of the other of said webs, cutting slits in both the overlapping portions simultaneously at each of a plurality of positions to form at each position a pair of identical tabs, one in each web, each of which remains attached to its web along a line at the base of the tab extending substantially transversely of the length of the web, bending all the tabs of both webs in the same direction so that all the tabs of one of said portions project through the other of said portions, and advancing said trailing end portion relative to said leading end poriton, the improement comprising cutting said slits in such manner that each tab is substantially in the form of a circular disc at its free end, the circular disc being integral with a narrower straight sided stem connecting the disc to the root of the tab, so that when the tabs are bent, the circular disc forming the head of each tab of the trailing end portion is caused to project through the leading end portion, immediately below the corresponding tab of the latter portion, and when the trailing end portion is advanced relative to the leading end portion, the circular disc of each tab of the trailing end portion slides into engagement with the base of the corresponding tab of the leading end portion between the stem of the corresponding tab of the leading end portion and the exposed surface of the leading end portion adjacent to the space from which the stem of its tab has been removed preventing disengagement of said webs without relative movement of said leading end portion relative to said trailing end portion in the opposite direction by a distance at least equal to said advancement.

2. A method of splicing two elongated webs of paper, card or the like during their lengthwise travel, compris-

ing the steps of feeding the two webs in overlapping relationship, forming identical, superimposed pairs of tabs in said webs by a single slitting operation on both webs, each tab being connected to its web, along a line at the base of the tab extending substantially transversely of the length of the web, by a narrow portion and having a wider portion at its free end, bending both tabs simultaneously in the same direction so that the tab of one of the webs passes through the plane of the other web, and advancing one web relatively to the other so that the narrow portion of one tab of each pair slides along the slot vacated by the narrow portion of the other tab, until the wide portion of said one tab has been drawn to the end of said slot into engagement with the base of the other tab between the narrow portion of the other tab and the surface of the web adjacent the space from which the narrow portion of the other tab has been removed and locks the two webs together whereby said webs cannot be separated without first moving said webs relative to each other in the opposite direction by the same distance as the advancement of said webs relative to each other.

3. A method according to claim **2,** wherein the wide portions of said tabs take the form of substantially circular discs.

4. A method of splicing two elongated webs of paper, card or the like wherein each web includes at least one tab cut from the web material leaving an aperture therein, each tab comprising an elongated narrow portion connected to its web along a line at the base of the tab extending substantially transversely of the length of the web and a wider portion at its free end, and each aperture having a corresponding configuration, said method comprising

a. placing said webs in overlapping relationship with said tabs and apertures registering,

b. bending the pair of superimposed tabs in one direction such that the tab of one web passes through the aperture in the other, and

c. moving one web relative to the other in a direction such that the elongated narrow portion of the tab of said one web passes along the slot in the other web vacated by the narrow portion of the tab of the other web and the wide portion of the tab of said one web is engaged adjacent the base of the tab of the other web between the narrow portion of the tab of the other web and the surface of the other web locking said webs together,

d. whereby said webs cannot be separated without first moving said webs relative to each other by the same distance in the opposite direction.

* * * * *